

Burner Control Box

For oil, gas and combination burners of unlimited capacity. Suitable for continuous operation

Possible flame detectors:

- FZE 780 Photo-cell
- Ionisation Probe
- UVZE 780 UV Sensor

INTRODUCTION

The TME 780 is capable of controlling and monitoring oil, gas and combi burners of unlimited capacity.

It has been approved for continuous operation in unattended installations (tested and approved as per EN 298, EN 230 and 4788, also tested and approved for 72-hour operation as per TRD 604).

TYPES

- | | |
|--------------------|---|
| TME 780 Mod. 32-25 | for general use (Terminal 5: Start valve with 2 sec. safety interval) |
| TME 780 Mod. 32-52 | specially suitable for oil burners with gas-electric ignition (Terminal 5: Main oil valve with 5 sec. safety interval) |

CONSTRUCTIONAL FEATURES

The control box is enclosed in a protective, flame resistant, transparent, plug-in type plastic housing, and includes:

- Synchronous motor with reduction gearing driving cam switches
- Cam switch with informative, coloured programme indicator
- 16-way cam switch assembly controlling the programme sequence
- 2 DC relays and 1 remanence relay on common yoke
- Plug-in printed circuit board with mains transformer, additional relays and the electronic components

On the underside of the unit are robust plug terminals and, for selecting the programme sequence, a programming tag and 2 wire jumpers which can be cut. The following important indicators and operating controls can be found on the front of the control box:

- Reset button incorporating a fault signal lamp
- Coloured programme indicator
- Central screw fastening

The base is keyed to prevent the wrong type of control box from being fitted to the baseplate.



TECHNICAL DATA

| | |
|---|---|
| Supply voltage | 220 / 240 V (-15... +10%) 50 Hz (40 - 60 Hz) |
| AC frequency variations | result in proportional timing deviations |
| Fuse rating | 10 A rapid, or 6 A slow |
| Power consumption | approx. 15 VA |
| Max. current | per output terminal 4 A, total 6 A |
| Air-proving contact | 1 contact 6 A, 230 V |
| Start delay | approx. 13 sec. |
| Pre-purge time | 22 sec. |
| Pre-ignition time | oil 30 sec., gas 1.6 sec. |
| Safety intervals | Mod. 32-52 Mod. 32-25 |
| - Pilot valve terminal 2 | 5 sec. 5 sec. |
| - Valve terminal 5 | 2 sec. 5 sec. |
| - Valve terminal 6 | 2 sec. 2 sec. |
| Pilot valve switched-on time | 11 sec. |
| Valve 2 delay (release of power regulation) | 2 sec. |
| Post-purge | 8 sec. (motor on term. 19) |
| Reset delay after shutdown | none |
| Flame detector cables: | |
| - Ionisation probe | max. 20 m |
| - UVZE 780 | max. 10 m |
| - separate, screened | max. 100 m |
| - FZE 780 laid separate | max. 10 m |
| - separate, screened | max. 100 m |
| UV sensor for all burners | UVZE 780 |
| Photo-cell for oil burners | FZE 780 |
| Permissible ambient temperature | -20° C to +60° C |
| Control box and detector: | |
| Insulation standard | IP 44 |
| Mounting attitude | any |
| Weights: | |
| Control box incl. base | approx. 1200 g |
| UVZE 780 with ball-joint mount | approx. 670 g |
| Classified acc. to EN 298 | BLLXK |

TECHNICAL FEATURES

FLAME DETECTION

The periodic self-check procedure of the flame detection system also includes the power-carrying contacts responsible for fuel release. The timing cycle is approx. 240 sec. Flame detection can be carried out by the UVZE 780 ultra-violet sensor, ionisation probe(s) or the FZE 780 photo-cell, as preferred. During monitoring periods, the ionisation probe or photo-cell are temporarily switched out of the circuit, or all light is cut off from the UV sensor. If, despite this, a flame signal is still received during this monitoring period because of a defect, shutdown is initiated and the control box switches to lockout.

Description of the fail-safe check procedure

1. Normal start procedure until the burner is operating normally, i.e. until the flame has been established correctly. Relay RM holds itself open.
2. Flame signal relay RF closes its contacts, and cuts the power to capacitor C1.
3. The discharge from C1 causes the bridging relay RÜ to close after approx 240 sec., and the interrupt relay RT to release its contacts. RM receives power from capacitor C2.
4. Relay RÜ bridges the contact f2 (which supplies power to the valve), and at the same time, prevents lockout from being initiated when flame signal relay RF then opens.
5. Relay RT interrupts the circuit between the ionisation probe or FZE photo-cell and the amplifier, or causes all light to be cut off from the UV tube in the UVZE (solenoid controlled).
6. If functioning correctly, the flame signal relay RF must then open, and capacitor C1 is again charged.
7. Relay RT again closes its contacts. The flame detectors are again connected to the amplifier, and the shutter over the UVZE opens.
8. Flame signal relay RF closes, relay RÜ opens and the procedure begins again with the discharge of capacitor C1. The next test cycle follows after approx. 240 sec.

If flame signal relay RF does not open during the test procedure, the relays RÜ and RT remain in their test positions. As a result, main relay RM opens its contacts after capacitor C2 has discharged, and shutdown and lockout are initiated via the contacts m2, f4 (closed) and ü3.

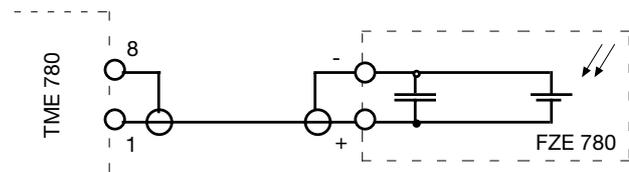
FZE 780 PHOTO-CELL

The FZE 780 light sensor contains a silicon photo-electric cell which produces a voltage when light falls upon it. This device is sealed in a glass tube, and has a maximum spectral sensitivity of 620 nm. The FZE 780 photo-cell is therefore suitable for monitoring burners with brightly radiating flames.

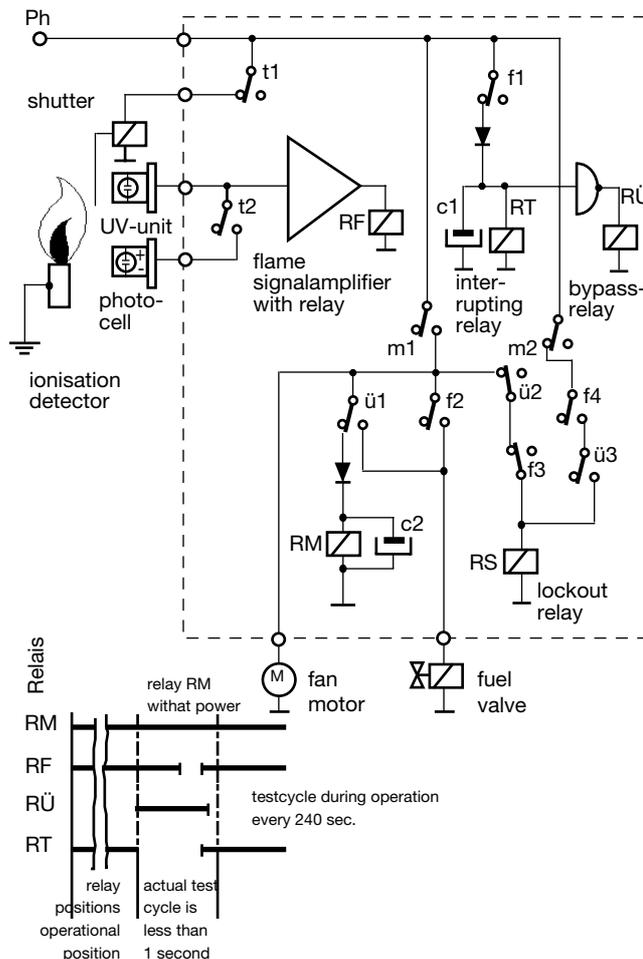
Technical data

| | |
|------------------------|-----------------------|
| Flame viewing attitude | axial or radial |
| Spectral response | 400... 700 nm |
| Sensitivity | 50 Lux and above |
| Signal current | min. 2 µA - max. 8 µA |
| Ambient temperature | max. 60° C |

Connections



- The cable to the TME must always be laid away from other cables, and if it is longer than 10 m, screened cable must always be used. Maximum cable length is 100 m.
- The screening should be connected at one end to the negative terminal of the FZE 780, and at the other, to terminal 8 in the control box baseplate.



- The negative terminal of the FZE 780 must always be directly connected to terminal 8 in the control box baseplate. Connecting it to other neutral terminals in the burner control wiring could cause malfunctions.

IONISATION FLAME DETECTOR

Technical data

| | |
|-----------------------|---|
| Amplifier sensitivity | <1 µA |
| Signal current | min. 5 µA |
| Stray capacitance, | <1000 pF (with approx. 20 m cable) ionisat. detector to earth |
| Electrode insulation | >50 MΩ |
| Electrode material | heat resistant (as ignition electrodes) |

Note

- The burner must be properly earthed. The voltage between neutral and earth must not be greater than 25 V. Observe correct polarity of live and neutral connections.
- The ionisation electrode must be positioned within the response zone of the flame.
- The ignition electrode(s) must not be in contact with the flame, and must be as far away as possible.
- High voltage (ignition) cables and the ionisation detector cable must not be laid parallel to each other.
- The root of the flame should not "lift off" away from the baffle, under any conditions of combustion.

UVZE 780 ULTRA-VIOLET DETECTION SYSTEM

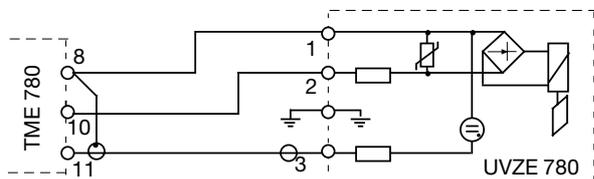
This flame detector incorporates a UV photo-cell which monitors the electromagnetic radiation from the ultra-violet part of the spectrum. Flame detection with a UV photo-cell is, for familiar reasons, not always fail-safe. In order to test the behaviour of the UV sensor during the ignition and extinguishing phases, light is cut off periodically. This is achieved by a shutter (which is otherwise held open by a high performance solenoid during the entire switched-on time), covering both the axial and radial openings simultaneously. Light is cut off in this way every 240 sec., but the "dark phase" itself lasts less than 1 sec. (reaction time of amplifier). The solenoid and shutter mechanism are contained in a dust-proof unit, and do not require any kind of maintenance. The UVZE 780 also contains a mechanical sensitivity adjustment device, which allows fine adjustment of both light admission apertures. Two self-interrupting plug-type connections allow the UV signal current to be measured quickly and easily.



Technical data

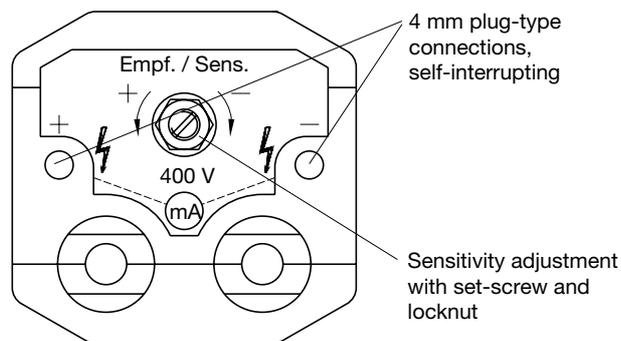
| | |
|------------------------|---------------------------|
| Flame viewing attitude | axial or radial |
| Spectral range | 190... 270 nm |
| Axial sensitivity | min. 0.5 m candle power |
| Radial sensitivity | min. 0.5 m candle power |
| Flame signal current | min. 0.7 mA - max. 1.0 mA |
| Ambient temperature | max. 60° C |
| Insulation standard | IP 41 |
| UV sensor fitted | Sylvania P 607 |

Connections



- Cables to the UVZE 780 must be laid away from other wiring.
- If the length of the signal cable exceeds 10 m, a separate, screened, single-core cable must be used. Maximum cable length is 100 m. The screening must be directly connected to terminal 8 on the control box.

ADJUSTMENT AND MEASUREMENT FACILITIES ON THE UVZE 780



Basic adjustment of the UVZE 780 for optimal light admission is carried out using the supplied ball-joint mount. This allows the detector to be adjusted $\pm 18^\circ$ around its axis. If the UVZE 780 is fitted axially, the adjustment procedure is as follows:

- Connect an ammeter with a sensitivity range from 0... 1 mA (e.g. Ionimeter range 1 mA).
- Align the UVZE roughly by eye.
- Turn the sensitivity adjustment screw towards minus (-), until a UV current of approx. 0.5 mA can be measured.
- Adjust detector alignment until the maximum reading is obtained on the ammeter.
- Re-adjust the sensitivity screw (as far as it will go) towards plus (+), and then tighten the locknut.

If the UVZE 780 is fitted radially, the procedure described above is not normally necessary. In most cases, alignment of the detector by eye, followed by checking the signal current with the ammeter, is sufficient.

Note

The ammeter must be connected via the 4 mm sockets (banana type). Otherwise, the self-interrupting function is not activated. The plug sockets for the ammeter carry a voltage of 400 V measured against earth/ground.

DANGER! HIGH VOLTAGE!

TME 780 PROGRAMME SELECTION (UNDERSIDE OF UNIT)

1. With or without monitoring of air damper open/close time - jumper II. WITH jumper, no shutdown if confirmation signal of damper having reached its position is not received. WITHOUT jumper, shutdown after approx. 100 sec. if no confirmation signal is received.
2. Short or long pre-ignition - jumper III. WITH jumper, long pre-ignition, in other words, over the total pre-purge time with oil burners. WITHOUT jumper, short pre-ignition, in other words, after end of pre-purge time and signal that air damper has reached MIN position. Pre-ignition interval before pilot valve opens is 1.6 sec.
3. With or without ignition spark monitoring - jumper IV. WITH jumper, no ignition spark monitoring. WITHOUT jumper, ignition spark monitoring, in other words, the fuel valve is only released if an ignition spark is present. Ignition spark monitoring is only possible in conjunction with the UVZE 780. The ignition spark must be within the viewing angle of the UV sensor.
4. External programming tag for indication of lockout or operational status.



Voltage at terminal 7 when control box has switched to lockout.



Voltage at terminal 7 when control box has not switched to lockout.

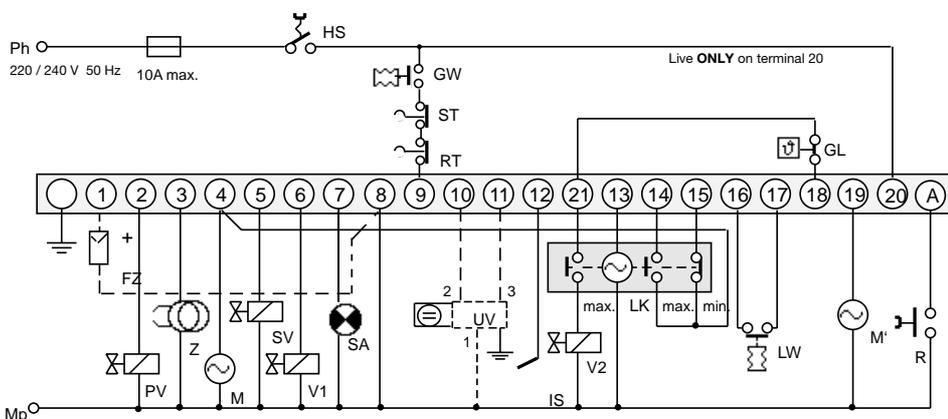
COMMISSIONING AND MAINTENANCE

- Check the wiring exactly. Incorrect wiring could damage the control box and flame detector and put the safety of the burner system at risk.
- The applicable installation regulations must be observed when mounting and wiring the control box. The specified contact ratings must not be exceeded.
- The chosen fuse rating must not, under any circumstances, be higher than the value listed in the technical data.
- Switch off or disconnect the power before plugging in or unplugging the unit.
- Burner control boxes are safety devices and should not be opened.
- In burners with ionisation flame detection, measure the voltage between neutral and earth/ground. If this voltage is greater than 25 V, an isolating transformer must be installed.
- Check the operation of the system exactly without the gas supply being turned on. The gas proving switch should be bridged for these checks.
- Special attention must be paid to terminal 20. Check that it carries a voltage when thermostats or other controlling devices are switched off. This is important for the safety of the flame detection system.
- The control box requires no maintenance, and must not be opened.
- The flame detector light admission apertures should be checked periodically for cleanliness. Dirt and dust reduce the amount of light admitted, which could cause the control box to initiate a shutdown.
- It is recommended that any control boxes or flame detectors kept as spares should be put to use every three months. This ensures that these units are fully functional, and that they have not been adversely affected by prolonged storage.
- If, during burner operation, the air proving switch signals loss of air pressure, a complete restart procedure is initiated.

FAULT FINDING

- Burner will not start, programme indicator at beginning of blue section
 - Check wiring and fuses
 - No (or too low) voltage at terminals 9 and 20
 - Air-pressure switch not in normally closed position
- Burner motor running, programme indicator at beginning of blue section, lockout shut-down occurs after approx. 100 secs:
 - Without programme jumper II, no signal confirming air damper has reached MAX-position
- Programme stops between blue and orange, shutdown after approx. 100 sec.
 - Signal for confirmation of damper having reached MIN position not received
- Shutdown in orange section
 - Stray light
- Shutdown between the yellow and orange sections
 - Jumper for ignition spark monitoring (IV) is cut, but no monitoring is possible because FZE or ionisation probe is fitted
 - UVZE detector incorrectly positioned and not able to "see" ignition spark
- Shutdown between yellow and red, flame is not established
 - No ignition or no fuel
- Shutdown between yellow and red, flame is established
 - No flame signal
 - Flame detector wired incorrectly
 - Burner with ionisation monitoring not earthed
- Shutdown in red section
 - Flame signal too weak, (less than 2 μ A), detector is dirty
- Shutdown between yellow and green
 - Main flame does not ignite during pilot valve operation
- Shutdown between green and white
 - Flame collapses during normal operation
 - Air-proving switch contacts activated
 - Flame signal too weak, detector is dirty
 - Interference picked up by flame detector cable
 - UVZE light cut-off doesn't work (test cycle every 240 sec.)
- Shutdown between white and blue
 - Stray light during normal, controlled burner switch-off

PROGRAMME SEQUENCE TME 780 MOD. 32-52



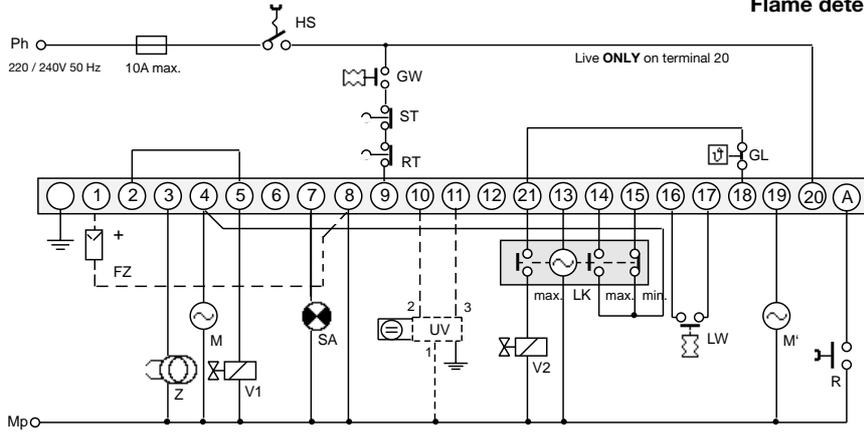
CAUTION

- When operating with gas burners, only the pilot valve (term. 2) or the start valve (term. 5) may be connected.
- The gas flow controlled by the start valve and main valves 1 and 2 must lead to a common nozzle chamber.
- When installing an ionisation probe, the necessary precautionary measures must be observed.

| programme indicator | Thermostat ON start-up delay |
|---------------------|-----------------------------------|
| blue | pre-purge/preignition OIL |
| orange | air damper CLOSED/preignition GAS |
| yellow | safety times PV and SV |
| red | safety time V1 |
| yellow | Sz V1 |
| green | operation |
| white | post-purge |

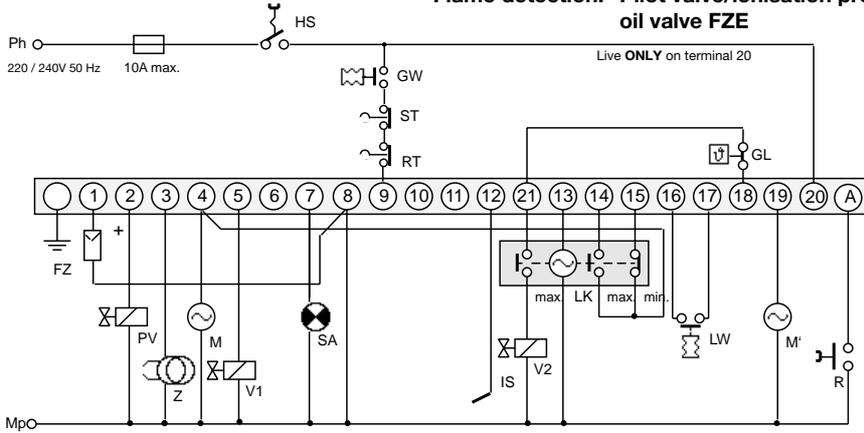
TME 780 MOD. 32 - 52

**Oil burner
Flame detection: FZE/UVZE**



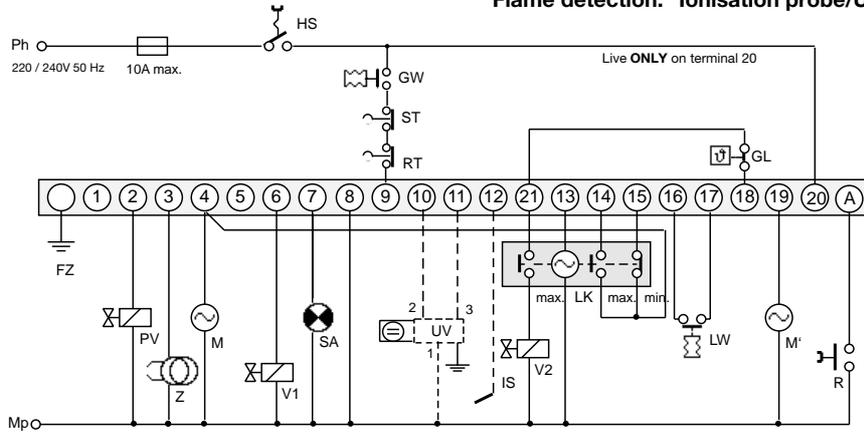
TME 780 MOD. 32 - 25

**Oil burner with gas-electric ignition
Flame detection: Pilot valve/ionisation probe,
oil valve FZE**



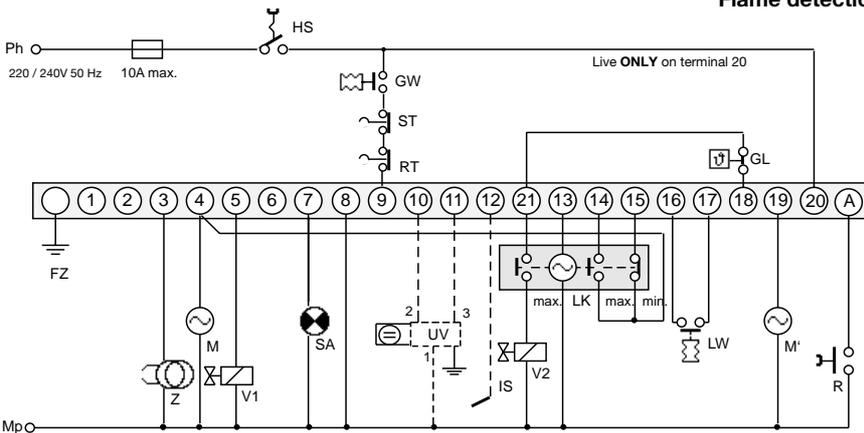
TME 780 MOD. 32 - 52 / MOD. 32 - 25

**Gas burner pilot valve
Flame detection: Ionisation probe/UVZE**



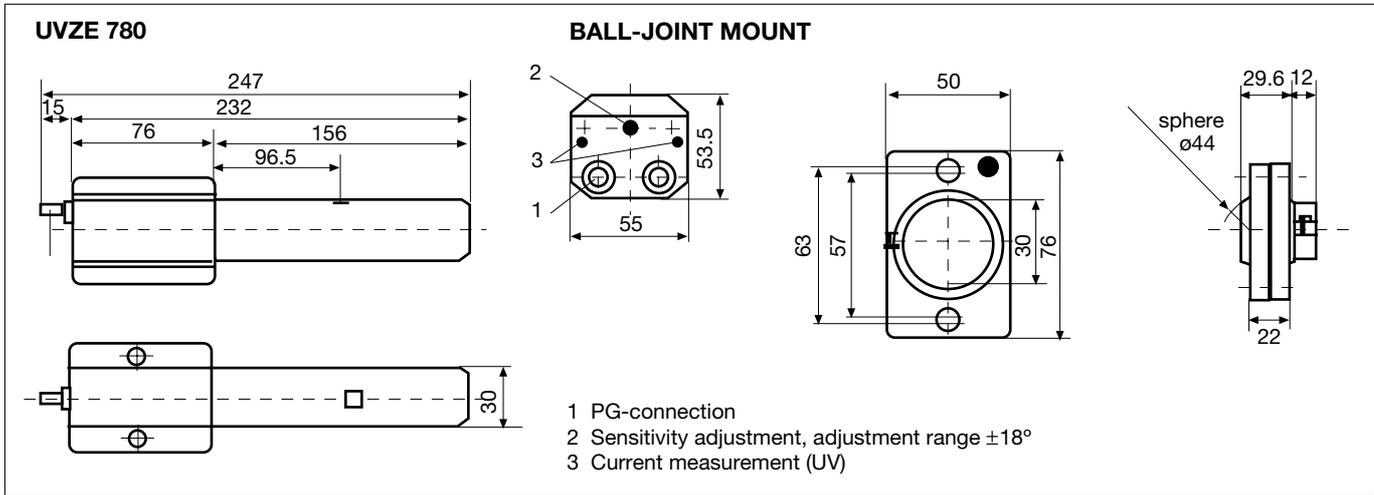
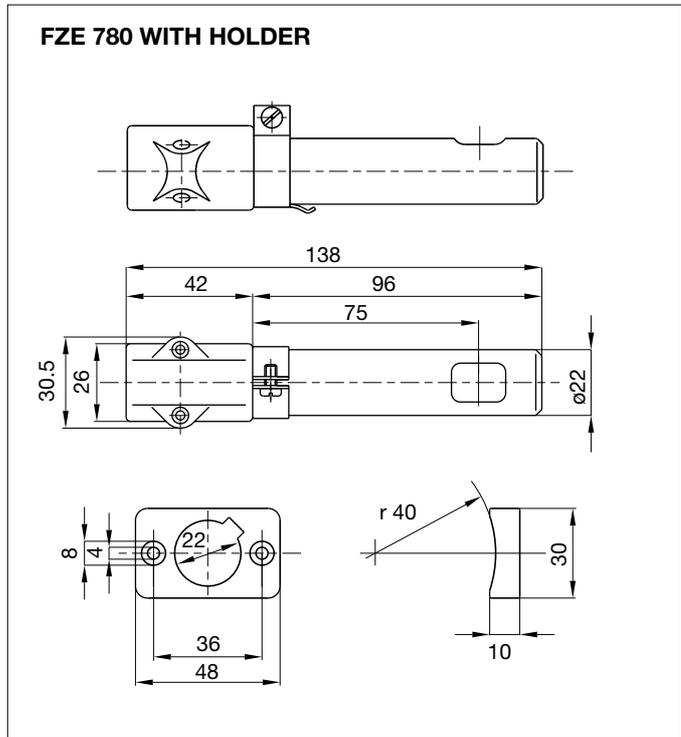
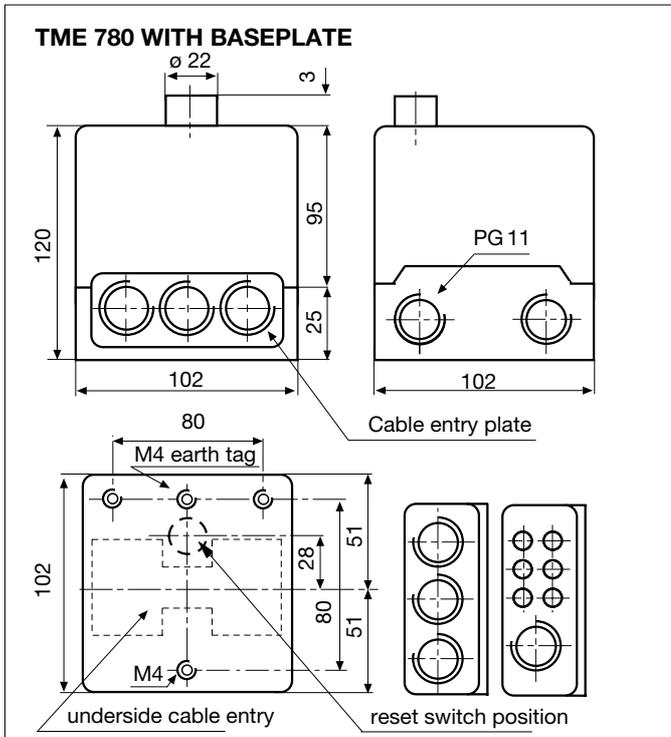
TME 780 MOD. 32 - 52

**Gas burner, ignition spark
Flame detection: Ionisation probe/UVZE**



KEY

- HS Main switch
- GW Gas-proving switch
- FZ Photo-cell type FZE 780
- UV UV sensor type UVZE 780
- IS Ionisation probe
- PV Pilot valve
- SV Start valve
- V1 Main valve 1
- V2 High-flame valve 2
- SA Indicator "lockout" or "no lockout"
- R Reset
- ST Safety thermostat
- RT Regulating thermostat
- GL High-flame thermostat
- Z Ignition
- LK Air damper actuator
- LW Air-proving switch
- M Burner motor
- M' Burner motor - post-purge



ORDERING INFORMATION

| ITEM | DESIGNATION | ITEM NO. |
|-----------------------|---------------------|----------|
| Control box | TME 780 Mod. 32-52 | 08801 |
| | TME 780 Mod. 32-25 | 08803 |
| Baseplate | TME baseplate | 70220 |
| Insert plate | PG-connection plate | 70502 |
| | Cable grip plate | 70501 |
| Flame detector | UVZE 780 | 18815 |
| | FZE 780 | 18238 |
| Flame detector holder | UVZE holder | 18808 |
| | FZE holder | 18807 |

The above ordering information refers to the standard versions.
Special versions are also included in our product range.

Specifications subject to change without notice.

TME 780



A Honeywell Company

Satronic AG
Honeywell-Platz 1
Postfach 324
CH-8157 Dielsdorf