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KETEK

OEM electronics kit for VIAMP module

Manual

DV/AV
VICO

Table of Contents

This manual covers the KETEK VICO-DV (s/n DVxxxx) and VICO-AV (s/n AVxxxx) products only.
For other products please refer to an another documents or contact us (chapter 8).

Revision history:

Rev. 1.3, March 2021: Declaration of conformity updated
Rev. 1.2, August 2019: section 3.3 revised
Rev. 1.1, November 2017: temperature settings adapted for non-linearized VIAMP version.
Rev. 1.0, September 2016

Dear Customer,

Thank you for choosing the KETEK VICO-AV/DV system. We ensure you that this product has been manufactured with highest industry standards in order to meet your quality expectations. Our highest priority is to deliver you the best product on the market.

1 Safety and Warranty

1.1 Cautions and Warnings

It is strongly recommended to read this user manual carefully and completely before installing or activating the device. Please keep this user manual always with the system to allow any operator access to this important information. In case of a potential resale or scrapping of the system at the end of its lifetime, this manual should be given along with the device.

This device generates a high voltage during the operation.
DO NOT TOUCH the board or the connectors when powered on.

Follow the cautions and warnings listed below to avoid injuries and warranty loss.

Make sure that only properly trained staff installs and operates the VICO-DV/AV and any equipment in which the device will be operated.

To prevent an electrical shock, make sure that energized contacts (PCB, flex connection, etc) are not accessible during operation (finger-safe).

Make sure that energized contacts (PCB, flex connection, etc) cannot be mechanically damaged.

The KETEK VICO-DV/AV must only be operated as an integrated element inside the housing of the customer's final instrument.

Scrapping of a VICO-DV/AV device at end of its lifetime has to be done according to the country-specific legal regulations.

Repair or maintenance of the VICO-DV/AV and the device into which it is integrated must be performed by KETEK only. Any violation leads to the loss of the product warranty.

Keep the device dry and clean!

Please notice that the devices are not designed to be operated under vacuum conditions.

This unit fulfills the EMI safety standards as a standalone device and is considered a component which will be installed into a final equipment. The final equipment must be reconfirmed that it still meets the EMC directives.

1.2 Warranty

KETEK GmbH warrants to the original purchaser this instrument to be free from defects in materials and workmanship for a period of one year from shipment. KETEK GmbH will, without charge, repair or replace (at its option) a defective instrument upon return to the factory. This warranty does not apply in the event of misuse or abuse of the instrument or unauthorized alterations or repair. KETEK GmbH shall not be liable for any consequential damages, including without limitation, damages resulting from the loss of use due to failure of this instrument. All products returned under the warranty must be shipped prepaid to the factory with documentation describing the problem and the circumstances under which it was observed. Additionally the statement of contamination must be filled out completely and returned with the product. KETEK must be notified prior to return shipment. The instrument will be evaluated, repaired or replaced, and promptly returned if the warranty claims are substantiated. A nominal fee will be charged for unsubstantiated claims. Please include the model and serial number in all correspondence with KETEK.

2 Product Description

The KETEK VICO-DV/AV OEM system is designed for operation with the KETEK VIAMP module only. Two product variants are available: CUBE and FET.

The device comprises a high-performance digital pulse processor, temperature controller, and high voltage supply for the VIAMP and can be used with VIAMP SDD sizes from 7 mm² (H7) to 50 mm² (H50) collimated area.

- The **VICO-DV** contains the KETEK VICO-DP digital pulse processor. It is the digital variant of the featured OEM system. The digital output (complete spectrum) is accessible via USB or RS-232 interface. Moreover the analog output is also available (ramped reset type).
- The **VICO-AV** is the analog variant without the VICO-DP. Only the analog output (ramped reset type) is available.

2.1 Ordering information

EVICO-DV: for the VICO-DV (digital)

EVICO-AV: for the VICO-AV (analog)

EVICO-DV-CORDSET: for a set of cables (power supply, USB, RS232, analog out), which is useful for first tests

2.2 Features

- Small dimensions 95 x 50 x 19 mm^3
- Temperature controller and HV supply for VIAMP
- Ramped reset type preamplifier output
- High-speed USB 2.0 interface
- RS-232 interface (up to 921 kBaud)

Fig. 1 shows the top view of the VICO-DV/AV PCB with its outline dimensions.

Fig. 2 shows the top view of the VICO-DV/AV PCB with the functional features of the VICO-DV/AV components.

For more details of the referenced pins, please refer to section 3.1

Fig. 1 VICO-DV/AV PCB - outline dimensions

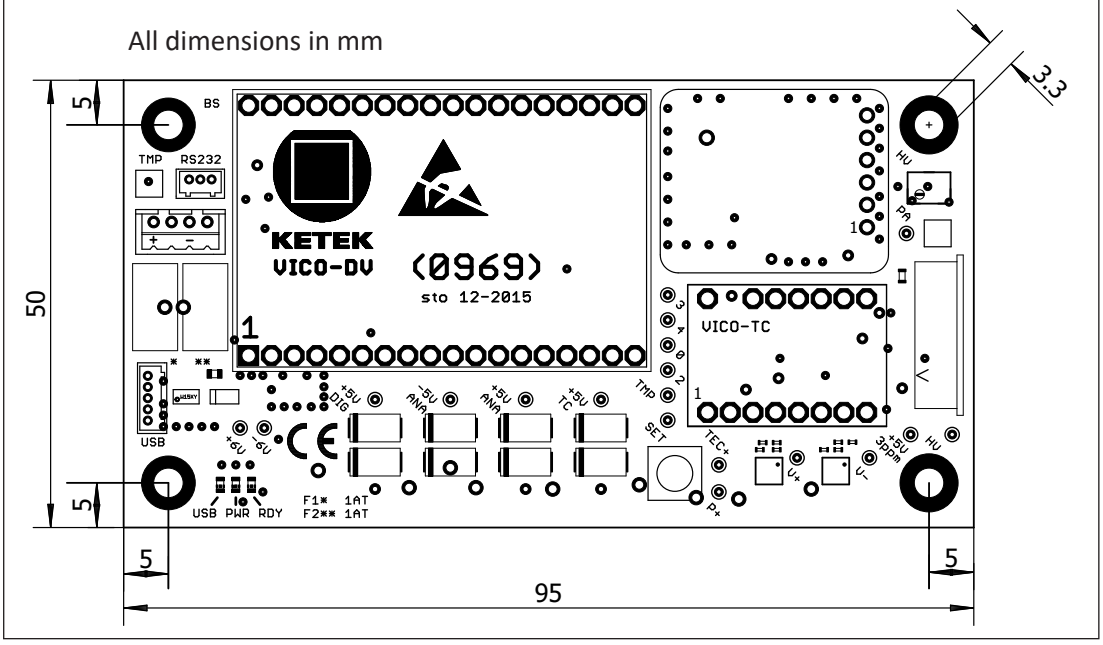


Fig. 2 VICO-DV/AV PCB - topology

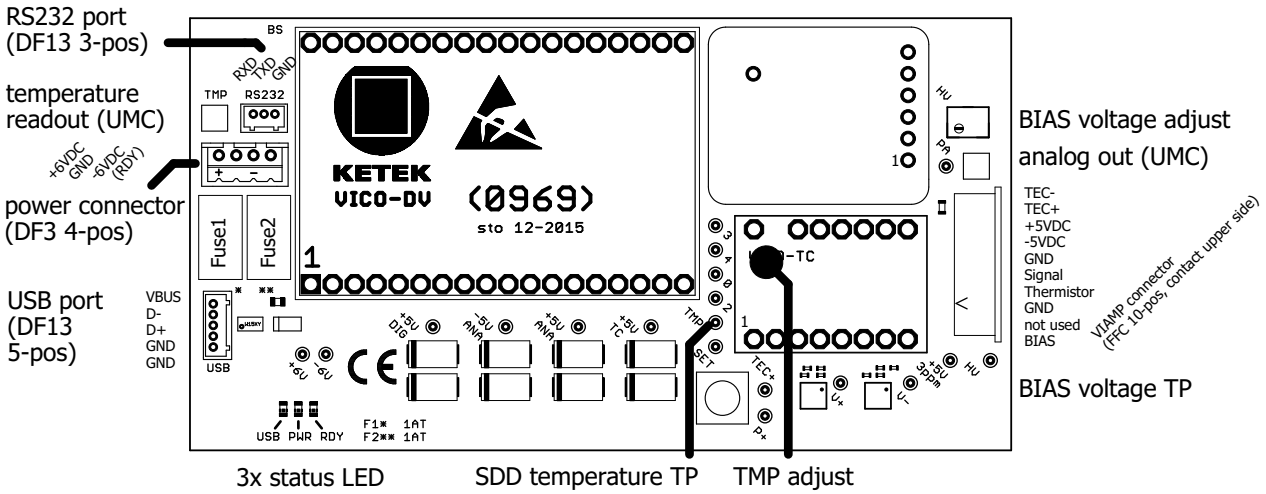
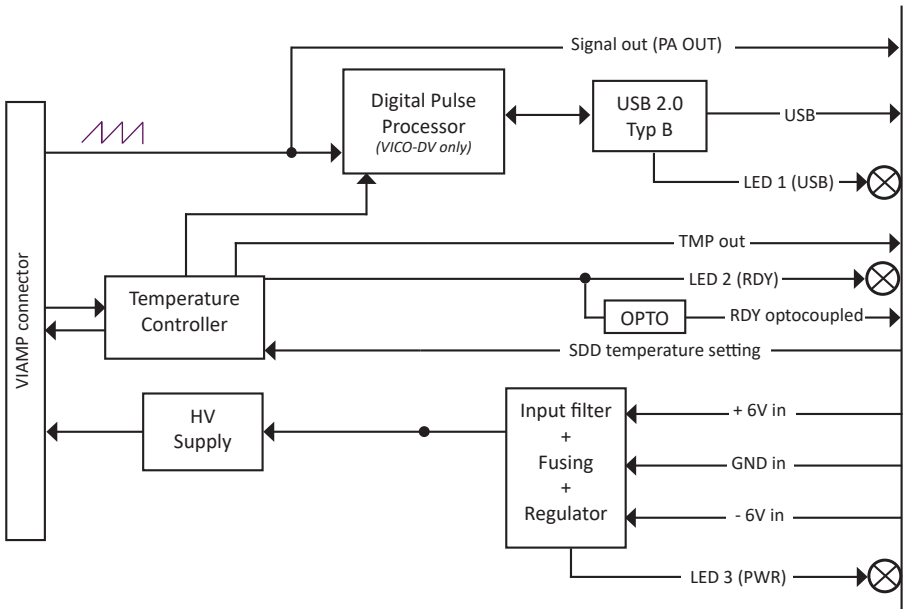


Fig. 3 Functional block diagram (see following tables for details)



3 Specifications

Tab. 1 Environmental Requirements		
Characteristics	Specification	Note
Operating Temperature Range	0 °C to +50 °C	–
Storage Temperature Range	-30 °C to +80 °C	–
Operating Humidity Range	5 .. 80 %	Non-condensing
Vibration test	Acc. to EN 60068-2-27	Approved

Tab. 2 General information		
Characteristics	Specification	Note
Outline dimensions	95 x 50 x 19 mm³	See drawing in attachment
Weight	74 g (51 g VICO-AV)	Without cables
RoHS compliant	Yes	–
EMC requirements	Acc. to EN 61326-1: 2013 class B	See appendix (chapter 7)

Tab. 3 Required power supply and stability		
Parameter	Specification	Note
Line Voltage Regulation	±0.03 %	–
Load Voltage Regulation	±0.03 %	–
Voltage Ripple	30 mV_{p-p}	–

Tab. 4 VICO-DV electrical parameters		
Parameter	Typ. rating*	Max. rating**
Pos. DC volt.	+6 V ± 5 %	+6.3 V
Pos. current	380 mA	990 mA
Pos. dissipation loss	2800 mW	3050 mW
Neg. DC volt.	-6 V ± 5 %	-6.3 V
Neg. current	35 mA	65 mA
Neg. dissipation loss	105 mW	114 mW

Tab. 5 VICO-AV electrical parameters		
Parameter	Typ. rating*	Max. rating**
Pos. DC volt.	+6 V ± 5 %	+6.3 V
Pos. current	200 mA	750 mA
Pos. dissipation loss	2000 mW	2300 mW
Neg. DC volt.	-6 V ± 5 %	-6.3 V
Neg. current	11 mA	15 mA
Neg. dissipation loss	30 mW	39 mW

* Measured at +20 °C housing bottom side temp. of VIAMP module, -20 °C SDD chip temp., steady state
** Max. rating values reached for few seconds after powering on or full thermal load

3.1 VICO-DV/AV Pin Description

3.1.1 VIAMP

Tab. 6 VIAMP connector FFC 10 pos. (only for KETEK VIAMP)

Pin #	Name	Type	Description	Note	Reference
1	TEC-	pas	TEC return		
2	TEC+	out	TEC supply		
3	+5VDC	out	VIAMP supply		
4	-5VDC	out	VIAMP supply		
5	GND	pas			
6	Signal	in	VIAMP signal line	Identical with ANALOG OUT	Section 3.1.5
7	Thermistor	in		Identical with TEMPERATURE READOUT	Section 3.1.6
8	GND	pas			
9	n.c.	–	Not connected		
10	BIAS	out	HV supply	Typical: -168 VDC (Cube Type), -140 VDC (FET Type)	

3.1.2 Power

Tab. 7 Power connector DF3 4-pos.

Pin #	Name	Type	Description	Note	Reference
1	+6VDC	in	Supply	max. 990 mA	See Tab. 4 and Tab. 5
2	GND	pas			
3	-6VDC	in	Supply	max. 65 mA	See Tab. 4 and Tab. 5
4	RDY*	out	Status: SDD operating temperature	Optocoupled: High level (cooling down) Low level (operating temperature has been reached)	Internal pull-up resistor (10 kΩ @ +6 V), Rload = 20 kΩ. See Fig. 4

* If cord set used for optocoupled output please plug in the provided yellow cable into the corresponding connector

3.1.3 USB

Tab. 8 USB port DF13 5-pos.

Pin #	Name	Type	Description	Note	Reference
1	V_BUS	in	USB supply		Refer to the VICO-DP manual
2	D-	I/O	USB Data-		
3	D+	I/O	USB Data+		
4	GND	pas			
5	GND	pas			

3.1.4 RS 232

Tab. 9 RS 232 port DF13 3 pos.					
Pin #	Name	Type	Description	Note	Reference
1	GND	pas		Do not use RS232 interface and USB simultaneously!	Refer to the VICO-DP manual
2	TX	I/O	Transmit Data		
3	RX	I/O	Receive data		

3.1.5 Analog output (UMC)

Tab. 10 Analog out PA					
Pin #	Name	Type	Description	Note	Reference
1	PA	out		Load resistance ≥ 10 kΩ	
2	Shield	pas			

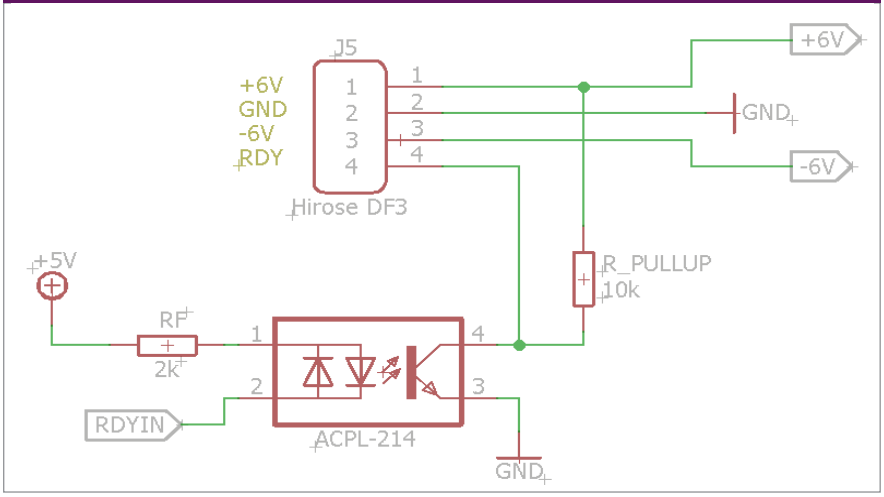
3.1.6 Temperature readout (UMC)

Tab. 11 Temperature readout TMP					
Pin #	Name	Type	Description	Note	Reference
1	TMP	out	SDD temperature monitor	Load resistance ≥ 1 MΩ, current ≤ 1 mA	See section 5.1
2	Shield	pas			

3.2 Connector Description

Tab. 12 Connectors and contacts			
Name	Connector Type	Mating contact	Note
VIAMP	TE connectivity 1-84953-0	FFC 10-pos, 1 mm	ZIF contact upper side, length 30 mm (other on request), unshielded, THT variant on request, only compatible with KETEK VIAMP series
Power	Hirose: DF3-4P-2DSA(01)	DF3-4S-2C socket DF3-2428SCC crimp	Crimping tool: Hirose DF3-TA2428H
USB	Hirose: DF13-5P-1.25DSA	DF13-5S-1.25C socket DF13-3032SCFA crimp	Crimping tool: Hirose DF13-TB2630HC
RS 232	Hirose: DF13-3P-1.25DSA	DF13-3S-1.25C socket DF13-3032SCFA crimp	Crimping tool: Hirose DF13-TB2630HC
PA	Emerson: 128-0711-201	UMC low profile series	Coaxial cable assembly
TMP	Emerson: 128-0711-201	UMC low profile series	Coaxial cable assembly

Fig. 4 RDY signal output stage



3.3 Accessories

Optionally a cord set is available which consists of:

- USB connection cable
- RS-232 connection cable
- Power supply cable
- Optocoupler connection cable for RDY signal.

Tab. 13 Pinning of USB 2.0 connection cable

Pin #	Color	Description	USB-A Pin
1	Red	V_{bus}	1
2	White	D-	2
3	Green	D+	3
4	Black	GND	4

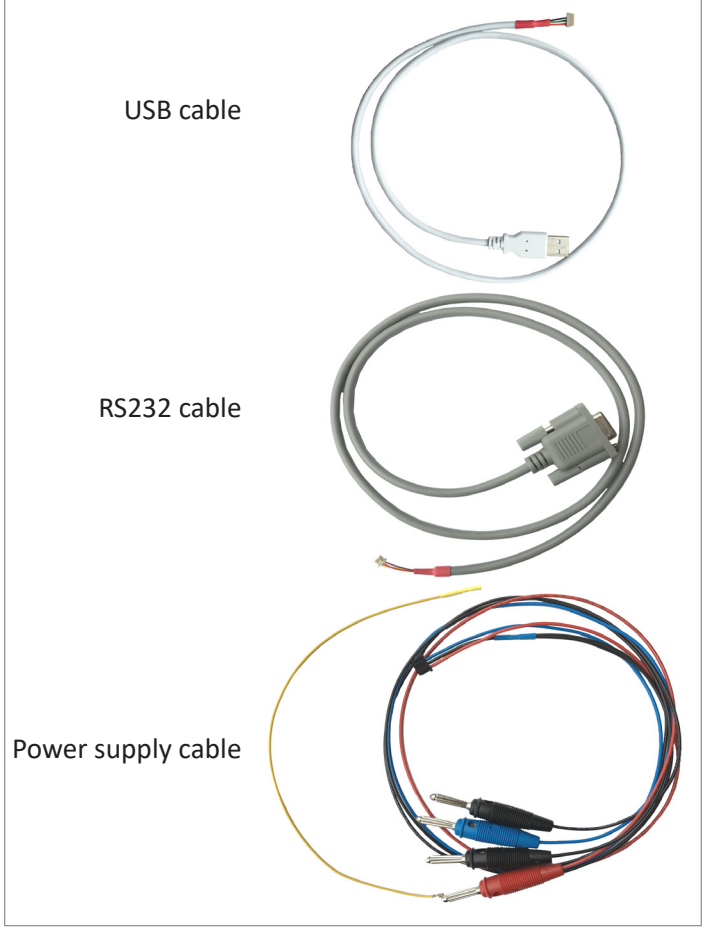
Tab. 14 Pinning of RS-232 connection cable

Pin #	Color	Description	SUB-D Pin
1	Yellow	GND	5
2	Red	Tx	3
3	Brown	Rx	2

Tab. 15 Pinning of power supply cable

Pin #	Color	Description	Note
Banana plug (4 mm)	Red	+6 V (±5 %)	Max. 1 A
	Black	GND (+6 V line)	
	Blue	-6 V (±5 %)	Max. 0.1 A
	Black	GND (-6 V line)	
Fischer PK1G	Yellow	RDY status	See Tab. 7

Fig. 5 Optional cord set



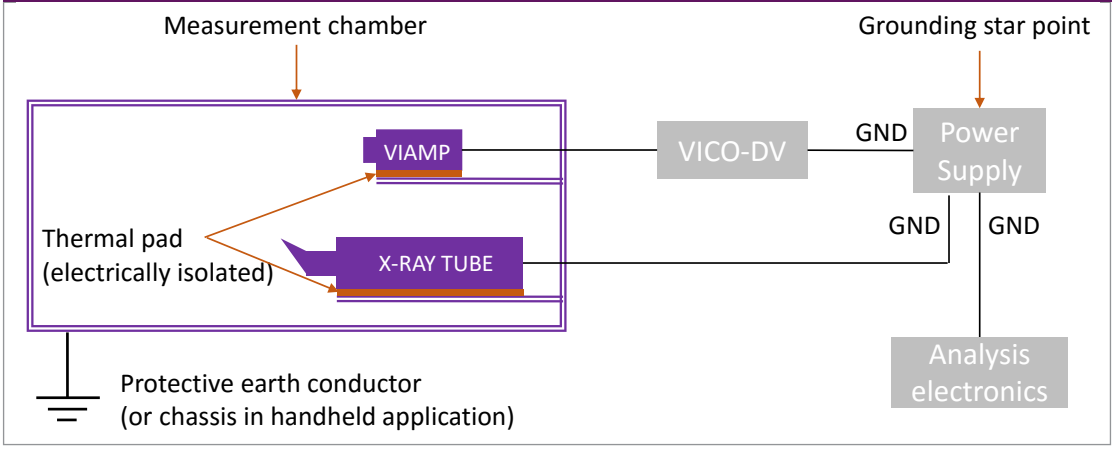
4 Getting started

IMPORTANT

Make sure that all necessary requirements for meeting the ESD cautions are fulfilled.

1. Remove the VICO-DV/AV and VIAMP carefully from the transport case.
2. Leave the protection cap on the SDD in order to avoid window damage while handling the system.
3. Mount the VICO-DV/AV in your measurement equipment at a desired position, using the four fixation holes. Please note that the holes are connected to **ground potential**.
   Moreover make sure that the neutral point of the system is close to the power supply or in case you are using battery close to the '–' pole. Fig. 6 shows a possible grounding configuration of the instrument.

Fig. 6 A possible grounding configuration



IMPORTANT

Please notice that the devices are not designed to be operated under vacuum conditions.

4. Mount the VIAMP in a way that it is **electrically isolated** but **thermally conductive**, as the VIAMP housing functions as a heat sink.
5. Check the BIAS voltage (- 168 VDC for CUBE '*KB5**C**xT0-...*' and - 140 VDC for FET version'*KB5**F**xT0-...*') and if necessary adjust them (section 5.2).
6. Establish the VIAMP contact with the separate FFC cord or the integrated FFC cable. Cable orientation: contacts on the upper side.

IMPORTANT

Avoid a mechanical contact with the SDD at any time, as this may cause a beryllium window damage which is not covered by warranty.

7. Remove the protection cap slowly and carefully. Do not touch the SDD with your fingers or with the protection cap.
8. Connect the power cord. If the cord set is used please refer to section 3.3 for detail on pinning.

9. Turn on the power supply.
10. Be sure that the PWR LED indication is on.
11. Wait until the RDY LED indication lights up. Your VICO-DV/AV & VIAMP system is ready for operation.
12. Connect USB with the PC. The USB LED will light up (**VICO-DV only**).
13. Alternatively: Connect RS232 (**VICO-DV only**).
14. Check preamplifier output signal at the UMC connector Analog out using an oscilloscope.
15. Please continue reading the VICO-DP manual for details on operating the VICO-DV/AV.

The typical output signal is a ramp as shown in Fig. 7. If the SDD is exposed to an X-ray radiation, the ramp signal is shorter with some low amplitude steps as shown in Fig. 8. Every single step on the ramp signal corresponds to a photon which has been absorbed in the SDD. By measuring the height of this step the energy of this photon can be determined.

Fig. 7 Ramped preamplifier output signal

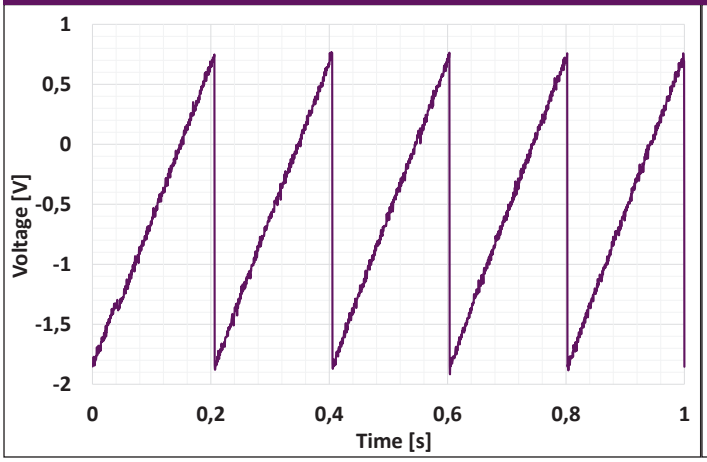
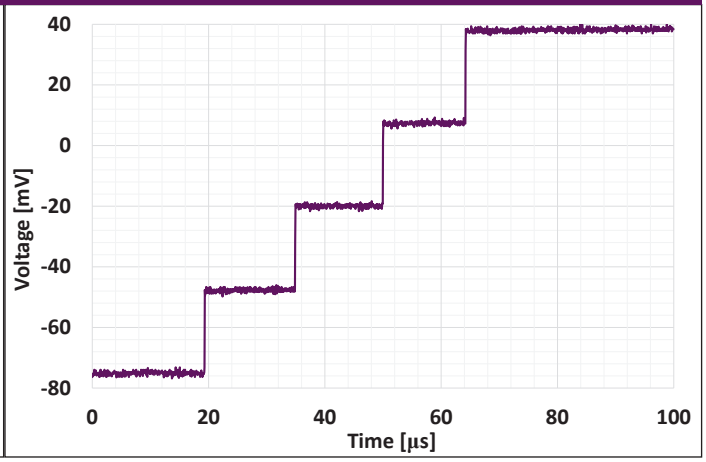


Fig. 8 Ramp signal with steps, marking X-ray radiation



The ramped signal is caused by the leakage current of the SDD, which leads to a continuously rising output signal level.

This is a normal behavior which occurs even if the SDD is not exposed to any radiation. In order to avoid an electrical saturation of the signal-processing electronic, the signal level is periodically reset as soon as a particular signal level has been reached. Thus the signal can not exceed a defined voltage range. During the reset procedure (typically < 500 ns), no valuable information can be acquired and the signal is being lowered to the base level.

5 Operating the VICO-DV

For detailed operating instructions of the VICO-DP software, please refer to the VICO-DP Manual. See section „3 The ProSpect Software“.

KETEK allows the customer to perform the following settings only. Other adjustments of the VICO-DV/AV than described in this manual are not allowed and may lead to a warranty loss.

Please be sure that the stuff performing those adjustments is well trained in regards to the electrical safety and ESD.

5.1 Reading and setting the Temperature of the SDD

The temperature of the SDD chip can be measured by using the integrated temperature readout circuit.

The TMP output provides positive voltage which is measured with a high ohmic (≥ 1 MΩ) multimeter. This output is buffered and cannot exceed 5 VDC. Typically it is below 2 VDC.

The temperature readout circuit consists of a thermistor which is mounted on the rear side of the SDD interposer.

The thermistor whose resistance varies with the changing temperature is supplied with a constant current. As a consequence the thermistor voltage is related to the thermistor temperature.

To determine the SDD temperature it is necessary to measure the TMP out voltage and to compare the measured value with look-up table below.

Optionally, the SDD’s temperature can be also adjusted. The default temperature setting of the SDD is - 20 °C.

IMPORTANT
Sine the VIAMP-KC version the thermistor output can be either non-linearized (default configuration) or on request linearized (as previous versions -KA and -KB). Please note that the both configurations would provide different voltage readouts for the same chip temperature. Refer to the Tab. 16 and Tab. 17 for more details.

In order to set the temperature please follow the instructions below.

VICO-DV includes a TEC controller component (VICO-TC). By means of a small potentiometer situated inside the VICO-TC.

1. Connect the VIAMP.
2. Connect the power supply and turn the device on.
3. Connect the multimeter to SET test point.
4. Adjust the SET voltage to the desired value according to Tab. 16 for **non-linearized** and Tab. 17 for **linearized** (all VIAMPs -KA and -KB) VIAMP thermistor output configuration.
   Use a **1.3 x 15** ceramic trimming tool to reach the potentiometer and adjust the temperature.
   The position of the VICO-TC is indicated in Fig. 2 on page 4.
5. Wait until the RDY LED lights up to indicate that the set SDD temperature has been reached.
6. Connect the multimeter to TMP test point.
7. Check TMP according to Tab. 16.
8. Turn the device off.

Tab. 16 Temperature setting and readout table. Thermistor output NON-LINEARIZED.

SDD temp. [°C]	SET [V]	TMP [mV]	SDD temp. [°C]	SET [V]	TMP [mV]	SDD temp. [°C]	SET [V]	TMP [mV]
-50	0.500	579.9	-26	1.100	132.1	-2	1.700	35.2
-49	0.525	544.5	-25	1.125	124.6	-1	1.725	33.5
-48	0.550	511.1	-24	1.150	117.5	0	1.750	31.8
-47	0.575	479.9	-23	1.175	110.9	1	1.775	30.2
-46	0.600	450.5	-22	1.200	104.6	2	1.800	28.8
-45	0.625	423.0	-21	1.225	98.8	3	1.825	27.4
-44	0.650	397.2	-20	1.250	93.3	4	1.850	26.0
-43	0.675	373.0	-19	1.275	88.2	5	1.875	24.8
-42	0.700	350.3	-18	1.300	83.3	6	1.900	23.6
-41	0.725	329.0	-17	1.325	78.8	7	1.925	22.5
-40	0.750	309.1	-16	1.350	74.5	8	1.950	21.4
-39	0.775	290.4	-15	1.375	70.5	9	1.975	20.4
-38	0.800	273.0	-14	1.400	66.7	10	2.000	19.4
-37	0.825	256.6	-13	1.425	63.1	11	2.025	18.5
-36	0.850	241.2	-12	1.450	59.8	12	2.050	17.7
-35	0.875	226.9	-11	1.475	56.6	13	2.075	16.9
-34	0.900	213.4	-10	1.500	53.6	14	2.100	16.1
-33	0.925	200.8	-9	1.525	50.8	15	2.125	15.4
-32	0.950	189.0	-8	1.550	48.2	16	2.150	14.7
-31	0.975	177.9	-7	1.575	45.7	17	2.175	14.0
-30	1.000	167.5	-6	1.600	43.4	18	2.200	13.4
-29	1.025	157.8	-5	1.625	41.1	19	2.225	12.8
-28	1.050	148.7	-4	1.650	39.1	20	2.250	12.22
-27	1.075	140.1	-3	1.675	37.1			

Tab. 17 Temperature setting and readout table. Thermistor output LINEARIZED (all VIAMPs -KA and -KB).

SDD temp. [°C]	SET [V]	TMP [mV]	SDD temp. [°C]	SET [V]	TMP [mV]	SDD temp. [°C]	SET [V]	TMP [mV]
-50	0.500	192.8	-26	1.100	118.6	-2	1.700	67.8
-49	0.525	190.1	-25	1.125	115.7	-1	1.725	66.5
-48	0.550	187.4	-24	1.150	112.9	0	1.750	65.2
-47	0.575	184.5	-23	1.175	110.1	1	1.775	64.1
-46	0.600	181.6	-22	1.200	107.3	2	1.800	62.9
-45	0.625	178.7	-21	1.225	104.7	3	1.825	61.9
-44	0.650	175.6	-20	1.250	102.1	4	1.850	60.8
-43	0.675	172.6	-19	1.275	99.6	5	1.875	59.8
-42	0.700	169.4	-18	1.300	97.1	6	1.900	58.9
-41	0.725	166.3	-17	1.325	94.8	7	1.925	58.0
-40	0.750	163.1	-16	1.350	92.5	8	1.950	57.1
-39	0.775	159.9	-15	1.375	90.3	9	1.975	56.3
-38	0.800	156.6	-14	1.400	88.1	10	2.000	55.5
-37	0.825	153.4	-13	1.425	86.0	11	2.025	54.8
-36	0.850	150.1	-12	1.450	84.0	12	2.050	54.0
-35	0.875	146.9	-11	1.475	82.1	13	2.075	53.3
-34	0.900	143.6	-10	1.500	80.3	14	2.100	52.7
-33	0.925	140.4	-9	1.525	78.5	15	2.125	52.1
-32	0.950	137.2	-8	1.550	76.7	16	2.150	51.5
-31	0.975	134.0	-7	1.575	75.1	17	2.175	50.9
-30	1.000	130.8	-6	1.600	73.5	18	2.200	50.4
-29	1.025	127.7	-5	1.625	72.0	19	2.225	49.8
-28	1.050	124.6	-4	1.650	70.5	20	2.250	49.3
-27	1.075	121.6	-3	1.675	69.1			

5.2 Reading and setting HV Bias

The high voltage driver is set by default to:

- -168 VDC (±0.2 V) for CUBE based VIAMP (product code *KB5**C**xT0-...*)
- -140 VDC (±0.2 V) for FET based VIAMP (product code *KB5**F**xT0-...*)

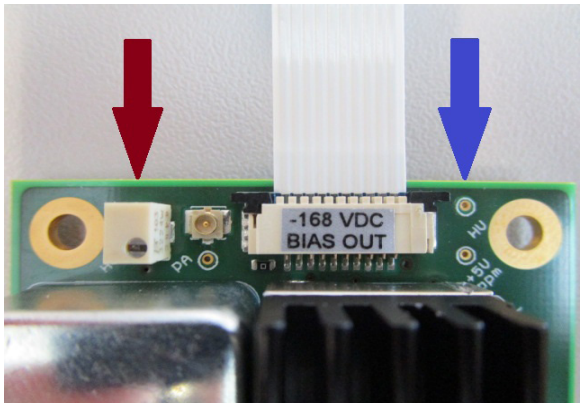
This voltage can be changed by an experienced user.

In order to change the high voltage setting please follow the instructions below.

This procedure is exact the same for the VICO-DV as well as the VICO-AV.
The HV Bias can be set by adjusting the potentiometer, labeled “Bias voltage adjust” in Fig. 2 on page 4.
The current HV setting can be read out at the HV test point, labeled “Bias voltage TP” in Fig. 2 on page 4.

Both, the HV set trimmer (red arrow) and HV test (blue arrow) point are shown in Fig. 9.

Fig. 9 High voltage set and test points



1. Connect the VIAMP.
2. Connect the power supply and turn the device on.
3. Connect a high ohmic (≥ 1 MΩ) multimeter to HV test point.
4. Adjust the HV voltage to the desired value.
   Use a **0.8 x 60** screw driver tool to reach the HV potentiometer.
5. Check the voltage at the HV test point.
6. Turn the device off.

5.3 Spectroscopic Performance

The VICO-DV/AV's spectroscopic performance is determined by the VIAMP module. Typical performance is shown in the following graphs.

Fig. 10 Input Count Rate vs. FWHM for different peaking times

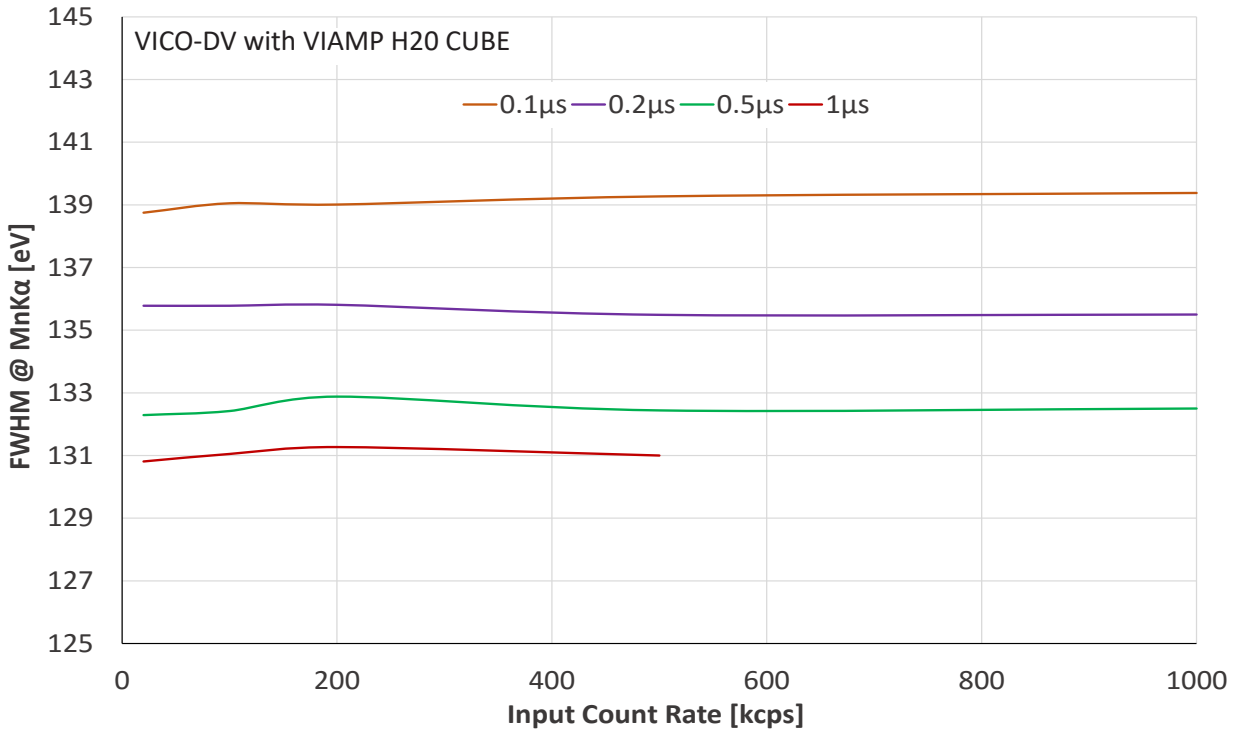
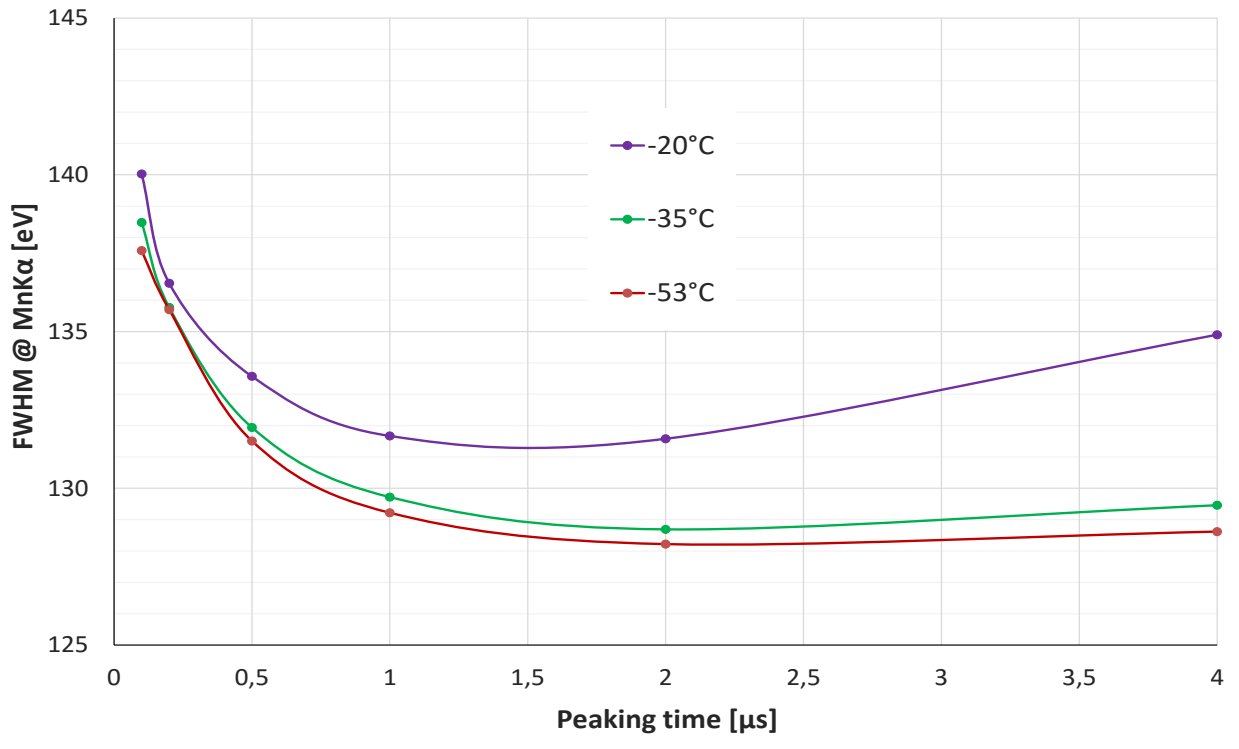


Fig. 11 FWHM vs. peaking time at different chip temperatures



6 Troubleshooting

This VICO-DV/AV unit has passed the quality control and the functional test. Thus no technical malfunction is expected during the operation. However if you are experiencing an unusual behavior of the system please read the instructions below. In case the existing problem is not listed or the proposed actions did not solve the issue please contact the KETEK support team.

Issue	Possible solution
PWR LED remains off	The power supply of the VICO-DV/AV is not working properly: • Please check the POWER connector. • The two fuses can be blown, if so replace those (Fuse 1 for +6 V). Make sure that only fuses with the required rated current and of specific type are used for the replacement. The usage of makeshift fuses or short circuiting of the fuse socket is not allowed. Recommended fuses: **LITTELFUSE 1 AT, 0154001.DRT** • Try the power cable which is included in the cord set.
USB LED remains off	• Please check the wiring of the USB connector. • USB cable connected and the PC on? • Try the USB cable which is included in the cord set.
The VICO-DV is not recognized by Windows	The VICO-DP driver is not installed properly: • Please refer to the VICO-DP Manual.
RDY LED remains off	The set SDD temperature has not been reached: • Please wait at least 1-2 min. after powering up the device. • The SDD temperature has been set to a too low value. Set the SDD to a higher temperature. • The ambient temperature is to high and the desired SDD temperature cannot be reached. Set the SDD to a higher temperature. • The thermal coupling between the VIAMP and the instrument is not sufficient. Please be sure that the generated heat by the VIAMP can be transfered away.
Poor spectroscopic performance	KETEK specifies the full width at half maximum for Mn Kα peak with ^{55}Fe as an x-ray source. • The FWHM performance is directly related to the detector temperature. Thus be sure the specified SDD temperature has been reached. • The other electrical devices near the detector, e.g. the x-ray tube, can induce a noise in the spectrum. Be sure that other devices are electrically decoupled from the VIAMP. The VIAMP housing should be electrically decoupled from the instrument. • High Voltage has not been set correctly. Please double check this setting as described in section 5.2. • Be sure that your grounding and shielding concept do not induce a noise into the system (e.g. grounding loops). Refer to Fig. 6 on page 9.

7 EMC Declaration of Conformity

Declaration of Conformity

CE

We,
KETEK GmbH, Hofer Str. 3, 81737 Munich, Germany,
declare under our sole responsibility, that the OEM product

Name:	**Vitus Components with Vitus Preamplifier**
Brand:	**KETEK – Creative Detector Solutions**
Type, Model, Article No.:	**VICO-DV with VIAMP-KC**

fulfills the requirements of the standard and regulations of the following directives:

I) **Directive 2014/30/EU** of the European Parliament and of the Council from April 20th, 2016 on the approximation of the laws of the member states relating to electromagnetic compatibility.

II) **DIN EN 61326-1:2018-09 (IEC 61326-1:2018-09)**
Electrical equipment for measurement, control and laboratory use;
EMC – requirements; Part 1: general requirements.

III) **Directive 2014/35/EC** Low Voltage Directive of the European Parliament and of the Council from February 26th, 2014 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

IV) **DIN EN 61010-1:2015-04 (Third Edition) Part 1 & A1 & A2 (IEC61010-1:2015-04)**
Safety requirements for electrical equipment for measurement, control and laboratory use; Part 1: general requirements.

V) **DIN EN 60068-2-27:2010-02 (IEC60068-2-27:20010-02)**
Environmental tests, vibration tests, mechanical shock tests (mS).

VI) **Restriction of Hazardous Substances Directive RoHS 2 (including 2011/65/EU and 2015/863/EU)** of the European Union from July 21st, 2011 restricting the use of ten hazardous and conflict materials in the manufacture of various types of electronic and electrical equipment. Documentation according to EN 50581:2012.

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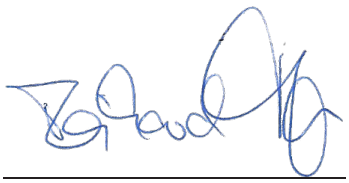
VII) **Directive 2012/19/EU (WEEE)** of the European Economic Community (EEC) from February 2003 on waste electrical and electronic equipment, setting collection, recycling and recovery targets for all types of electrical goods.

This product is considered a component which will be installed into a final equipment. Thus it must be reconfirmed that this final equipment still meets the EMC directives.

Munich, January 22nd, 2021



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8 Contact

If you have any questions regarding this or any of our products please do not hesitate to contact us via e-mail or phone.

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