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# AVASPEC NEXOS BENCH ONLY

## SPECTROMETERS

Operation manual

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# Table of Contents

# Introduction

Thank you for purchasing an Avantes optical bench.

This manual provides OEM users with instructions and technical details on implementing the AvaSpec-NEXOS™ Bench Only into their system.

All information in this manual must be considered confidential and may not be duplicated or given to third parties without written permission from Avantes BV.

## 1.1 Previous versions and revision codes

| | |
|---|---|
| OEM Manual – June 2023 | First release |
| OEM Manual – April 2024 | Revised product name and Temperature range |

## 1.2 AvaSpec- NEXOS™ Bench Only introduction

The AvaSpec-NEXOS™ Bench Only is a compact optical bench integrated into a small aluminum unibody, as illustrated in Figure 1.

Currently supported detectors are the Hamamatsu S11639-11 (2048CL) and Hamamatsu S13496-11 (4096CL)

The AvaSpec-NEXOS™ Bench Only detector board provides separated video and digital control datalines and contains a 128 kb EEPROM.

Specifications regarding detector timing of the control datalines and video signal can be found in Appendix A.

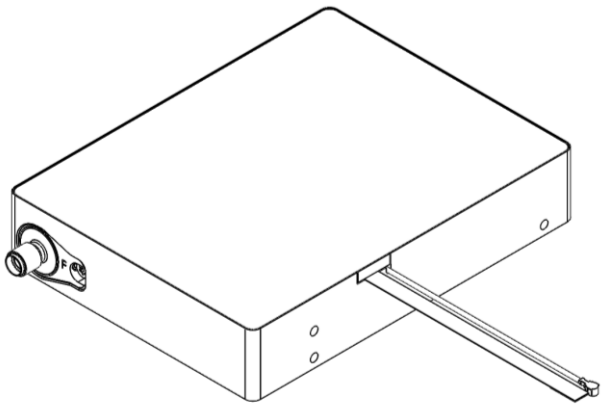


**Figure 1: AvaSpec-NEXOS™ Bench Only**

The used interfaces are a ZIF 8 and a coax connector.
The ZIF 8 connector contains the digital control signals and 5VDC, the coaxial connector provides the analog video output signal.

## 1.3 Technical specifications AvaSpec-NEXOS™ Bench Only

**Table 1: Technical specifications AvaSpec-NEXOS™ Bench Only**

| | |
|---|---|
| Digital control | ZIF 8: 8pins, digital signals |
| Analog ouptut | Coax: 1 Analog video output |
| Power supply | 5VDC, 64 mA<br>The power supply for the AvaSpec-NEXOS™ Bench Only must be able to deliver 5V +/- 5% with a noise level of maximum 20mV.<br>**NOTE:**<br>The power inlet for the AvaSpec-NEXOS™ Bench Only does not have polarity protection |
| Temperature range | 5 - 55 °C |
| Dimensions | 105 x 80 x 20 mm |
| Weight | 255 g |

## 1.4 Interface cables

The ZIF 8 interface connector is intended to provide digital control signals and power to the sensor.
The coax connector is the analog video output of the sensor.

The length of the outgoing flat cable is 130mm (±5mm) with top side contacts.
The length of the outgoing coax cable is 195mm (±5mm) with a female coax connector.

### 1.4.1 Mating parts

Necessary mating parts:
**ZIF:**
Würth series: FPC Connector and FFC cable 0.5mm SMT ZIF 8 pins horizontal bottom contact.
Würth: 687 108 149 022 - WR-FPC 0.50 mm SMT ZIF Horizontal - Hinge Type
**Mini coax connector:**
Würth 636 101 111 001 - WR-UMRF PCB Receptacle SMT with 3 Pads
Hirose U.FL-R-SMT(01) male - Light Weight Micro SMT Coaxial Connector, 1.9mm to 2.4mm Mated Height

Mating parts are suggestions, other similar contra connectors can be used.

### 1.4.2 Pinout ZIF 8

The table and picture below describes the required pinout and orientation of the ZIF 8 cable.

| Pinout ZIF 8 | Function |
|---|---|
| | **2048CL / 4096CL** |
| 1 | n.c. |
| 2 | Ground |
| 3 | Sensor CLK |
| 4 | Sensor ST |
| 5 | Vdd, 5Volt |
| 6 | n.c. |
| 7 | $I^2C$ SDA |
| 8 | $I^2C$ SCL |

**Table 2: Interface pinout.**

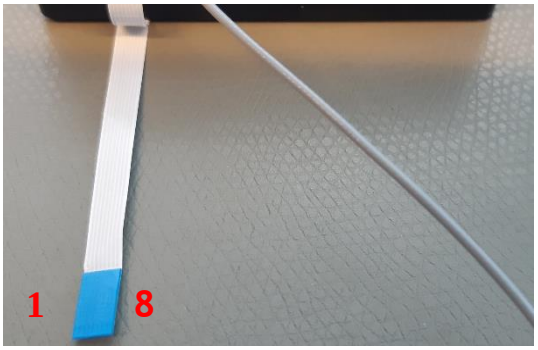



**Figure 2: ZIF 8 cable orientation.**

## 1.5 EEPROM

The AvaSpec-NEXOS™ Bench Only is equipped with a non-volatile memory.

As memory the following 128kb(=16kB) serial I²C EERPOM is used:
- 24LC128T-E/MNY from Microchip.

This device uses device address: -0x1010000

For detailed read and write operations please refer to the manufacturer's datasheet.

http://ww1.microchip.com

The EEPROM does contain the following information at the given address: see Table 3.

| Address | Length | Name | Description |
|---|---|---|---|
| **0x00 – 0x01** | 2 bytes [UINT16] | Structure Version Number | Version number of the data structure in this EEPROM |
| **0x02 – 0x0B** | 10 bytes | Avabench Serial number | 9 characters + 1 terminating zero byte |
| **0x0C – 0x4B** | 64 bytes | Detector Name | HAM S11639 or HAM S13496 |
| **0x4C – 0x4D** | 2 bytes [UINT16] | Nr total pixels | Total number of data, optical black and invalid pixels |
| **0x4E – 0x4F** | 2 bytes [UINT16] | Nr obp left | Number of optical black pixels before data pixels, starting at pixel 0. Optical black pixel numbers are: [0 … Nr_obp_left-1] |
| **0x50 – 0x51** | 2 bytes [UINT16] | Nr obp right | Number of optical black pixels after data pixels, starting at pixel "Nr_total_pixels -/- Nr_obp_right". Optical black pixel numbers are: [Nr_total_pixels - Nr_obp_right … Nr_total_pixels-1] |
| **0x52 – 0x53** | 2 bytes [UINT16] | First effective pixel | First pixel with data |
| **0x54 – 0x55** | 2 bytes [UINT16] | Last effective pixel | Last pixel with data |
| **0x56 – 0x91** | 60 bytes 30x [UINT16] | Defective/Hot pixels | Pixels numbers of defective or hot pixels. 30x65535 if no defective or hot pixels |
| **0x92 – 0xA5** | 20 bytes 5x [FLOAT] | Wavelength calibration | 4th order polynomial for wavelength calibration coefficient (Avantes uses a 3rd order polynomial (x0 to x3), so x4 = 0.0) |

**Table 3: EEPROM content.**

## 1.6 Temperature sensor

The new AvaSpec-NEXOS™ Bench Only is equipped with a temperature sensor. This sensor is placed near the detector to obtain the best possible detector temperature. It does not provide a good absolute detector temperature, but can be used to determine temperature changes.

The temperature sensor is accessible via the same I²C bus as the EEPROM, but uses a different device address.

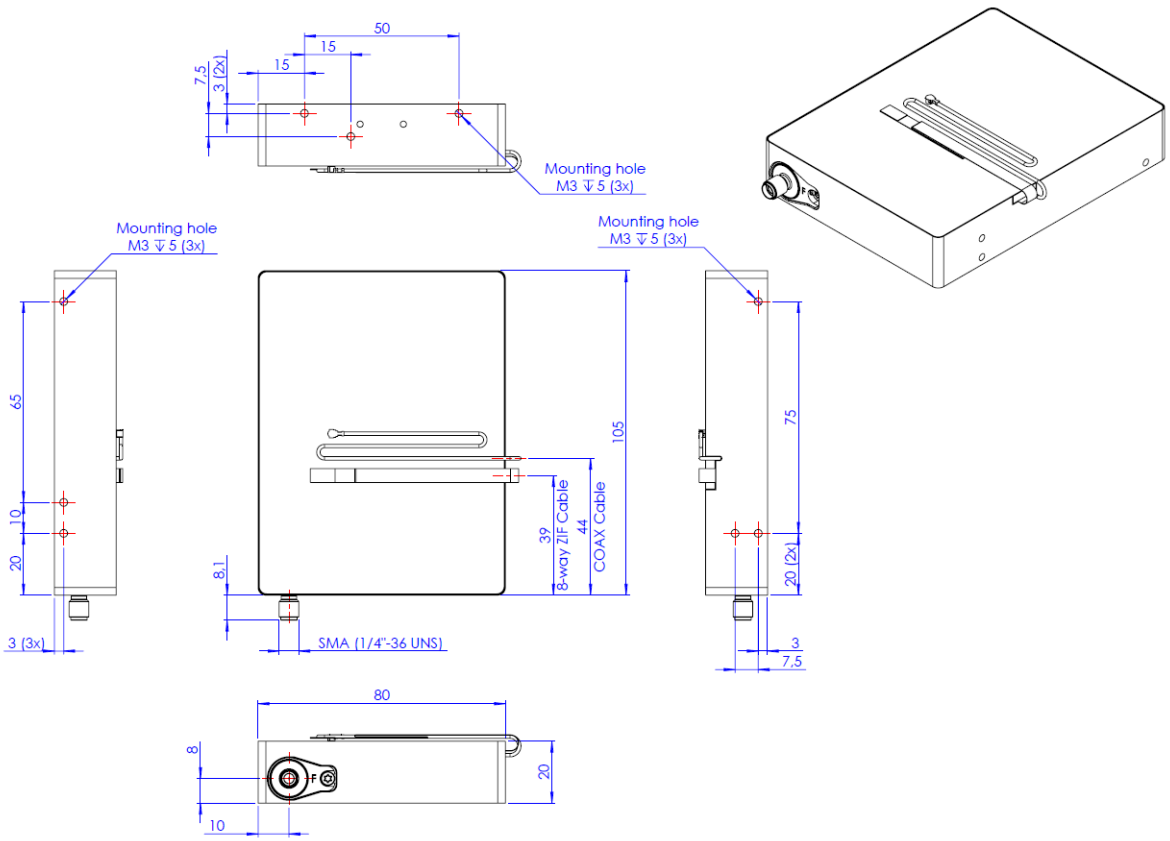
The type of the I²C temperature sensor is:
- LM73CIMK-0/NOPB from Texas Instruments

This temperature sensor uses device address: -0x1001001

For detailed read and write operations please refer to the manufacturer's datasheet.
https://www.ti.com

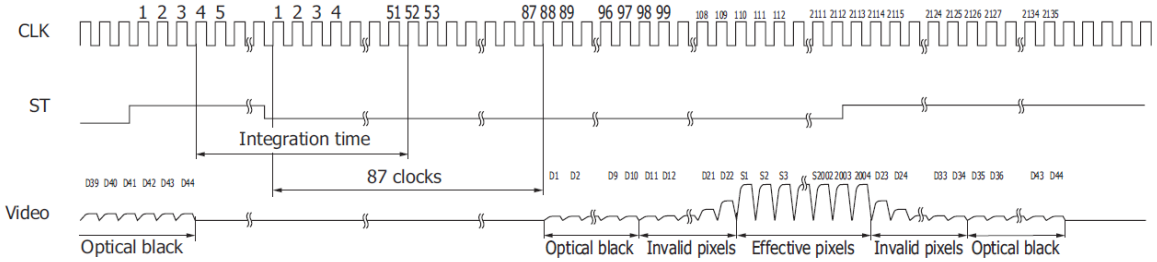
Note: The ALERT pin is not connected, therefore the Alert function is not available.

## 1.7 Dimensions AvaSpec-NEXOS™ Bench Only

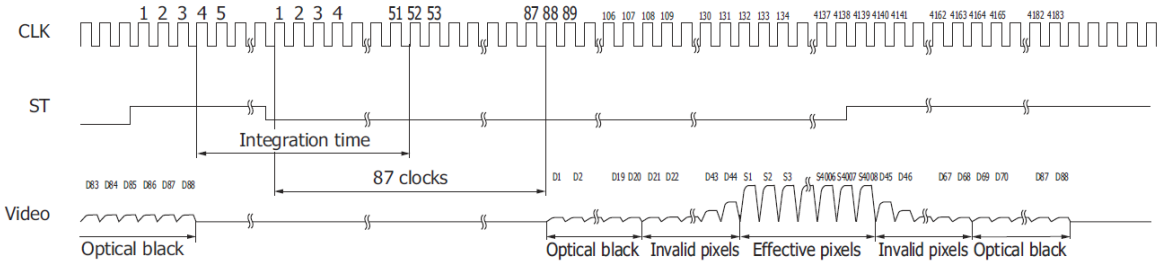


# Appendix A: Detector timing specification

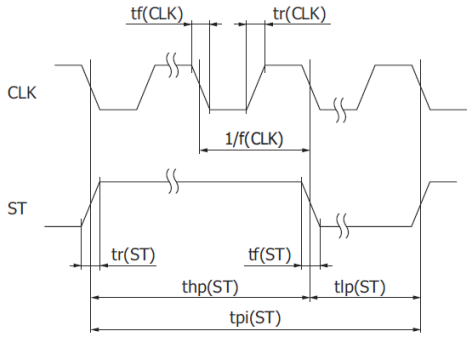
source: Hamamatsu datasheet




**Detector timing specification Hamamatsu S11639-11 (2048)**




**Detector timing specification Hamamatsu S13496-11 (4096)**




| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **Start pulse width interval *1** | tpi(ST) | 106/f(CLK) | - | - | s |
| **Start pulse high period *1 *2** | thp(ST) | 6/f(CLK) | - | - | s |
| **Start pulse low period** | tlp(ST) | 100/f(CLK) | - | - | s |
| **Start pulse rise and fall times** | tr(ST), tf(ST) | 0 | 10 | 30 | ns |
| **Clock pulse duty** | - | 45 | 50 | 55 | % |
| **Clock pulse rise and fall times** | tr(CLK), tf(CLK) | 0 | 10 | 30 | ns |

*1: Dark output increases if the start pulse period or start pulse high period is lengthened.

*2: The integration time equals the high period of ST plus 48 CLK cycles.
The shift register starts operation at the rising edge of CLK immediately after ST goes low.
The integration time can be changed by changing the ratio of the high and low periods of ST.