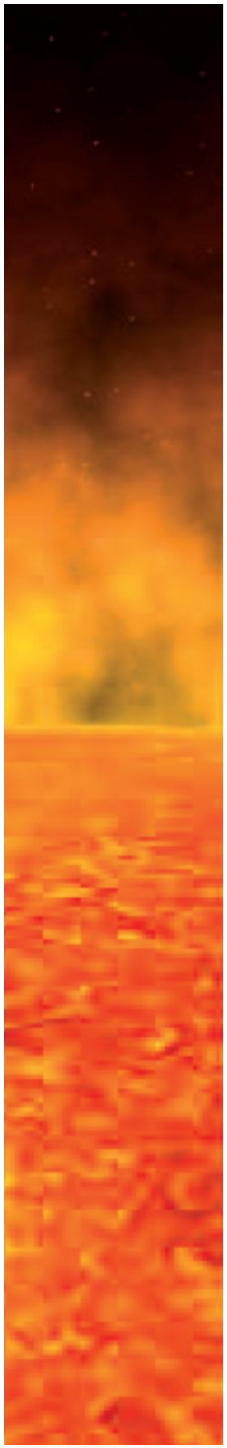


Munters SIAL®

Mobile Diesel Heaters
TOR / MIR

Technical Training Course

Munters

Rev. No. 0 March 3rd, 2010

MIR
Indirect-fired Diesel Heaters

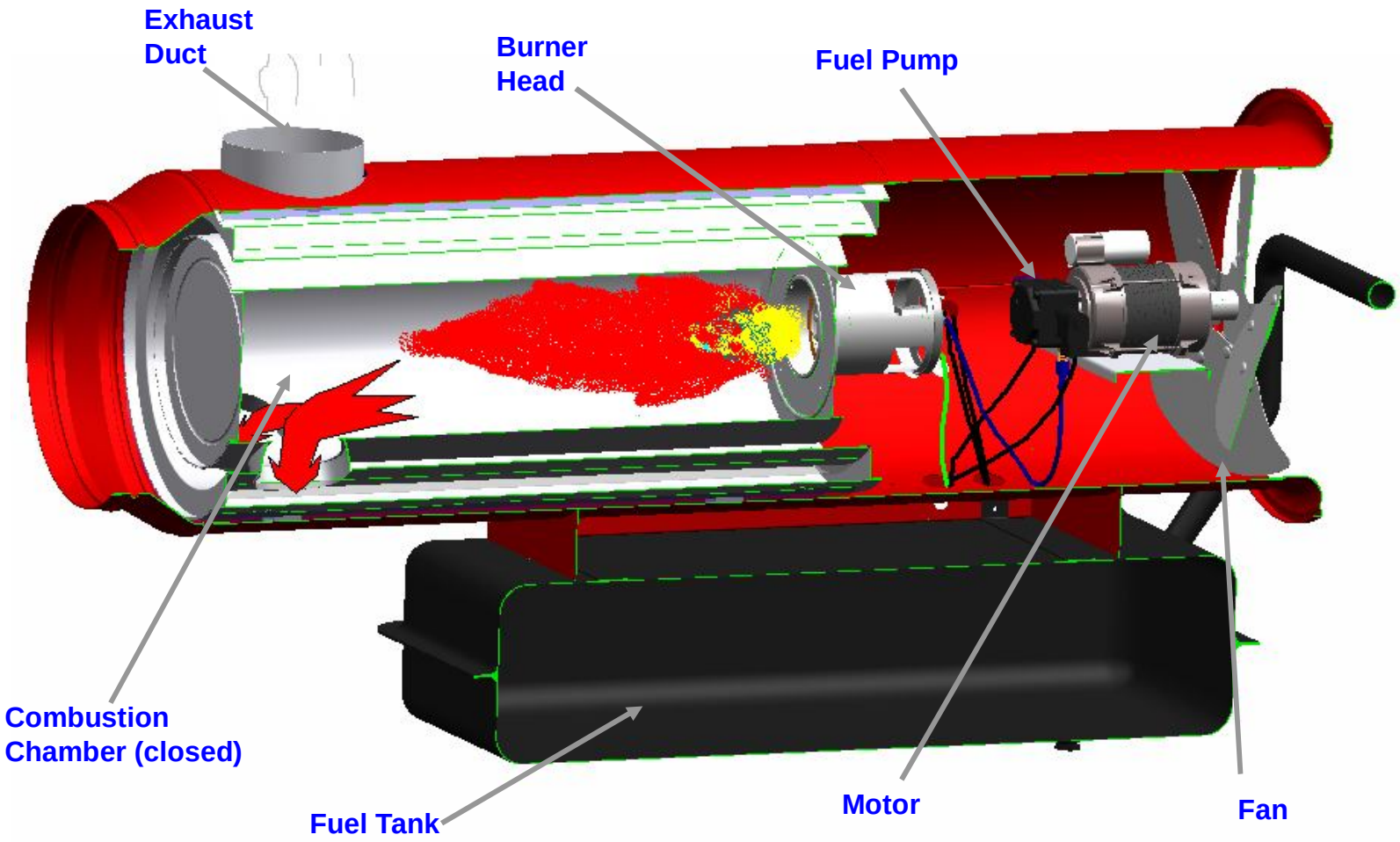
•	MIR 37 WE	MIRAGE 37 H	
•	MIR 55 WE	MIRAGE 55 H	(EURO MODELS)
•	MIR 85 WE	MIRAGE 85 H	
•	MIR 37 WU	MIRAGE 125 H	
•	MIR 55 WU	MIRAGE 180 H	(USA MODELS)
•	MIR 85 WU	MIRAGE 290 H	

TOR
Direct-fired Diesel Heaters

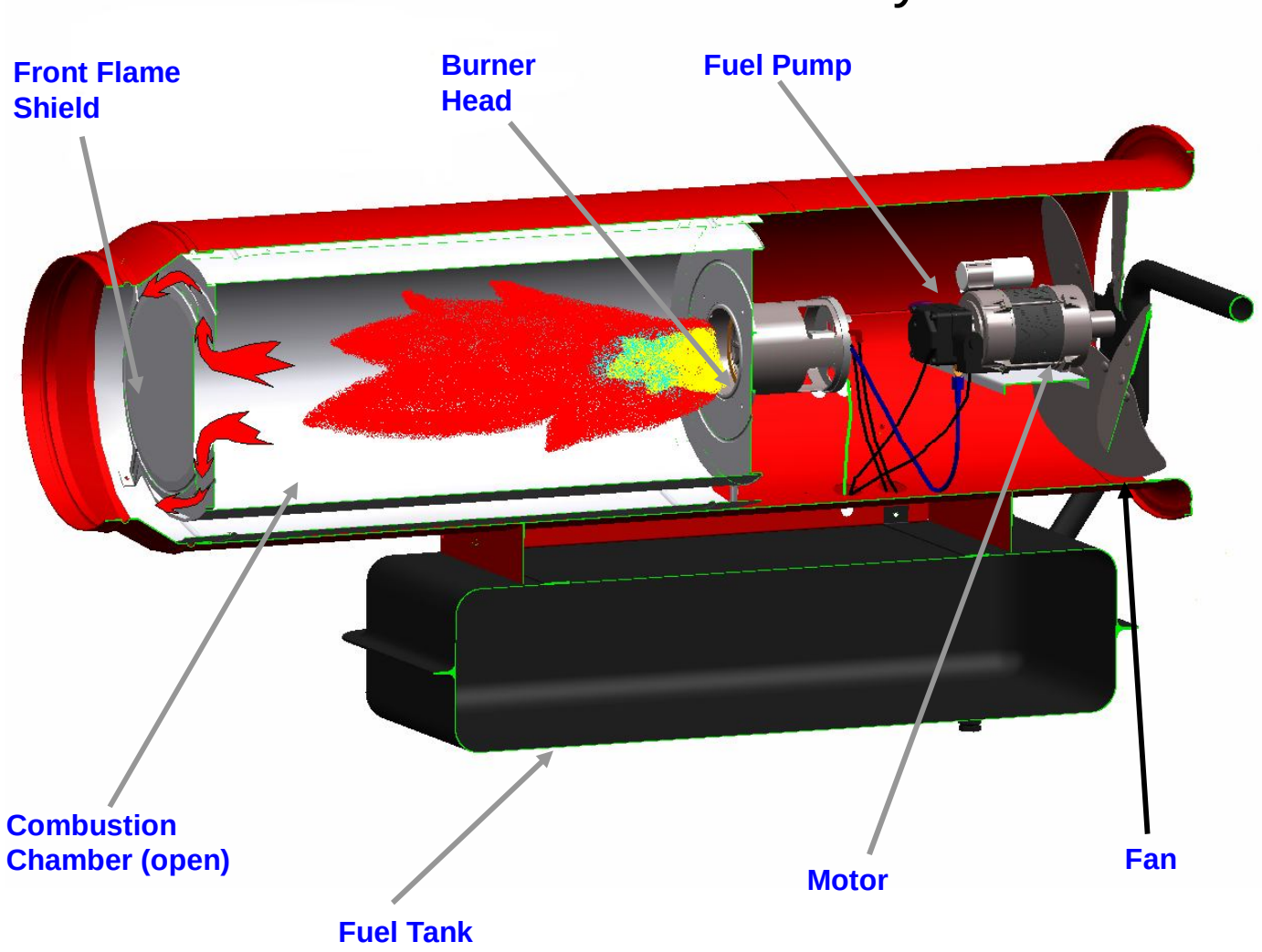
- TOR 67 WE TORNADO 67
- TOR 115 WE TORNADO 115 (EURO MODELS)

- TOR 67 WU TORNADO 230
- TOR 115 WU TORNADO 400 (USA MODELS)
- TOR 175 WU TORNADO 610

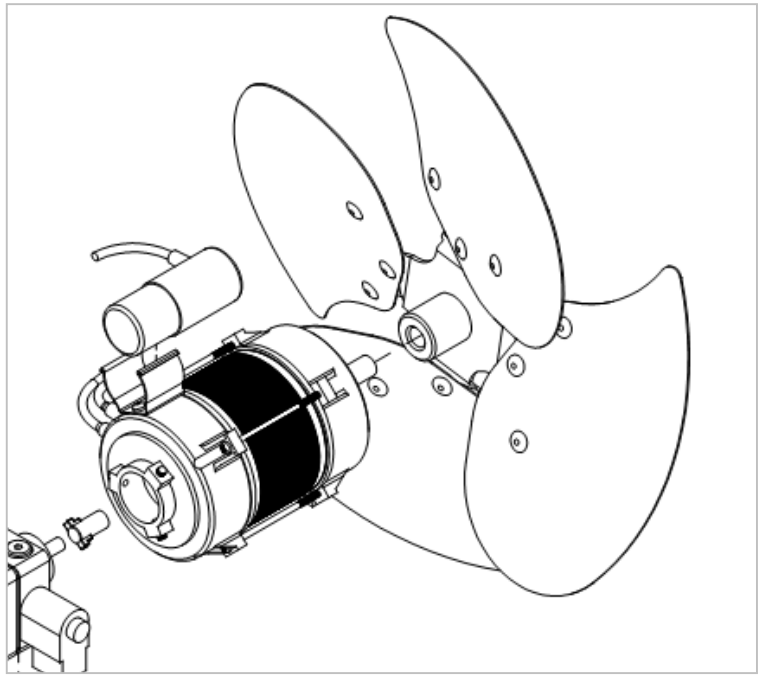
MIR
General Assembly



TOR
General Assembly



FAN MOTOR ASSEMBLY



EU Motors

430W	2700 rpm	2 poles	16 µF	MIR 37 WE - MIR 55 WE - TOR 67 WE
750W	1400 rpm	4 poles	20 µF	MIR 85 WE - TOR 115 WE

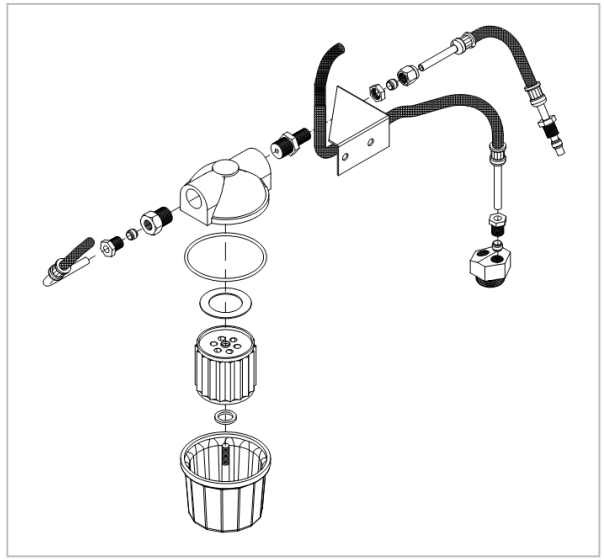
US Motors

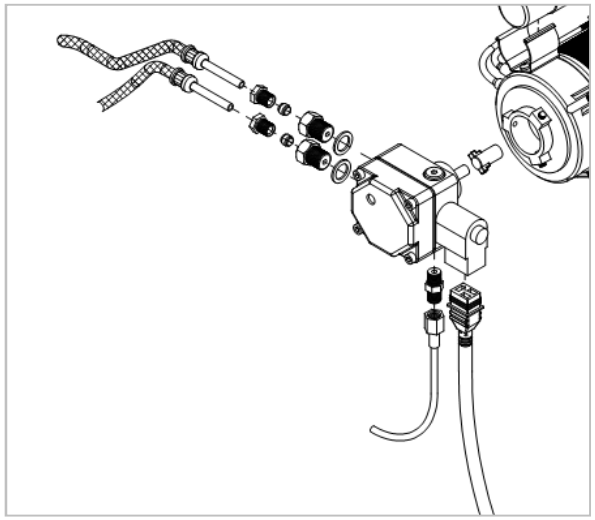
430W	3300 rpm	2 poles	50 µF	MIR 37 WU - MIR 55 WU - TOR 67 WU
750W	1650 rpm	4 poles	80 µF	MIR 85 WU - TOR 115 WU
1100W	1650 rpm	4 poles	100 µF	TOR 175 WU

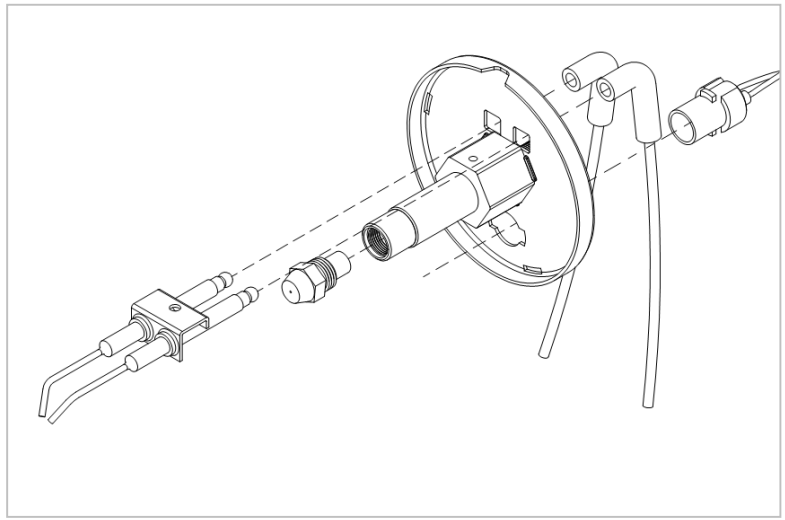
FUEL CIRCUIT

The fuel circuit is basically composed of :

- fuel tank
- suction and return hoses
- fuel filter (normal or heated)
- fuel pump
- fuel solenoid valve
- high pressure microhose
- burner head
- nozzle







Fuel Tank

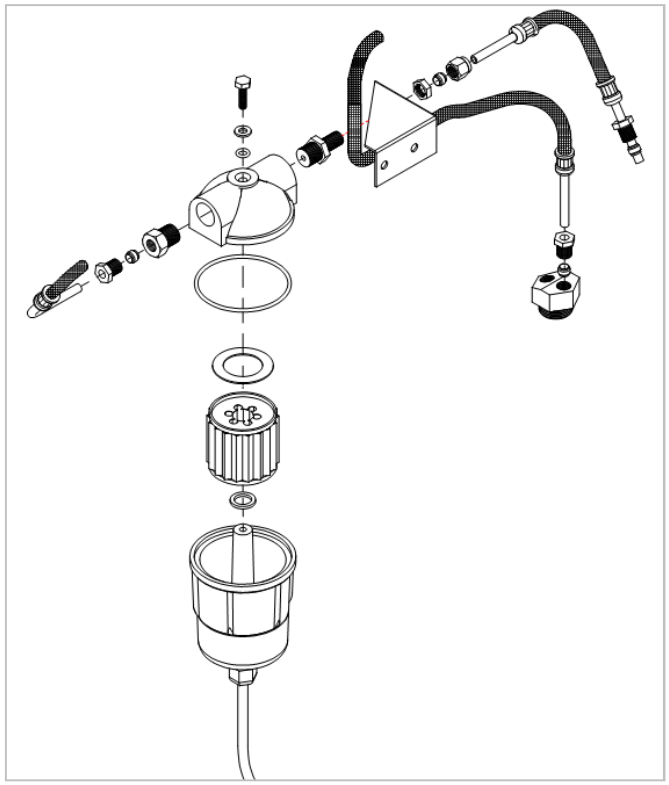
Available Tank Capacities

51 l (13.5 US gal)	**MIR 37 WE/WU - MIR 55 WE/WU - TOR 67 WE/WU**
100 l (26.5 US gal)	**MIR 85 WE/WU - TOR 115 WE**
139 l (36.7 US gal)	**TOR 175 WU**

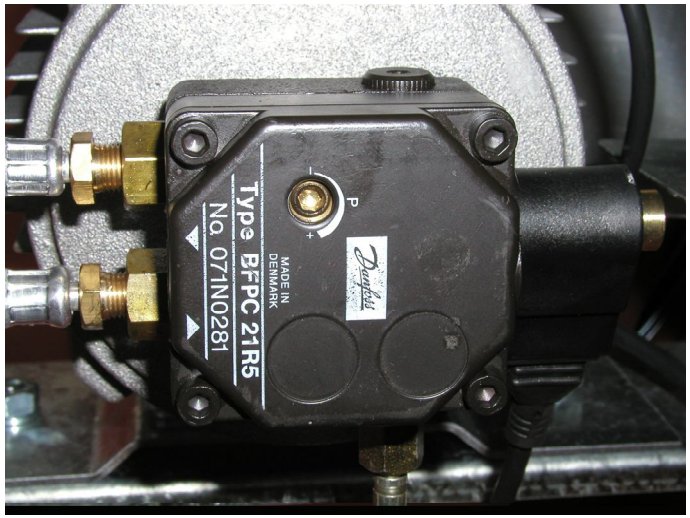
Fuel Filter

Standard Filter

Heated Filter



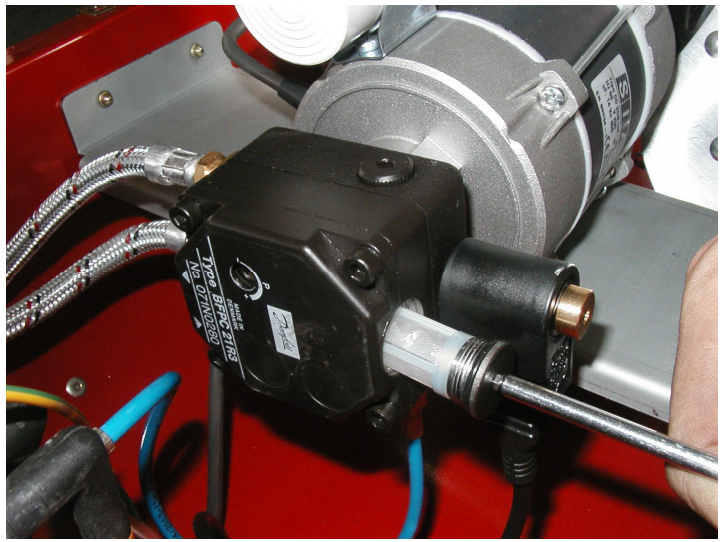
Fuel Pump



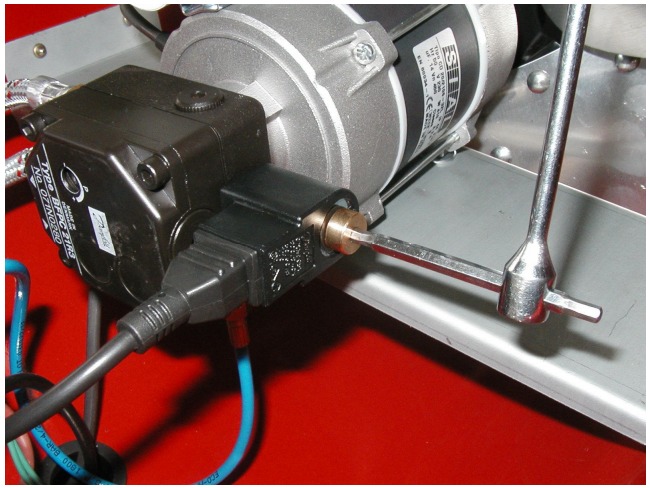
Danfoss BFPC
fuel pump (front view)

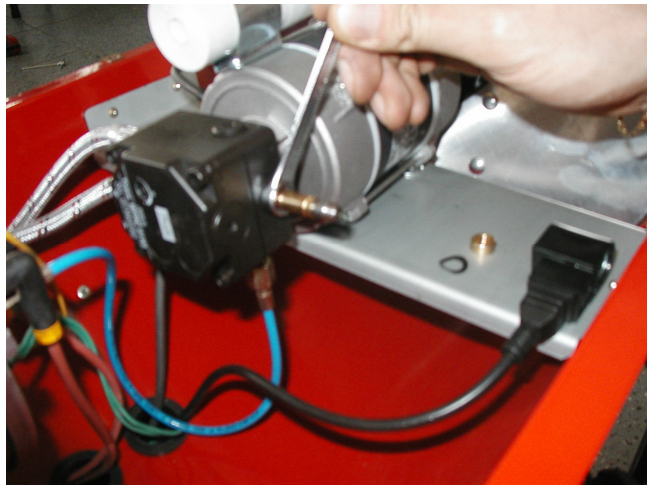
BFPC 21R3	MIR 37 MIR 55 TOR 67
BFPC 21R5	MIR 85 TOR 115 TOR 175

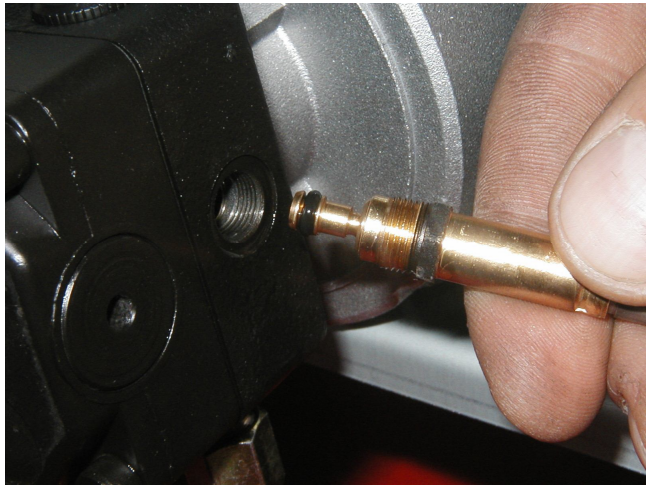
Fuel pump filter



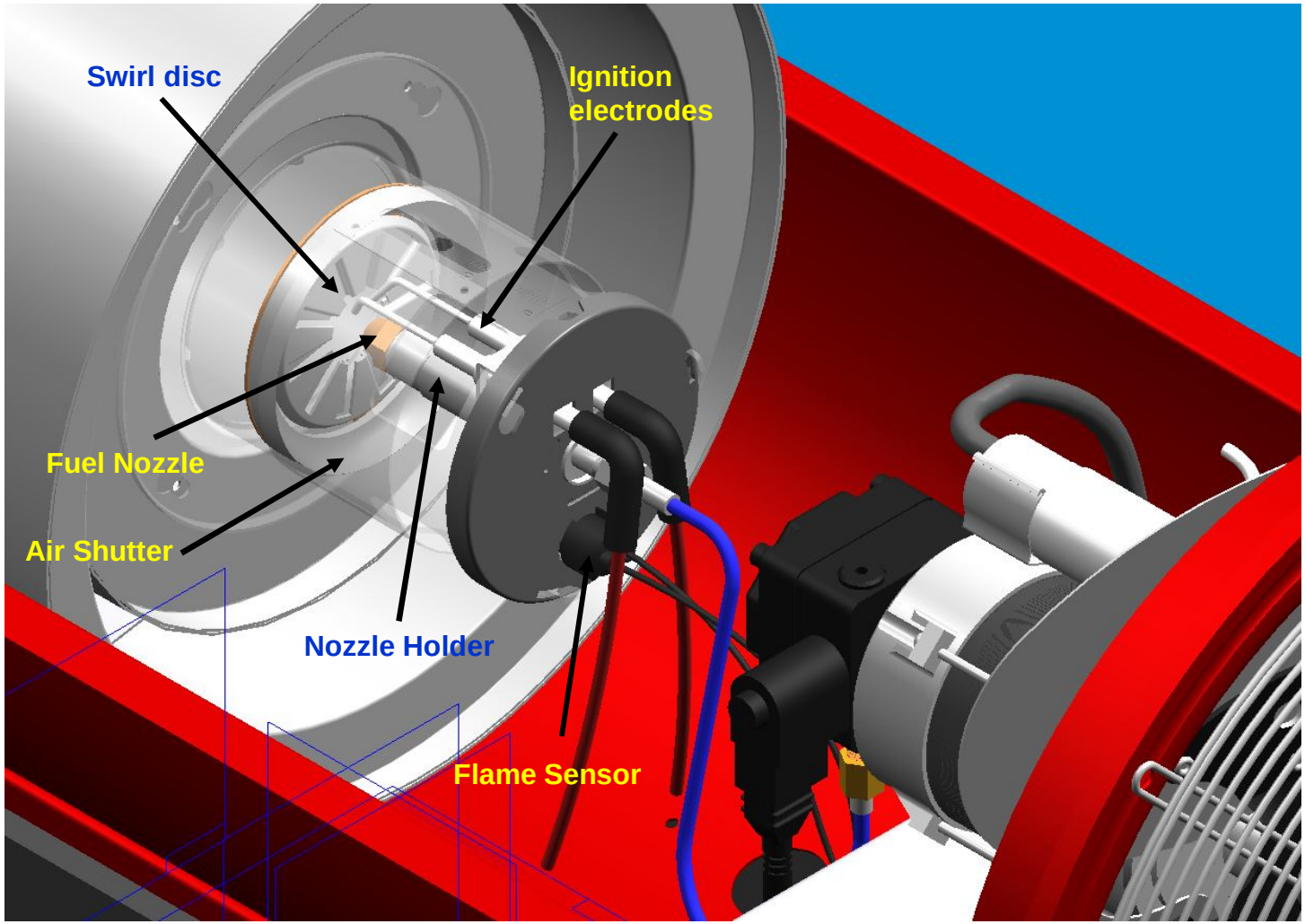
Fuel Cutoff Valve







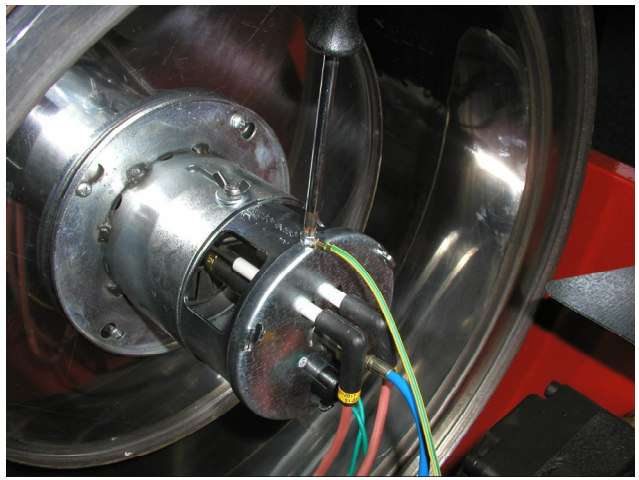
BURNER ASSEMBLY

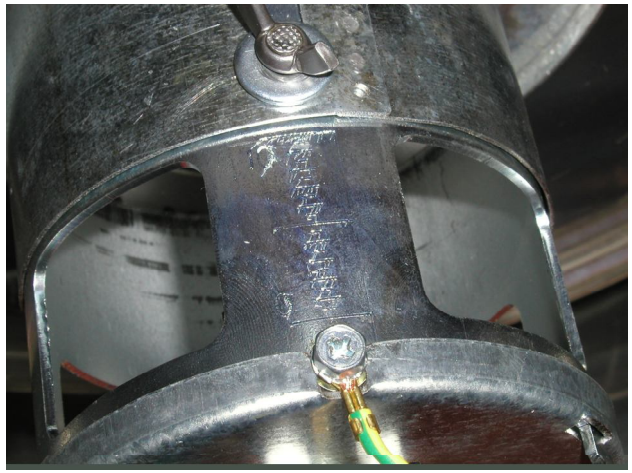


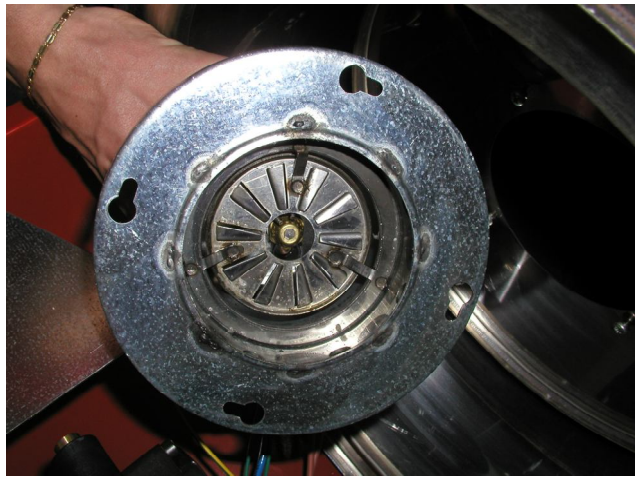
BURNER ASSEMBLY

The burner assembly includes :

- nozzle holder
- air shutter
- swirl disc
- fuel nozzle

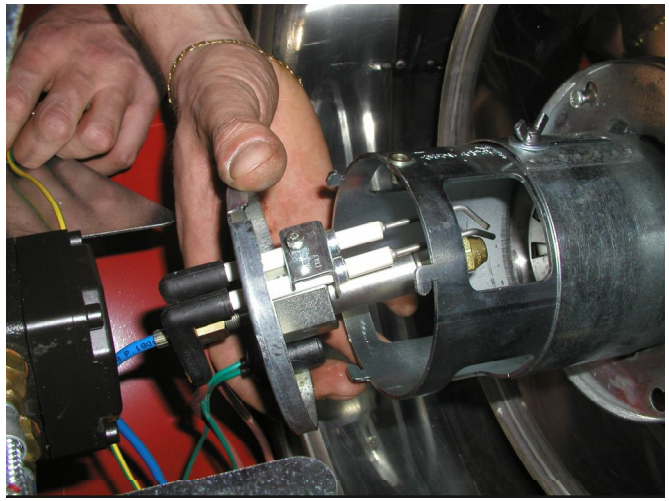




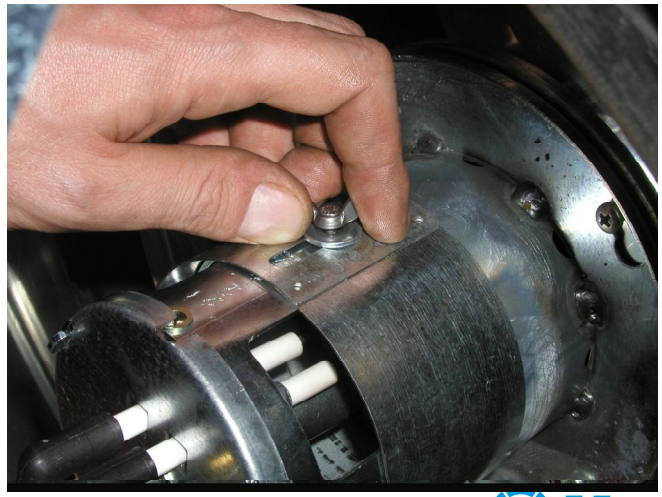


BURNER ASSEMBLY

- ignition electrode

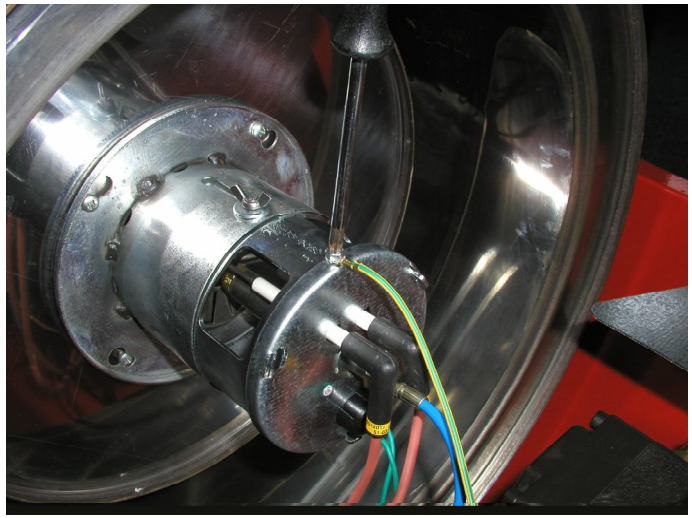


- air shutter



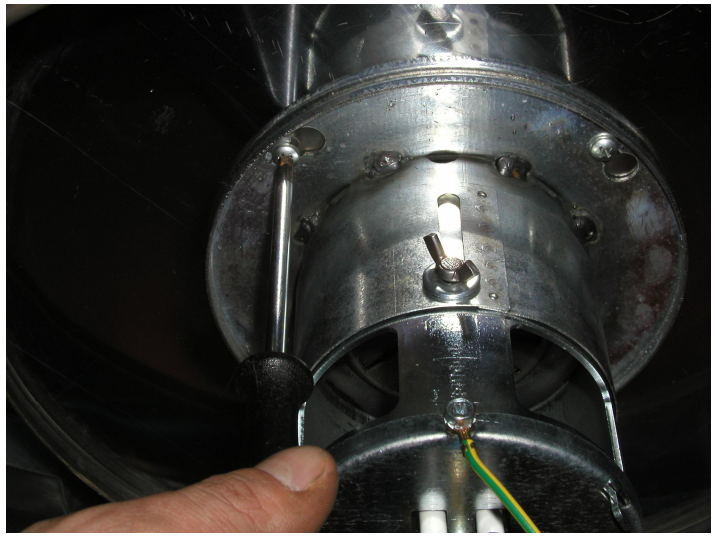
BURNER ASSEMBLY

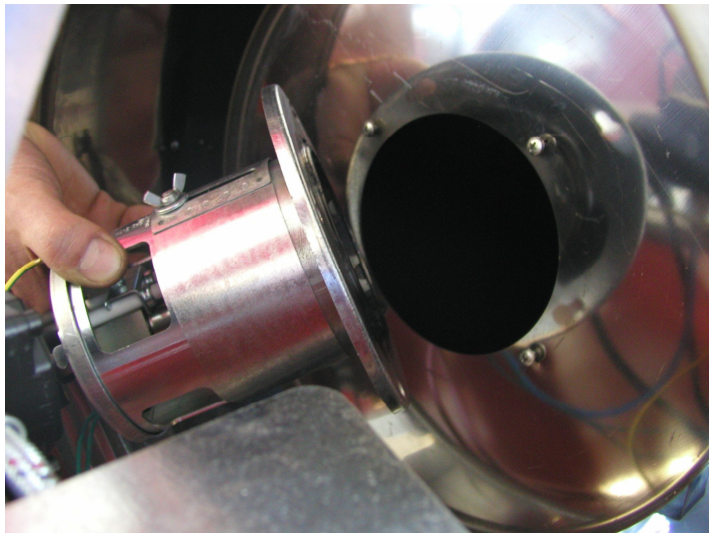
- Removing burner head for maintenance and service



CHAMBER INLET

- Removing chamber inlet for maintenance/cleaning



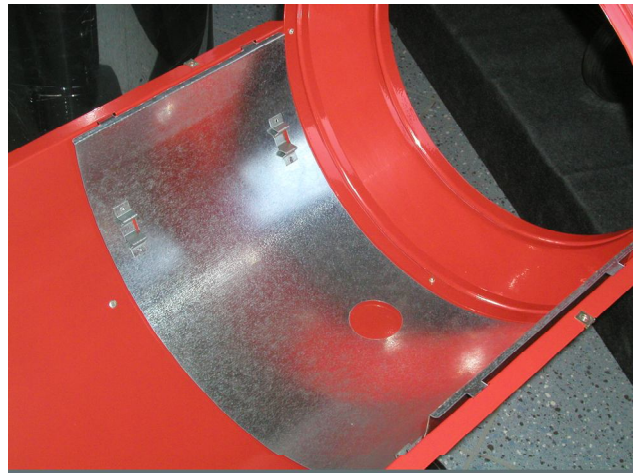


COMBUSTION CHAMBER

Combustion chamber (MIR)

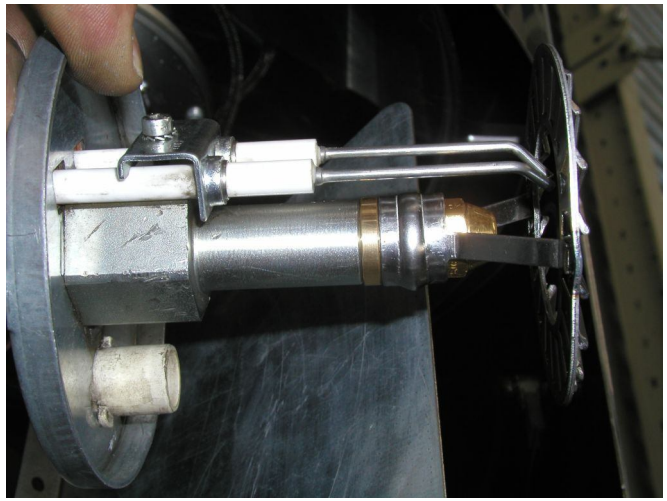
Combustion chamber inside (MIR)

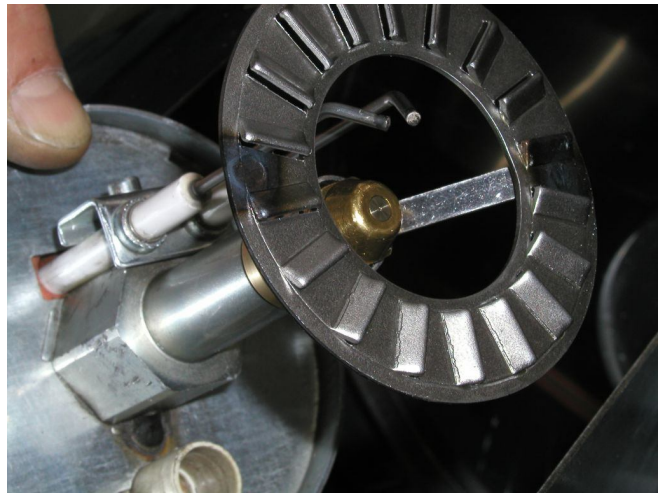
TOR Combustion Chamber

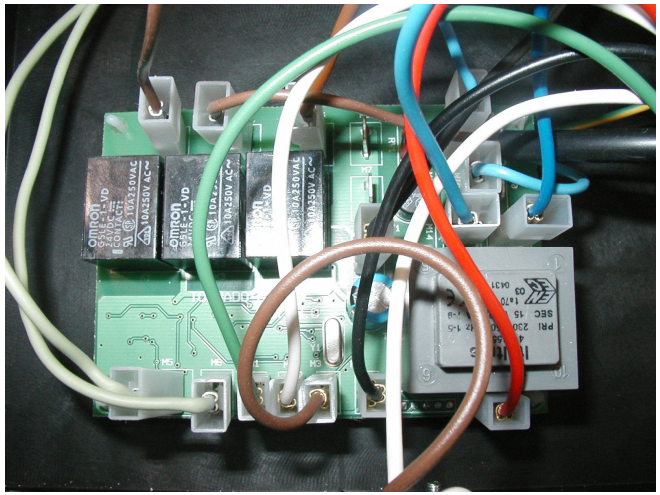


Protection Shield (TOR)

TOR 175 WU
Special Features



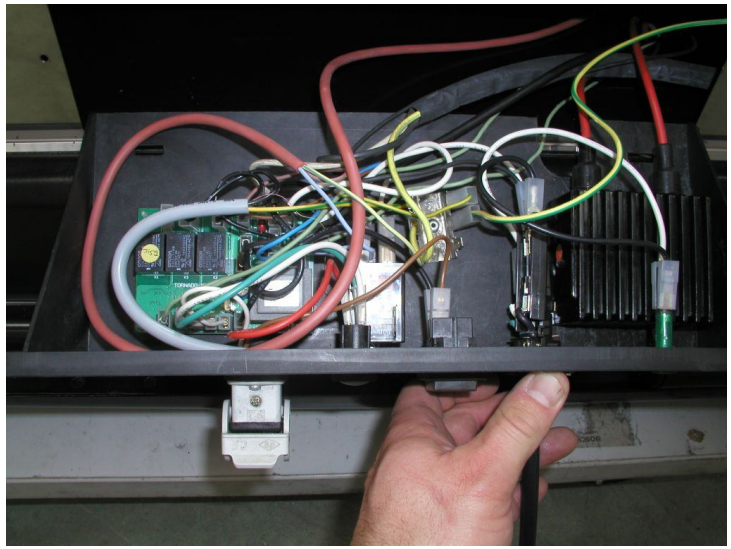


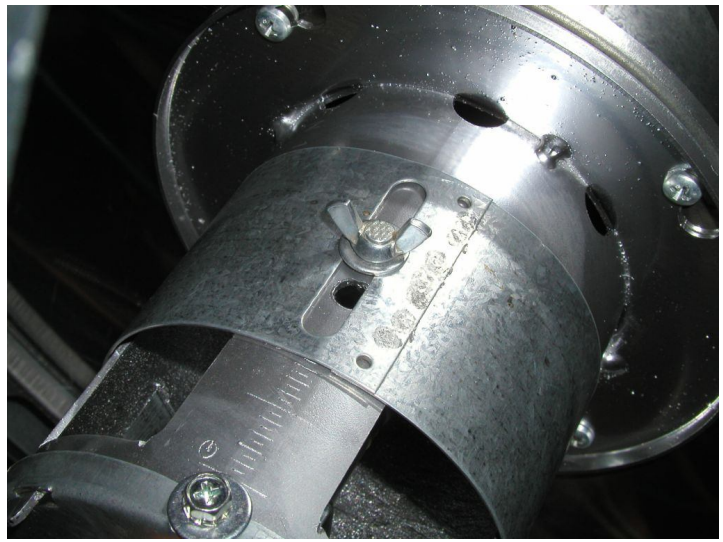


Special swirl disc

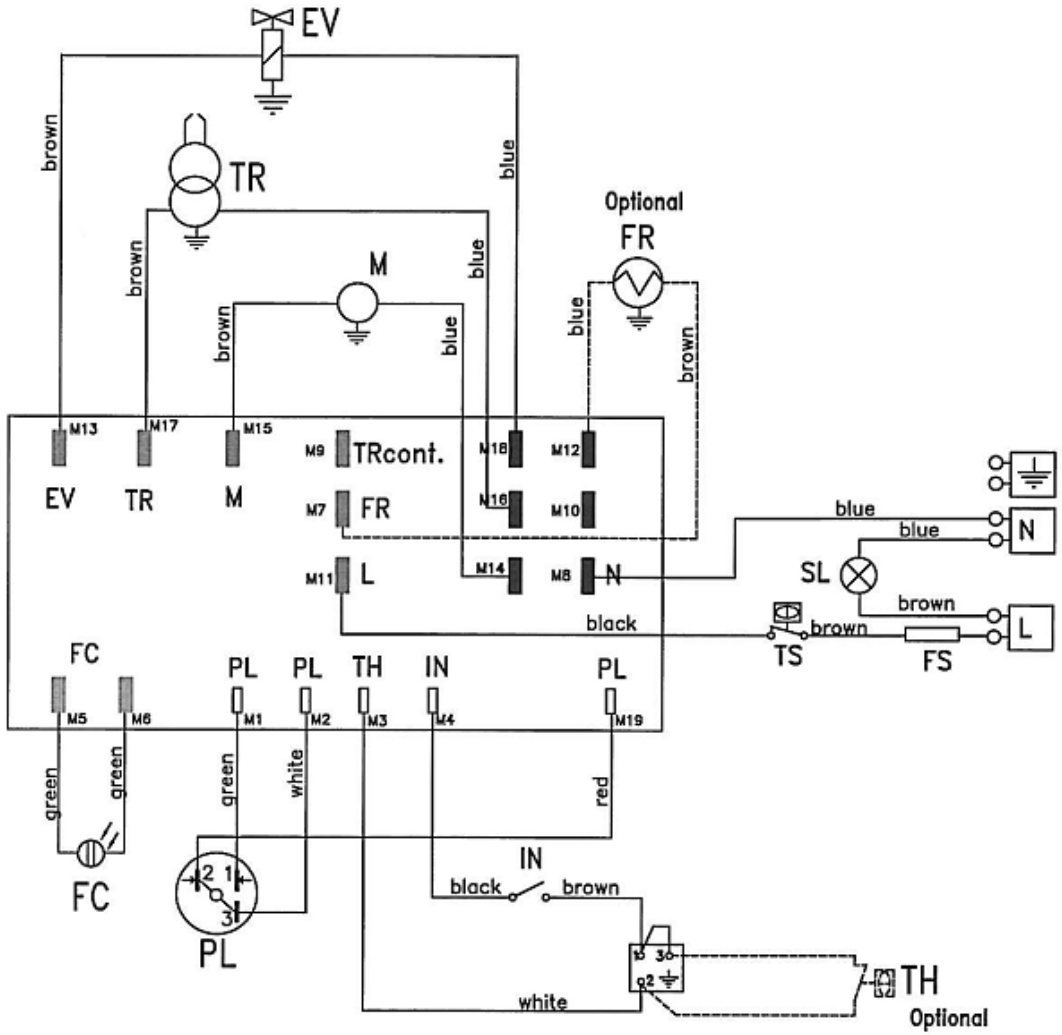
Special BCU with shortened safety time: 5 s

TOR 175 WU
Special features

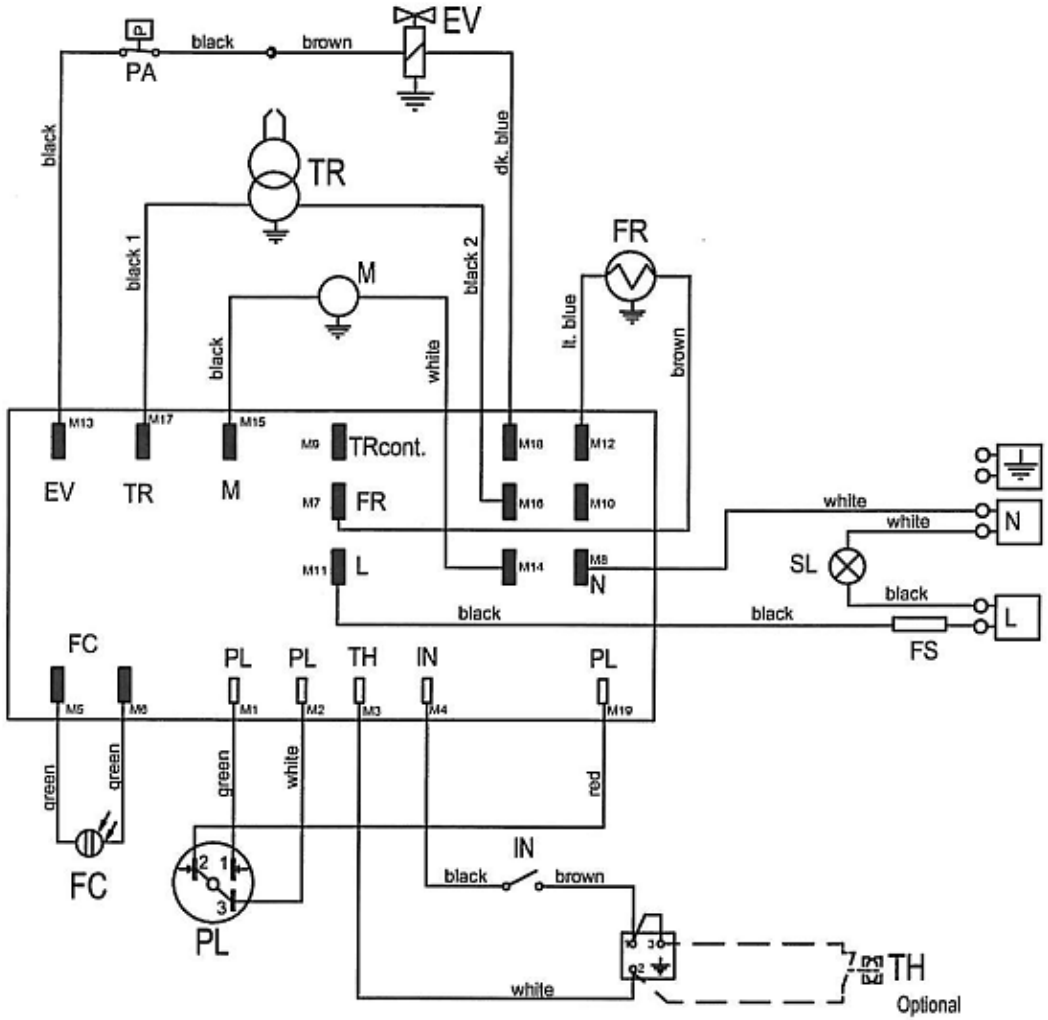




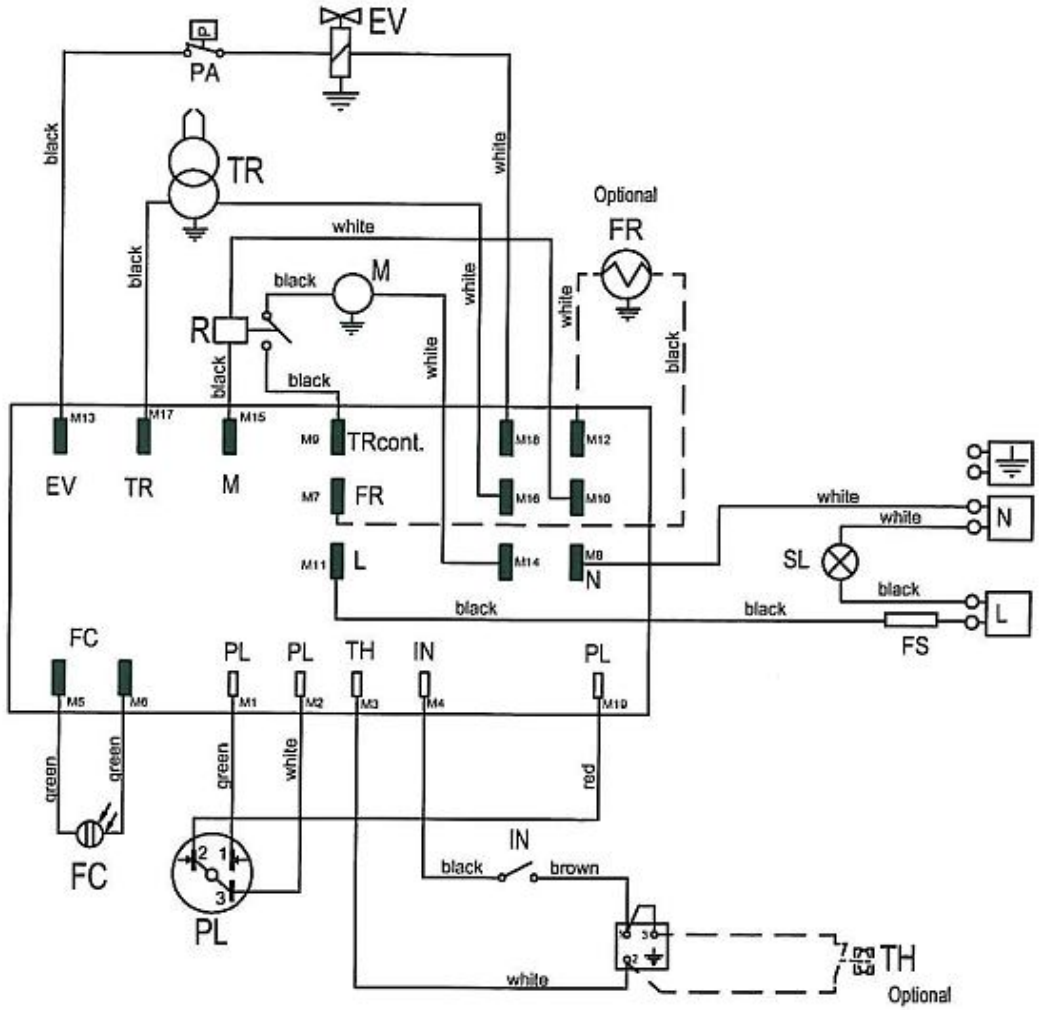
WIRING DIAGRAM (TOR/MIR EU)

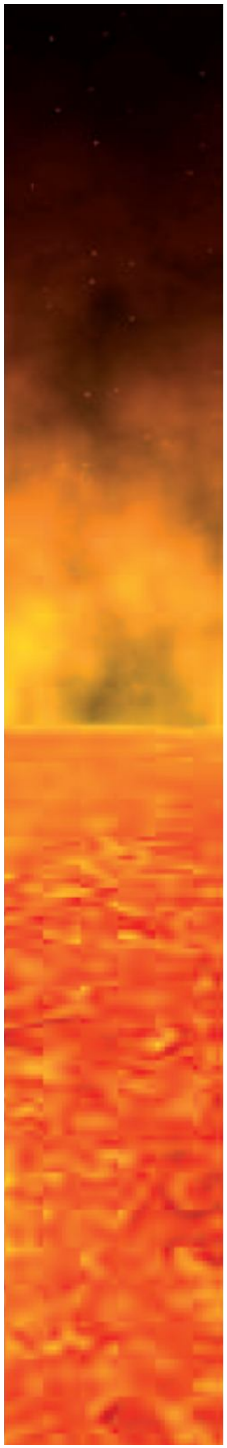


WIRING DIAGRAM (TOR 67/MIR 37/MIR55)



WIRING DIAGRAM (TOR 115/TOR 175/MIR 85)



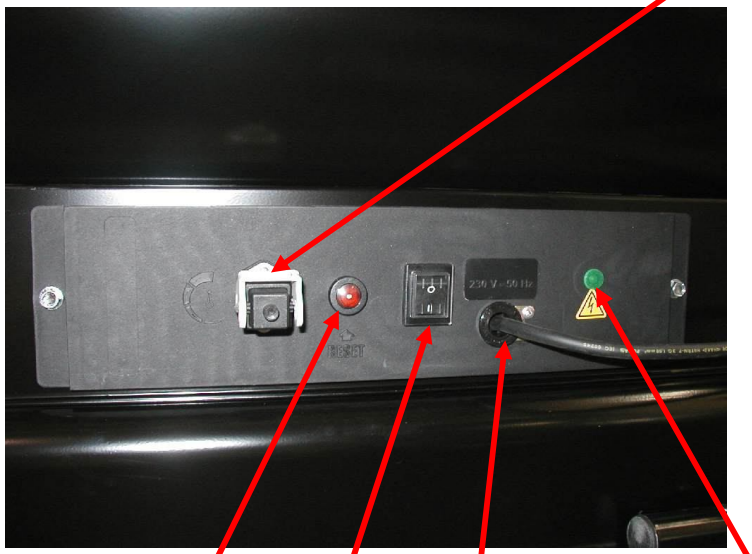


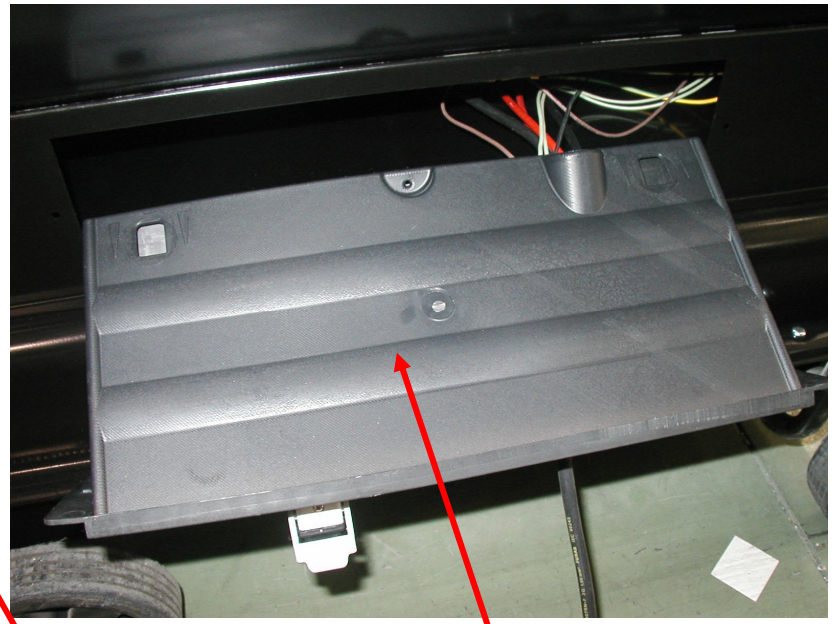
ELECTRICAL BOARD

The electrical board consists of:

- Control panel
- Protection casing (against water/dust)
- Power cable with strain relief and plug
- ON/OFF switch
- Room thermostat receptacle and cap with inner jumper (to close circuit for operation without thermostat)
- Reset pushbutton with built-in warning lamp
- High voltage ignition transformer
- Fuse with fuseholder
- Electronic burner (flame) control unit (BCU)
- Power Lamp

Control Panel and Protecting Cover





Room Thermostat Socket

Power Cable

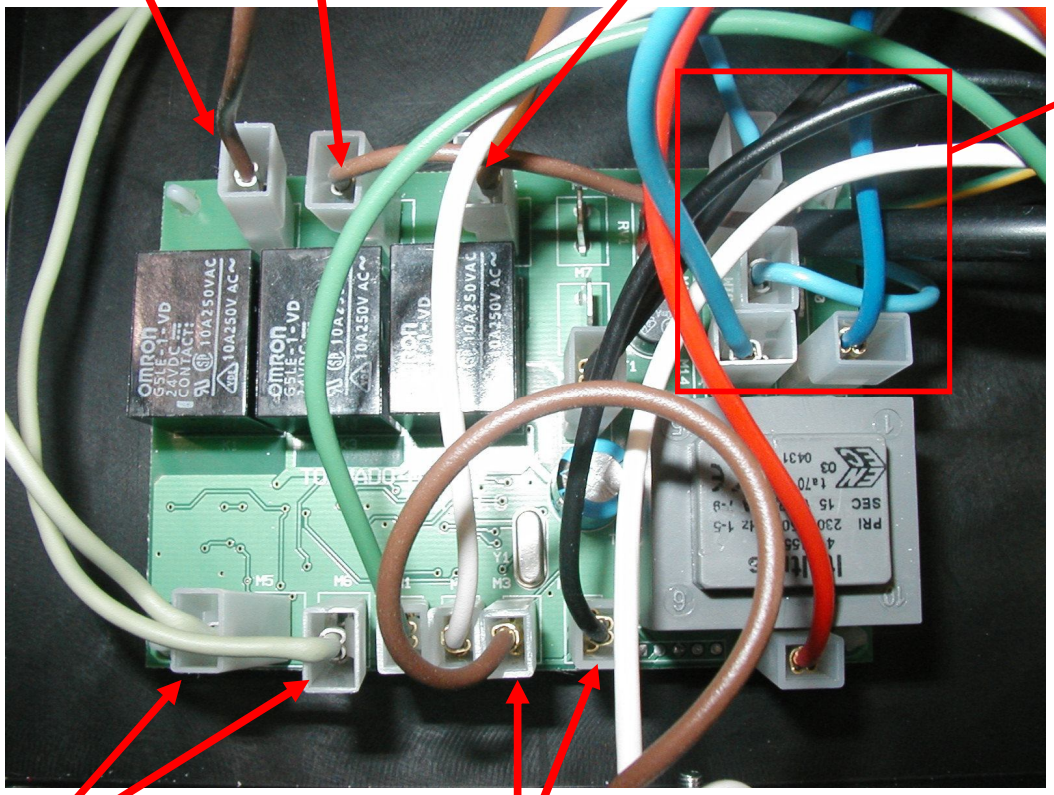
ON-OFF Switch

Reset
Pushbutton

Power Lamp

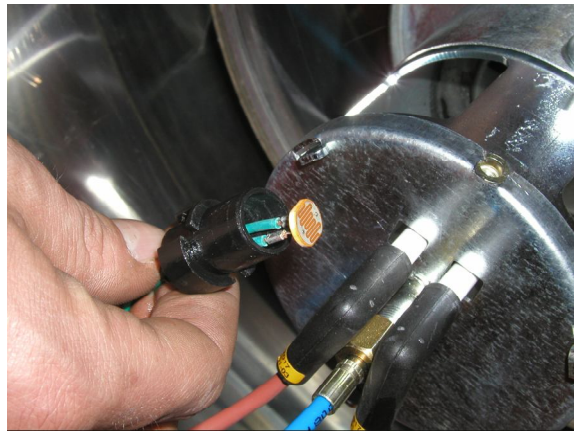
Protection
Cover (IPX4)

Electronic
Burner Control Unit

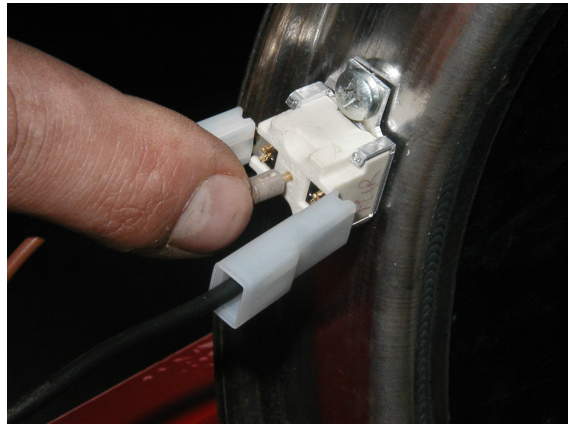


SAFETY DEVICES

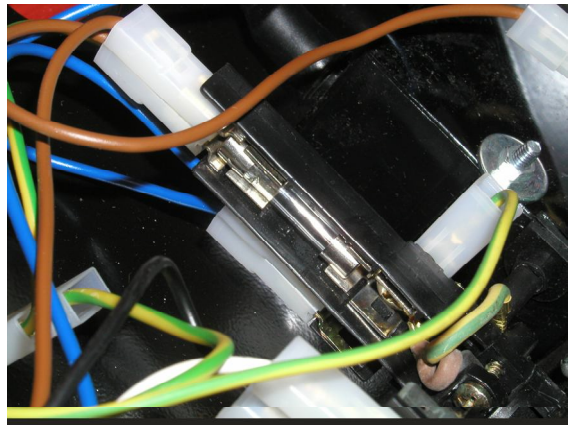
- **Flame Sensor (photoresistor)**
  - Detects false flame signal or anticipated ignition
  - Monitors flame at ignition
  - Monitors flame failure during operation



- **Safety Thermostat (limit control, EU models only)**
  - Prevents unit overheating
  - Requires manual reset

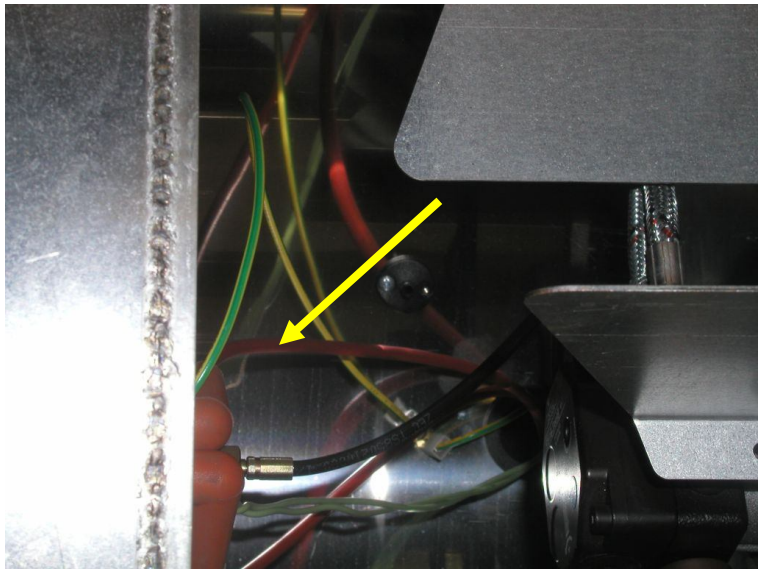


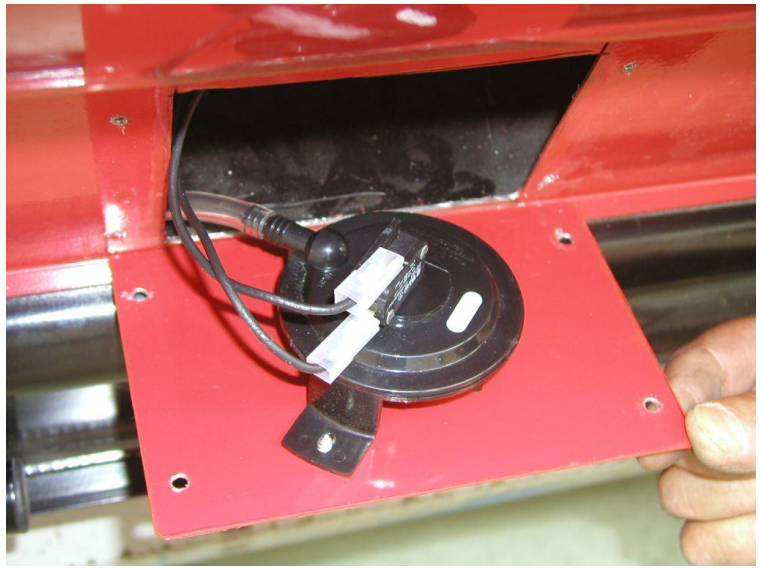
- **Line Fuse**
  - Protects unit from overcurrents



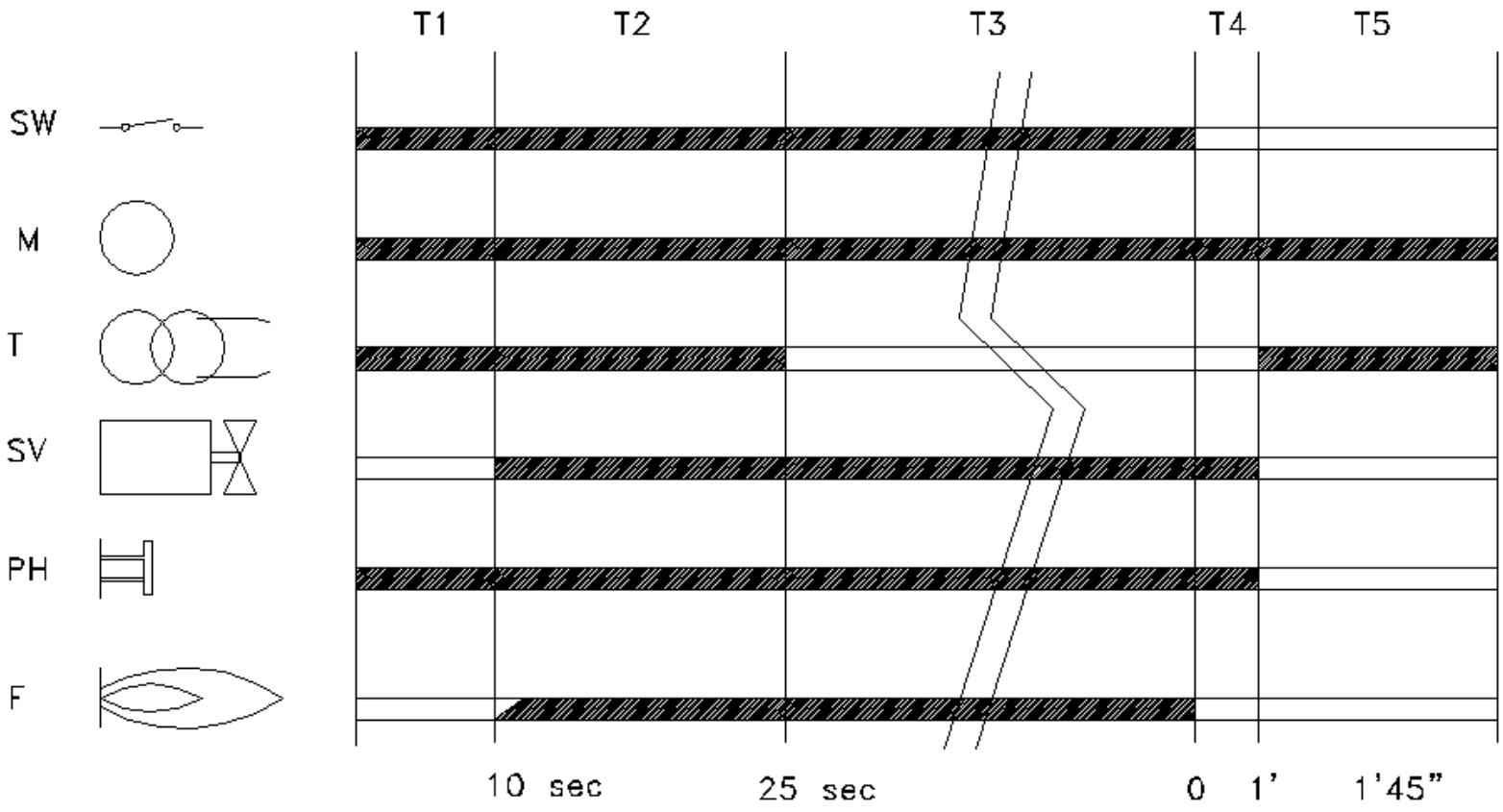
SAFETY DEVICES

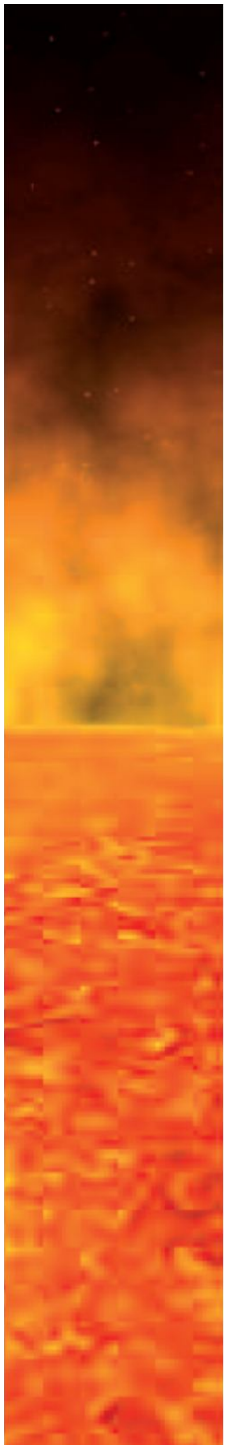
- **Air Pressure Switch (US models only)**
  Monitors fan pressure
  Shuts burner off in case of reduced pressure/airflow





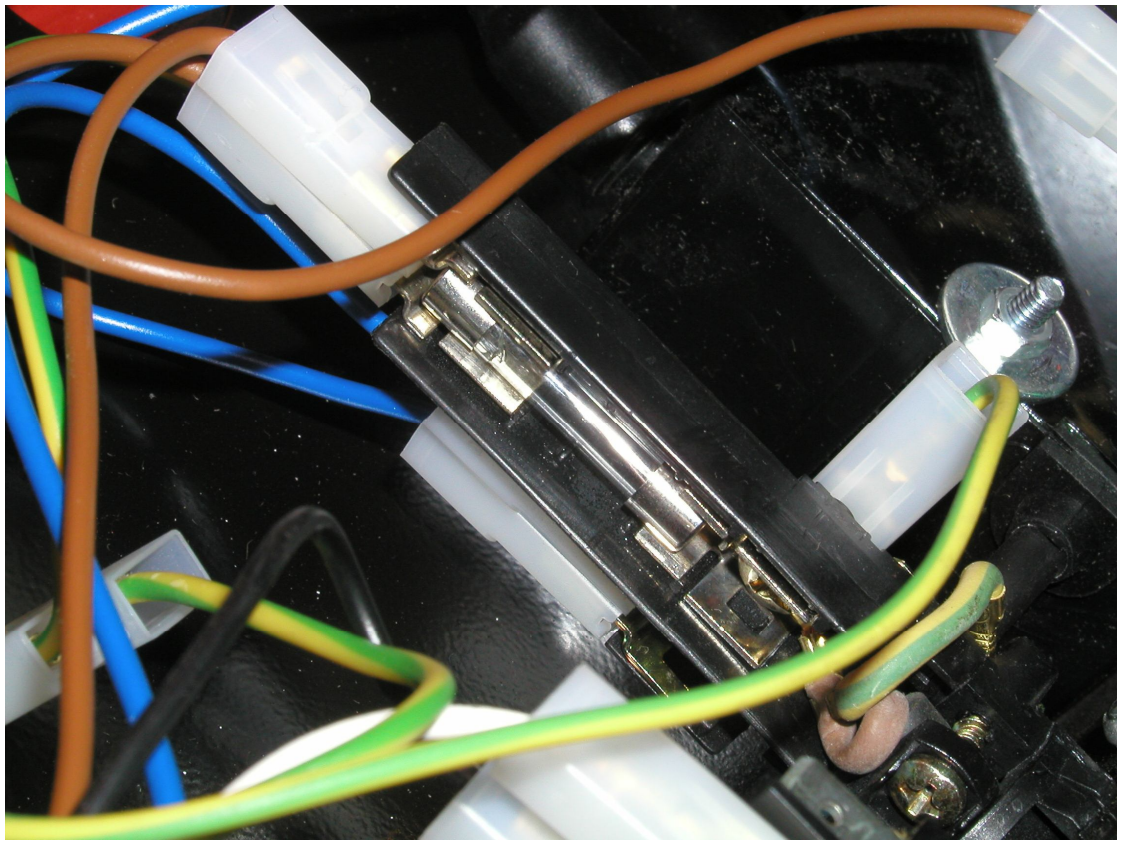
TOR-MIR
OPERATIONAL SEQUENCE



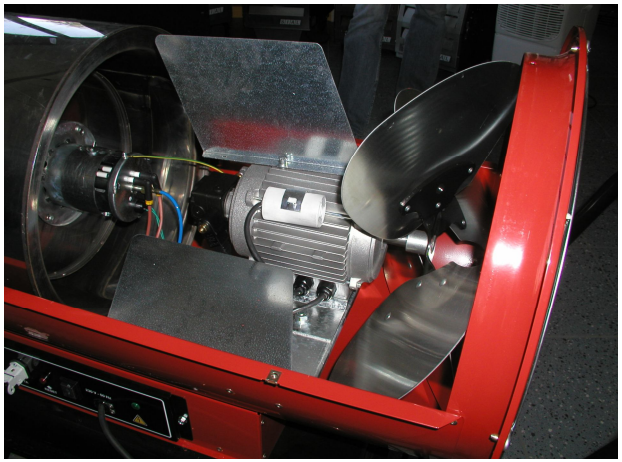


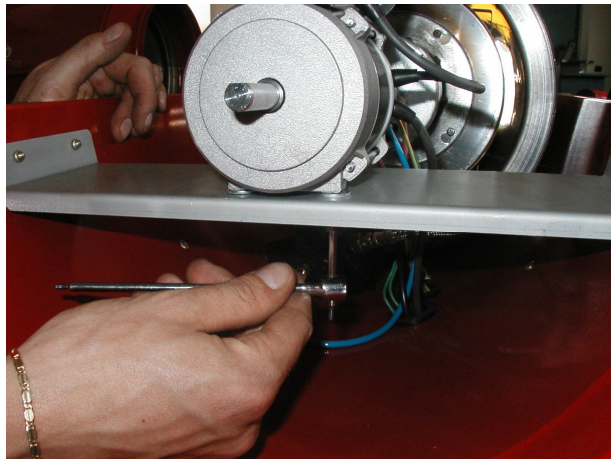
BASIC SERVICE PROCEDURES

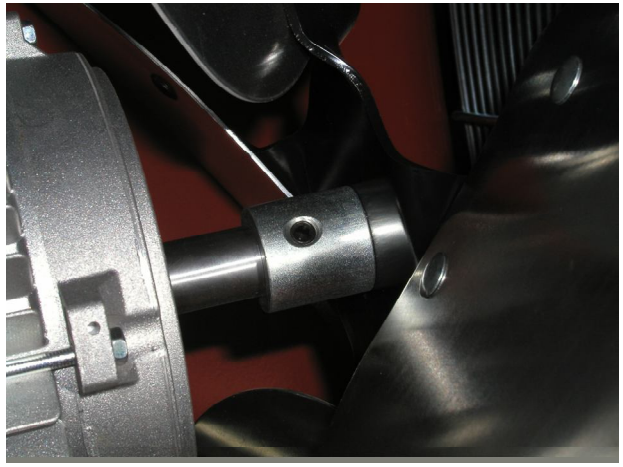
Line Fuse Check



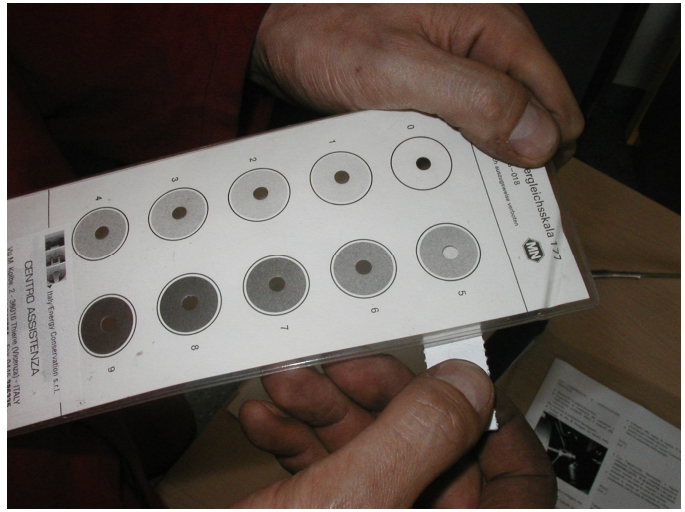
Fan motor/capacitor check



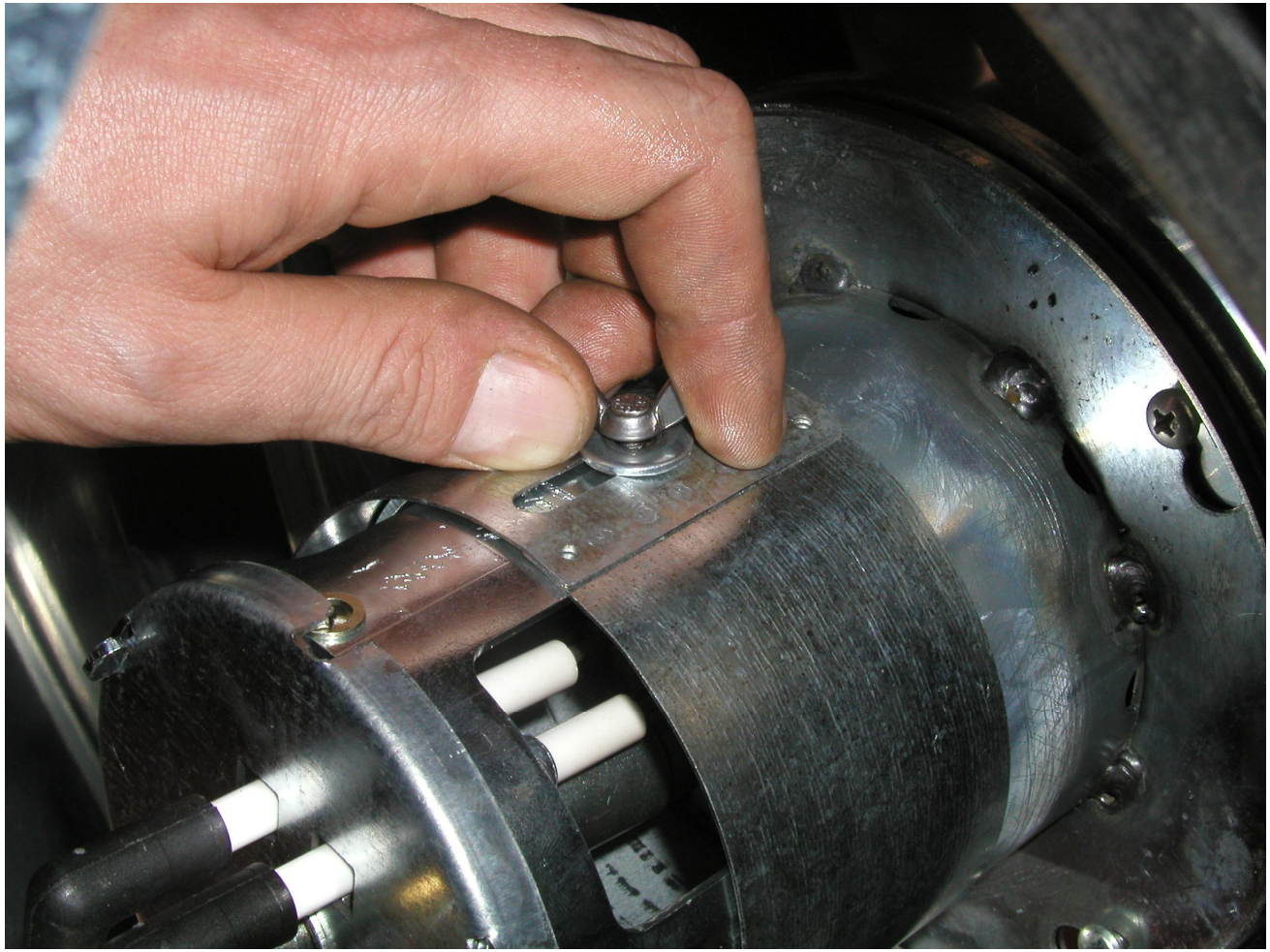




Smoke Index Test
(Bacharach-Shell, indirect only)

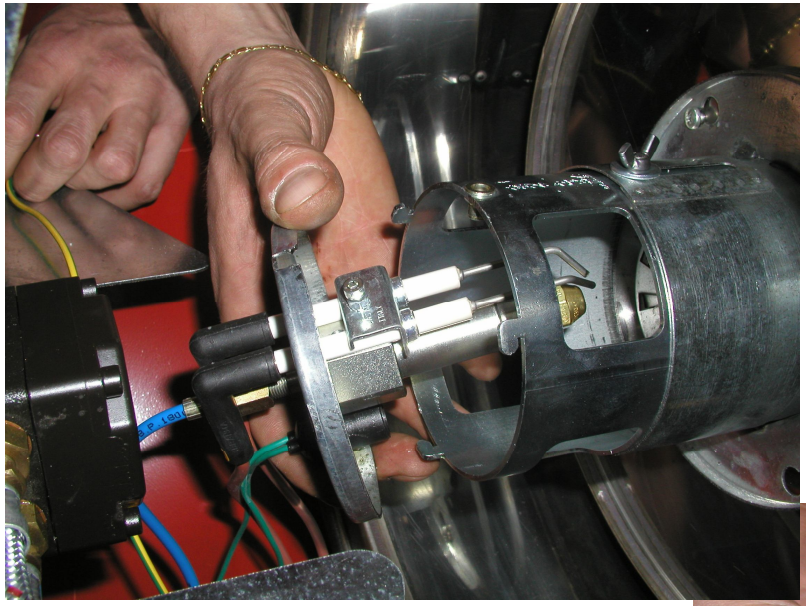


Air Shutter Adjustment

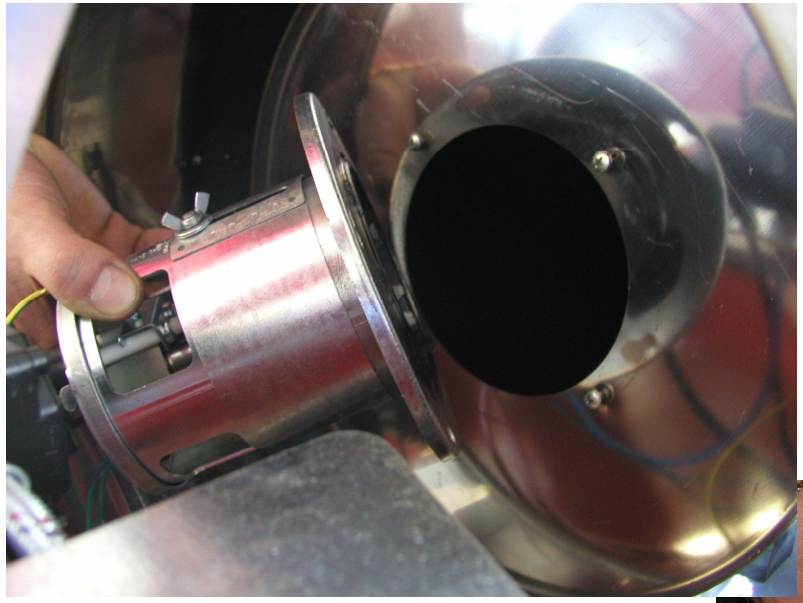


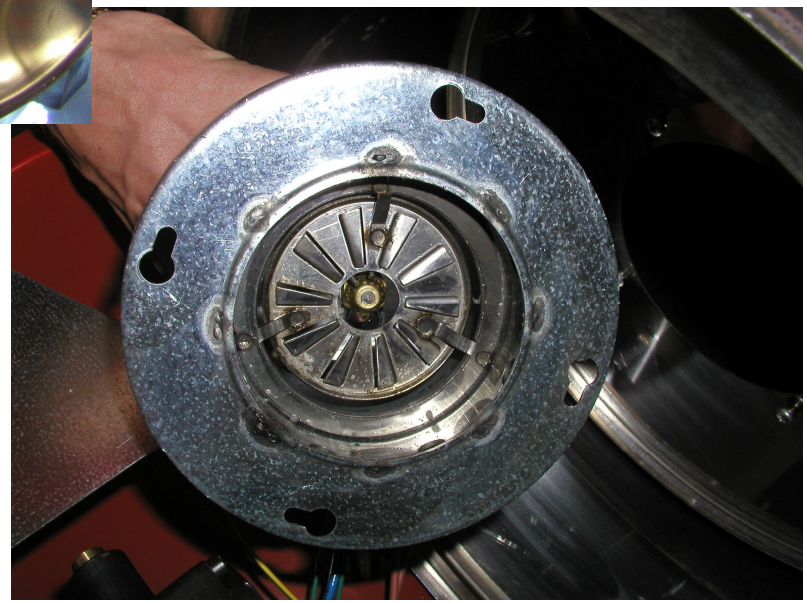
Fuel Filter Maintenance

Burner Nozzle Maintenance

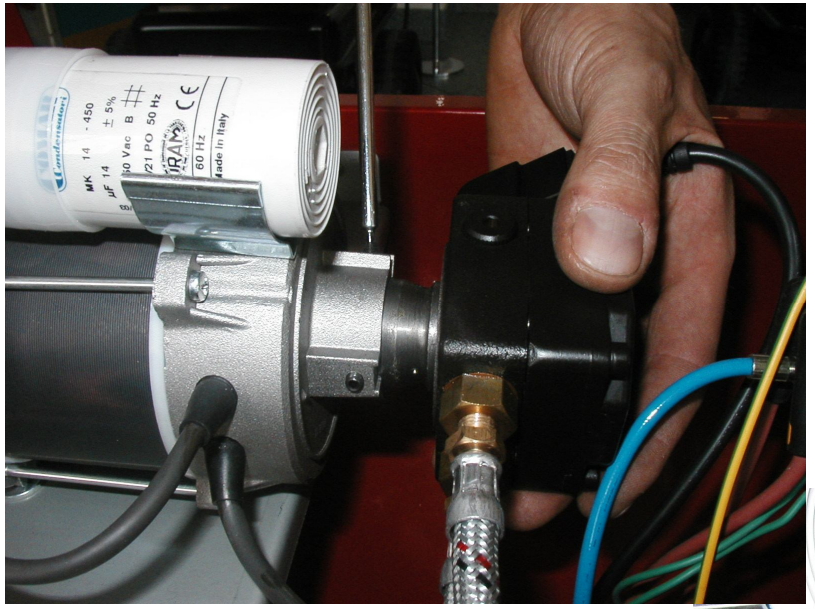


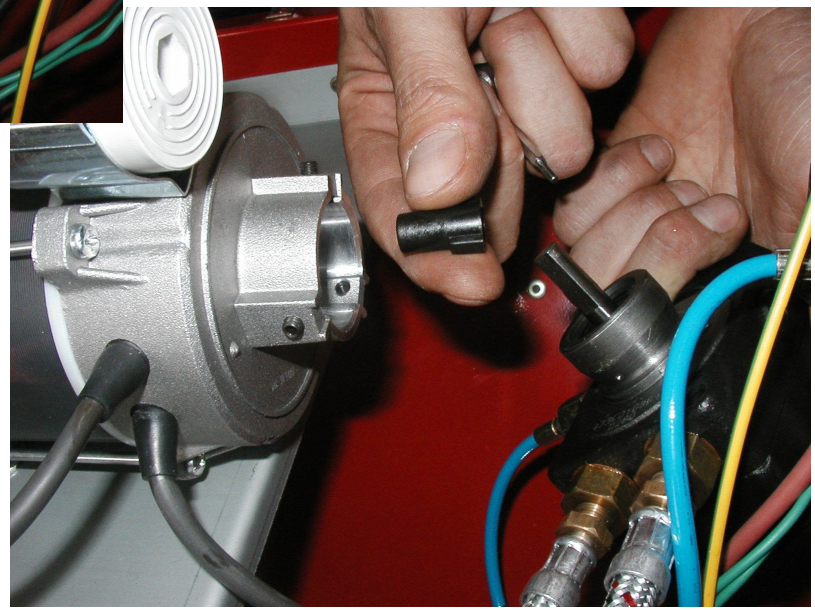
Burner Head Maintenance



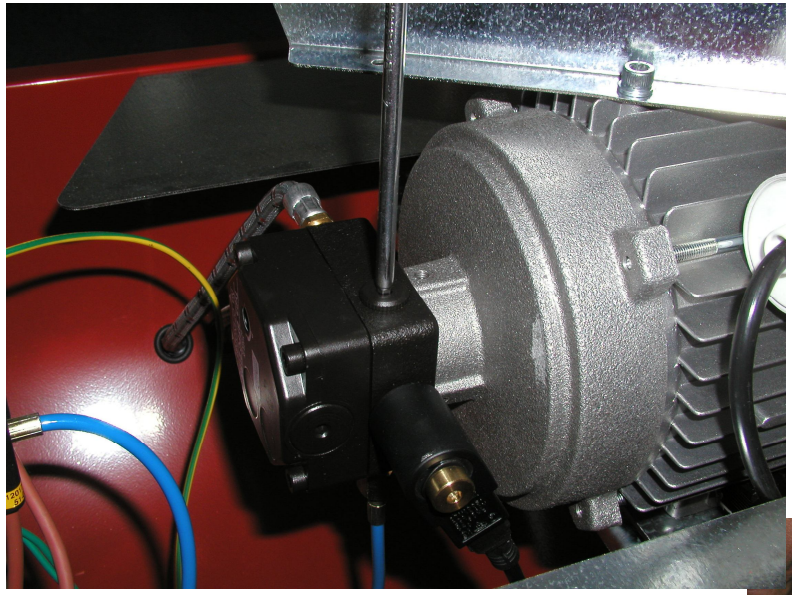


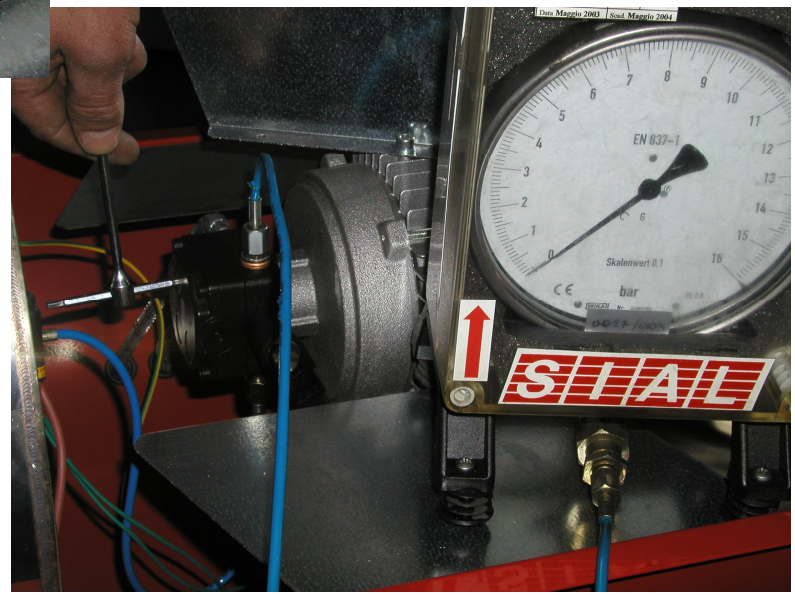
Fuel Pump Replacement





Fuel Pressure Adjustment

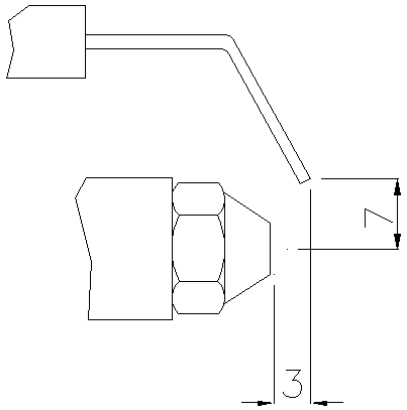


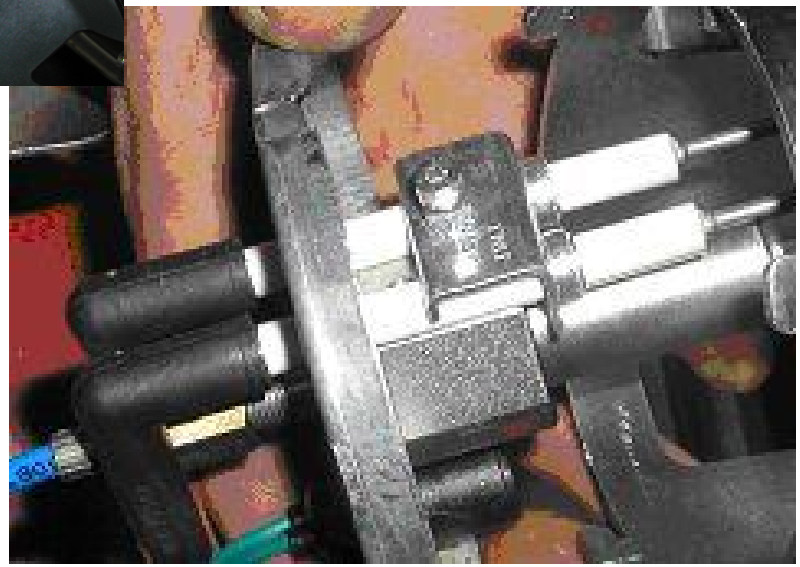


Pump pressure setting for all TOR/MIR:

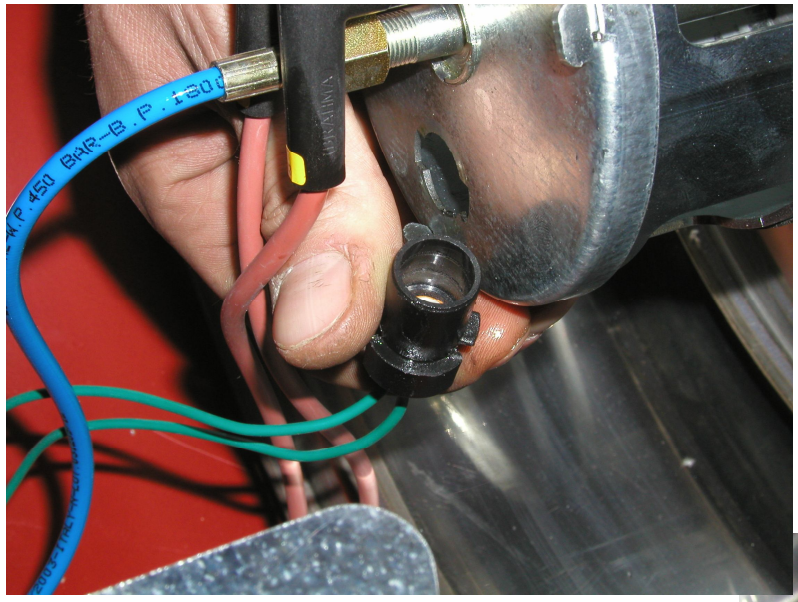
12 bar (175 psi)

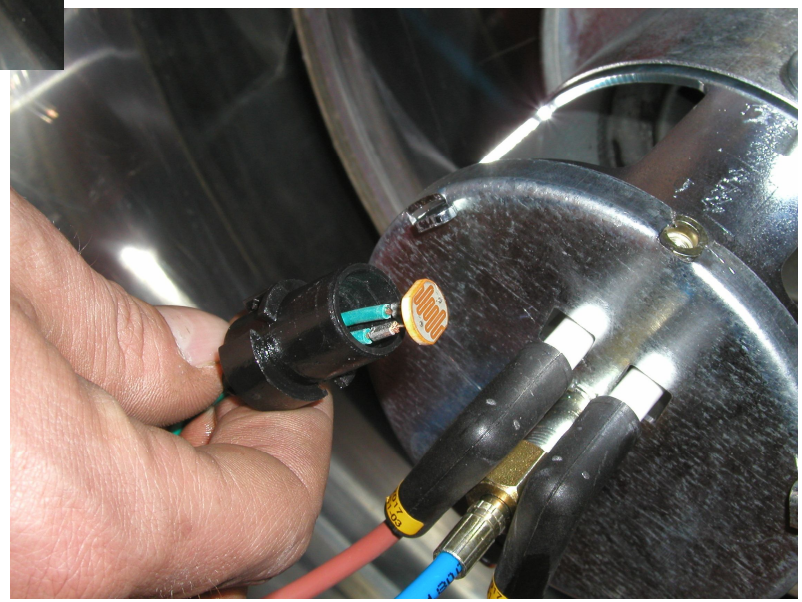
Ignition Electrode Service





Flame Sensor Service

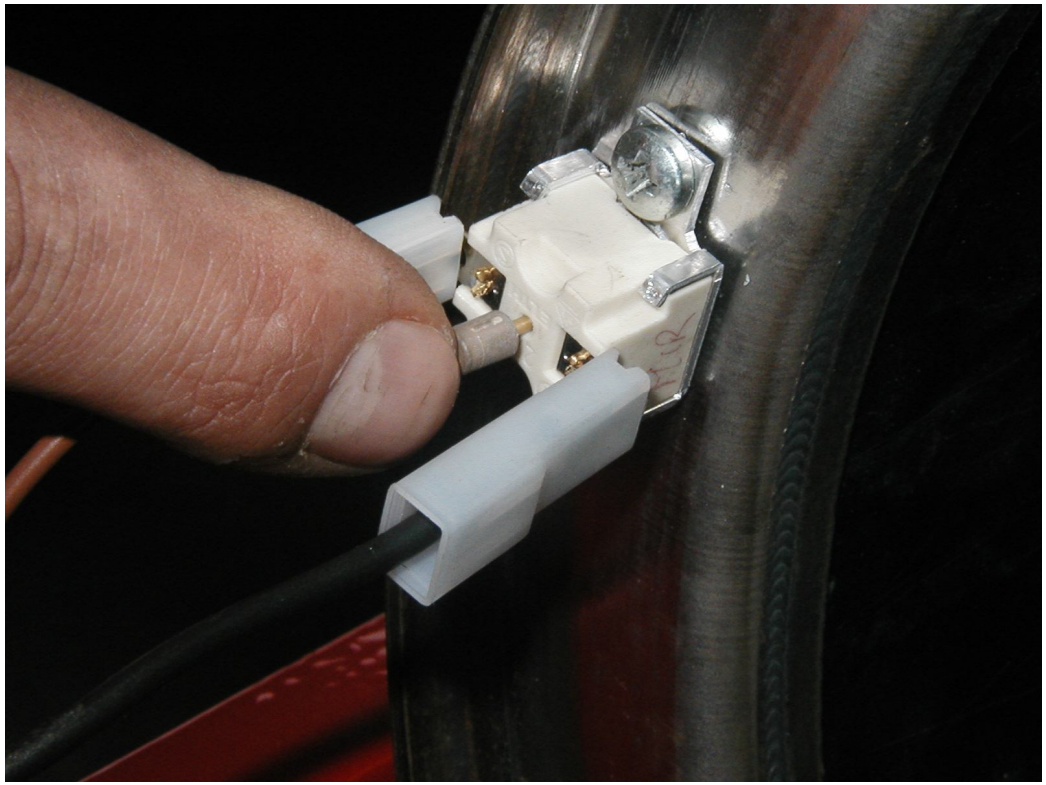




Typical sensor resistance values

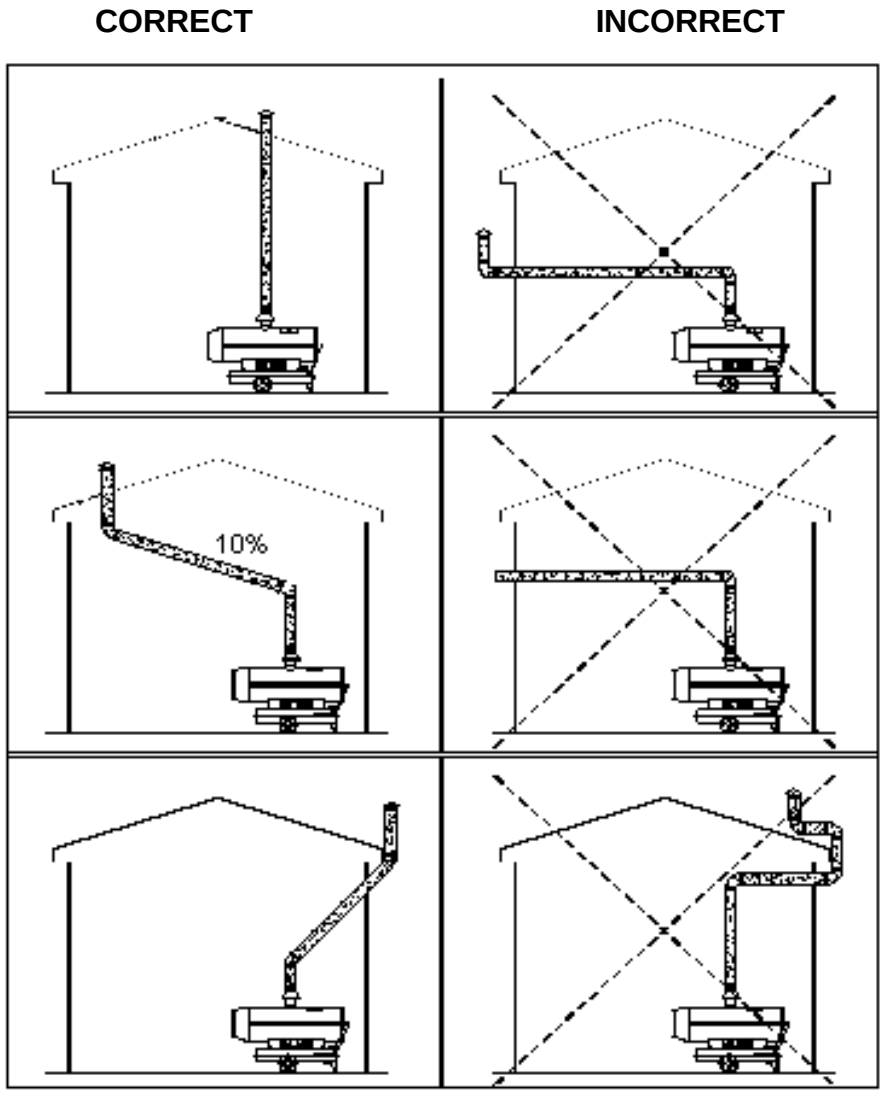
Light **~ 100 Ω**
Dark **~ 100 kΩ or more, tending to ∞**

Limit Control Reset

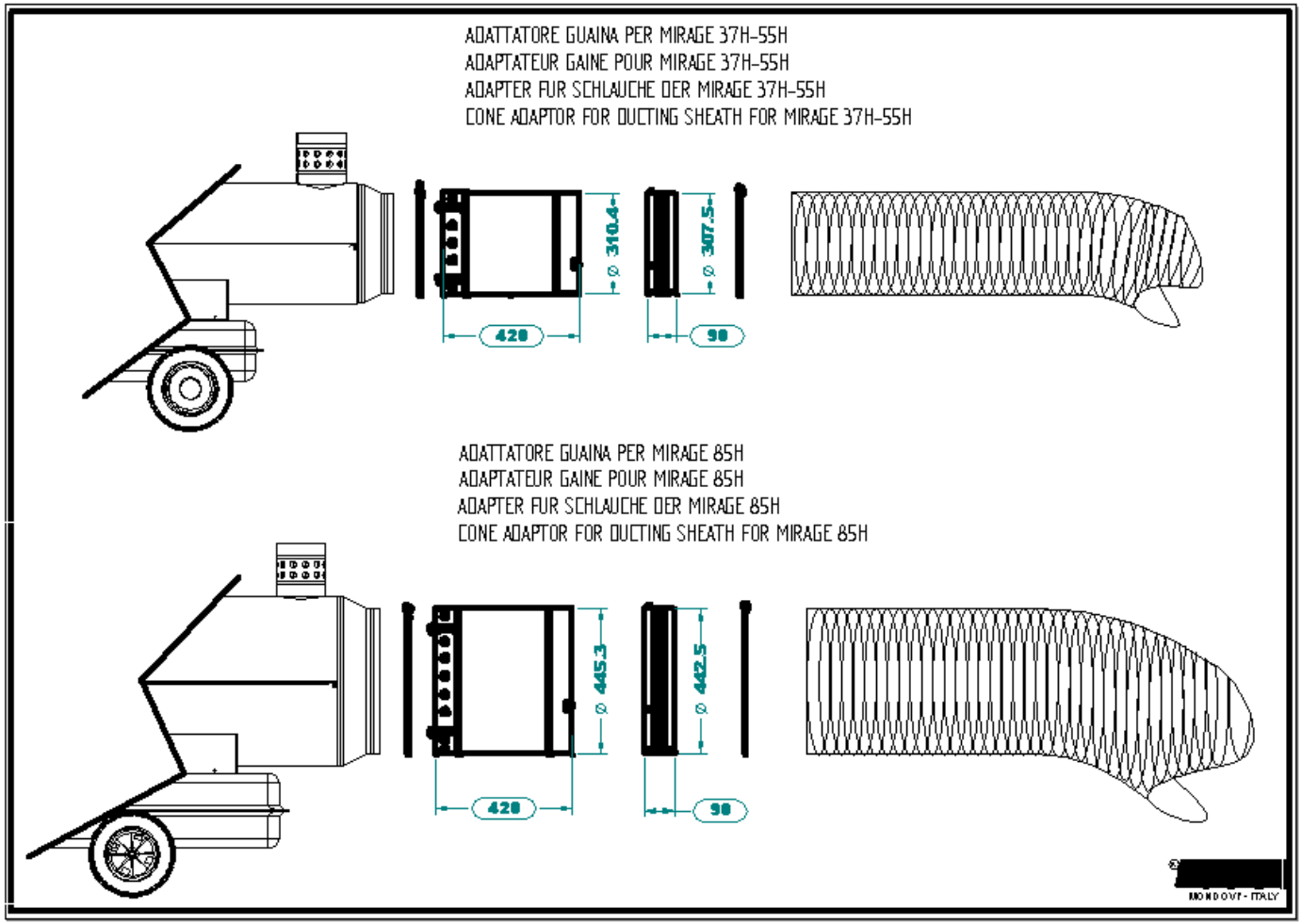


Thermostat Settings
Indirect Heaters: 170°C (338 F)
Direct Heaters: 100°C (212 F)

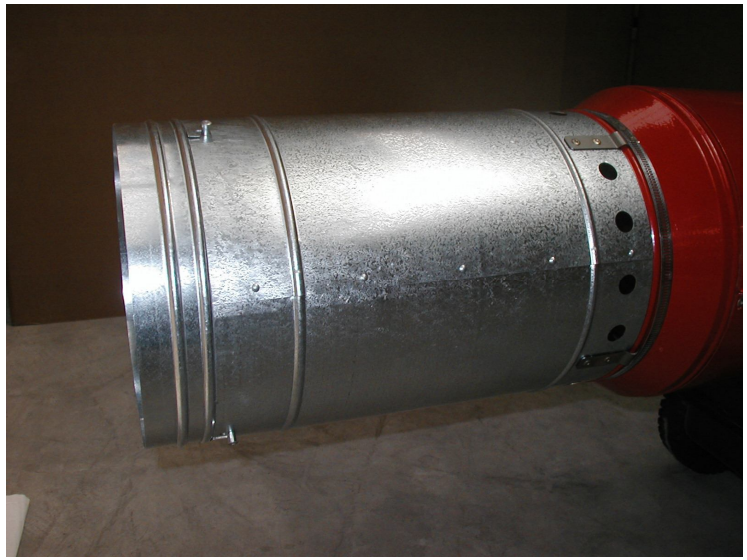
Installation Guidelines
Exhaust Pipe Design



Installation Guidelines
Air Ducting



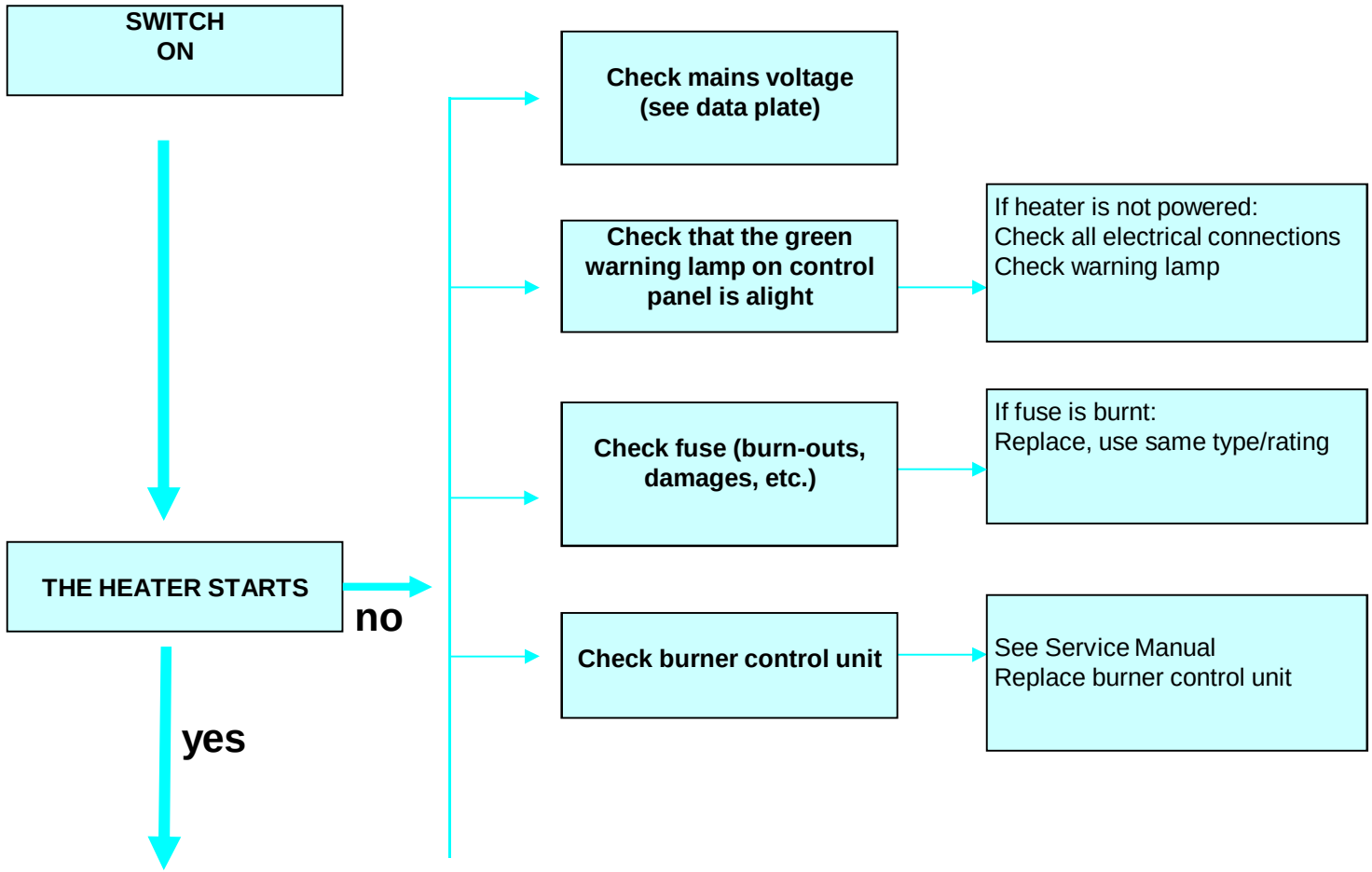
Installation Guidelines
Air Ducting Accessories

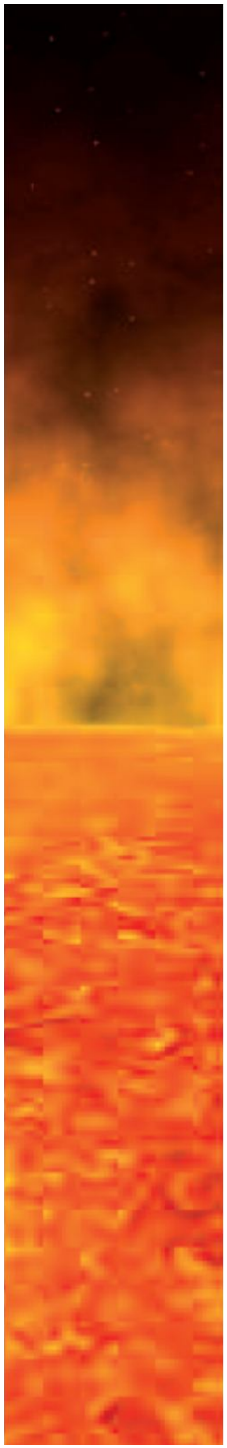


MIR 37/55 max duct length: 40 ft

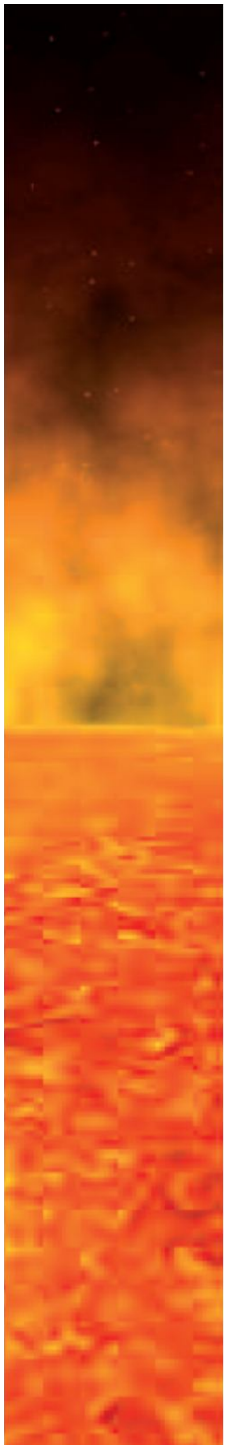
MIR 85 max duct length: 60 ft

TROUBLESHOOTING





Check that lock-out warning lamp (red) is not alight	Lock-out from previous operation: Wait 30 seconds and press reset button
Check that overheat thermostat has not been activated	Safety thermostat action from previous operation: Open inspection cover and push thermostat reset button
Check that room thermostat is properly connected and adjusted	Check connections Set on a temperature higher than room temperature
For operation without remote thermostat: check that thermostat socket cap is correctly inserted	Check electric jumper inside cap Reinsert and lock cap

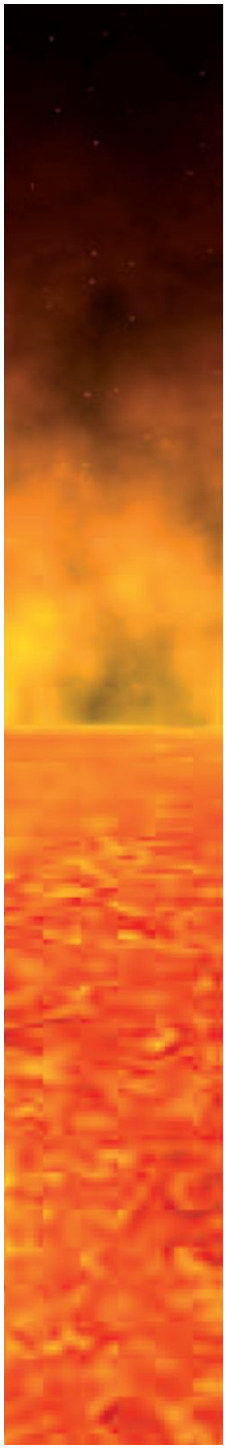


THE HEATER STARTS, THE PREPURGE SEQUENCE STARTS BUT THEN THE HEATER STOPS WITHOUT IGNITION

yes

no

Check that fuel tank is full	Fill tank with proper clean fuel
Check for air bubbles or leaks in fuel lines	Tighten fuel line fittings Check for damages/cracks in fuel hoses
Check that nozzle is clean	See Service Manual “Cleaning the combustion head”
Check that swirl disc is clean	See Service Manual “Cleaning the combustion head”
Check that flame sensor is not damaged, clean and properly fixed in its seat	Clean flame sensor with a soft cloth and ethylic alcohol Replace flame sensor if damaged or burnt
Check air shutter adjustment	See Setting Chart
Check presence of external false flame signals (sunlight, lamps, etc.) during prepurge time	Check - and remove - light reflections due to sunrays, lamps etc. that could reach and disturb the flame sensor Look for flames inside chamber

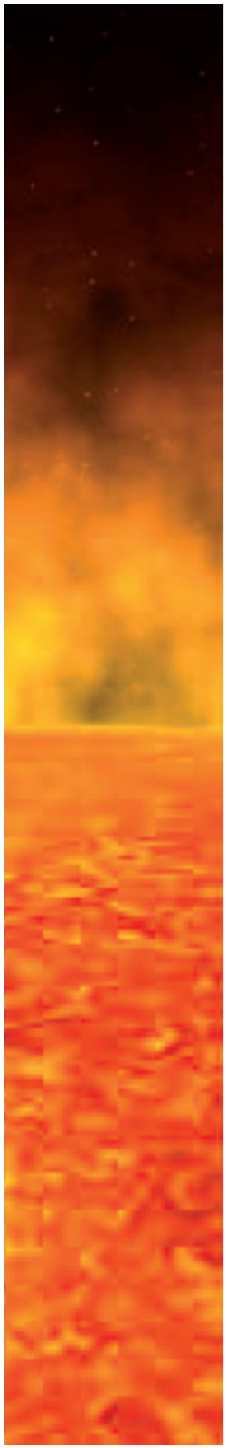


HEATER STARTS, FLAME IGNITES BUT COMBUSTION IS NOT GOOD

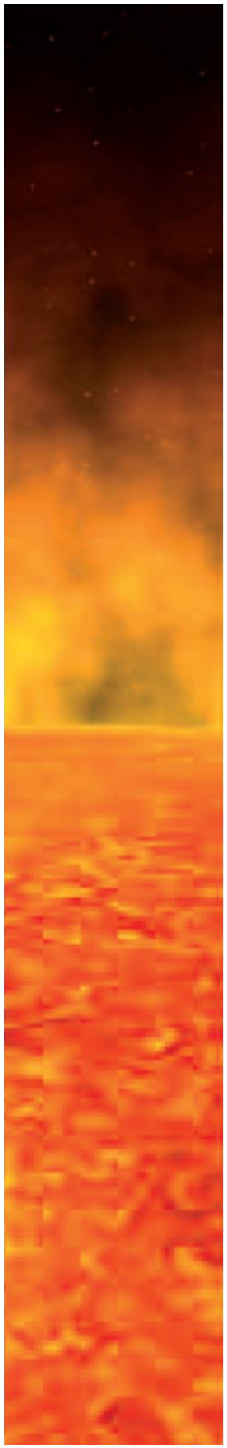
yes

no

Check nozzle size	Check for correct nozzle size on setting chart. Replace nozzle if necessary
Check air shutter adjustment	See setting chart
Check that nozzle is clean	Clean or Replace nozzle See Service Manual chapter 3.8
Check that fuel filter is clean	See Service Manual chapter 3.7
Check that pump filter is clean	See Service Manual chapter 3.12



Check that there are no air bubbles in the fuel lines	Tighten fittings Replace faulty pipes/hoses
Incorrect fuel pressure	Measure and adjust fuel pressure Replace pump (see Service Manual chapter 3.12)
Fuel of incorrect type, dirty, polluted or containing water	Empty tank and refill with clean fuel of proper type



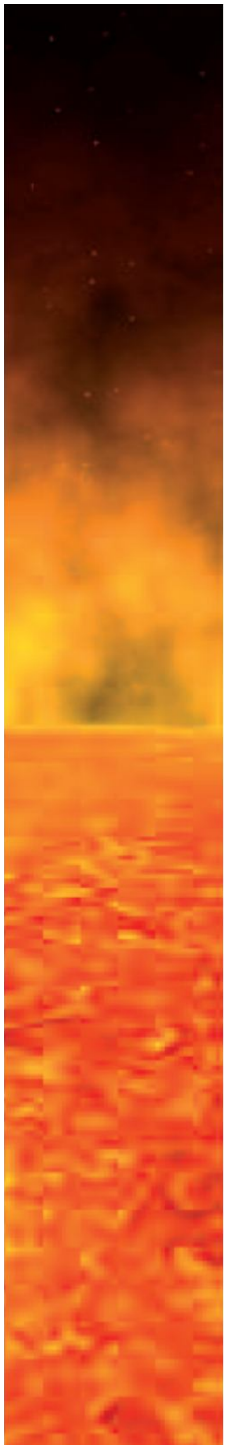
THE BURNER SHUTS OFF DURING OPERATION AND THE FAN CONTINUES TO ROTATE (US MODELS ONLY!)

yes

Trip of air pressure switch

Check air inlet/outlet for blockage, restrictions, etc.
Check supply voltage, motor fan rpm, fan blades, fan/shaft coupling

no



THE HEATER SUDDENLY STOPS

yes

Excessive overheating of combustion chamber (overheat thermostat correctly activated)

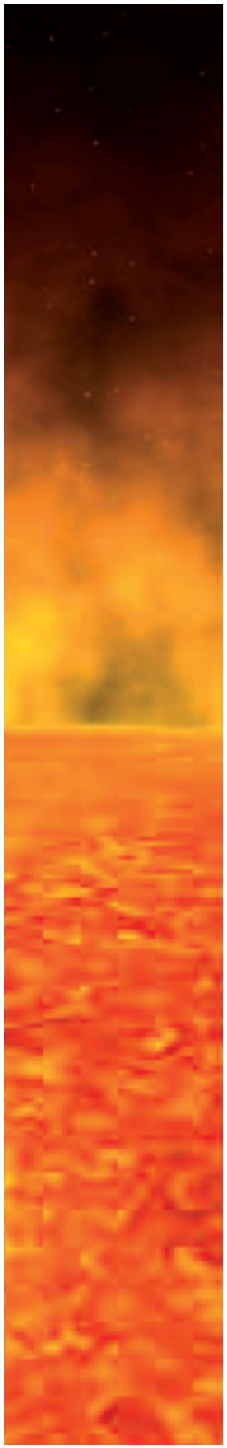
Wrong (too large) nozzle size
Wrong (too high) fuel pressure
Insufficient ventilation air due to motor fault
Insufficient ventilation air due to fan failure
Blockage of air inlet/outlet due to dirt or foreign objects
Exhaust pipe obstruction
Combustion chamber clogged by soot. (see chapter.3.10)

Overheat thermostat incorrectly activated

Wrong location of overheat thermostat (after incorrect service, repairs etc.)
Wrong thermostat setting/type
Faulty thermostat

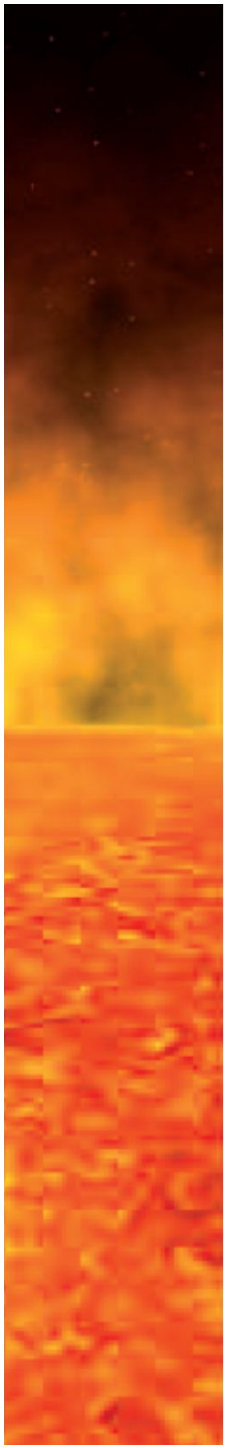
no

OK



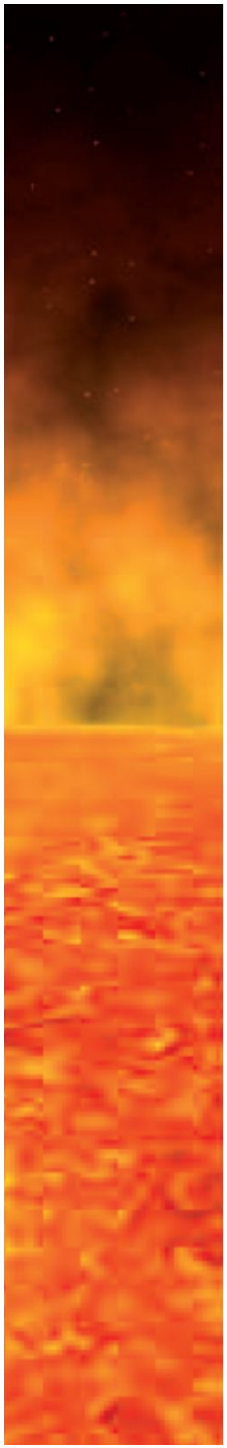
MIR WE (EU) - SETTING CHART

	CHAMBER INLET	FAN	SWIRL DISC	FUEL PUMP	FUEL PRESSURE	BURNER NOZZLE	AIR LOCK OPENING	OVERHEAT THERMOSTAT
MIR 37 WE (EU)	# 8 holes 6 mm dia.	dia.=350mm 3 blades 22°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R3	12 bar	DANFOSS 0.65 60° H	3 mm lock position 1	170 °C (red markings)
MIR 55 WE (EU)	# 8 holes 6 mm dia.	dia.=350mm 4 blades 18°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R3	12 bar	DANFOSS 1.00 60° H	6 mm lock position 1.5-2	170 °C (red markings)
MIR 85 WE (EU)	# 8 holes 10 mm dia.	dia.=500mm 4 blades 33°	out. dia.=76mm in. dia.=22mm 10 blades	DANFOSS R5	12 bar	DELAVAN 1.50 80° W	20 mm lock position 5.5	170 °C (red markings)



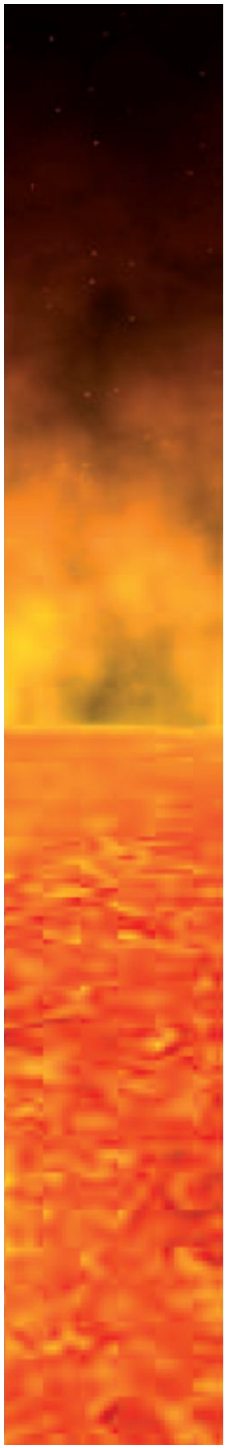
TOR WE (EU) - SETTING CHART

	CHAMBER INLET	FAN	SWIRL DISC	FUEL PUMP	FUEL PRESSURE	BURNER NOZZLE	AIR LOCK OPENING	OVERHEAT THERMOSTAT
TOR 67 WE (EU)	# 8 holes dia. 6 mm	dia.=350mm 4 blades 18°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R3	12 bar	DANFOSS 1.25 60° H	10 mm lock position 2.5	100 °C (black markings)
TOR 115 WE (EU)	# 8 holes dia. 10 mm	dia.=500mm 4 blades 33°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R5	12 bar	DELAVAN 2.25 80° W	28 mm lock position 8.5	100 °C (black markings)



MIR WU (USA) - SETTING CHART

	CHAMBER INLET	FAN	SWIRL DISC	FUEL PUMP	FUEL PRESSURE	BURNER NOZZLE	AIR SHUTTER SETTING	OVERHEAT THERMOSTAT
MIR 37 WU USA	# 8 holes 6 mm dia.	dia.=350mm 3 blades 18°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R3	12 bar 175 psi	DANFOSS 0.65 60° H	3 mm lock position 1	170 °C (red markings)
MIR 55 WU USA	# 8 holes 6 mm dia.	dia.=350mm 3 blades 18°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R3	12 bar 175 psi	DANFOSS 1.00 60° H	7 mm lock position 2	170 °C (red markings)
MIRAGE 85 WU USA	# 8 holes 10 mm dia.	dia.=500mm 4 blades 33°	out. dia.=76mm in. dia.=22mm 10 blades	DANFOSS R5	12 bar 175 psi	DELAVAN 1.50 80° W	14 mm lock position 3.5 - 4	170 °C (red markings)



TOR WU (USA) - SETTING CHART

	CHAMBER INLET	FAN	SWIRL DISC	FUEL PUMP	FUEL PRESSURE	BURNER NOZZLE	AIR SHUTTER SETTING	OVERHEAT THERMOSTAT
TOR 67 WU USA	# 8 holes dia. 6 mm	dia.=350mm 3 blades 18°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R3	12 bar 175 psi	DANFOSS 1.25 60° H	4 mm lock position 1.5	100 °C (black markings)
TOR 115 WU USA	# 8 holes dia. 10 mm	dia.=500mm 4 blades 33°	out. dia.=76mm in. dia.=27mm 10 blades	DANFOSS R5	12 bar 175 psi	DELAVAN 2.25 80° W	13 mm lock position 3.5	100 °C (black markings)

SERVICE & MAINTENANCE TOOLS