EN

P1XF001

Color Sensor

Interface Protocol RS-232

Subject to change without notice
Available as PDF version only
Version: 2.0.0
Status: 27.03.2017
www.wenglor.com

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1. Control characters

Character	ASCII value	Function
/	0x47	Start character
.	0x46	Stop character

2. Frame layout for data transmission

	Length	Notation	Frame section
Start character	1 byte (0x47)	/	Frame header
Length information	2 bytes	SS	
Command byte	2 bytes	CC	
1st data byte	2 bytes	DD	User data
2nd data byte	2 bytes	DD	
...	...	DD	
nth data byte	2 bytes	DD	
Checksum	2 bytes	qq	Frame end
Stop character	1 byte (0x46)	.	

2.1 Frame header

- **Start character (1 byte)**
  Frame start character < / > indicates the beginning of the protocol

- **Length information (2 bytes)**
  Indicates the number of characters in hexadecimal contained in the data field

- **Command byte**
  Specifies the command type

2.2 User data

The data stream includes user data which varies in length. The length of the data stream parameters is set in the “Length information” bytes from the frame header.

2.3 Frame end

- **Checksum (2 bytes)**
  The checksum must be recalculated for each send frame (see section “2.3.1 Checksum calculation“ on page 4)
- **Stop character (1 bytes)**
  The stop character < . > indicates the stop of the protocol

2.3.1 Checksum calculation

The calculated checksum is used to verify data integrity.
If "qq" used in place of the calculated value, there is no check, but the command is running.

The checksum is generated from an EXOR link to the frame, beginning with the start byte and ends with the last character of the user data.

Example:

/	2Fh	=	0010 1111		
0	30h	=	0011 0000		
	XOR	=	0001 1111		
2	32h	=	0011 0010		
	XOR	=	0010 1101		
0	30h	=	0011 0000		
	XOR	=	0001 1101		
D	44h	=	0100 0100		
	XOR	=	0101 1001		
0	30h	=	0011 0000		
	XOR	=	1101 001		
0	30h	=	0011 0000		
	XOR	=	0101 1001	=>	Checksum = 59h

3. Commands

3.1 Protocol description

To send a valid command to the sensor it should respect the data layout:
/SSCCDDDD...DDqq.

If the command is valid, the sensor will respond with:
/SS0MCCDDDD...DDqq.

If the frame is valid but some parametres have been detected with invalid values, the response could also be:
/SS0MCCDDDD...DDNOK!!qq.

3.2 Commands overview

Function	Command
Pin function	P or p
Input/output	O
Operating mode	m
Filter size	F
Emitted light	L
Test input pin	t
Version	V
Reset	R
Read	D
Expert menu	E
Status	W

3.3 Commands description

In the next sections are explained the sensor commands and the bytes and bits fields used in these commands.

3.3.1 Pin function configuration – first method

The command used to configure the functionality for a pin is < **0P** > with the next syntax:

Send frame to sensor	Received frame
/**030P0ifqq.** (Write then read) /**020P0iqq.** (Read)	/**SS0M0P0ifqq.**

SS : Payload length
qq: Checksum
< i > character refers to the configured pin number, 1…12
< f > took a value from "0" to "9" or from "a" to "o", like in the next table:

< i > data field description										
I/O pin function	**Description**	**HiZ**	**NPN**	**PNP**	**PP**	**NO**	**NC**	**Ub active**	**Ub inactive**	**i**
Disabled	High impedence state (HiZ)	X								0
Switching Output	NPN and NO		X			X				1
	PNP and NO			X		X				2
	PP and NO				X	X				3
	NPN and NC		X				X			4
	PNP and NC			X			X			5
	PP and NC				X		X			6
Error output	NPN and NO		X			X				7
	PNP and NO			X		X				8
	PP and NO				X	X				9
	NPN and NC		X				X			a
	PNP and NC			X			X			b
	PP and NC				X		X			c
Contamination output	NPN and NO		X			X				d
	PNP and NO			X		X				e
	PP and NO				X	X				f
	NPN and NC		X				X			g
	PNP and NC			X			X			h
	PP and NC				X		X			i
Emmited light	Ub active							X		j
	Ub inactive								X	k
External teach	Ub active							X		l
	Ub inactive								X	m
Trigger input	Ub active							X		n
	Ub inactive								X	o

When the frame sent to sensor contains invalid parameter, it responds with the frame /SS0P0ifNOK!!qq.

3.3.2 Pin function configuration – second method

Another alternative command used to configure the functionality for a pin is < **0p** > with the next syntax:

Send frame to sensor	Received frame
/070p0ijklmnqq. **/020p0iqq.**	**/SS0M0p0ijklmnqq.**

< i > character refers to the configured pin number, 1…12
SS: Payload Length
qq: Checksum
< j, k, l, m, n > characters can be configured like in the next table:

Output	j
Inactive Output	0
Switching Output	1
Error Output	2
Contamination Output	3

Input	k
Emitted Light	0
Ext T Ax	1
Trigger	2

Output Config	l
PNP	0
NPN	1
PP	2
Hiz	3

Output Logic	m
NO	0
NC	1

Input Logic	n
Ub active	0
Ub inactive	1

If the configuration is mistaken /**SS0p0ixlmnqq.** it will still keep the last correct configuration active. This is useful when only some of the fields need reconfiguration and others not. The fields that don't need to be configured can be filled with an “illegal” character (for example “x”), and settings will take effect only on those with valid parameter.

3.3.3 Assignment Teach-In

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Make Assignment Teach	/040O0Ai0qq.	/060M0O0Ai0qq.	/SS0M0O0AiNOKqq.
Write then read Assignment Teach Red channel value	/080O0AiRrrrrqq.	/0A0M0O0AiRrrrrqq.	–
Read Assignment Teach Red channel value	/040O0AiRqq.	/0A0M0O0AiRrrrrqq.	–
Write then read Assignment Teach Orange channel value	/080O0AirRRRRqq.	/0A0M0O0AirRRRRqq.	–
Read Assignment Teach Orange channel value	/040O0Airqq.	/0A0M0O0AirRRRRqq.	–
Write then read Assignment Teach Yellow channel value	/080O0AiGggggqq.	/0A0M0O0AiGggggqq.	–
Read Assignment Teach Yellow channel value	/040O0AiGqq.	/0A0M0O0AiGggggqq.	–
Write then read Assignment Teach Green channel value	/080O0AigGGGGqq.	/0A0M0O0AigGGGGqq.	–
Read Assignment Teach Green channel value	/040O0Aigqq.	/0A0M0O0AigGGGGqq.	–
Write then read Assignment Teach Blue channel value	/080O0AiBbbbbqq.	/0A0M0O0AiBbbbbqq.	–
Read Assignment Teach Blue channel value	/040O0AiBqq.	/0A0M0O0AiBbbbbqq.	–
Write then read Assignment Teach Violet channel value	/080O0AibBBBBqq.	/0A0M0O0AibBBBBqq.	–
Read Assignment Teach Violet channel value	/040O0Aibqq.	/0A0M0O0AibBBBBqq.	–

< i > character refers to the configured pin number 1…12
<rrrr>, <gggg>, <bbbb> 4 digit hex RGB value for describing Teach assignment values. (4digit hex value; range 0x0000.....0x0FFF ;)
SS: Payload Length
qq: Checksum

3.3.4 Window Teach-In

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Make Output Window Teach	/040O0ai0qq.	/SS0M0O0ai0qq.	/SS0M0O0aiNOKqq.
Make Subsequent Teach OK	/040O0ai1qq.	/SS0M0O0ai1qq.	/SS0M0O0aiNOKqq.
Make Subsequent Teach NOK	/040O0ai2qq.	/SS0M0O0ai2qq.	/SS0M0O0aiNOKqq.

< i > character refers to the configured pin number 1…12
SS: Payload Length
qq: Checksum

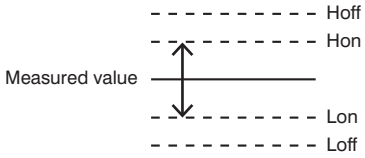
3.3.5 Read/Write Switching Points for Hue

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read switching points Hue Red	/140O0aiRHoffHonLonLoffqq.	/SS0M0O0aiRHoffHon LonLoffqq.	/SS0M0O0aiNOKqq.
Read switching points Hue Red	/040O0aiRqq.	/SS0M0O0aiRHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Write then read switching points Hue Orange	/140O0airHoffHonLonLoffqq.	/SS0M0O0airHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Read switching points Hue Orange	/040O0airqq.	/SS0M0O0airHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Write then read switching points Hue Yellow	/140O0aiGHoffHonLonLoffqq.	/SS0M0O0aiGHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Read switching points Hue Yellow	/040O0aiGqq.	/SS0M0O0aiGHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Write then read switching points Hue Green	/140O0aigHoffHonLonLoffqq.	/SS0M0O0aigHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Read switching points Hue Green	/040O0aigqq.	/SS0M0O0aigHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Write then read switching points Hue Blue	/140O0aiBHoffHonLonLoffqq.	/SS0M0O0aiBHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Read switching points Hue Blue	/040O0aiBqq.	/SS0M0O0aiBHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Write then read switching points Hue Violet	/140O0aibHoffHonLonLoffqq.	/SS0M0O0aibHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.
Read switching points Hue Violet	/040O0aibqq.	/SS0M0O0aibHoffHon-LonLoffqq.	/SS0M0O0aiNOKqq.

< i > character refers to the configured pin number, 1…12
SS: Payload Length
qq: Checksum

<Hoff><Hon><Lon><Loff>: switching points

Hue is described as a 6 variable compound value, where:
One of the variables is always at maximum (4095),
One is always minimum (0) and
Four are somewhere in between 1...4094.
Switching points:
The following switching points are calculated on the basis of the measured value during Teach-In:



Hoff = Hon + Hysteresis
Hon = Hue value + window size
Lon = Hue value – window size
(this result can easily become negative)
Loff = Lon – Hysteresis (this result can easily become negative)

Window – is the tolerance around the taught value. This is expressed in absolute value and is added and substracted, making the actual window two times WindowSize.
Hysteresis – is usually an internally aproximated value that should cover signal noise in processing pipeline in order to avoid parasitic switching when the signal is at the Hon or Lon switching points extreme.

Switching points around a taught value are offset with 2 ^ 15 (in order to facilitate microcontroller processing with positive 16 bit integer values).

Offset value: 2 ^ 15 = 0x8000 = 32768

So, the switching point values complete interpretation looks like this:

Hoff = Hon + Hysteresis + 0x8000
Hon = Taught value + window size + 0x8000
Lon = Taught value – window size + 0x8000
Loff = Lon – Hysteresis + 0x8000

Data representation:
Actual value + 0x8000H
Where: - actual value can be positive or negative
- 0x8000H positive offset value

Hue R Channel

Hoff: Upper switching point off, red	length: 4 Byte (4 digit hex value)
Hon: Upper switching point on, red	length: 4 Byte (4 digit hex value)
Lon: Lower switching point on, red	length: 4 Byte (4 digit hex value)
Loff: Lower switching point off, red	length: 4 Byte (4 digit hex value)

Hue O Channel

Hoff: Upper switching point off, orange	length: 4 Byte (4 digit hex value)
Hon: Upper switching point on, orange	length: 4 Byte (4 digit hex value)
Lon: Lower switching point on, orange	length: 4 Byte (4 digit hex value)
Loff: Lower switching point off, orange	length: 4 Byte (4 digit hex value)

Hue Y Channel

Hoff: Upper switching point off, yellow length: 4 Byte (4 digit hex value)
Hon: Upper switching point on, yellow length: 4 Byte (4 digit hex value)
Lon: Lower switching point on, yellow length: 4 Byte (4 digit hex value)
Loff: Lower switching point off, yellow length: 4 Byte (4 digit hex value)

Hue G Channel

Hoff: Upper switching point off, green length: 4 Byte (4 digit hex value)
Hon: Upper switching point on, green length: 4 Byte (4 digit hex value)
Lon: Lower switching point on, green length: 4 Byte (4 digit hex value)
Loff: Lower switching point off, green length: 4 Byte (4 digit hex value)

Hue B Channel

Hoff: Upper switching point off, blue length: 4 Byte (4 digit hex value)
Hon: Upper switching point on, blue length: 4 Byte (4 digit hex value)
Lon: Lower switching point on, blue length: 4 Byte (4 digit hex value)
Loff: Lower switching point off, blue length: 4 Byte (4 digit hex value)

Hue V Channel

Hoff: Upper switching point off, violet length: 4 Byte (4 digit hex value)
Hon: Upper switching point on, violet length: 4 Byte (4 digit hex value)
Lon: Lower switching point on, violet length: 4 Byte (4 digit hex value)
Loff: Lower switching point off, violet length: 4 Byte (4 digit hex value)

3.3.6 Read/Write Teach Switching Points for Saturation and Lightness

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read switching points	/140O0aiSHoffHonLonLoffqq.	/SS0M0O0aiSHoffHonLonLoffqq.	Hardware teach
Read switching points	/040O0aiSqq.	/SS0M0O0aiSHoffHonLonLoffqq.	Hardware teach
Write then read switching points	/140O0aiLHoffHonLonLoffqq.	/SS0M0O0aiLHoffHonLonLoffqq.	Hardware teach
Read switching points	/040O0aiLqq.	/SS0M0O0aiLHoffHonLonLoffqq.	Hardware teach

Switching points interpretation is the same as explained at Hue (see section “3.3.5 Read/Write Switching Points for Hue“ on page 8)

< i > character refers to the configured pin number 1…12
SS: Payload Length
qq: Checksum
<Hoff><Hon><Lon><Loff>: switching points

3.3.7 Read Out Color Values

3.3.7.1 Read RGB color values

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Read RGB color values	/020D0s1A.	/SS0M0D0srrggbbqq.	/SS0M0D0sNOK!!qq.

SS: Payload Length
<rr>: color values to be displayed for red; 2digit hex value; range 0x00.....0xFF
<gg>: color values to be displayed for green; 2digit hex value; range 0x00.....0xFF
<bb>: color values to be displayed for blue; 2digit hex value; range 0x00.....0xFF
<qq>: Checksum

3.3.7.2 Read HSL color values

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Read HSL color values	/020D0p19.	/SS0M0D-0pHHHHhhhhHHHHhhhhHHHHhhhhSSSSLLLLqq.	/SS0M0D0pNOK!!qq.

SS: Payload Length
<HHHH>: hue color channel red; 4digit hex value; range 0x0000.....0xFFFF
<hhhh>: hue color channel orange; 4digit hex value; range 0x0000.....0xFFFF
<HHHH>: hue color channel yellow; 4digit hex value; range 0x0000.....0xFFFF
<hhhh>: hue color channel green; 4digit hex value; range 0x0000.....0xFFFF
<HHHH>: hue color channel blue; 4digit hex value; range 0x0000.....0xFFFF
<hhhh>: hue color channel violet; 43digit hex value; range 0x0000.....0xFFFF
<SSSS>: color saturation; 4digit hex value; range 0x0000.....0xFFFF
<LLLL>: color lightness; 4digit hex value; range 0x0000.....0xFFFF
qq: Checksum

3.3.7.3 Read ROYGBV Compensated Color sensor Channel values

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Read ROYGBV channel values	/020D0r1B.	/SS0M0D0rRRRROOOOYYYYGGGGBBBB-VVVVqq.	/SS0M0D0rNOK!!qq.

SS: Payload length
<RRRR>: compensated channel values for red; 4digit hex value; range 0x0000....0xFFFF
<OOOO>: compensated channel values for orange; 4digit hex value; range 0x0000....0xFFFF
<YYYY>: compensated channel values for yellow; 4digit hex value; range 0x0000....0xFFFF
<GGGG>: compensated channel values for green; 4digit hex value; range 0x0000....0xFFFF
<BBBB>: compensated channel values for blue; 4digit hex value; range 0x0000....0xFFFF
<VVVV>: compensated channel values for violet; 4digit hex value; range 0x0000....0xFFFF
qq: Checksum

3.3.8 Adjust Window Size/Tolerance

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read Window Size	/070O0bihhhhqq.	/SS0M0O0bihhhhqq.	/SS0M0O0bihhhhNOK!!qq.
Read Window Size	/030O0biqq.	/SS0M0O0bihhhhqq.	–
Write then read Window Size Hue	/070O0cihhhhqq.	/SS0M0O0cihhhhqq.	/SS0M0O0cihhhhNOK!!qq.
Read Window Size Hue	/030O0ciqq.	/SS0M0O0bihhhhqq.	–
Write then read Window Size Saturation	/070aO0dihhhhqq.	/SS0M0O0dihhhhqq.	/SS0M0O0dihhhhNOK!!qq.
Read Window Size Saturation	/030O0diqq.	/SS0M0O0bihhhhqq.	–
Write then read Window Size Lightness	/070O0eihhhhqq.	/SS0DM0O0eihhhhqq.	/SS0M0O0eihhhhNOK!!qq.
Read Window Size Lightness	/030O0eiqq.	/SS0M0O0bihhhhqq.	–
Write then read Window Size red*	/080O0ciRhhhhqq.	/SS0M0O0ciRhhhhqq.	/SS0M0O0ciRhhhhNOK!!qq.
Read Window Size red*	/040O0ciRqq.	/SS0M0O0biRhhhhqq.	–
Write then read Window Size orange*	/080O0ciOhhhhqq.	/SS0M0O0ciOhhhhqq.	/SS0M0O0ciOhhhhNOK!!qq.
Read Window Size orange*	/040O0ciOqq.	/SS0M0O0biOhhhhqq.	–
Write then read Window Size yellow*	/080O0ciYhhhhqq.	/SS0M0O0ciYhhhhqq.	/SS0M0O0ciYhhhhNOK!!qq.
Read Window Size yellow*	/040O0ciYqq.	/SS0M0O0biYhhhhqq.	–
Write then read Window Size green*	/080O0ciGhhhhqq.	/SS0M0O0ciGhhhhqq.	/SS0M0O0ciGhhhhNOK!!qq.
Read Window Size green*	/040O0ciGqq.	/SS0M0O0biGhhhhqq.	–
Write then read Window Size blue*	/080O0ciBhhhhqq.	/SS0M0O0ciBhhhhqq.	/SS0M0O0ciBhhhhNOK!!qq.
Read Window Size blue*	/040O0ciBqq.	/SS0M0O0biBhhhhqq.	–
Write then read Window Size violet*	/080O0ciVhhhhqq.	/SS0M0O0ciVhhhhqq.	/SS0M0O0ciVhhhhNOK!!qq.
Read Window Size violet*	/040O0ciVqq.	/SS0M0O0biVhhhhqq.	–

SS: Payload Length
< i > character refers to the configured pin number 1…12
<hhhh>: Window Size; 4digit hex value; 0x0000.....0x0FFF
qq: Checksum

* Gültig ab Firmware: 1.3.1

3.3.9 Configuration On-/Off-Delay and Impulse

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read On-Delay	/070O0jihhhhqq.	/SS0M0O0jihhhhqq.	/SS0M0O0jihhhhNOK!!qq.
Read On-Delay	/030O0jiqq.	/SS0M0O0jihhhhqq.	–
Write then read Off-Delay	/070O0kihhhhqq.	/SS0M0O0kihhhhqq.	/SS0M0O0kihhhhNOK!!qq.
Read Off-Delay	/030O0kiqq.	/SS0M0O0kihhhhqq.	
Write then read impulse	/070O0lihhhhqq.	/SS0M0O0lihhhhqq.	/SS0M0O0lihhhhNOK!!qq.
Read impulse	/030O0liqq.	/SS0M0O0lihhhhqq.	–

< i > character refers to the configured pin number 1…12
<hhhh>: 4 digit hex value; Delay value for On-/Off-Delay and Impulse valid values range:
Decimal 0---10000
Hex: 0x0000.....0x2710
representing timings expressed in milliseconds
SS: Payload Length
qq: Checksum

3.3.10 Set Sensor Status

3.3.10.1 Operating mode and filter size

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read operating mode	/SS0M0iqq.	/SS0M0M0jqq.	/SS0M0M0jNOK!!qq.
Read operating mode	/SS0M0qq.	/SS0M0M0jqq.	–
Write then read filter size	/020F0sqq.	/SS0M0F0sqq.	/SS0M0F0sNOK!!qq.
Read filter size	/010F068.	/SS0M0F0sqq.	–

<j> : j = 0 color detection ; j = 1 color assignment ; j=2* color detection ROYGBV
SS: Payload Length
<s> : Filter size. Valid values range 0x0..0xC representing 2 ^ s number of samples on which averaging is performed (eg. 2 ^ 0 = 1 … 2 ^ 12=4096). Response time increases in direct proportion with this averaging buffer size.
qq: Checksum

* Gültig ab Firmware: 1.3.1

3.3.10.2 Set emitted light

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read emitted light	/020L0iqq.	/SS0M0Liqq.	/SS0M0L0iNOK!!qq.
Read emitted light	/010L062.	/SS0M0Liqq.	–

SS: Payload Length

<i> : i= 0 light OFF ; i= 1 light intensity minimum // emitted light
i = 2 light intensity dark ; i = 3 light intensity middle // emitted light
i = 4 light intensity bright ; i = 5 light intensity maximum // emitted light
i = 6 light automatic // emitted light

qq: Checksum

3.3.10.3 Test mode: set output state

Function	Send frame transmitted to sensor	Received frame Returned from sensor	Returned frame from sensor in case of Error
Write then read state of sensor Output Pin	/030t0isqq.	/SS0M0t0isqq.	/SS0M0t0iNOK!!qq.
Read state of sensor Output Pin	/020t0iqq.	/SS0M0t0isqq.	

SS: Payload Length

< i > character refers to the configured pin number 1…12

<s> : s = state {forceHigh, forceLow, running}
s = 0 Low; s = 1 High ; s = 2 Running (exit test mode)

qq: Checksum

3.3.11 Query Sensor Status

Function	Send frame transmitted to sensor	Received frame Returned from sensor
Query Status	/000W48.	/SS0M0Wppppeeedqq.

Receive frame fields:

SS: Payload Length

<pppp>: pin status, 4 digit hex value (this translates into 4×4bit bitfield, “1” pin in high state; “0” pin in low state; b0 state of A1; b1 state of A2; b2 state of A3; b3 state of A4; b4 state of A5; b5 state of A6; b6 state of A7; b7 state of A8; b8 state of A9; b9 state of A10; b10 state of A11; b11 state of A12

<eee>: error status, 3 digit hex value (this translates int 3×4bit bitfield, “1” error state; “0” no error state; (b0 ….b11 TBD)

<d>: contamination status; 3 digit hex value (this translates int 3×4bit bitfield, “1” contamination state; “0” no contamination r state; (b0->overexposure ; b1 underexposure)

qq: Checksum

Bitfield definitions:

dirty_UnderExposure	0b0000000000000001
dirty_OverExposure	0b0000000000000010
error_LEDTempTooHigh	0b0000000000000001
error_LEDTempTooLow	0b0000000000000010
error_LEDCurrentMismatch	0b0000000000000100
error_TriggerTooFast	0b0000000000001000
error_UnableToAssignColor	0b0000000000010000
error_Black	0b0000000001000000

3.3.12 Expert Menu

Function	Send frame transmitted to sensor	Received frame Returned from sensor
Write then read Expert Menu	/020Ehhqq.	/SS0M0Ehhqq.
Read Expert Menu	/000E5A.	/SS0M0Ehhqq.

SS: Payload length
<hh>: 2 digit hex value 0x01 = Expert menu ON
0x00 = Expert menu OFF
qq: Checksum

3.3.13 Execute Sensor Reset

Function	Send frame transmitted to sensor	Received frame Returned from sensor
Execute Reset	/000R4D.	/070Vaa:bbqq.

SS: Payload length
Receive frame fields:
<aa>: Software version
<bb>: Sensor group
qq: Checksum

3.3.14 Query Sensor Version

Function	Send frame transmitted to sensor	Received frame Returned from sensor
Read sensor version	/000V49.	/070Vaa:bbqq.

SS: Payload length
Receive frame fields:
<aa>: Software version
<bb>: Sensor group
qq: Checksum

4. Change Index, Interface Protocol

Version	Date	Description/Change
1.0.0	01.07.2015	Initial version of the interface protocol
2.0.0	27.03.2017	• Addition of operating mode "detection ROYGBV" with appropriate commands (firmware 1.3.1). • Adjustments of the telegrams to the sensor with calculated data length, if these not dependent on variables.