



KOLMAR TECHNOLOGIES DETECTOR OPERATION MANUAL

1. INTRODUCTION

This document describes Kolmar Technologies infrared detectors with amplifiers in the KMPV, KLD, and KISDP series.

The KMPV series detectors are high speed [wide bandwidth] HgCdTe photodiodes with integral amplifiers in pour filled Dewars. The KLD series detectors are moderate speed [2MHz bandwidth] HgCdTe photodiodes with integral amplifiers in pour filled Dewars. Both KMPV series and KLD series are available to cover either the 2 to 12 spectral range, or the 2 to 9 range. Various infrared window materials are available to optimize performance in a desired spectral range. The standard window for the KMPV series is ZnSe with a 2 to 12um anti-reflection coating. The standard window for the KLD series is BaF₂. The KMPV and KLD dimensions are identical.

The KISDP series detectors are high speed/wide bandwidth InSb photodiodes with amplifiers in pour filled Dewars. They cover the 1 to 5 um spectral range. The standard window is sapphire. The most common size detector is 1mm diameter.

For KMPV and KISDP series the detector size determines the upper limit of frequency response. The detector response time is RC time constant limited -- junction capacitance and series resistance and load resistance. Smaller detectors will be faster.

2. CAUTIONS AND WARNINGS

- CAUTION 1.

Always power the negative and positive voltages simultaneously. This means connecting all the wires before turning on the power with the power supply switch or an in line connector. Some models have a multi pin power socket on the Dewar.

Connect the detectors wires with solder. Do not use "clips" where one lead may come off and cause single supply on condition which may degrade some components.

- CAUTION 2.

Cool the detector to liquid nitrogen temperature before the power is turned on -- except for models with automatic on/off switch. Do not leave power on for extended periods with the detector at room temperature. It takes several hours for the detector to warm up, so there is time for an orderly shut down. When the detector warms, the DC output of the amplifier reaches the maximum value -- 12 Volts. Extended time in this state with a 50Ohm or lower load can degrade amplifier performance and shorten its life. An [AUTOMATIC POWER SHUTOFF](#) option is available for dual amplifier models.

- CAUTION 3.

Never position your face over the top of the Dewar.

Liquefied nitrogen gas is extremely cold and can produce an effect on the skin similar to a burn.

The geyser effect: the physical properties of the Dewar materials causes an unusual geyser effect if the Dewars are filled quickly. This is the result sudden decrease in the specific heat of the components in the well at low temperatures, causing a sudden release of heat to the liquid nitrogen. This does the Dewar no harm but the liquid erupting could injure the person filling the Dewar. Partially fill the Dewar until geyser effect observed, then complete the filling.

- WARNING: FRAGILE

The detector/Dewar assembly is FRAGILE. DO NOT DROP. The shock could rupture seals and cause loss of vacuum.

3. POWER REQUIREMENTS

All model require dual power supplies. These can be linear, switched power supplies, or batteries.

The normal operating voltage is +15V and -15V and a ground/return connection. The batteries achieve the lowest noise, but are not necessary. The front end of the amplifiers are voltage regulated and have a very high power supply noise rejection ratio. The KMPV and KISDP series with single output draw 35mA, and with dual outputs draw 55mA. The KLD series draws 20mA with single output, and 38mA with dual outputs.

The detectors may also be operated with +12V -12V power supplies. On detectors with a DC output, this requires the readjustment of the DC level to zero for the ambient background, when the detector is operating. There is a small hole above the DC output connector with a 15 turn potentiometer, which can be accessed with a small screwdriver.

4. CALIBRATION TEST REPORT DESCRIPTION

Every detector is tested 100% and calibrated against a 500K blackbody. The rise time is measured from 10% to 90% with a diode laser pulse. Below is a typical test report for a KLD series detector.

Kolmar Technologies, Inc.
Test Data Sheet

18 DEC 2004

Infrared detector:

Detector Model: KLD-1-J1/DC
Detector Serial No. 3888-11
Lot: MCT PV 3385-10

Description:

Window:	ZNSE 10.6UM ARC	
Distance detector/front Window nominal	1.02 CM	
Field of View [FOV]	60 degrees full angle nom.	
Connector(s)	BNC	
TEMP SENSOR:	NA	
TRANSIMPEDANCE AMP.	10000 DC.CH	NA AC.CH
Dewar type	J SIDELOOKING	SN 04-4737
LN2 hold time	12 nominal	
Detector Temperature	77 K	
Detector data:		Units
Size:	1 mm	DIA.
Active area:	7.85E-03	cm ²
Responsivity(DETECTOR):	6.78	Amp/Watt
Quantum efficiency PEAK:	0.80 @ BIAS V 0.06	window included
Peak wavelength:	10.53	um
Cut off wavelength:	11.45	um
Resistance (@V=0):	200	Ohm
RoA :	1.57	Ohm-cm ²
BACK IMPEDANCE	3000 0.063 @ V	Ohm
R series	5 max	Ohm
risetime	1.86E-07	sec
Bandwidth(-3db)	2 NOM	MHz
D*[@PEAK,@50kHz]	7.86E+10	Jones
RESPONSIVITY	6.78E+04	DC OUTPUT V/W
RESPONSIVITY	NA	AC OUTPUT V/W
Pin Configuration:		

5. OPERATION OF DETECTOR

Requirements: Detector, fill tube, and liquid nitrogen, dual power supply +15V return

-15V 100mA minimum. Will also operate with +12V return -12V supply or batteries.

Connect power supply to detectors pins or socket. Connect the signal output coaxial cables to the BNC or SMA connector[s] output connectors.

Cool detector with liquid nitrogen using the funnel fill tube. Keep filling the funnel in cone increments. Repeat until reservoir is full [spill over]. Cool down time is about 5 to 10 minutes. The detector is at WK once the rapid boil off venting has stopped. Place the fill port plug in the fill port. Turn on the power. Connect the DC channel output to an oscilloscope and check the DC output level. This has been set to zero with 295K background temperature in the detector's field of view. Confirm that this is still true. If the detector is still cooling, this voltage may be decreasing. Wait until it has stabilized. If this level is not at zero Volts, it may be adjusted by turning the 15 turn potentiometer in the hole above the DC output connector. You are good to go.

6. TROUBLE SHOOTING

There should be no problems when operating these detectors. But sometimes things do go wrong. The problem cases are: no signal, low signal, excess noise, poor signal to noise ratio.

- NO SIGNAL

We like to think our products are perfect so first look for a cause elsewhere. Is there power to the detector? Are both positive and negative sides connected? Is the return connected? Is the amplifier drawing the correct current -- 35mA, 20mA, or 60mA depending on the specification? What is the signal source and is it on? What is the signal power-- is it too low to see in the peak-peak 5mV broadband noise? or is it too high and the amplifier is saturated at +12V DC output? And the obvious, is the detector still cold?

A quick check with a DC coupled detector; look at the output on a scope. It should be near zero volts with white noise 5mV peak to peak. Hold you hand in the field of view and the DC level should go up. If nothing happens, or if the DC level is at -12V or +12V, contact technical support.

- LOW SIGNAL

Assuming the source has not changed and the signal has decreased, this may be a detector problem. Contact technical support.

- EXCESS NOISE

Excess noise may be caused by the environment, poor ground connections, high background photon flux, or ground loops. Power supply noise should not be a problem because of the high noise rejection built into the amplifier.

7. MAINTENANCE

The KMPV, KLD and KISDP series detectors should provide years of trouble free use with proper care and handling. However, after several years of operation, the Dewar may require a refreshing of the vacuum. Signs that this may be necessary are shorter LAND hold time, or condensation on the outside Dewar walls.

Contact technical support to make arrangements to have this procedure performed on the Dewar. Or, this can be done by the owner, if a high vacuum pump system is available. The vacuum refresh procedure requires the VO-1 valve operator [see accessories listed at www.kolmartech.com/prod_1st.htm] and the procedure listed below.

**DO NOT OPEN DEWAR VACUUM VALVE WHEN COLDWELL IS STILL COLD.
CONDENSATION ON DETECTOR MAY DEGRADE PERFORMANCE.
IT TAKES EIGHT (8) HOURS TO WARM UP PASSIVELY.**

Procedure:

- 1. Extract plunger of operator VO-1
- 2. Place gold colored adapter over valve and tighten. Finger tightening is sufficient.
- 3. Push plunger in to plug and screw in 2.5 to 3 turns. There is a mark on the knob.
- 4. Place the smooth end (0.375 inch/ 9.5mm O.D.) into vacuum system -- the connection may be adapter on pump or a high vacuum hose.
- 5. Rough pump manifold. Valve still closed.
- 6. Open valve. Pull out plunger and valve plug to open dewar valve.
- 7. Evacuate dewar to pressure less than 1E-6 Torr.

- 8. Close Valve. Push plunger in completely.
- 9. Close high vacuum valve and vent system, then unscrew plunger from valve plug. Then retract plunger.
- 10. Loosen gold colored adapter and remove VO-1 from dewar.
- 11. Replace dust cap on valve.

8. SPECIFICATIONS

MODEL KMPV11 SERIES

Size(mm \times mm)	1.0, 0.5,0.25, 0.2,0.15,0.1.0.05	
Quantum Efficiency	>50%	
Wavelength cutoff	>11.5 μ m	
Bandwidth	DC to 20MHz 100Hz to 20MHz	
FOV	60 degrees full angle	
D*(peak,10kHz,60,1)	3×10^{10} Jones nom.	
Responsivity (output)	> 40,000 V/Watt	
Power	+12V,-12V or +15V,-15V 55mA	

MODEL KISDP-X-X SERIES

Size(mm \times mm)	2.0, 1.0, 0.5
Quantum Efficiency	>75%

Wavelength cutoff	5.4 um
Bandwidth	DC to 20MHz 100Hz to 20MHz
FOV	60 degrees full angle
D*(peak,10kHz,60,1)	2 X 10 ¹¹ Jones nom.
Responsivity (output)	> 40,000 V/Watt
Power	+12V,-12V or +15V,-15V

KLD Series Configurations

Model *	Wavelength (m) Peak Cutoff	Size (mm)	Bandwidth (Hz)	D* (60FOV) (Jones,typ)	Responsivity (Volts/mWatt)
KLD-1-J1-3/11	10.5 >11.5	1 x 1	2M	3E10	>40
KLD-1-J1-3/9	7.6 >8.5	1 x 1	2M	6E10	>32
KLD-0.5-J1-3/10/DC	9.5 >10.5	0.5x0.5	DC - 2M	3E10	>40
KLD-2-J1-3/11/DC	10.5 >11.5	2 x 2	DC - 1M	3E10	>40

*Key:model-size-package-window/wavelength

AUTOMATIC ON/OFF FEATURE

Starting with serial number 3316-1, models KMPV50-* -J2, KMPV11-* -LJ2, KLD-* -J2 KISDP-* -J2 [HgCdTe and InSb photodiodes with dual integral amplifiers] have an automatic on/off feature. The power to the amplifiers and detector is turned on when the temperature approaches the operating point [77K]. When liquid nitrogen is depleted, power is turned off when temperature increases above 100K.

The detector/amplifier interface is optimized at 77K operation for amplifiers with bandwidth above 20MHz. When the detector is not cold, its impedance changes and this may stress the amplifiers if the power is on for an extended period. The power should always be turned off when the detector is not cooled.

The automatic on/off feature prevents problems by avoiding an accidental power on condition.

9. WARRANTY INFORMATION

KOLMAR TECHNOLOGIES WARRANTY

KTI warrants that equipment shall be free from defects in materials and workmanship for a period of one (1) year from the date of shipment from KTI. Liability under this warranty is limited to replacing, repairing, or giving credit for the purchase price of any equipment returned and shipped prepaid to KTI within one (1) year of delivery to the original Purchaser, provided prior authorization for such return has been given by an authorized representative of KTI. In-warranty repaired or replaced equipment is warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced equipment.

This warranty shall not apply to equipment or components which our inspection shall disclose to have become defective or unworkable due to abuse, mishandling, misuse, accidental alteration, negligence, improper installation, or other causes beyond our control. Detectors damaged by lasers are not covered by warranty, but will be repaired for a nominal fee. This type of laser damage includes current damage to contacts when the detector is illuminated with high laser illumination and/or under high bias conditions.

THE FOREGOING WARRANTY IS IN LIEU OF ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

10. TECHNICAL SUPPORT

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