DALI Ambient Sensor

iLumTech

Author: Anton Paus, DocID: 0013001, Date: 29/05/2017, DocVer: 1.1

Functionality

DALI Ambient Sensor is a sensing and regulation device. It can sense the Lux level and Correlated Colour Temperature (CCT). The values of Lux Level and CCT can be read by external application. However the sensor itself can be used for regulation of Tunable White luminaires. Three types of TW luminaires are supported:

Cold/Warm mode – single group address for cold, and single group address for warm channel
Brightness/CCT mode – single group address for Brightness, and single group address for CCT channel
Type 8 mode – single group address for both Brightness and CCT channels

All three modes can be used in parallel. Group addresses are used for the regulation. The user can independently activate Lux or CCT regulation. The regulation sends control commands to the group addresses in order to reach specified Lux and CCT values.

An extra function is used when Threshold Lux regulation is activated. This can be used for ON/OFF control – when the measured Lux level is higher than Final Lux Level (day condition) the OFF command is sent to brightness channel. If measured Lux level drops below Threshold Lux Level (night condition) the ON (Recall Max) command is sent to the brightness channel.

Another extra function is the reference function. Any DALI Ambient sensor can be set as the reference. This reference sensor then sends its measured values of Lux Level and CCT and another sensor (or sensors, defined by Group address sensor) stores these values as its final Lux Level and Final CCT Level. This can be useful in daylight simulation application (outdoor sensor works as reference) or when you want to keep all the luminaire in the same CCT settings (one TW luminaire acts as reference light source sensed by reference sensor).

Communication protocol

DALI Ambient Sensor appear as standard DALI slave device with standard commissioning support according to the IEC 62386-102 standard. The reported device type is 145.
From standard commands DALI Ambient Sensor supports Query status and Query Groups and as Add to Group / Remove from group commands. The commands connected with ambient light sensing and regulation are extended commands and Enable Device type 145 command must be used prior their usage. All extended commands **must be repeated within 100 ms** in order to be valid (the same behaviour as standard STORE DTR AS… commands). For transfer of values DTR (Data transfer register) and DTR 1 is used. DTR is used also for reading 16 bit values.

Extended commands for DALI Ambient Sensor:

Command number	**Command name**
224 (0xE0)	Query Sensor Status
225 (0xE1)	Toggle Cold/Warm Mode
226 (0xE2)	Toggle Brightness/CCT Mode

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227 (0xE3)	Toggle Type 8 Mode
228 (0xE4)	Toggle Lux Level Regulation
229 (0xE5)	Toggle CCT Regulation
230 (0xE6)	Query Sensor Timing Register
231 (0xE7)	Set Sensor Timing Register
232 (0xE8)	Query Lux Level
233 (0xE9)	Query CCT Level
234 (0xEA)	Query Final Lux Level
235 (0xEB)	Query Final CCT Level
236 (0xEC)	Set Final Lux Level
237 (0xED)	Set Final CCT Level
238 (0xEE)	Query Threshold Lux Level
239 (0xEF)	Set Threshold Lux Level
240 (0xF0)	Toggle Reference Function Mode
241 (0xF1)	Query Group Address Sensor
242 (0xF2)	Set Group Address Sensor
243 (0xF3)	Query Reference Sensor Timing
244 (0xF4)	Set Reference Sensor Timing
245 (0xF5)	Reserved
246 (0xF6)	Query Group Address Cold
247 (0xF7)	Set Group Address Cold
248 (0xF8)	Query Group Address Warm
249 (0xF9)	Set Group Address Warm
250 (0xFA)	Query Group Address Brightness
251 (0xFB)	Set Group Address Brightness
252 (0xFC)	Query Group Address CCT
253 (0xFD)	Set Group Address CCT
254 (0xFE)	Query Group Address Type 8
255 (0xFF)	Set Group Address Type 8

Examples abbreviations:

ENABLE DT 145: *193-145 (0xC1- 0x91)*

DTR: *163- data (0xA3- data)*

DTR1: *195- data (0xC3- data)*

READ_DTR: *address- 152 (address- 0x98)*

READ_DTR1: *address- 156 (address- 0x9C)*

Note:

Address value contains shifted short (A5:A0) or group address (G3:G0). In case of group address MSB bit must be set. In this document the address value is always used for sending command so LSB bit must be always set:

Example for short address: *0 A5 A4 A3 A2 A1 A0 1* *A range from 0 to 63*

Example for group address: *1 0 0 G3 G2 G1 G0 1* *G range from 0 to 15*

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The description of commands:

Query Sensor Status Command 224 (0xE0)

Response contains the status register of DALI Ambient Sensor. Each bit of the register works as flag:

Bit 0 (LSB): Cold/Warm regulation mode active (1)/ not active (0)
Bit 1: Brightness/CCT regulation mode active (1)/ not active (0)
Bit 2: DALI Device Type 8 regulation mode active (1)/ not active (0)
Bit 3: Lux regulation active (1)/ not active (0)
Bit 4: CCT regulation active (1)/ not active (0)
Bit 5: Measurement limit error – if set measured value is out of range (Lux or CCT)
Bit 6: Regulation limit error – if set the regulation doesn´t cause changes in measured values
Bit 7 (MSB): Threshold regulation active (1)/ not active (0)

Example:

ENABLE DT 145, address-224 (address-0xE0), < 100 ms, address-224 (address-0xE0) -> response

Toggle COLD/WARM Mode Command 225 (0xE1)

This command activates or deactivates Cold/Warm regulation mode. As result bit 0 in Status register should change its value.

Example:

ENABLE DT 145, address-225 (address-0xE1), < 100 ms, address-225 (address-0xE1)

Toggle Brightness/CCT Mode Command 226 (0xE2)

This command activates or deactivates Brightness/CCT regulation mode. As result bit 1 in Status register should change its value.

Example:

ENABLE DT 145, address-226 (address-0xE2), < 100 ms, address-226 (address-0xE2)

Toggle Type 8 Mode Command 227 (0xE3)

This command activates or deactivates Type 8 regulation mode. As result bit 2 in Status register should change its value.

Example:

ENABLE DT 145, address-227 (address-0xE3), < 100 ms, address-227 (address-0xE3)

Toggle Lux Regulation Command 228 (0xE4)

This command activates or deactivates Lux regulation (DTR = 0) or Threshold Lux regulation (DTR = 1). As result bit 3 and bit 7 in Status register should change their values. Only one of bits 3 and 7 can be active at the same time (defined in FW). When toggling bit 3, bit 7 is automatically cleared (and opposite).

Example:

ENABLE DT 145, address-228 (address-0xE4), < 100 ms, address-228 (address-0xE4)

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Toggle CCT Regulation **Command 229 (0xE5)**

This command activates or deactivates CCT regulation. As result bit 4 in Status register should change its value.

Example:

ENABLE DT 145, address-229 (address-0xE5), < 100 ms, address-229 (address-0xE5)

Query Sensor Timing **Command 230 (0xE6)**

Response contains the value of Sensor Timing register which controls the speed of regulation. The value written in this register represents period between two consecutive regulation commands in steps of 500 ms.

Example:

ENABLE DT 145, address-230 (address-0xE6), < 100 ms, address-230 (address-0xE6) -> response

Set Sensor Timing **Command 231 (0xE7)**

When this command is sent (repeated) the value written in DTR is stored inside Sensor Timing register which controls the speed of regulation. The value written in this register represents period between two consecutive regulation commands in steps of 500 ms.

Example:

DTR (with data)

ENABLE DT 145, address-231 (address-0xE7), < 100 ms, address-231 (address-0xE7)

Query Lux Level **Command 232 (0xE8)**

The measured Lux Level is 16 bit value. Higher byte is sent as response. Lower byte can be read from DTR after using this command.

Example:

ENABLE DT 145, address-232 (address-0xE8), < 100 ms, address-232 (address-0xE8)
-> response Higher byte

READ DTR -> response Lower Byte

Query CCT Level **Command 233 (0xE9)**

The measured CCT Level is 16 bit value. Higher byte is sent as response. Lower byte can be read from DTR after using this command.

Example:

ENABLE DT 145, address-233 (address-0xE9), < 100 ms, address-233 (address-0xE9)
-> response Higher byte

READ DTR -> response Lower Byte

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Query Final Lux Level **Command 234 (0xEA)**

The final Lux Level (used for regulation) is 16 bit value. Higher byte is sent as response. Lower byte can be read from DTR after using this command.

Example:

ENABLE DT 145, address-234 (address-0xEA), < 100 ms, address-234 (address-0xEA)
-> response Higher byte
READ DTR -> response Lower Byte

Query Final CCT Level **Command 235 (0xEB)**

The final CCT Level (used for regulation) is 16 bit value. Higher byte is sent as response. Lower byte can be read from DTR after using this command.

Example:

ENABLE DT 145, address-235 (address-0xEB), < 100 ms, address-235 (address-0xEB)
-> response Higher byte
READ DTR -> response Lower Byte

Set Final Lux Level **Command 236 (0xEC)**

This command stores the values previously written into DTR (high byte) and DTR1 (low byte) as the final Lux Level (used for regulation).

Example:

DTR (with Higher byte)
DTR1 (with Lower byte)
ENABLE DT 145, address-236 (address-0xEC), < 100 ms, address-236 (address-0xEC)

Set Final CCT Level **Command 237 (0xED)**

This command stores the values previously written into DTR (high byte) and DTR1 (low byte) as the final CCT Level (used for regulation).

Example:

DTR (with Higher byte)
DTR1 (with Lower byte)
ENABLE DT 145, address-237 (address-0xED), < 100 ms, address-237 (address-0xED)

Query Threshold Lux Level **Command 238 (0xEE)**

The Threshold Lux Level (used for Threshold Lux regulation) is 16 bit value. Higher byte is sent as response. Lower byte can be read from DTR after using this command.

Example:

ENABLE DT 145, address-238 (address-0xEE),< 100 ms, address-238 (address-0xEE)
-> response Higher byte
READ DTR -> response Lower Byte

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Set Threshold Lux Level Command 239 (0xEF)

This command stores the values previously written into DTR (high byte) and DTR1 (low byte) as the Threshold Lux Level (used for regulation).

Example:

DTR (with Higher byte)

DTR1 (with Lower byte)

ENABLE DT 145, address-239 (address-0xEF), < 100 ms, address-239 (address-0xEF)

Toggle Reference Function Command 240 (0xF0)

This command activates or deactivates Reference function. As result bit 0 in Reference Timing register should change its value. Other Timing register bits are not affected.

Example:

ENABLE DT 145, address-240 (address-0xF0), < 100 ms, address-240 (address-0xF0)

Query Group Address Sensor Command 241 (0xF1)

Response contains group address of the sensor which should be regulated by the Ambient sensor with Reference function. The group address is already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

ENABLE DT 145, address-241 (address-0xF1), < 100 ms, address-241 (address-0xF1) -> response

Set Group Address Sensor Command 242 (0xF2)

The value written previously to the DTR is stored as group address of the sensor which should be regulated by the Ambient sensor with Reference function. The group address must be already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

DTR (with data)

ENABLE DT 145, address-242 (address-0xF2), < 100 ms, address-242 (address-0xF2)

Query Reference Sensor Timing Command 243 (0xF3)

Response contains the status of the reference function – if Bit 0 is set Reference function is enabled. Bits 7:2 contains timing values for the reference function – the period between two consecutive reference regulation commands in 500 ms.

Example:

ENABLE DT 145, address-243 (address-0xF3), < 100 ms, address-243 (address-0xF3) -> response

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Set Reference Sensor Timing Command 244 (0xF4)

The value written previously to the DTR is stored as configuration of reference function – if Bit 0 is set Reference function is enabled. Bits 7:2 contains timing values for the reference function – the period between two consecutive reference regulation commands in 500 ms. Using this command directly affects the reference function activation.

Example:

DTR (with data)

ENABLE DT 145, address-244 (address-0xF4), < 100 ms, address-244 (address-0xF4)

Query Group Address Cold Command 246 (0xF6)

Response contains group address of the cold channel which should be regulated by the Ambient sensor within Cold/Warm mode. The group address is already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

ENABLE DT 145, address-246 (address-0xF6), < 100 ms, address-246 (address-0xF6) -> response

Set Group Address Cold Command 247 (0xF7)

The value written previously to the DTR is stored as group address of the cold channel which should be regulated by the Ambient sensor within Cold/Warm mode. The group address must be already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

DTR (with data)

ENABLE DT 145, address-247 (address-0xF7), < 100 ms, address-247 (address-0xF7)

Query Group Address Warm Command 248 (0xF8)

Response contains group address of the warm channel which should be regulated by the Ambient sensor within Cold/Warm mode. The group address is already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

ENABLE DT 145, address-248 (address-0xF8), < 100 ms, address-248 (address-0xF8) -> response

Set Group Address Warm Command 249 (0xF9)

The value written previously to the DTR is stored as group address of the warm channel which should be regulated by the Ambient sensor within Cold/Warm mode. The group address must be already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

DTR (with data)

ENABLE DT 145, address-249 (address-0xF9), < 100 ms, address-249 (address-0xF9)

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Query Group Address Brightness Command 250 (0xFA)

Response contains group address of the brightness channel which should be regulated by the Ambient sensor within Brightness/CCT mode. The group address is already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

ENABLE DT 145, address-250 (address-0xFA), < 100 ms, address-250 (address-0xFA) -> response

Set Group Address Brightness Command 251 (0xFB)

The value written previously to the DTR is stored as group address of the brightness channel which should be regulated by the Ambient sensor within Brightness/CCT mode. The group address must be already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

DTR (with data)

ENABLE DT 145, address-251 (address-0xFB), < 100 ms, address-251 (address-0xFB)

Query Group Address CCT Command 252 (0xFC)

Response contains group address of the CCT channel which should be regulated by the Ambient sensor within Brightness/CCT mode. The group address is already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

ENABLE DT 145, address-252 (address-0xFC), < 100 ms, address-252 (address-0xFC) -> response

Set Group Address CCT Command 253 (0xFD)

The value written previously to the DTR is stored as group address of the CCT channel which should be regulated by the Ambient sensor within Brightness/CCT mode. The group address must be already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

DTR (with data)

ENABLE DT 145, address-253 (address-0xFD), < 100 ms, address-253 (address-0xFD)

Query Group Address Type 8 Command 254 (0xFE)

Response contains group address of the Type 8 channel which should be regulated by the Ambient sensor within Type 8 mode. The group address is already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

ENABLE DT 145, address-254 (address-0xFE), < 100 ms, address-254 (address-0xFE) -> response

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Set Group Address Type 8 Command 255 (0xFF)

The value written previously to the DTR is stored as group address of the Type 8 channel which should be regulated by the Ambient sensor within Type 8 mode. The group address must be already shifted. The regulation function automatically sets MSB (group address flag) and LSB (command flag) when transmits this value to DALI.

Example:

DTR (with data)

ENABLE DT 145, address-255 (address-0xFF), < 100 ms, address-255 (address-0xFF)

Revision history:

V1.0	**06/12/2017**	Initial release
V1.1	**29/05/2017**	Changed description of Toggle Lux Regulation commands (previously it wasn´t completely described.