

UV-IR Flame Detector User Manual

Model: VS-200P



<VS-200PA>



<VS-200PB>



<http://www.flame-detection.co.kr>

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Introduction

VS-200P/VS-200P-RF are the smart “non-explosion” UV/IR flame detector with its POLYCARBONATE enclosure, combining two sensors for both the UV(Ultra-violet) and IR(Infrared) spectra. Its built-in microcontroller monitors and analyzes each sensors in an “AND” configuration, adding an extra alarm criterion of flicker frequency of fires to identify a variety of flame conditions. Only when all those three detection criteria(in UV/IR/Flicker frequency) meets a fire condition, the detector will intelligently alarm.

This detector is well protected against the versatile false alarms, such as ARC weldings, artificial light sources(halogen lamps, electronic flashes, etc) and other well-known spurious fires.

Typical applications

- Oil, gas and petrochemical refineries/production/storage/off loading/shipping
- Various production, processing and storage facilities
- Automotive-manufacturing and paint spray booths
- Warehouses(flammable liquids/toxic gases) and tank farms
- Printing industry facilities
- Power generation pumps, generators, engine rooms and manned stations
- Trade centers, culture halls, any other public buildings in commercial areas
- Especially for RF wireless solutions, with its optional RF module/Antenna.

Detection range

The practical application distance is directly related to the intensity of the ultraviolet/infrared radiation sources. The following ranges are on its highest sensitivity setting.

Fuel	Size	Distance (at field of view angle of 100 degree)
n-heptane	1 sq. ft (33x33cm)	Nom. 20 meters (65ft)
gasoline	1 sq. ft (33x33cm)	Nom. 20 meters (65ft)

Response time

Its response time is typically as 3 to 5 seconds as per 15 meters(50ft) of n-heptane pan fire.

Immunity to false alarms

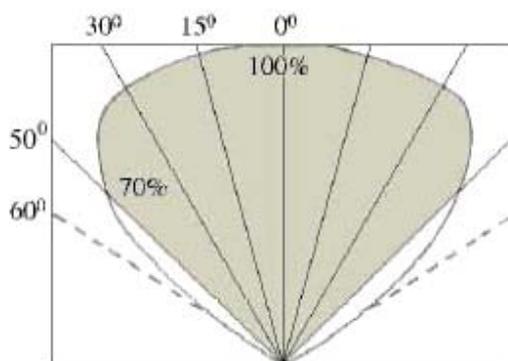
VS-200P exhibits excellent immunity to many conditions/activities including but not limited to the followings

- Artificial light sources(halogen lamps, electronic flash, flashlights, etc) and those transient switching on/off(up to 2Hz)
- Hot body radiations, radiation heaters(1500 W)
- ARC welding radiator (4mm rod, 240A)
-“arc welding free” on customer request or up to 3 meters for general applications
- Sunlight (direct/reflected), etc

For details, refer to Appendix D.

Field of View

VS-200P/VS-200PRF have “more than 100 degree” horizontal/vertical field of view as cone of vision.



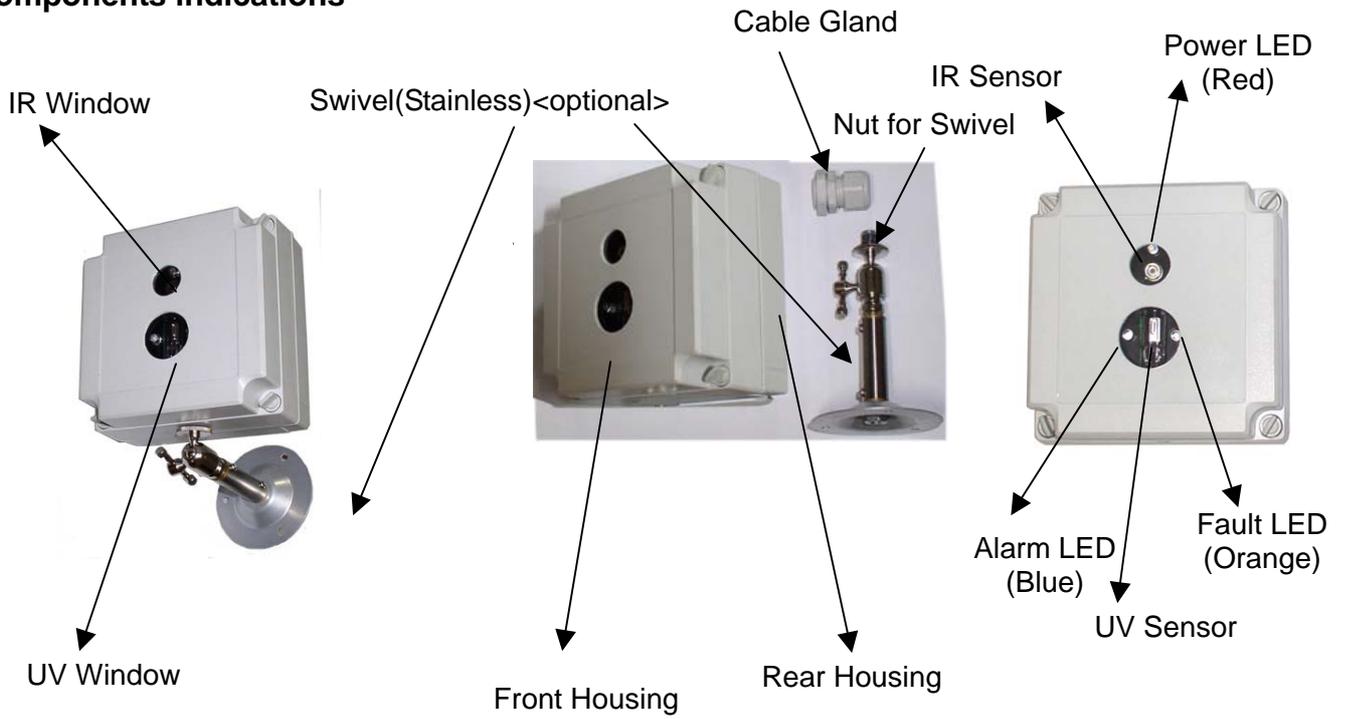
The detector's field of view is the area which the detector “sees” and therefore monitors. Any obstructions, within the detector's field of view, will impede the detector's effectiveness.

Installation Considerations

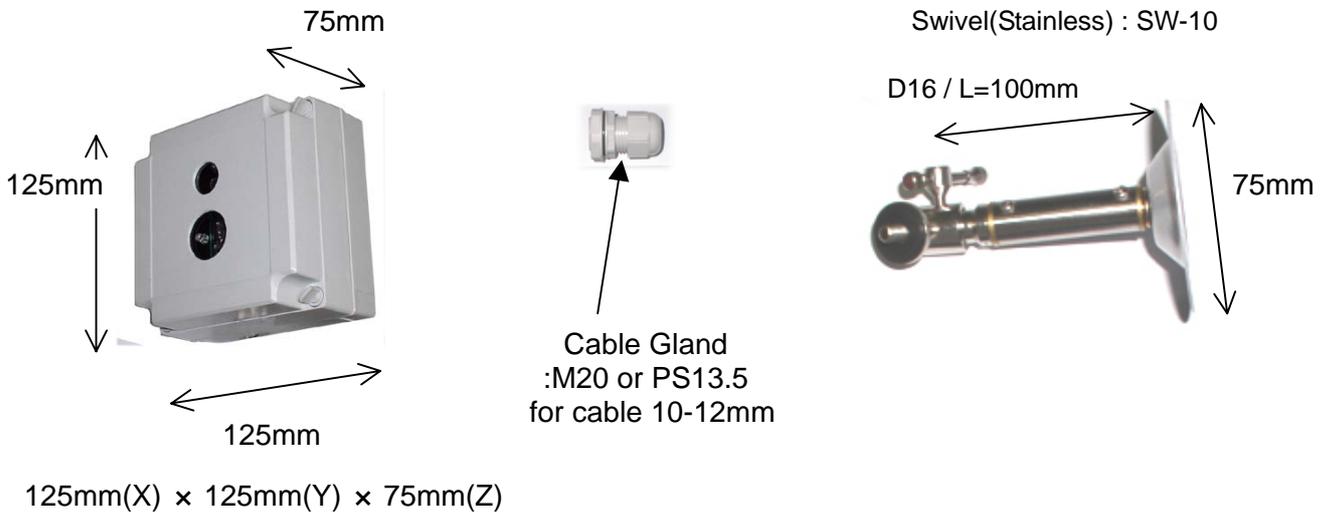
The followings should be considered when installing flame detectors.

- Point detector toward where the flame is expected.
- Ensure an unobstructed view of the area to be monitored.
- Employ more than one detector to ensure the hazard is fully covered.
- Mount the detector about 1 meter below the ceiling so it can respond before being blocked by smoke accumulation at the ceiling.
- Tilt detector down a minimum of 10 degree or 20 degree(most desirable at 45 degree) to reduce dirt and dust accumulation which could obscure the detector's viewing window.
- The detector should be accessible for cleaning the windows.
- Securely mount detector so as to reduce vibration, impact as much as possible.
- Consider adjusting the sensitivity/time delays against the false alarms/potential inhibitors below in surroundings below, which may prevent detector from detecting a fire or reduce its sensitivity to fire;
 - Solid objects such as machinery, glass or plexiglass between the detector and potential fire source
 - Water, fog, rain, dirt or dust on the detector window or heavy smoke between the detector and potential fire.

Components indications

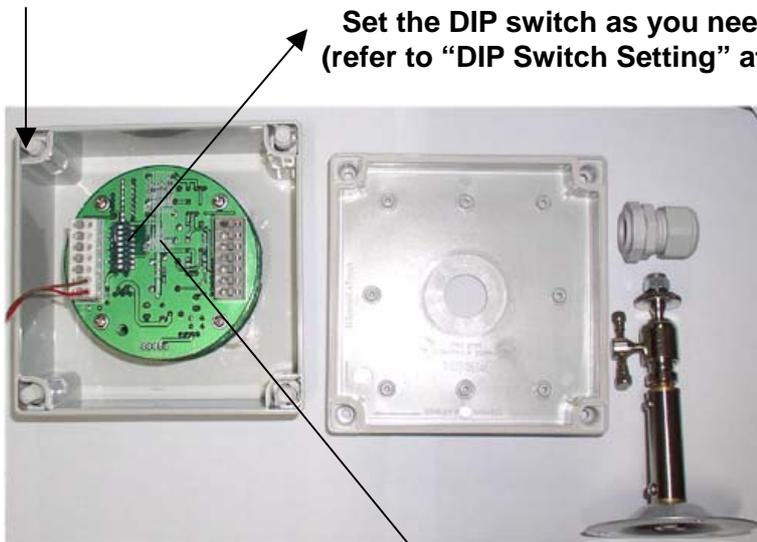


Dimensional Drawing



Field Installation

Unscrew the Front Housing to open the enclosure.



Set the DIP switch as you need
(refer to “DIP Switch Setting” at Appendix B)

In case of RF(Wireless) detector, load the applicable 9V battery on battery case to be supplied

Using the accompanying nut, connect the swivel to the Rear Housing tightly.

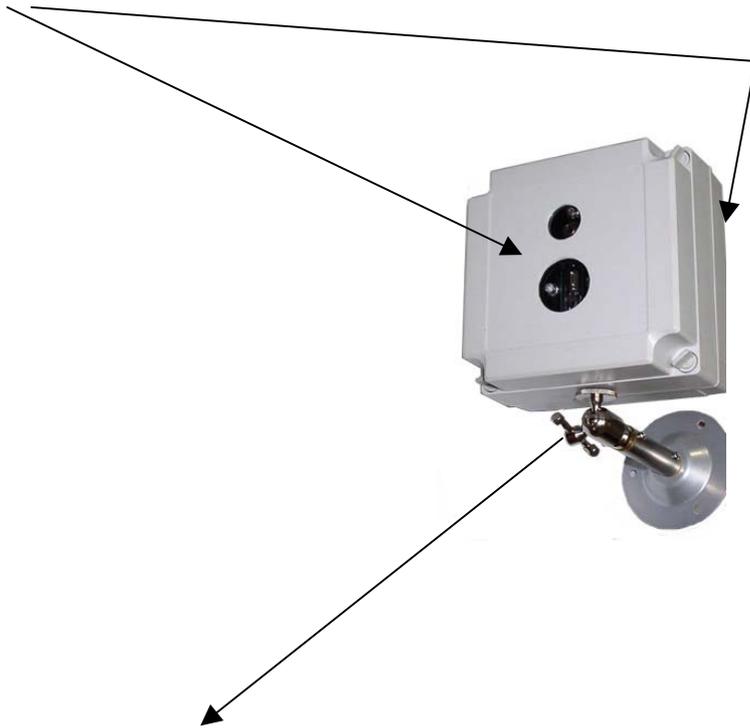


□ Separate the supplied cable gland/its nut and combine them to the Rear housing tightly.

Let the applicable wires(referring to “Appendix F”) go through the cable gland of Rear Housing and connect them to the terminal blocks **according to the wiring connections(referring to “Appendix C”).**

WARNING: ⚠ Do not disassembly or touch internal components other than DIP switches/Terminal blocks against possible any damages inside.

Combine the Front Housing with the Rear Housing by screwing tightly to close the enclosure.



Using the lever of swivel, adjust the tilting angle of detector for actual application and lock it securely against possible vibrations, impacts, etc.

Note: Appendix E(“Recommendations in installing”) is advisable to the end-users.

Start up procedure

Once powered up, VS-200P will begin appr. 20 sec start up routine. During this time, the Red(power) LED will be Flashing. Once the start up procedure has finished and no faults are present, the detector will begin Normal operation (Red Led will remain on).

Table 2: Status LEDs

LED Status	Red LED (Power)	Blue LED (Alarm)	Orange LED (Fault)	Current Output <Optional>
Power up – 20 second start delay	Flashing	Off	Off	2 mA
Internal Power Fault or system power out of range / Fault	Off	Off	Flashing	0 mA
Normal Operation	Solid	Off	Off	4 mA
UV Detection	Solid	Off	Off	12 mA
IR Detection	Solid	Off	Off	8 mA
Fire Detection(Warning)	Off	Solid	Off	16 mA
Fire confirmed	Flashing	Flashing	Flashing	20 mA

WARNING:  During Start up procedure, ensure all external equipments are disabled to prevent unwanted activation until its procedure completion..

Detector Maintenance

Perform the following maintenances on a regular basis.

- Clean the windows.
-Use a cleaner (solvent) that completely vaporizes such as Ethanol.

WARNING:  **Do not clean the windows with a cleaner that contains silicon, making the windows shinning, resulting in absorbing UV radiation.**

- Tighten the mounting screws/swivel/cable gland
- Check for un-obstructed view
- Check for possible spurious alarm items in the Field of View
- Grounding of detector/panel and its cable shielding
- Ingress protection at cable gland, etc.

Appendix A: <Technical Specification>



VS-200P/VS-200P-RF are UV/IR flame detectors with Polycarbonate enclosure.

VS-200P is for 24V input and VS-200PRF with built-in 9V battery (in “extremely as low as 70uA for stand-by” current), enabling RF wireless communications between the detector and the control panel.

- **Non-Explosion Proof**
- **UV/IR Dual-Sensor**
- **Extremely low stand-by current(70uA) for RF wireless solution**
- **High Immune to False Alarms**
- **User-Programmable Configuration**

<p>Applications:</p> <ul style="list-style-type: none"> – Chemical Processing & Storage Facilities – Fuel Loading Facilities – Warehouses – Public buildings/Others – Especially for RF wireless solutions <p>Spectral Response: UV : 0.185-0.260 microns IR : 4.30 microns</p> <p>Detection Range: (Highest Sensitivity Range) Min. 65ft(20m) at 1sq.ft. N-Heptane fire</p> <p>Response Time: Typical 3 to 5 seconds for a 1 sq.ft. n-heptane pan fire</p> <p>Time Delay: Adjustable time delay up to 10 seconds</p> <p>Field of View: 100° hori./100° verti.</p> <p>Temperature Range -40 - +85</p> <p>Humidity: Up to 95% RH</p> <p>Power Supply: <VS-200P> : DC24V (11V to 32V) <VS-200PRF> : built-in 9V battery (5.2 to 12 VDC) *Low Volt. Detect: 5.8V</p> <p>Power Consumption: <VS-200P> Max. 50mA in standby Max. 80mA in alarm <VS-200PRF> *Max. 70uA in standby *Max. 20mA in alarm *Low Volt. Detect:10mA</p> <p>Electrical Connection: M20 Cable gland(for cable 10-12mm) or on request</p> <p>Dimensions: Detector Unit :125 x 125 x 75 mm Swivel: D=16 / L=100mm</p> <p>Weight(kg) Detector/Swivel :0.40/0.15</p>	<p>Electrical Input Protection: Complete electrical interface protection against reversed polarity voltage, surges, and spikes according to IEC 801-4/5</p> <p>Electromagnet Compatibility The detector is designed to meet the following EMC requirements: Electrostatic Discharge (ESD) IEC801-2 Conducted Emission EN55022 Class A Radiated Emission:EN55022 Class A Radiated Immunity IEC801-3</p> <p>Outputs: * Dry Contact Relays (for VS-200P) Alarm: 2A at 30VDC 0.6A at at 125VAC Fault: 2A at 30VDC 0.6A at at 125VAC Accessory: 2A at 30VDC 0.6A at at 125VAC</p> <p>* Open Collect Output (for VS-200PRF) Alarm output (+) Alarm output (-) Low Battery output (+) Low Battery output (-)</p> <p>* 4-20mA Current output (OPTION) * RS-485 Output (OPTION) * RF Wireless Output (OPTION)</p> <p>Enclosure: Polycarbonate</p> <p>Water/Dust Protection IP66/67</p> <p>Certification -Designed to meet EN54-10/FM</p>
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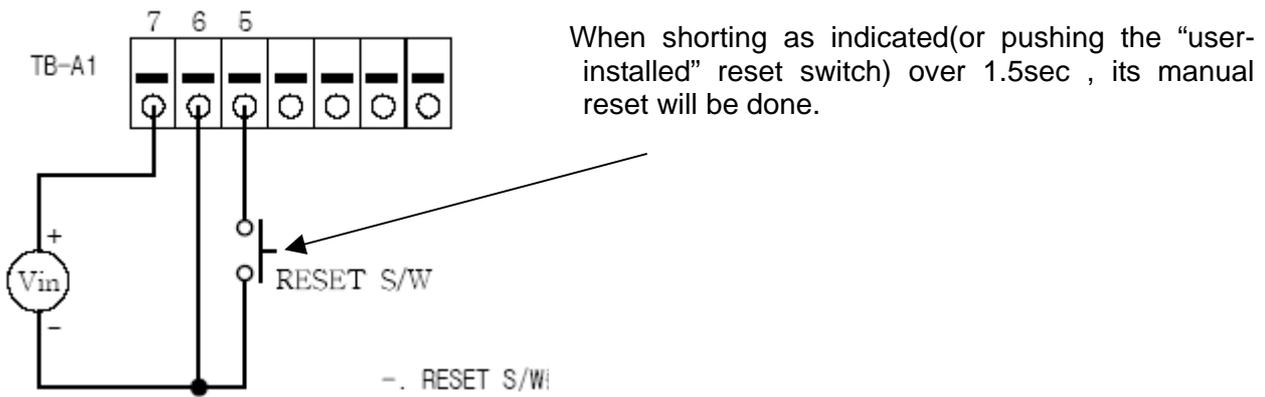
Appendix B: <DIP Switch Setting>

DIP SWITCH SETTING

DIP SWITCH								Function Descriptions	Remarks
8	7	6	5	4	3	2	1		
*	*	*	*	*	*	b2	b1	Sensitivity Setting 0 0 : Highest <Factory Setting> -Max. Detection Distance (Min. Counts per Duration) 0 1 : High 1 0 : Middle 1 1 : Lowest -Min. Detection Distance (Max. Counts per Duration)	
*	*	*	*	b2	b1	*	*	Alarm Latch On/Off Setting 0 0 : Reset after 5 sec <Factory Setting> 0 1 : Reset after 10 sec 1 1 : Latch until external reset (Not Available in Wireless Detector)	
*	*	b2	b1	*	*	*	*	Alarm Delay Time Setting 0 0 : 0 sec(No delay) <Factory Setting> 0 1 : 3 sec after alarm output 1 0 : 5 sec after alarm output 1 1 : 10 sec after alarm output	
b	b							Reserved (for future requests)	

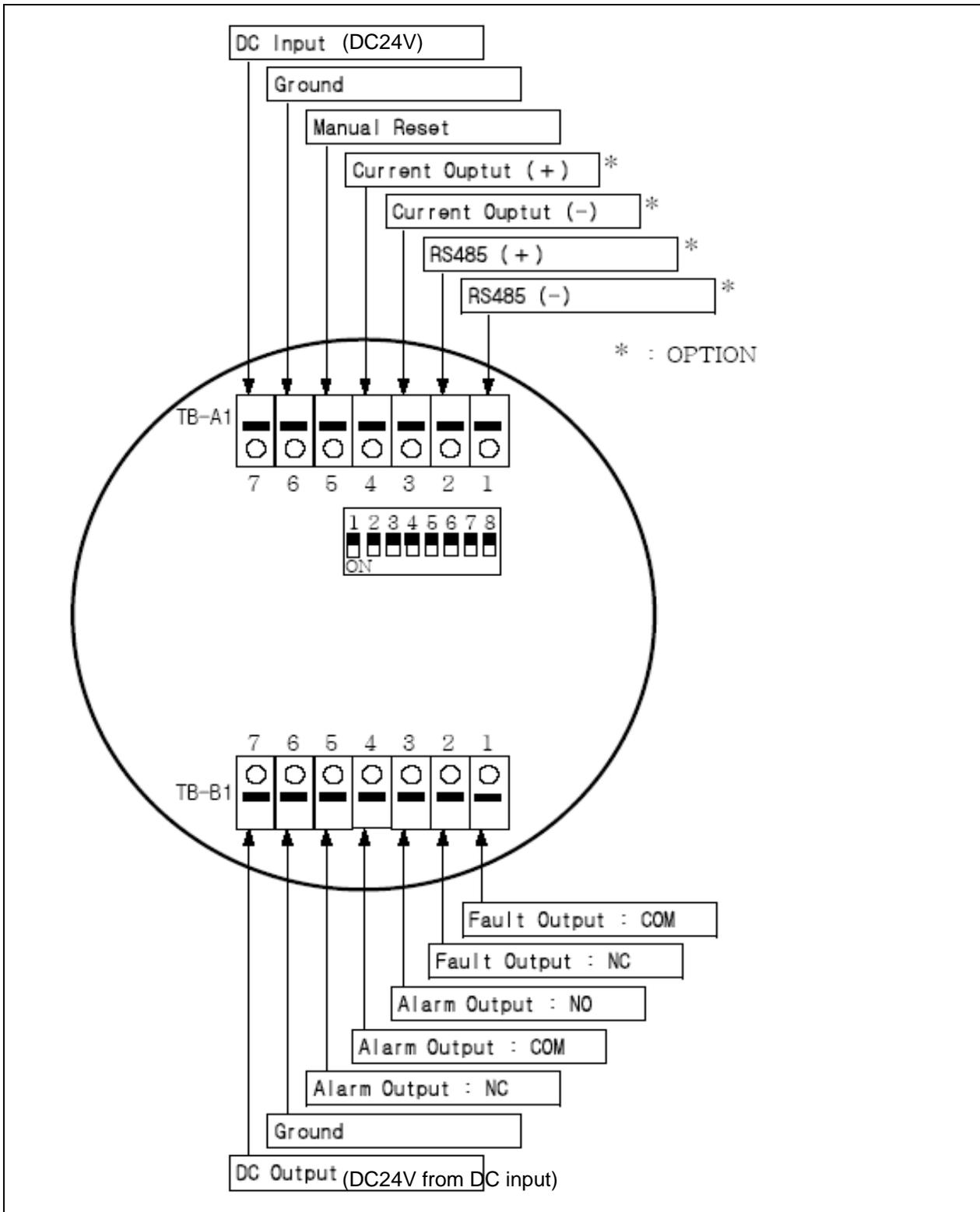
Appendix C: <Wiring Connection>

Manual Reset (for VS-200P/VS-200P-RF)

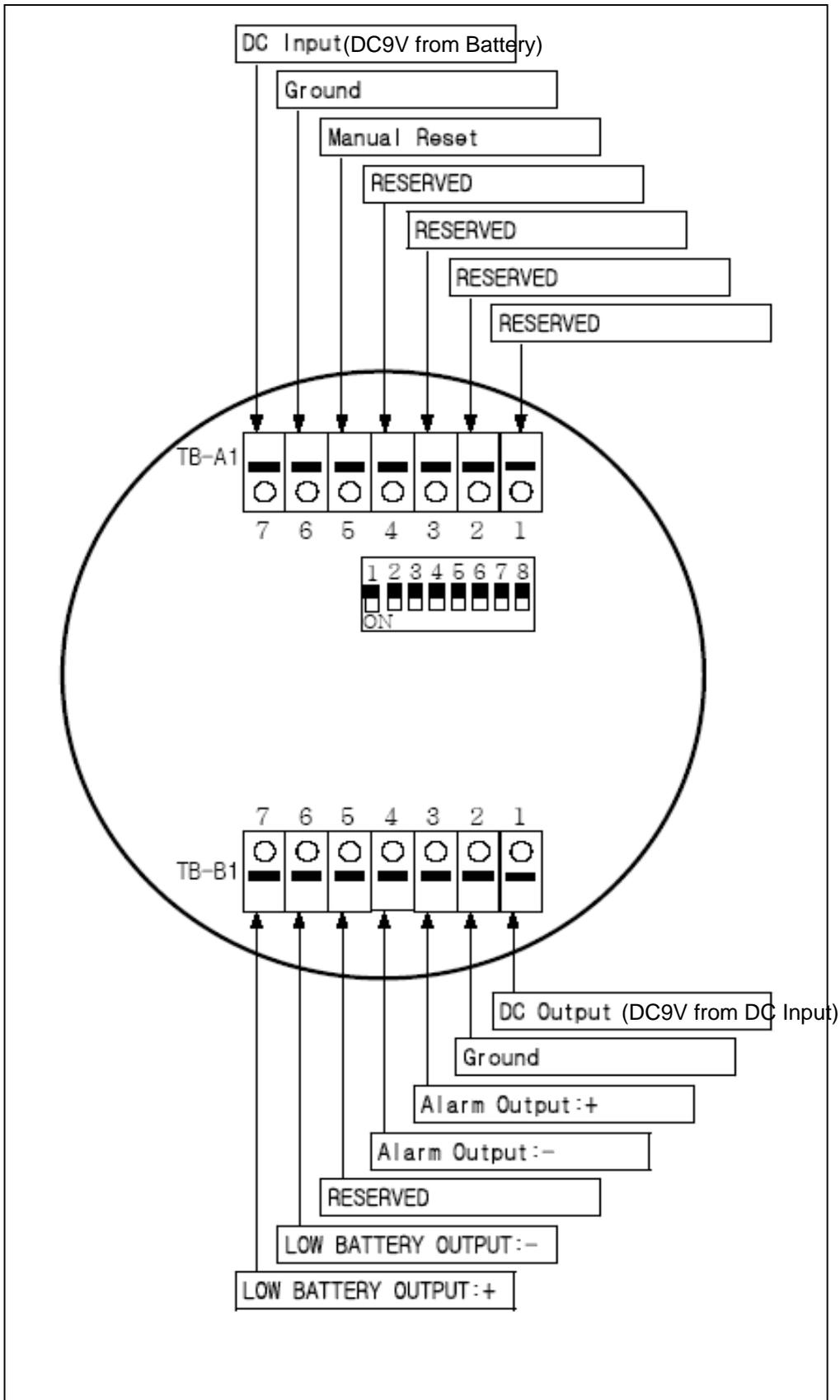


For the detailed wiring diagrams of each models(VS-200P / VS-200P-RF),
Please refer to the next pages.

Wiring Diagram for VS-200P (24V Input)



Wiring Diagram for VS-200P-RF (9V battery/RF wireless)



Appendix D: <Immunity to False Alarms>

Radiation Sources		Immunity Distance(m)
	Halogen Lamps(500W/1,000W)	IAD
	Switching ON/OFF of Halogen Lamp(500W) - 1HZ/2HZ Switching	IAD
	ARC Welding -4mm rod / 240A	3m(nominally) or IAD (on request)
	Strobe lights(Electronic Flash of appr. 200W) for photoshops	IAD
	Grinding metal	1m
	Lit cigar or cigarette	1m
	Others - Sunlight (direct/indirect) - 100W Incandescent lights(frost/clear) - 40w Fluorescent lights - Radiation heater, 1500W - Radiation heater, 1000W with fan - Bright-colored clothings, etc - Flashlight (MX991U)	IAD

Notes: IAD=Immune at any Distance

Appendix E: <Recommendations in installing>

2-1. Mounting

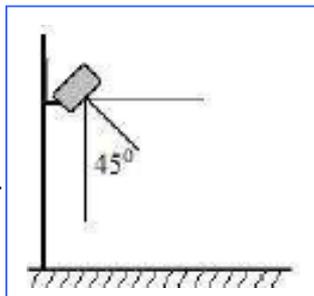
The detector can be mounted using the two mounting holes on the detector housing or the included swivel. It is preferred that the cable gland is pointing down. Leave a loop of spare cable with a diameter of apr. 10 cm (4 inch).

2.1.2 Weather Protection

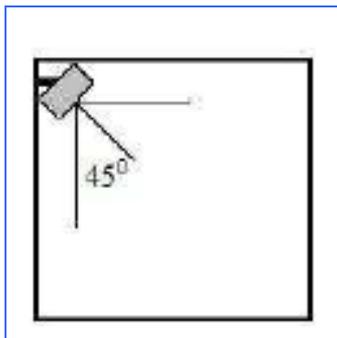
In dirty or wet environments you should consider to mount a hood over the detector. A non-corrosive sheet metal plate of appr. 30 by 30 cm (1 by 1 ft) can be mounted directly above the detector without effecting the Field of View of the detector. A similar plate can be used to protect the detector from unwanted alarm sources.

2.1.3 Field of View

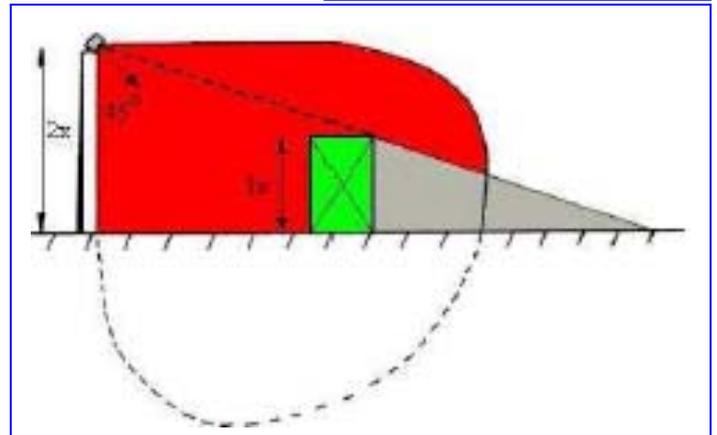
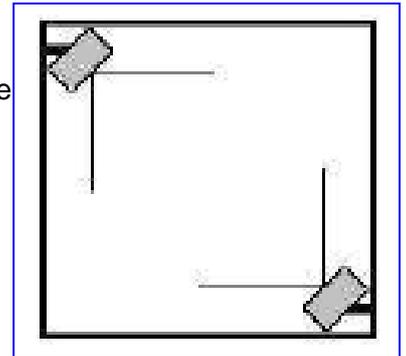
Keep in mind that the detector has a Cone of Vision f more than 90° (appr. 100°). Make sure that detector is not directly looking into potential false alarm sources or friendly fires. By pointing the detector down in an angle of 45° it allows you to fully utilize the Field of View. In this case one side of the Cone of Vision will cover the area horizontally and the other side of the Cone of Vision will cover the area vertically.



When the detector is also mounted in a diagonal way at 45° it will cover a volume.



In order to avoid shadow area's that can not be seen by the flame detector it is advised to put another detector in the opposite corner.

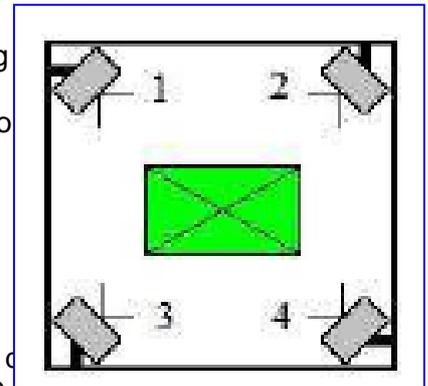


As a rule of thumb the detector is mounted twice as high as the highest object in the protected area.

Warning:

The detector in the opposite corner cannot be used as a redundant detector in a double detector system for actions like activation of an extinguishing system. Contact the factory for advise.

Example: Use voting out of 4 for correct double detector action



Warning:

Smoke absorbs flame radiation. This could effect the sensitivity of the detector at least 150 cm (5 feet) from the ceiling.

Warning:

Cold CO2 absorbs 4.4 μ radiation from a fire. When used in combination with a CO2 extinguishing system, be aware of the fact that re-ignition of the fire when CO2 gas is present may not be detected by the IR sensor.

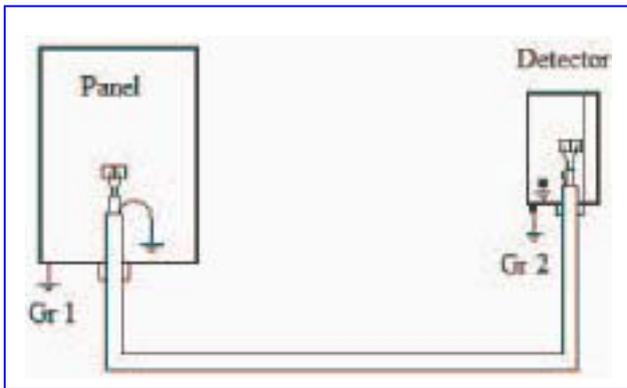
2-2. Cabling

A minimum of a two twisted cores cable is needed to wire the detector correctly. The diameter of the cores must be 0.6 to 1.5 mm (24 to 16 AWG). The cores must be shielded and have a shield core for use with grounding terminals. The isolation resistance to ground must be at least 500K Ohm.

The length and diameter of the cable should be selected so that the detector will still have enough power under all detector conditions (normal and alarm).

2.2.1 Local grounding

In case the area where the detector is mounted has facilities to ground the panel (Gr 1) and the detector (Gr 2) and where both the panel ground and detector ground have no potential difference, the following must apply:



Panel:

Leave the cores protected by the shield as much as possible. Isolate the shield wire if necessary and connect it to the ground lug or screw.

Detector:

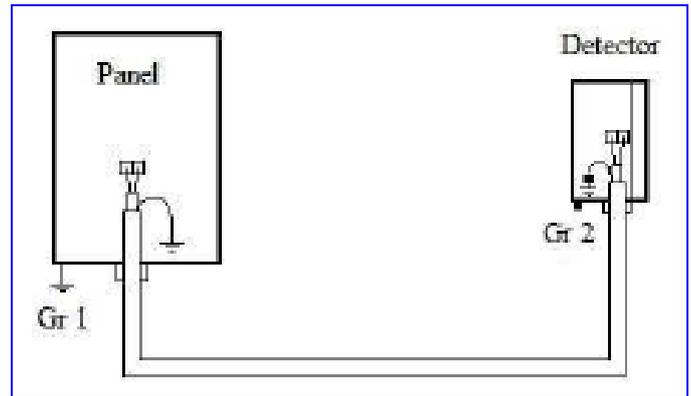
Leave the cores protected by the shield as much as possible. Isolate the shield wire or cut it off.

Do not connect it to the ground lug or screw.

Ground the housing of the detector locally using a stranded copper wire of at least 6mm².

2.2.2 Central grounding

If local grounding of the detector housing is not available the following applies:



Panel:

Leave the cores protected by the shield as much as possible. Isolate the shield wire if necessary and connect it to the ground lug or screw.

Detector:

Leave the cores protected by the shield as much as possible. Connect the shield wire to the ground lug or screw.

Do not ground the detector housing in any way. If necessary the detector should be isolated from the detector housing and /or swivel.

Warning:

It is recommended to use the local grounding method as much as possible. Make sure there is no potential difference between the detector housing and the panel. Use the central grounding method only for small installations.

3. Operation

3-1. Commissioning

Before the detector is put in operation the following should be checked:

- Clean the detector lens
- Close the detector housing
- Position and alignment check
- False alarm sources in the Field of View
- Correct and useful application
- Wiring at the detector and the panel
- Cable Shielding
- Grounding of the detector and panel
- Ingress Protection at gland
- Tighten the mounting screws
- Tighten the gland
- Test alarm

Before final commissioning the detector should run without alarm actions during a period that represents the normal operation conditions. When fault occur during the test run the installation should be checked and adjusted until the detector works without failures. After a final test alarm the installation can be switched on permanently.

3.2 Testing

The detector is factory tested. However, on a regular basis the detector must be tested to ensure normal operation and fire condition. The detector lens needs to be clean in order to be able to detect a fire. Build up of contamination will effect the sensitivity of the detector.

If the customer demanded a certain performance and that performance is confirmed by fire testing or otherwise, the final installation should be tested using the applicable fuel and conditions specified. Make sure that every thinkable precaution has been taken to avoid damage to people, property and the environment while testing.

EGM supplies our own Test Lamp for use with all 185-235 nm UV and 4.4 μ IR or UV/IR combination Flame detectors. Read the instructions of the Test Lamp.

3.3 Faults

Spurious alarms can be caused by:

- The detector is activated by a known or unknown UV and IR source in the Field of View.
- The detector is activated by an electromagnetic interference on the wiring and/or electronics.
- The detector is activated by wrong or faulty wiring.
- The detector's electronics is damaged.
-

Finding the cause of the spurious alarm needs an accurate recording of the alarms and conditions. E.g. time, date, weather and lighting conditions etc. are important to determine the cause.

First of all the power supply needs checking for e.g. voltage, current, ripple etc. Then check all items mentioned under Operation. Replace the detector if a spare is available.

To determine if the spurious alarm is caused by an event in the Field of View or the wiring and electronics the detector can be blinded by a cover. Make sure no light or other radiation can reach the sensor. If the detector still alarms it is likely that the spurious alarm is caused by the wiring and/or electronics. Make sure that the cover is removed after testing.

Warning:

Commissioning and tests must be performed by knowledgeable technicians. All local regulations for installation and cabling apply including regulations for activation of alarm systems, extinguishing systems and other activations.

Warning:

UV sensors are based on the Geiger-Muller counter that is also used for radioactive measurements. If the sensor still alarms at the application although the lens is covered and the wiring/electronics is okay, please consider the presence of radio activity. Contact the factory for a solution.

Warning:

If a sudden high energy IR source is put close to the detector the sensor might go in to saturation. As a result a time delay of 30 seconds applies and the detector goes in alarm if the source is still present. If this behavior is unwanted do not use this detector.

Warning:

UV/IR detectors have strengths and weaknesses. Consider these before installation.

4 Maintenance

4.1 Routine check

Besides cleaning the detector needs no specific maintenance. Inspection of the following items is necessary:

- Position and alignment check
- Check for possible spurious alarm sources in the Field of View
- Check for un-obstructed view
- Clean the detector lens
- Close the detector housing
- Correct and useful application
- Wiring at the detector and the panel
- Cable Shielding
- Grounding of the detector and panel
- Ingress Protection at gland
- Tighten the mounting screws
- Tighten the gland
- Test alarm

The enduser is responsible for optimal operation conditions. Should there be a situation that changes the starting points of the protection system, please make sure a knowledgeable technician takes all necessary actions.

Do not clean the lens of the UV detector with a cleaner that contains silicones. They make the lens really shining but the silicones absorb the UV radiation. Use a cleaner (solvent) that completely vaporizes such as Ethanol (at least 90%). Make sure that once a year (e.g. during routine inspection) the lens is also cleaned on the inside. Particles from the electronic components may have settled on the lens.

4.1. Testing

The detector is factory tested. However, on a regular basis the detector must be tested to ensure normal operation and fire condition. The detector lens needs to be clean in order to be able to detect a fire. Build up of contamination will effect the sensitivity of the detector.

If the customer demanded a certain performance and that performance is confirmed by fire testing or otherwise, the final installation should be tested using the applicable fuel and conditions specified. Make sure that every thinkable precaution has been taken to avoid damage to people, property and the environment while testing.

Appendix F: <Wiring Resistance Table(ohms)>

Distance (Feet)	AWG #20	AWG #18	AWG #16	AWG #14	AWG #12	AWG #10	AWG #8
100	1.02	0.64	0.40	0.25	0.16	0.10	0.06
200	2.03	1.28	0.80	0.51	0.32	0.20	0.13
300	3.05	1.92	1.20	0.76	0.48	0.30	0.19
400	4.06	2.55	1.61	1.01	0.64	0.40	0.25
500	5.08	3.20	2.01	1.26	0.79	0.50	0.31
600	6.09	3.83	2.41	1.52	0.95	0.60	0.38
700	7.11	4.47	2.81	1.77	1.11	0.70	0.44
800	8.12	5.11	3.21	2.02	1.27	0.80	0.50
900	9.14	5.75	3.61	2.27	1.43	0.90	0.57
1000	10.20	6.39	4.02	2.53	1.59	1.09	0.63
1250	12.70	7.99	5.03	3.16	1.99	1.25	0.79
1500	15.20	9.58	6.02	3.79	2.38	1.50	0.94
1750	17.80	11.20	7.03	4.42	2.78	1.75	1.10
2000	20.30	12.80	8.03	5.05	3.18	2.00	1.26
2250	22.80	14.40	9.03	5.68	3.57	2.25	1.41
2500	25.40	16.00	10.00	6.31	3.97	2.50	1.57
3000	30.50	19.20	12.00	7.58	4.76	3.00	1.88
3500	35.50	22.40	14.10	8.84	5.56	3.50	2.21
4000	40.60	25.50	16.10	10.00	6.35	4.00	2.51
4500	45.70	28.70	18.10	11.40	7.15	4.50	2.82
5000	50.10	32.00	20.10	12.60	7.94	5.00	3.14
5500	55.80	35.10	22.10	13.91	8.73	5.50	3.46
6000	61.00	38.30	24.10	15.20	9.53	6.00	3.77
6500	66.00	41.50	26.10	16.40	10.30	6.50	4.08
7000	71.10	44.70	28.10	17.70	11.10	7.00	4.40
7500	76.10	47.90	30.10	19.00	12.00	7.49	4.71
8000	81.20	51.10	32.10	20.20	12.70	7.99	5.03
9000	91.40	57.50	36.10	22.70	14.30	8.99	5.65
10 000	102.00	63.90	40.20	25.30	15.90	9.99	6.28

Note: Resistance shown is one way. This figure should be doubled when determining closed loop resistance.