



## UV cells

UV cells contain a vacuum tube as the flame sensor.

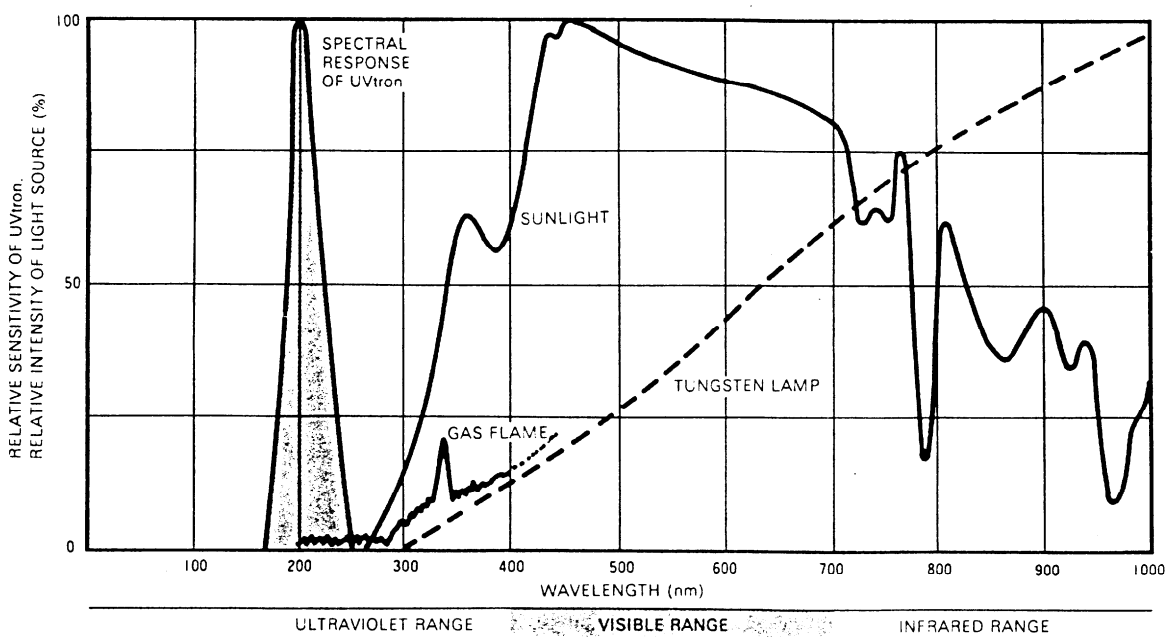
### Types

UVZ 780 (for intermittend operation) and UVZE 780 (for continous operation).

The UVZ 780 is used together with either a MMG 8xx, TMG 740-3 or SGU 930(i) control box to detect flames of gas or dual fuel burners. It contains mainly the UV tube itself (make: Sylvania) and is available in 3 different sensitivities:

|               |                      |               |
|---------------|----------------------|---------------|
| UVZ 780 white | standard sensitivity | TMG, SGU      |
| UVZ 780 blue  | low sensitivity      | TMG, SGU      |
| UVZ 780 red   | high sensitivity     | MMG, TMG, SGU |

Due to its spectral sensitivity, the UV cell does not react visible or IR light, therefore it does not react to stray light (exception: ignition spark):



Although UV cells are widely used on both domestic and industrial applications, they all feature a huge disadvantage: ageing, which can lead to an unsafe operation of the burner. Therefore, special precaution has to be taken to overcome this subject.

Notes

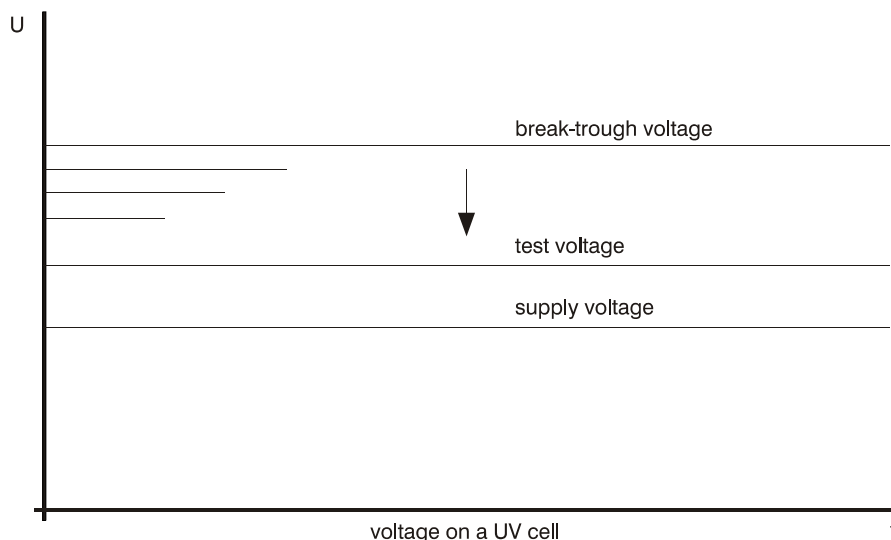


As all vacuum tubes, a UV cell needs an operation voltage of several hundred volts. The UV cell itself contains two electrodes (electrically insulated from each other), sealed in a glass tube which is filled with a special gas. If the tube is supplied by its operation voltage, still no current runs between the two electrodes. But as soon UV radiation is provided, the gas drops in resistance, the tube «ignites» and an electrical current can flow from one to the other electrode (several micro amps). If the supply voltage would be too high, the UV tube would also ignite without any UV radiation provided (known as «break-through» voltage).

Usually, there is a difference of the operating voltage and break-through voltage which allow the safe operation of the UV tube.

The ageing process is that during the lifetime of the UV tube, the break-through voltage drops and comes close to the operation voltage. If it is too close, the UV tube would ignite even without UV radiation. This would be detected during the pre-purge resp. stray light check at the beginning of each operating cycle. But if the break-through voltage would come to the level of the operation voltage during one operating cycle, the UV tube would not detect if the flame would extinguish and the fuel valve would stay open! This most dangerous situation must be avoided.

This can be achieved with the following procedure: during pre-purge resp. stray light check, the UV tube would be supplied with a higher-than-normal supply voltage (test voltage). If the break-through voltage is already close to the normal supply voltage, the UV tube would ignite and the burner would not start due to stray-light. This feature is standard on all Satronic controls suitable for UV flame detection. The typical life time of a UV cell is approx. 5–10'000 hours.



Notes



## UVZE 780

As this mentioned UV test feature is performed only once during the start of a burner, it is not suitable for burners in continuous operation mode. A more sophisticated test is performed there.

### UVZE 780 standard sensitivity TME 780

The UVZE 780 is available in standard sensitivity only!

The UVZE 780 consists of a quite bulky housing, which contains the UV tube itself plus a shutter mechanism. During operation, every four minutes, the TME 780 sends out a «check-signal», which activates the shutter.

The shutter covers the viewing areas of the UVZE 780 (end-on and side-on) for approx. one sec. The TME 780 checks during this time if the flame signal disappears; if not, it would mean the UV tube is in self-igniting state due to ageing. Of course, the flame relay inside the TME 780 amplifier is bridged for this period, otherwise the TME 780 would go to a safety shutdown.

Due to this additional feature, both the UVZE and the TME 780 are remarkable more sophisticated and therefore more expensive than the normal UVZ and TMG combination.

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## Infrared flicker detector

### *Types available*

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| IRD 810            | separate sensor and amplifier, potential-free output            |
| IRD 810 Industrial | same, sensor in heavy-duty housing, for industrial applications |
| IRD 820            | separate sensor and amplifier, ionisation signal output         |
| IRD 820 Industrial | same, sensor in heavy-duty housing, for industrial applications |

The IRD 8xx can be used on all Satronic control boxes

|          |                                                                                                                             |
|----------|-----------------------------------------------------------------------------------------------------------------------------|
| IRD 1010 | for blue burning oil burners (domestic)<br>available in many different variations and viewing attitudes                     |
| IRD 1020 | for gas power burners<br>available in many different variations and viewing attitudes<br>needs magnetic mounting flange M93 |

As the appropriate standard EN298 asks for a switch-off facility if the IRD 1020 would be removed from the burner, a built-in reed relay plus the magnetic mounting flange M93 are used. By removing the IRD 1020 from its flange, the reed relay would open and interrupt the flame signal!

### Notes



IR flame sensors (solid state sensors, similar to those used in remote control receivers, like TV's) detect all kind of IR radiation (heat sources). If used without a special circuit, the flame sensor would be far too slow to detect a loss-of-flame within the safety time of 1 sec, because glowing parts inside the burning chamber would emit enough IR radiation to fool the sensor.

A built-in electronic filter lets only pass the «flickering» part of the IR signal, which can be compared to an electric AC signal. As all flames flicker within a certain frequency, it is easy to separate between the continuous IR light signal from glowing burner parts and the alternating signal provided by the flame itself.

| Satronic type     | MZ 770 S                        | FZ 711 S                        | FZE 780                            | Flame rod                                   | UVZ 780           | UVZE 780                       | IRD 1010                 | UVD 970                  | IRD 1020                        | UVD 971                         |
|-------------------|---------------------------------|---------------------------------|------------------------------------|---------------------------------------------|-------------------|--------------------------------|--------------------------|--------------------------|---------------------------------|---------------------------------|
| principle         | photo resistor                  | photo resistor                  | photo cell                         | flame                                       | UV-cell           | UV-cell                        | IR flickering detection  | UV solid state           | IR flickering detection         | UV solid state                  |
| fuel              | oil                             | oil                             | oil                                | gas                                         | gas / dual fuel   | gas / dual fuel                | oil                      | oil                      | gas                             | gas                             |
| operation mode    | intermittent                    | intermittent                    | continuous                         | intermittent                                | intermittent      | continuous                     | intermittent             | intermittent             | intermittent                    | intermittent                    |
| flame colour      | yellow / orange                 | yellow / orange                 | yellow / orange                    | blue / transp.                              | blue / transp.    | blue / transp.                 | blue / yellow            | blue / yellow            | blue / transp.                  | blue / transp.                  |
| reliability       | good                            | good                            | good                               | good                                        | bad / ageing      | bad / ageing                   | good                     | good                     | good                            | good                            |
| safety            | good                            | good                            | good                               | excellent                                   | (good)            | (good)                         | good                     | good                     | good                            | good                            |
| size              | small                           | small                           | average                            | Very small                                  | average           | bulky                          | good                     | good                     | good                            | good                            |
| costs             | cheap                           | cheap                           | expensive                          | cheap                                       | expensive         | Very expensive                 | reasonable               | reasonable               | reasonable                      | reasonable                      |
| viewing angle     | end / side on                   | end / side on                   | end / side on                      | -                                           | end / side on     | end / side on                  | end or side on           | end (or side) on         | end or side on                  | end (or side) on                |
| runs on control.. | TF83x, Dx97x                    | TF80x, TMO                      | TME                                | TFI, MMI, MMG, TMG, SGU, Dx97x              | MMG, TMG, SGU     | TME780                         | TF8xx, TMO, DxO97x       | TF8xx, DxO97x            | TFI, MMI, MMG, TMG, SGU, DxG97x | TFI, MMI, MMG, TMG, SGU, DxG97x |
| application       | oil burner for domestic heating | oil burner for domestic heating | industrial oil burner (continuous) | atmospheric gas boilers / power gas burners | power gas burners | power gas burners (continuous) | low emission oil burners | low emission oil burners | power gas burners               | power gas burners               |
| extra             |                                 |                                 |                                    | not available from satronic                 |                   | self-checking                  | var. sensitivity         |                          | very sensitivity magn. flange   |                                 |

With the built-in potentiometer, the gain of the internal flame signal amplifier can be adjusted and easily adapted to the specific burner.

As the output signal is in digital form (high resistance = no flame, low resistance = flame), measuring the output current to as a reference of the strength of the IR flame signal does not help, therefore the two built-in LED's are used to indicate the status of the IRD.

### Notes

