Eclipse Trilogy
Flame Safeguards

T600 Series
Version 2

ECLIPSE®
Innovative Thermal Solutions

Liability and Warranty
We have made every effort to make this manual as accurate and complete as possible. Should you find errors or omissions, please bring them to our attention so that we may correct them. In this way we hope to improve our product documentation for the benefit of our customers. Please send your corrections and comments to our Marketing Communications Manager.

Document Conventions
There are several special symbols in this document. You must know their meaning and importance.

The explanation of these symbols follows below. Please read it thoroughly.

How To Get Help
If you need help, contact your local Eclipse representative. You can also contact Eclipse at:

1665 Elmwood Rd.
Rockford, Illinois 61103 U.S.A.
Phone: 815-877-3031
Fax: 815-877-3336
http://www.eclipsenet.com

Please have the information on the product label available when contacting the factory so we may better serve you.

T600 Series Settings
ID: XXXXXXXXXX-XXXX
T600XX.1-XXXXXXXXXXXX

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TRILOGY SERIES

This is the safety alert symbol. It is used to alert you to potential personal injurt hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Is used to address practices not related to personal injury.

NOTE Indicates an important part of text. Read thoroughly.

Table of contents

Introduction

Features

- **Programmable parameters**
- **Continuous or intermittent operation**
- **Communication options**
- **Modulating output control (0-10V, 4-20 mA or PWM)**
- **Two programmable flame sensor inputs**
- **Programmable "operation" output terminal**
- **Advanced diagnostics**
- **Runtime, lifetime and cycle counters**
- **History shows last 10 errors**
- **Software for status, settings and logging**
- **CE, FM, UL, CSA, GOST-R, AGA and SIL 3 approvals**

Type 1

Type 3

**Type 2
Integral Display**

**Type 2
Modulating**
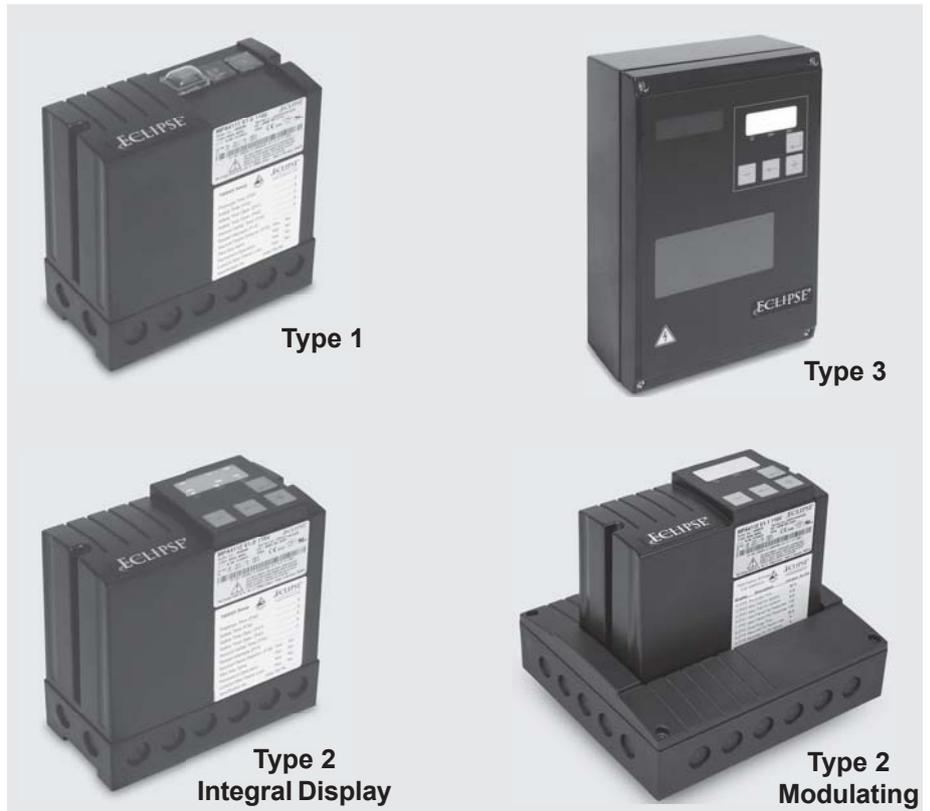
Description

The T600 microprocessor-controlled automatic flame safeguard control is for intermittent and continuous operation of gas, oil or combination gas / oil burners.

The flame is monitored by either an ionization (flame rod) input, dual contacts (NO and NC), a single contact (NO) or a combination of the ionization and contact inputs. This dual monitoring capability combined with configurable sequences enables supervision of burners with two flame sensor positions, long line burners, redundancy for burners with a moving flame, and two burners from a single valve train (one-down-all-out).

The program sequence and timings can be configured to match the application.

The settings are protected by passwords against unauthorized access.

All settings for the T600 can be made by means of a laptop / PC via the VisionBox or through the integral display (certain models only).

For operation in burner networks, Profibus or Modbus communication is available as an option.

T600 Types
- Type 1 without display
  This version may be used if accessing information via the display is not required or limited state/fault information is acceptable.
- Type 2 with integral display
  This version gives local display of detailed information.
- Type 2 with modulating capabilities
  This version allows for modulating control of process components.
- Type 3 with metal housing and integral display
  This version provides an extra level of environmental protection for particularly demanding installations.

Application
For industrial burners, with or without pilot (start gas), for ovens and furnaces meeting the requirements of NFPA 86 and for industrial thermoprocessing equipment meeting the requirements of EN 746-2 or ISO 13577 series.

Approvals
CE, FM, UL, CSA, GOST, AGA
(See page 18 for details)

T600 Options

Type 1		
Purge / No Purge	No Display	
	Communications Special Order	
Type 2		
Purge / No Purge	Display Standard	
	Communications Option	
Modulating	Display Standard	
	Communications Included	
Type 3		
Purge / No Purge	Display Standard	
	Communications Option	
Modulating	Display Standard	
	Communications Included	

Integral Display
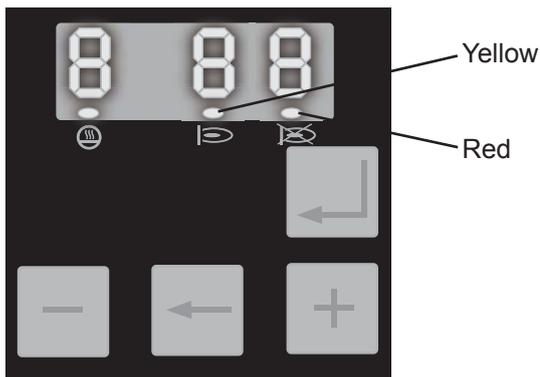
The integral display provides information through various modes:

Operation Display
- Current operating state
- Program state
- Bus address

Info Display
- Flame quality value
- Resettable counters for start-up, operating hours and operating cycles

Error Display
- Automatic activation of error messages
- Additional information about faults
- Query of the last ten faults

Parameter Display
- Password-protected access for qualified personnel to make parameter adjustments
- Includes important parameters such as:
  - Pre-purge
  - Safety time for startup phase
  - Post-purge time
  - Behavior after flame lift-off
  - Operating modes of V1 and V2
  - Continuous or intermittent operation

Status Information

Designation	Description	Visible via VisionBox	Visible via Display
General Information			
Lockout	System is locked, error code	●	LED
State Number	Current state of the system, key combination + and -	●	7-segment
Current Access Level	For parameter changes via password entry	●	
Flame	Flame detected	●	LED
Manual Mode	System in manual mode	●	7-segment
Flame Quality	Value > 49 good flame (ionization)	●	Info
Bus Connection Present	Communication via Profibus, Modbus	●	7-segment
Burner Start Request	Signal combination from bus setpoint input and hardware input	●	LED
Inputs			
Air Pressure Switch	Signal to terminal 18	●	
Flame 1	Signal from flame 1 input, terminal 5	●	
Flame 2 NO	Signal from flame 2 NO input, terminal 16	●	
Flame 2 NC / Gas Pressure Switch / POC	Signal from flame 2 NC input, gas pressure switch or POC, terminal 17	●	
Hardware Input for Burner Start	On / off signal for burner start, terminal 19	●	
Outputs			
Gas valve V1	Pilot valve, terminal 13	●	
Gas valve V2	Main valve, terminal 14	●	
Ignition	Igniter or ignition transformer, terminal 15	●	
Fan	Combustion air blower starter, terminal 8	●	
Counters			
Time Counter / Lifetime Counter	Time since switching on the power	●	
Runtime Meter	Fixed operating time	●	
Resettable Runtime Meter	Resettable via VisionBox and display	●	Info
Start Counter	Fixed counter of startups	●	
Resettable Start Counter	Resettable via VisionBox and display	●	Info
Switching Cycles Counter V2	Count of main valve cycles	●	Info
Internal Information			
State Timer in Minutes	Displayed state timer runs in minutes, otherwise in 1/16s.	●	
Initialization Phase	The flame safeguard is being initialized	●	
Multi-function Switch	"ON" when reset button is pressed	●	
Access Level Change	CCC or value flashes on display, ↵ key expected	●	7-segment
Safety Switch-off Flag	System is locked	●	
Error Index	Internal error counter	●	
Remaining State Time	65535 if unlimited remaining time	●	
Cycl. State Counter	Counts in 1/128s cycle	●	
Processor Load	Represents percentage of processor capacity	●	

LED: Indicated by one of the 3 LEDs on the display
7-segment: Indicated by one or several characters of the 7-segment display
Info: Displayed in informative display mode

Accessories

UV 41HE / UV 42
UV flame detectors. Suitable for intermittent operation.

UV 41HE - Ionization output
UV 42 - Contact output
Suitable for continuous operation in conjunction with shutter module UV 4x EM 1/1 and T600 with self-check control option.

FLW 41I
Flame detector module used when a second ionization flame detector is required. The FLW 41I is connected to the second flame sensor input of the T600.

Configured Part Number

NOTE: Not all functions or capabilities are shown here. Contact Eclipse for additional options.

T600rr
rr = revision number

| 1 | 2 | – | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

1 - Customer	
.	Standard Product Options

2 - Model	
1	No-Purge
2	Purge
3	Analog Modulating Control

3 - Type	
1	No Display
2	Integral Display
3	Metallic with Display

4 - Voltage	
1	115VAC
2	230VAC

5 - Ignition Configuration	
A	Interrupted Pilot
B	Direct Spark / Intermittent Pilot
C	High-Low

6 - Application	
A	Single Burner, Aux (NC) Input for POVC
B	Single Burner, Aux (NC) Input for Gas Switch (No POVC)
C	Dual Burners, Aux (NC) Input for POVC
D	Dual Burners, Aux (NC) Input for Gas Switch (No POVC)
E	Line Burner and 2 Flame Sensors, Aux (NC) Input for POVC
F	Line Burner and 2 Flame Sensors, Aux (NC) Input for Gas Switch (No POVC)
G	Redundant: Pilot 1 or 2, Main 1 or 2, Aux (NC) Input for POVC
H	Redundant: Pilot 1 or 2, Main 1 or 2, Aux (NC) Input for Gas Switch (No POVC)
J	High-Low Burner, Aux (NC) Input for POVC
K	High-Low Burner, Aux (NC) Input for Gas Switch (No POVC)

7 - Pre-Purge Time	
3	3 seconds
A	10 seconds
C	20 seconds
D	30 seconds
F	60 seconds
K	120 seconds
M	240 seconds
P	360 seconds
R	600 seconds
T	900 seconds
U	1200 seconds
X	No Purge

Configured Part Number (Continued)

```
              1   2     3   4   5   6   7   8   9   10  11  12  13  14
      T600rr [  ][  ] – [  ][  ][  ][  ][  ][  ][  ][  ][  ][  ][  ][  ]
rr = revision number
```

8 - First Safety Time (Pilot TFI)	
3	3 seconds
5	5 seconds
A	10 seconds
B	15 seconds

9 - Second Safety Time (Main TFI)	
3	3 seconds
5	5 seconds
A	10 seconds
B	15 seconds
X	None (Direct Spark / Intermittent Pilot)

10 - FFRT - Pilot and Main	
1	1 seconds
3	3 seconds

11 - Post Purge Time	
3	3 seconds
A	10 seconds
D	30 seconds
F	60 seconds
X	None

12 - Extended Capabilities	
A	Self-Check Scanner Control Only
B	Modbus Communications Only
C	Profibus Communications Only
D	Modbus Communications and Self-Check Scanner Control
E	Profibus Communications and Self-Check Scanner Control
J	Modulating with Self-Check Scanner Control Only
K	Modulating with Modbus Communications Only
L	Modulating with Profibus Communications Only
M	Modulating with Modbus Communications and Self-Check Scanner Control
N	Modulating with Profibus Communications and Self-Check Scanner Control
X	None

13 - Modulating Control Signal	
A	PWM
B	0-10 VDC
C	4-20 mA
X	None

14 - Actuator Stroke Time	
C	12.5 seconds
D	15 seconds
F	25 seconds
G	30 seconds
J	45 seconds
M	60 seconds
X	None

Typical System Diagram

Burner with Pilot Ignition
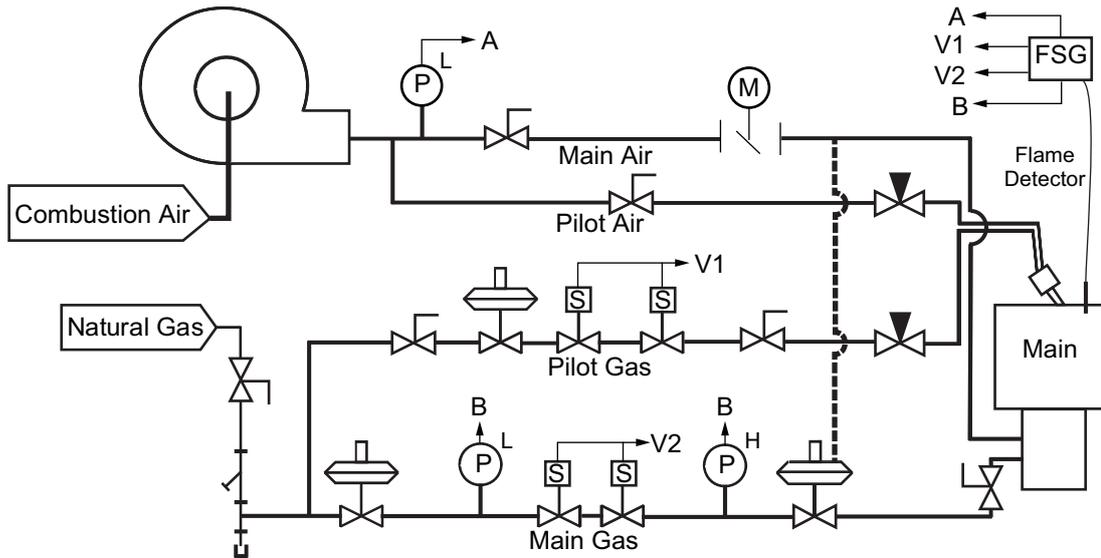
After the burner start signal, the fan is switched on and the air pressure is checked by the pressure switch. After the pre-purge time has lapsed, the ignition is switched on and the pilot valve(s), V1, is opened for the trial for ignition. After proof of pilot flame, the main valve(s), V2, is opened. See section 5, "Operational State Overview" for details on the complete sequence.

Burner with Direct Spark / Intermittent Pilot Ignition
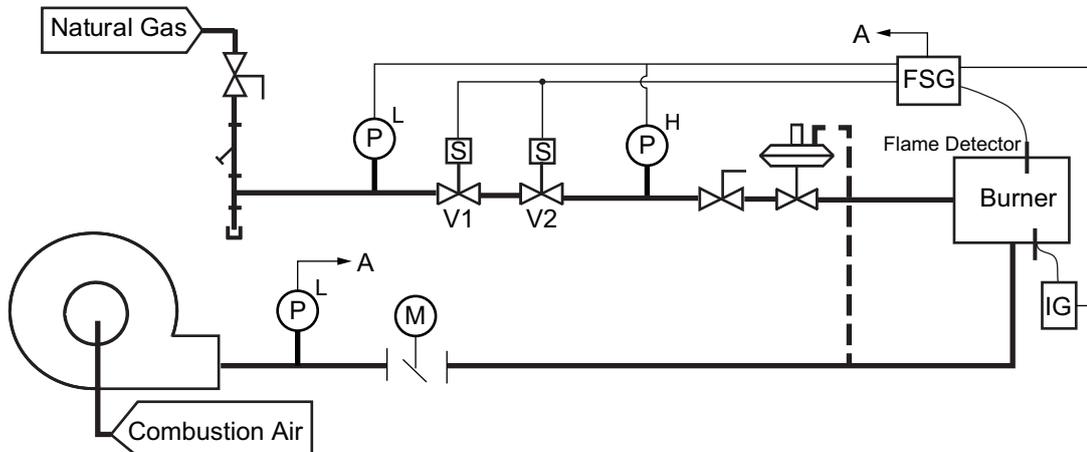
After the burner start signal, the fan is switched on and the air pressure is checked by the pressure switch. After the pre-purge time has lapsed, the ignition is switched on and the two valves V1 and V2 are opened together. See section 5, "Operational State Overview" for details on the complete sequence.

High-Low or Line Burner
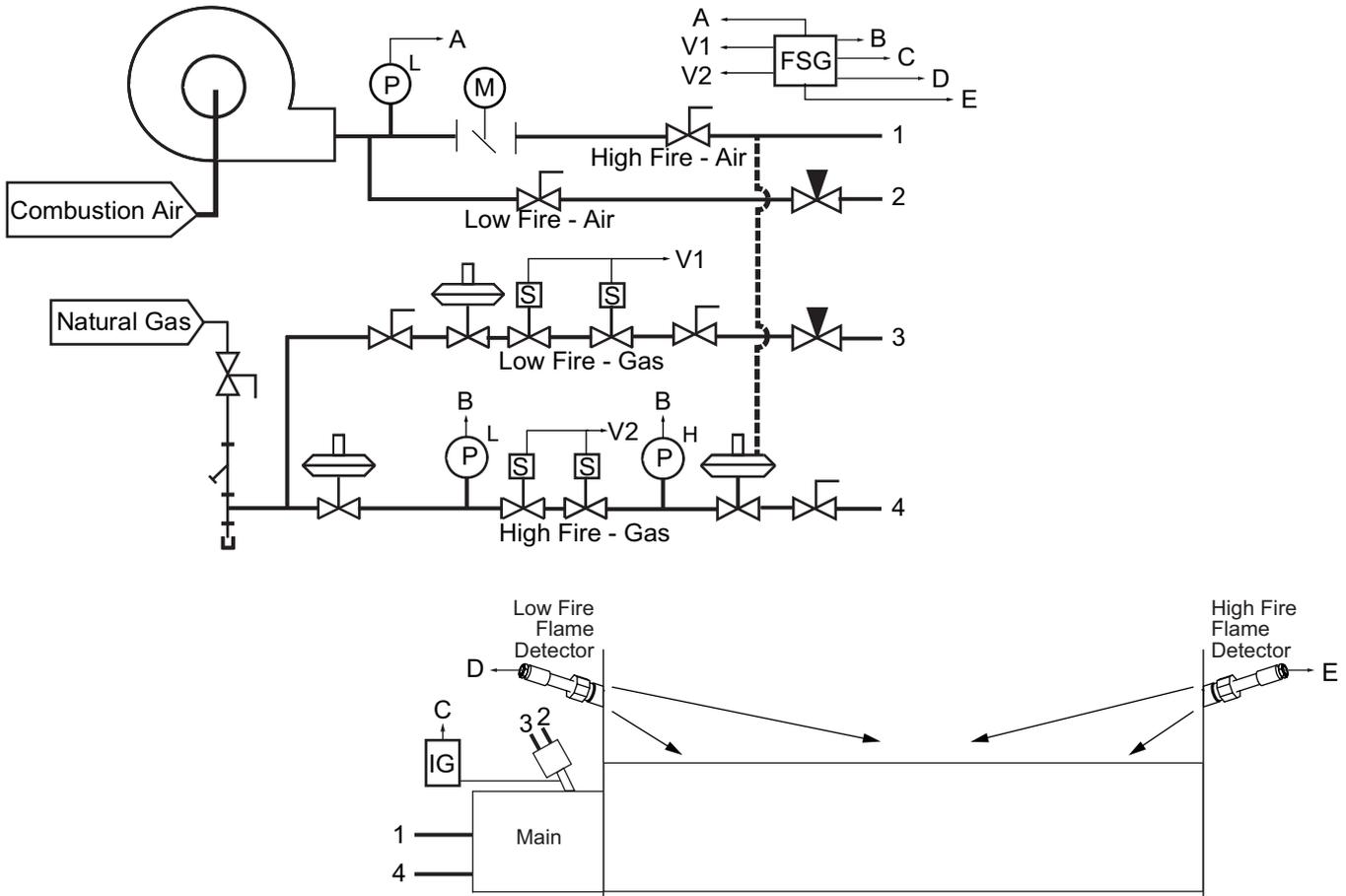
After the burner start signal, the fan is switched on and the air pressure is checked by the pressure switch. After the pre-purge time has lapsed, the ignition is switched on and the low fire valve, V1, is opened for the trial ignition. V1 stays open and V2 will open and close depending on the communication bus command. If two flame detectors are used, a valid signal from either detector will allow operation. A loss of signal from both detectors causes a shutdown. See section 5, "Operational State Overview" for details on the complete sequence

Dual burner with Direct Spark / Intermittent Pilot Ignition of Main Gas Flame
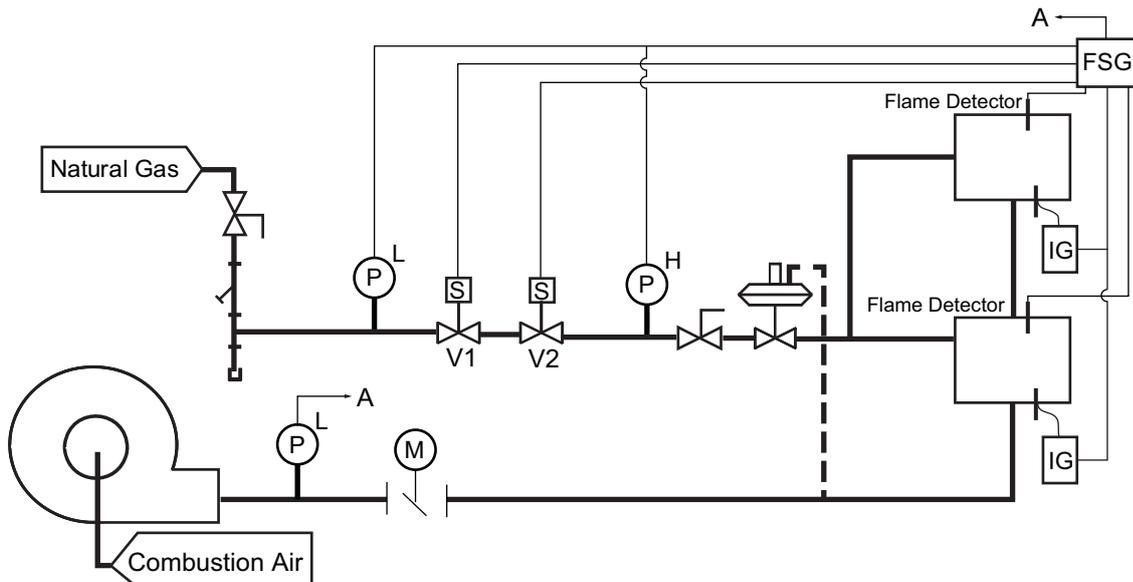
After the burner start signal, the fan is switched on and the air pressure is checked by the pressure switch. After the pre-purge time has lapsed, the ignition is switched on and the two valves V1 and V2 are opened together. On failure of either flame detector, both V1 and V2 are closed and both burners are shut-off. NOTE: Dual burner pilot ignition is also possible. See section 5, "Operational State Overview" for details on the complete sequence

Modulating Burner with Pilot Ignition
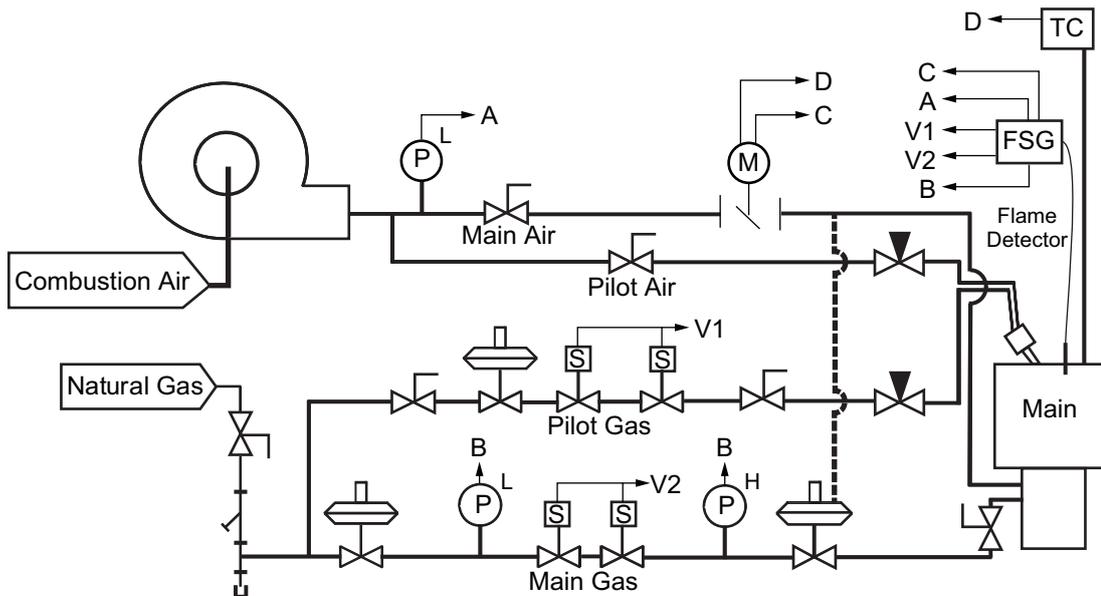
After the burner start signal, the fan is switched on and the air pressure is checked by the pressure switch. The actuator drives to the high fire position and remains here until the pre-purge time has elapsed. The actuator drives to the low fire position, the ignition is switched on and the pilot valve(s),V1, is opened for the trial for ignition. After proof of pilot flame, the main valve(s), V2, is opened and the burner will begin modulation based on feedback from the temperature controller. See section 5, "Operational State Overview" for details on the complete sequence

Modulating Burner with Direct Spark / Intermittent Pilot Ignition
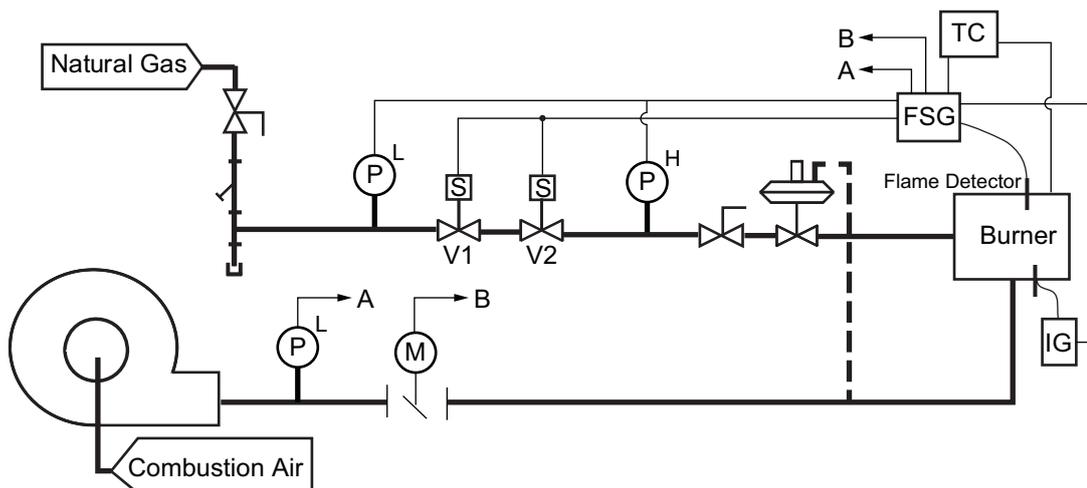
After the burner start signal, the fan is switched on and the air pressure is checked by the pressure switch. The actuator drives to the high fire position and remains here until the pre-purge time has elapsed. The actuator then drives to the low fire position, the ignition is switched on and valves V1 and V2 are opened together for the trial for ignition. After proof of pilot flame, valves V1 and V2 will remain open and the burner will begin modulation based on feedback from the temperature controller. See section 5, "Operational State Overview" for details on the complete sequencez

General Mechanical	

Protection Rating of the Plastic Housing	Type 1: IP 42 (approximately equivalent to NEMA 12)
	       Not UV (sunlight) protected
	Type 2: IP 54 (approximately equivalent to NEMA 3)
	       Not UV (sunlight) protected

Protection Rating of the Metal Housing	Type 3: IP 65 (approximately equivalent to NEMA 4) Not UV (sunlight) protected ATTENTION: use suitable cable screw connectors only
Ambient Temperature	-20°C ... +60°C (-4°F ... +140°F) (UL Approval) -40°C ... +70°C (-40°F ... +158°F)
Storage and Transport	-40°C ... +80°C (-40°F ... +176°F)
Humidity	< 95%, no condensation permitted (tested to DIN 60730-1)
Useful Life of Switching Outputs	Minimum 250,000 switching operations
Mounting Position	as desired
Approximate Dimensions in mm (inches) (excluding cable screw connector)	Type 1 (L x H x T): 152.5 x 148.5 x 77 (6.0 x 5.9 x 3.0) Type 2 Purge / No Purge (L x H x T): 152.5 x 151.5 x 77 (6.0 x 6.0 x 3.0) Type 2 Modulating (L x H x T): 190 x 151.5 x 170 (7.5 x 6.0 x 6.7) Type 3 (L x H x T): 160 x 240 x 80 (6.3 x 9.5 x 3.2)
Weight in kg (lbs)	Type 1: 0.82 (1.8) Type 2 Purge / No Purge: 0.82 (1.8) Type 2 Modulating: 1.42 (3.13) Type 3: 2.2 (4.85)
Display	Type 1: 2 LEDs - 1 red, 1 yellow Type 2: 3-digit 7-segment display plus 3 LEDs Type 3: 3-digit 7-segment display plus 3 LEDs

General Electrical

Rated Voltage	230 VAC -15% ... + 10% or 115 VAC -15% ... + 10%, depending on the version
Frequency	50 Hz ... 60 Hz
Fuse	6.3A slow-blow fuse or 10A fast-blow fuse, integrated, exchangeable
Isolation	No galvanic isolation between mains and 24 VDC or 5 VDC
Electrical Connection	ATTENTION: • Assure correct line voltage and protective earth conductor connection according to the wiring diagram. • The contact protection for the UV sensor must be guaranteed by mounting it in the operating equipment. Assure protection for the wiring and connector of the UV sensor through proper mechanical mounting and support. • All connecting wires must be suitable for maximum expected temperatures and must not be rated less than 167°F (75°C).
Power Consumption (own consumption)	Maximum 10W Typically 115V 230V Standby 1.5W ... 1.8W Operation 3.4W ... 4.8W With communications or self-check option: Standby 3.3W ... 3.5W Operation 5.4W ... 6.3W

Designation	Type of Input	Electrical Data
L1 Connection Over Replaceable Fuse Type 1 / Type 2	Power supply	L1 protected by integrated fuse, 6.3A slow-blow or 10A fast-blow
TWI Interface Type 1 / Type 2	TWI	Connection only for VisionBox and parameterization box **NOT galvanically isolated!**
Switch for Parameter Mode Type 1 / Type 2	2 - position switch	ON / OFF switch on flame safeguards (may only be switched after having removed the flame safeguard from the base)
User Interface Type 1 (without display)	One momentary switch	Confirm or reset
User Interface Types 2 and 3 (with display)	Four buttons	Reset, back, plus and minus

Spark generator connection

The T600 does not include an ignition transformer.

For suitable ignition transformers, see Datasheet 841 at www.eclipsenet.com/products/ignition_transformers.

ATTENTION: A special ignition transformer is required depending on the electrode arrangement (i.e. for single-electrode operation).

Outputs

Designation	Safety-Related	Type of Output	Line Length	Electrical Data
V1 Main Gas Valve	●	Relay contact	Maximum 100 m (328 ft)	115/230 VAC / 2A cos φ = 1 (resistive) Minimum load 0.5W
V2 Safety Gas Valve	●	Relay contact	Maximum 100 m (328 ft)	115/230 VAC / 2A cos φ = 1 (resistive) Minimum load 0.5W
Ignition	●	Relay contact	Maximum 100 m (328 ft)	115/230 VAC / 1A cos φ = 0.4 corresponds to 115/230 VAC / 2.5A cos φ = 1 (resistive)
Fan	-	Relay contact	Maximum 100 m (328 ft)	115/230 VAC / 1A cos φ = 0.4 corresponds to 115/230 VAC / 2.5A cos φ = 1 (resistive)
Operation	-	Relay contact	Maximum 100 m (328 ft)	115/230 VAC / 1A cos φ = 1 (resistive)
Fault	-	Relay contact	Maximum 100 m (328 ft)	115/230 VAC / 1A cos φ = 1 (resistive)
Flame Detector Supply	-	For UV 41HE or UV 42	Maximum 100 m (328 ft)	230 VAC / 10 mA*
Modulating Outputs				
Fan Activation	-	PWM 4 kHz, without detection of speed feedback	Maximum 10 m (32.8 ft)	24 VDC (3 lines: GND, +24 VDC, PWM control signal)
Frequency Converter Activation	-	0...10 V	Maximum 10 m (32.8 ft)	10 VDC
Activation of Shutter	-	Switching contact	Maximum 100 m (328 ft)	24 VDC

*The flame detector is always supplied with 230 VAC (even the 115 VAC version) via the T600 flame detector power supply, pin 7

The sum of the currents of all safety-related loads must not exceed 5 A!
The sum of the currents of all loads must not exceed the installed fuse value

Inputs

Designation	Type of Input	Line Length	Electrical Data
Safety Chain	Voltage-free (dry-contact)	Maximum 100 m (328 ft)	115 / 230 VAC / max. 10 A
Flame Detector 1 (Ionization)	Ionization for one- or two-probe operation	Maximum 10 m (32.8 ft)*	Threshold: ~ 1.2 µA Short-circuit current to N: 280 µA
Flame Detector 2 NO	Switching contact	Maximum 100 m (328 ft)	115 / 230 VAC "normally open"
Flame Detector 2 NC	Switching contact	Maximum 100 m (328 ft)	115 / 230 VAC "normally closed"
Burner Start	Switching contact	Maximum 100 m (328 ft)	115 / 230 VAC
Air Pressure Switch	Switching contact	Maximum 100 m (328 ft)	115 / 230 VAC
Remote Unlocking	Switching contact	Maximum 100 m (328 ft)	115 / 230 VAC
Modulating Inputs			
"High Fire" Feedback	Switching contact	Maximum 100 m (328 ft)	115/230 VAC
"Low Fire" Feedback	Switching contact	Maximum 100 m (328 ft)	115/230 VAC
Power +	Switching contact	Maximum 100 m (328 ft)	115/230 VAC
Power -	Switching contact	Maximum 100 m (328 ft)	115/230 VAC

*If the line length must be greater than 10 m (32.8 ft), an additional flame detector should be used.

Flame Signal Strength (current) vs. T600 Display
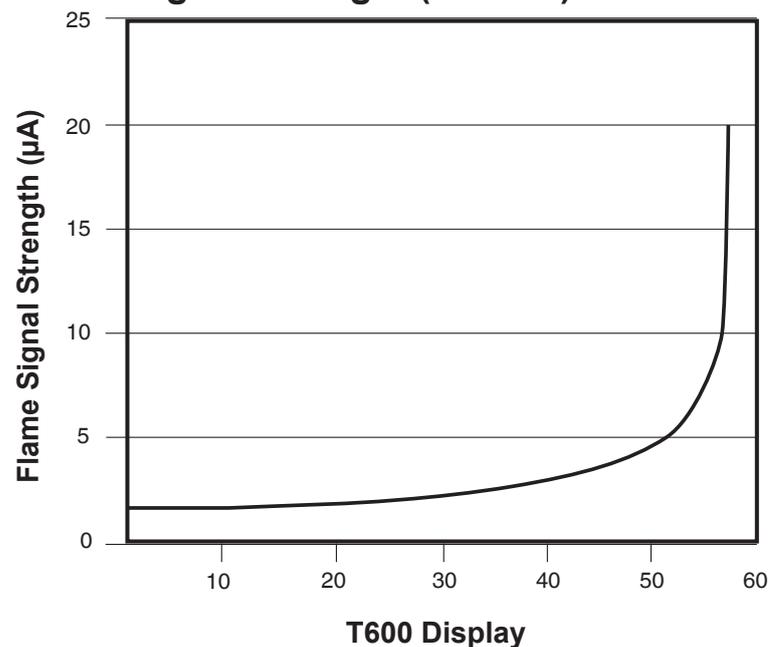
The quality of the flame signal is displayed for flame detector 1 as a number between 0 and 58.
Evaluation of the flame signal is only possible with ionization flame monitoring.
When using the UV 42, the maximum value is always displayed.

Approval Overview

Approval Overview	Order No.	CE	FM	UL Recognized	CAN/CSA-C22.2	GOST	AGA
T600 Type 1 / AC 115V	Configured	x	x	x	x	x	x
T600 Type 1 / AC 230V	Configured	x	x		x	x	x
T600 Type 2 / AC 115V	Configured	x	x	x	x	x	x
T600 Type 2 / AC 230V	Configured	x	x		x	x	x
T600 Type 3 / AC 115V	Configured	x	x	x	x	x	x
T600 Type 3 / AC 230V	Configured	x	x		x	x	x
Flame detector							
FLW 41I	101013621	x			x	x	x
UV 41HE	See page 104	x	x	x	x	x	x
UV 42	See page 106	x	x	x	x	x	x
UV 4x EM 1/1	101015404	x	x	x	x	x	x

Approvals

EC type-examination certificate according to the EC Gas Appliances Directive:
T600 Series   CE-0085 BU 0487

EC type-examination certificate according to the EC Pressure Equipment Directive:
T600 Series   CE0036

FM Approved to FM 7610

UL Recognized Component per UL 372, UL 1998 and CAN/CSA-C22.2.

GOST/Rostechnadzor

Suitable for applications up to SIL3

Meets the requirement according to IEC 61508 (2nd ed. 2011)

Certified by TÜV Süd

AGA Certified to AS 4625-2005 and EN 298 - 2003

SIL (Safety Integrity Level)

T600 Series from V1.1	UV 4x	UV 4x-EM1/1 (Shutter)	Components	SIL	SFF	PFH
x			Ionization input	3	99.48%	1.80E-09
x			Input Flame Sensor 2 NO, Flame Sensor 2 NC, Air pressure switch and remote unlocking	3	99.38%	1.80E-09
x	x		UV 41HE + ionization input	2	96.91%	1.50E-07
x	x		UV 42 + input Flame Sensor 2 NO	2	96.87%	1.51E-07
x	x	x	UV 4x-EM1/1 (shutter) + UV 41HE + ionization input	3	99.35%	3.15E-08
x	x	x	UV 4x-EM1/1 (Shutter) + UV 42 + input Flame Sensor 2 NO	3	99.34%	3.15E-08

Dimensions in mm (inches)

Type 1 Purge / No Purge Dimensions

148.5 (5.9)

75.2 (3.0)

(No screw connections on top)

8X Ø16 (0.6)

152.5 (6.0)
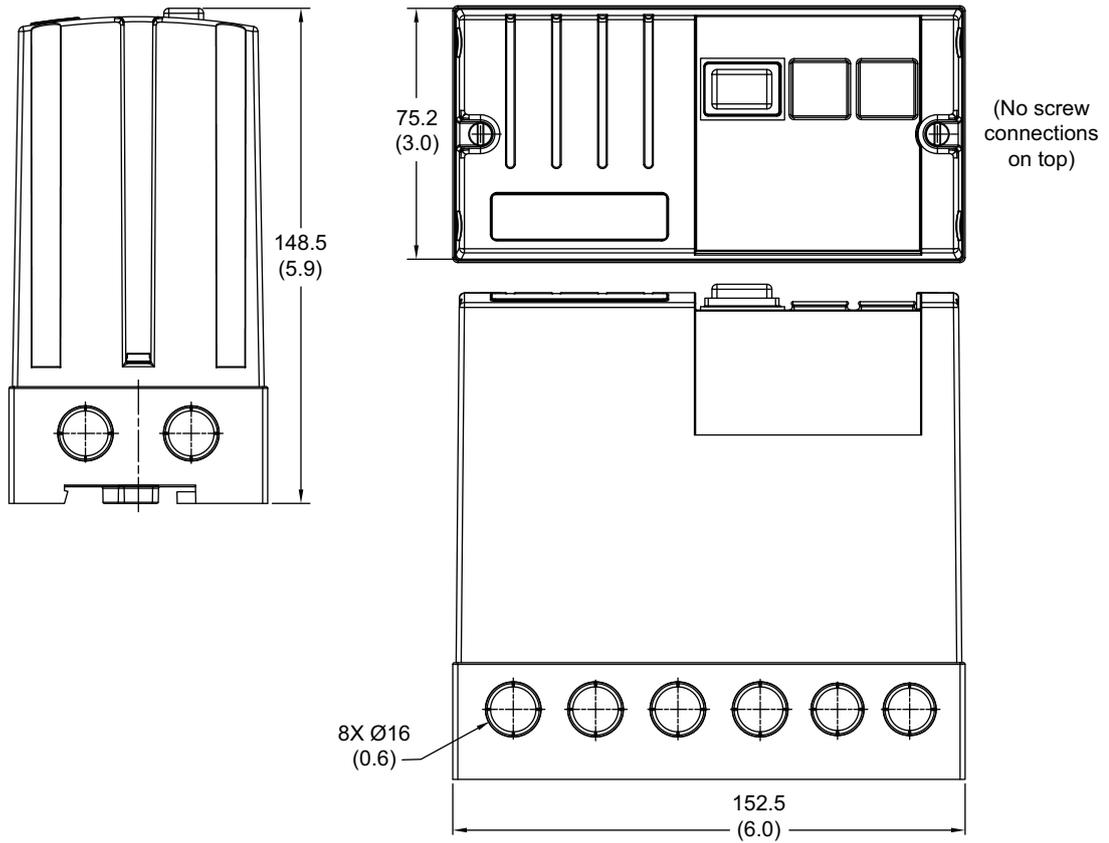
Figure 2.1

Type 2 Purge / No Purge Dimensions

151.5 (6.0)

75.5 (3.0)

(No screw connections on top)

Ø15.7 (0.6) for communications connection

8X Ø16 (0.6)

152.5 (6.0)
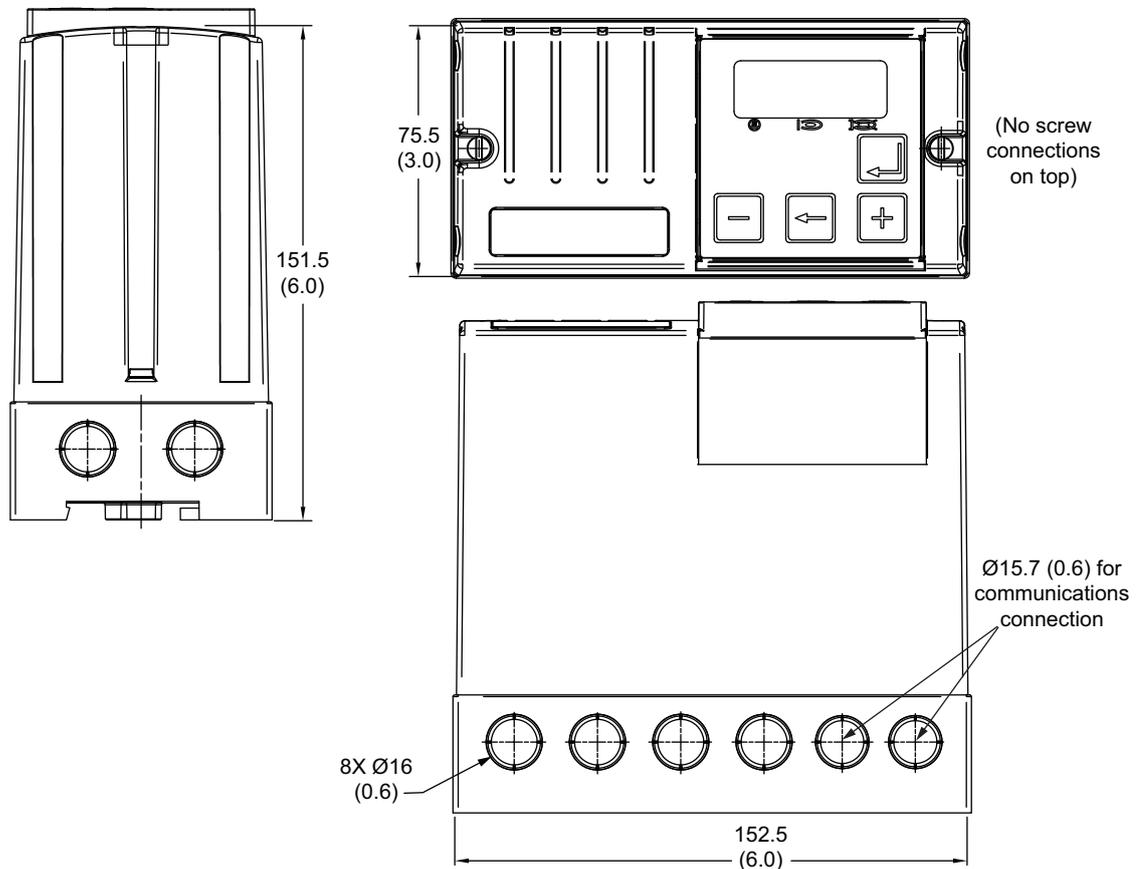
Figure 2.2

Type 2 Modulating Dimensions

151.5
(6.0)

21X Ø16
(0.6)

190
(7.5)

170
(6.7)

(No screw
connections
on top)
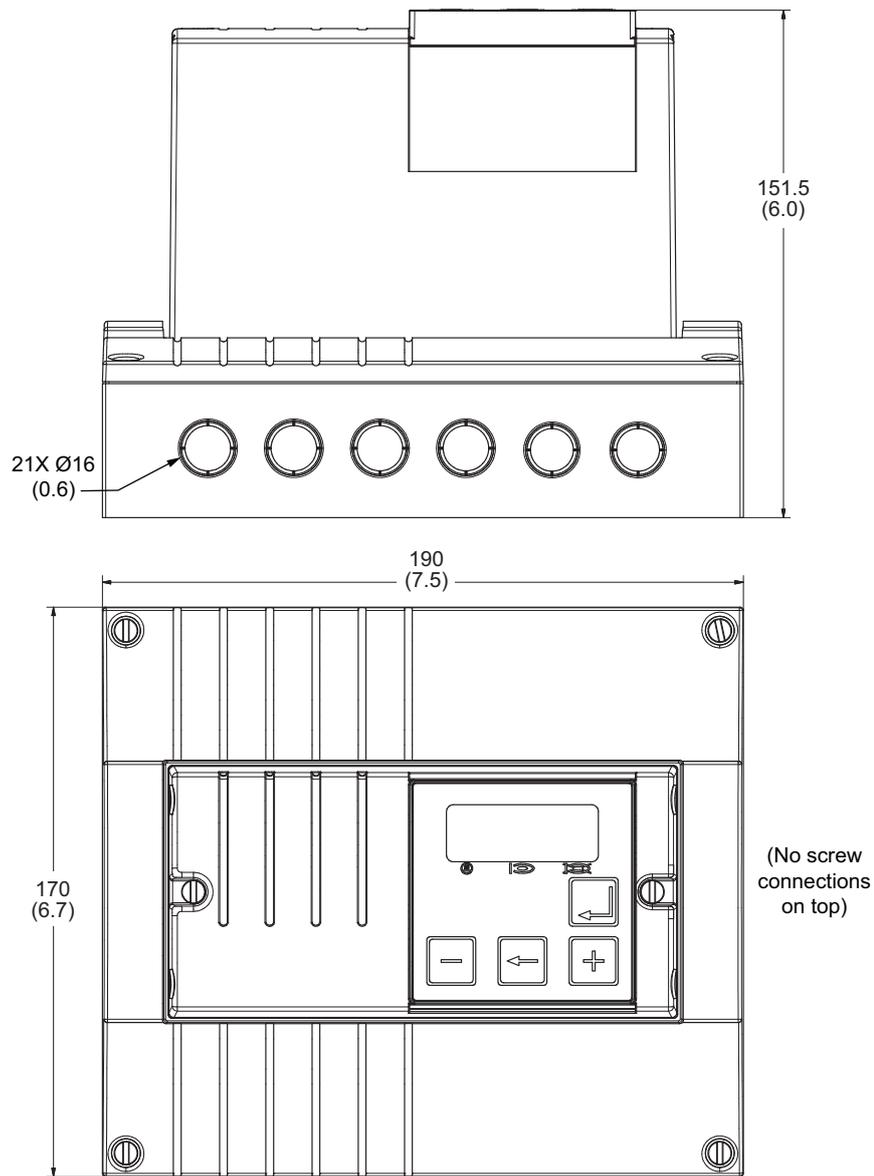
Figure 2.3

Type 3 Purge / No Purge and Modulating Dimensions

37.5 (1.5)   40.5 (1.6)   26 (1.0)   12 (0.5)

18.5 (0.7)

32 (1.3)

18.5 (0.7)

2X M32x1.5 - 6H   3X M16x1.5 - 6H
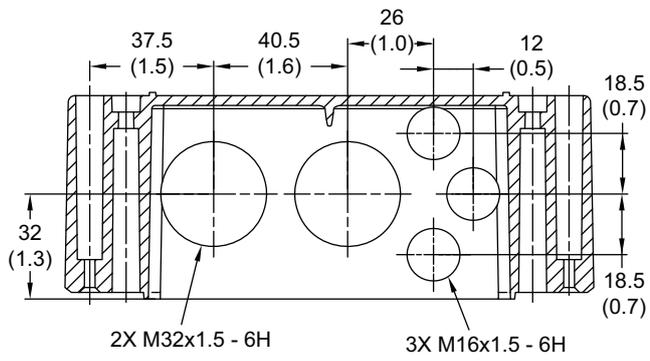
Section A-A
View shown with door removed

160 (6.3)

80 (3.2)

240 (9.4)

A   A
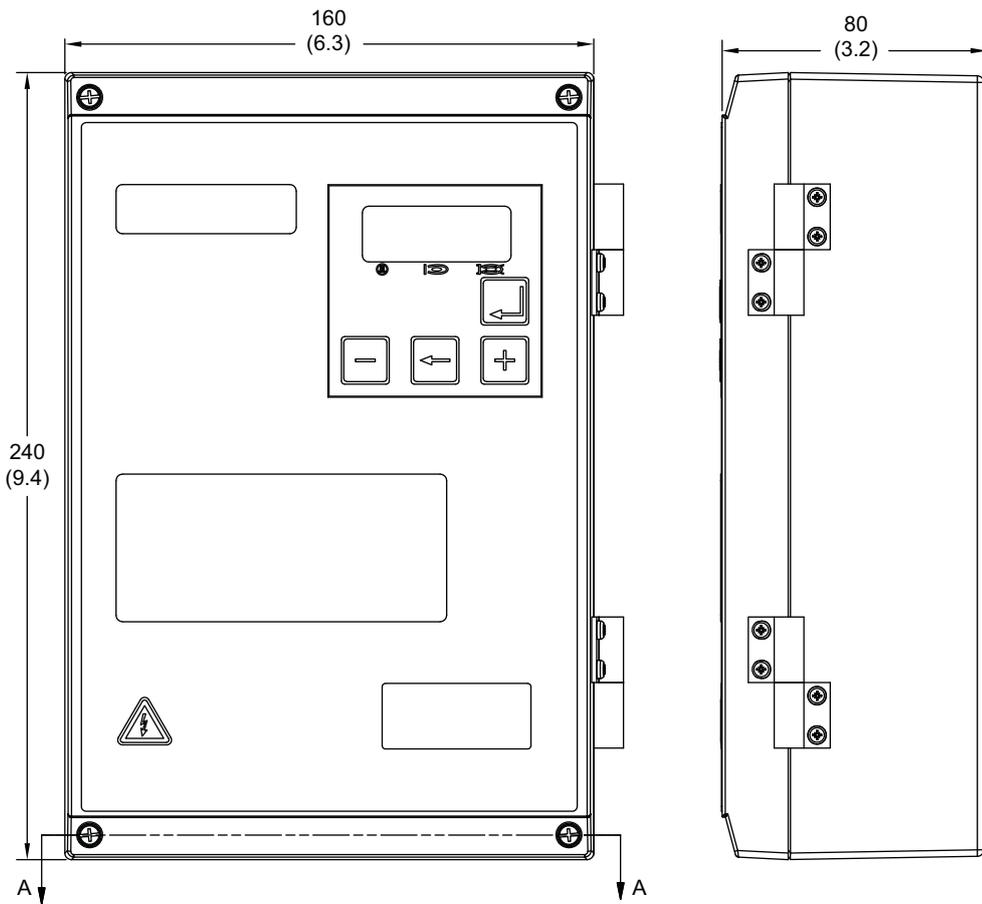
Figure 2.4

Safety Warnings

Important notices for safe operation of the flame safeguard will be found in this section. To avoid personal injury, damage to property or the facility, the following warnings must be observed. Read this entire manual before attempting to start the system. If any part of the information in this manual is not understood, contact Eclipse before continuing

Danger

• The Flame Safeguard is a safety device. Do not open, interfere with or modify the unit.

Caution

• Use of this product in the European community shall only be deployed in a manner that meets the applicable EC directives and laws.

Warning

• All activities (mounting, installation, and service) must be performed by qualified staff.

• Protect against electrical shock before making any wiring changes in the connection area by turning off the main power supply. Ensure that the power cannot be inadvertently switched on again and that it is indeed off.

• Each time work is carried out such as mounting, installation, or service, check that wiring and parameterization is correct and perform safety checks.

• If the housing or area near the operating panel is damaged, the unit must be immediately put out of operation or there may be a risk of electrical shock.

• Do not use any tools or pointed objects when pressing the buttons on the display. If the film on the operating panel is damaged, there is a risk of electrical shock.

• Fall or shock can adversely affect the safety functions. Such burner controls must not be put into operation, even if they do not appear to be damaged.

• If applicable, the dataline for the VisionBox PC interface must be connected or disconnected only when the main supply voltage is off to guard against electrical shock in case of an internal fault.

• Power must be cycled on the unit to register a switch position change. Do NOT remove or insert unit while power is applied!

Capabilities

Adjustment, maintenance and troubleshooting of the mechanical parts of this system should be done by qualified personnel with good mechanical aptitude and experience with combustion equipment.

Operator Training

The best safety precaution is an alert and competent operator. Thoroughly instruct operators so they demonstrate an understanding of the equipment and its operation.

Replacement Parts

Order replacement parts from Eclipse only.

Disposal

The unit contains electrical and electronic components and must not be disposed of together with domestic waste. Local and currently valid legislation must be observed

WARNING: Keep units straight when pulling apart. If bent, the circuit board may become damaged. Do not touch the circuit board. Oils from your fingers may prevent electrical conductivity.
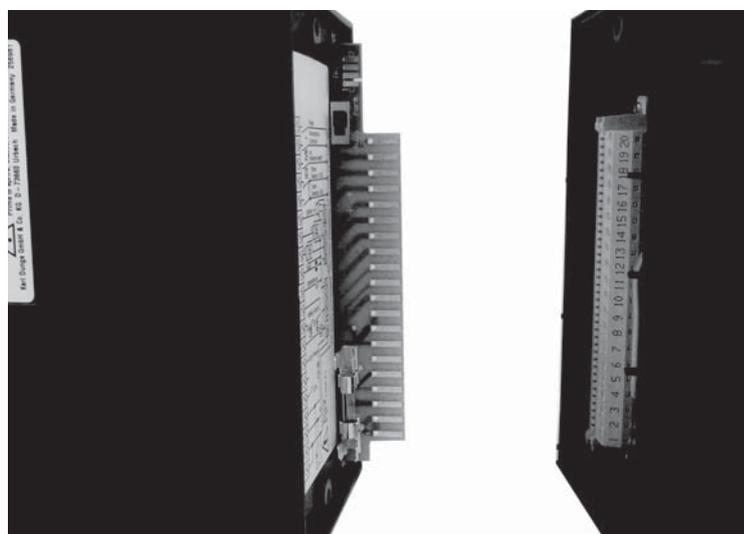
Figure 3.1

Types 1 and 2 Purge / No Purge Installation Options

Mounting

- Base surface mounting: use two M4 or #8 screws. Thickness through the base is 9 mm (0.34 inches).
- DIN rail mounting (locking the base into place on a standard 35mm DIN rail). See page 26 for details.

NOTE: When knocking out base holes for use with the conduit adapter, be sure to use every other hole.

38.5 (1.5)

100 (3.9)

Base Surface Mounting

Figure 3.2

DIN rail mounting

N   PE   ⏚
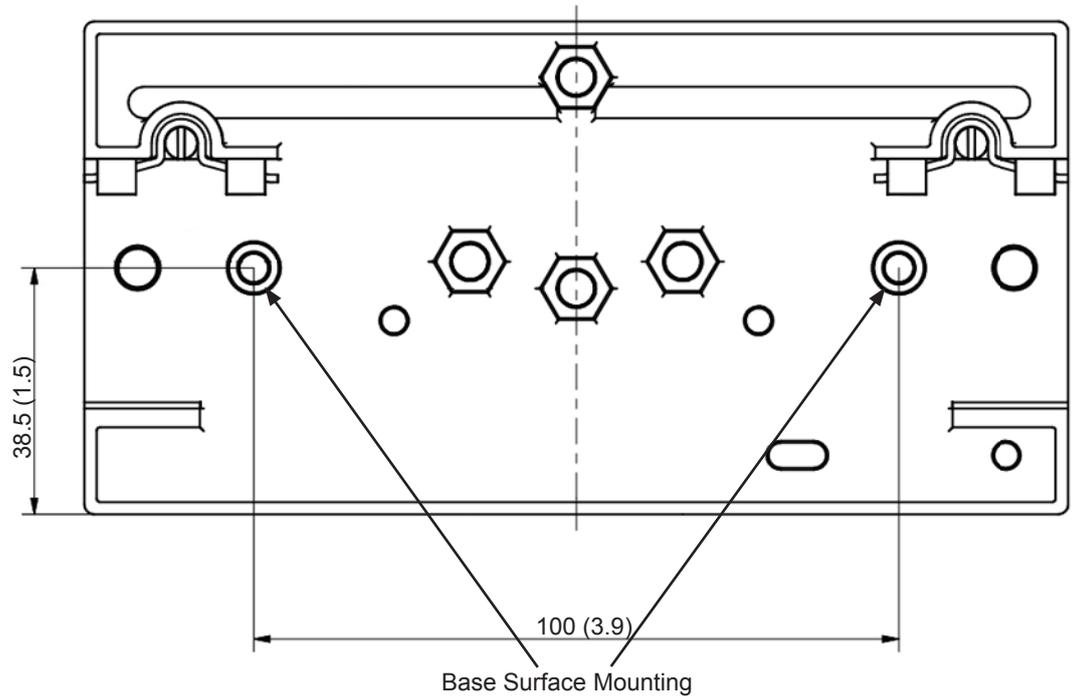
Figure 3.3

Type 2 Modulating Installation Options

Mounting
- Base surface mounting: use two M4 or #8 screws. Thickness through the base is 9 mm (0.34 inches).
NOTE: When knocking out base holes for use with the conduit adapter, be sure to use every other hole.
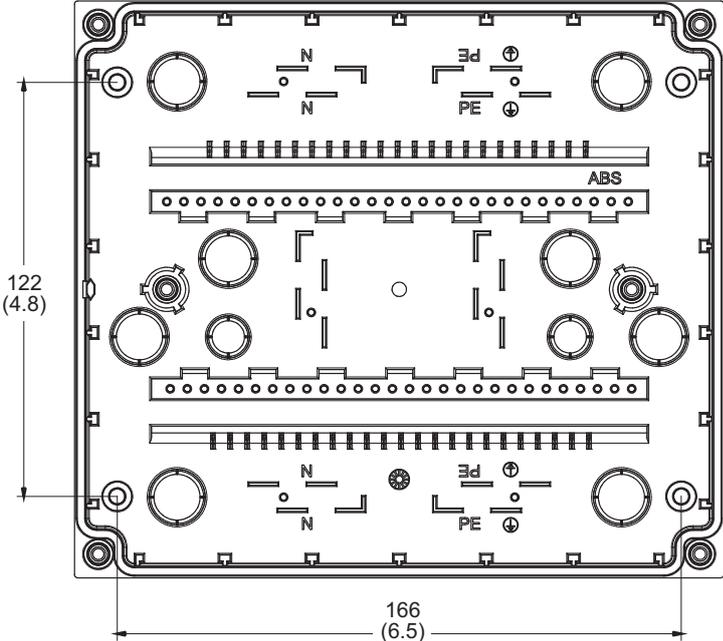
Figure 3.4

Wiring Accessories for Field Mounting

These accessories apply to all Purge / No Purge models and the Type 2 Modulating model if the T600 is not mounted in an enclosure.

Part Number	Description
101011915	Brass M16 - 1.5 x 1/2" NPT conduit adapter fitting
101011907	Sealing washer for use with 101011915
101011906	M16 - 1.5 Lock nut for use with 101011915

Lock Nut

Sealing Washer

Conduit Adapter Fitting
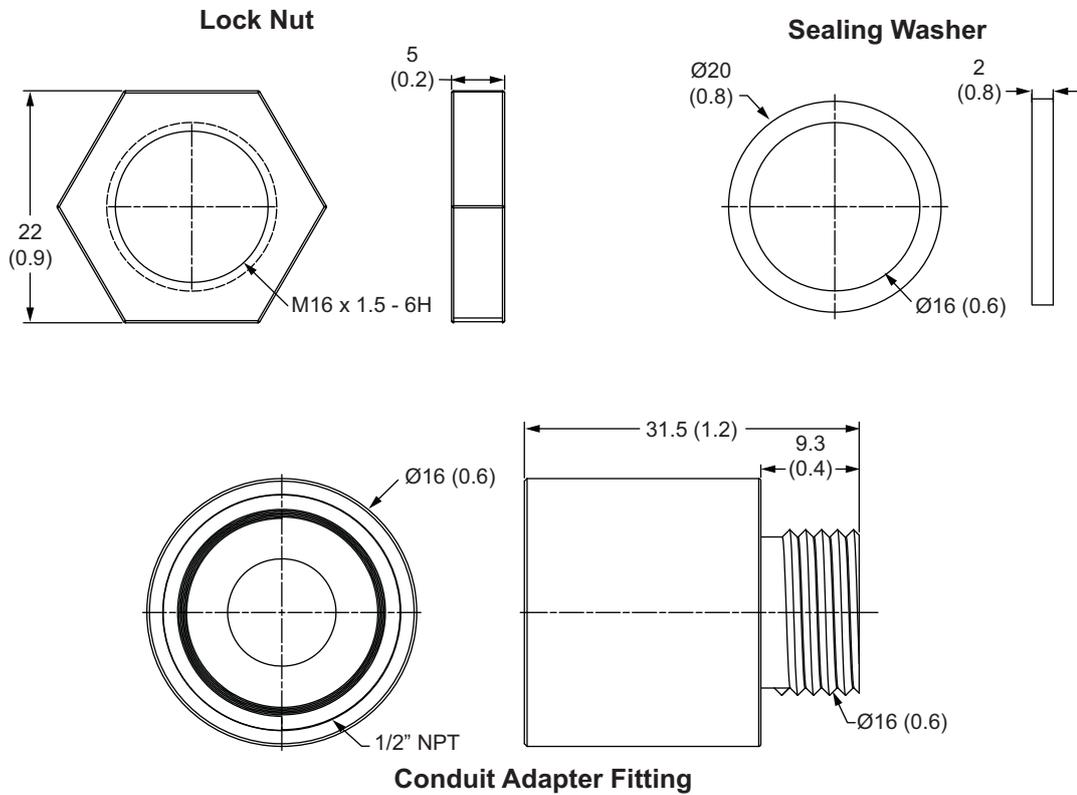
Types 1 and 2 Purge / No Purge Installation on DIN Rail

2. Push the base downward to compress the springs.

1. Guide the DIN rail upper lip into the mounting tabs containing the compression springs.

3. While compressing the springs, rotate the controller base to allow full engagement of the locking tabs.
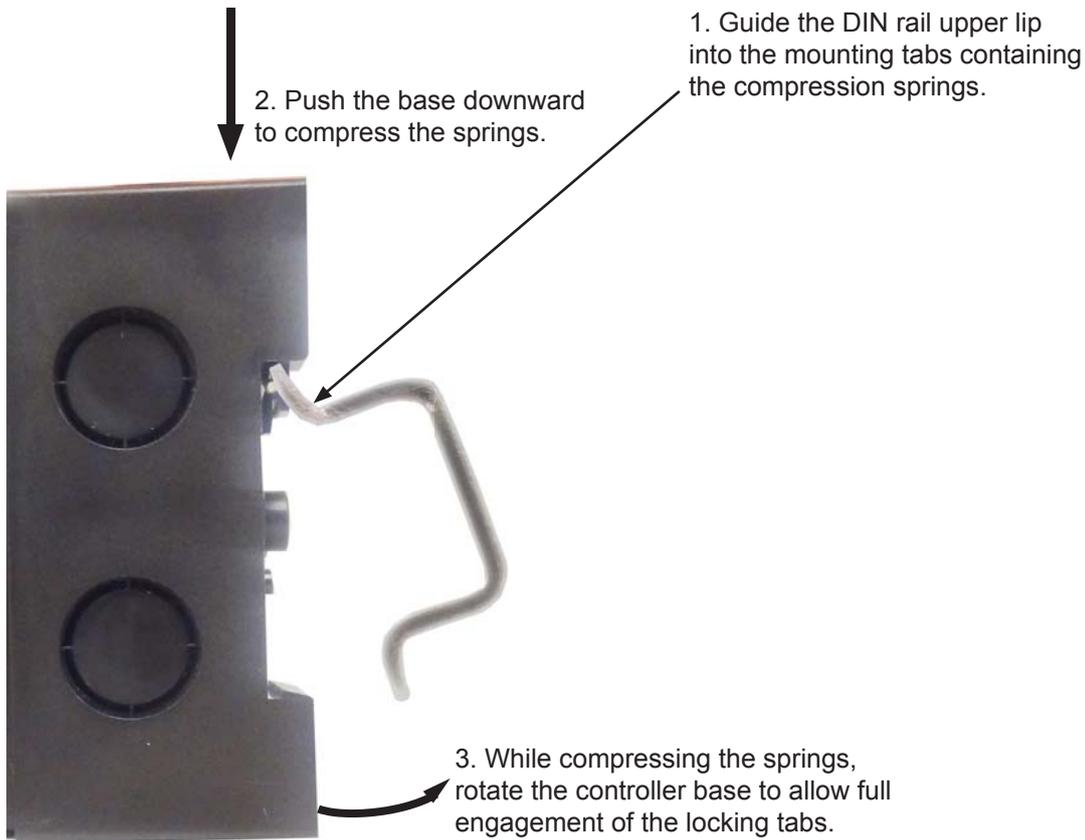
Figure 3.5

Removal from DIN rail

1. Push the base downward to compress the springs.

2. While compressing the springs, rotate the controller base away from the DIN rail to disengage the locking tabs.

3. When clear off the bottom rail, lift.
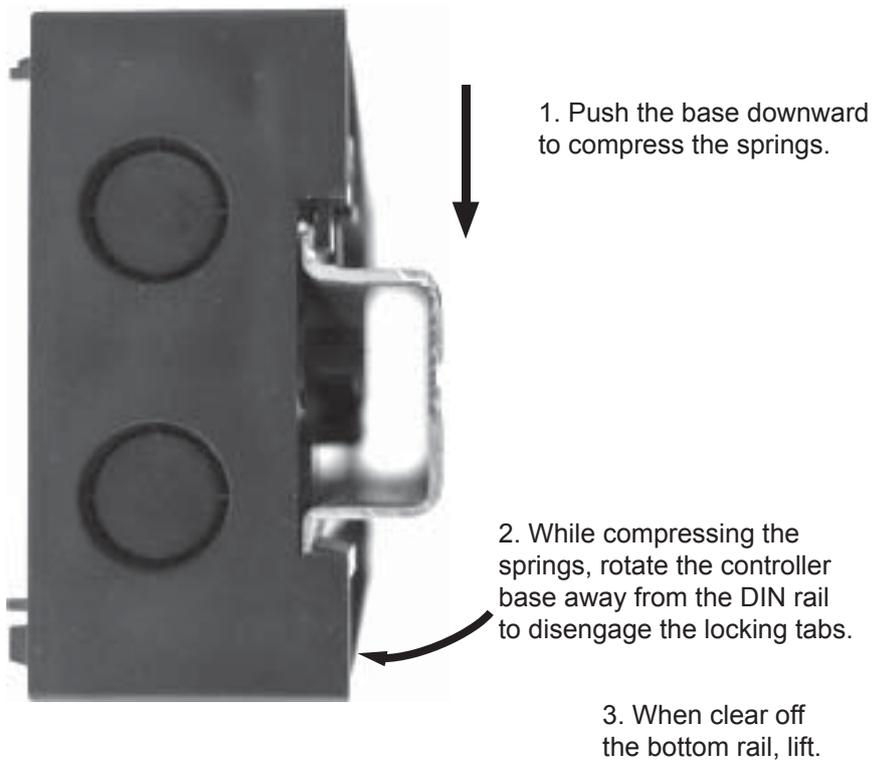
Figure 3.6

Type 3 Installation Options

- Direct screw mounting connection of the housing on the installation surface using M4 or #8 screws; thickness through the base is 12 mm (0.5 inches)
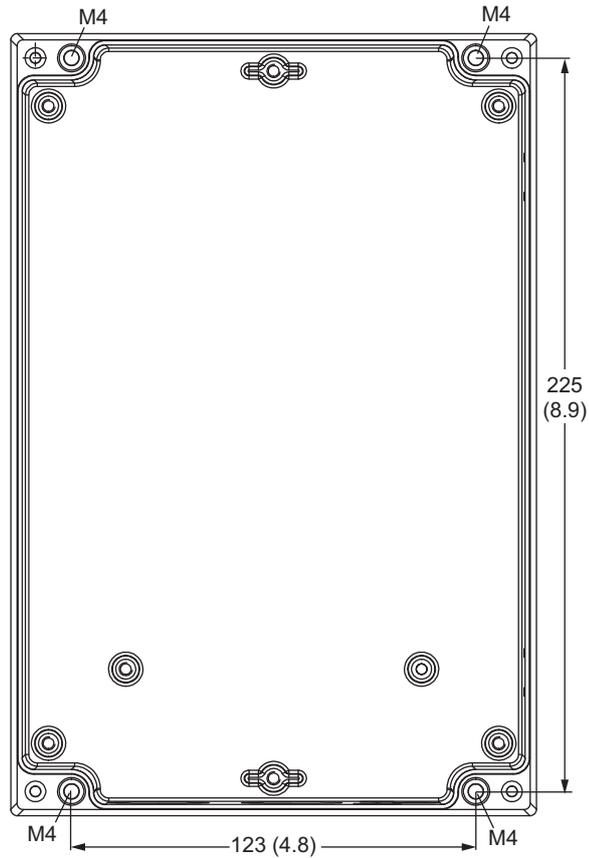
Figure 3.7

Wiring Terminal Description and Parameter Index

Terminal	Description	Modulating	Associated Parameter
1	Main control power is connected to Terminal 1. This terminal should be powered at all times during burner sequencing.		
2	Terminal 2 must be jumpered to Terminal 1 at all times. Terminal 2 is not used for any other purpose. The factory installed jumper between Terminal 1 and Terminal 2 must not be removed for any purpose.		
3	The neutral side of the power supply is connected to Terminal 3.		
4	Terminal 4 must be grounded to the Earth Ground bar G for single igniter / flame rod (unirod) operation. When individual / separate igniter and flame rod are used the connection between Terminal 4 and Earth Ground bar G may need to be disconnected.		
5	Terminal 5 is used for connecting a flame rod or a flame detector that provides a rectification ionization type output.		P33, P36
6	Not used		
7	Terminal 7 provides a 230 VAC / 10 mA power supply for use with the T600 UV Scanner flame detectors. **This power supply is always 230 VAC even with the 115 VAC T600 version!** It can supply two UV detectors (UV 41HE and UV 42) or one flame detector (FLW 41I).		
8	Terminal 8 is relay contact output for operating the fan either directly or through a motor starter depending on the power requirements of the fan.		
9	This terminal is the output (supply voltage) to the safety switches. All safety limits should be wired in series between Terminal 9 and Terminal 10. Safety limits may include but are not limited to the low gas pressure switch, high gas pressure switch, and high temperature limit.		P12, P15, P20
10	This terminal is the input (signal voltage) from the safety switches. All safety limits should be wired in series between Terminal 9 and Terminal 10. Safety limits may include but are not limited to the low gas pressure switch, high gas pressure switch, and high temperature limit.		P12, P15, P20
11	Voltage output for burner operation. Timing is parameter selectable.		P19
12	Voltage output for alarm.		
13	Valve 1 represents the first valve(s) to energize in the ignition sequence of a burner system. This output is used to energize the pilot valves during the pilot trial for ignition sequence. For direct spark / intermittent pilot ignition burners, this output energizes the main valves.		P31, P38
14	Valve 2 represents the second valve(s) to be energized during the burner ignition sequence. In piloted burners, this contact would be used to energize the main gas valves during the main flame trial for ignition period.		P38
15	Terminal 15 provides the power for the ignition transformer during the ignition sequence. See Datasheet 841 at www.eclipsenet.com/products/ignition_transformers for more information.		P31
16	Terminal 16 provides for the use of a second "relay output type" flame sensor device with a normally open contact that closes when a flame is present.		P18, P33, P36
17	Terminal 17 provides for the use of a second "relay output type" flame sensor device with a normally closed contact that opens when a flame is present. Alternatively, Terminal 17 can be used for a POVC input when POVC switch(s) are used on the safety shutoff valves.		P18, P22, P33, P36
18	Terminal 18 is for the combustion air switch input.		P16
19	Burner startup is initiated when power is applied to this terminal. Removal of power results in a normal shutdown.		P52
20	This input allows for reset of the control from a remote location.		
21	Terminal 21 is the common for Relay 1, Relay 2 and Relay 3.	●	P249

Terminal	Description	Modulating	Associated Parameter
22	Terminal 22 is the analog switching on/off high fire relay (Relay 3).	●	P249
23	Terminal 23 is the analog switching on/off low fire relay (Relay 2).	●	P249
24	Terminal 24 is the analog switching on/off automatic relay (Relay1).	●	P249
25	Not used		
26	Terminal 26 must be connected to the neutral side of the power supply if terminals 27 - 30 are used.	●	P249
27	Terminal 27 is the low fire feedback switching input.	●	P249
28	Terminal 28 is the high fire feedback switching input.	●	P249
29	Terminal 29 is the heat/power decrease switching input.	●	P249
30	Terminal 30 is the heat/power increase switching input.	●	P249
31	Not used		
32	Terminal 32 is the ground (signal -) for terminals 33 and 34 if the unit is configured for analog output control (PWM, 0-10 V, 4-20 mA).	●	P240 - P249
33	Terminal 33 is the analog output (signal +) if the unit is configured for analog output control.	●	P240 - P249
34	Terminal 34 is the VCC out (10.5-24 VDC) if the unit is configured for PWM/4-20 mA analog output control and 10 V out if the unit is configured for 0-10 V analog output control.	●	P240 - P249
35	Not used		
36	Terminal 36 is the ground (shutter -) for terminals 37 - 40.		P21
37	Terminal 37 is the VCC (5 V) bus termination if utilizing the integrated Profibus or Modbus communications.		P11
38	Terminal 38 is the data line plus (B conductor) if utilizing the integrated Profibus or Modbus communications.		P11
39	Terminal 39 is the data line minus (A conductor) if utilizing the integrated Profibus or Modbus communications.		P11
40	Terminal 40 is the shutter +.		P21

Purge / No Purge Wiring Examples

Typical NFPA86 Wiring

Incoming single phase voltage

115 VAC 50/60 Hz or 230 VAC 50/60 Hz
(Model Dependent)

Internally fused (6.3A slow or 10A fast)

Note: Power must be applied to terminal 1 at all times during burner sequencing

Terminal	
1	
2	
3	Attach neutral at bar in mounting base
4	Attach ground at bar in mounting base
5	Flame sensor 1 (Ionization)
7	UV 41HE, UV 42, FLW 41I power supply*
8	Fan (M)
9	Safety chain
10	Interlocks — HTL — LGP — HGP
11	Burner On
12	Burner Alarm
13	V1 - Pilot Valve
14	V2 - Main Valve
15	Ignition
16	Flame sensor 2 (relay type)
17	Proof of Valve Closure
18	Air Flow Switch
19	Stop/Start
20	Reset

*Terminal 7's output is always 230 VAC

Typical EN746-2 Wiring

Incoming single phase voltage
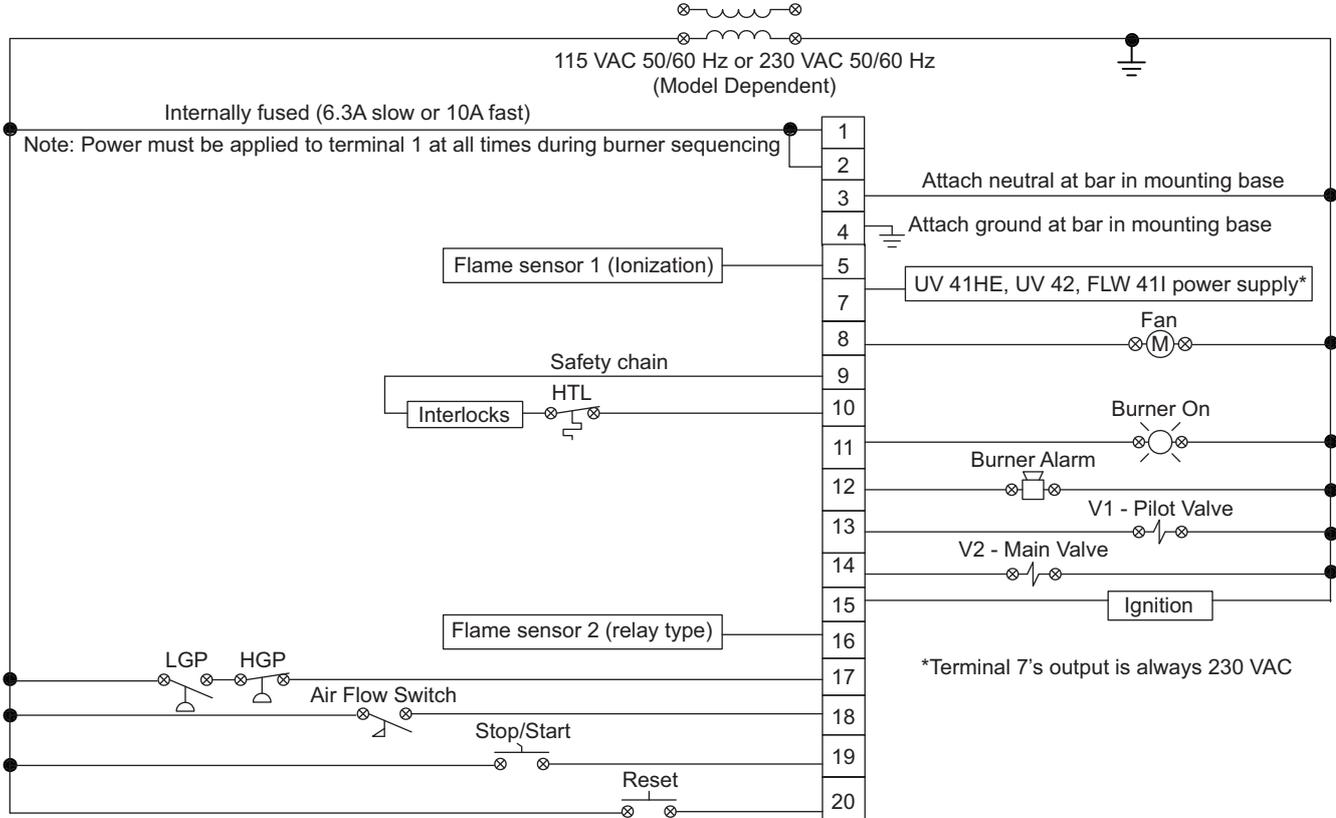
115 VAC 50/60 Hz or 230 VAC 50/60 Hz
(Model Dependent)

Internally fused (6.3A slow or 10A fast)

Note: Power must be applied to terminal 1 at all times during burner sequencing

Terminal	
1	
2	
3	Attach neutral at bar in mounting base
4	Attach ground at bar in mounting base
5	Flame sensor 1 (Ionization)
7	UV 41HE, UV 42, FLW 41I power supply*
8	Fan (M)
9	Safety chain
10	Interlocks — HTL
11	Burner On
12	Burner Alarm
13	V1 - Pilot Valve
14	V2 - Main Valve
15	Ignition
16	Flame sensor 2 (relay type)
17	LGP — HGP
18	Air Flow Switch
19	Stop/Start
20	Reset

*Terminal 7's output is always 230 VAC

Wiring Safety

- Risk of fatal electric shocks! You must interrupt the power supply before removing the hood.
- After having removed the hood, you might get in contact with the electrical connections in the terminal socket.
- Do not remove the jumper between terminals 1 and 2, which was mounted in the factory. It is required for the intended use of the automatic gas burner control system.

Modulating Wiring Examples

Incoming single phase voltage

115 VAC 50/60 Hz or 230 VAC 50/60 Hz
(Model Dependent)

Internally fused (6.3A slow or 10A fast)

Note: Power must be applied to terminal 1
at all times during burner sequencing

Terminal	
1	
2	
3	Attach neutral at bar in mounting base
4	Attach ground at bar in mounting base
5	Flame sensor 1 (Ionization)
7	UV 41HE, UV 42, FLW 41I power supply*
8	Fan
9	
10	Safety chain — Interlocks HTL LGP HGP
11	Burner On
12	Burner Alarm
13	V1 - Pilot Valve
14	V2 - Main Valve
15	Ignition
16	Flame sensor 2 (relay type)
17	Proof of Valve Closure
18	Air Flow Switch
19	Stop/Start
20	Reset

*Terminal 7's output is always 230 VAC

Actuator

Temperature Controller

4-20 mA or 0-10 VDC

Shielded Cable

Sensor — T/C Input

Terminal	
21	
22	HF — Control Terminals
23	LF
24	-
26	
27	LF — Position Feedback
28	HF
29	
30	
32	
33	
34	
36	
37	
38	
39	
40	

Wiring Safety

- Risk of fatal electric shocks! You must interrupt the power supply before removing the hood.
- After having removed the hood, you might get in contact with the electrical connections in the terminal socket.
- Do not remove the jumper between terminals 1 and 2, which was mounted in the factory. It is required for the intended use of the automatic gas burner control system.

Incoming single phase voltage

115 VAC 50/60 Hz or 230 VAC 50/60 Hz
(Model Dependent)

Internally fused (6.3A slow or 10A fast)

Note: Power must be applied to terminal 1
at all times during burner sequencing

Attach neutral at bar in mounting base

Attach ground at bar in mounting base

Flame sensor 1 (Ionization)

UV 41HE, UV 42, FLW 41I power supply*

Fan

Safety chain

Interlocks   HTL   LGP   HGP

Burner On

Burner Alarm

V1 - Pilot Valve

V2 - Main Valve

Ignition

Flame sensor 2 (relay type)

Proof of Valve Closure

*Terminal 7's output is always 230 VAC

Air Flow Switch

Stop/Start

Reset

Actuator

L1   N

Temperature
Controller

L1   N

Alarm
Contacts   NO
C
NO

Sensor

Sensor   T/C Input

-
+
4-20 mA
or
0-10 VDC

1
2
3
4
5
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
26
27
28
29
30
32
33
34
36
37
38
39
40

Wiring Safety

- Risk of fatal electric shocks! You must interrupt the power supply before removing the hood.
- After having removed the hood, you might get in contact with the electrical connections in the terminal socket.
- Do not remove the jumper between terminals 1 and 2, which was mounted in the factory. It is required for the intended use of the automatic gas burner control system.

Flame Sensor and Ignition Wiring Examples

Single-Electrode Operation Ionization

Flame Safeguard Connection

15: Ignition

3: N

4: PE

5: ION*

7: Power Sensor Power

16: Flame Sensor 2 NO
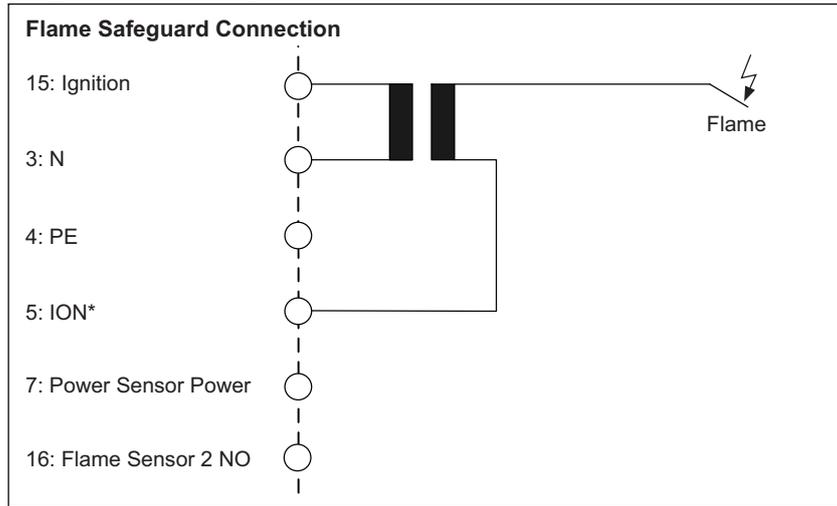
Flame

*Use proper ignition transformer when using single-electrode ionization.

Figure 3.8

Two-Electrode Operation Ionization

Flame Safeguard Connection

15: Ignition

3: N

4: PE

5: ION

7: Power Sensor Power

16: Flame Sensor 2 NO
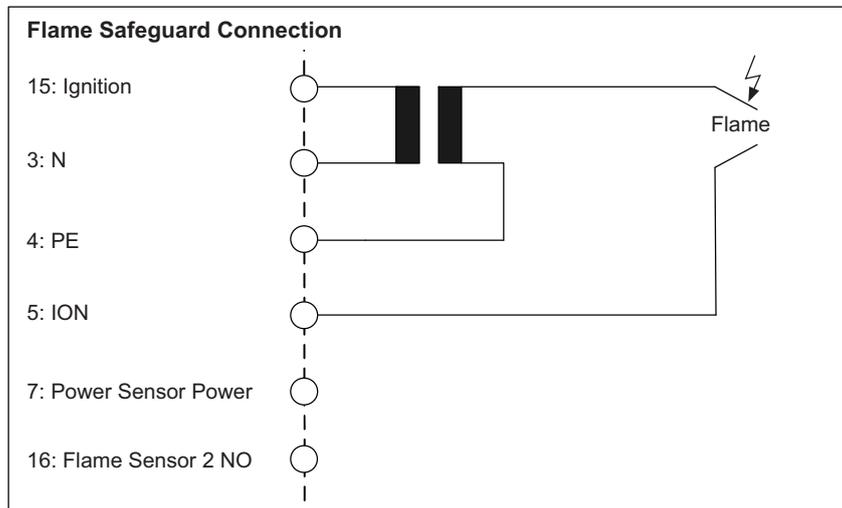
Flame

Figure 3.9

Flame Detector UV 41HE

Flame Safeguard Connection

15: Ignition

3: N

4: PE

5: ION

7: Power Sensor Power

16: Flame Sensor 2 NO

Flame

UV 41HE

GND*

N*

Out*

L*
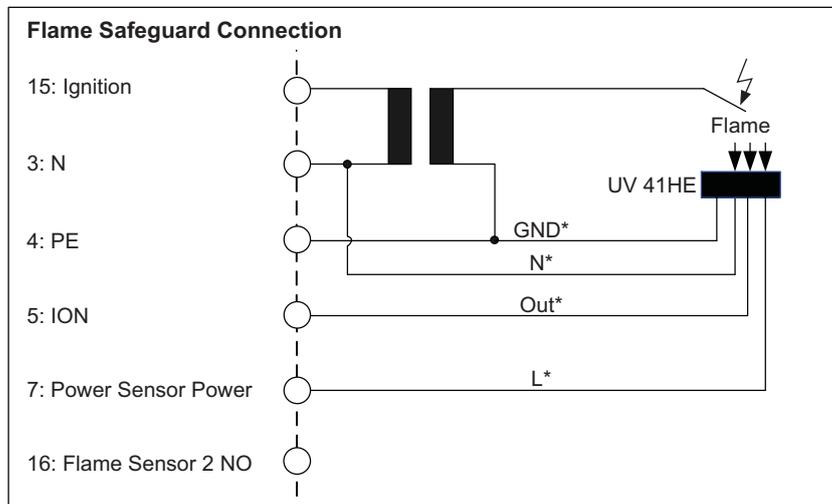
*UV 41 HE PIN terminals

Figure 3.10

FLW 41I Operation

Flame Safeguard Connection   *FLW 41I PIN terminals

15: Ignition

3: N

4: PE

FLW 41I

5: ION

3 2 1

Terminal 3*

7: Power Sensor Power   Terminal 2*

16: Flame Sensor 2 NO   Terminal 1*
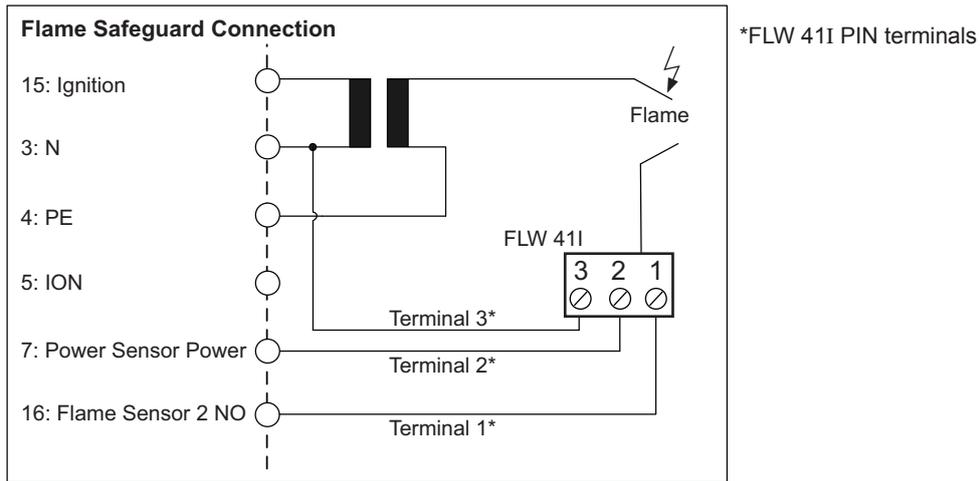
NOTE: See Figure 9h-4 (page 110) for complete wiring of FLW 41I

Figure 3.11

Flame Detector UV 42

Flame Safeguard Connection   *UV 42 PIN terminals

15: Ignition

Flame

3: N

4: PE   GND*

N*

5: ION

7: Power Sensor Power   Out*

16: Flame Sensor 2 NO   L*
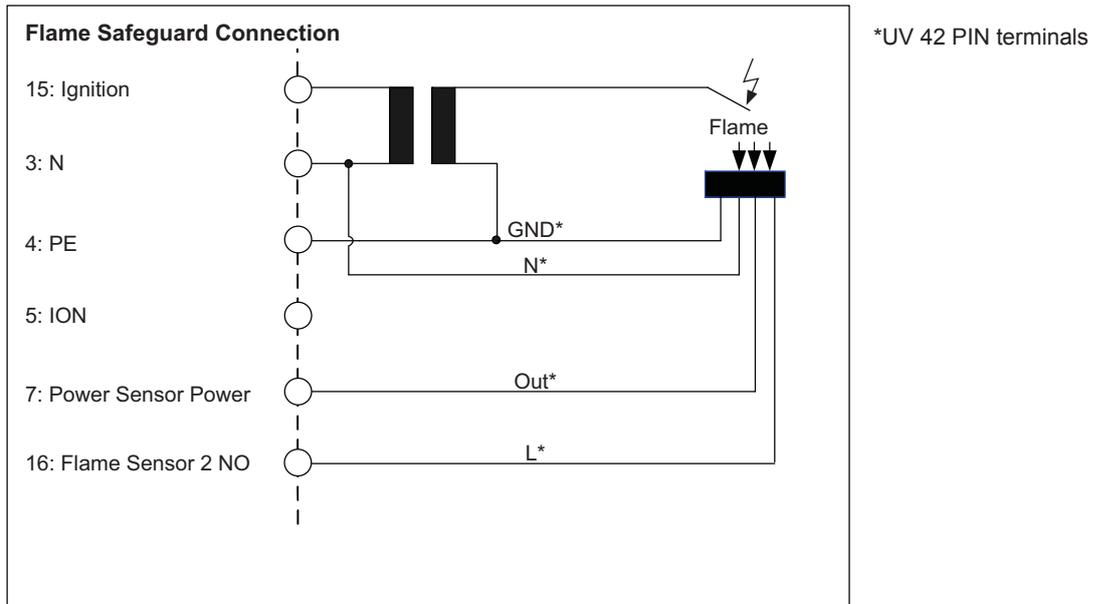
Figure 3.12

Combustion Air Switch Input Wiring Examples
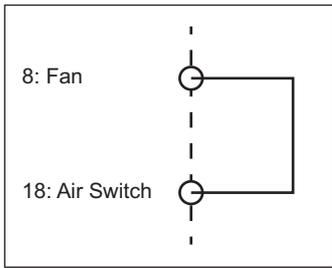
Figure 3.13

If the system does not require an air switch input, parameter P16 can be set to 0.1 or terminals 8 and 18 can be wired together as shown in Figure 3.13.
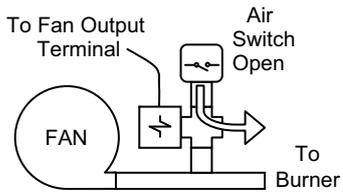
3-Way Solenoid Valve De-energized
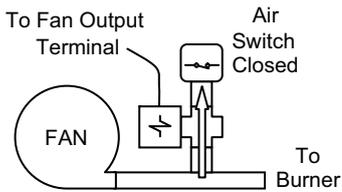
3-Way Solenoid Valve Energized

Figure 3.14

If the combustion air blower is not controlled by Terminal 8, a three-way solenoid valve must be installed between the air switch port and the blower pressure sensing port. The valve de-energized state shall vent the air switch port to ambient pressure. The valve energized state shall connect the air switch port to the blower pressure sensing port. The valve shall be powered by Terminal 8.

Reset function

If the flame safeguard is locked (state 0, error), unlock it by pressing the reset button, the hard-wired reset input, or via the fieldbus (Profibus, Modbus, etc.). The reset must last a minimum of 0.5s (maximum 5s).

The number of resets is limited to 5 in 15 minutes. Reset will be allowed only after waiting 15 minutes while the flame safeguard is powered.

The waiting time is 3 minutes for each reset or 15 minutes.

Extended reset

The described limitation of 5 reset operations in 15 minutes can be cleared by means of "Extended Reset". To do this, the reset key must be pressed for at least 5s (maximum 10s); after 5s the display begins to flash.

The "Extended Reset" is active in all operational states of the flame safeguard, which means an operating burner will be shut down and restarted with an extended reset.

Extended reset is not possible via the hard-wired reset input or via fieldbus modules.

Parameter Mode - Manual and Automatic Operation

A switch on the bottom of the flame safeguard is used for switching between parameter and automatic mode (see Figures 4.1 and 4.2).

WARNING: Power must be cycled on the unit to register a switch position change. Do NOT remove or insert unit while power is applied!

Types 2 and 3
After connecting the main supply in Parameter mode, a message is prompted on the display requesting you to enter the password. Enter the password for service or OEM level.

After having changed the access level, the selected parameters are activated one after the other.

See section 6, "Parameter Overview" for parameters and sequence.

The parameter values may be modified by pressing the + and - keys. The enter key is used for saving the displayed value. Press the back key (←) to return to the previous position or parameter.

As the display uses only two digits, values greater than 99 will show "- -" and must be shown in subsequent stages (see page 61 for an example).

Manual Operation
After parameters are set, there is an automatic start for checking the parameter values. The program stops in pause states; press a key to proceed (Hx is displayed).

The set parameter values will be applied or released when the H5 state is reached.

If you do not press any key for 30 minutes in parameter mode, the program tries a restart.

"Auto" Operation

With the switch in the "Auto" position, the flame safeguard is working in normal operation. If a monitored parameter was changed and not properly released, the flame safeguard indicates an error by showing "F 60" on the display and "0x60" in the VisionBox.
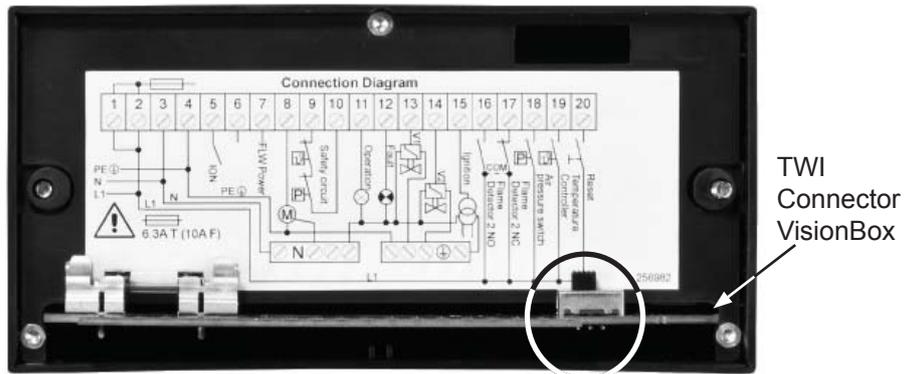
Figure 4.1 Purge / No Purge Types 1 and 2

TWI Connector VisionBox

Parameter switch
Left: "Auto" or "Run" position
Right: "Para" or "Program" position
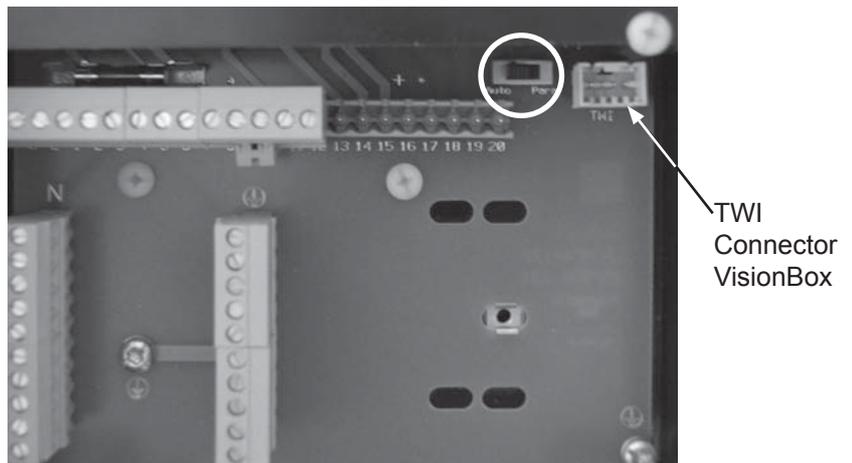
Figure 4.2 Type 3 Parameter Switch Location

TWI Connector VisionBox

Sequence chart

The program sequence should be customized by parameter configuration at Eclipse, Inc when ordering a T600. Additional modifications to the parameter settings may be conducted in the field by authorized Eclipse service personnel only.

ATTENTION
All modifications must comply with the requirements of the valid standard and application.

Eclipse shall not assume any liability for material or personal damage caused by unauthorized or improper use of the flame safeguard.

NOTES (see flow charts on the following pages)**:**

*1 Monitoring of the air pressure switch depends on the operating mode set in P16.

*2 V1 can be deactivated via P38 after the second safety time (= interrupted start gas)

*3 The two inputs Flame 1 and Flame 2 can be activated or deactivated independently of one another per parameters P18, P33, P36 for phase 1 and phase 2.

*4 Both flame inputs must be off!

*5 With "Follow-up", it will run 15 minutes of follow-up after a regular switch-off. After 24 hours OFF, the signal will be activated for 1 minute to prevent blocking a circulation pump in a heated liquid application.

*6 The input "Flame 2 NC" can also be configured as gas pressure switch. The gas pressure switch tolerates faulty signals of up to 1s.

*7 The follow-up time starts during the "Post-purge" state. If the post-purge is greater than / equal to the follow-up time, the "Follow-up time" state will be skipped.

*8 The flame safeguard can also run in High-Low operation (P38=2). The selection of High-Low will be made via the fieldbus. V1 is always open (= Low Fire). V2 will open after a fieldbus setpoint input (= High Fire). In the operating modes "interrupted start gas" (P38=0) and "permanent start gas" (P38=1), V2 is always ON.

*9 The input "Flame 2 NC" can also be configured as Proof of Valve Closure (POVC) as a function of output V1 or V2. The POVC tolerates faulty signals of up to 1s.

*10 In the operating mode P38 = 2 (High-Low operation), the second safety time is skipped, and the flame safeguard goes from "Pause 3" directly to the "Operation" state!

*11 The after-burning time starts already in the "Post-Purge" state. When the post-purge becomes larger or equal to the after-burning time, the "After-Burning Time" will be skipped.

*12 Monitoring of the "High Fire" input will not be started until the time defined in P248 has expired.

*13 The ignition speed is already set before the end of the pre-purge time, this time being defined in P248. Starting from this moment, the "High Fire" input will no longer be monitored.

*14 Monitoring of the "High Fire" and "Low Fire" inputs can be activated or deactivated via parameter P249.

*15 P249, bits 2+3 can be used to define whether the speed is "Off" or whether the fan is working in cooling mode.

*16 The start value of the speed, following a software restart, is established via P244 if the cooling mode is active.

*17 P249 is used to establish whether the "Purge" position is activated also during post-purge.

*18 P249 is used to establish whether the "Switch Modulation" is Open or connected to the "Other" input.

Purge / No Purge Flow Chart
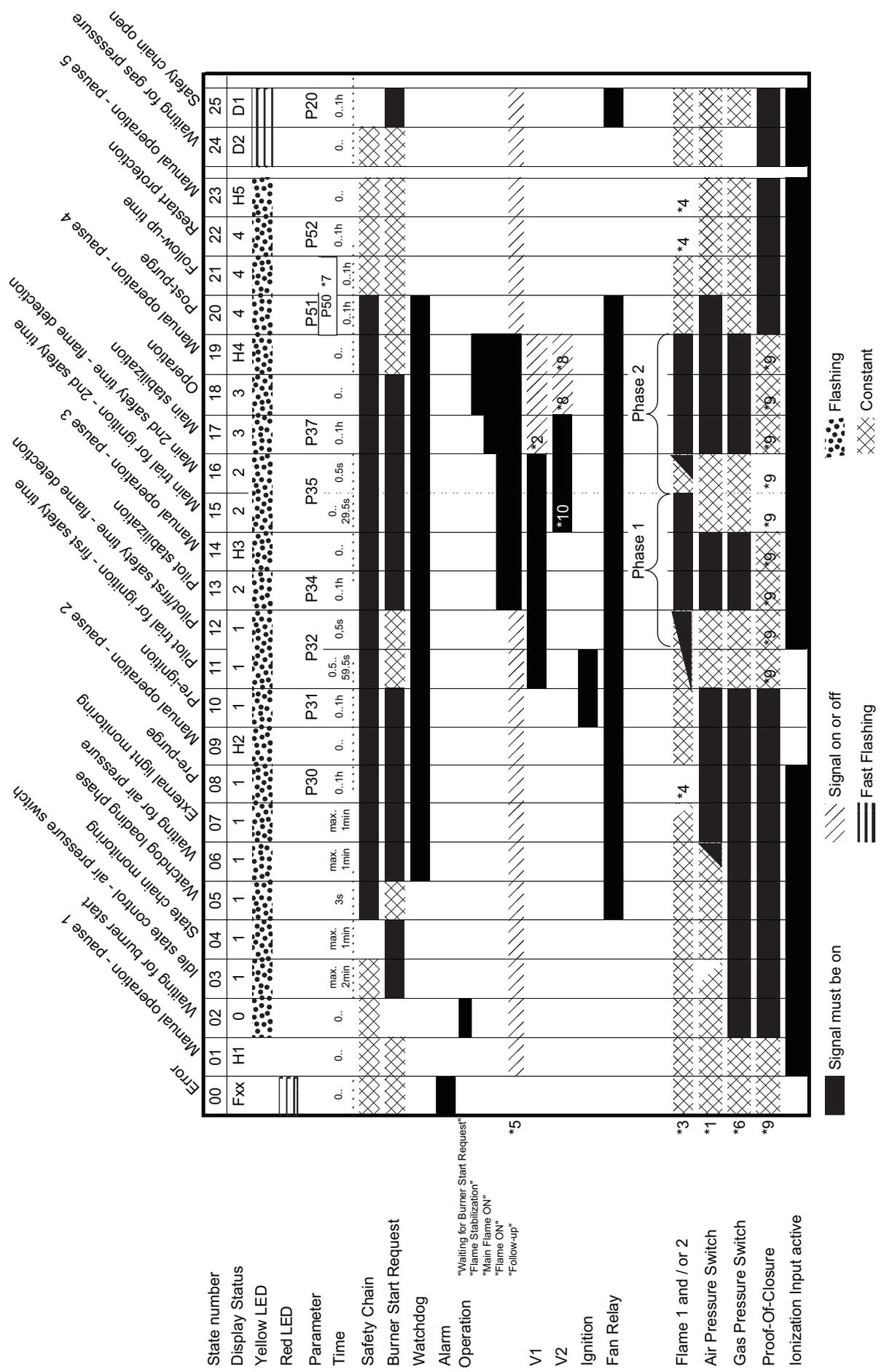
Figure 5.1

See notes, page 38

Modulating Flow Chart

Figure 5.2

See notes, page 38

Row	Values (by state number)
State number	00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
Display Status	Fxx, H1, 0, 1, 1, 1, 1, 1, 1, H2, 1, 1, 1, 2, H3, 2, 2, 3, 3, H4, 4, 4, 4, H5, D2, D1

Phase descriptions (by state):
- 00 — Error
- 01 — Manual operation - pause 1 / Waiting for burner start
- 02 — Idle state control - air pressure switch
- 03 — State chain control - air pressure
- 04 — Watchdog loading phase
- 05 — External light monitoring
- 06 — Waiting for air pressure
- 07 — Waiting for air pressure
- 08 — Pre-purge
- 09 — Manual operation - pause 2
- 10 — Pre-ignition
- 11 — Pilot trial for ignition - first safety time
- 12 — Pilot/first safety time - flame detection
- 13 — Pilot stabilization
- 14 — Manual operation - pause 3
- 15 — Main trial for ignition - 2nd safety time
- 16 — Main 2nd safety time - flame detection
- 17 — Main stabilization
- 18 — Operation
- 19 — Manual operation - pause 4
- 20 — Post-purge
- 21 — Follow-up time
- 22 — Restart protection time
- 23 — Manual operation
- 24 — Waiting operation - pause 5 / Safety chain open
- 25 — Waiting for gas pressure

Time
- State 08: P30; p248 *12; p248 *13; 0..1h
- State 20–21: P51; P50 *11; p248 *12; 0..1h

Speed (PWM)
- States 01–04: "Off" or "Cooling Mode" *15 *16
- States 05–08: "Pre-Purge Speed"
- States 09–14: "Ignition Position Speed" P241
- States 15–17: "Stabilization Speed" P242
- States 18–19: Control Mode
- States 20–21: "Post-Purge Speed" P243
- States 22–25: "Off" or "Cooling Mode" *15

"Switch Modulation" output
- States 01–04: Open or "Other" position *18
- States 05–08: "Purge" position
- States 09–17: "Ignition" position
- States 18–19: "Other" position
- States 20–21: "Purge" or "Other" position *17
- States 22–25: Open or "Other" position *18

"High Fire" input *14 — signal states per diagram

"Low Fire" input *14 — signal states per diagram

Legend:
- Input
- Signal must be on (black)
- Signal off (light gray)
- Signal on or off (hatched)

State Descriptions

State xx	Designation	Description
00	Error	If the flame safeguard is in this state, there is an error. The display automatically shows an error message and indicates the current error (e.g. "F 11") instead of the state number.
01	Manual Operation - Pause 1	If the switch is on "Para" for the parameter mode, the flame safeguard stops in this state. Press the next key (reset button) to continue with the next state. If you do not press any key during 30 minutes, the flame safeguard restarts or indicates an error. The manual mode may only be cancelled after it is run completely through all states and after the parameter switch is reset to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the flame safeguard indicates an error.
02	Waiting for Burner Start	The automatic control system is ready for operation, but there is not any burner start request on terminal 19.
03	Idle State Control - Air Pressure Switch	Depending on the air pressure switch operating mode (P16), check whether air pressure switch reports "no air pressure". Max. waiting time 2 min. → Restart.
04	Safety Chain Monitoring	In this state, check whether the safety chain is voltage-free (dry-contact) . The fan relay is still open, and the watchdog relay has not yet picked up. If the safety chain is not voltage-free (dry-contact), the system waits a maximum of one minute before trying to restart.
05	Watchdog Loading Phase	The safety-related watchdog -circuit is activated. If the safety chain is interrupted → State 25.
06	Waiting for Air Pressure	The air pressure must be applied within a maximum state time of 1 min., otherwise, the system tries to restart.
07	External Light Monitoring	The flame may not be detected within the maximum state time of 1 min., otherwise, the system tries to restart.
08	Pre-Purge	This state provides sufficient pre-purge. Both flame inputs must be switched off for the duration defined in P30 (pre-purge).
09	Manual Operation - Pause 2	If the switch is on "Para" for the parameter mode, the flame safeguard stops in this state. Press the next key (enter key) to continue with the next state. If you do not press any key during 30 minutes, the flame safeguard restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the flame safeguard indicates an error.
10	Pre-Ignition	The ignition is activated for the duration specified in P31 without opening valve V1.
11	Pilot (V1) Trial for Ignition - First Safety Time	The gas valve V1 is opened in this state. The duration of this state is P32 - 0.5 s.
12	Pilot / First Safety Time - Flame Detection	After deactivating the ignition, the process for flame detection is started. If an ionization current flows or the contact input is switched on - depending on the configuration - the flame safeguard reports a flame. The duration of this state is 0.5 s.

State xx	Designation	Description
13	Pilot Stabilization	The flame can stabilize in this state. The duration of the pilot stabilization phase (P34) can be configured.
14	Manual Operation - Pause 3	If the switch is on "Para" for the parameter mode, the flame safeguard stops in this state. Press the next key (reset button) to continue with the next state. If you do not press any key during 30 minutes, the flame safeguard restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5, and you have modified parameters, they are not yet applied, and the flame safeguard indicates an error.
15	Main Trial for Ignition - Second Safety Time	The gas valve V2 is opened in this state. The duration of this state is P35 - 0.5 s.
16	Main Second Safety Time - Flame Detection	The process for detecting the second flame is started. If an ionization current flows or the contact input is switched on - depending on the configuration - the flame safeguard reports flame 2. The duration of this state is 0.5 s.
17	Main Stabilization	The flame can stabilize in this state. The duration of the main stabilization phase (P37) can be configured.
18	Operation	The flame safeguard is now operating. a voluntary switch-off after a defined time can be activated (P40). If this time is set to a maximum of 23 hours and 59 minutes, the flame safeguard is in intermittent mode.
19	Manual Mode - Pause 4	If the switch is on "Para" for the parameter mode, the flame safeguard stops in this state. Press the next key (reset key) to continue with the next state. If you do not press any key for 30 minutes, the flame safeguard restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the flame safeguard indicates an error.
20	Post-Purge	In this state, the post-purge of the combustion chamber is carried out (P51). The gas valves remain closed from this state on. The fan continues running in this state; it is switched off in the next state.
Note regarding States 20, 21 and 22	**Post-Purge (P51) may be interrupted by a repeated burner start if the restart protection (P52) has been set to 0 and the follow-up time (P50) has already lapsed.**	
21	Follow-Up Time	During this time (P50-P51 > 0), a flame signal may be present from the previous mode caused by e.g. existing residual gas in the combustion chamber. The extraneous flame signal monitoring is only started in the following state. The follow-up time starts in the post-purge state if the post-purge is equal to or greater than the follow-up time; then the follow-up time state is skipped.

State xx	Designation	Description
22	Restart Protection	In this state, the system waits until P52 is finished; this prevents an immediate restart of the flame safeguard if a burner start is active. The flame may no longer be detected in this state; otherwise, the flame safeguard reports an external light error.
23	Manual Mode - Pause 5	If the switch is on "Para" for the parameter mode, all parameters are set, and the system has run through the entire process, the flame safeguard stops in this state. The set parameter values are now applied automatically. You may reset the parameter switch to the "Auto" mode. Alternatively, you may press the next key (enter key) to restart parameter setting from the beginning. If you do not press any key for 30 minutes, the flame safeguard restarts or indicates an error.
24	Waiting for Gas Pressure	If the flame safeguard is configured for use of a Gas pressure switch, it changes to state 24 when detecting missing gas in states 1 to 10. It leaves it in state 1 after sufficient gas pressure has been built up. The flame safeguard runs through the post-purge, follow-up time and restart protection states before changing to state 24.
25	Safety Chain Open	The flame safeguard remains in this state during the time set in P20 if the system does not detect a closed safety chain. After the time has lapsed, it decides based on P15 whether it locks immediately or tries to restart. In this state, the fan relay is active; the fan is running. If the safety chain is closed before the time of P20 has lapsed, the flame safeguard restarts to check state 1 to check the safety chain again.

Access Level

Write access to the flame safeguard is defined on different access levels. Each parameter is assigned to a certain access level. In order to modify a parameter, the flame safeguard must be in either the assigned level or a higher level.

If the access level is not sufficient for modifying a parameter, VisionBox reports it, or a message is prompted on the flame safeguard display requesting the valid password. In higher access levels, the users must press a key to confirm they are on site. The display will flash for 30 s. In this time a key must be pressed, otherwise, the flame safeguard remains in the previous level.

In order to change the access level, enter the correct password either on the display (Types 2 and 3) or in VisionBox → flame safeguard settings → Access level.

The access level is automatically reset after 5 hours or after power failure. Exception: If the flame safeguard makes a restart during these 5 hours, due to an error for example, these 5 hours for the current access level are counted again from the beginning.

NOTE: Eclipse recommends resetting the access level after having configured the flame safeguard.

In order to change a parameter, you need to have access to the level assigned to the parameter. Only qualified personnel have permissions to access levels 4 and above.

Level	Designation	Key Confirmation Required
1	Manufacturer	yes
2	OEM Expert	yes
3	OEM	yes
4	Service	yes
5	Operator	no

Parameter Change

Parameter types:
1-bit parameter (U1) - setting 0 and 1 (displayed as ON / OFF), no limits
8-bit parameter (U8) - value setting within variable limits
16-bit parameter (U16) - value setting within variable limits.

A parameter may be modified on the display of Types 2 and 3 or via Vision-Box software on a PC.

The value must be within the variable limits; a value outside these limits is not possible.

Any parameter changes must be made in "para" mode. No parameter changes are allowed in "auto" mode.

Most of the parameters are monitored in automatic mode (switch the board to "Auto"). The flame safeguard detects changes of the values and immediately changes to lockout (error F 60 on the display or 0x60 in the VisionBox). Any changes must be released in parameter mode, which includes a manual program run (see parameter table on the following page).

Purge / No Purge Parameter Descriptions

Parameter	Designation	Description	Setting / Examples
P11	**Fieldbus Address (Address Field Bus)**	Setting the bus slave address of the flame safeguard. If an invalid address for the connected bus module is set and the flame safeguard is in automatic mode, it shuts off (error 0x18). If an invalid value for the connected bus module is set and the flame safeguard is in parameter mode, an error message is generated, and the address is set to "of". During operation and error messages, the current bus address may be seen by pressing the back key (←).	Value range: • OFF (no Fieldbus) (VisionBox 255) • 0 to 254 Modbus • 1 to 126 Profibus NOTE: A modified value for this parameter is not applied before a restart or extended reset.
P12	**Restart Attempts, All (Recycle Count)**	Number of restart attempts of the flame safeguard. After a failed last start, the flame safeguard goes to lockout, state 0 (error). This anti-cycle counter is reset when returning to operating state or when resetting the flame safeguard.	Value range: • 0-5 attempts NOTE: Set to 0 for NFPA86 applications.
P13	**Restart Attempts, Pilot TFI (Recycle Count after Flame Failure During Safety Time)**	The number of restart attempts (P12) after creating a flame can be further limited. P13 sets the number of restart attempts allowed when the flame is not established in the pilot TFI / first safety time. This restart counter and the anti-cycle counter are reset when changing to the operating state or after resetting.	Value range: • 0-5 attempts Example: P12 = 5, P13 = 1 During the first start phase, no flame is generated → 1. Restart attempt → Error idle state control air pressure switch → 2. Restart attempt → Error idle state control air pressure switch 3. Restart attempt. After the third restart attempt, air pressure switch OK, still no flame. Flame safeguard is locked, although the number of restart attempts (P12) was only three, but the number of restart attempts after missing flame (P13) has exceeded one.
P14	**Restart Attempts - Main TFI (Recycle Count after Flame Failure)**	The number of restart attempts (P12, P13) can be further limited by this counter (P14) when there is a flame failure during Main TFI / second safety time and operation. The restart counter and the anti-cycle counter are reset when changing to the operating state or after resetting.	Value range: • 0-5 attempts Example: P12 = 5, P13 = 2, P14 = 1 Flame lift-off during operation → 1. Restart attempt → Error Idle state control air pressure switch → 2. Restart attempt → Error Idle state control air pressure switch → 3. Restart attempt → Air pressure switch OK, the flame is lost during Main TFI, the T600 is locked. (P12 = 3, P13 = 0, P14 > 1)

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

Parameter	Designation	Description	Setting / Examples
P15	Safety Chain Lockout (Lockout after Opening Safety Chain)	If the safety chain is not closed, the flame safeguard waits in state 25 (safety chain open). When P15 is 0 and if the adjustable time (P20) has lapsed and the safety chain is still open, the T600 goes to lockout or restarts (depending on the anti-cycle counter).	This setting is also valid if the safety chain is opened after state 4. Setting: • 0: Restart attempt depending on 12 (anti-cycle counter) • 1: Immediate lockout
P16	Air Pressure Switch Operating Mode (Air Pressure Switch Mode)	Monitoring of the air pressure may be activated for startup (states 6 to 10) and / or operation (states 13, 14 and 17 to 20) and / or during post-purge (state 20) and / or idle (state 3).	

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

Air pressure switch operating mode				
Setting	Air Pressure Monitoring During Post-Purge	Air Pressure Monitoring During Startup	Air Pressure Monitoring During Operation	Idle State Control
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

Parameter	Designation	Description	Setting / Examples
P17	Burner Start Request	A burner start (terminal 19) from the temperature controller can be operated in the following operating modes:	**Setting 0:** The burner start is always switched OFF, independently of the hardware input **Setting 1:** The burner start is always switched ON, independently of the hardware input **Setting 2:** The burner start is OFF, however, this operating mode must be defined again within one minute. Otherwise the flame safeguard switches to setting 3. This can happen, for example, if the fieldbus communication is interrupted. **Setting 3:** The burner start is determined by hardware input "temperature controller". **Setting 4:** The burner start is ON, however, this operating mode must be defined again within one minute. Otherwise the automatic gas burner control system switches to setting 3. This can happen, for example, if the fieldbus communication is interrupted.
P18	Flame Detector 2 Input Selection (Configuration Flame Detector 2-NC, Gas Pressure Switch or POC)	This parameter defines whether a second flame detector, a gas pressure switch or a limit switch for valve monitoring is connected. NOTE: Also see P33 and P36 for setting the detection sequence.	**Setting 0:** The inputs NO and NC are monitored for the flame signal. The signals must be inverse. **Setting 1:** Only input NO is monitored for the flame signal. **Setting 2:** Only input NO is monitored for the flame signal. In addition, the gas pressure switch signal is read on input NC. **Setting 3:** Only input NO is monitored for the flame signal. In addition, the limit switch signal (POVC) for valve 1 is read on input NC. **Setting 4:** Only input NO is monitored for the flame signal. In addition, the limit switch signal (POVC) for valve 2 is read on input NC.

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

Parameter	Designation	Description	Setting / Examples
P19	**Operation Output Selection (Configuration Output Operation)**	The output may be switched to different states by means of the following parameter settings. ON means 115 VAC or 230 VAC, for all others, OFF, i.e. 0V. NOTE: Setting 4 is typically used for a circulation pump in heated liquid applications	**Setting 0:** "Wait": Output is ON in state 2 (waiting for burner start). **Setting 1:** "Stable": Output is ON in states 18 (operation) and 19 (pause 4). **Setting 2:** "Main flame ON" output is ON in states 17 (flame B Stabilization) to 19 (pause 4). **Setting 3:** "Flame ON" Output is ON from states 13 (flame A Stabilization) to 19 (pause 4). **Setting 4:** "Follow-up": Output is ON from state 13 (flame A Stabilization) until 15 minutes after state 19 (pause 4). In "Follow-up", the output remains activated beyond a restart attempt, but not if the main supply is switched off and on again. In addition, to prevent blocking the pump, the output is switched on for one minute after 24 hours have passed. NOTE: After a restart, the pump blocking protection cycle starts new within 24 hours.
P20	**Safety Chain Open Delay (Duration Safety Chain Open)**	This parameter defines the duration of state 25 (safety chain open), which is the time until the system restarts or changes to lockout, depending on the anti-cycle counter and P15 (restart attempts safety chain).	Value range: • 0 to 65535 (resolution in 1/16 s).

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

Parameter	Designation	Description	Setting / Examples
P21	**UV Self Check Mode (Shutter Test)**	The shutter test of the flame detector is activated by means of this parameter. NOTE: Make sure to observe the settings for P33 (flame sensing input active for pilot) and P36 (flame sensing input active for main).	Example: If P33=1 and P36=1, there is no shutter flame test for flame detector 2. The test is only active in states with "flame ON" (states 12-19). **Setting 0:** Shutter flame test is inactive. **Setting 1:** Shutter flame test for flame detector 1. **Setting 2:** Shutter flame test for flame detector 2. **Setting 3:** Shutter flame test for flame detectors 1 and 2 (expert setting). With this setting, the test starts only if both flame signals report ON; it ends with success if both flame signals report OFF
P22	**NC Input Lockout (FM Mode Active)**	This parameter defines whether the unit goes to lockout if the NC input (P18) is set for gas pressure or valve switch (POVC).	**Setting 0:** not active **Setting 1:** Lockout with missing gas and fault of limit switch for main gas.
P30	**Pre-Purge (Duration Pre-Purge**	This parameter defines the duration of state 8 (pre-purge).	Value range: • 0 to 65534 (resolution in 1/16s).
P31	**Igniter Heat-up Time (Pre-Ignition Time)**	This parameter defines the duration of state 10 (pre-ignition). During this time, the igniter is on, the gas valve is closed.	Value range: • 2 to 65534 (resolution in 1/16s). Example: Used for hot surface igniters to allow time to reach suitable ignition temperature.
P32	**Pilot TFI (First Safety Time)**	Defines the duration of the start-gas flame proving period. Maximum time from opening the gas valves to detecting a flame. NOTE: This duration is divided into states 11 and 12. State 12 is always 0.5 seconds.	Value range: • 16 to 960 (resolution in 1/16s). ATTENTION: For FM applications the following values should not be exceeded. Burner with pilot flame: 10 s Burner with direct spark / intermittent pilot ignition: < 2,500,000 Btu/h (732 kW) ≤ 15s > 2,500,000 Btu/h (732 kW) ≤ 10s*
P33	**Flame Sensing Input Active for Pilot (Active Flame Input Phase 1)**	The parameter controls which flame detector(s) (states 11 to 16) is / are active for detecting a flame. NOTE: If flame signal 2 is used, make sure to observe the setting for P18 (flame detector 2 input selection).	Setting: 1: Only flame signal 1 relevant 2: Only flame signal 2 relevant 3: Flame 1 AND flame 2 4: Flame 1 OR flame 2

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

*Other standards may allow more or less safety time. See other safety requirements such as NFPA 86, EN746-2, etc. for more information.

Parameter	Designation	Description	Setting / Examples
P34	**Pilot Flame Stabilization Time (Stabilization Time A)**	Duration of state 13 (pilot stabilization) NOTE: This is not FFRT	Value range: • 0 to 65534 (resolution in 1/16s).
P35	**Main TFI (Second Safety Time)**	Duration of the second safety time; maximum time from opening the V2 gas valves to detecting a flame.	NOTE: This duration is divided into states 15 and 16. State 16 is always 0.5 seconds. Value range: • 16 to 480 (resolution in 1/16s). ATTENTION: For FM applications, the following values should not be exceeded. Burner with pilot flame: 10s (Setting value max. 160) Burner with direct spark / intermittent pilot ignition: < 2,500,000 Btu/h (732 kW) ≤ 15s (Setting value max. 240) > 2,500,000 Btu/h (732 kW) ≤ 10s (Setting value max. 160)*
P36	**Flame Sensing Input Active for Main (Active Flame Input Phase 2)**	The parameter controls which flame detector(s) (states 17 "Flame B stabilization" to 19 "Pause 4") is / are active in phase 2 for detecting a flame. NOTE: If flame signal 2 is used, please make sure to observe the setting for P18 (flame detector 2 input selection).	Setting: 1: Only flame signal 1 relevant 2: Only flame signal 2 relevant 3: Flame 1 AND flame 2 4: Flame 1 OR flame 2
P37	**Main Flame Stabilization Time (Stabilization Time B)**	Duration of state 17 (main stabilization) NOTE: This is not FFRT	Value range: • 0 to 65534 (resolution in 1/16s).
P38	**Pilot Operation (Configuration V1 and V2)**	Defines the operating modes for gas valves V1 and V2 during operation. This parameter affects V1 in states 17 (main stabilization) to 19 (pause 4) and V2 in states 18 (operation) and 19 (pause 4).	0: Interrupted start gas. V1 OFF, V2 ON 1: Permanent start gas. V1 and V2 ON 2: Two-level operation. V1 ON, V2 ON / OFF during operation; determined by bus. V2 does not open during the second start-main flame proving period! NOTE: If you use setting 2, a bus connection is required. If it is missing, restart is tried because the bus connection is monitored in the operating states.

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

*Other standards may allow more or less safety time. See other safety requirements such as NFPA 86, EN746-2, etc. for more information.

Parameter	Designation	Description	Setting / Examples
P40	**Continuous / Intermittent Mode (Duration Standard Operation)**	Duration of state 18 (operation); if not set for continuous, the control restarts (state 2) after the set time has elapsed. Intermittent operation is normally set for a self-test during startup every 24 hours (1439 minutes). When using intermittent timing, the pilot (P34) and main (P37) stabilization times will be included in the operating time value that is compared to P40. If the total stabilization time is longer than the P40 setting, the unit will switch off immediately upon entering state 18 (operation).	Value range • 1 to 65534: Time until restart (resolution in minutes) • 65535: Continuous operation • 1439: Intermittent operation
P41	**Flame Detector 1 FFRT (Flame Failure Response Time Sensor 1)**	Defines the duration of the safety time (Flame Fail Response Time) for T600 during operation for flame 1. Time until gas valves close when there is not any flame.	Value range: • 12 to 48 (resolution in 1/16s). ATTENTION: The entire reaction time after there is not any flame during operation is a combination of P41 and possible reaction times of external flame detectors, see section 9d, "Flame Detector Options".*
P42	**Flame Detector 2 FFRT (Flame Failure Response Time Sensor 2)**	Defines the duration of the safety time (Flame Fail Response Time) during operation for flame 2. Maximum time until gas valves close when there is not any flame.	Value range: • 3 to 48 (resolution in 1/16s). ATTENTION: The entire reaction time after there is not any flame during operation is a combination of P42 and possible reaction times of external flame detectors, see section 9d, "Flame Detector Options".*
P50	**Follow-up Time (Extraneous Light)**	Defines the duration of the follow-up time (state 21). It is the delay after post-purge before allowing another start. The timing starts at post-purge (state 20). If the follow-up time is smaller than or equal to the post-purge time, the follow-up state is skipped.	Value range: • 9 to 65534 (resolution in 1/16s).
P51	**Post-Purge (Post-Purge Time)**	Defines the duration of the post-purge time (state 20).	Value range: • 0 to 65534 (resolution in 1/16s)
P52	**Restart Delay (Reraising Delay)**	Defines the duration of the restart protection (state 22). It is the delay before being able to restart the system via burner start	Value range: • 0 to 65534 (resolution in 1/16s).
Note regarding P50, P51 and P52	**Post-purge (P51) may be interrupted by a repeated burner start if the restart delay (P52) has been set to 0 and the follow-up time (P50) has already lapsed.**		

Designation titles in parentheses are the titles that are displayed in the VisionBox software.

Modulating Parameters

All "speed" values or the like refer to the PWM control signal and have no significance for the actual speed of the fan.

The values P240 - P244 can be changed after entry of a password, depending on the access level.

Reading access is possible for all parameters, independently of the access level.

Parameters P245 - P249 can be changed without a password.

Parameters can be changed via the VisionBox or the display of the flame safeguard.

Changed parameters are applied to the fan control after no more than 10s.

Modulating Parameter Descriptions

Parameter	Designation	Description	Setting / Examples
P240	Pre-Purge / Activation of the Extension Module	The parameter value is used for states 5 - 8 (start to pre-purge) of the flame safeguard, making it possible for state 8 (pre-purge) to be divided. See P248.	Setting from 0.01% to 100% *1 Resolution: 0.01%
P241	Ignition Position	The parameter value is used for states 8 - 14 (ignition to flame detection) of the flame safeguard, making it possible for state 8 (pre-purge) to be divided. See P248.	Adjustable from 0% to 100% *1 Resolution: 0.01%
P242	Stabilization	The parameter value is used for states 15 - 17 (second safety time, SZB, and stabilization B) of the flame safeguard.	Adjustable from 0% to 100% *1 Resolution: 0.01%
P243	Post-Purge	The parameter value is used for state 20 (post-purge) of the flame safeguard.	Adjustable from 0% to 100% *1 Resolution: 0.01%
P244	Start Value	If the flame safeguard is started by Mains On, this value will be used as the start value. If the flame safeguard changes to one of states 21 - 25 (after-burn time to safety chain open), and the current speed is 0, it is started again from the start value. If the flame safeguard changes to state 1 or 2 (e.g., due to cancelling the burner start request), and the current speed is 0, it is started again from the start value.	Adjustable from 0% to 100% *1 Resolution: 0.01%
P245	Minimum Speed	Control will not output a smaller value. All parameter values of the control must be above or at this limit. This parameter relates directly to the PWM control signal.	Adjustable from 0% to 100% *1 Resolution: 0.01%
P246	Maximum Speed	Control will not output a larger value. All parameter values of the control must be below or at this limit.	Adjustable from 0% to 100% *1 Resolution: 0.01%

Parameter	Designation	Description	Setting / Examples
P247	**Increment of Speed Change**	Indicates the value by which the desired speed of the fan is incremented or decremented. The calculation is carried out 16 times per second, i.e., the value of the parameter is added to or subtracted from the current value in the 1/16s cycle. The increment in the tables is used for certain positions of the inputs. See D+ and D-.	Adjustable from 0.01% to 100% Resolution: 0.01% Calculation of the time based on the increment. Time [in 1/16] = (Maximum [in %] - Minimum [in %]) / Increment [in %]. Calculation of the increment (contents P247). P247 [in 0.01%] = [(Maximum [in %] - Minimum [in %]) / (Time [in s] * 16)] * 100. Examples: Increment P247 = 40 (= 0.4% per 1/16s) requires 12.5s of the minimum speed = 20% to the maximum speed 100%. Longest time from 0% to 100% at increment P247 = 1 is 625s.
P248	**Actuator Stroke Time**	The parameter value is used for state 8 (pre-purge) of the flame safeguard. This parameter indicates at which time the fan is moved to the ignition position. The value corresponds to the time before the end of pre-purge (remaining pre-purge state time). NOTE: Must not be greater than the P30 pre-purge time, otherwise fault configuration with restart will be carried out. State 8 (pre-purge) is divided into 3 parts. P248 + x + P248 = P30 (x must be greater than 1 if monitoring is active). After the first High Fire time (P248), state 20 (post-purge) P248 + x = P51 (x must be greater than 1 if monitoring is active). The control of parameters P248, P30, and P50 takes place during the watchdog loading phase. During changes in operation (parameter not monitored), Low / High Fire monitoring can be disabled if P248 ≤ P50.	Adjustable from 0 to 1h Resolution: 1/16s
P249	**See next page for information regarding this parameter.**		
P260 and following	**Internal Parameters**	Do not change!	

P249 Bit Functions

The parameter includes the PWM/ analog switchover, the idle state control of both air pressure switches and a ramp function (desired value delay).

The output of the correct signal depends on the switch position, which must be identical to the setting of this parameter.

The parameter is divided into 16 bits:

Bit: 0
Setting 0: PWM output.
Set slide switch to PWM position.

Setting 1: Analog output.
Set slide switch to voltage or current position.
All parameter values (in %) are now converted to the output of the analog value.

Example:
A post-purge parameter of 6000 gives 6V at the analog output, etc.

Bit 1:
Setting 0:
Voltage output active 0..10V

Setting 1:
Current output active 4..20 mA

Bits 2 + 3:
Setting 0:
During standby and fault PWM = 0

Setting 1: During standby and fault PWM = power +/-

Setting 2: During standby and fault PWM = power +/-

Setting 3: Error configuration

Bit 4:
Setting 0: All relay outputs open

Setting 1: Relay 1 (automatic closed)

Bit 5:
Setting 1: High fire input control during pre-purge time

Bit 6:
Setting 1: Low fire input control during ignition and stabilization time

Bit 7:
High Fire input control during post-purge time

Bit 8:
Setting 1: High Fire relay 3 closed

Bit 9
Bit 10
Bit 11 ⎤ **5-bit value**
Bit 12
Bit 13 ⎦

The ramp (desired value delay) of the output signal is active during each change in speed. The More Heat / Less Heat inputs have priority if they are active.

Bit 14:
Not Used: Setting 0

Bit 15:
Not Used: Setting 0

Factory Settings

Display Number	Parameter	Designation	Factory Setting Display	Factory Setting Vision-Box	Access Level	Range Display	Range VisionBox
n[*1]	P11	Fieldbus address	OFF[*6]	255[*6]	Service	0...99	0...255
	P12	Restart attempts, all	N/A	0	OEM		0...5
A	P13	Restart attempts, Pilot TFI	0	0	OEM	0...5	0...5
9	P14	Restart attempts, Main TFI	0	0	OEM	0...5	0...5
b	P15	Safety chain lockout	1	1	OEM	0...1	0...1
C	P16	Air pressure switch operating mode	15	15	OEM	0...15	0...15
	P17	Temperature controller operating mode	N/A	3	Operator	0...4	0...255
E	P18	Flame detector 2 input selection[*3]	custom	custom	OEM	0...4	0...4
L	P19	Operation output selection	1	1	Service	0...4	0...255
	P20	Safety chain open delay	16	16	OEM		0...65535[*5]
h[*2]	P21	UV self check mode	0[*7]	0[*7]	OEM	0...3	0...3
	P22	NC input lockout (FM mode)	N/A	1	OEM		
0	P30	Pre-purge[*3]	custom	custom	OEM	0...99	0...65534[*5]
1	P31	Igniter heat-up time	0	0	OEM	0...99	0...65534[*5]
2	P32	Pilot TFI[*3]	custom	custom	OEM	0...60	16...960[*5]
3	P33	Flame sensing input active for pilot	1	1	OEM	1...4	1...4
	P34	Pilot flame stabilization time	N/A	16	OEM		0...65534[*5]
4	P35	Main TFI[*3]	custom	custom	OEM	1...30	16...480[*5]
5	P36	Flame sensing input active for main	custom	custom	OEM	1...4	1...4
	P37	Main flame stabilization time	N/A	16	OEM		0...65534[*5]
d	P38	Pilot operation[*3]	custom	custom	OEM	0...2	0...2
F	P40	Continuous / Intermittent mode	1	65535	OEM	0 or 1	0...65535
6	P41	Flame detector 1 FFRT[*3]	custom	custom	OEM	0.8...3[*4]	12...48[*5]
7	P42	Flame detector 2 FFRT[*3]	custom	custom	OEM	0.5...3[*4]	3...48[*5]
	P50	Follow-up time	N/A	80	OEM		16...65534[*5]
8	P51	Post-purge[*3]	custom	custom	OEM	0...99	0...65534[*5]
o	P52	Restart delay	0	0	Service	0...99	0...65534[*5]
Pr0	P240	Pre-Purge	10000	10000	OEM	0...99	0...65535
Pr1	P241	Ignition Position	0	0	OEM	0...99	0...65535
Pr2	P242	Stabilization	0	0	OEM	0...99	0...65535
Pr3	P243	Post-Purge	10000	10000	OEM	0...99	0...65535
Pr4	P244	Start Value	0	0	OEM	0...99	0...65535
Pr5	P245	Minimum Speed	0	0	Service	0...99	0...65535
Pr6	P246	Maximum Speed	10000	10000	Service	0...99	0...65535
Pr7	P247	Increment of Speed Change	custom	custom	Service	0...99	0...65535
Pr8	P248	Actuator Stroke Time	custom	custom	Service	0...99	0...65535
Pr9	P249	Bit Functions	custom	custom	Service	0...99	0...65535

[*1] Use the shortcut - and + pressed simultaneously to switch between OFF (display = oF) and the address. The setting "n" is only displayed if a bus module is connected. Addresses over 99 must be set by means of VisionBox.
[*2] The setting "h" is only displayed if continuous operation is active or has been activated in setting F.
[*3] Specify factory setting during configuration of your order.
[*4] Values are in units of 1 second except P41 and P42, which are in units of 0.1 second
[*5] VisionBox values are in 1/16 second resolution
[*6] If configured with extended capabilities and bus communications are utilized, default factory setting is 1.
[*7] If configured with extended capabilities and self check shutter function is utilized, default factory setting is 1.

Version without Display (Type 1)

The system status is indicated by means of two LEDs.

Red LED

Reset Button   Yellow LED
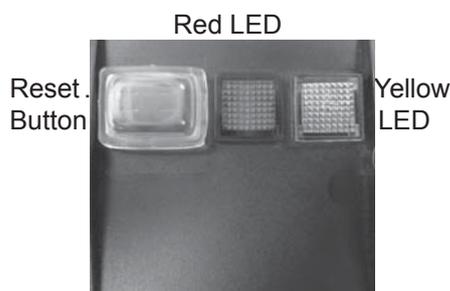
Yellow LED
- Operation

Yellow LED information

LED OFF:
State 0 (Error)

LED steadily or continuously ON:
State 2 (waiting for burner start) until state 16 (second safety time for flame detection) and from states 20 (post-purge) to 23 (pause 5).

Flashing LED (0.5 Hz):
States 18 and 19 (operation and pause 4).

Fast flashing LED (2 Hz):
State 24 (waiting for gas pressure) if gas is missing and state 25 (safety chain open).

Red LED
- Fault
- Flashing signal for error code
- Pause state during parameter setting

Red LED information

The different flashing frequencies indicate the most important error codes.

The remaining error codes are indicated by a steadily lit LED.

Both LED information

Both LEDs are lit twice to check their functionality when live voltage is applied.

LEDs flash alternately:
Control is expecting entry of a password

Both LEDs flash alternately if the system is started in parameter mode and the password for changing the parameters has not been entered yet (in VisionBox on PC). The RESET button and the manual mode are locked.

LEDs flash simultaneously:
Password has been accepted, parameter change is enabled.

Both LEDs flash (1 Hz) when you are requested to press a button to change a level or if the flame safeguard is ready for extended reset (pressing reset button for 5 to 10 s).

Multifunction key
- Reset
- Extended reset
- Confirmation of access level change

Error code - flashing frequency

The following error codes are indicated by the flashing red LED.
All other errors are indicated by a continuously lit red LED

Type 1 Error Flash Code	VisionBox Error Code	Error Designation Please section 8, "Error Messages" for more information about the individual errors.
1	0xA2	Error: Safety chain open
2	0x60	Error: Parameter change not released
3	0xA7	Error: No flame during trial for ignition (TFI) time
3	0xbC	Error: No flame during second safety time
3	0xA9	Error: Flame out during stabilization
4	0xA8	Error: Flame out during operation
5	0xAA	Error: Idle state control air pressure switch
5	0xAb	Error: No air pressure
6	0xA6	Error: External light
7	0x18	Error: External application
8	0x16	Error: TWI communication and low voltage

Example: Fault A8 is indicated by the red LED flashing off four times and then remaining steady for four seconds.
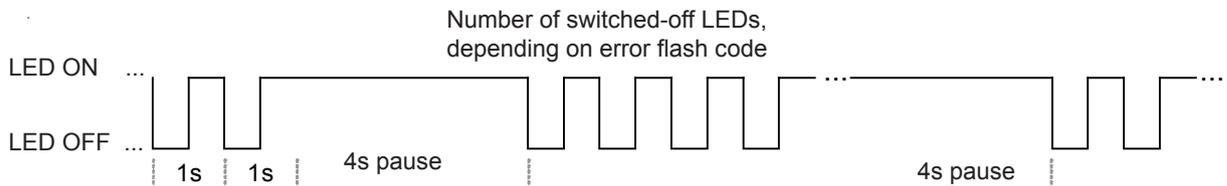
Figure 7.1

Parameter setting

To change parameters, set the switch on the bottom of the flame safeguard to "Para" and supply the system with power; both LEDs will flash alternately.

Enter the password from the Vision-Box and confirm it by pressing the RESET button. Both LEDs will flash simultaneously.

The parameters may now be changed.

ATTENTION: The changed parameters are applied or released after state 23 (pause 5).

In parameter mode, the flame safeguard stops in pause states; press the RESET button to continue to the next state (see pages 41-43, "State Descriptions").

The flashing frequency of the LED shows the pause state and that it is required to press the RESET button.

Example: When pause 4 state has been reached, the red LED flashes 4 times and is then switched off for 4 seconds.
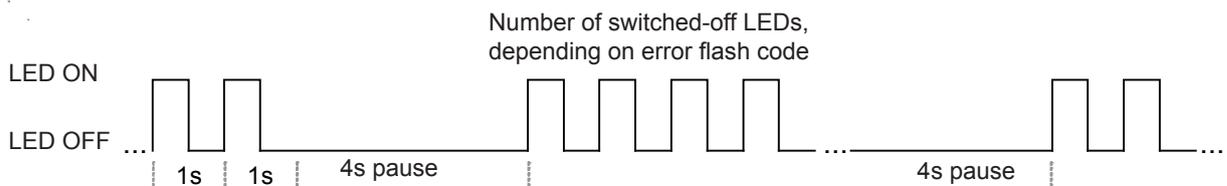
Figure 7.2

Versions with Display (Types 2 and 3)

Models with integral display can show various information depending on the operating state and mode.

Depending on the operating state of the flame safeguard system, different information is displayed
All important parameters may be set by means of the four operating keys.

The complete set of parameters can be set by means of VisionBox.

Display: 3 digit, 7 segment

Burner Start Request
Blue LED

Fault
Red LED

Flame Quality
(flashes if weak)
Yellow LED

Reset Button:
  – Reset fault
  – Confirmation/Enter
  – Extended reset
  – Next

Minus Button:
Reduces the
displayed value

Plus Button:
Increases the
displayed value

Back Button: Return to operation display
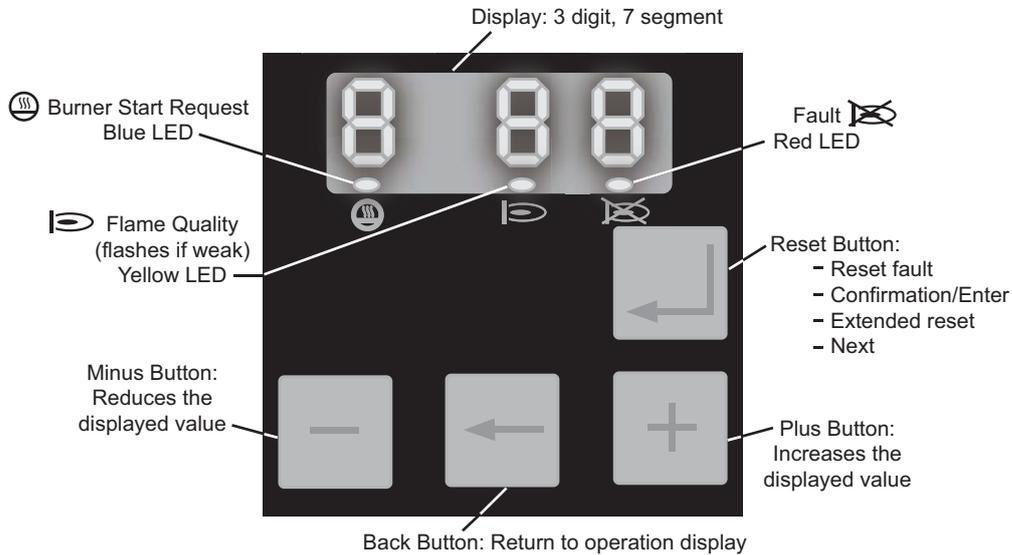
Overview of the Display Modes

Mode:	Active:
Operation display	In normal operation if no error is active
Error display	If the flame safeguard is in lockout
Info display	From operation display by pressing both ⊕ and ↵
Display of the error memory	From operation display by pressing both ⊕ and ←
Parameter display	From operation display by pressing both ↵ and ←
Reset display	From operation display by pressing both ⊖ and ←
Flashing display	Depending on the display mode:
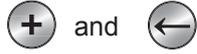
Depending on the display mode:

1. Request to confirm the access level change
2. Keep the reset button pressed for more than 5s to restart Types 2 and 3 ("Extended reset")
3. Processor 2 error, see section 8 "Error Messages".
4. New password after password change
5. Restart of the system, all segments and LEDs are flashing

Additional information from the operation display mode:

State number (operation display)	⊖ and ⊕
Bus address (operation display)	←
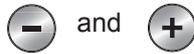
Additional information from the error display mode:

State number	⊕
Additional error note	⊖
Next previous error	↵

Display

Types 2 and 3 Display
Displayed operating state for setting parameters and troubleshooting

These symbols are used to represent the display in the following diagrams:

Character
blue

Burner start   Flame   Fault
request blue   yellow   red
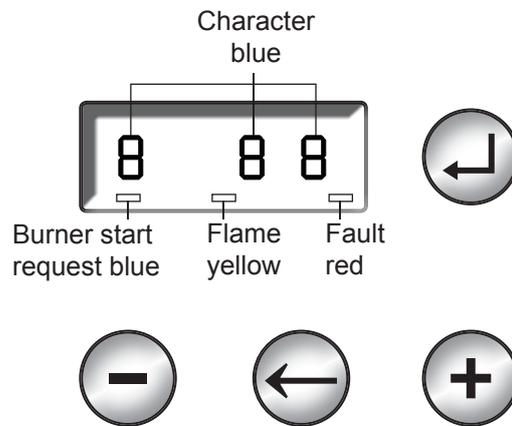
ATTENTION
Illustration in 7-Segment display

1. Digits

6 =   6

8 =   8

0 =   0

2. Characters

B or b = b

D or d = d

O or o = o

Operating State

Types 2 and 3 Display	
	Shows the operating status of the system

Parameter switch to
"Auto", power supply "On"

Waiting for burner
start request
0

Idle state control air
pressure switch
Safety chain check
Watchdog loading phase
Waiting for air pressure
External light control
Pre-purge
1

Waiting for safety chain with open safety chain from watchdog loading phase state

d 1

d 2

Waiting for gas pressure with insufficient gas pressure

Pre-Ignition
Trial for ignition time -
ignition
Trial for ignition time -
flame detection
1

Flame A stabilization
2

Second safety time
Second safety time -
Flame detection
2

Flame B stabilization
Operation
3

Post-purge
Follow-up time
Restart protection
4

Additional Display Information

	Display of state number
	Display of bus address

Press the keys simultaneously to change the state display

Display of state number

$8\ 8$

Operation display

Display of bus address while pressing a key

$8\quad 8\ 8$

Display of bus address or OFF (Display = OF)
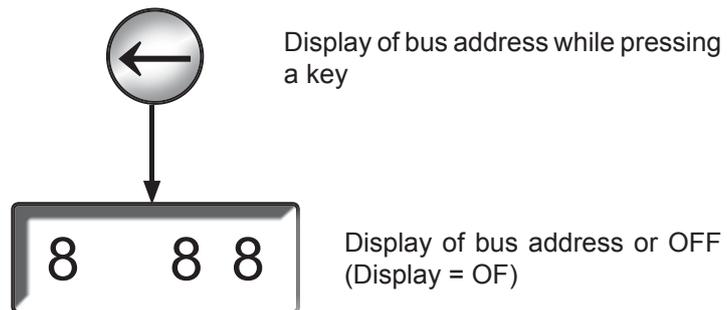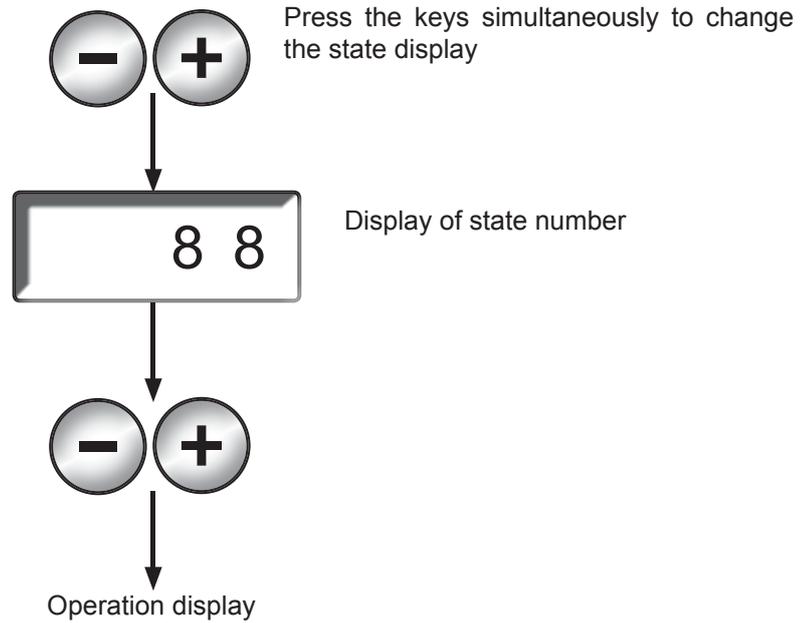
Information Display

	The information display is activated from the operation display (not during parameter setting).
	The information display allows you to see the flame quality, the resettable runtime meter, the resettable start counter and the switching cycles counter.
	This mode times out after 60 seconds if you do not press any key.

0   8 8 — Display of flame quality Max 58 < 50 flashing

1   8 8 — Display of resettable runtime meter, seconds Tens of thousands digit

2   8 8 — Display of resettable runtime meter, seconds Hundreds digit

3   8 8 — Display of resettable runtime meter, seconds Units digit

4   8 8 — Display of resettable start counter Tens of thousands digit

5   8 8 — Display of resettable start counter Hundreds digit

6   8 8 — Display of resettable start counter Units digit

7   8 8 — Display of switching cycle counter V2 Tens of thousands digit

8   8 8 — Display of switching cycle counter V2 Hundreds digit

9   8 8 — Display of switching cycle counter V2 Units digit

Back to operation display

from each info display state

Back to operation display

* Example: For a total runtime of 3 hours, 25 minutes, 45 seconds, (=12,345 seconds) then the display shows:

1   0 1   **2   2 3**   **3   4 5**

Error Display

	The error display is automatically activated if the gas burner control system signals an error.
	The last error is displayed.

Automatic activation
if a fault is active

$$F \quad 8\,8$$

$$(+) \quad F \quad 8\,8$$

The state number is displayed
as long as the plus button is pressed

$$(-) \quad F \quad 8\,8$$

The additional error note is displayed
as long as the minus key is pressed

$$(\leftarrow) \quad 8 \quad 8\,8$$

The current bus address is displayed
as long as the back key is pressed

Unlock
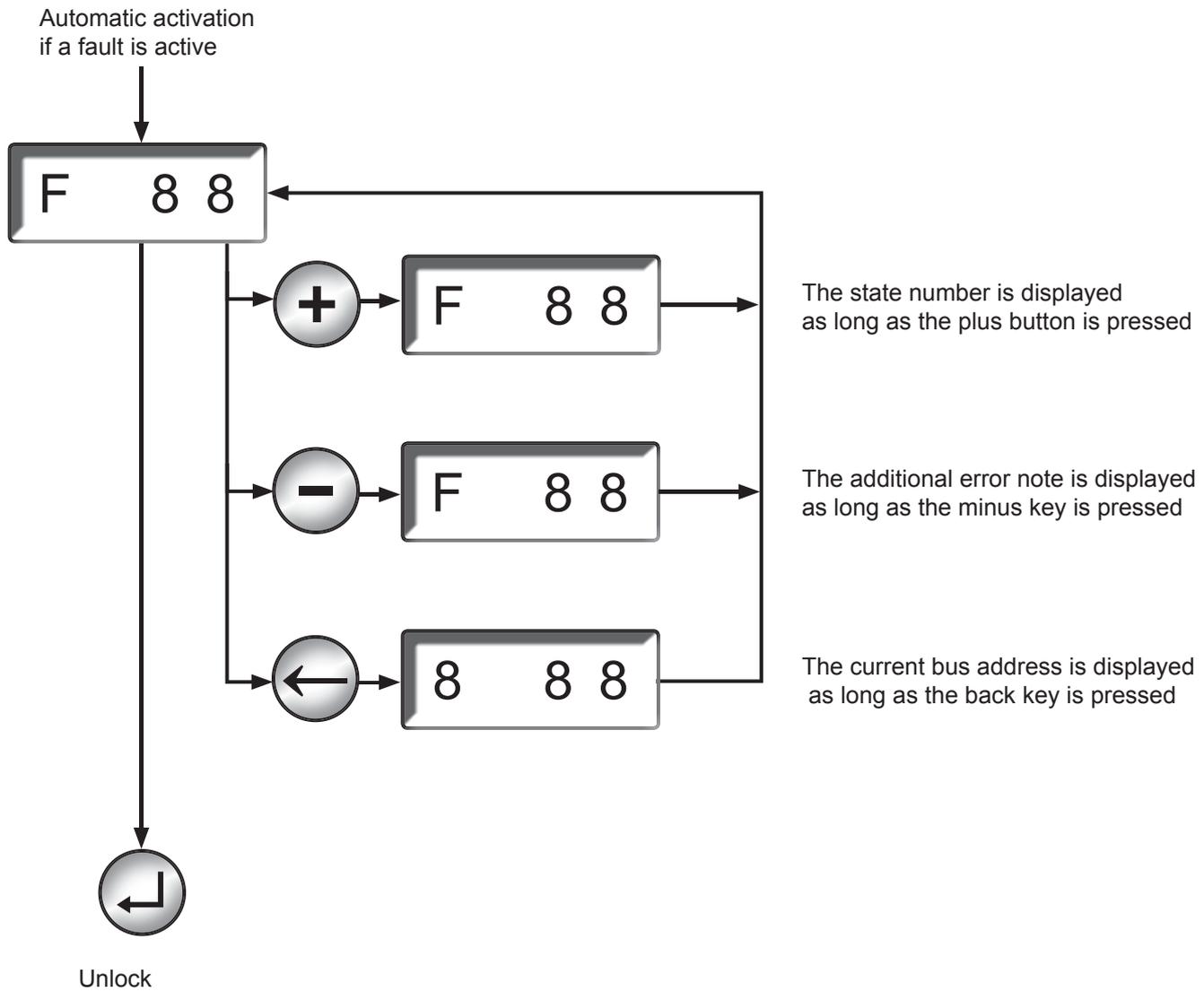
Display of the Error Memory

	The error memory shows the last 10 errors.
	The error that has occurred last is displayed.
	The error memory display is activated during the operation display (not during parameter setting).
	The error code is displayed on the two-digit seven-segment display. The left digit shows "F" (fault).
	This error memory display times out after 60 seconds if you do not press any key.
	If there is not any error for the error position, -- is displayed.

and

0 8 8   Most recent error

+ 0 8 8   The state number is displayed as long as the plus button is pressed

− 0 8 8   The additional error note is displayed as long as the minus key is pressed

↵ If the enter key is pressed, the previous error is always displayed.

↵ From each error display state ← **Back to operation display**

.
.
.

↵

9 8 8   Tenth or oldest error

+ 9 8 8   The state number is displayed as long as the plus button is pressed

− 9 8 8   The additional error note is displayed as long as the minus key is pressed

↵

Back to operation display

Parameter Display

	After activating the parameter mode, the parameter values in the table below must be defined.
	This parameter setting will not timeout.
	A password is required to change the parameters.
	ATTENTION: As the display uses only two digits, values greater than 99 will show "- -" and must be shown in subsequent stages
	To change service or OEM parameters, the required password or a higher-level password must be entered (e.g. all service parameters may also be changed using the OEM password).
	This mode can be entered from the "Auto" mode by pressing reset () and back (). Any changes, however, will result in error 0x60 (F 60), parameter change not released.

Display Number	Parameter	Value Range	Unit
0	P30 - Pre-purge	0...99	1 s
1	P31 - Delay between ignition coming on and valve 1 opening	0...99	1 s
2	P32 - Pilot TFI (NFPA max. of 15 seconds)	1...60	1 s
3	P33 - Flame sensing input active for pilot	1...4	
4	P35 - Main TFI	1...30	1 s
5	P36 - Flame sensing input active for mains	1...4	
6	P41 - Flame failure response time pilot (NFPA max. of 3 seconds)	06...30 (=0.6...3s)	0.1s [1]
7	P42 - Flame failure response time mains (NFPA max. of 3 seconds)	05...30 (=0.5...3s)	0.1s [1]
8	P51 - Post-purge	0...99	1s
9	P14 - Number of restart attempts upon failure during operation	0...5	
A	P13 - Number of restart attempts upon failure during TFI	0...5	
b	P15 - Restart attempt after safety chain failure	0 = OFF / 1 = ON	
C	P16 - Air pressure switch operating mode	0...15	
d	P38 - Pilot operation	0...2	
E	P18 - Flame detector 2 input selection	0...4	
F	P40 - Continuous operation mode	0 = OFF / 1 = ON	
h[3]	P21 - UV self check on / off	0...3	
L	P19 - Operation output selection	0...4	
o	P52 - Delay time before being able to restart the system via burner start	0...99	1s
n[2]	P11 - Fieldbus address	0...99 [2]	
Pr0	P240 - Pre-Purge	0...99	%
Pr1	P241 - Ignition Position	0...99	%
Pr2	P242 - Stabilization	0...99	%
Pr3	P243 - Post-Purge	0...99	%
Pr4	P244 - Start Value	0...99	%
Pr5	P245 - Minimum Speed	0...99	%
Pr6	P246 - Maximum Speed	0...99	%
Pr7	P247 - Increment of Speed Change	0...99	%
Pr8	P248 - Actuator Stroke Time	0...99	1s
Pr9	P249 - Bit Functions	0...99	

[1] Adjustable in steps:

05 = 0.5s	8/16	(only possible for flame detector 2 for FLW 41I with 0.19s reaction time)
08 = 0.75s	12/16	(only possible for flame detector 1, smallest possible adjustment)
09 = 0.875s	14/16	(for UV 41HE / UV 42 with 0.125s reaction time)
10 = 1s	16/16	
15 = 1.5s	24/16	(for FLW 41I with 0.19s reaction time)
19 = 1.875s	30/16	(for UV 41HE / UV 42 with 0.125s reaction time)
20 = 2s	32/16	
25 = 2.5s	40/16	(for FLW 41I with 0.19s reaction time)
29 = 2.875s	46/16	(for UV 41HE / UV 42 with 0.125s reaction time)
30 = 3s	48/16	

[2] Use the shortcut - and + pressed simultaneously to switch between OFF (display = oF) and the address. The setting "n" is only displayed if a bus module is connected. Addresses over 99 must be set by means of VisionBox.

[3] The setting "h" is only displayed if continuous operation is active or has been activated in setting F.

ATTENTION: Press the back button (⬅) to return to previous steps in parameter mode.
If you have reached the first entry field again, press the back key again to quit the parameter mode.

"Para" mode

Power Supply OFF
Parameter switch to "Para",
Power Supply "On"
Password entry

During "Auto" mode press

↵ and ⬅

```
C    0 0
```
Password entry
1st two characters

− +

```
C    0 0
```
Password
entry
2nd two
characters

− +

```
C  C C
```
flashing (30s timeout) ⟶
```
C    0 0
```
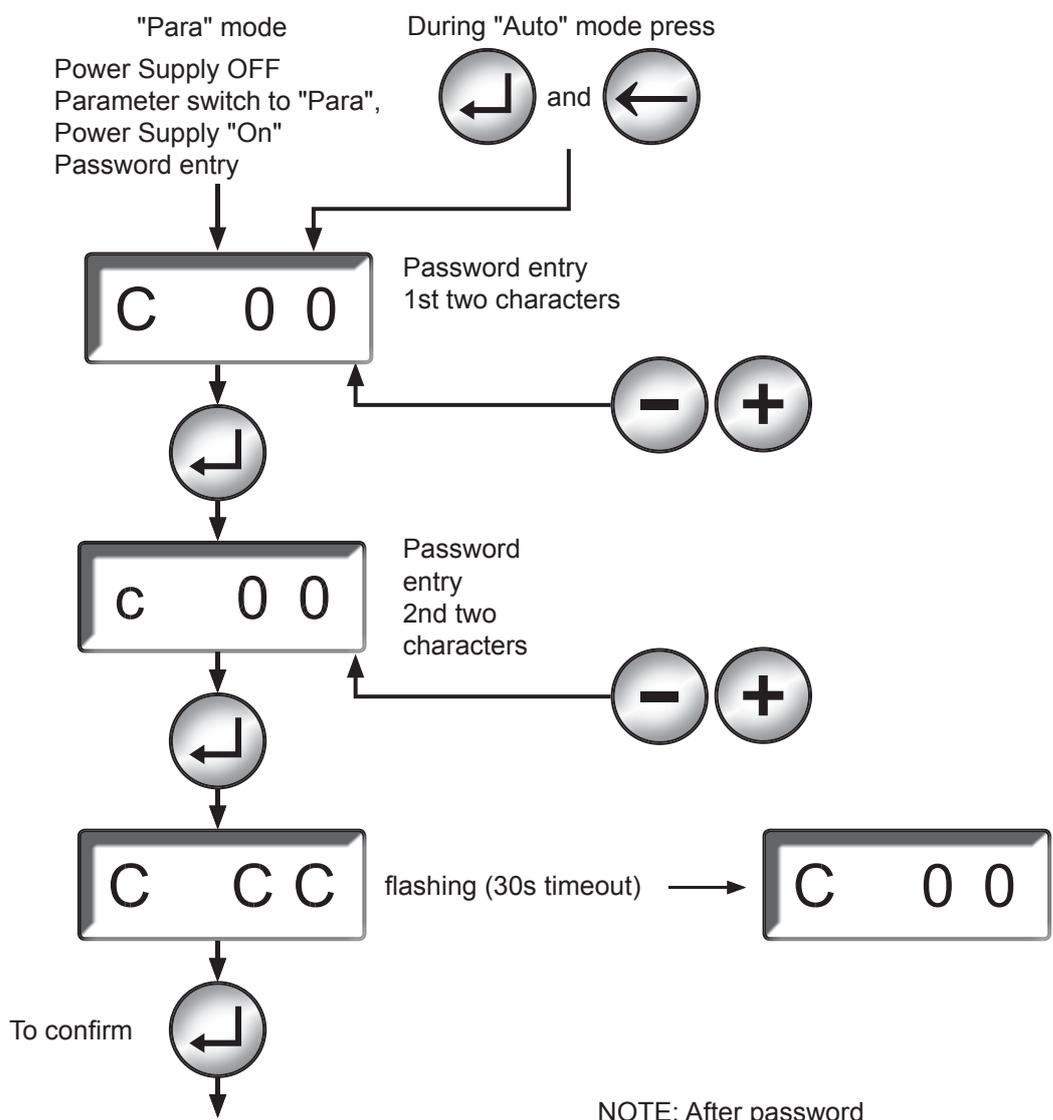
To confirm ↵

NOTE: After password
confirmation pressing

↵ ⬅

Skips the following parameter
setting steps and jumps to
manual mode checking,
Pause 1 = H I ⌐

Eclipse Trilogy Flame Safeguard, T600, V2, Instruction Manual 835, 11/11/2014

0   0   2   Parameter 0 (P30)
                    Pre-purge (0-99s / 1s)

PF indicated "value accepted"

1   0   1   Parameter 1 (P31)
                    Delay between-ignition
                    coming on and valve 1
                    opening (0-99s / 1s)

2   0   1   Parameter 2 (P32)
                    Pilot TFI (0-60s / 1s)

3   0   1   Parameter 3 (P33)
                    Flame sensing input active for pilot
                    (1-4)

Parameter 4 (P35)
Main TFI (1-30s / 1s)

Parameter 5 (P36)
Flame sensing input active for mains (1-4)

Parameter 6 (P41)
Flame failure response time pilot (0.8-3s / 0.1s)

Parameter 7 (P42)
Flame failure response time mains (0.5-3s / 0.1s)

Eclipse Trilogy Flame Safeguard, T600, V2, Instruction Manual 835, 11/11/2014

Parameter 8 (P51)
Post-purge (0-99s / 1s)

Parameter 9 (P14)
Number of restart attempts upon failure during operation (0-5)

Parameter A (P13)
Number of restart attempts upon failure during TFI (0-5)

Parameter b (P15)
Restart attempt after safety chain failure
0 = (0-5) Dependent on P12
1 = Lockout

C 1 5

Parameter C (P16)
Air pressure switch operating mode (0-15)

d 0 1

Parameter d (P38)
Pilot operation (0-2)

E 0 0

Parameter E (P18)
Flame detector 2 input selection (0-4)
ATTENTION: Set parameter to 1 if Terminals 16 and 17 are unused.

F 0

Parameter F (P40)
Continuous operation mode
0 = NO (OFF)
1 = YES (ON)

Parameter h (P21)
UV self check on / off (0-3)

ON

OFF

h 0 1

L 0 1

Parameter L (P19)
Operation output selection (0-4)

o 0 5

Parameter O (P52)
Delay time before being able
to restart the system via burner
restart (0-99s / 1s).

Parameter n (P11)
Fieldbus address
(0-99)

Model with communications

Model without
communications

n o F

Model without
communications

(press + and -
together to switch
fieldbus On / Off

"Para" mode

"Auto" mode

H I ⌐

Back to
parameter 0

Manual mode for
checking the settings

Operation Display

Manual mode for
checking settings

Waiting for burner
start

| 0 | in manual mode | → | H　1　⌐ | Manual operation - Pause 1 |

Idle state control air
pressure switch
Safety chain check
Watchdog loading phase
Waiting for air pressure
External light control
Pre-purge

1 ⌐

Waiting for safety
chain with open safety
chain from watchdog
loading phase

d 1

d 2

Waiting for gas pres-
sure with insufficient
gas

H　2　⌐　Manual operation - Pause 2

Pre-Ignition
Trial for ignition time -
ignition
Trial for ignition time -
flame detection

1 ⌐

Flame A stabilization

2 ⌐　in manual mode　→　H　3　⌐　Manual operation - Pause 3

Second safety time
Second safety time -
Flame detection

2 ⌐

Flame B stabilization
Operation

3 ⌐　in manual mode　→　H 4　⌐　Manual operation - Pause 4

Post-purge
Follow-up time
Restart protection

4 ⌐　in manual mode　→　H 5　⌐　Manual operation - Pause 5

Parameter setting finished
Interrupt voltage supply
Switch from "Para" to "Auto"

Start parameter 0

Reset Display

	Reset Display mode is activated from the Operating Display mode (not during parameter setting).
	Reset Display mode can clear the error memory, resettable runtime meter and resettable start counter. It also can reset the access level and change the passwords for both the service level and the OEM level.\
	This mode times out after 60 seconds if you do not press any key.
	If the test mode of the program is active, the Reset Display mode is inactive. This mode is not available when the unit is in the manual checking steps (switch on "Para").

Activation of the Reset Display mode by simultaneously pressing keys

E 8 8

Previous action #

Next action #

Cancel the action

Action 0,1,2,3

Back to operation display

Action to be carried out:
0 clears the error memory
1 resets the access level
2 clears the resettable runtime meter
3 clears the resettable start counter
4 changes the password for service level
5 changes the password for OEM level

Action 4,5

C 0 0 — Entry of the previous password 1st character

c 0 0 — Entry of the previous password 2nd character

Correct password

Incorrect password

C C C

F 3

Back to operation display

C 8 8 — Entry 1st character

c 8 8 — Entry 2nd character

C 0 0 — Display of new password

c 0 0 — Display of new password

Operation display

Modulating

The modulating capabilities include the following functions:

- Relay outputs as a function of state
- PWM output
- Voltage output 0 - 10V
- Current output 4 - 20 mA
- Profibus interface
- Modbus interface
- Output for activation of the UV 4x EM 1/1 shutter module or the continuous operation function of the FLW 41I.

Relay Outputs as a Function of the State

As a function of the programming state, the relay contacts are closed or opened.

Applications

- Signaling of operational states
- Activation of analog actuators

PWM Output

A PWM signal can be modulated during the operation state by applying a main voltage signal.

Analog Output for Current/Voltage

The current signal (4 - 20 mA) or the voltage signal (0 - 10 VDC) can be modulated by applying a mains voltage signal.

Fieldbus Communications

Profibus DP and Modbus interface are integrated into this option; refer to Appendix 10-a.

Shutter Activation for Continuous Operation

The activation of the UV 4x EM 1/1 shutter module is integrated into this option; refer to Appendix 10-g.

Modulating Base

The part number for the Type 2 modulating base is 101017649.

Modulating Connection Diagram

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Common	Relay 3 (High Fire)	Relay 2 (Low Fire)	Relay 1 (Automatic)	Not Used	N	Low Fire	High Fire	Heat -	Heat +	Not Used	GND	Analog Out	VCC	Not Used	GND / Shutter -	5V Supply (Bus Term.)	Data Line Plus (B)	Data Line Minus (A)	Shutter +

Profibus / Modbus
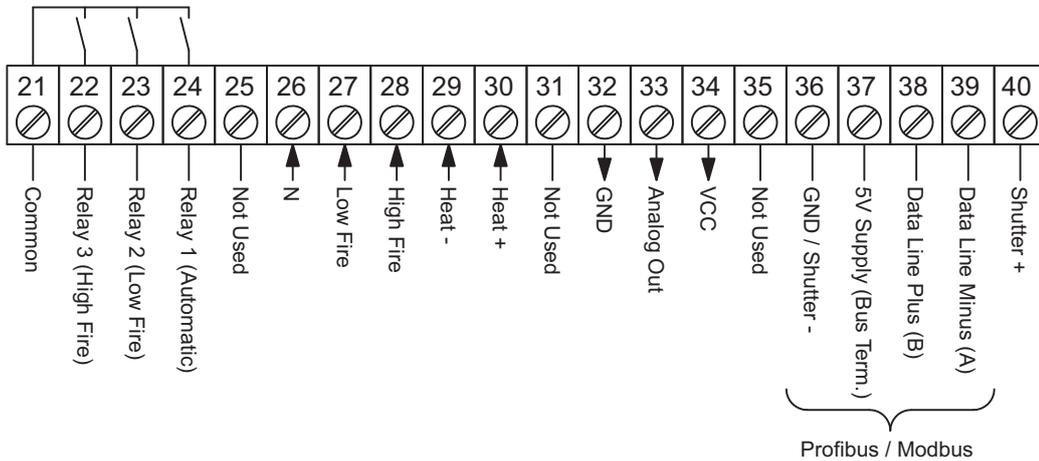
For supply connections: Use wires acceptable for at least 167°F (75°C)

Type 3 Modulating Pin Assignment

Connector 1 (analog On / Off 115 VAC / 230 VAC)

21: Common
22: Relay 3 (High Fire)
23: Relay 2 (Low Fire)
24: Relay 1 (Automatic)

Connector 2 (115 VAC / 230 VAC inputs)

26: N
27: Low Fire
28: High Fire
29: Heat -
30: Heat +

Connector 3 (analog out)

PWM output (switch bottom)
32: GND
33: PWM
34: VCC

Analog output 0...10V (switch center)
32: GND
33: Analog Out
34: VCC

Analog output 4...20 mA (switch top)
32: GND
33: Analog Out
34: VCC

Connector 4 (bus and shutter)

36: GND / Shutter -
37: 5V Supply (Bus Terminal)
38: Data Line Plus (B)
39: Data Line Plus (A)
40: Shutter +

*Switch position analog output
4...20 mA switch top
0...10 V switch center
PWM switch bottom
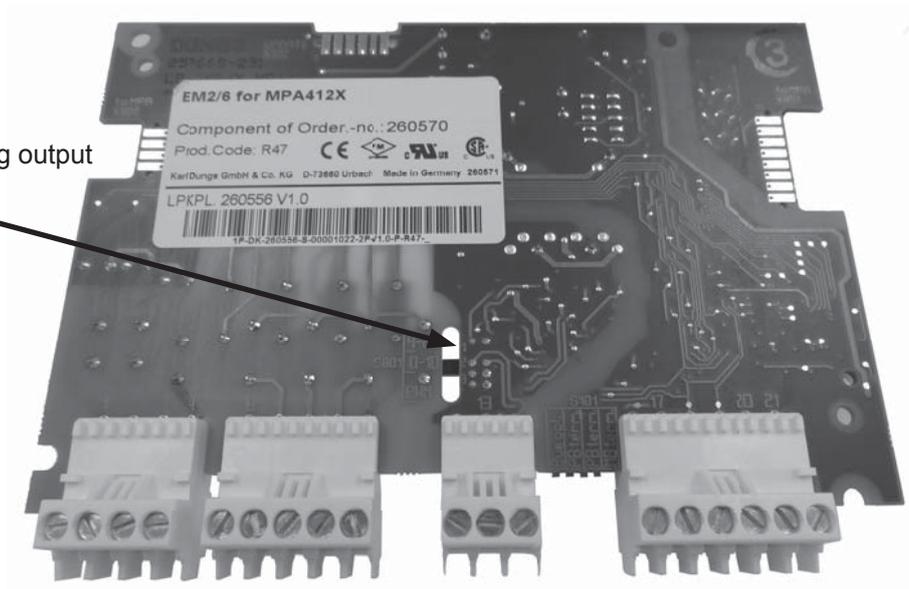
*Note: Plastic housing can only be switched over when the module is removed.
ATTENTION: Switch over only in the de-energized state.

Calculation as Ramp

5-bit Value	Duration in s Example: if change is from 0% to 100%
0	Jump
1	3.125
2	6.25
3	9.375
4	12.5
5	15.625
6	18.75
7	21.875
8	25
9	28.125
10	31.25
11	34.375
12	37.5
13	40.625
14	43.75
15	46.875
16	50
17	53.125
18	56.25
19	59.375
20	62.5
21	65.625
22	68.75
23	71.875
24	75
25	78.125
26	81.25
27	84.375
28	87.5
29	90.625
30	93.75
31	96.875

Formula for ramp calculation:
Duration = (old desired value - new desired value) * 5-bit value * 1/16s

Example:
Change from 0% to 100%, 5-bit value 31
100% / 2% * 31/16s = 97s

F Code Errors

Display Error Code	Internal Error	Error Description
		T600 Error without Error Code (Types 2 and 3)
F1 Flashing		Low voltage Bus connection interrupted Internal error
F2 Flashing	x	The connected display is invalid
F3 Flashing		The password has been entered incorrectly when trying to change it or it has not been confirmed by means of the multifunction key
F4 Flashing		The signal of the remote reset via communications bus is active too long
F5 to F8		Not used
F9 Flashing		Connection to the bus is missing. The bus module has been connected, but there is no connection to the master.
FA Flashing	x	Failed to read parameter P19 (Operation Output Selection), the output for the operating mode is not switched

T600 Series Errors

Error from the Basic System (0x01 to 0x16)				
Vision-Box Error Code	Type 1 Error Flash Code	Types 2 and 3 Error Code	Internal Error	Error Description
0x01	0	F 01	x	Error: Interrupt cycle state frame
0x02	0	F 02	x	Error: Watchdog triggering

0x03	0	F 03		Error: Watchdog hardware
				Possible causes of the error:
				  • Ambient temperature is too high
				  • Overvoltage

0x04	0	F 04		Error: Unlocking denied Possible cause of the error: • More than 5 unlocking operations performed in the last 15 minutes. Remedy: Wait 15 minutes or activate the extended unlocking feature
0x05	0	F 05	x	Error: Failed ROM test
0x06	0	F 06	x	Error: Failed RAM test
0x07	0	F 07	x	Error: Internal short circuit
0x08	0	F 08	x	Error: Stack overflow
0x09	0	F 09	x	Error: Programming
0x0A	0	F 0A	x	Error: DI Variable
0x0b	0	F 0b	x	Error: In table control error
0x0C	0	F 0C	x	Error: Configuration
0x0d	0	F 0d	x	Error: Failed CPU test
0x0E	0	F 0E	x	Error: EEPROM parameter
0x0F	0	F 0F	x	Error: Failed address test
0x10	0	F 10	x	Error: Function error ID
0x11	0	F 11		Error: Undervoltage Possible cause of the error: • The supply voltage dropped below the lower limit
0x12	0	F 12		Error: Power failure Possible cause of the error: • The supply voltage was interrupted during startup, operation or regular switch-off
0x13	0	F 13	x	Error: Watchdog status Possible cause of the error: • The fan continued running too long. Remedy: Increase the time for the restart protection
0x14	0	F 14	x	Error: Failed DI segment test
0x15	0	F 15	x	Error: Failed SFR register test

0x16	8	F 16		Error: TWI communication
				Possible causes of the error:
				  • A TWI bus (VisionBox) user was connected to the bus or separated from the bus while the flame safeguard was connected to the main power source.
				Remedy: Connect or separate the connection of the TWI bus only if the flame safeguard is disconnected from the main power source.
				  • Too many users were connected to the TWI bus or EMC faults occured on the TWI line.
				Remedy: Use shorter lines or reduce the number of users

0 means steadily lit

Vision-Box Error Code	Type 1 Error Flash Code	Types 2 and 3 Error Code	Internal Error	Error Description
		Error from the Basic System (0x17 to 0x1E)		
0x17	0	F 17	x	Error: State frame overload

0x18	7	F 18		Error: External application
				Possible causes of the error:
				• Addtional byte 1: 0xB4 (error in VisionBox)
				Switch-off was caused externally, for example by selecting the "switch-off function in the PC software of the VisionBox
				• Additional byte 1: 0x90 (internal T600 error P2)
				Additional byte 4: 0xA0 timeout parameterization mode
				Additional byte 4: 0xA1 invalid bus address
				Additional byte 4: 0xA2 parameter adjustment error of the service case
				Additional byte 4: 0xA3 anti-oscillation function shutter error
				• Additional byte 4: 0xE0 parameter error
				Additional byte 4: 0xE1/0xE2 calibration value not set in EEPROM or not OK
				Additional byte 4: 0xE3 not used
				Additional byte 4: 0xE4 High Fire Signal missing during pre-purge
				Additional byte 4: error 0xE5 configuration:
				  - Parameter P249 one or more bits without function
				  - Pre- or post-purge time too short for P248
				• Additional byte 4: 0xE6 error configuration:
				  - P248 < 16 (1s)
				  - P30-2*P248 < 16 (1s)
				  - P51-P248 < 16 (1s)
				• Additional byte 4: 0xE7 not used
				• Additional byte 4: 0xE9 wrong signal Low Fire during ignition and stabilization
				• Additional byte 4: 0xE4 wrong signal High Fire during post-purge time

0x1A	0	F 1A	x	Error: Software watchdog failed during initialization
0x1b	0	F 1b	x	Error: Buffer overflow
0x1C	0	F 1C	x	Error: Synchronization failed during initialization
0x1d	0	F 1d		Error: Processor failure Possible cause of the error: • Strong EMC interference on the flame safeguard
0x1E	0	F 1E	x	Error: SFR register state block

0 means steadily lit

Error from the Extended Functions (0x43 to 0x61)				
Vision-Box Error Code	Type 1 Error Flash Code	Types 2 and 3 Error Code	Internal Error	Error Description
0x43	0	F 43	x	Error: Failed ionization input test
0x59		F 59		Error: Monitoring interface P2 Possible cause of the error: • Fieldbus was not connected or was interrupted while P38 was set at 2 (High-Low bus control of V2)
0x60	2	F 60		Error: Parameter change not released A parameter was changed but was not released
0x61		F 61		Error: Failed shutter test Possible cause of the error: • Defective UV tube • Defective mechanical shutter (physically binding) • Damaged electrical connection

0 means steadily lit

Vision-Box Error Code	Type 1 Error Flash Code	Types 2 and 3 Error Code	Internal Error	Error Description
Error from the Extended Functions (0xA0 to 0xAA)				
0xA0	0	F A0	x	Error: State duration too long
0xA2	1	F A2		Error: Safety chain open Possible causes of the error: • The safety chain was not closed or was opened • The wires of the safety chain were interrupted
0xA4	0	F A4	x	Error: Feedback for V1 incorrect
0xA5	0	F A5	x	Error: Feedback for V2 incorrect
0xA6	6	F A6		Error: External light Possible causes of the error: • Flame detector is defective or detected light from another source, a nearby burner for example • Defective UV tube • Earth connection to an ionization electrode
0xA7	3	F A7		Error: No flame during trial for ignition (TFI) time Additional information byte 0: Bit 0 = Flame to flame detector 1; Bit 1 = Flame to flame detector 2 Additional information byte 1: Flame quality for flame detector 1 Possible causes of the error: • Gas valves did not open the gas flow • Ignition electrode incorrectly set • Damaged insulated leads of the ignition electrode • Defective ionization electrode • Ionization electrode incorrectly set • Flame detector did not detect light or is defective • Lines of mains connection on the flame safeguard exchanged ("N" and "L1")
0xA8	4	F A8		Error: Flame out during operation Additional information byte 0: Bit 0 = Flame to flame detector 1; Bit 1 = Flame to flame detector 2 Additional information byte 1: Flame quality for flame detector 1 Possible causes of the error: • Damaged burner nozzle • Flame detector did not detect light or is defective
0xA9	3	F A9		Error: Flame out during stabilization Additional information byte 0: Bit 0 = Flame to flame detector 1; Bit 1 = Flame to flame detector 2 Additional information byte 1: Flame quality for flame detector 1 Possible causes of the error: • Damaged burner nozzle • Flame detector did not detect light or is defective
0xAA	5	F AA		Error: Idle state control air pressure switch Possible causes of the error: • The air pressure switch is defective • There was air pressure during the idle state control from another source, an air flow from the exhaust line for example • The set point of the air pressure switch was set incorrectly

0 means steadily lit

Error from the Extended Functions (0xAb to 0xbF)				
Vision-Box Error Code	Type 1 Error Flash Code	Types 2 and 3 Error Code	Internal Error	Error Description
0xAb	5	F Ab		Error: No air pressure Possible causes of the error: • Defective air pressure switch • Set point incorrect • Loss of combustion air pressure
0xAC	0	F AC	x	Error: Feedback for ignition incorrect
0xAd	0	F Ad		Error: Lack of gas pressure switch minimum Possible causes of the error: • Gas pressure switch defective • Gas supply off • Set point incorrect
0xb0	0	F b0	x	Error: Test circuit extension
0xb3		F b3	x	Error: Gas valve feedback false Additional information byte 0:1 = V1, 2 = V2
0xb6	0	F b6		Error: Limit switch main gas (POC) Possible causes of the error: • Defective proof of closure (POC) switch • Gas valve stuck open
0xbA		F bA		Error: False flame start False flame > 1 minute after burner start Possible causes of the error: • Flame detector is defective or detects light from another nearby burner for example • Defective UV tube • Earth connection to an ionization electrode
0xbC	3	F bC		Error: No flame during second safety time Additional information byte 0: Bit 0 = Flame to flame detector 1; Bit 1 = Flame to flame detector 2 Additional information byte 1: Flame quality for flame detector 1 Possible causes of the error: • Damaged burner nozzle • Flame detector does not detect light or is defective
0xbd	0	F bd		Error: Flame detector not switched inverse Possible causes of the error: • Flame detector 2 not configured properly • Damaged wires to flame detector 2 N.O. or N.C.
0xbF	0	F bF		Error: Safety chain not voltage-free (dry-contact) Safety chain not voltage-free (dry-contact) Safety chain is not powered from terminal 9

0 means steadily lit

Profibus, Modbus and UV Self-Check Shutter

General Description

Integrated functions:
- Profibus DP interface
- Modbus RTU / ASCII
- Activation for shutter module UV 4x EM1/1 / Shutter

With this option the T600 can communicate in fieldbus systems with up to 32 slaves. The bus protocol is factory set according to the configured part number, but it can be changed in the field. Commands can be transmitted via the bus to the flame safeguard and status information can be queried.

Because Type 1 units do not have a local display to set the fieldbus address, the communications option is only available as a special order and the address(es) will need to be set by Eclipse or Eclipse trained personnel.

The T600 Purge / No Purge Type 2 uses two externally accessible mini-connectors for wiring the bus cable. A termination resistor plug can be used on the second connector.
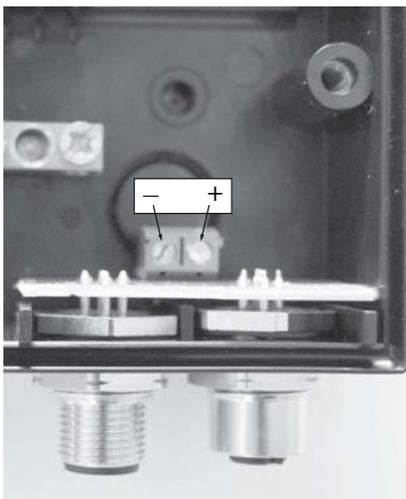
Types 1 and 2 Purge / No Purge

Figure 10a-1

The cable conductors attach to internal screw terminals on the Purge / No Purge Type 3 and on the Modulating Types 2 and 3. Bus termination is required on the first and last device on the bus. In addition, an output activates the UV 4x shutter module for continuous operation.
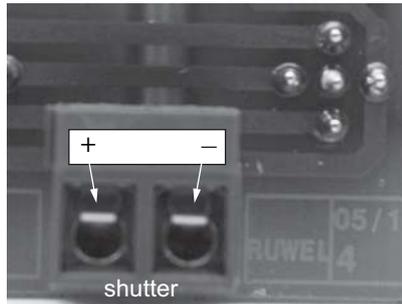
Purge / No Purge Type 3

Figure 10a-2

Changing Protocol and Termination

BUS Protocol Presettings.

The 4-pin DIP switch is used to select the bus protocol and to activate the respective line termination.

The bus protocol must only be selected with dead voltage (when power to the control is off). Modifications cannot be made during operation.

Bus Protocol Selection

DIP Switch No. 4:

OFF position = Profibus
ON position = Modbus
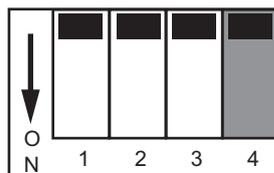
Figure 10a-3

Setting the Bus Address

The bus address is entered in P11 (display indication "n").

OFF is displayed if no address has been entered.

An address between 1 and 99 (up to 254 via VisionBox) can be entered in parameter mode. Any modifications will take effect only after a restart or an extended reset.

A flashing segment on the display shows when there is a bus connection.

Flashing segment
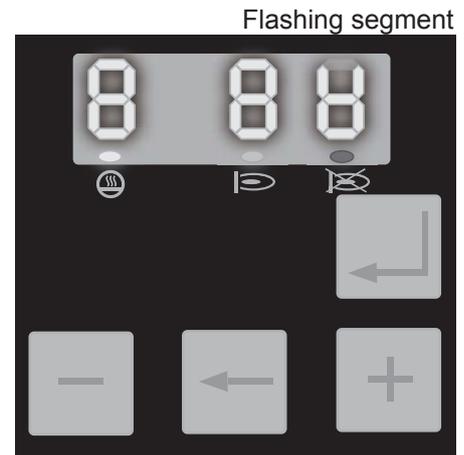
Figure 10a-4

During operation and error messages, the current bus address may be seen by pressing the back key (←).

Bus Interruption

For Modbus, the bus module requires at least one query per minute.

For Profibus, the bus module requires continuous cyclic data stream with interruptions shorter than the Profibus Watchdog period defined by the master (e.g. 2.5s). When these requirements are not met, then:

- either the unit does a safety switchoff (if V2 is activated via the bus)
- or, after an additional minute, the unit looks at the terminal 19 input for burner start request.

Eclipse Trilogy Flame Safeguard, T600, V2, Instruction Manual 835, 11/11/2014

Flame Detector Device Test for UV 4x EM 1/1 Shutter

For continuous operation, the T600 must be configured with optional UV 4x shutter control.

The UV 4X shutter allows the use of a UV flame detector device, UV 41HE or UV 42, in continuous operations.

The shutter signal can also be used for continuous operation of one or more FLW 41I flame detector device.

The control signal is independent from the use of the bus interface

Supply voltage: 24 VDC

Current: Max. 200 mA

Shutter frequency: 1 shutter signal / 10 minutes, the frequency is not adjustable.

Parameter setting: The shutter signal is turned on / off by means of P21 (parameter "h" in the display).

Profibus Configuration   *10-b*

Wiring

Purge / No Purge Types 1 and 2 use M12-5 connectors attached to the cable with 4 conductors and a shield. Modulating Types 2 and 3 have screw terminals within their enclosures.

Maximum line length is 1200 m and galvanic isolation is 4kV.

Bus Termination

Termination is required on the first and last device on the bus.

Connect the shielding of the bus cable to PE to suppress electromagnetic radiation.

Terminal Resistors
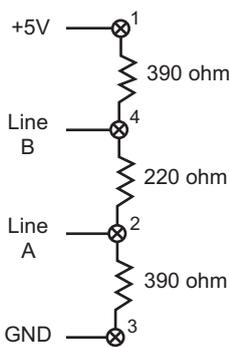
Figure 10b-1

Pin Assignment (M12-5 B-coded) Purge / No Purge Types 1 and 2
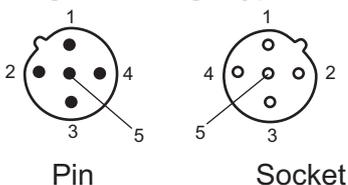
Pin   Socket

Pin no.	Signal
1	+5V supply for bus termination
2	Data line minus (A conductor)
3	Earth (GND)
4	Data line plus (B conductor)
5	not used
Thread	Shielding (earth connection) recommended

Figure 10b-2

Pin Assignment Purge / No Purge Type 3
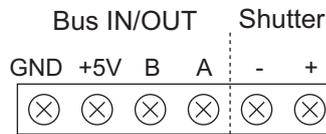
Bus IN/OUT   Shutter

GND	+5V	B	A	-	+
⊗	⊗	⊗	⊗	⊗	⊗

Pin Assignment Modulating Type 2 (Terminal Strip)

GND/-	+5V	B	A	+
36	37	38	39	40

Pin Assignment Modulating Type 3 (Connector)

GND/-	+5V	B	A	+
36	37	38	39	40
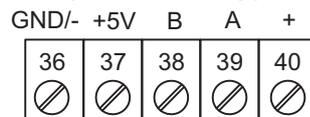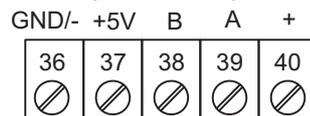
Line Length

The following table is only valid for cables meeting type A of EN 50170 requirements.

Max. Line Length in m (ft)	Transfer Speed in kBit/s
1200 (3937)	9.6
1200 (3937)	19.2
1200 (3937)	45.5
1200 (3937)	93.8
1000 (3281)	187.5
400 (1312)	500
200 (656)	1500
100 (328)	3000
100 (328)	6000
100 (328)	12000

Part Number	Description
10062057	Terminating Resistor
10062055	Male Connector
10062056	Female Connector
101012848	Cap
101012849	Plug

Profibus Data

The amount of the input and output data is defined by the modules in the GSD file for Profibus. This file is available online at eclipsenet.com

Profibus Output Data, Master to Flame Safeguard

Bit	Output byte AB0
0	Burner start
1	High power / level 2
2	Remote reset
6	Ignore bit 0 (burner start via bus)

Command Contents of Assigned Bits
AB0:

Bit 0: set to 1 by master initiates burner startup.

Bit 1: set to 1 by master means V2 is opened in states 18 (operation) and 19 (pause4) (P38 is set to value 2).

Bit 2: set to 1 by master (at least 0.5 s, max. 5 s) will reset the control.

Bit 6: set to 1 by master ignores bit 0, so the flame safeguard does not receive a burner start via the bus. The burner start is only possible via the hardware input.

The basic, standard and extended modules in the GSD file do not contain any output bytes, only input bytes (information about flame safeguard). They cannot, therefore, give any commands to the flame safeguard.

Bit	Output byte AB1
0	Control bit bus inputs activate more/less heat
1	More heat
2	Less heat

Command Contents of Assigned Bits
AB1:

Bit 0: set to 1 by master initiates control of more/less heat inputs via control bus.

Bit 1: set to 1 by master will drive control actuator to "high fire" position.

Bit 2: set to 1 by master will drive control actuator to "low fire" position.

Profibus Input Data, Flame Safeguard to Master
Input data is information about the state of the flame safeguard. The input data contains a different number of bytes, depending on the data transfer module. The lower bytes are always the same, i.e. Basic transfer is included in Standard transfer, Standard transfer in Extended transfer.

Basic Transfer
2 bytes EB0 and EB1

Standard Transfer
7 bytes EB0 to EB6

Extended Transfer
15 bytes EB0 to EB14

Special Extended Transfer
25 bytes EB0 to EB24

Some bits are active during the fault (marked with "X"), others are 0.

Profibus Basic Transfer Area

Bit	Input Byte EB0	Description	During Fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	x
2	Flame 2 NC / Gas Pressure Switch	There is a signal for flame 2 NC or gas pressure switch	x
3	Flame Detection	The resulting flame signal has been detected	x
4	Air Pressure Switch	Sufficient air pressure available	x
5	Input for Burner Start	Signal of the hardware input "burner start"	x
6	Valve 1	The gas valve V1 is open	x
7	Valve 2	The gas valve V2 is open	x
Bit	**Input Byte EB1**	**Description**	**During Fault**
0	Spark Generator	Ignition active	x
1	Manual Mode	Manual mode active	x
2	Fan	Fan relay on	x
3	Not Used		0
4	Burner Start (hardware + bus)	Evaluation between burner start hardware input and bus specification	x
5	Not Used		0
6	Not Used		0
7	Fault	There is a fault in the flame safeguard	x

Profibus Standard Transfer Area

Bit	Input Byte EB2	Description	During Fault
0-7	State Number or Error Code	Current state number or error code if there is a fault	x
Bit	**Input Byte EB3**	**Description**	**During Fault**
0-7	Flame Quality	Quality of the flame via ionization input (Terminal 5)	0
Bit	**Input Byte EB4**	**Description**	**During Fault**
0	More Heat	HW input state	x
1	Less Heat	HW input state	x
2	High Fire	HW input state	x
3	Low Fire	HW input state	x
4	Warning: More/Less Heat Simultaneously On	The inputs for heat (+) and heat (-) are simultaneously active	x
5	Not Used		0
6	Not Used		0
7	Not Used		0
Bit	**Input Byte EB5**	**Description**	**During Fault**
0	Relay Matrix Output		x
1	(2-bit) 00 = Off 01 = Relay 1 10 = Relay 2 11 = Relay 3		x
2	Warning: Low/High Fire Simultaneously On		x
3	Not Used		0
4	Not Used		0
5	Not Used		0
6	Not Used		0
7	Not Used		0
Bit	**Input Byte EB6**	**Description**	**During Fault**
	Degree of Modulation in %		

Profibus Extended Transfer Area

Bit	Input Byte EB7	Description	During Fault
0-7	Resettable Runtime Meter	Low byte (byte 0) of the 32-bit runtime meter (in seconds)	x
Bit	**Input Byte EB8**	**Description**	**During Fault**
0-7	Resettable Runtime Meter	Byte 1 of the 32-bit runtime meter (in seconds)	x
Bit	**Input Byte EB9**	**Description**	**During Fault**
0-7	Resettable Runtime Meter	Byte 2 of the 32-bit runtime meter (in seconds)	x
Bit	**Input Byte EB10**	**Description**	**During Fault**
0-7	Resettable Runtime Meter	High byte (byte 3) of the 32-bit runtime meter (in seconds)	x
Bit	**Input Byte EB11**	**Description**	**During Fault**
0-7	Resettable Start Counter	Low byte (byte 0) of the 32-bit start counter	x
Bit	**Input Byte EB12**	**Description**	**During Fault**
0-7	Resettable Start Counter	Byte 1 of the 32-bit start counter	x
Bit	**Input Byte EB13**	**Description**	**During Fault**
0-7	Resettable Start Counter	Byte 2 of the 32-bit start counter	x
Bit	**Input Byte EB14**	**Description**	**During Fault**
0-7	Resettable Start Counter	High byte (byte 3) of the 32-bit start counter	x

Profibus Special Extended Transfer Area

Bit	Input Byte EB15	Description	During Fault
0-7	Switching Cycles Counter V2	Low byte (byte 0) of the 32-bit switching cycle counter V2	x
Bit	**Input Byte EB16**	**Description**	**During Fault**
0-7	Switching Cycles Counter V2	Byte 1 of the 32-bit switching cycle counter V2	x
Bit	**Input Byte EB17**	**Description**	**During Fault**
0-7	Switching Cycles Counter V2	Byte 2 of the 32-bit switching cycle counter V2	x
Bit	**Input Byte EB18**	**Description**	**During Fault**
0-7	Switching Cycles Counter V2	High byte (byte 3) of the 32-bit switching cycle counter V2	x
Bit	**Input Byte EB19**	**Description**	**During Fault**
0-7	Runtime Meter V2	Low byte (byte 0) of the 32-bit runtime meter V2 (in seconds)	x
Bit	**Input Byte EB20**	**Description**	**During Fault**
0-7	Runtime Meter V2	Byte 1 of the 32-bit runtime meter V2 (in seconds)	x
Bit	**Input Byte EB21**	**Description**	**During Fault**
0-7	Runtime Meter V2	Byte 2 of the 32-bit runtime meter V2 (in seconds)	x
Bit	**Input Byte EB22**	**Description**	**During Fault**
0-7	Runtime Meter V2	High byte (byte 3) of the 32-bit runtime meter V2 (in seconds)	x
Bit	**Input Byte EB23***	**Description**	**During Fault**
0-7	Error Additional Information 1	First additional error info byte	x
Bit	**Input Byte EB24***	**Description**	**During Fault**
0-7	Error Additional Information 4	Fourth additional error info byte	x

*See error messages section for more information on data contained in EB23 and EB24. Not all error messages contain additional information.

Profibus Declaration of Profibus Interface	
Manufacturer Identification	ID OXOCF1 (Karl Dungs GmbH & Co. KG)
ASCIC Type	VPC3+C
Sync and Freeze Mode	Is Supported (Sync command: Freeze all outputs of the addressed slaves Freeze command: Freeze all inputs of the addressed slaves)
Cycle Time	Maximum time until there is a response to a request telegram, depending on the bus transfer rate: 9.6 kBit/s to 500 kBit/s → 15 bit times 1500 kBit/s → 20 bit times 3000 kBit/s → 35 bit times 6000 kBit/s → 50 bit times 12000 kBit/s → 95 bit times
Diagnosis	The Profibus module creates an external diagnosis if it detects an internal error. The diagnosis information of the DP slave consists of standard diagnosis information (6 bytes) and a user-specific diagnosis information error number (2 bytes). Octet 1: Bit 0 = Diagnosis station does not exist (sets master) Bit 1 = Diagnosis station not ready: The slave is not ready for data exchange. Bit 2 = Diag.cfg_Fault: Configuration data do not match Bit 3 = Diag.ext_diag: Slave has external diagnosis data Bit 4 = Diag.not supported: Requested function is not supported in slave Bit 5 = Diag.invalid_slave_response (sets slave fixed to 0) Bit 6 = Diag.prm_fault: Wrong parameters (ID number, etc.) Bit 7 = Diag.master_lock (sets master): Parameters of slave are set by another master Octet 2: Bit 0 = Diag.Prm_req: Slave requires new parameters Bit 1 = Diag.Stat_diag: Statical diagnosis (byte diag-bits) Bit 2 = fixed to 1 Bit 3 = Diag.WD_ON: Reaction monitoring active Bit 4 = Diag.freeze_mode: Freeze command received Bit 5 = Sync_mode: Sync command received Bit 6 = reserved Bit 7 = Diag.deactivated (sets master) Octet 3: Bit 0 - Bit 6 = reserved Bit 7 = Diag.ext_overflow Octet 4: Diag master_add: Master address after setting parameters (FF without parameter setting) Octet 5: High byte ID number Octet 6: Low byte ID number
Parameter	Only cyclical communication supported
Automatic Baud Rate Detection	Is Supported

Modbus Configuration   *10-c*

Wiring
Purge / No Purge Types 1 and 2 use M12-5 connectors attached to the cable with 4 conductors and a shield. Modulating Types 2 and 3 have screw terminals within their enclosures.

Maximum line length is 1200 m and galvanic isolation is 4kV.

Bus Termination
A 120 ohm termination resistor is required on the first and last device of the bus structure in order to meet the full maximum specification.

The terminating plug, however, may be used for lower baud rates and shorter line lengths.

Connect the bus cable shielding to PE to suppress electromagnetic radiation.

Termination Resistors
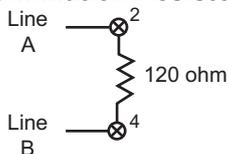
Figure 10c-1

Pin Assignment (M12-5 B-coded)
Purge / No Purge Types 1 and 2
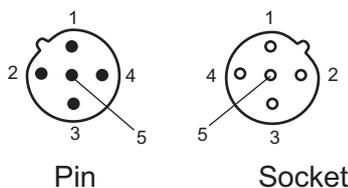
Pin   Socket

Pin no.	Signal
1	+5V Supply for Bus Termination
2	Data Line Minus (A conductor)
3	Earth (GND)
4	Data Line Plus (B conductor)
5	Not Used
Thread	Shielding (earth connection) Recommended

Figure 10c-2

Pin Assignment
Purge / No Purge Type 3
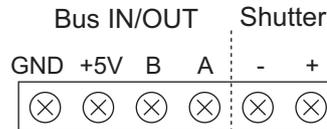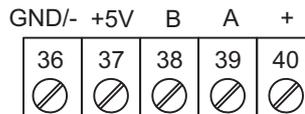
Bus IN/OUT   Shutter

GND	+5V	B	A	-	+

Pin Assignment
Modulating Type 2
(Terminal Strip)

GND/-	+5V	B	A	+
36	37	38	39	40

Pin Assignment
Modulating Type 3
(Connector)

GND/-	+5V	B	A	+
36	37	38	39	40
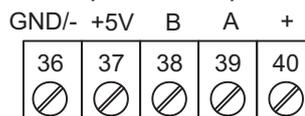
Part Number	Description
10062057	Terminating Resistor
10062055	Male Connector
10062056	Female Connector
101012848	Cap
101012849	Plug

Modbus Configuration

A configuration data file (Hex) can be programmed into non-volatile memory of the T600 slave to change the default values of mode, baud rate and parity. If needed, this step only needs to be done once during commissioning.

Modbus RTU or ASCII Mode
The Modbus protocol can be switched over to ASCII mode using the FunctionCode 0x41. Standard value (upon delivery) is Modbus RTU.

Supported Baud Rates
9600 bauds, 19200 bauds, 19200 bauds and 57600 bauds

The baud rate can be changed during operation by means of the Function-Code 0x41.

The relative parity bit can also be defined. None, Even and Odd are supported.

Default values (upon delivery) are 19200 bauds and Even Parity.

Modbus Output Data, Master to the Flame Safeguard

Bit	Output Byte AB0
0	Burner start
1	High power / level 2
2	Remote reset
6	Ignore bit 0 (burner start via bus)
8	Control bit bus inputs activate more / less
9	More Heat
10	Less Heat

Command Contents of Assigned Bits
AB0:

Bit 0: set to 1 by master initiates the burner startup.

Bit 1: set to 1 by master means V2 is opened in states 18 (operation) and 19 (pause4) (P38 is set to value 2).

Bit 2: set to 1 by master (at least 0.5 s, max. 5 s) will reset the control.

Bit 6: set to 1 by master ignores the bit 0 signal "burner start", so the flame safeguard does not receive a burner start via the bus. The burner start is only possible via the hardware input. Use the following FunctionCodes to write to these bits.

05 (0x05) Write Single Coil (Coil = bit at bit address x)

06 (0x06) Write Single Register (to register address)

16 (0x10) Write Single Register (from register address)

If no data is written to AB0, the flame safeguard functions via the hardware inputs.

Bit 8: set to 1 by master initiates control of more / less heat inputs via the control bus.

Bit 9: set to 1 by master will drive the control actuator to the "high fire" position.

Bit 10: set to 1 by master will drive the control actuator to the "low fire" position.

**Modbus Input Data,
Flame Safeguard to Master**

Input data is information about the state of the flame safeguard. The input data contains a different number of bytes, depending on the used data transfer module. The lower bytes are always the same, i.e. Basic transfer is included in Standard transfer, Standard transfer in Extended transfer.

An input data (EBx) contains 16 bits (2 bytes).

Basic Transfer
4 bytes EB0 and EB1

Standard Transfer
8 bytes EB0 to EB3

Extended Transfer
24 bytes EB0 to EB11

Special Extended Transfer
42 bytes EB0 to EB20

Use the following FunctionCodes to read this information.
03 (0x03) Read Holding Registers
01 (0x01) Read Coils.

Notes:
1. All runtime meters are accumulated in seconds in the registers.
2. When sending a remote reset command to register AB0 (byte 2) the duration must be between 0.5 - 5 seconds, then a 0 must be sent to clear the reset command.
3. When sending a burner start command to register AB0 (byte 0) ensure that a 0 is written to this register upon controller fault to prevent automatic start-up upon reset.

Modbus Basic Transfer Area

Bit	Input Byte EB0 Register Address 0	Description	During Fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	x
2	Flame 2 NC / Gas Pressure Switch	There is a signal for flame 2 NC or gas pressure switch	x
3	Flame Detection	The resulting flame signal has been detected	x
4	Air Pressure Switch	Sufficient air pressure available	x
5	Input for Burner Start	Signal of the hardware input "burner start"	x
6	Valve 1	The gas valve V1 is open	x
7	Valve 2	The gas valve V2 is open	x
8...15	Not Used		0
Bit	**Input Byte EB1 Register Address 1**	**Description**	**During Fault**
0	Spark Generator	Ignition active	x
1	Manual Mode	Manual mode active	x
2	Fan	Fan relay on	x
3	Not Used		0
4	Burner Start (hardware + bus)	Evaluation between burner start hardware input and bus specification	x
5	Not Used		0
6	Not Used		0
7	Fault	There is a fault in the flame safeguard	x
8...15	Not Used		0

Modbus Standard Transfer Area

Bit	Input Byte EB2 Register Address 2	Description	During Fault
0-7	State Number or Error Code	Current state number or error code if there is a fault	x
8...15	Not Used		0

Bit	Input Byte EB3 Register Address 3	Description	During Fault
0-7	Flame Quality	Quality of the flame via ionization input (Terminal 5)	0
8...15	Not Used		0

Bit	Input Byte EB4 Register Address 4	Description	During Fault
0	More Heat	HW input state	x
1	Less Heat	HW input state	x
2	High Fire	HW input state	x
3	Low Fire	HW input state	x
4	Warning: More/Less Heat Simultaneously On		x
5	Not Used		0
6	Not Used		0
7	Not Used		0
8-15	Not Used		0

Bit	Input Byte EB5 Register Address 5	Description	During Fault
0	0..1 OR 8..9: Output State		x
1	Switch Modulation (2-bit): 0 = Off 01 = Relay 1 10 = Relay 2 11 = Relay 3		x
2	Warning: Low/High Fire Simultaneously On		x
3	Not Used		0
4	Not Used		0
5	Not Used		0
6	Not Used		0
7	Not Used		0
8-15	Not Used		0

Bit	Input Byte EB6 Register Address 6	Description	During Fault
0-15	Degree of Modulation in %		x

Modbus Extended Transfer Area

Bit	Input Byte EB7 Register Address 7	Description	During Fault
0-7	Resettable Runtime Meter	Low byte (byte 0) of the 32-bit runtime counter (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB8 Register Address 8	Description	During Fault
0-7	Resettable Runtime Meter	Byte 1 of the 32-bit runtime meter (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB9 Register Address 9	Description	During Fault
0-7	Resettable Runtime Meter	Byte 2 of the 32-bit runtime meter (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB10 Register Address 10	Description	During Fault
0-7	Resettable Runtime Meter	High byte (byte 3) of the 32-bit runtime meter (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB11 Register Address 11	Description	During Fault
0-7	Resettable Start Counter	Low byte (byte 0) of the 32-bit start counter	x
8...15	Not Used		0

Bit	Input Byte EB12 Register Address 12	Description	During Fault
0-7	Resettable Start Counter	Byte 1 of the 32-bit start counter	x
8...15	Not Used		0

Bit	Input Byte EB13 Register Address 13	Description	During Fault
0-7	Resettable Start Counter	Byte 2 of the 32-bit start counter	x
8...15	Not Used		0

Bit	Input Byte EB14 Register Address 14	Description	During Fault
0-7	Resettable Start Counter	High byte (byte 3) of the 32-bit start counter	x
8...15	Not Used		0

Bit	Input Byte EB15 Register Address 15	Description	During Fault
0-7	Switching Cycles Counter V2	Low byte (byte 0) of the 32-bit switching cycle counter V2	x
8...15	Not used		0

Bit	Input Byte EB16 Register Address 16	Description	During Fault
0-7	Switching Cycles Counter V2	Byte 1 of the 32-bit switching cycle counter V2	x
8...15	Not used		0

Bit	Input Byte EB17 Register Address 17	Description	During Fault
0-7	Switching Cycles Counter V2	Byte 2 of the 32-bit switching cycle counter V2	x
8...15	Not used		0

Bit	Input Byte EB18 Register Address 18	Description	During Fault
0-7	Switching Cycles Counter V2	High byte (byte 3) of the 32-bit switching cycle counter V2	x
8...15	Not used		0

Bit	Input Byte EB19 Register Address 19	Description	During Fault
0-7	Runtime Meter V2	Low byte (byte 0) of the 32-bit runtime meter V2 (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB20 Register Address 20	Description	During Fault
0-7	Runtime Meter V2	Byte 1 of the 32-bit runtime meter V2 (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB21 Register Address 21	Description	During Fault
0-7	Runtime Meter V2	Byte 2 of the 32-bit runtime meter V2 (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB22 Register Address 22	Description	During Fault
0-7	Runtime Meter V2	High byte (byte 3) of the 32-bit runtime meter V2 (in seconds)	x
8...15	Not Used		0

Bit	Input Byte EB23 Register Address 23*	Description	During Fault
0-7	Additional Error Information 1	First additional error information byte	x
8...15	Not Used		0

Bit	Input Byte EB24 Register Address 24*	Description	During Fault
0-7	Additional Error Information 4	Fourth additional error information byte	x
8...15	Not Used		0

Bit	Input Byte EB25 Register Address 25	Description	During Fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	x
2	Flame 2 NC / Gas Pressure Switch	There is a signal for flame 2 NC or gas pressure switch	x
3	Flame Detection	The resulting flame signal has been detected	x
4	Air Pressure Switch	Sufficient air pressure available	x
5	Input for Burner Start	Signal of the hardware input "burner start"	x
6	Valve 1	The gas valve V1 is open	x
7	Valve 2	The gas valve V2 is open	x
8	Spark Generator	Ignition active	x
9	Manual Mode	Manual mode active	x
10	Fan	Fan relay on	x
11	Not Used		0
12	Burner Start (hardware + bus)	Evaluation between burner start hardware input and bus specification	x
13	Not Used		0
14	Not Used		0
15	Fault	There is a fault in the flame safeguard	x

*See error messages section for more information on data contained in EB23 and EB24. Not all error messages contain additional information.

Bit	Input Byte EB26 Register Address 26	Description	During Fault
0-7	State Number or Error Code	Current state number or error code if there is a fault	x
8-15	Flame Quality	Quality of the flame via ionization input	0

Bit	Input Byte EB27 Register Address 27	Description	During Fault
0	More Heat	HW input state	x
1	Less Heat	HW input state	x
2	High Fire	HW input state	x
3	Low Fire	HW input state	x
4	Warning: More/Less Heat Simultaneously On		x
5	Not Used		x
6	Not Used		x
7	Not Used		x
8..9	Output State Switch Modulation (2-bit): 0 = Off 01 = Relay 1 10 = Relay 2 11 = Relay 3		x
10	Warning: Low/High Fire Simultaneously On		x
11	Not Used		0
12	Not Used		0
13	Not Used		0
14	Not Used		0
15	Not Used		0

Bit	Input Byte EB28 Register Address 28	Description	During Fault
0-15	Degree of Modulation in %		x

Bit	Input Byte EB29 Register Address 29	Description	During Fault
0-7	Resettable Runtime Meter	Low byte (byte 0) of the 32-bit runtime meter (in seconds)	x
8-15	Resettable Runtime Meter	Byte 1 of the 32-bit runtime meter (in seconds)	x

Bit	Input Byte EB30 Register Address 30	Description	During Fault
0-7	Resettable Runtime Meter	Byte 2 of the 32-bit runtime meter (in seconds)	x
8-15	Resettable Runtime Meter	High byte (byte 3) of the 32-bit runtime meter (in seconds)	x

Bit	Input Byte EB31 Register Address 31	Description	During Fault
0-7	Resettable Start Counter	Low byte (byte 0) of the 32-bit start counter	x
8-15	Resettable Start Counter	Byte 1 of the 32-bit start counter	x

Bit	Input Byte EB32 Register Address 32	Description	During Fault
0-7	Resettable Start Counter	Byte 2 of the 32-bit start counter	x
8-15	Resettable Start Counter	Byte 3 of the 32-bit start counter	x

Bit	Input Byte EB33 Register Address 33	Description	During Fault
0-7	Switching Cycles Counter V2	Low byte (byte 0) of the 32-bit switching cycles counter V2	x
8-15	Switching Cycles Counter V2	Byte 1 of the 32-bit switching cycles counter V2	x
Bit	Input Byte EB34 Register Address 34	Description	During Fault
0-7	Switching Cycles Counter V2	Byte 2 of the 32-bit switching cycles counter V2	x
8-15	Switching Cycles Counter V2	High byte (byte 3) of the 32-bit switching cycles counter V2	x
Bit	Input Byte EB35 Register Address 35	Description	During Fault
0-7	Runtime Meter V2	Low byte (byte 0) of the 32-bit runtime meter V2 (in seconds)	x
8-15	Runtime Meter V2	Byte 1 of the 32-bit runtime meter V2 (in seconds)	x
Bit	Input Byte EB36 Register Addres 36	Description	During Fault
0-7	Runtime Meter V2	Byte 2 of the 32-bit runtime meter V2 (in seconds)	x
8-15	Runtime Meter V2	High byte (byte 3) of the 32-bit runtime meter V2 (in seconds)	x
Bit	Input Byte EB37 Register Addres 37*	Description	During Fault
0-7	Additional Error Information 1	First additional error info byte	x
8-15	Additional Error Information 4	Fourth additional error info byte	x

*See error messages section for more information on data contained in EB37. Not all error messages contain additional information.

Modbus Special Extended Transfer Area

In the following inputs, EB21 - EB31, the information is linked to allow the complete use of the 16 bits register. Use of these can reduce the bus load.

Bit	Input Byte EB21 Register Address 21	Description	During Fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	x
2	Flame 2 NC	There is a signal for flame 2 NC input, (flame, gas pressure or valve closed)	x
3	Flame Detection	The resulting flame signal has been detected	x
4	Air Pressure Switch	Sufficient air pressure	x
5	Input for Burner Start	Signal of the hardware input "Burner start"	x
6	Valve 1	The gas valve V1 is open	x
7	Valve 2	The gas valve V2 is open	x
8	Spark Generator	Ignition active	x
9	Manual Mode	Manual mode active	x
10	Fan	Fan relay on	x
11	Not Used		0
12	Burner Start (hardware + bus)	Evaluation between burner start hardware input and bus specification	x
13	Not Used		0
14	Not Used		0
15	Fault	There is a fault in the flame safeguard	x
Bit	**Input Byte EB22 Register Address 22**	**Description**	**During Fault**
0-7	Error Code	Current state number OR error code if there is a fault	x
8-15	Flame Quality	Quality of the flame over ionization input	0
Bit	**Input Byte EB23 Register Address 23**	**Description**	**During Fault**
0-7	Resettable Runtime Meter	Low byte (byte 0) of the 32-bit runtime meter	x
8-15	Resettable Runtime Meter	Byte 1 of the 32-bit runtime meter	0
Bit	**Input Byte EB24 Register Address 24**	**Description**	**During Fault**
0-7	Resettable Runtime Meter	Byte 2 of the 32-bit runtime meter	x
8-15	Resettable Runtime Meter	High byte (byte 3) of the 32-bit runtime meter	x
Bit	**Input Byte EB25 Register Address 25**	**Description**	**During Fault**
0-7	Resettable Start Counter	Low byte (byte 0) of the 32-bit start counter	x
8-15	Resettable Start Counter	Byte 1 of the 32-bit start counter	x
Bit	**Input Byte EB26 Register Address 26**	**Description**	**During Fault**
0-7	Resettable Start Counter	Byte 2 of the 32-bit start counter	x
8-15	Resettable Start Counter	High byte (byte 3) of the 32-bit start counter	x
Bit	**Input Byte EB27 Register Address 27**	**Description**	**During Fault**
0-7	Switching Cycles Counter V2	Low byte (byte 0) of the 32-bit cycle counter V2	x
8-15	Switching Cycles Counter V2	Byte 1 of the 32-bit cycle counter V2	x

Bit	Input Byte EB28 Register Address 28	Description	During Fault
0-7	Switching Cycles Counter V2	Byte 2 of the 32-bit cycle counter V2	x
8-15	Switching Cycles Counter V2	High byte (byte 3) of the 32-bit cycle counter V2	x
Bit	**Input Byte EB29** **Register Address 29**	**Description**	**During Fault**
0-7	Runtime Meter V2	Low byte (byte 0) of the 32-bit runtime meter V2	x
8-15	Runtime Meter V2	Byte 1 of the 32-bit runtime meter V2	x
Bit	**Input Byte EB30** **Register Address 30**	**Description**	**During Fault**
0-7	Runtime Meter V2	Byte 2 of the 32-bit runtime meter V2	x
8-15	Runtime Meter V2	High byte (byte 3) of the 32-bit runtime meter V2	x
Bit	**Input Byte EB31** **Register Address 31***	**Description**	**During Fault**
0-7	Additional Error Information	First additional error information byte	x
8-15	Not Used	Not used	0

*See error messages section for more information on data contained in EB31. Not all error messages contain additional information.

Flame detectors tested and authorized by Eclipse:

Designation	Type	Output Signal	Safety Time Flame Detector	Total Reaction Time After Flame Lift-Off	Intermittent	Continuous Operation
Flame Rod (Electrode)	Ionization	Ionization	0s	P41	Yes	Yes
UV 41HE	UV tube	Ionization	0.125s (2/16s)	P41 + 0.125s	Yes	Continuous operation only together with shutter function
UV 42	UV tube	Switching output 230 VAC	0.125s (2/16s)	P42 + 0.125s	Yes	Continuous operation only together with shutter function
FLW 41I	Ionization	Ionization	0.19s (3/16s)	P41 + 0.19s	Yes	Continuous operation only in connection with shutter signal

Flame detectors not included in this list must be authorized by Eclipse before being used.
NOTE: Even though the UV 41HE, UV 42 and FLW 41I operate at 230VAC, the output is compatible with 115V models.

When using flame detectors not specified in this instruction manual:

The flame detectors must be tested and approved for monitoring burners.

The reaction times (FFRT) must be observed!

Total reaction time is equal to the reaction time of the flame safeguard plus the reaction time of the flame detector.

The reaction time after a flame lift-off of an external flame detector may not be longer than the pilot or main flame proving period.

For Europe, proof of compliance with the requirements of EN 298 is required.

NOTE: The use of other flame detectors with ionization or contact outputs must carry the approval mark of the agency (CE, FM, UL, CSA, GOST, AGA, etc.) as required by the end-use application and location.

When connected to the ionization input, Terminal 5, the ionization behavior of a flame must be simulated (rectifier effect). The following values are active on the ionization input and output of the flame safeguard:
230 VAC, +10%, -15%.

The internal resistance of the flame safeguard is approximately 1 MΩ. For safety reasons, the flame detector must work properly, and with an internal resistance of 360 kΩ. Under these conditions, the simulation circuit in the flame detector must reach at least a direct current 3 µA.

If an alternating current with a DC component is simulated, the DC component should reach at least 25%.

The current can be derived to N, PE or returned to N on the flame safeguard.
When connected to flame detector 2, the switching output of a suitable flame detector must be connected to flame detector 2, Terminal 16 NO (115 VAC or 230 VAC).

For continuous operation, flame detector 2, Terminal 17 NC must also be connected (EXOR signal). The selected flame detector must be certified for continuous operation. Alternatively, a flame detector for intermittent operation (only NO) may be used in continuous operation if combined with shutter model UV 4x.

For Europe, the EMC regulations must be observed (EN 298). The entire system must not produce inadmissible emissions.

T600 is not galvanically isolated.
T600 and the flame detector must be connected according to the correct phase.

ATTENTION:
Eclipse cannot be held liable if the flame detector and the flame safeguards do not work properly together, especially if the electromagnetic behavior does not follow the regulations or if the time-dependent behavior (FFRT) is not correct.

UV 41HE

The UV 41HE flame detector responds to UV radiation from the flame and provides a simulated ionization signal to the T600. It is suitable for intermittent operation.

For use in continuous operation applications, the UV 4x shutter is also required.

The complete assembly includes a 1/2" NPT adapter for mounting the UV 41HE to the burner sighting pipe and a M16x1.5 to 1/2" NPT fitting adapter for the wiring conduit.

Technical Data

UV 41HE General	
Rated Voltage	230 VAC -15%...+10%
Frequency	50…60 Hz
Power Consumption	< 1 W
Approvals	CE, FM, UL Recognized, CAN/CSA-C22.2, GOST, AGA
Spectral Response	185 to 260 nm
Type of Protection	IP 54 (approximately equivalent to NEMA 3)
Ambient Temperature	-40°C ... +60°C (-40°F ... +140°F) -40°C ... +80°C (-40°F ... +176°F) with reduced lifetime of the UV tube
Storage and Transport	-40°C ... +80°C (-40°F ... +176°F)
Lifetime	10,000 operating hours
Humidity	DIN 60730-1, no condensation permitted
Mounting Position	as desired
Dimensions	Diameter: 44.5 mm (1.8 inches) Length: 94 mm (3.7 inches) Length with threaded adapter: approx. 128 mm (5 inches)
Maximum Line Length	10 m (32.8 ft)

Even though the UV 41HE operates at 230VAC, the output is compatible with the 115V models of the T600.

Dimensions in mm (inches)

UV 41HE   **Mounting Adapter**

136.8 (5.4)

65.5 (2.6)

1/2" NPT

Ø44.5 (1.8)

1/2" NPT

50 (2.0)

1/2" NPT (female)

44.5 (1.8)
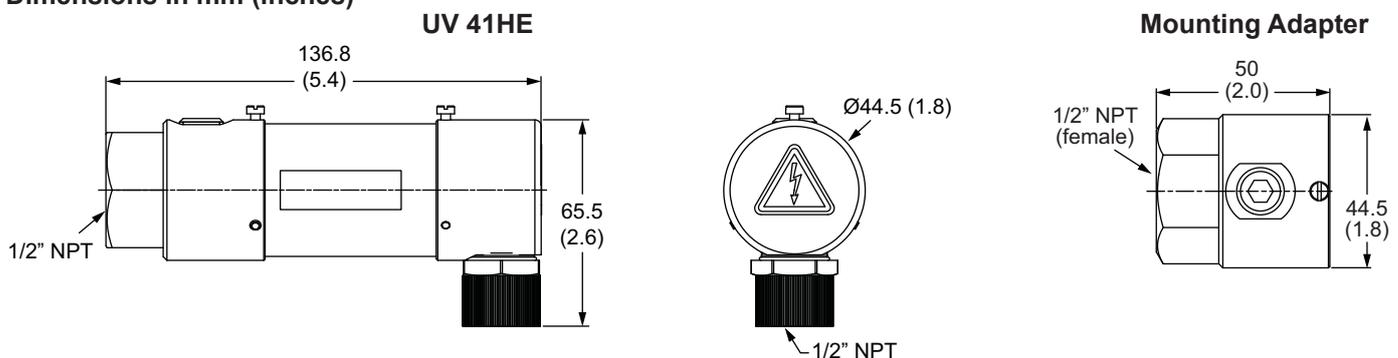
Figure 10e-1

Installation

Mount the UV41HE with the shortest practical sighting pipe onto the burner. Excessively long sighting pipes will narrow the field of view and reduce the detector sensitivity to weak flames.

The UV sensor will also detect external sources of radiation and should be guarded against flames from other devices or burners; mercury, sterilization, and halogen lamps; electrical and welding sparks; radioactive sources; and high electric fields (including static).

The lifetime of the UV sensor tube is 10,000 hours under mild environmental conditions. The lifetime is reduced with increasing ranges of temperature, vibration and mechanical shock.

The UV sensor tube can be damaged by impacts and high vibration. Take care in handling and check the mounting connections for tightness to prevent unintended drop.

Where the process sighting path or the conducted heat from the burner will exceed 60°C (140°F), use an adapter with a quartz window and, if necessary, a purging air connection.

ATTENTION
The maximum allowed line lengths must not be exceeded. Supply and signal lines for other equipment must be laid separately, as far apart as possible.

ATTENTION
The supplied fitting adapter can be removed and replaced with any appropriate M16x1.5 cable fitting. Be sure the required cable or conduit is properly supported against its own weight and that the fitting connections maintain the required protection class. For flexible cable, the diameter range is 5 to 9 mm with 3 conductors plus shield where the individual wire sizes range from 0.75 mm² (20 AWG) to 1.5 mm² (16 AWG).

The protective earth conductor (PE) must be connected using an insulated female connector for the grounding tab, 6.3 mm width x 0.8 mm thick (0.250" x 0.032") or to DIN 46245-3.

The length of the connector should not exceed 22 mm to prevent interference with the cover. Examples of connectors: Panduit DPF18-250FIB-C for wires 18-22 AWG or DPF14-250FIB-C for 16-14 AWG.

Electrical Connection

Figure 10e-2

Connector	UV 41HE	T600
1	O (Out)	5 (Ionization)
2	N (Neutral)	N (Neutral Bar)
3	L (Line)*	7 (Flame Detector Supply)
Ground or shield wire	⊥ (PE / Earth)	⊥ (PE bar)

*Line voltage refers to required scanner power voltage on 230 VAC.

Part Number	Description
101014097	UV 41HE with 1/2" NPT mounting adapter with quartz lens
101014093	UV 41HE replacement scanner (without mounting adapter)
101014240	1/2" NPT mounting adapter with quartz lens

UV 42

10-f

The UV 42 flame detector responds to UV radiation from the flame and provides a 230 VAC signal to the second flame detector input of the T600. It is suitable for intermittent operation.

For use in continuous operation applications, the UV 4x EM 1/1 shutter is also required.

The complete assembly includes a 1/2" NPT adapter for mounting the UV 42 to the burner sighting pipe and a M16x1.5 to 1/2" NPT fitting adapter for the wiring conduit.

Technical Data

UV 42 General	
Rated Voltage	230 VAC -15%...+10%
Frequency	50…60 Hz
Power Consumption	< 1 W
Approvals	CE, FM, UL Recognized, CAN/CSA-C22.2, GOST, AGA
Spectral Response	185 to 260 nm
Type of Protection	IP 54 (approximately equivalent to NEMA 3)
Ambient Temperature	-40°C ... +60°C (-40°F ... +140°F) -40°C ... +80°C (-40°F ... +176°F) with reduced lifetime of the UV tube
Storage and Transport	-40°C ... +80°C (-40°F ... +176°F)
Lifetime	10,000 operating hours
Humidity	DIN 60730-1, no condensation permitted
Mounting Position	as desired
Dimensions	Diameter: 44.5 mm (1.8 inches) Length: 94 mm (3.7 inches) Length with threaded adapters: approx. 128 mm (5 inches)
Maximum Line Length	100 m (328 ft)

Even though the UV 42 operates at 230VAC, the output is compatible with the 115V models of the T600.

Dimensions in mm (inches)

UV 42

Mounting Adapter
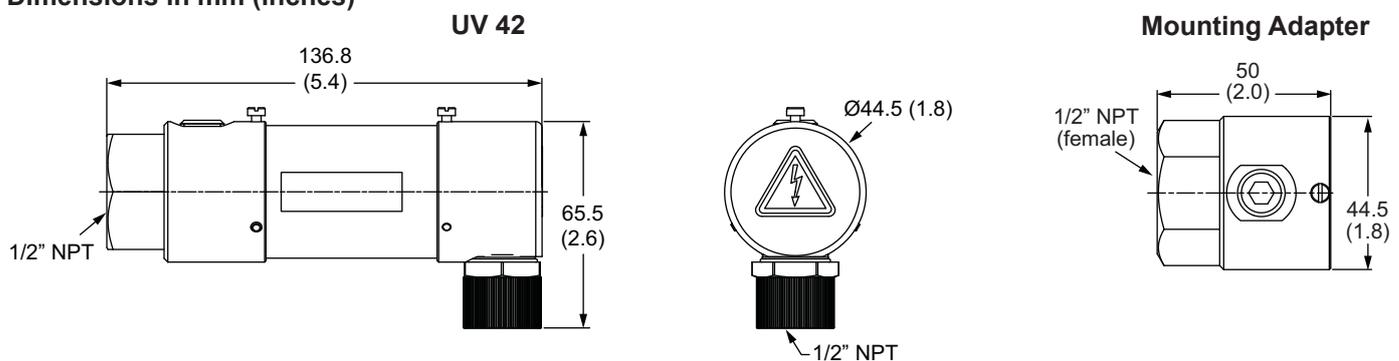
Figure 10f-1

Installation

Mount the UV42 with the shortest practical sighting pipe onto the burner. Excessively long sighting pipes will narrow the field of view and reduce the detector sensitivity to weak flames.

The UV sensor will also detect external sources of radiation and should be guarded against flames from other devices or burners; mercury, sterilization, and halogen lamps; electrical and welding sparks; radioactive sources; and high electric fields (including static).

The lifetime of the UV sensor tube is 10,000 hours under mild environmental conditions. The lifetime is reduced with increasing ranges of temperature, vibration and mechanical shock.

The UV sensor tube can be damaged by impacts and high vibration. Take care in handling and check the mounting connections for tightness to prevent unintended drop.

Where the process sighting path or the conducted heat from the burner will exceed 60°C (140°F), use an adapter with a quartz window and, if necessary, a purging air connection.

ATTENTION

The maximum allowed line lengths must not be exceeded. Supply and signal lines for other equipment must be laid separately, as far apart as possible.

ATTENTION

The supplied fitting adapter can be removed and replaced with any appropriate M16x1.5 cable fitting. Be sure the required cable or conduit is properly supported against its own weight and that the fitting connections maintain the required protection class. For flexible cable, the diameter range is 5 to 9 mm with 3 conductors plus shield where the individual wire sizes range from 0.75 mm^2 (20 AWG) to 1.5 mm^2 (16 AWG).

The protective earth conductor (PE) must be connected using an insulated female connector for the grounding tab, 6.3 mm width x 0.8 mm thick (0.250" x 0.032") or to DIN 46245-3. The length of the connector should not exceed 22 mm to prevent interference with the cover. Examples of connectors: Panduit DPF18-250FIB-C for wires 18-22 AWG or DPF14-250FIB-C for 16-14 AWG.

Electrical connection

Figure 10f-2

Connector	UV 42	T600
1	O (Out)	16 (NO)
2	N (Neutral)	N (Neutral Bar)
3	L (Line)*	7 (Flame Detector Supply)
Ground or shield wire	$\perp$ (PE / Earth)	$\perp$ (PE bar)

*Line voltage refers to required scanner power voltage on 230 VAC.

Part Number	Description
101014101	UV 42 with 1/2" NPT mounting adapter with quartz lens
101013620	UV 42 replacement scanner (without mounting adapter)
101014240	1/2" NPT mounting adapter with quartz lens

UV 4x EM 1/1 (Shutter Module)

The UV 4x shutter module allows continuous operation when used in conjunction with UV 41HE or UV 42 UV scanners and an appropriately configured T600 flame safeguard.

The shutter module is inserted between the UV scanner and the corresponding mounting adapter.

A separate power supply is not necessary as only the shutter signal provided by the T600 with optional shutter control must be connected.

The assembly includes a M16x1.5 to 1/2" NPT fitting adapter for the wiring conduit.

Technical data

| UV 4x EM 1/1 General (shutter module)	
Part Number	101015404
Rated Voltage	24 VDC
Approvals	CE, FM, UL Recognized, CAN/CSA-C22.2, GOST, AGA
Type of Protection	IP 54 (approximately equivalent to NEMA 3)
Ambient Temperature	-20°C ... +60°C (-4°F ... +140°F) -40°C ... +80°C (-40°F ... +176°F) (with reduced lifetime)
Storage and Transport	-40°C ... +80°C (-40°F ... +176°F)
Humidity	DIN 60730-1, no condensation permitted
Lifetime	1 million switchings for rates of 1 operation per 5 minutes or longer
Mounting Position	as desired
Dimensions	Diameter: 44.5 mm (1.8 inches) Length: 75 mm (3 inches) Height: approx. 101 mm (4 inches)
Maximum Line Length	100 m (328 ft)

UV 4x EM 1/1 Dimensions in mm (inches)
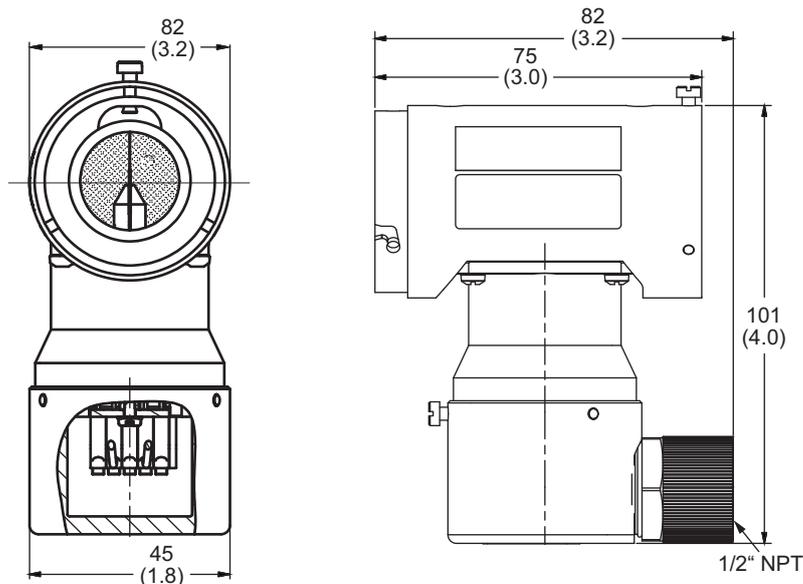
**Figure 10g-1**

ATTENTION

The maximum allowed line lengths must not be exceeded. Supply and signal lines must be laid separately, as far apart possible.

ATTENTION

The supplied fitting adapter can be removed and replaced with any appropriate M16x1.5 cable fitting. Be sure the required cable or conduit is properly supported against its own weight and that the fitting connections maintain the required protection class. For flexible cable, the diameter range is 5 to 9 mm with 3 conductors plus shield where the individual wire sizes range from 0.75 mm^2 (20 AWG) to 1.5 mm^2 (16 AWG).

The shutter module is mounted between the UV 41HE or UV 42 flame detector and the mounting adapter.

The T600 supports the use of one shutter module with either a UV 41HE or a UV 42 scanner for continuos operation.

Figure 10g-2

Electrical Connection
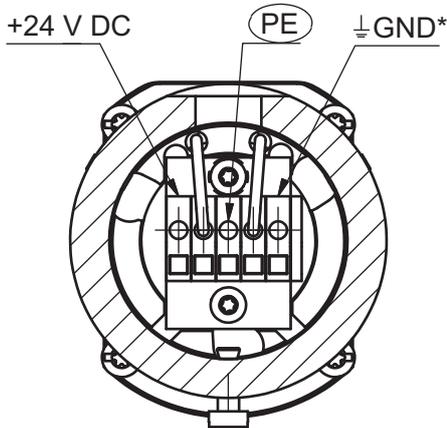
Figure 10g-3

Connector	UV 4x EM 1/1	T600
1	+24 VDC	+ shutter
2	PE	PE bar
3	$\perp$ GND*	- shutter

*NOTE: $\perp$ GND terminal of UV 4x EM 1/1 wires to the (-) shutter terminal in the T600.
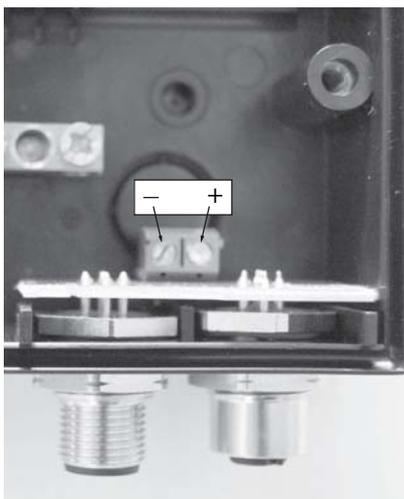
Purge / No Purge Type 3
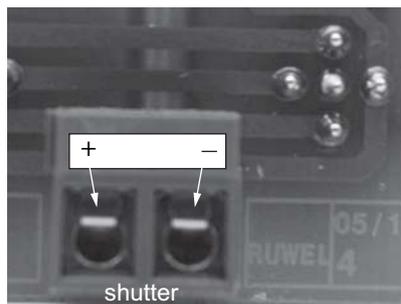

Purge / No Purge Types 1 and 2

Figure 10g-4

FLW 41I

The FLW 41I flame detector module allows a T600 to monitor burners with two ionization detectors (flame rods). The unit is suitable for intermittent operation and also for continuous operation when connected with an electronic shutter signal. The FLW 41I is powered from the T600. The output of the FLW 41I is connected to the second flame detector input of the T600.

Technical data

FLW 41I General	
Part Number	101015002
Rated Voltage*	230 VAC -15%...+10%
Approvals	CE, CAN/CSA-C22.2, GOST, AGA
Frequency	50…60 Hz
Power Consumption	< 3W
Type of Protection	IP 54 (approximately equivalent to NEMA 3)
Ambient Temperature	-40°C ... +70°C (-40°F ... +158°F)
Storage and Transport	-40°C ... +80°C (-40°F ... +176°F)
Humidity	<95%, no condensation permitted, (tested to DIN 60730-1)
Mounting Position	as desired
Dimensions (LxHxT)	approx. 152.5 x 151.5 x 77 mm (6.0 x 6.0 x 3.0 inches)
Weight	0.6 kg (1.3 lb)
Maximum Line Length	100 m (328 ft)
Display	LED (3)

*Even though the FLW 41I operates at 230VAC, the output is compatible with the 115V models of the T600.

FLW 41I Dimensions in mm (inches)
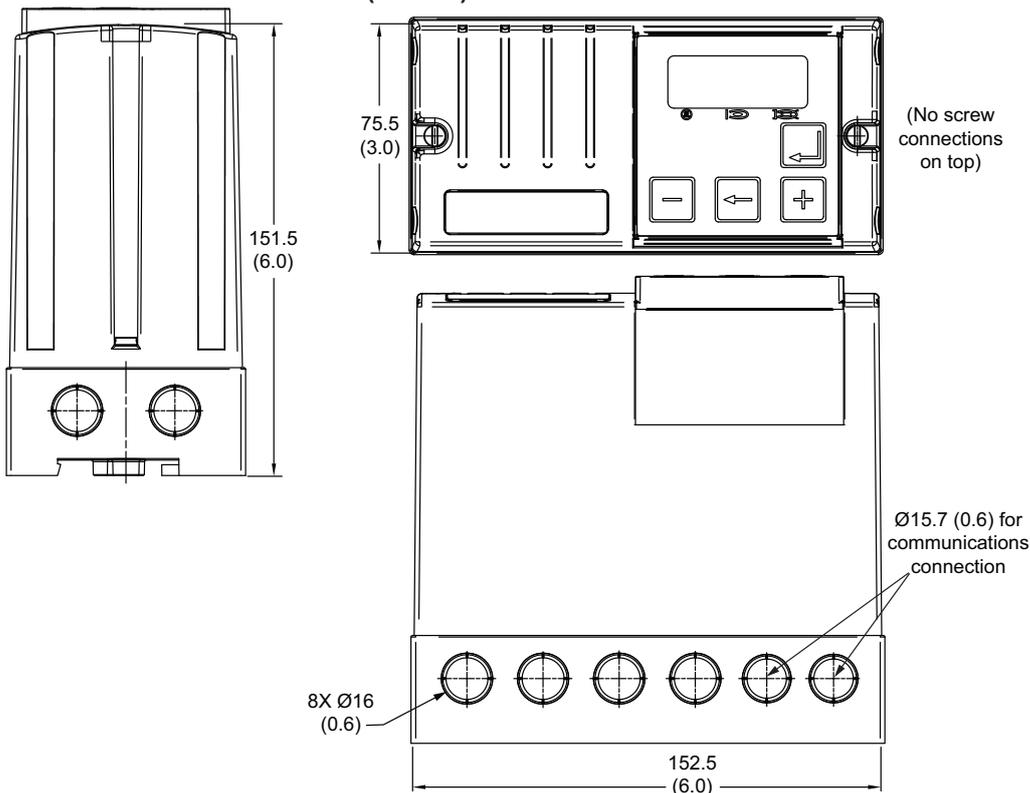
Figure 10h-1

Assembly

The FLW 41I can be mounted either on a standard 35mm DIN rail or by means of a direct screw connection (all mounting dimensions are identical to the T600)

ATTENTION

The maximum allowed line lengths must not be exceeded.

Only one FLWI (and no other devices) may connect to the T600 detector supply, terminal 7.

Supply and signal lines must be laid separately.

Function

The FLW 41I allows either a flame to be monitored at two measuring points or two flames to be monitored independently of one another.

If the T600 is configured with shutter control, the FLW 41I is suitable for continuous operation.

Example

Flame detector 1

T600

Flame detector 2

FLW 41I

Figure 10h-2

Display:

Shutter signal
Flame signal
Voltage supply ON
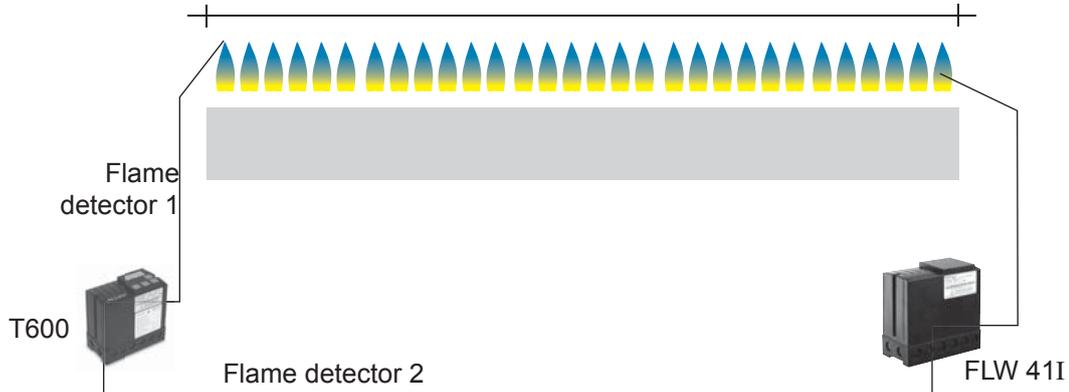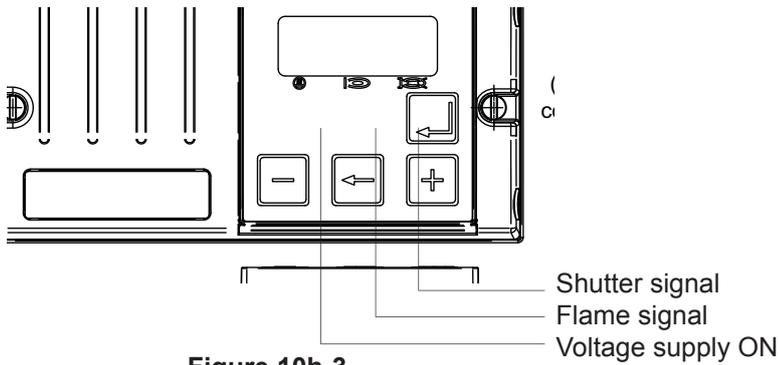
Figure 10h-3

FLW 41I Wiring Diagram

1	To Terminal 16 on T600
From Terminal 7 on T600 — 2	
3	To Neutral Bar on T600
4	To Ground Bar on T600
Flame Rod Connection — 5	
7	Self Check Shutter 1 (+)
8	Self Check Shutter 2 (-)

Figure 10h-4