# Optris CTratio communication interface

## Serial interface parameters

| | |
|---|---|
| **Baud rate:** | **115,2 / 921,6 kBaud (factory default: 115,2)** |
| **Data bits:** | **8** |
| **Parity:** | **none** |
| **Stop bits:** | **1** |
| **Flow control:** | **off** |

## Protocol

The protocol of the optris CTratio is a binary protocol. Checksum is needed for set commands but not for read commands. The protocol has no additional overhead with CR, LR or ACK bytes. This makes the communication fast.
To get the current object temperature the user must send a simple $01_{hex}$ byte and the CTratio will respond with the two byte temperature. To get the temperature as a floating value subtract 1000 and divide by 10.

## Checksum's

If the device is setup to use checksums any SET command must have a checksum suffix. The checksum can be switched off with command AD. After every "Power on" the device will expect the checksum again. The checksum byte is build by the arithmetical XOR of all command bytes except of the address prefix.

To switch off the checksums with the SET command AD you must send the checksum.
To switch on the checksums with the SET command AD you must not send the checksum.

**Please note that all commands that are more than one byte long require a checksum!**

The checksum is formed by an XOR combination of all bytes to be sent.
Checksum = byte1 XOR byte2 XOR byte3 …

## Addressing RS485

This is relevant for communication with the RS485 bus only. If you use the RS485 interface board you must use the multidrop addresses.
A multidrop address is a simple prefix byte to the command. The byte is build by adding the hexadecimal value B0 to the device address. B5 01 will read the temperature from the device with the address 5.

The address of any device can be set by the device user interface ("M__01") or by the communication interface with the command 90 (Hex).

A special case is address prefix B0 for set commands. Because there is no multidrop address 0 this addresses no certain device. But a SET command with prefix broadcast the command to all devices at the RS485 bus.
Note: The command is executed immediately on any of the devices even if they do not respond to the command. That is because all are slaves and can't talk at the same time.



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# 1 Basic Functions

| DECIMAL | HEX | Command | Data | Answer | Result | Unit |
|---|---|---|---|---|---|---|
| 1 | 0x01 | READ Temp. - Process | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | °C |
| 2 | 0x02 | READ Temp. - Det | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | °C |
| 3 | 0x03 | READ Temp. - Box | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | °C |
| 10 | 0x0A | READ Temp. - Ratio | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | °C |
| 11 | 0x0B | READ Temp. – T2 | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | °C |
| 12 | 0x0C | READ Temp. – T1 | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | °C |
| 13 | 0x0D | READ Temp. - Attenuation | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | % |

## 1.1 IR- Settings

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 4 | 0x04 | READ Epsilon<br>SET Epsilon<br>(0x00 for Emissivity<br>0x01 for Slope) | byte1 byte2 byte 3 | byte1 byte2 | =(byte1*256 + byte2) / 1000 |
| 144 | 0x90 | READ Epsilon T1 | | byte1 byte2 | =(byte1*256 + byte2) / 1000 |
| 145 | 0x91 | READ Epsilon T2 | | byte1 byte2 | =(byte1*256 + byte2) / 1000 |
| 146 | 0x92 | READ Slope | | byte1 byte2 | =(byte1*256 + byte2) / 1000 |

### 1.1.1 Example of READ and SET the emissivity value

**READ** emissivity value (FFFF for READ): 0400FFFF04

| byte1 | byte2 | byte3 | byte4 | byte5 |
|---|---|---|---|---|
| **04** | **00** | **FF** | **FF** | **04** |
| Command | Index | Value | Value | Check sum |

**SET** emissivity value to 0.8: 0400032027

| byte1 | byte2 | byte3 | byte4 | byte5 |
|---|---|---|---|---|
| **04** | **00** | **03** | **20** | **27** |
| Command | Index | Value | Value | Check sum |

Explanation:
Bring value to HEX: $0{,}8_{Float} \rightarrow 800_{Decimal} \rightarrow 0320_{HEX}$
Check sum: 04 XOR 00 XOR 03 XOR 20 = 27

## 1.2 Aiming

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 37 | 0x25 | READ Laser<br>SET Laser | byte1 | byte1 | = ON if byte1 =1 , OFF if byte1=0<br>Read byte1 = 0xFF |



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# 2 Signal Processing

## 2.1 Averaging

Smart averaging stops averaging if big temperature changes are occurring. For more information see manual.

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 6 | 0x06 | READ AVG Time<br>SET AVG Time | byte1 byte 2 byte 3 | byte1 byte2 | See AVG Value |
| 28 | 0x1C | READ AVG Mode<br>SET AVG Mode<br>(smart averaging) | byte1 | byte1 | 1 = Smart averaging<br>0 = Normal<br>(0xFF for READ) |

### 2.1.1 Description Avg READ / SET (all bytes in HEX)

06 xx yy yy

Possible values for xx:

| | | |
|---|---|---|
| 00 | Time | (yyyy - 1…65000 ms, FFFF for READ) |
| 01 | Smart Avg on | (0 - off, 1- on, FFFF for READ) |
| 02 | Smart threshold | (1, FFFF for READ) |

## 2.2 Hold Functions

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 7 | 0x07 | READ Hold Value<br>SET Hold Value | byte 1byte2 byte3 | byte1 byte2 | See Hold Value |

### 2.2.1 Description Hold READ / SET (all bytes in HEX)

07 xx yy yy

Possible values for xx:

| | | |
|---|---|---|
| 00 | Mode | (0 - off, 1 - Peak, 2 - Valley, Adv. Peak, Adv. Valley, FFFF for READ) |
| 01 | Time | (yyyy - 1...64999 (65000 for infinity), FFFF for READ) |
| 02 | Adv. threshold | (yyyy - Temperature range, FFFF for READ) |
| 03 | Adv. Hysteresis | (1, FFFF for READ) |



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# 3 Output, Inputs settings

For the analog output there are the output channels 1 and 2. Details are shown in the tables below. For further information see the examples.

| DECIMAL | HEX | Command | Data | Answer | Result | Unit |
|---|---|---|---|---|---|---|
| 8 | 0x08 | READ F1, F2, F3 mA value | byte1 | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 | V |
| 17 | 0x11 | READ / SET Output Value (mA) | byte1 bye2 byte3 byte4 | byte1 byte2 | See Output Values | |
| 21 | 0x15 | READ / SET I/O Pin Values | byte1 byte2 byte3 …byte6 | byte1 byte2 | See I/O Pin Values | |

### 3.1.1 Description Output Value (mA/mV) READ / SET (all bytes in HEX)

11 xx yy uu uu
Possible values for xx (Output-No.): 00 or 01
Possible values for yy:

**00 - Mode**

0000 = Off (0 mA)
0001 = Analog Output
0002 = Alarm Output

**10 - Analog Source**

0000 = TempProcess
0001 = TempRatio
0002 = TempT1
0003 = TempT2
0004 = Attenuation
0005 = TempDet
0006 = TempBox

**11 - Analog mA below**

uu uu = µA Value

**12 - Analog mA above**

uu uu = µA Value

**13 - Analog Range below**

uu uu = Temp. or Attenuation Value

**14 - Analog Range above**

uu uu = Temp. or Attenuation Value

**18 - Analog Failsafe mA below**

uu uu = µA Value

**19 - Analog Failsafe mA above**

uu uu = µA Value

**1A - Analog Failsafe Range below**

uu uu = Temp. or Attenuation Value

**1D - Analog Failsafe active above**

0000 = inactive
0001 = active

**20 - Alarm Source**

0000 = TempProcess
0001 = TempRatio
0002 = TempT1
0003 = TempT2
0004 = Attenuation
0005 = TempDet
0006 = TempBox

**21 - Alarm Threshold**

uu uu = Temp. or Attenuation Value

**22 - Alarm Hysteresis**

uu uu = Hysteresis

**23 - Alarm mA - NO Alarm**

uu uu = µA Value

**24 - Alarm mA - Alarm**

uu uu = µA Value

**25 - Alarm N.O. / N.C.**

0000 = normally open
0001 = normally close

**26 - Alarm Difference Mode**

0000 = inactive
0001 = active



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**1B - Analog Failsafe Range above**

uu uu = Temp. or Attenuation Value

**1C - Analog Failsafe Active below**

0000 = inactive
0001 = active

### 3.1.2 Description I/O Pin Values READ / SET (all bytes in HEX)

Send for READ I/O 1: 15 nn xx yy FF FF, SET: 15 nn xx yy zz zz
Possible values for nn: 0x00...0x02 (I/O1…I/O3)
Possible values for xx:

**0x00: Function**
Possible values for yy: 0x00
Possible values for zz zz:
0x00: not used
0x01: Alarm
0x02: valid low
0x03: valid high
0x04: Hold LoHi
0x05: Hold HiLo
0x05: Hold Reset low
0x06: Hold Reset high
0x07: analog Slope
0x08: analog Epsilon

**Alarm Values:**
0x10: Source
Possible values for yy: 0x00
Possible values for zz zz:
0x00: Threshold TProcess
0x01: Threshold TempRatio
0x02: Threshold TempT1
0x03: Threshold TempT2
0x04: Threshold Attenuation
0x05: Threshold TempDet
0x05: Threshold TempBox

0x11: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00…0x0F (Source) | up to 16 entries (Source) |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Temperature * 10 +1000 |

0x12: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00…0x0F (Source) | up to 16 entries (Source) |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

0x13: normally open / closed

| | | |
|---|---|---|
| Possible values for yy: | 0x00…0x0F (Source) | up to 16 entries (Source) |
| Possible values for zz zz: | 0x0000...0x0001, 0xFFFF for READ | zz zz = 0x0000 - normal open, 0x0001 - normal closed |



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0x14: normally / differential

| | | |
|---|---|---|
| Possible values for yy: | 0x00…0x0F (Source) | up to 16 entries (Source) |
| Possible values for zz zz: | 0x0000...0x0001, 0xFFFF for READ | zz zz = 0x0000 - normal, 0x0001 - differential |

**Valid low values:**

0x20: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x21: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

**Valid high value:**

0x30: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x31: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

**Hold LoHi value:**

0x40: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x41: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

**Hold HiLo value:**

0x50: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x51: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

**Hold Reset low value:**

0x60: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x61: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

**Hold Reset high value:**

0x70: Threshold

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |



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0x71: Hysteresis

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0x0000...0xFFFE, 0xFFFF for READ | Hysteresis*10 |

**Analog Slope value:**

0x80: mV bottom

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x81: mV top

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x82: Slope bottom

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | Slope * 1000 |

0x83: Slope top

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | Slope * 1000 |

**Analog Emissivity T1:**

0x90: mV bottom

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x91: mV top

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | mV |

0x92: Eps bottom

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | Eps * 1000 |

0x93: Eps top

| | | |
|---|---|---|
| Possible values for yy: | 0x00 | |
| Possible values for zz zz: | 0…10000, 0xFFFF for READ | Eps * 1000 |



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# 4 Visual Alarm Settings and Display

The optris CTratio has up to 8 adjustable color ranges.

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 110 | 0x6E | READ / SET Visual Alarm Entry | byte1 to byte7 | byte1 to byte7 | See Visual Alarm Entries |
| 111 | 0x6F | READ / SET Visual Alarm Value | byte1 byte2 byte3 | byte1 byte2 | See Visual Alarm Values |

### 4.1.1 Description Visual Alarm Entries READ / SET (all bytes in HEX)

6E xx yy uu uu vv vv ww

Possible values for xx (Source):

- 00: TempRatio
- 01: TempT1
- 02: TempT2
- 03: Attenuation
- 04: TempDet
- 05: TempBox
- 06: TempProcess

Possible values for yy (Entry): 00 - 07

- uu uu below value (FF FF for READ)
- vv vv above value (FF FF for READ)
- ww LEDs (Combination of: 01 - Red, 02 - Green, 04 - Blue, FF for READ)

### 4.1.2 Description Visual Alarm Value READ / SET (all bytes in HEX)

6F xx yy yy

Possible values for xx (Value Index):

| | | |
|---|---|---|
| 00 | Source | 0-TempProcess, 1-TempRatio, 2-TempT1, 3-TempT2, 4-Attenuation, 5-TempBox |
| 01 | Mode | 1-normal, 0-advanced |
| 02 | Low Alarm | |
| 03 | High Alarm | |
| 04 | Hysteresis | |
| 05 | Low Alarm normally closed | 0-off, 1-on |
| 06 | High Alarm normally closed | 0-off, 1-on |



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# 5 Advanced Settings

## 5.1 Sensor Information/ Calibration

With the user offset function the sensor can be linear recalibrated.

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 14 | 0x0E | READ Serial number | none | byte1 byte2 byte3, byte 4 | =byte1*$2^{24}$ + byte2*$2^{16}$ + byte3*$2^{8}$ + byte4 |
| 15 | 0x0F | READ FW Rev. | none | byte1 byte2 | =byte1*256 + byte2 |
| 24 | 0x18 | READ / SET User Offset | byte1 byte2 byte 3 | byte1 byte2 | See User Offset Value |
| 25 | 0x19 | READ /SET User Gain | byte1 byte2 byte 3 | byte1 byte2 | See User Gain Value |
| 69 | 0x45 | READ Model Information | byte1 | byte1…byteX | See Model Information |

### 5.1.1 Description User Offset Value READ / SET (all bytes in HEX)

Send for READ: 18 xx FF FF, SET: 18 xx yy yy

Possible values for xx:
- 0x00: Temp. Ratio
- 0x01: Temp. T1
- 0x02: Temp. T2

Possible values for yyyy: 0...2000 0 = -100.0 °C; 1000 = 0 °C; 2000 = 100 °C

### 5.1.2 Description User Gain Value READ / SET (all bytes in HEX)

Send for READ: 19 xx FF F, SET: 19 xx yy yy

Possible value for xx:
- 0x00: Temp. Ratio
- 0x01: Temp. T1
- 0x02: Temp. T2

Possible values for yyyy: 0...65535 Factor = yyyy / $2^{15}$

### 5.1.3 Description Model Information READ value: (all bytes in HEX)

Send for READ: 45 xx

Possible values for xx:
- 00: Block 0 yy yy = 0 - Fix, 1 - Detector temperature
- 01 Block 1 yy yy = Temp.*10+1000

Answer: XX = 0: 30 Byte, XX = 1: 24 Source = yy yy = 0 - Fix, 1 - Detector temperature
Temp. = (yy yy → Decimal) /10 - 100



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**Block 0:**

| | |
|---|---|
| Byte0 Byte1 | Model word (Optris internal) |
| Byte2 Byte3 | ModelFlags1 (Optris internal) |
| Byte4 Byte5 | ModelFlags2 (Optris internal) |
| Byte6 Byte7 | ModelFlags3 (Optris internal) |
| Byte8 Byte9 | ModelFlags4 (Optris internal) |
| Byte10 Byte11 | Temp Ratio min |
| Byte12 Byte13 | Temp Ratio max |
| Byte14 Byte15 | Detector temp min |
| Byte16 Byte17 | Detector temp max |
| Byte18 Byte19 | Temp Bot min |
| Byte20 Byte21 | Temp Top min |
| Byte22…Byte29 | 0 |

**Block 1:**

| | |
|---|---|
| Byte0...Byte7 | Model String 1 |
| Byte8...Byte15 | Model String 2 |
| Byte16…Byte23 | Model String 3 |

## 5.2 Advanced IR-Settings

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 18 | 0x12 | READ / SET Max Attenuation | byte1 byte2 byte3 | byte1 byte2 | See Max Attenuation Values |
| 19 | 0x13 | READ / SET Amb. Temp. | byte1 byte2 byte3 | byte1 byte2 | See Ambient Values |
| 20 | 0x14 | READ Amb. Temp. Fix Value | none | byte1 byte2 | = (byte1*256 + byte2 - 1000) / 10 |

### 5.2.1 Description Max Attenuation Value READ / SET (all bytes in HEX)

Send for READ: 12 xx FF FF, SET: 12 xx yy yy

Possible values for xx:

| | | |
|---|---|---|
| 00 | max. Attenuation | 1000 - 1999 |
| 01 | Mode | 0 - TRatio = fixed value; 1 - TRatio = last valid value |
| 02 | fixed TRatio Value | Tmin…Tmax |

### 5.2.2 Description Ambient Values READ / SET (all bytes in HEX)

Send for READ: 13 xx FF FF, SET: 13 xx yy yy

Possible values for xx:

| | | |
|---|---|---|
| 00 | Ambient Source | yy yy = 0 - Fix, 1 – Detector temp, 2 - mV Input |
| 01 | Ambient Temp | yy yy = Temp.*10+1000 |
| 02 | Ambient Temp @ 0V ext. voltage | yy yy = Temp.*10+1000 |
| 03 | Ambient Temp @ 10V ext. voltage | yy yy = Temp.*10+1000 |
| | Answer: yy yy | Source = yy yy = 0 - Fix, 1 - Detector temp.<br>Temp. = (yy yy → Decimal) /10 - 100 |



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### 5.3 Advanced Digital Communication Settings

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 16 | 0x10 | READ / SET Multidrop Address | byte1 | byte1 | = byte1 (1…79), 0xFF for READ, 0 = RS422 |
| 45 | 0x2D | READ / SET check sum | byte1 | byte1 | = ON if byte1 = 1, OFF if byte1 = 0, for READ byte1 = 0xFF |
| 81 | 0x51 | Read /Set Burst Value | byte1 to byte16 | byte1 to byte16 | See Burst Value |
| 82 | 0x52 | Set Burst Mode | byte1 byte2 byte3 | byte1 byte2 byte3 | Byte1 = Mode (1 = start, 0 = stop) Byte2*256 + byte3 = interval in ms |
| 83 | 0x53 | READ single Burst | | byte1 to byteN | |

#### 5.3.1 Description Burst-Value READ / SET (all bytes in HEX)

51 yy yy yy yy yy yy yy yy yy yy yy yy yy yy yy yy

Possible values for yy: (16x)

- 00: Burst end
- 01: TProcess
- 02: TRatio Avg
- 03: T1 Avg
- 04: T2 Avg
- 05: TRatio Act
- 06: T1 Act
- 07 T2 Act
- 08 Attenuation Avg
- 09 TDetector
- 0A TBox
- 0B Epsilon T1
- 0C Epsilon T2
- 0D TProcess Avg
- 0E TProcess Act
- 0F mA I/O 1
- 0G mA I/O 2
- 0H mA I/O 3
- 0I Attenuation Act
- 0J Slope
- FF for READ

**Examples:**

**Set Burst string** to TProcess (01), TRatio (02), T1 (03), T2 (04) and Attenuation (08), SEND:

| | | | | | | | | Byte | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| **51** | **01** | **02** | **03** | **04** | **08** | **00** | **00** | **00** | **00** | **00** | **00** | **00** | **00** | **00** | **00** | **5D** |
| CMD | | | | | | | | | | | | | | | | Check sum |

**Start Burst mode** in 100 ms (100 ms → $0064_{HEX}$), SEND:

| Byte1 | Byte2 | Byte3 | Byte4 | Byte5 |
|---|---|---|---|---|
| **52** | **01** | **00** | **64** | **37** |
| Command | Index | Value | Value | Checksum |



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**Stop Burst mode**, SET:

| Byte1 | Byte2 | Byte3 | Byte4 | Byte5 |
|---|---|---|---|---|
| **52** | **00** | **00** | **00** | **52** |
| Command | Index | Value | Value | Checksum |

### 5.4 Loop Maintenance

In order to simulate hot objects in the scene and double check the analog circuits the loop maintenance makes the analog output sending fixed values. Note: It is necessary to reset DAC percentage to get back to measure mode.

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 143 | 0x8F | SET DAC percentage output / mA | Byte1 byte2 byte3 | Byte1 byte2 | See Loop Maintenance |

#### 5.4.1 Description SET Output mA (all bytes in HEX)

8F xx yy yy

Possible values for xx (Outgoing No.): 00, 01

Possible values for yy:
Value in 0.1 mA

### 5.5 Further Advanced Settings

| DECIMAL | HEX | Command | Data | Answer | Result |
|---|---|---|---|---|---|
| 169 | 0xA9 | SET DEFAULT | none | byte1 | 0 – not set<br>1 - set |
| 67 | 0x43 | READ / SET Panel lock | byte1 | byte1 | = ON if byte1 = 1, OFF if byte1 = 0, for READ byte1 = 0xFF |
| 9 | 0x09 | READ / SET Temp. Unit | byte1 | byte1 | °C if byte1 = 1<br>°F if byte1 = 0<br>(for READ use FF) |

# 6 Contact information

**If you plan your own software to query and control the optris CTratio sensor and you have further questions please contact:**

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