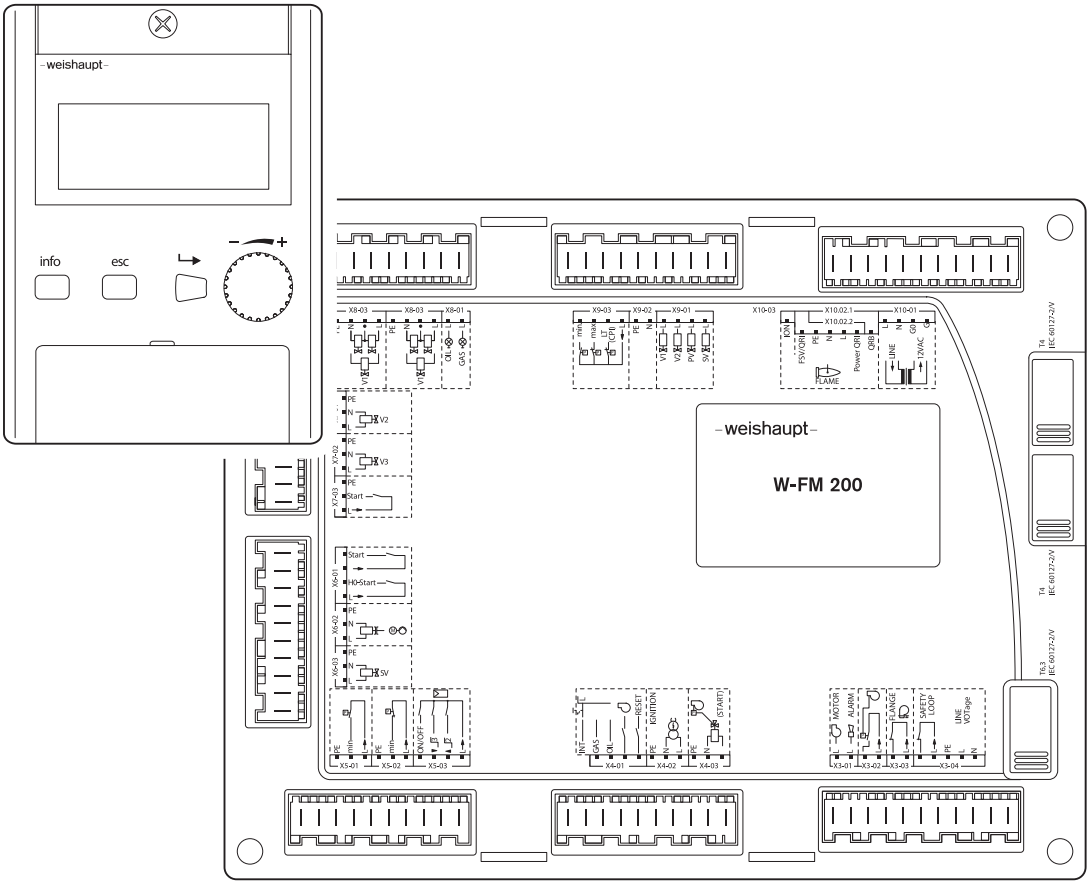
–weishaupt–

manual

Installation and operating instruction



Combustion manager W-FM 100 und W-FM 200

83054802 ▪ 1/2018-07

1 User instructions

Translation of original operating instructions

This manual forms part of the equipment and must be kept on site.

Carefully read the manual prior to working on the unit.

1.1 Target group

The manual is intended for the operator and qualified personnel. They should be observed by all personnel working with the unit.

Work on the unit must only be carried out by personnel who have the relevant training and instruction.

Persons with limited physical, sensory or mental capabilities may only work on the unit if they are supervised or have been trained by an authorised person.

Children must not play with the unit.

1.2 Symbols

 DANGER	Immediate danger with high risk. Non observance can lead to serious injury or death.
 WARNING	Danger with medium risk. Non observance can lead to environmental damage, serious injury or death.
 CAUTION	Danger with low risk. Non observance can cause damage to the equipment and injury to personnel.
	Important information
▸	Requires direct action
✓	Result after an action
▪	Itemisation
…	Range of values

1.3 Guarantee and Liability

Guarantee and liability claims for personal and equipment damage are excluded, if they can be attributed to one or more of the following causes:

- non approved application,
- non-observance of the manual,
- operation with faulty safety equipment,
- continual operation despite a fault,
- improper installation, commissioning, operation and service,
- repairs, which have been carried out incorrectly,
- the use of non original Weishaupt parts,
- force majeure,
- unauthorised modifications made to the unit,
- the installation of additional components, which have not been tested with the unit,
- the installation of combustion chamber inserts, which impede full flame formation,
- unsuitable fuels,
- defects in the inlet lines.

2 Safety

The combustion manager W-FM 100/200 is suitable for use with:
- oil burners
- gas burner
- dual fuel and triple fuel burners,
- dual gas burners.

Improper use could:
- endanger the health and safety of the user or third parties,
- cause damage to the unit or other material assets.

2.1 When gas can be smelled

Avoid open flames and spark generation, for example:
- do not operate light switches,
- do not operate electronic equipment,
- do not use mobile telephones.

- ► Open doors and windows.
- ► Close gas isolating valve.
- ► Warn the inhabitants, do not ring door bells.
- ► Leave the building.
- ► Inform the heating contractor or gas supplier from outside of the building.

2.2 Safety measures

Safety relevant fault conditions must be eliminated immediately.

Components, which show increased wear and tear or whose design lifespan is or will be exceeded prior to the next service should be replaced as a precaution.

The design lifespan of the components is listed in the service plan [ch. 8.2].

2.2.1 Normal operation

- All labels on the unit must be kept in a legible condition.
- Stipulated settings, service and inspection work should be carried out at regular intervals.
- Only operate the unit with its cover closed.
- Do not touch moving parts during operation.
- Do not touch the oil carrying parts of medium and heavy oil burners during operation.

2.2.2 Electrical connection

For work carried out on live components:
- Observe the accident prevention instructions DGUV Regulation 3 and adhere to local directives,
- tools in accordance with EN 60900 should be used.

2.2.3 Gas supply

- Only the gas supply company or an approved agent may carry out installation, alteration and maintenance work on gas appliances in buildings and properties.
- Pipework must be subject to a combined load and valve proving test and/or usability testing relative to the pressure range intended, e. g. DVGW-TRGI, worksheet G 600.
- Inform the gas supply company about the type and size of plant prior to installation.
- Local regulations and guidelines must be observed during installation, e. g. DVGW-TRGI, worksheet G 600; TRF Band 1 and Band 2.
- The gas supply pipework should be suitable for the type and quality of gas and should be designed in such a way that it is not possible for liquids to form, e. g. condensate. Observe vaporisation pressure and vaporisation temperature of liquid petroleum gas.
- Use only tested and approved sealing materials, whilst observing all process information.
- Re-commission the appliance when changing to a different type of gas. Changing from LPG to Natural Gas and visa versa requires a conversion.
- Carry out soundness test after each service and fault rectification.

2.3 Alterations to the construction of the equipment

All conversions require written approval from Max Weishaupt GmbH.

- No additional components may be fitted, which have not been tested for use with the equipment.
- Do not use combustion chamber inserts, which hinder flame burnout.
- Use only original Weishaupt replacement parts.

2.4 Noise emission

The noise emissions are determined by the acoustic behaviour of all components fitted to the combustion system.

Prolonged exposure to high noise levels can lead to loss of hearing. Provide operating personnel with protective equipment.

Noise emissions can further be reduced with a sound attenuator.

2.5 Disposal

Dispose of all materials and components in a safe and environmentally friendly way at an authorised location. Observe local regulations.

3 Product description

3.1 Variations

Type	Version	Functions
W-FM 100	LMV51.0…	▪ Burner Control ▪ Low gas programme ▪ Valve proving
	LMV51.1…	▪ as type LMV51.0… ▪ Load controller
W-FM 200	LMV52.2…	▪ as type LMV51.1… ▪ Variable speed drive ▪ O_2 trim
	LMV52.4…	▪ as type LMV52.2… ▪ FGR with temperature compensation ▪ CO monitor and CO controller function

3.2 Function

3.2.1 Burner Control

A burner control for oil, gas and dual fuel burners is integrated in the combustion manager.

It controls the sequence of operation, monitors the flame and communicates with all components.

3.2.2 Low gas programme

The low gas pressure switch monitors the gas connection pressure from phase 21. If the gas pressure set at the low gas pressure switch is not achieved, the combustion manager initiates a safety shutdown and starts the low gas programme.
In the low gas programme, the combustion manager initiates a restart after the low gas waiting time (Parameter: `DelayLackGas`). This low gas waiting time doubles after every unsuccessful start attempt. If the start attempts exceed the repetition limit value (Parameter: `StartRelease`) the combustion manager goes to lockout. The repetition counter and the low gas waiting time are automatically reset when the burner starts.

3.2.3 Valve proving

The valve proving gas pressure switch checks if the valves are tight. It signals the combustion manager if the pressure increases or decreases to an impermissible level during valve proving.

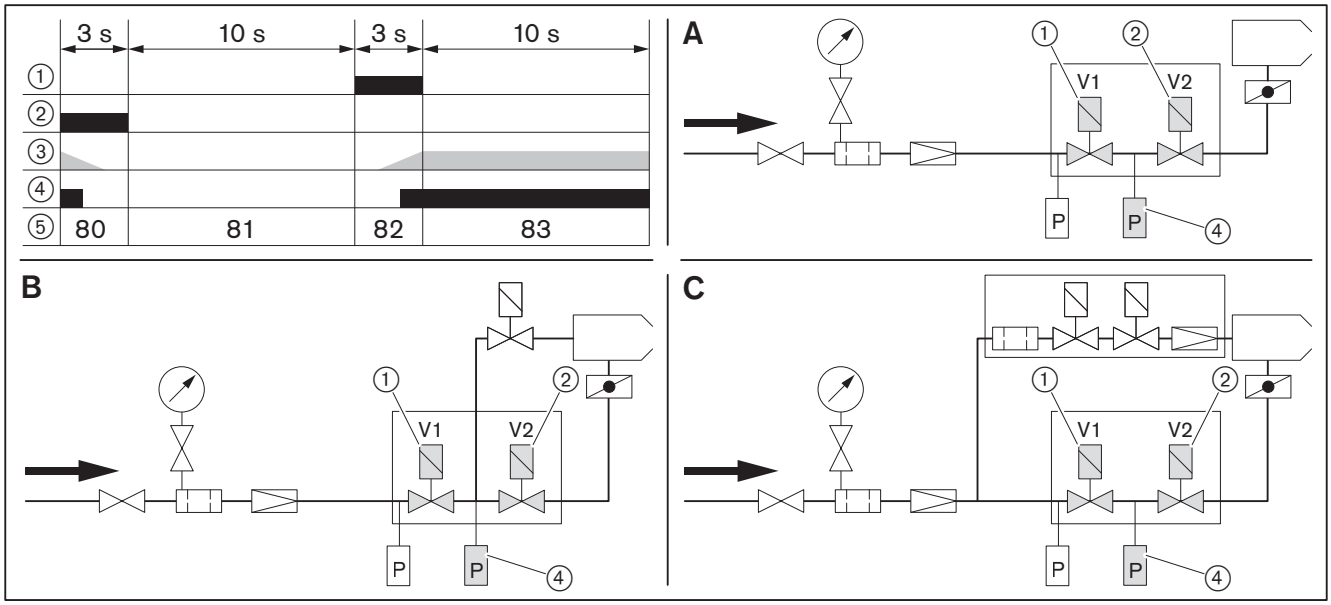
Valve proving is carried out automatically by the combustion manager:
- after every controlled shutdown,
- prior to burner start following lockout or power outage.

1. Test phase (function sequence for valve proving valve 1):
- Valve 1 remains closed, valve 2 opens,
- the gas escapes and the pressure between valve 1 and valve 2 reduces,
- valve 2 closes again,
- both valves remain closed for 10 seconds.

If the pressure increases to above the value set during these 10 seconds, valve 1 is leaking. The combustion manager initiates a controlled shutdown.

2. Test phase (function sequence for valve proving valve 2):
- Valve 1 opens, valve 2 remains closed,
- pressure between valve 1 and valve 2 increases,
- valve 1 closes again,
- both valves remain closed for 10 seconds.

If the pressure decreases to below the value set during these 10 seconds, valve 2 is leaking. The combustion manager initiates a controlled shutdown.



① Valve 1
② Valve 2
③ Pressure between valve 1 and valve 2
④ Valve proving gas pressure switch
⑤ Operating phases
A Direct ignition
B Ignition gas tube
C Gas ignition device

3.2.4 Load controller

The W-FM 200 is equipped with an internal PID load controller as standard, with the W-FM 100 the internal load controller is optional.

The load controller is suitable for multi-stage and modulating burners. In modulating operation, control variables calming reduces the drive impulses and protects the actuators.
It is possible to choose between two setpoints using an external contact.
The boiler cold start function reduces the thermal load of the heat exchanger during burner start.

3.2.5 Variable speed drive

Only the W-FM 200 is equipped with a frequency converter module for variable speed control.

Via an analogue output (0/4-20 mA), the W-FM 200 control the frequency converter of the fan motor and matches the speed to the burner capacity. This reduces electrical consumption.
The speed and the rotation direction are monitored by an inductive proximity switch and an asymmetrical transmitter disc.

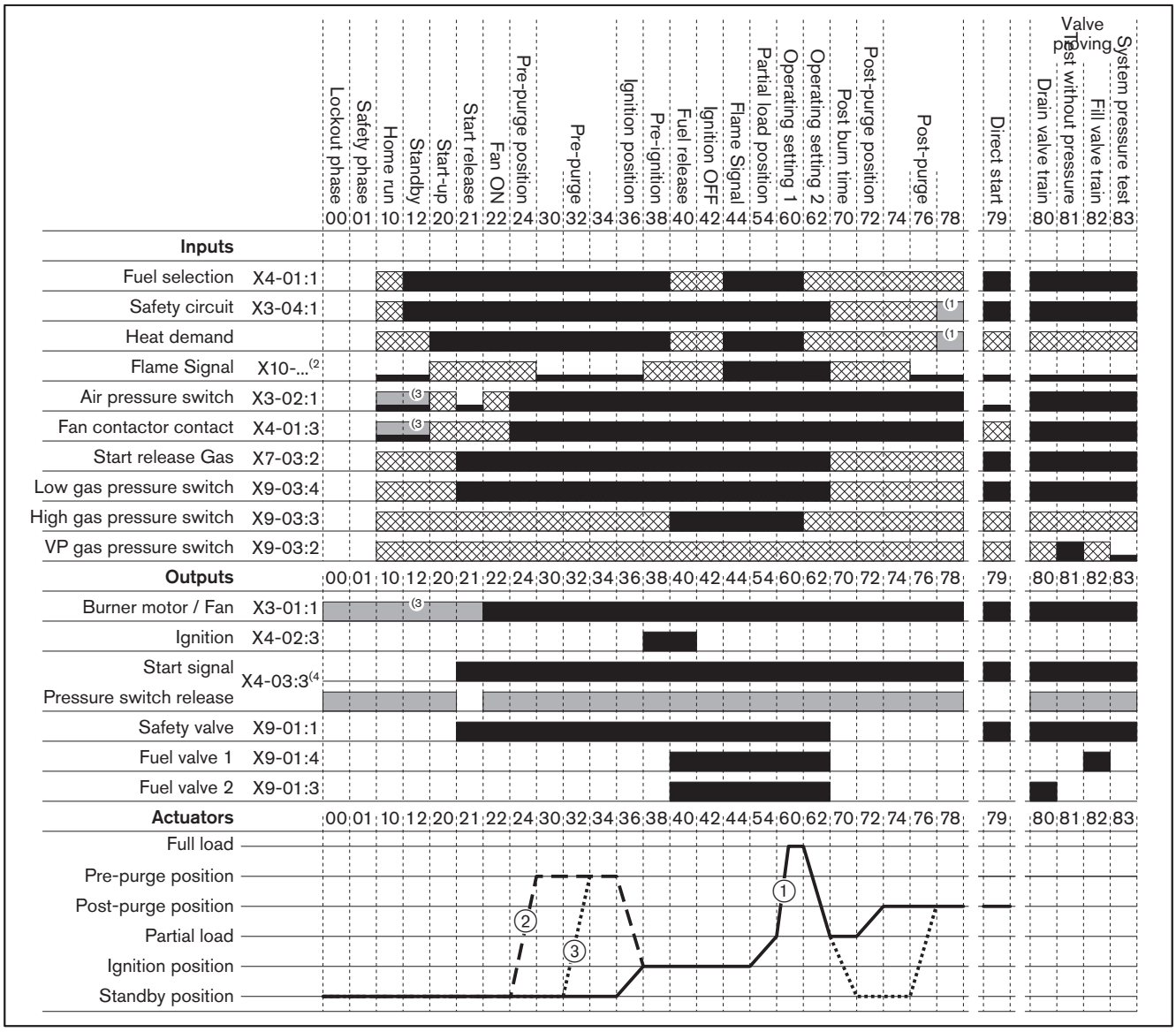
3.2.6 O2 trim / monitoring

Only the W-FM 200 is equipped with an O_2 trim function. An additional O_2 module (PLL52…) is required for O_2 trim.

A sensor measures the O_2 content in the flue gas. During operation, the W-FM 200 compares the O_2 content with the setpoints determined during commissioning. If deviations occur, the W-FM 200 activates the air regulating devices and corrects the O_2 content. This increases the boiler efficiency.

3.2.7 Program sequence

3.2.7.1 Gas direct ignition



(1 Signal only required to jump to Phase 79 (direct start)

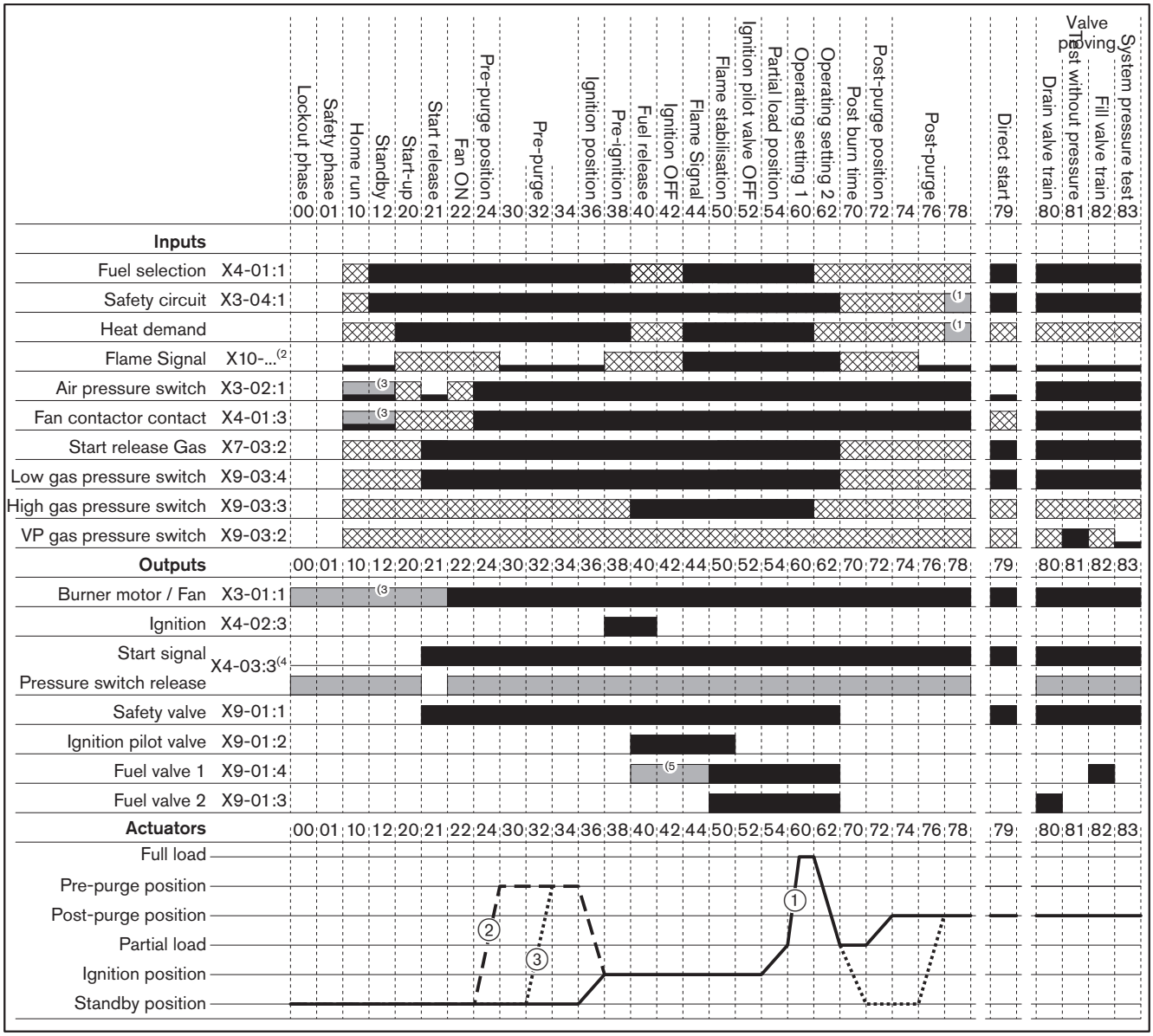
(2 with QRI / QRA7x: Input X10-02:6
with ionisation electrode: Input X10-03:1

(3 Only with continuous running fan

(4 Signal is dependent on parameter: Start/PS valve (start signal or pressure switch release)

- Signal on input / output activated
- No signal on input
- Input without influence
- Signal optional or depending on parameter settings
- ① Fuel actuator
- ② Actuators air, Aux1, Aux2 / frequency converter
- ③ Actuator flue gas recirculation

3.2.7.2 Gas with ignition pilot valve



(1 Signal only required to jump to Phase 79 (direct start)

(2 with QRI / QRA7x: Input X10-02:6
with ionisation electrode: Input X10-03:1

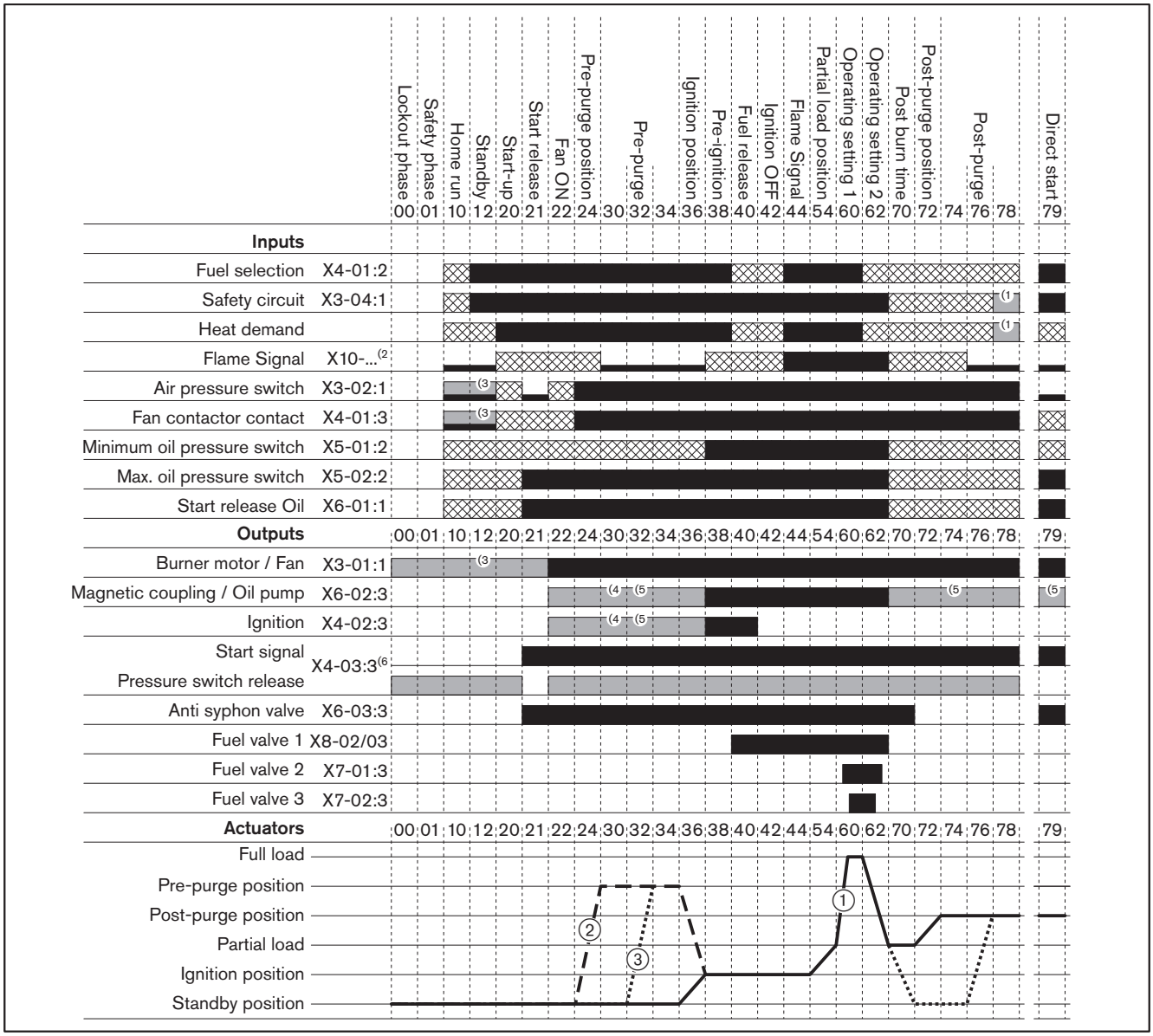
(3 Only with continuous running fan

(4 Signal is dependent on parameter: Start/PS valve (start signal or pressure switch release)

(5 If a pilot valve is fitted between fuel valve 1 and 2: Signal from Phase 40
If a gas ignition device is fitted in front of fuel valve 1: Signal from Phase 50

Signal on input / output activated
No signal on input
Input without influence
Signal optional or depending on parameter settings
① Fuel actuator
② Actuators air, Aux1, Aux2 / frequency converter
③ Actuator flue gas recirculation

3.2.7.3 Light oil direct ignition



(1 Signal only required to jump to Phase 79 (direct start)

(2 with QRI / QRA7x: Input X10-02:6
with QRA2: Input X10-03:1
with QRB: Input X10-02:1

(3 Only with continuous running fan

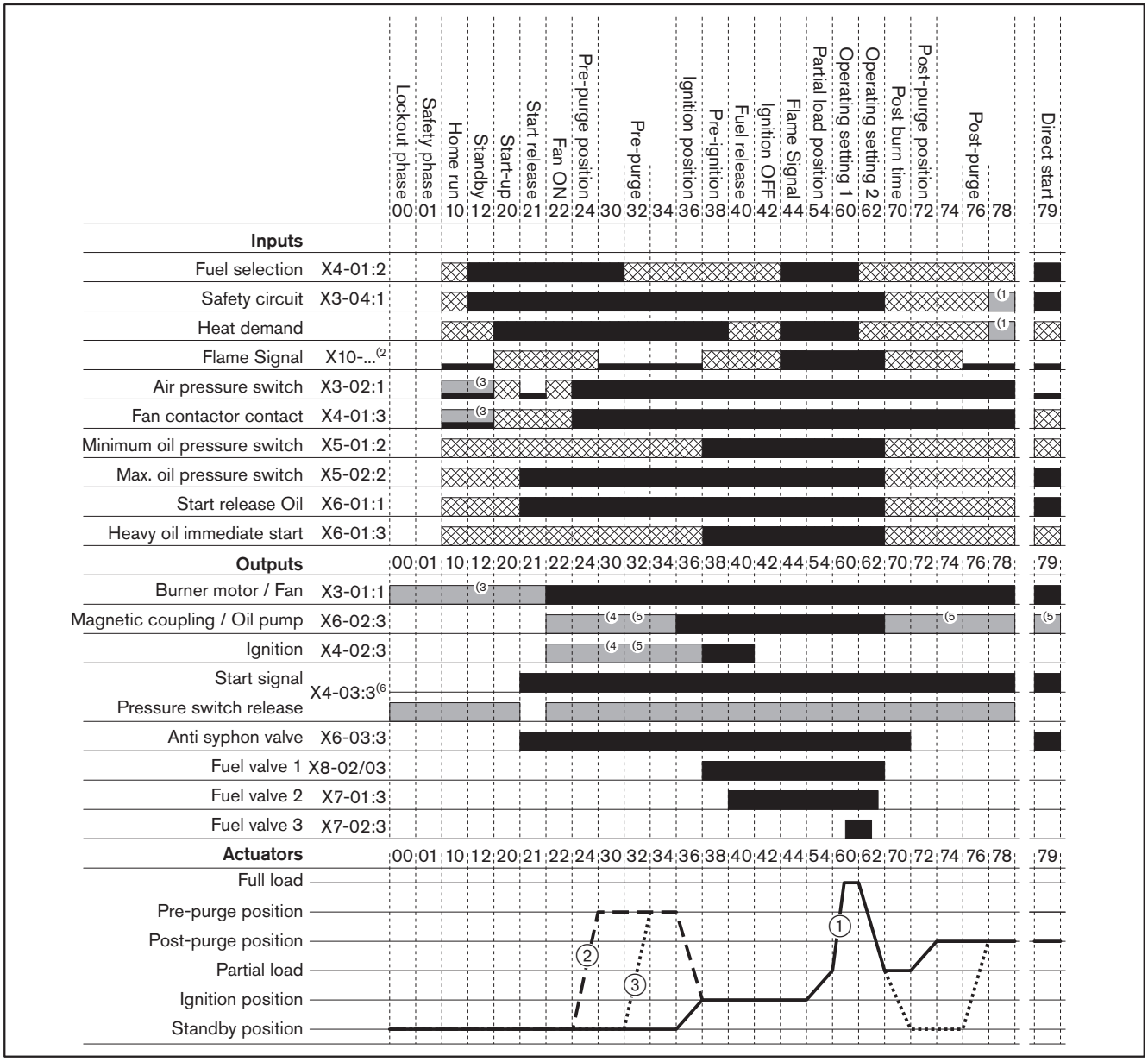
(4 Signal depends on parameter: OnIgnPointOilIgnition (long or short pre-ignition)

(5 Signal depends on parameter: OilPumpCoupling (direct coupling)

(6 Signal depends on parameter: Start/PS valve

Signal on input / output activated
No signal on input
Input without influence
Signal optional or depending on parameter settings
① Fuel actuator
② Actuators air, Aux1, Aux2 / frequency converter
③ Actuator flue gas recirculation

3.2.7.4 Heavy oil direct ignition



(1 Signal only required to jump to Phase 79 (direct start)

(2 with QRI / QRA7x: Input X10-02:6
with QRA2: Input X10-03:1
with QRB: Input X10-02:1

(3 Only with continuous running fan

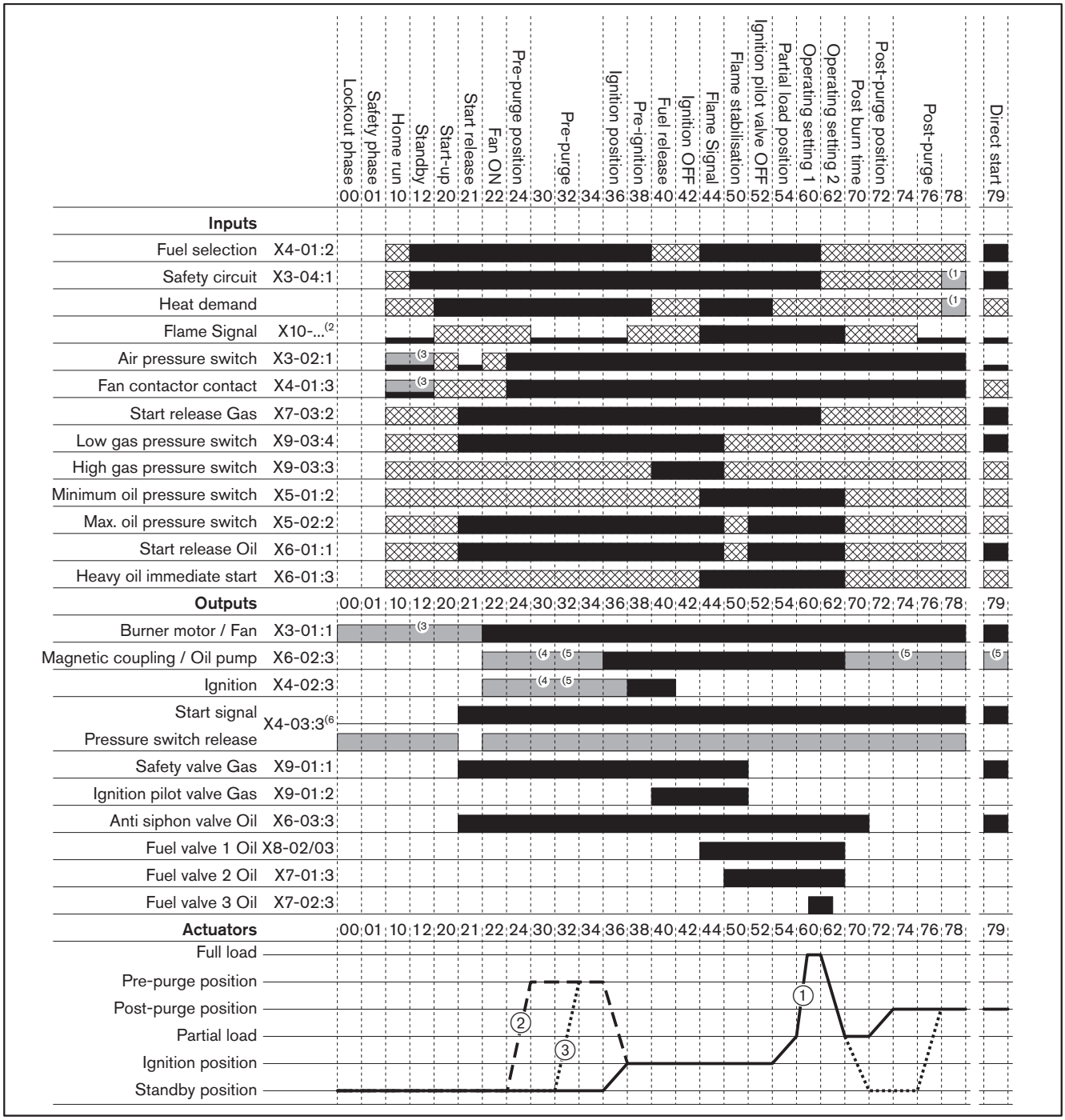
(4 Signal depends on parameter: OnIgnPointOilIgnition (long or short pre-ignition)

(5 Signal depends on parameter: OilPumpCoupling (direct coupling)

(6 Signal depends on parameter: Start/PS valve

Signal on input / output activated
No signal on input
Input without influence
Signal optional or depending on parameter settings
① Fuel actuator
② Actuators air, Aux1, Aux2 / frequency converter
③ Actuator flue gas recirculation

3.2.7.5 Heavy oil with gas pilot ignition



(1 Signal only required to jump to Phase 79 (direct start)

(2 with QRI / QRA7x: Input X10-02:6
with ionisation electrode on gas ignition device: Input X10-03:1

(3 Only with continuous running fan

(4 Signal depends on parameter: OnIgnPointOilIgnition (long or short pre-ignition)

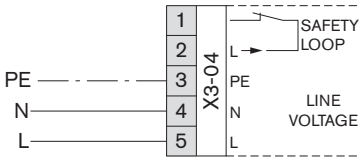
(5 Signal depends on parameter: OilPumpCoupling (direct coupling)

(6 Signal depends on parameter: Start/PS valve

Signal on input / output activated
No signal on input
Input without influence
Signal optional or depending on parameter settings
① Fuel actuator
② Actuators air, Aux1, Aux2 / frequency converter
③ Actuator flue gas recirculation

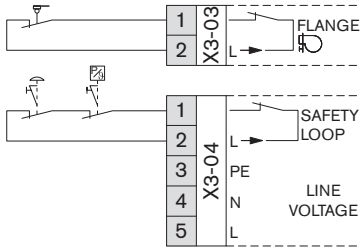
3.3 Inputs

3.3.1 Voltage supply



The voltage supply is connected to inputs X3-04:3-5.

3.3.2 Safety circuit



In the diagnostic code, the inputs X3-03:1/2 and X3-04:1/2 are combined as safety circuit. If one of the inputs is open the W-FM carries out at least one safety shutdown. If the repetition value is exceeded an open input leads to lockout.

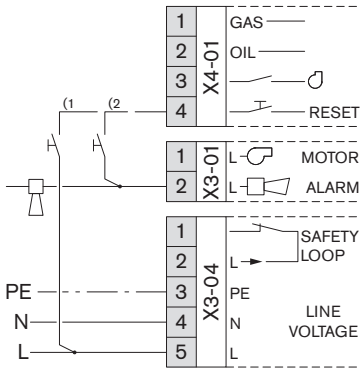
The repetition value can be set in parameter `RepetitCounter` under `SafetyLoop`, see [ch. 6.8.12].

At input X3-04:1/2 all external components of the safety circuit are switched in sequence, these include:

- Emergency-Off switch
- Safety time limiter (STL)
- Low water safety interlock, etc.

The burner flange limit switch is connected to input X3-03:1/2.

3.3.3 Reset



A reset button can be connected to input X4-01:4. Pressing this button in lockout will reset the combustion manager.

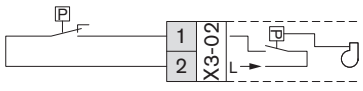
With lockout function(1

If the push button is also required for manual lockout, it must be connected to mains input X3-04:5 (L). If the combustion manager is in an operating phase pressing the button will initiate a manual lockout.

Without lockout function(2

If the push button is not required to carry out manual lockout it must be connected to alarm output X3-01:2.

3.3.4 Air pressure switch



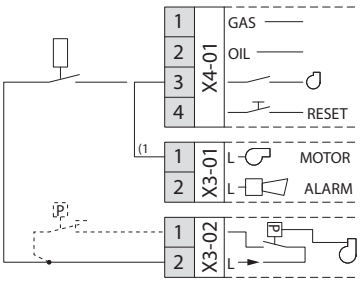
Depending on the burner configuration, the input is activated at the factory in the OEM level.

The input is activated for:

- gas burner
- dual fuel burners,
- oil burners with separately driven pump.

In these cases, the closing contact of the air pressure switch is connected to input X3-02:1. The fan will only start, if no signal is present at the input during start release. If the signal is missing once the fan has started, the combustion manager initiates a lockout.

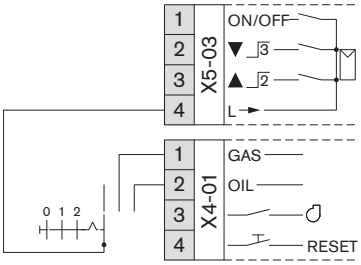
3.3.5 Fan contactor contact



The auxiliary contact (closer) of the fan contactor is connected to input X4-01:3. The fan will only start, if no signal is present at the input during start release. If the signal is missing once the fan has started, the combustion manager initiates a lockout.

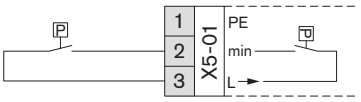
([1]Only with frequency converter:
For fans with frequency converter, the signal is generated via a bridge from output X3-01:1 (burner motor / fan).

3.3.6 Fuel selection



The fuel selection switch is connected to input X4-01:1/2. The fuel selection switch has priority over fuel selection via display and operating unit (ABE) or building management system (BMS). Fuel selection via ABE or BMS is only possible if no signal is present at input X4-01:1/2. There is no priority between ABE and BMS, the last fuel selection is valid and is retained after power failure.

3.3.7 Minimum oil pressure switch

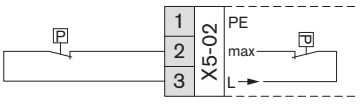


The closing contact of the minimum oil pressure switch is connected to input X5-01. On burners without minimum oil pressure switch the input is deactivated.

In oil operation the combustion manager expects a signal at input X5-01:2 from Phase 38, in Phase 44 with heavy oil with gas ignition device. If the pressure falls below the value set, the pressure switch contact opens and the combustion manager initiates a lockout. In Phase 38 (in Phase 44 with heavy oil with gas ignition device) lockout occurs after a waiting time of 3 seconds, in the following phases lockout is immediate.

To avoid a lockout caused by pressure fluctuations during fuel release, the input reacts time delayed in Phase 40 and 42. The time delay can be adjusted in parameter `PressReacTime`, see [ch. 6.8.1].

3.3.8 Max. oil pressure switch

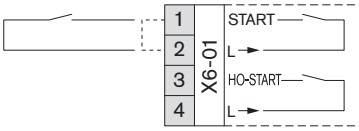


The opening contact of the max. oil pressure switch is connected to input X5-02. On burners without maximum oil pressure switch the input is deactivated.

In oil operation the combustion manager expects a signal at input X5-02:2 from Phase 22. If the value set at the pressure switch is exceeded, the pressure switch contact opens and the combustion manager initiates a lockout. In Phase 21 (start release) lockout occurs after a waiting time of 120 seconds, in the following phases lockout is immediate.

To avoid a lockout caused by pressure fluctuations during fuel release, the input reacts time delayed in Phase 40 and 42. The time delay can be adjusted in parameter `PressReacTime`, see [ch. 6.8.1].

3.3.9 Start release Oil

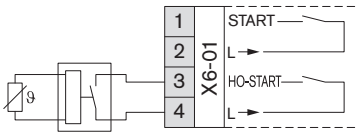


The start conditions for the oil operation are interrogated via input X6-01:1, e. g.:
- oil shut off combination limit switch,
- oil temperature release contact (for heavy oil),
- cooling air fan contact (WK burners with hot air, version ZMH).

For burners without start conditions, a bridge is connected between terminals 1 and 2.

In oil operation the combustion manager expects a signal at input X6-01:1from Phase 21. If the signal is missing after Phase 21, the combustion manager initiates a shutdown.

3.3.10 Heavy oil immediate start



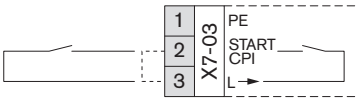
The input is only activates on heavy oil burners with return flow temperature sensor. The release contact of the return flow temperature sensor is connected to input X6-01:3.

In heavy oil operation, the combustion manager carries out a nozzle circulation for maximum 45 seconds. If the signal is present at input X6-01:3 before this time has elapsed, the nozzle circulation is shortened accordingly. If the signal is missing after this time has elapsed, the combustion manager initiates a home run with subsequent repetition.

Depending on the burner nozzle circulation is carried out in phase:
- 38 (with direct ignition),
- 44 (with gas ignition device).

If the signal fails after Phase 44, the combustion manager initiates a safety shutdown.

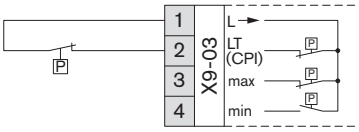
3.3.11 Start release Gas



The input is activated in gas operation and in heavy oil operation with gas ignition device.

The combustion manager expects a signal at input X7-03:2 from Phase 21. If the signal is missing after Phase 21, the combustion manager initiates a shutdown.

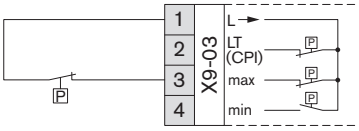
3.3.12 Valve proving gas pressure switch



The opening contact of the valve proving gas pressure switch is connected to input X9-04:2. Input X9-04:2 is only activated during valve proving [ch. 3.2.3].

If the pressure set is not achieved in Phase 81 (test without pressure), the contact closes.
If the pressure set is exceeded in Phase 83 (test with system pressure), the contact opens.

3.3.13 High gas pressure switch

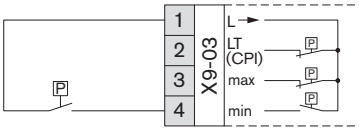


The input is activated in gas operation and in heavy oil operation with gas ignition device. The opening contact of the high gas pressure switch is connected to input X9-03:3.
On burners without high gas pressure switch the input is deactivated.

The combustion manager expects a signal at input X9-03:3 from Phase 40. If the value set at the pressure switch is exceeded, the pressure switch contact opens and the combustion manager initiates a lockout.

To avoid lockouts caused by pressure fluctuations when the valves open, the input reacts time delayed in Phase 40, 42 and 50. The time delay can be adjusted in parameter `PressSigReactTime` ,see [ch. 6.8.1].

3.3.14 Low gas pressure switch



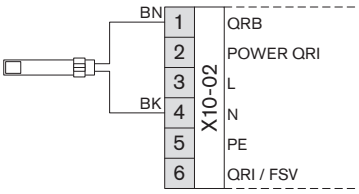
The input is activated in gas operation and in heavy oil operation with gas ignition device. The closing contact of the low gas pressure switch is connected input X9-03:4.

In gas operation, the combustion manager expects a signal at input X9-03:4 from Phase 21. If the pressure drops below the value set, the pressure switch contact opens and the combustion manager starts the low gas programme [ch. 3.2.2].

To avoid lockouts caused by pressure fluctuations when the valves open, the input reacts time delayed in Phase 40, 42 and 50. The time delay can be adjusted in parameter `PressSigReactTime` ,see [ch. 6.8.1].

3.3.15 Flame sensor

If the flame signal from Phase 44 does not correspond to the value required, the combustion manager initiates safety shutdown with restart. The number of safety shutdowns set in parameter `LossOfFlame` in sequence lead to lockout [ch. 6.8.12].
Depending on parameter `ReactionExtranL` , a flame signal in Standby (Phase 12) will lead to start prevention or lockout.
A flame signal during pre-purge (Phases 30 to 36) or post-purge (Phase 76 and 78) leads to lockout after one repetition and repeated occurrence.
The `OperationalStat` shows the current flame signal as a percentage value.

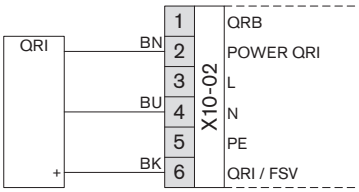


QRB…

The flame sensor QRB… (photo resistor) is connected to input X10-02:1/4.
The flame sensor QRB is not suitable for continuous operation.

If the combustion manager is installed in a control panel, the sensor cable must be routed separately (max 100 m).

Flame signal	Sensor current	Display
Minimum flame signal	DC 30 µA	approx. 35 %
Maximum flame signal	DC 70 µA	approx. 100 %
Extraneous light detection from	DC 5 µA	-

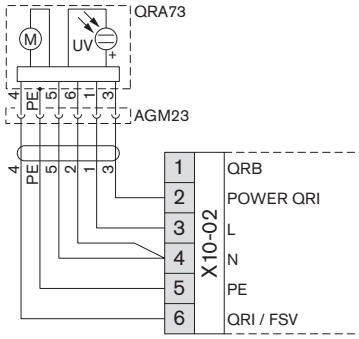


QRI

The flame sensor QRI (infrared) is connected to input X10-02:2/4/6.
The flame sensor QRI is suitable for continuous operation. The combustion manager tests the flame sensor in cycles in operating position (Phase 60) by simulating a flame failure. The voltage at output X10-02:2 is increased from 14 V to 21 V for 0.5 seconds. The signal voltage at the flame sensor therefore drops to 0 V and the combustion manager receives the expected Off signal at input X10-02:6.

If the combustion manager is installed in a control panel, the sensor cable must be routed separately (max 100 m).

Flame Signal	Display
Min. signal voltage: DC 3.5 V (X10-02:6)	approx. 50 %

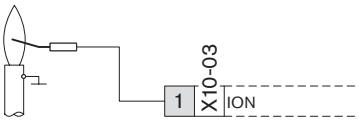


QRA73

The flame sensor QRA73 (UV cell) is connected to input X10-02:2-6 using plug AGM23.
The flame sensor QRA73 is suitable for continuous operation. The combustion manager tests the flame sensor in cycles in operating position (Phase 60) by simulating a flame failure. The voltage at output X10-02:2 is increased 14 V to 21 V for 0.5 seconds. The signal voltage at the flame sensor therefore drops to 0 V and the combustion manager receives the expected Off signal at input X10-02:6.

If the combustion manager is installed in a control panel, the connection must be divided into 2 lines after the AGM23 plug and routed separately (max 100 m):
- Supply line: Core 1, 2 and PE (L / N / PE),
- Signal line (screened): Core 3, 4 and 5 (POWER QRI / N / QRI).

Flame Signal	Display
Min. signal voltage: DC 3.5 V (X10-02:6)	approx. 50 %



Ionisation electrode

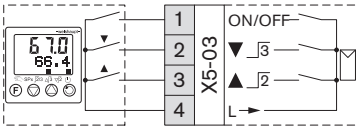
The ionisation electrode is connected to input X10-03:1.

If the combustion manager is installed in a control panel, the sensor cable must be routed separately:
- Max. length: 100 m,
- Line capacity: 100 pF/m.

Flame signal	Sensor current	Display
Minimum flame signal	DC 6 µA	approx. 50 %
Maximum flame signal	DC 85 µA	approx. 100 %

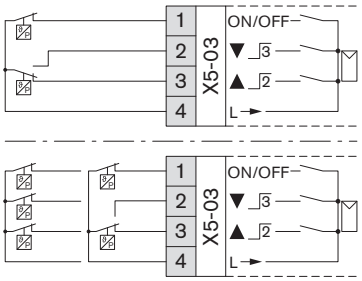
3.3.16 External load controller (X5-03)

For operation with load controller via contacts, parameter `LC_OptgMode` must be set to `ExtLC X5-03` see [ch. 6.12.2]. The contact for heat demand is connected to input X5-03:1 (burner ON/OFF).



Modulating operation with load controller

If input X5-03:2 (CLOSED) is activated, the burner capacity reduces.
If input X5-03:3 (OPEN) is activated, the burner capacity increases.
If none of the two inputs is activated, the burner capacity remains unchanged.

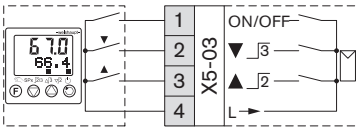


Modulating operation with thermostat

If thermostats or pressure regulators are connected to inputs X5-03, the modulating fuel can only be operated in sliding two stage operation.

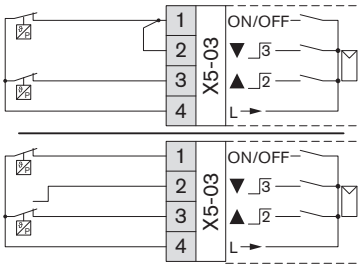
At heat demand input X5-03:2 (CLOSED) is activated and the burner drives to partial load. If the temperature drops below the value set, input X5-03:3 (OPEN) is activated and the burner drives to full load.

Multi-stage operation (fuel oil only)



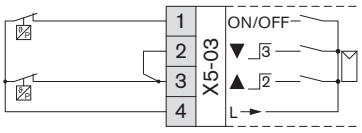
Two and three stage:

Input	Operating mode	
	two stage	three stage
X5-03:1	Stage 1	Stage 1
X5-03:2	Stage 1	Stage 2
X5-03:3	Stage 2	Stage 3



Low impact start:

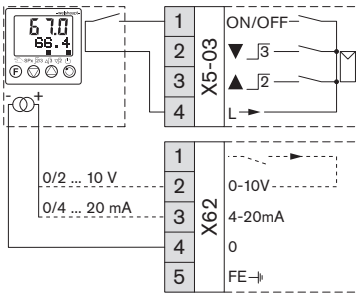
At heat demand and with the bridge between terminal 1 and 2 the burner ignites in stage 1 and then automatically drives to stage 2. If input X5-03:3 is also activated the burner drives to stage 3.
Alternatively, low impact start can be carried using a change-over contact.



Change-over release:

A bridge connects terminals 2 and 3. At heat demand the burner drives to stage 1. If inputs X5-03:2/3 are then activated simultaneously the burner drives via stage 2 to stage 3.

3.3.17 External load controller (X62)



For operation with external load controller on the analogue input, parameter `LC_OptgMode` must be set to `Ext LC X62` see [ch. 6.12.2].
The contact for heat demand is connected to input X5-03:1 (burner ON/OFF).
The analogue load signal is connected to terminals X62:2/4 (0/2-10 V) or X62:3/4 (0/4-20 mA). In parameter `Ext Inp X62 U/I` the input must be matched to the analogue signal [ch. 6.12.4].

Modulating operation

In modulating operation, parameter `MinActuatorStep` determines the minimum correcting element step [ch. 6.12.9].

Signal on X62	Load W-FM
3 … 4 mA	20 %
20 mA	100 %

Multi-stage operation (fuel oil only)

In multi-stage operation a hysteresis of 1 mA exists between the operating points, which eliminates unnecessary load changes.

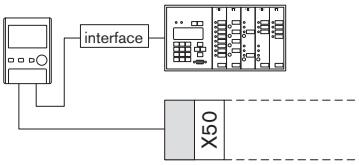
Two stage:

Signal on X62	Load W-FM
3 … **5** … 12 mA	Stage 1
13 … **15** … 20 mA	Stage 2

Three stage:

Signal on X62	Load W-FM
3 … **5** … 7 mA	Stage 1
8 … **10** … 12 mA	Stage 2
13 … **15** … 20 mA	Stage 3

3.3.18 External load controller (Bus)

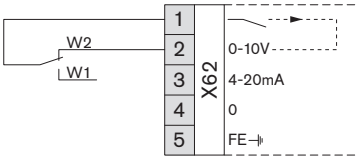


For the operation with external load controller via Bus connection, parameter `LC_OptgMode` must be set to `Ext LC Bus` ,see [ch. 6.12.2]. The building management system specifies the load signal via the bus connection.

In modulating operation, parameter `MinActuatorStep` determines the minimum correcting element step [ch. 6.12.9].

3.3.19 Setpoint switch-over

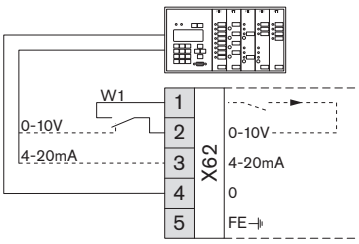
When operating with internal load controller it is possible to switch between 2 setpoints. To do this, a potential free contact is connected to terminal X62:1/2.



Operating mode IntLC

Two internal setpoints (W1/W2) are available in operating mode `IntLC` . The contact is used to switch between the setpoints.

- Open: Setpoint W1 activated
- Closed: Setpoint W2 activated

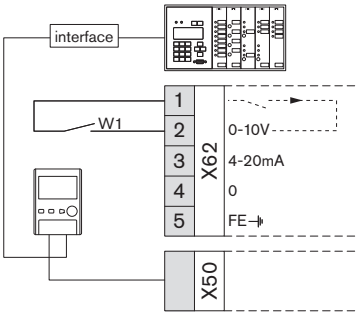


Operating mode IntLC X62

In operating mode `IntLC X62` the building management system provides the setpoint for the internal load controller via the analogue input.
In parameter `Ext Inp X62 U/I` , the input has to be matched to the analogue signal [ch. 6.12.4]. Parameters `Ext Setpoint min/-max` can be used to limit the external setpoint [ch. 6.12.6].

The contact is used to switch from the external setpoint to the internal setpoint W1. If a voltage signal is present at input X62:2, the voltage signal has to be separated from input X62:2 when switching over to the internal setpoint W1.

- Open: External setpoint activated
- Closed: Internal setpoint W1 activated

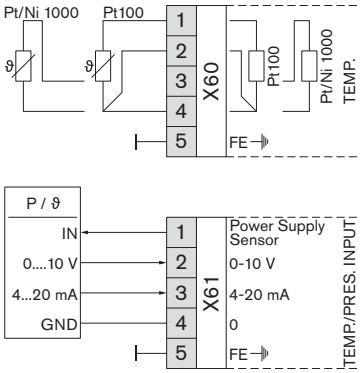


Operating mode IntLC Bus

In operating mode `Int LC Bus` the building management system provides the setpoint for the internal load controller via the Bus connection. The contact is used to switch from the external setpoint to the internal setpoint W1.

- Open: External setpoint activated
- Closed: Internal setpoint W1 activated

3.3.20 Temperature sensor



If the internal load controller is activated in parameter `LC_OptgMode` , a temperature sensor has to be connected to input X60 or a temperature or pressure sensor has to be connected to input X61.

On W-FM 200 with flue gas recirculation (FGR), the FGR temperature sensor is connected to input X60:3/4 as standard and is not available for the load controller. As an alternative, the flue gas temperature sensor on the O_2 module (accessory) can be used as FGR temperature sensor [ch. 3.3.23]. The sensor used must be defined in parameter `FGR-sensor`, see [ch. 6.15.3].

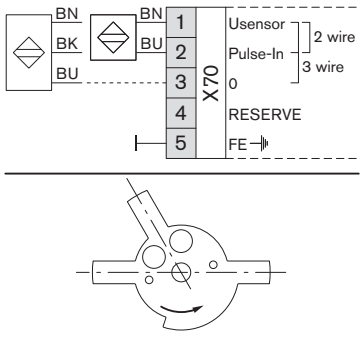
On W-FM 200 with CO control the combustion air sensor is fitted to input X60:3/4 and is not available for the load controller. Parameter `AirTempX60PT1000` (OEM level) must be set to `activated` .

The internal temperature monitor function is only possible with temperature sensor on input X60. If there is no external safety temperature limiter available in the safety circuit, two temperature sensors (Pt100/Pt1000 or Pt100/Ni1000) must be connected for the internal temperature monitor function.
With different cable resistances in the three-wire circuit (Pt100) line compensation is required.

Depending on the circuitry, the inputs must be configured via the following parameters:
- Sensor selection [ch. 6.12.3]
- Ext Inp X61 U/I [ch. 6.12.4]
- Measuring range [ch. 6.12.5]
- Additional sensor for boiler start function [ch. 6.12.14].

The voltage supply (20 V DC) on terminal X61:1 can not be changed.

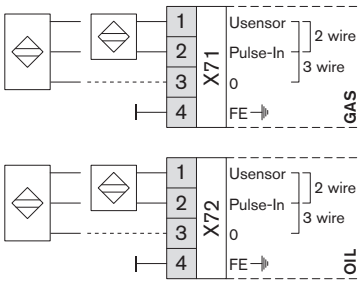
3.3.21 Speed measurement



For operation with frequency converter (W-FM 200 only) the proximity switch for speed measurement is connected to input X70.

Via the transmitter disc, the proximity switch detects 3 impulses per rotation. The number of impulses must be defined in parameter `Num Puls per R`, see [ch. 6.14.2]. The direction of rotation is detected by the asymmetrical transmitter disc (60°, 120°, 180°).

3.3.22 Fuel Meter

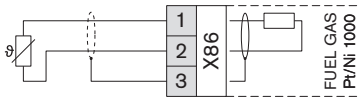


It is possible to connect 2 fuel meters to the W-FM 200:
- Gas meter: X71
- Oil meter: X72

Supply (PIN 1)	approx. 10 V DC / max 45 mA
Input (PIN 2)	▪ max 10 V DC ▪ High level: min 3 V DC ▪ Low level: max 1.5 V DC
Sensor	▪ Inductive sensor to DIN 19234 (Namur) ▪ Open Collector (pnp) ▪ Reed contact
Frequency	max 300 Hz

The number of impulses per unit of volume must be set in parameter `Pulse-Value…` .

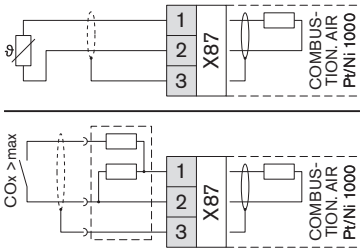
3.3.23 Flue gas temperature sensor



The flue gas temperature sensor is connected to the O_2 module input X86 (accessory).
The sensor has to be configured in parameter `FlueGasTempSens`, see [ch. 6.10.9].

Alternatively, the flue gas temperature sensor can be used as FGR temperature sensor (flue gas recirculation). In parameter `FGR sensor  X86PtNi1000` must then be defined as FGR temperature sensor [ch. 6.15.3].

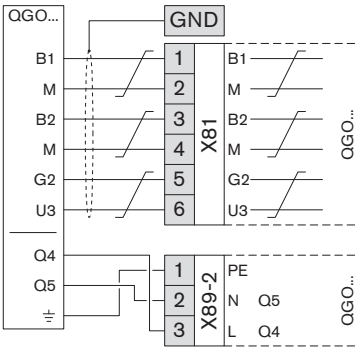
3.3.24 Combustion air sensor / CO resistance circuit board



The combustion air temperature sensor is connected to the O_2 module input X87 (accessory).
The sensor has to be configured in parameter `SupAirTempSens`, see [ch. 6.10.9].

In conjunction with CO control, a resistance circuit board is connected to input X87. The digital output 3 of the CO measurement amplifier is connected to the O_2 module via the resistance circuit board. The combustion air sensor then has to be connected to input X60:3/4 [ch. 3.3.20].

3.3.25 O2 sensor



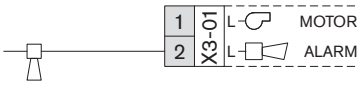
The O_2 sensor is connected to the O_2 module (accessory).
Connect the signal cable (3 x 2 x 0.25 mm^2), twisted in pairs, to X81. Connect the screen to one side of the creen clamp of the O_2 module, cable length maximum 10 m.
Connect separate cable (3 x 0.75 mm^2) for the sensor heating to output X89-2:Q4/Q5.

The O_2 sensor has to be configured in parameter `O2 Sensor`, see [ch. 6.10.7].

Terminal	Function
B1 / M	Nernst voltage depending on the current O_2 content [ch. 6.10.16].
B2 / M	Thermo element of the O_2 sensor (0 … 33 mV), 700 °C equal to approx. 29.1 mV. Current operating temperature [ch. 6.10.20].
G2	Voltage supply for temperature compensation
U3	Signal of temperature compensation
L (Q4) N (Q5)	Pulsed voltage supply for sensor heating 230 V, N (Q5) is switched. Parameter `QGO HeatingLoad` shows the current heating capacity [ch. 6.10.21].

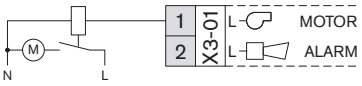
3.4 Outputs

3.4.1 Alarm



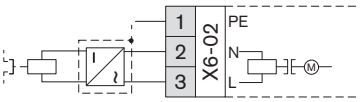
In lockout position (Phase 00) a mains voltage signal is emitted at alarm output X3-01:2.
Additionally, it is also possible to signal prevention. To do this parameter `Alarm-StartPrev` is set to activated [ch. 6.8.2]. The time, before a start prevention triggers an alarm is set in parameter `AlarmDelay`, see [ch. 6.8.1].
Parameter `Alarm act/deact` is used to deactivate the alarm signal [ch. 9.1.1]. The deactivation only affects the alarm output, lockout or start prevention are not reset. Reset or burner start are reset automatically by the deactivation and the alarm output is ready of use again.

3.4.2 Motor



The fan motor is connected to output X3-01:1 via contactor or star delta switching. Depending on parameter `ContinuousPurge` the output is controlled from Phase 22 or continuously [ch. 6.8.7].
If an air pressure switch is fitted, continuous running fan is only possible via pressure switch relief. To do this, a vent valve has to be fitted and connected to output X4-03.

3.4.3 Oil pump / magnetic coupling



Either the magnetic coupling, a separate oil pump or the anti syphon valve are connected to output X6-02.

The type of oil pump coupling is set in parameter `OilPumpCoupling`, see [ch. 6.8.4].

Magnetic coupling / separate oil pump

On dual fuel burners with magnetic coupling or on burners with separate oil pump, parameter `OilPumpCoupling` is set to `Magnetcoupl` . The switch-on point of the ignition should be set to short pre-ignition (`on in Ph38`). In light oil operation, the output is controlled from the start of pre-ignition (phase 38) to operating setting 2 (phase 62). In heavy oil operation, the output is controlled in phase 36, to ensure oil pressure is available for the subsequent nozzle circulation.

Direct coupling

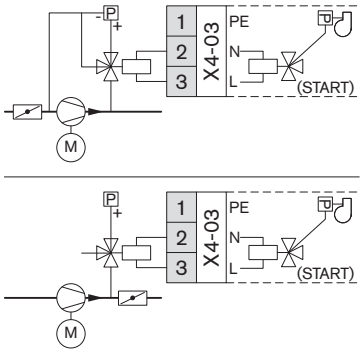
On oil burners with the oil pump directly coupled to the burner motor, the anti syphon valve is connected to output X6-02. Parameter `OilPumpCoupling` must be set to `Directcoupl`, this means that long ignition is activated automatically. The output is controlled together with the fan from phase 22 and remains activated for a further 15 seconds after the fan has switched off.

3.4.4 Start signal, pressure switch relief

Output X4-03 is controlled depending on parameter `Start/PS valve`, see [ch. 6.8.10].

Start signal

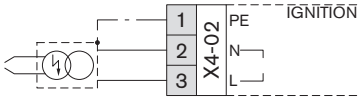
If parameter `Start/PS valve` is set to `Start signal` , the output is controlled in phase 21 to phase 79.



Pressure switch relief

If an air pressure switch is fitted, continuous venting or direct start is only possible via pressure switch relief. To do this, a normally open vent valve has to be fitted to the air pressure switch and parameter `Start/PS valve` must be set to `PS Reli_Inv` The output is controlled together with the fan motor, except at start release (phase 21) and direct start (phase 79). The output is not controlled in phase 21 and 79, the air pressure switch de-energises via the open vent valve and the signal at input X3-02:1 corresponds to the program sequence.

3.4.5 Ignition



The ignition unit is connected to output X4-02.

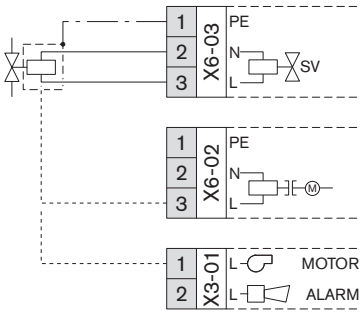
Ignition behaviour Gas

In gas operation, the output is controlled in phase 38 and 40.
The pre-ignition time in phase 38 can be adjusted in parameter `PreignitionT-Gas`, see [ch. 6.8.1].

Ignition behaviour Oil

The switch-on point of the ignition is determined in parameter `IgnOilPump-Start`, see [ch. 6.8.4].
The pre-ignition time in phase 38 can be adjusted in parameter `Preignition-TOil`, see [ch. 6.8.1].

Parameter `IgnOilPumpStart`	**Application**
`on in Ph38` Output is controlled in phase 38 and 40 (short pre-ignition).	Dual fuel burners with magnetic coupling between burner motor and oil pump.
	Burners with separate pump or pump station.
`on in Ph22` Output is controlled in phases 22 to 40 (long pre-ignition).	Burners with oil pump coupled directly to the burner motor.



3.4.6 Anti syphon valve

If an anti syphon valve is fitted in the oil supply, the valve can be connected to output X6-03, X6-02 or X3-01.

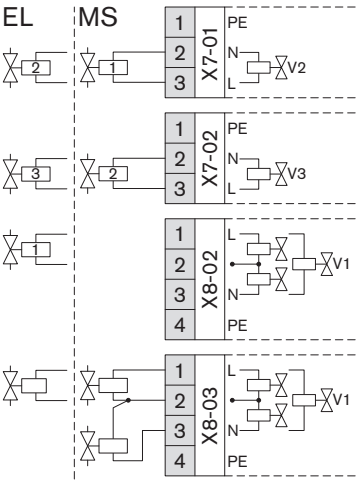
Output X6-03:
- Dual fuel burners with magnetic coupling between burner motor and oil pump
- Oil and dual fuel burners with separately driven oil pump

Output X6-02:
- Oil burners with oil pump coupled directly to the burner motor (without continuous running fan)

Output X3-01:
- Dual fuel burners with oil pump coupled directly to the burner motor (without continuous running fan)
- Oil burners with oil pump coupled directly to the burner motor (with continuous running fan)

3.4.7 Oil fuel valves

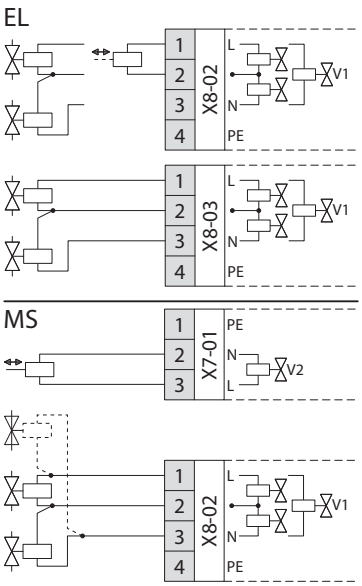
The oil solenoid valves are connected to the outputs X7-01, X7-02, X8-02 and X8-03. The outputs are controlled according to the program sequence [ch. 3.2.7].



Multi-stage operation

Output	Light oil (EL) Heavy oil (MS) three stage	Heavy oil (MS) two stage
X7-01	Stage 2	Stage 1
X7-02	Stage 3	Stage 2
X8-02	Stage 1	-
X8-03	Additional solenoid valve	Additional solenoid valve

Nozzle circulation via output X8-03 is not possible on three stage heavy oil burners, as the combustion manager controls outputs X8-02 and X8-03 simultaneously. The solenoid valve for nozzle circulation is connected to output X4-02 (ignition) and parameter `IgnOilPumpStart` must be set to `on in Ph22` (long pre-ignition) [ch. 6.8.4].



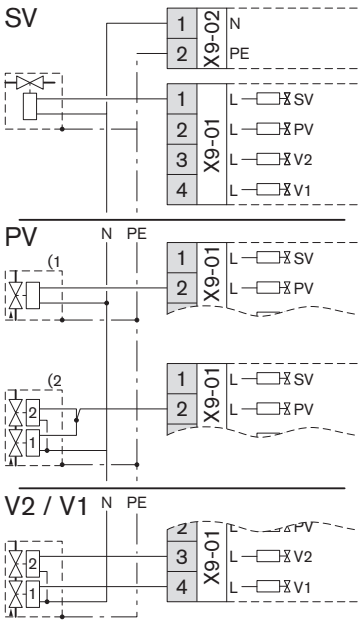
Modulating operation

Output	Light oil (EL)	Heavy oil (MS)
X7-01	-	Nozzle solenoid (nozzle head)
X8-02	Nozzle solenoid (nozzle head) -or- Solenoid valves(1	Additional solenoid valves(1
		Bypass valve (only with separate pump station)
X8-03	Additional solenoid valves(1	-

(1 The solenoid valve in the supply is always switched electrically in series with the solenoid valve in the return.

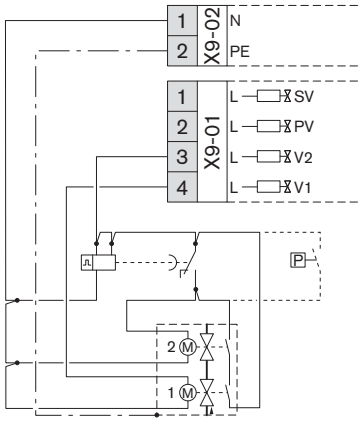
3.4.8 Fuel valves Gas

The fuel valves are connected to output X9-01. The contacts are controlled in accordance with the program sequence [ch. 3.2.7].



Output	Fuel valve
X9-01:1 (SV)	External gas solenoid valve (optional)
X9-01:2 (PV)	Ignition gas valve(1 - or - Gas ignition device(2
Main gas X9-01:3 (V2) X9-01:4 (V1)	Double gas valve Valve 2 Valve 1

(1 Only for burners with ignition gas tube.
(2 Only for heavy oil burners with gas ignition

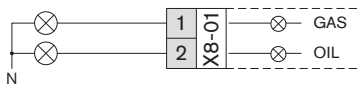


Valve lift monitoring

The two actuators (SKP15) of double gas valves type VGD (from DN 125) are equipped with limit switches. The limit switches monitor the valve lift and are switched in sequence with the voltage supply of actuator V2.
At burner start, the limit switches are bridged via a timer relay for approx. 25 seconds. If both limit switches are closed once this time has elapsed, valve V2 remains open.
If a valve does not maintain the minimum lift, the relevant limit switch opens and interrupts the voltage from actuator V2. Valve V2 closes and the combustion manager initiates a safety shutdown with restart. The number of safety shutdowns in sequence set in parameter `LossOfFlame` result in a lockout [ch. 6.8.12].

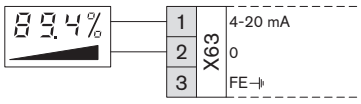
Alternatively with pressure regulator on double gas valve:
If a pressure regulator (SKP25) is mounted on the gas double valve, a low gas pressure switch monitors the valve lift. In this case, the contact of the gas pressure switch is connected in series with the power supply of actuator V2. When starting the burner, the gas pressure switch is bridged by a time relay for approx. 5 seconds.

3.4.9 Operational display



Output X8-01 is controlled together with valve 1 of the current fuel. The output may only be used as the operating display.

3.4.10 Analogue output



If the combustion manager is equipped with an internal load controller, a system value can be issued at output X63 via an analogue signal (0/4 … 20 mA). The output can be configured in parameter `Analog Output`, see [ch. 6.12.7].

Load signal

If the parameter `Selection analog output` is set to `Load` the analogue signal corresponds to defined values. For different scaling, the parameter has to be set to `Load 0` .

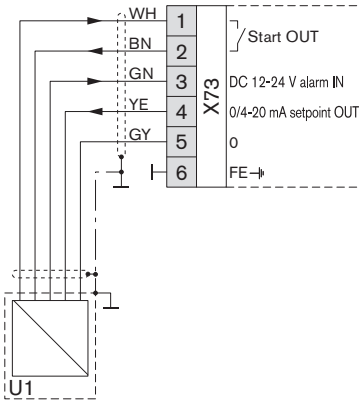
Modulating operation:

Burner capacity	OFF	0 %	100 %
Analogue signal	4 mA	4 mA	20 mA

Multi-stage operation:

Burner capacity	OFF	Stage 1	Stage 2	Stage 3
Analogue signal	4 mA	5 mA	10 mA	15 mA

3.4.11 Frequency converter



The frequency converter is connected to output X73 using a screened cable (W-FM 200 only). The screen must be connected to ground on both sides.

Terminal (W-FM 200)	**Function**
X73:1/2	Enable contact: The enable contact for the frequency converter closes from a desired speed greater than 0 %. The switch status in phase 10 (home run) for the standby position (0 %) can be specified via parameter `ReleasecontctVSD`, see [ch. 6.14.1].
X73:3	Alarm input: A signal from the frequency converter (DC 12 … 24 V) results in a safety shutdown.
X73:4/5	Setpoint output (0/4 … 20 mA): The output and input (W-FM 200 / frequency converter) must be matched. The output signal can be set in parameter `Setpoint Output`, see [ch. 6.14.5].

3.5 Technical data

3.5.1 Electrical data

Combustion Manager

Mains voltage / Mains frequency	(120) 230 V / 50 … 60 Hz
Consumption	max 30 W
Internal unit fuse	T6.3H, IEC 127-2/5
External fuse	max 16 AB
Type of protection	IP 00

Total contact load outputs	max 5 A
Fan motor (output X3-01:1)	1 A
Alarm (output X3-01:2)	1 A
Ignition (output X4-02)	(1.6) 2 A
Pressure switch relief (output X4-03)	0.5 A
Magnetic coupling (output X6-02)	(1.6) 2 A
Oil fuel valves	(1.6) 1 A
Fuel valves Gas	(1.6) 2 A

Display and operating unit (ABE)

Mains voltage	AC 24 V
Consumption	max 50 mW
Type of protection (front)	IP54 to ICE 529
Type of protection (rear)	IP00 to ICE 529

Transformer

Mains voltage / Mains frequency	(120) 230 V / 50 … 60 Hz
Secondary 1	AC 12 V
Secondary 2	2 x AC 12 V

Actuator

	SQM45…	**SQM48.497A**	**SQM48.697A**	**SQM91.391A9**
Mains voltage	AC 2 x 12 V	AC 2 x 12 V	AC 2 x 12 V	AC 2 x 12 V
Consumption	9 … 15 VA	26 … 34 VA	26 … 34 VA	approx. 40 VA
Torque	3 Nm	20 Nm	35 Nm	60 Nm
Setting time	10 s / 90°	30 s / 90°	60 s / 90°	30 s / 90°
Type of protection	IP 54	IP 54	IP 54	IP 66

O_2 module

Mains voltage / Mains frequency	(120) 230 V / 50 … 60 Hz
Consumption O_2 module Consumption O_2 sensor	max 4 W max 90 W
Internal unit fuse	2.5 T, IEC 127-2/1
External fuse	max 16 AB
Type of protection	IP 44

O_2 sensor

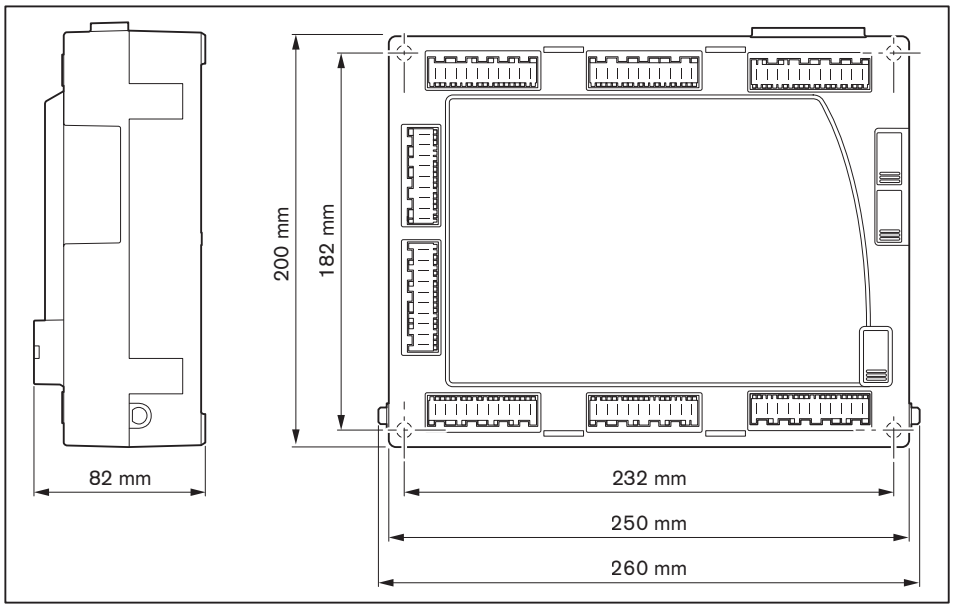
Mains voltage / Mains frequency	(120) 230 V / 50 … 60 Hz
Consumption	max 90 W
Type of protection	IP 44
Permissible flue gas velocity	1 … 10 m/s
Flue gas temperature	max 300 °C
Permissible fuels	QGO 20: ▪ Natural and Liquid Petroleum Gas ▪ Fuel oil EL QGO 21: ▪ Natural and Liquid Petroleum Gas ▪ Fuel oil EL ▪ Heavy oil to DIN 51603-3 and DIN 51603-5

3.5.2 Ambient conditions

Temperature in operation	–20 … +60 °C
Temperature during transport / storage	–20 … +60 °C
relative humidity	max 95 %, no dew point

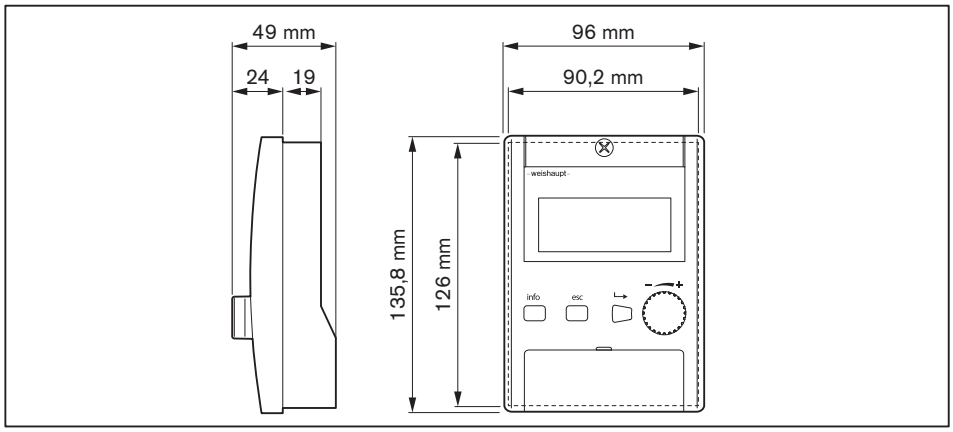
3.5.3 Dimensions

Combustion Manager

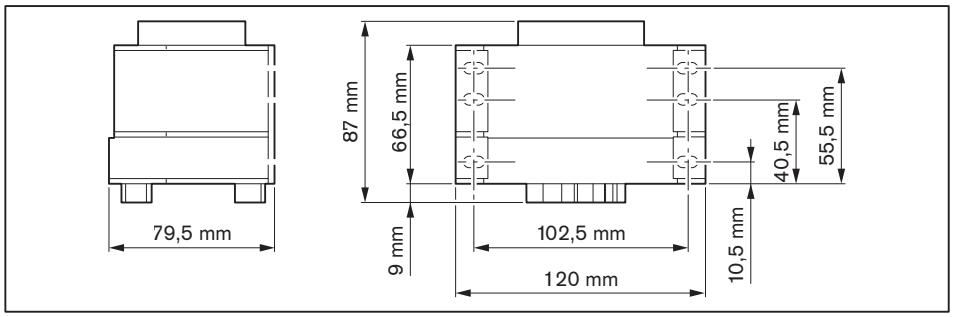


Display and operating unit (ABE)

Recess dimension: 127 x 91 mm ± 0.5 mm



Transformer

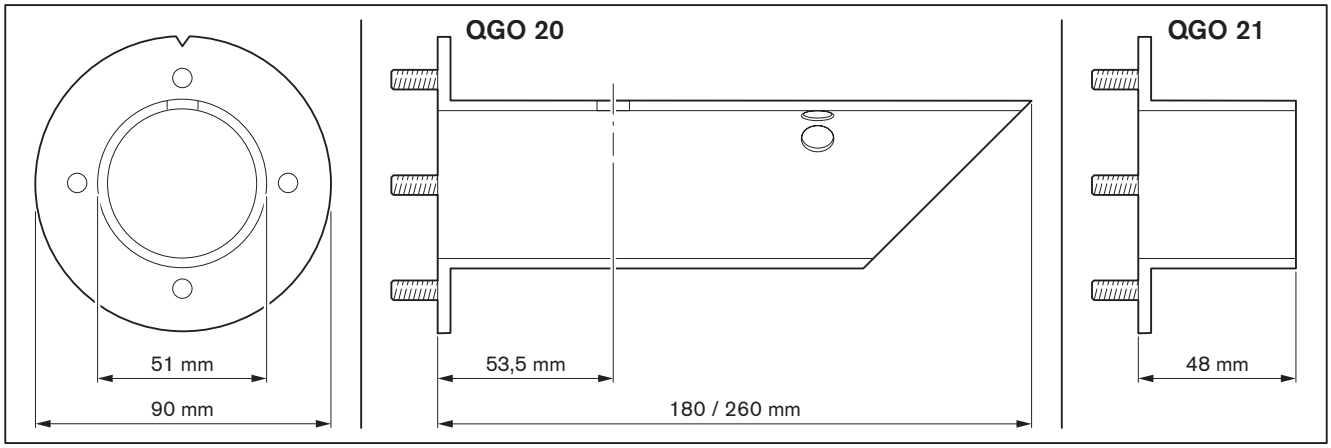


4 Installation

4.1 Installing O2 sensor

O_2 trim is only possible with W-FM 200 with O_2 module.
For O_2 measurement, an O_2 sensor must be fitted in the flue gas pipe and connected to the O_2 module. The distance between O_2 sensor and O_2 module must be no more than 10 m.

Flange dimensions



Prerequisite

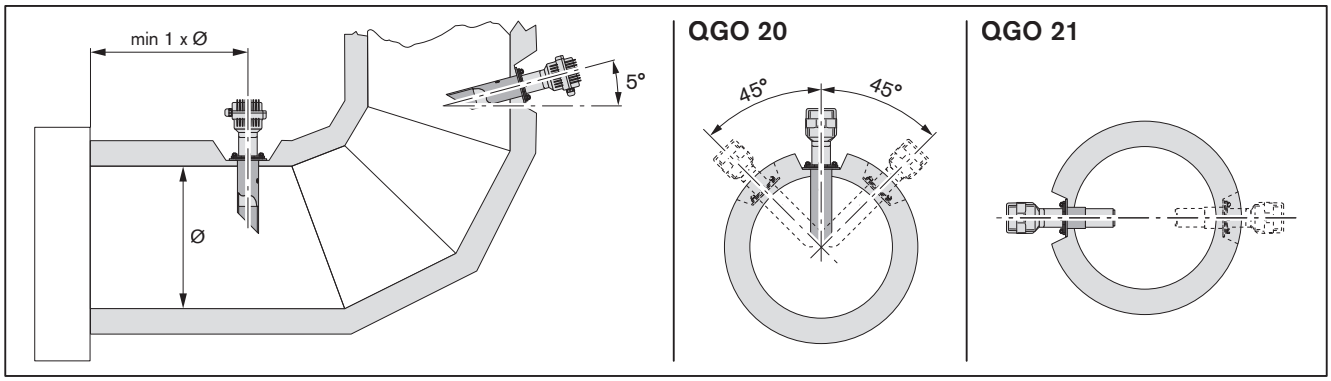
CAUTION

Damage to the O_2 sensor caused by overheating
Flue gas temperature above 300 °C can damage the O_2 sensor.
► Avoid flue gas temperatures above 300 °C at the O_2 sensor.

- Install O_2 sensor only with the corresponding flange.
- It must not be possible for extraneous air to enter in front of the sensor and at a distance of 2 x Ø of the flue gas pipe behind the sensor.

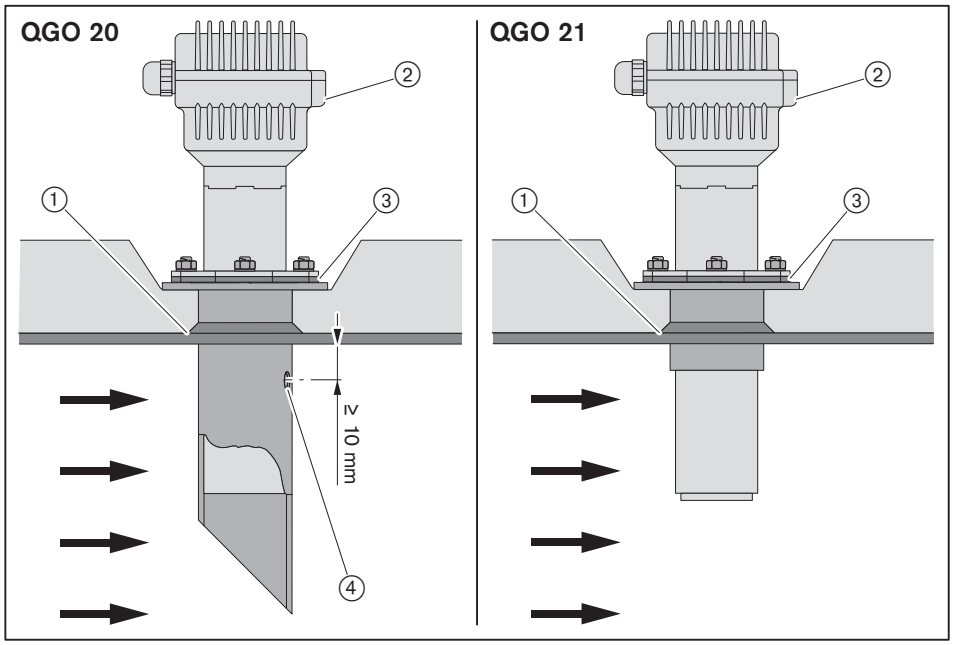
Installation position

- Install the sensor as close as possible to the flue gas outlet of the boiler, but at least at a distance of 1 x Ø of the flue gas pipe.
- Sensor in the horizontal part of the flue gas pipe:
  - QGO 20: vertically from above or at an angle of 45°.
  - QGO 21: horizontal
- Sensor in the vertical part of the flue gas pipe:
  - With a downward inclination of approx. 5°.



Installation

- ► Weld flange gastight to flue gas pipe ①, with QGO 20 observe the position of the flue gas outlet openings ④.
- ► Install O_2 sensor ②, ensuring correct alignment of the seal ③.
- ✓ Cable entry must be made on the opposite side to the flue gas flow.



5 Installation

5.1 Electrical connection

DANGER

Risk of electric shock
Working on the device when voltage is applied can lead to electric shock.
► Isolate the device from the power supply prior to starting any work.
► Safeguard against accidental restart.

WARNING

Electric shock despite disconnection from the voltage supply
It is possible that electrical components on burners with frequency converters continue to carry voltage and cause electric shock even after the voltage supply has been disconnected.
► Wait approx. 5 minutes before commencing work.
✓ Electric voltage has dissipated.

The electrical connection must only be carried out by qualified electricians. Observe local regulations.

Connect combustion manager

► Use cable entry grommets on the housing.
► Connect wiring to wiring diagram enclosed.

Control circuits, which are taken directly via a 16 AB fuse from a 3 phase or single phase alternating current supply, must only be connected between a phase conductor and earth potential neutral conductor.

On mains supply, which does not have a neutral, the control voltage must be supplied via an isolating transformer. The pole of the transformer, which is to be used as the neutral conductor, must be earthed.

Phase L must not be mixed up with the neutral conductor N. Contact protection will otherwise no longer be given. Malfunctions, which endanger operational safety could occur.

The cable cross section of the voltage supply must be suitable for the nominal current of the external fuse (maximum 16 AB). All other cable connections must be suitable for the relevant internal unit fuse (T6.3H).

Earthing and neutral conductor must conform to local regulations.

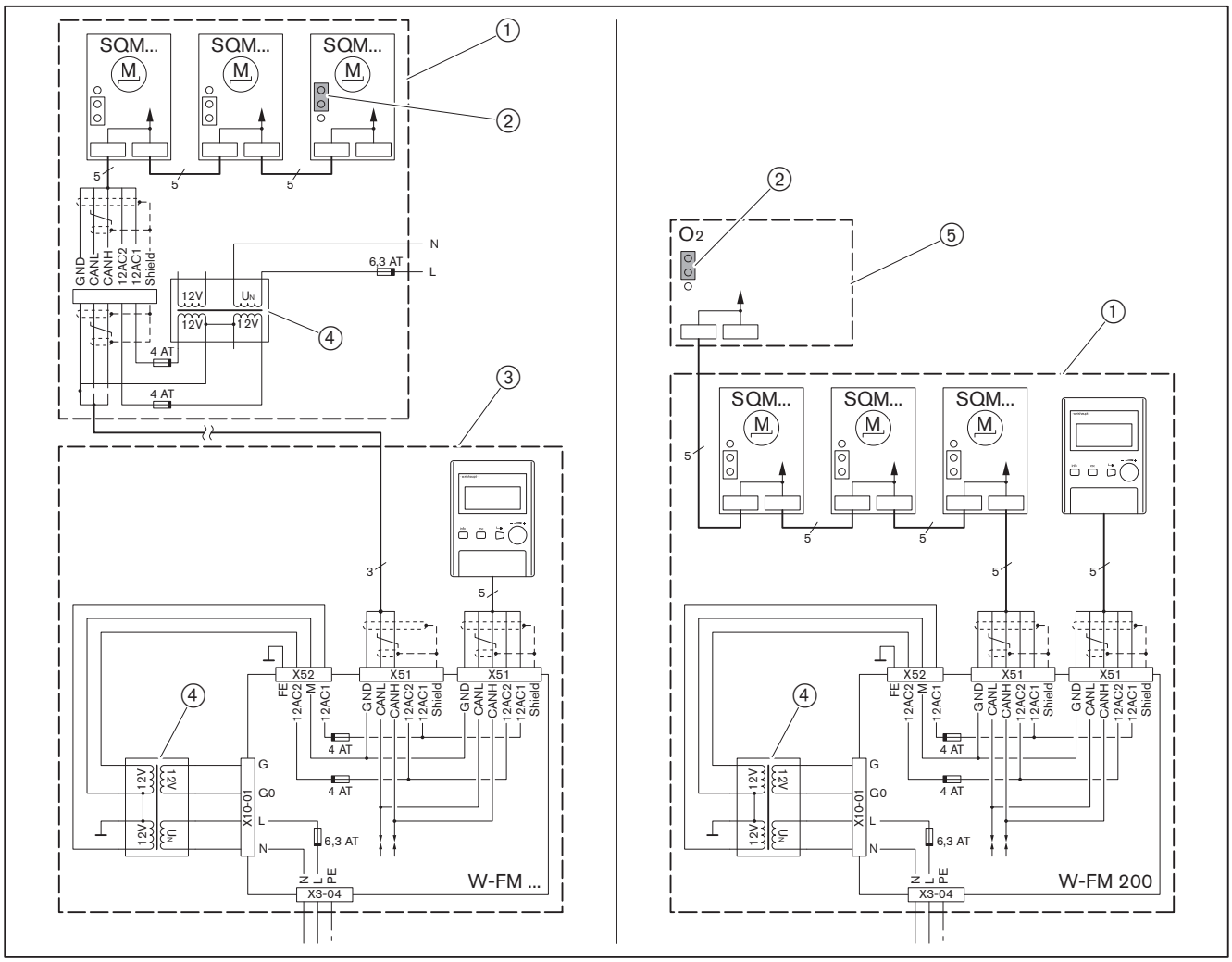
The following applies for cable length:
- all cable lengths maximum 100 m,
- use only original Weishaupt parts as Bus line,
- install Bus line as line configuration.

Bus connection / supply voltage

The CAN Bus line must not exceed a total length of 100 m. A second source transformer is required from a line length of 20 m between the combustion manager and the last actuator, e. g. if the combustion manager is fitted to control panel. In this case transformer 1 feeds the combustion manager and ABE, transformer 2 feeds the actuators. In so doing, the power supply of the CAN bus line (AC1 and AC2) between combustion manager and the first actuator must not be connected.

The ends of the bus line must be terminated with a bus termination resistor. The bus termination is permanently installed in the ABE. On the last actuator or at the O_2 module, the bus termination must be set via a jumper. Bus termination must be deactivated for all other participants.

The screen of the bus line must be terminated at both ends.



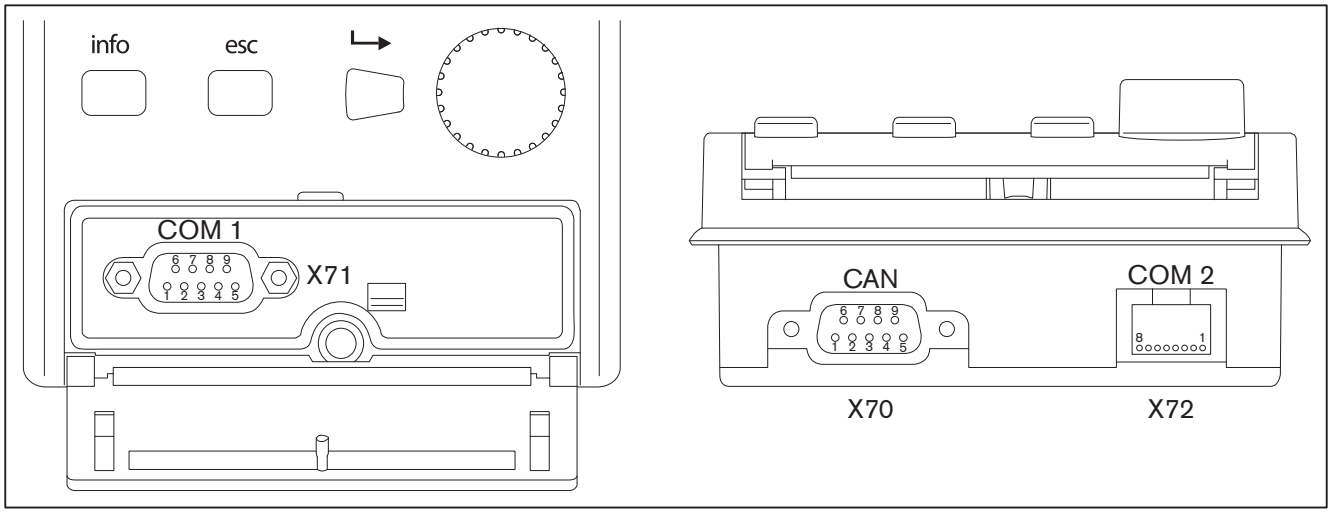
① Burner
② Bus termination
③ Control panel
④ Transformer
⑤ O_2 module

Display and operating unit (ABE)

The ABE is equipped with 3 interfaces.

- CAN (X70): CAN Bus connection to the combustion manager
- COM 1 (X71): RS-232 for PC connection
- COM 2 (X72): RJ45 connection building management system via Bus interface

The COM interfaces can not be used at the same time



PIN	CAN (X70)	COM 1 (X71)	COM 2 (X72)
1	-	-	TXD
2	CAN L	RXD	-
3	GND	TXD	RXD
4	VAC 2	-	GND
5	-	GND	U 1
6	-	-	GND
7	CAN H	-	U 2
8	VAC 1	-	-

Connect burner / fan motor, pump station

The motor must be protected against thermal overload and short circuit. Weishaupt recommend the use of a motor protection switch.

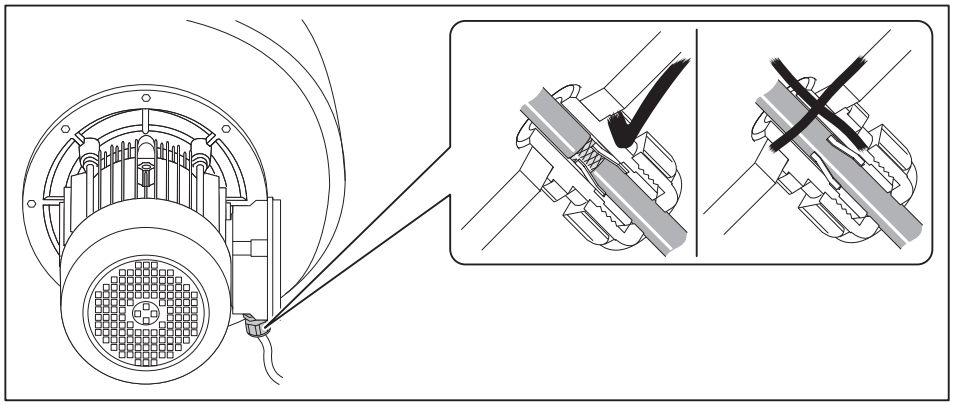
- ► Open terminal box on motor.
- ► Connect voltage supply to wiring diagram enclosed, observe motor rotation.

Variable speed drive (optional)

If the frequency converter is located on the motor, the cable to the frequency converter is not screened.

If the frequency converter is separate the control line and the motor connection must be screened.

- ► Apply screen to the screen clamp on frequency converter.
- ► Use screen cable glands (metal) on the burner.



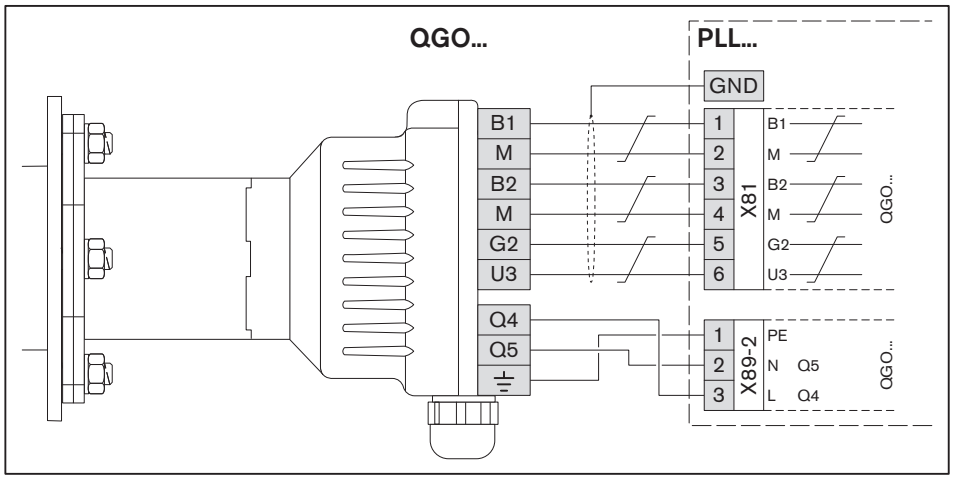
Connect gas valve train

Observe wiring diagram supplied.

- ► Connect double gas valve (plug K32).
  - ▪ Solenoid coil on W-MF or DMV
  - ▪ Actuator on VGD.
- ► Connect limit switch for valve lift monitoring (plug S33 / S35), only with VGD.
- ► Connect ignition gas valve (plug K31).
- ► Connect low gas pressure switch (plug B31).
- ► Connect valve proving gas pressure switch (plug B32).
- ► If required, connect high gas pressure switch (plug B33).
- ► Connect connection cable to burner using cable entry W-FM.

Connect O2 sensor

The O_2 sensor is connected to the O_2 module (accessory).
Connect the signal cable (3 x 2 x 0.25 mm^2), twisted in pairs, to X81. Connect the screen to one side of the creen clamp of the O_2 module, cable length maximum 10 m.
Connect separate cable (3 x 0.75 mm^2) for the sensor heating to output X89-2:Q4/Q5.

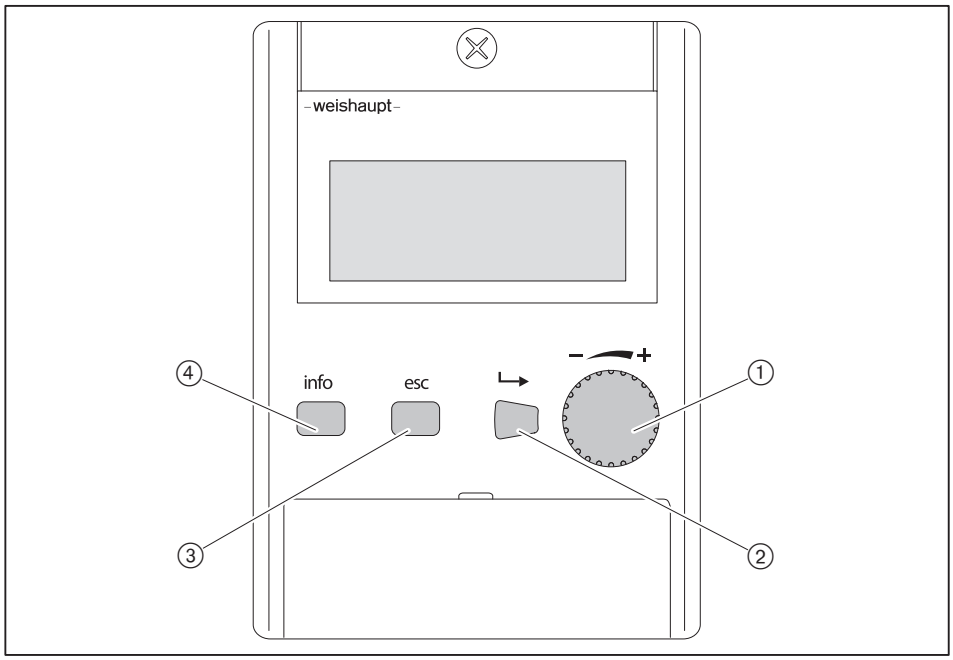


6 Operation

6.1 Operating interface

6.1.1 Operating panel

Display and operating unit (ABE)



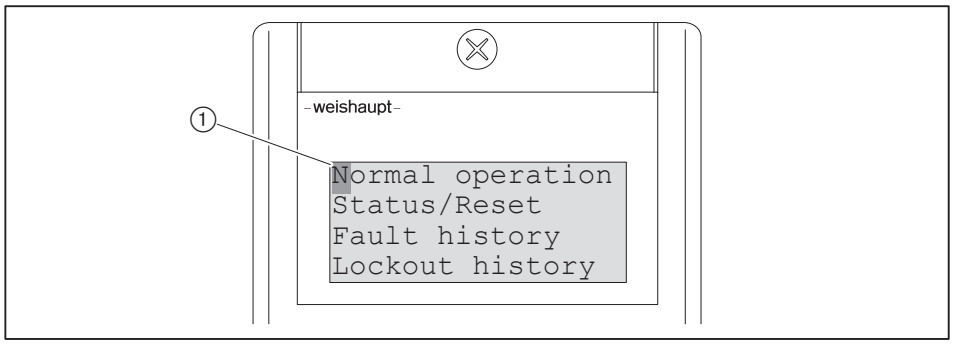
①	Dial knob	navigation through parameter structure; changing values
②	[Enter]	select
③	[esc]	return/cancel
④	[info]	return to operating display

OFF function

► Press [ENTER] and [esc] simultaneously.
✓ Immediate lockout.
✓ The lockout is stored in the fault history.

6.1.2 Display

The ABE is equipped with a 4 line display with 16 characters per line. The dial knob is used to scroll through the display, the cursor ① indicates the position selected.



Operating display

Normal operation Status/Reset Fault history Lockout history	The [info] key is used to jump from any menu level to the operating display menu. The [esc] key is used to return the display to the menu point previously used.

Menu level 1

Operating displa Operation Manual operation Param & Display	The [esc] key is used to leave any position and to go back all the way to menu level 1 [ch. 6.3].

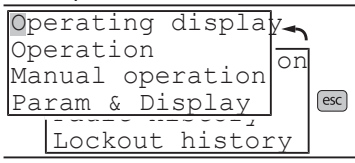
Fault display

During a fault condition, the display alternately shows the shutdown behaviour and the fault diagnosed as a plain text display.

Lockout	The combustion manager is in lockout. Once the fault has been rectified, the combustion manager has to be reset for restart [ch. 9.1].
Air pressure is off	
Safety shutdown	The combustion manager initiates a safety shutdown. The burner restarts automatically once the fault condition has been rectified.
Safety loop is open	

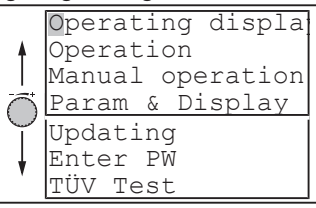
6.2 Displaying and adjusting parameters

Call up menu level 1



- ▶ Press [esc] key until menu level 1 is displayed.

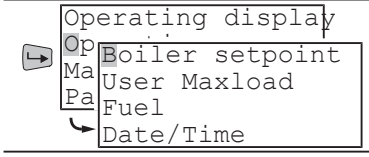
Navigating through the level



- ▶ Turn dial knob.
- ✓ Cursor switches to the next menu point.

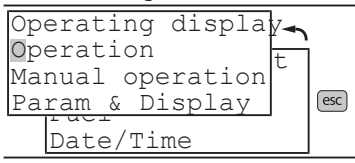
If a level has more than 4 menu points, the display scrolls up and down.

One level lower



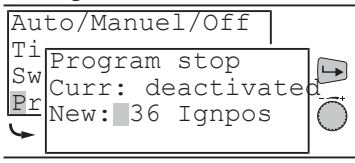
- ▶ Press [ENTER].

One level higher



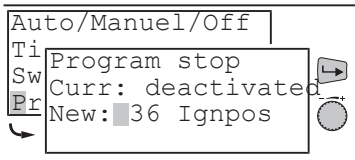
- ▶ Press [esc] key.

Change value



- ▶ Press [ENTER].
- ✓ Selected parameter is displayed.
- ▶ Turn dial knob.
- ✓ New value is displayed.

Save value



- ▶ Press [ENTER].
- ✓ The value changed is applied and saved.

Do not accept value:

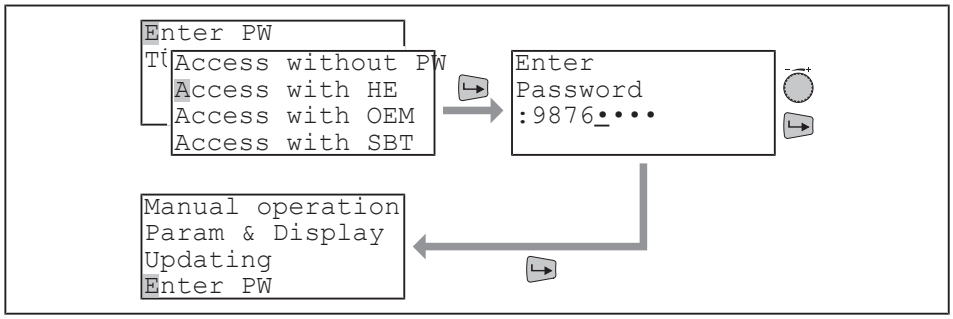
- ▶ Press [esc] without first confirming with [Enter] key.
- ✓ Exit parameter without changing the value.

6.2.1 Password

Enter password

- HE password: 9876

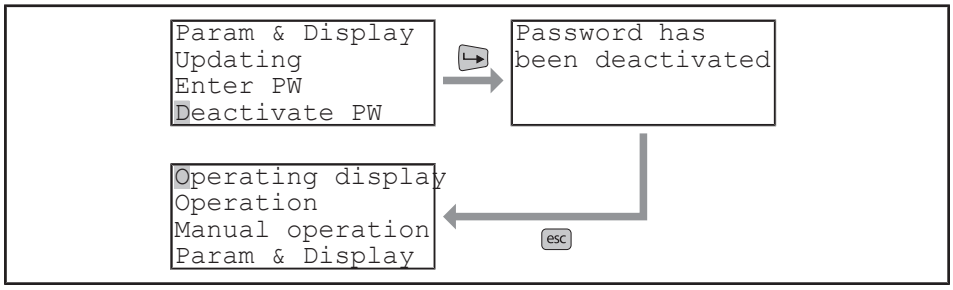
► Select `Enter PW` in menu level 1 and press the [Enter].
► Select `Access with HE` and press [Enter].
► Set first character using the dial knob and confirm with [Enter].
✓ A star appears and the cursor moves to the next position.
► Repeat procedure until the password has been entered.
► Confirm password with [Enter].
✓ Display changes to menu level 1.



Deactivating password

If no key is activated for 120 minutes, the combustion manager automatically deactivates the password and blocks the password level.

► Select `Deactivate PW` in menu level 1 and press [Enter].
✓ The display shows `Password has been deactivated`.
► Press [esc] key.
✓ Display changes to menu level 1.



6.3 Menu structure

Values in the square brackets show the factory setting.

Operating display

- Normal operation
- Status/Reset
- Fault history
- Lockout history
- Alarm act/deact

Operation

- Boiler setpoint
  - Setpoint W1
  - Setpoint W2
- Load limitAB
  - UserMaxLoadMod [100 %]
  - UserMaxLoadStg [S3]
- Fuel
  - CurrentFuel
  - FuelSelect
- Date/Time
  - Display the clock
    - Date
    - Time
    - Weekday
  - Set the clock
    - Date
    - Time
    - Weekday
- Hours run
  - Gas operation
  - OilStage1/Mod
  - OilStage2
  - OilStage3
  - TotalHoursReset
  - TotalHours
  - SystemOnPower
- StartCounter
  - GasStartCount
  - OilStartCount
  - TotalStartCountR
  - TotalStartCount
- Fuel meter[1]
  - Curr Flow Rate
  - Volume Gas
  - Volume Oil
  - Volume Gas R
  - Volume Oil R
  - Reset DateGas
  - Reset DateOil
- Number of lockouts

Operation (continued)

- O2 module
  - curr. O2 value[1]
  - O2 setpoint[1]
  - Inlet air temperature[1]
  - Flue gas temperature[1]
  - CombEfficiency[1]
- Burner identification
- Operating mode selection
  - Interface PC
  - GatewayBASon
  - GatewayBASoff
  - Type of Gateway [Modbus]
- O2Ctrl activate[1]

Manual operation

- SetLoad
- Autom/Manual/Off [Automatic]

Param & Display

- Burner Control
  - Times[2]
    - TimeStartup1
      - MinTimeStartRel [1 s]
      - FanRunUpTme [2 s]
      - PrepurgeTmeGas [20 s]
      - PrepurgeTmeOil [15 s]
      - PrepurgeSafeGas [20 s]
      - PrepurgeSafeOil [15 s]
      - PrepurgePtl1Gas [0.2 s]
      - PrpurgePt3Gas [0.2 s]
      - PrepurgePt1Oil [0.2 s]
      - PrepurgePt3Oil [0.2 s]
      - PreIgnTime_Gas [2 s]
      - PreIgnTime_Oil [2 s]
      - MinOnTime Oil pump [1 s]
    - TimeStartup2
      - Interval1Gas [2 s]
      - Interval1Oil [2 s]
      - Interval2Gas [2 s]
      - Interval2Oil [2 s]
      - PressReacTime [2 s]
    - TimeShutdown
      - MaxTmeLowFire [45 s]
      - AfterburnTme [8 s]
      - PostpurgeT1Gas [0.2 s]
      - PostpurgeT1Oil [0.2 s]
      - PostpurgeT3Gas [5 s]
      - PostpurgeT3Oil [5 s]
      - PostpurgeT3long [0 s][1]
      - DelayLackGas [10 s]

[1] W-FM 200 only
[2] only with HE password

Param & Display (continued)

- Times in general
  - AlarmDelay [35 s]
  - DelayStartPrev [35 s]
  - PostpurgeLockout [0.2 s]
  - MaxTmeStartRel [120 s]
- Configuration
  - ConfigGeneral(2
    - AlarmStartPrev [deactivated]
    - StandbyError [deactivated]
    - NormDirectStart[NormalStart]
    - OilPumpCoupling
    - IgnOilPumpStart
    - ForcedIntermit [activated]
    - Skip PrepurgeGas [deactivated]
    - ContinuousPurge [deactivated]
  - ConfigIn/output(2
    - RotSpeed PS on(1 [80]
    - RotSpeed PS off(1 [50]
    - Config X5-03 [LMV5x hrs]
    - Start/PS-Valve
  - ConfigFlamDet
    - ReacExtranLight [Startblock]
    - FlameSignal
  - RepetCounter(2
    - LossOfFlame [2]
    - HeavyOil [3]
    - StartRelease [10]
    - SafetyLoop [16]
  - ProductID
    - ASN ProductionDate
    - SerialNumber
    - ParamSet Code
    - ParamSet Vers
  - SW Version
- Ratio control
  - SettingGas / Oil(2
    - SpecialPositions
      - HomePos
      - PrepurgePos
      - IgnitionPos
      - PostpurgePos
      - ProgramStop [deactivated]
      - ResetIgnitPos
    - CurveParams
    - LoadLimits
      - MinLoad [0 %]
      - MaxLoad [100 %]

(1 W-FM 200 only
(2 only with HE password

Param & Display (continued)

- Load mask out
  - LoadMaskLowLimit [0 %]
  - LoadMaskHighLim [0 %]
- FC(1 [activated]
  - StartPoint Op [1]
- Autom/Manual/Off [Automatic]
- Times(2
  - OperRampMod
  - OperRampStage
  - TimeNoFlame
- ShutdownBehav(2 [Rest pos]
- ProgramStop(2 [deactivated]

O2Contr/Alarm(1

- Gas/Oil settings
  - Operating mode (2
  - O2 trim(2
  - O2 monitor(2
    - O2 Alarm
    - O2 MaxValue [15]
    - NumMinUntilDeact [1]
  - Controller parameter
    - PI
    - LowFireAdaptPtNo(2 [2]
    - O2CtrlThreshold(2 [0 %]
    - LoadCtrlSuspend(2 [5 %]
    - O2ModOffset(2 [0 %]
    - Type Air Change(2 [like theory]
    - O2MaxManVariable(2 [35%]
    - O2MinManVariable(2 [-35%]
  - Startmode
    - O2InitOffset(2 [0 %]
    - NoTauSuspend(2 [10]
    - Adjust. Temp O2 [20 °C]
  - Type of Fuel(2
  - Fuel user-def(2
    - V_LNmin
    - V_afNmin
    - V_atrNmin
    - A2
    - B/1000
  - COx(2
    - OptgMode COx Gas [deactivated]
    - OptgMode COx Oil [deactivated]
    - Time COx alarm [20 s]

(1 W-FM 200 only
(2 only with HE password

Param & Display (continued)

Process data

CombEfficiency
Man Var O2Ctrl
State O2Ctrl
Air-Related Load
Diag Reg State

Load controller

Controller parameters

ContrlParamList

StandardParam
P Part (Xp) [15 %]
I Part (Tn) [320 s]
D Part (Tv) [40 s]

MinActuatorStep [1 %]
SW_FilterTmeCon [3 s]
SetpointW1
SetpointW2
Sd_ModOn [1 %]
Sd_ModOff [10 %]
Sd_Stage1On [-2 %]
Sd_Stage1Off [10 %]
Sd_Stage2Off [8 %]
Sd_Stage3Off [6 %]
ThreshStage2On[300]
ThreshStage3On [600]

TempLimiter(2

TL_ThreshOff [95 °C]
TL_SD_On [-5 %]

Cold start

ColdStartOn (2 [deactivated]
ThresholdOn(2 [20 %]
StageLoad(2 [15 %]
StageSetp_Mod(2 [5 %]
StageSetp_Stage(2 [5 %]
MaxTmeMod(2 [3 min]
MaxTmeStage(2 [3 min]
ThresholdOff(2 [80 %]
AdditionalSens(2 [deactivated]
Temp. ColdStart
SetpAddSensor(2
Release Stages(2 [Release]

Configuration

LC_OptgMode [Int LR]
Sensor Select(2 [Pt100]
MeasureRangePtNi(2 [150 °C / 302 °F]
var.RangePtNi(2 [850 °C]
Ext Inp X61 U/I(2 [0 … 10 V]
MRange TempSens(2 [90 °C]
MRange PressSens(2 [2 bar]
Ext Inp X62 U/I(2 [4 … 20 mA]
Ext MinSetpoint(2 [0 %]
Ext MaxSetpoint(2 [60 %]

(1 W-FM 200 only
(2 only with HE password

Param & Display (continued)

- Analogue output[2]
  - OutValuSelection [Load]
  - CurrMod 0/4mA [4 … 20 mA]
  - Scale20mA perc [100 %]
  - Scale20mA temp [850 °C]
  - Scale20mA press [2 bar]
  - Scale20mA angle [90°]
  - Scale 0/4mA [0 %]
- Adaption
  - StartAdaption
  - AdaptionLoad [100 %]
- SW Version

ABE

- Times
  - Sum/WinterTime[Automatic]
  - Time EU/US
- Language
- DateFormat
- PhysicalUnits
- eBUS
  - Address [1]
  - SendCycleBU [30 s]
- Modbus
  - Address [1]
  - Baud rate [19200 bit/s]
  - Parity [none]
  - Timeout [30 s]
  - Local / Remote
  - Remote Mode
  - W3
- Display contrast
- ProductID
  - ASN
  - ProductionDate
  - SerialNumber
  - ParamSet Code
  - ParamSet Vers
- SW Version

Actuators

- Addressing[2]
  - 1 AirActuator
  - 2 GasActuator. (Oil)
  - 3 OilActuator
  - 4 AuxActuator
  - 5 AuxActuator2[1]
  - 6 AuxActuator3
- Rotation direction[2]
  - DeleteCurves

[1] W-FM 200 only
[2] only with HE password

Param & Display (continued)

ProductID

1 AirActuator
2 GasActuator. (Oil)
3 OilActuator
4 AuxActuator
5 AuxActuator2[1
6 AuxActuator3

SW Version

1 AirActuator
2 GasActuator. (Oil)
3 OilActuator
4 AuxActuator
5 AuxActuator2[1
6 AuxActuator3

VSD module[1

Configuration

Releasecontct.VSD[2 [closed]

Speed

Num Puls per R[2 [3]
Standardisation[2
StandardisedSp[2
Absolute Speed
Setpoint Output[2 [4 … 20 mA]

Fuel meter[2

PulseValueGas [1]
PulseValueOil [1]

Process data

Max Stat Dev
Max Dyn Dev
NumDev >0.3%
NumDev >0.5%
Absolute Speed

Product identification

ASN Production date
SerialNumber
ParamSet Code
ParamSet Vers

SW Version

O2 module[1

Configuration[2

O2 Sensor [no sensor]
O2SensServTim [0]
O2SensServTimRes
SupAirTempSens [no sensor]
FlueGasTempSens [no sensor]
MaxTempFlGasGas [300 °C]
MaxTempFlGasOil [300 °C]

[1 W-FM 200 only
[2 only with HE password

Param & Display (continued)

Process Data

- Current O2 value
- O2 Setpoint
- SupplyAirTemp
- FlueGasTemp
- CombEfficiency
- QGO SensorTemp
- QGOHeatingLoad
- QGO Resistance

ProductID

- ProductionDate
- SerialNumber
- ParamSet Code
- ParamSet Vers

SW Version

Flue gas recirculation[1]

- FGR-Mode [Aux3 Curve]
- FGR-sensor [X86PtNi1000]
- actTmpFGR-sensor
- ThresholdFGR Gas
- ThresholdFGR Gas [300 s]
- FGR Factor Gas [100]
- Operating temp Gas
- ThresholdFGR Oil
- ThresholdFGR Oil [300 s]
- Factor FGR Oil [100]
- Operation TempOil
- FGR MinPos [0]
- FGR MaxPos Fact [10]

SystemConfig

- LC_OptgMode [IntLC]
- Ext Inp X62 U/I[2] [4 … 20 mA]

TempLimiter[2]

- TL_Thresh_Off [95 °C]
- TL_SD_On [-5 %]
- Sensor Select [Pt100]
- MeasureRangePtNi [150 °C / 302 °F]

- O2Ctrl/LimitrGas[2] [man deact]
- O2Ctrl/LimitrOil[2] [man deact]
- LC Analog output[2] [Load]
- allowed Pot.diff[2] [15]

Hours run

- GasFiring
- OilStage1/Mod
- OilStage2
- OilStage3
- TotalHoursReset
- TotalHours
- SystemOnPower

[1] W-FM 200 only
[2] only with HE password

Param & Display (continued)

Reset

```
GasFiring
OilStage1/Mod
OilStage2
OilStage3
TotalHoursReset
```

StartCounter

GasStartCount
OilStartCount
TotalStartCountR
TotalStartCount

Reset

```
GasStartCount
OilStartCount
TotalStartCountR
```

Fuel meter

```
Curr Flow Rate
Volume Gas
Volume Oil
Volume Gas R
Volume Oil R
Reset DateGas
Reset DateOil
```

Updating

ParamBackup

Backup info

```
Date
TimeOfDay
BU included?
AZL included?
LC included?
SA1 included?
SA2 included?
SA3 included?
SA4 included?
SA5 included?
SA6 included?
VSD included?
O2 included?
```

LMV5x -> AZL(2
AZL -> LMV5x(2

Load SW from PC(2

Enter PW

Deactivate PW(2

TÜV Test

LossFlameTest(2

```
SLT Test
SLT TestloadMod [100 %]
SLT Testload Stg [S3]
```

(1 W-FM 200 only
(2 only with HE password

6.4 Operation and system information

6.4.1 Normal operation

Operating display	Normal operation		

In menu Normal operation you can switch between the standard display and the position display.

► Press [ENTER].
✓ Display changes.

Depending on the current operating phase, the standard display shows the following information:
- Setpoint and actual value
- Fuel selected
- Current operating phase (clear text and number)
- Fuel and air actuator positions
- Current burner capacity and flame signal

The position display shows the following information:
- Actuator positions
- Speed
- O_2 content
- Burner capacity

6.4.2 Fuel selection

Operation	Fuel	Current fuel Fuel selection	

Current fuel

The fuel selected is shown in parameter CurrentFuel (read only).

Fuel selection

With dual-fuel burners you can switch between oil and gas operation. A fuel change during operation will initiate a restart.

Fuel selection is possible via:
- Fuel selection switch on input X4-01:1/2 [ch. 3.3.6]
- Parameter fuel selection (ABE)
- Building management system (BMS) on Bus connection.

The fuel selection switch on input X4-01:1/2 has priority. Fuel selection via ABE or BMS is only possible if no signal is present at input X4-01:1/2. There is not priority between ABE and BMS, the last fuel selection is valid and is retained after power failure.

6.4.3 Operating hours

Operation	HoursRun		
or			
Param & Display	HoursRun		

Access in menu Operation/HoursRun is read only.
The individual operating hours counters can be reset in Param & Display/HoursRun/Reset/… .

Parameters	Function
Gas operation	Operating hours Gas (can be reset)
OilStage1/Mod	Operating hours Oil stage 1 / modulating operation (can be reset)
OilStage2	Operating hours Oil stage 2 (can be reset)
OilStage3	Operating hours Oil stage 3 (can be reset)
TotalHoursReset	Total operating hours (can be reset)
TotalHours	Total operating hours (read only, can not be reset)
SystemOnPower	Operating hours with voltage applied to device (read only, can not be reset)
Reset	Reset only possible under Param & Display / HoursRun

6.4.4 Start-up counter

Operation	StartCounter		
or			
Param & Display	StartCounter		

Access in menu Operation/StartCounter is read only.
The individual start counters can be reset via Param & Display/Start-Counter/Reset/… .

Parameters	Function
GasStartCount	Burner starts Gas (can be reset)
OilStartCount	Burner starts Oil (can be reset)
TotalStartCountR	Total burner starts Gas and Oil (can be reset)
TotalStartCount	Total burner starts Gas and Oil (read only, can not be reset)
Reset	Reset only possible under Param & Display / StartCounter

6.4.5 Fuel Meter

Only possible with W-FM 200.

Configuring the inputs

Param & Display	VSD module	Configuration	Fuel Meter

In menu `Fuel Meter` , the input for the relevant fuel meter is configured [ch. 3.3.22].

Parameters	Function
`PulseValueGas`	Number of impulses per volume unit of the gas meter at input X71
`PulseValueOil`	Number of impulses per volume unit of the oil meter at input X72

The impulses per volume unit are entered in parameter `Pulse value…` with 4 decimal places.

Using the number of impulses set in parameter `Pulse value…` the W-FM calculates the current fuel throughput.
In full load, the impulse frequency must not exceed 300 Hz.
In partial load, the impulse frequency must be minimum 0.1 Hz. If the fuel meter does not supply a signal for 10 seconds, no fuel throughput is detected.

Example

Gas meter: 100 impulses/m^3 Full load throughput: 300 m^3/h Partial load throughput: 50 m^3/h	
Full load frequency:	100 Imp/m^3 x 300 m^3/h = 30000 Imp/h 30000 Imp/h ÷ 3600 s = 8.333 Hz
Partial load frequency:	100 Imp/m^3 x 50 m^3/h = 5000 Imp/h 5000 Imp/h ÷ 3600 s = 1.389 Hz

Fuel throughput

Operation	Fuel Meter		
or			
Param & Display	Fuel Meter		

If a fuel meter is connected, the parameters show the fuel consumption.

Parameters	Function
`Curr Flow Rate`	Current fuel throughput (read only, can not be reset)
`Volume Gas`	Total gas throughput (read only, can not be reset)
`Volume Oil`	Total oil throughput (read only, can not be reset)
`Volume Gas R`	Gas throughput (can be reset via Enter)
`Volume Oil R`	Oil throughput (can be reset via Enter)
`ResetDateGas`	Reset date fuel volume Gas
`ResetDateOil`	Reset date fuel volume Oil

6.4.6 Number of lockouts

Operation	LockoutCounter		

The parameterLockoutCounter shows the number of faults with lockout since commissioning (can not be reset).

6.4.7 Flame Signal

Param & Display	Burner Control	Configuration	ConfigFlameDet	Flame Signal

The parameter FlameSignal shows the current flame signal [ch. 3.3.15].

6.4.8 Product identification

Param & Display	Burner Control	ProductID	
or			
Param & Display	AZL	ProductID	
or			
Param & Display	Actuators	ProductID	
or			
Param & Display	VSD module	ProductID	
or			
Param & Display	O2 module	ProductID	

In menu ProductID the following information is displayed for all components selected:
- ASN (type description)
- Production date
- Identification number
- Customer code parameters
- Version parameters

6.4.9 Software version

Param & Display	Burner Control	SW Version	
or			
Param & Display	LoadController	SW Version	
or			
Param & Display	AZL	SW Version	
or			
Param & Display	Actuators	SW Version	
or			
Param & Display	VSD module	SW Version	
or			
Param & Display	O2 module	SW Version	

In parameter SW Version the software version of the selected components is shown.

6.4.10 Burner identification

Operation	BurnerID		

The parameter `BurnerID` shows the burner specific serial number.
The burner identification serves as copy protection. Burner specific data in the memory of the ABE can not be transferred to another W-FM.

If a W-FM is delivered without burner identification and the backup copy from the ABE is installed, the W-FM adopts the burner identification of the backup copy [ch. 6.16.1].

6.5 Setting the display

6.5.1 Setting the language

Param & Display	AZL	Language	

The language for the display can be set in parameter `Language` .
If the language required is not available, the display and operating unit (ABE) with the relevant group of languages should be used.

Group of languages (ABE)	Languages
Western Europe 1	English, German, French, Italian, Spanish, Portuguese
Western Europe 2	English, Dutch, Danish, Swedish, Norwegian, Finnish
Eastern Europe 1	English, Polish, Hungarian, Czech, Croatian, Slovenian
Eastern Europe 2	English, German, Russian, Bulgarian, Turkish, Rumanian

6.5.2 Set contrast

Param & Display	AZL	Display Contrast	

The contrast of the display can be changed and saved using parameter `Display Contrast` .

If the operating display is in normal operation, the contrast can be changed using the dial knob of the ABE.

- ► Press and hold [Enter].
- ► Set the contrast using the dial knob.
- ✓ The setting will remain until the power supply is interrupted

6.5.3 Date/Time

Display date and time

Operation	Date/TimeOfDay	DisplayClock Set time	Date TimeOfDay Weekday

The date, time and weekday can be displayed in menu DisplayClock.
The date, time and weekday are set using SetClock.

Summer/Winter time

Param & Display	AZL	Times	Sum/WinterTime Time EU/US

Parameter Sum/WinterTime is used to select manual or automatic changeover from summertime to wintertime.

Parameter Time EU/US is used to select the European or American summertime or wintertime.

Date format

Param & Display	AZL	DateFormat	

Parameter DateFormat is used to select the date format DD.MM.YY or YY.MM.DD.

6.5.4 Units

Param & Display	AZL	PhysicalUnits	

Parameter PhysicalUnits is used to select the formats °C / bar or °F / psi. All relevant values will be displayed and adjusted in the unit selected.

6.6 Interfaces

6.6.1 Select interfaces

Operation	OptgModeSelect	InterfacePC Gateway BASon Gateway BASoff Type of Gateway	

Menu `OptgModeSelect` is used to select the serial interface in the operating and display unit (COM 1 or COM 2) [ch. 5.1].
The COM interfaces can not be used at the same time.

Interface for PC (COM 1)

The combustion manager can be programmed and operated via PC-Tool (Software: ACS450). The display and operating unit serves as interface.

► Select parameter `InterfacePC` and confirm with [Enter].
✓ The interface is activated until the [esc] key is used to exit from parameter `InterfacePC` .

Interface for building management system (COM 2)

The building management system can be connected to the ABE using an external Bus interface allowing it to access the W-FM.

Activating the interface:
► Select parameter `Gateway BMS on` and confirm with [Enter].
✓ The interface in the display and operating unit (ABE) has been activated and the building management system can access the W-FM. The ABE remains functional.

Deactivating the interface:
► Select parameter `Gateway BMS off` and confirm with [Enter].
✓ The interface of the display and operating unit (ABE) for the building management system is deactivated. Only the ABE can access the W-FM.

Select Bus protocol:
► Select Bus protocol in parameter `Type of Gateway` and confirm with [Enter].
- `eBus` [ch. 6.6.2]
- `Modbus` [ch. 6.6.3]
- `Data output` [ch. 6.6.4]

6.6.2 eBus

Param & Display	AZL	eBus	Address SendCycleBU

For Bus communication, the interface has to be activated and the bus protocol has to be defined.

eBus address

Parameter `Address` defines the eBus address, which is used to communicates with the W-FM.

Send cycle

Parameter `SendCycleBU` defines the time for the send cycle. The W-FM transmits its operating data to the eBus participants in the cycle set.

6.6.3 Modbus

Param & Display	AZL	Modbus	

For Bus communication, the interface has to be activated and the bus protocol has to be defined.

The display and operating unit (ABE) operates as Slave in the Modbus protocol. The RTU-Modus is used for transfer.

Modbus address

Parameter `Address` determines the Modbus address of the display and operating unit (ABE).

Baud rate

Parameter `Baudrate` determines the transfer speed. The Baud rate of the display and operating unit (ABE) and the Modbus participant connected must be identical.

Parity

Parameter `Parity` determines the type of parity protocols. The parity of the display and operating unit (ABE) and the Modbus participant connected must be identical.

Time out

Parameter `Timout` determines how long after Modbus communication fails the display and operating unit (ABE) switches from `Remote` to `Local` .
If building management is deactivated or the Modbus connection fails, the internal load controller of the W-FM takes over the control and the internal setpoint (W1) is activated. Prerequisite is that the W-FM is equipped with an internal load controller and has been configured [ch. 6.12].

Local / Remote

Setting	Function
`local`	The operating modes for the load controller via Bus `ExtLC Bus` or `IntLC Bus` have no influence [ch. 6.12.2]. The internal load controller takes over the control and the internal setpoint W1 is activated.
`remote`	Setting for load control via Bus [ch. 6.12.2]. If the operating mode `ExtLC Bus` has been selected, the building management system determines the load. If operating mode `IntLC Bus` has been selected, the building management system determines the setpoint. If Modbus communication fails, the W-FM automatically changes into `local` mode. When communication is restored, the mode has to be set to `remote` either via the ABE or via Modbus signal.

Remote mode

Parameter `Remote mode` is read only, the setting is made via Modbus (building management system).

Setting	Function
`Auto`	Setpoint W3 is determined by the building management system.
`On`	Load is determined by the building management system.
`Off`	The internal load controller takes over the control.

External setpoint W3

Parameter `W3` is read only, the setting is made via Modbus (building management system).

6.6.4 Trending data

`Operation` | `OptgModeSelect` | `Type of Gateway` | `Data output`

In Bus protocol `Data output` the interface COM 2 sends trending data for data recording.
Interface configuration in menu `Modbus` is required for data output [ch. 6.6.3].

Data recording is not possible for diagnostic purposes during servicing and without peripherals and software.

6.7 Manual / Automatic / Off

ManualOperation	SetLoad Autom/Manual/Off		
or			
Param & Display	RatioControl	Autom/Manual/Off	

Operating mode

Parameter `Autom/Manual/Off` determines the operating mode. In Remote operation the parameter is read only and can not be altered [ch. 6.6.3].

Setting	Function
`Automatic`	The burner starts if there is a heat demand at input X5-03:1. The load controller determines the burner capacity.
`Manuel`	The burner starts if there is a heat demand at input X5-03:1. Parameter `SetLoad` determines the burner capacity.
`Burner Off`	Burner drives to or remains in Standby (Phase 12). A message, that the W-FM is set to `Burner Off` in manual operation does not appear.

Target load

Load, to which the burner drives in `Manuel` operating mode.
In modulating operation, the target load can be set within the load limits [ch. 6.9.7].
In multi-stage operation, one of the stages can be selected as the target load.

6.8 Burner Control

6.8.1 Times

Param & Display	Burner Control	Times	TimesStartup1 TimesStartup2 TimesShutdown TimesGeneral

TimeStartup1

Time	Parameters	Function
Start release	MinTimeStartRel	Minimum residence time in phase 21. The W-FM remains at least the time set in phase 21, even if the start criteria have already been met.
Fan run-up time	FanRunupTime	Residence time in phase 22. Once this time has elapsed the burner drives to pre-purge position.
Pre-purge	PrepurgeTmeGas PrepurgeTmeOil	Time from reaching the pre-purge position until driving to ignition position. The time is divided into the phases 30 to 34. The W-FM remains in phase 30 for the time set under PrepurgeTimeTl1… and then drives to phase 34 via phase 32. The rest of the time, the W-FM remains in phase 34, or at least for the duration set under PrepurgeTimeTl3… .
	PrepurgeSafeGas PrepurgeSafeOil	Pre-purge time after the following occurrences: ▪ Lockout or safety shutdown ▪ Power failure ▪ Standby longer than 24h
	PrepurgePt1Gas PrepurgePt1Oil	For the duration of this time, auxiliary actuator 3 (FGR) remains in phase 30 and the fuel actuators remain in standby position. The air determining actuators remain in pre-purge position.
	PrepurgePt3Gas PrepurgePt3Oil	Minimum duration in phase 34. The air determining actuators and auxiliary actuator 3 (FGR) remain in pre-purge position. The fuel actuators remain in standby position.
Pre-ignition Nozzle circulation	PreIgnitionTGas PreIgnitionTOil	Residence time in phase 38. Once this time has elapsed, fuel is released for ignition. On heavy oil burners without return flow temperature sensor, nozzle circulation can be extended via PreIgnitionTOil .
Oil pump ON time	MinONTmeOilPump	Residence time in phase 36 (heavy oil operation only). In heavy oil operation, the time in phase 36 can be extended to allow oil pressure to build-up for ignition.

TimeStartup2

Time	Parameters	Function
Flame stabilisation	`Interval1Gas` `Interval1Oil`	Residence time in phase 44. Once this time has elapsed the burner drives to partial load.
	`Interval2Gas` `Interval2Oil`	Residence time in phase 52. Once this time has elapsed the burner drives to partial load.
Pressure switch reaction time	`PressReacTime`	Time delay in phase 40, 42 and 52. The pressure switches are interrogated in phase 40, 42 and 52 by the time delay set. Prevents shutdown caused by pressure fluctuation when opening the fuel valves.

TimeShutdown

Time	Parameters	Function
Load shutdown	`MaxTmeLowFire`	Residence time in phase 62. If there is no longer a demand for heat, the W-FM reduces the burner capacity and closes the fuel valves after the time set has elapsed. If partial load is reached before the time has elapsed, the fuel valves close immediately.
Anti siphon valve	`AfterburnTme`	Residence time in phase 70. Once the time has elapsed, the anti siphon valve at output X6-03 closes and the actuators for air and fuel drive to post-purge position.
Post-purge time	`PostpurgeT1Gas` `PostpurgeT1Oil`	Residence time in phase 74. Post-purge time 1 in phase 74 is always executed. Once this time has elapsed, the auxiliary actuator 3 (FGR) drives to post-purge position.
	`Post-purgeT3Gas` `Post-purgeT3Oil`	Residence time in phase 78. Post-purge time 3 in phase 78 is interrupted at heat demand. Once the time has elapsed without heat demand, the W-FM goes to Standby.
	`PostpurgeT3long` (W-FM 200 only)	Additional residence time in phase 78. The `PostpurgeT3long` is added to both fuel dependent times `PostpurgeT3Gas / Oil` .

Times in general

Time	Parameters	Function
Alarm delay during start prevention	`AlarmDelay`	Time delay until a start prevention at heat demand is issued at output X3-01:2. The function Alarm during start prevention must be activated in parameter `AlarmDelay`.
Message start prevention	`DelayStartPrev`	Time delay until a start prevention at heat demand is shown in the display of the ABE.
Post-purge time lockout	`PostpurgeLockout`	If lockout occurs, the fan motor at output X3-01:1 runs on by the time specified.
Heavy oil immediate start	`MaxTmeStartRel`	Maximum waiting time for signal at input X6-01:3.

6.8.2 Signalling start prevention

Alarm at start prevention

Param & Display	Burner Control	Configuration	ConfigGeneral	AlarmStartPrev

If parameter `AlarmStartPrev` is activated, start prevention is also signalled at output X3-01:2 [ch. 3.4.1].

Start prevention in Standby

Param & Display	Burner Control	Configuration	ConfigGeneral	Standby Error

If parameter `Standby error` is activated, faults are also recognised as start prevention in Standby and are displayed in the ABE.

6.8.3 Normal or direct start

Param & Display	Burner Control	Configuration	ConfigGeneral	NormDirectStart

Start prevention at heat demand during shutdown in phase 78.

Normal start

If `NormalStart` is activated, the fan switches off and the burner only starts after a home run in phase 10.

Direct start

If `DirectStart` is activated the fan continues to run and the W-FM jumps via phase 79 to phase 24.
In conjunction with an air pressure switch direct start is only possible with a release valve at output X4-03 [ch. 3.4.4]. In menu `Config input /output` the parameter `Start/PS-valve` must therefore be set to `PS Reli_Inv` .

6.8.4 Oil pump

Param & Display	Burner Control	Configuration	ConfigGeneral	OilPumpCoupling IgnOilPumpStart

Control of oil pump and switch on point of pre-ignition in oil operation [ch. 3.4.3].

Magnetic coupling / separate oil pump

For burners with magnetic coupling or separate oil pump:
- ► Set parameter `OilPumpCoupling` to `Magnetcoupl`.
- ► Set parameter `IgnOilPumpStart` to `On in Ph38` .

Direct coupling

For burners with oil pump coupled directly to the burner motor.
- ► Set parameter `OilPumpCoupling` to `Direct coupl` .
- ✓ The long pre-ignition (`on in Ph22`) is automatically activated in parameter `IgnOilPumpStart` .

6.8.5 Forced intermittent

Param & Display	Burner Control	Configuration	ConfigGeneral	ForcedIntermit

With ForcedIntermit activated, the W-FM initiates a controlled shutdown with subsequent restart after 23 h 50 min uninterrupted burner operation. If the burner is not suitable for continuous operation, forced intermittent has to be activated.

6.8.6 Pre-purge Gas

Param & Display	Burner Control	Configuration	ConfigGeneral	Skip PrepurgeGas

If the parameter is activated, the W-FM skips pre-purge in gas operation (Phase 24 to 34). According to EN 676 only allowed with Class A valves in conjunction with valve proving system.

Pre-purge is not skipped after:
- Lockout
- 24 h Standby
- Power failure
- Safety shutdown due to low gas

6.8.7 Continuous running fan

Param & Display	Burner Control	Configuration	ConfigGeneral	ContinuousPurge

If `ContinuousPurge` is activated, the fan runs in each operating phase.
If an air pressure switch is fitted, continuous purge is only possible with a relief valve at output X4-03 [ch. 3.4.4]. For this, parameter `Start/PS-valve` must be set to `PS Reli_Inv` in menu `Config Input /Output`.

Setting	Function
`deactivated`	In phases 00 to 21, output X3-01:1 (fan) is not activated. In Phase 00 to 21, the frequency converter is controlled with the idle speed (`HomePosVSD`) set, even if the safety circuit / burner flange is open.
`activated`	Output X3-01:1 (fan) and the frequency converter are always activated, even if the safety circuit / burner flange are open.
`off Sloop`	Output X3-01:1 (fan) and the frequency converter are always activated, except if the safety circuit / burner flange are open.
`deact/VSD-SL`	In phases 00 to 21, output X3-01:1 (fan) is not activated. In Phase 00 to 21, the frequency converter is controlled with the idle speed (`HomePosVSD`) set, except if the safety circuit / burner flange is open.

6.8.8 Additional air pressure switch

Param & Display	Burner Control	Configuration	Config input/ output	RotSpeed PS on RotSpeed PS off

The speed range set is monitored by an additional air pressure switch.
In the OEM level, the additional air pressure switch is deactivated, the function is not used in standard applications.

Parameters	Function
`RotSpeed PS on`	The additional air pressure switch must supply an ON signal above the speed set.
`RotSpeed PS off`	The additional air pressure switch must supply an OFF signal below the speed set.

6.8.9 Configuring input X5-03

Param & Display	Burner Control	Configuration	Config input/ output	Config X5-03

Parameter `Config X5-03` determines how the W-FM reacts to signals at input X5-03.

Load controller multi-stage operating mode

If a load controller is connected to input X5-03 [ch. 3.3.16], the parameter determines the control of the operating stages.

Setting	Input X5-03		Operating mode	
	Pin 2	Pin 3	two stage	three stage
`LMV2/3 inv` (Standard)	0	0	Stage 1	Stage 1
	1	0	Stage 1	Stage 2
	0	1	Stage 2	Stage 3
	1	1	Stage 2	Stage 3
`LMV5x std` (with KS40 load controller)	0	0	Stage 1	Stage 1
	1	0	Stage 1	Stage 1
	0	1	Stage 2	Stage 2
	1	1	Stage 2	Stage 3
`LMV2/3 std` (special application)	0	0	Stage 1	Stage 1
	1	0	Stage 2	Stage 3
	0	1	Stage 2	Stage 2
	1	1	Stage 2	Stage 3

Deactivate O_2 trim / stop in phase 36

If function `DeaO2/Stp36` is set in parameter `Config X5-03` , input X5-03 can be used to deactivate O_2 trim or to trigger a stop function. For this setting, parameter `LC_OptgMode` must not be set to `ExtLC X5-03` .

Input	Function
Pin 2 (X5-03)	Mains voltage input at X5-03:2 deactivates O_2 trim and the W-FM 200 operates to the compound curves. The function O_2 alarm remains activated.
Pin 3 (X5-03)	If no mains voltage is applied to input X5-03:3, the burner stops at the start in phase 36. If the stop function is not used in conjunction with the O_2 deactivation, fit a bridge at input X5-03 between terminals 3 and 4.

Deactivate O_2 trim via operating mode

If the function `AutoDeactO2`is set in parameter `Config X5-03` and if mains voltage is applied to input X5-03:2, the operating mode of the O_2 controller changes from `conAutoDeac` to `auto deact`. The O2 controller is deactivated and the burner operates to the compound curves. The function O_2 alarm remains activated. No message will be shown on the display. If voltage is no longer applied to input X5-03:2, the operating mode changes back to `conAutoDeac` and O_2 trim is reactivated [ch. 6.10.1]. For this setting, parameter `LC_OptgMode` must not be set to `ExtLC X5-03` .

6.8.10 Configuring output X4-03

Param & Display	Burner Control	Configuration	Config input/ output	Start/PS valve

Parameter `Start/PS valve` determines if output X4-03 is used for a start signal or for pressure switch relief [ch. 3.4.4].

Setting	Function
`Start signal`	Output X4-03:3 is activated in phase 21 to 79.
`PS Relief`	Output X4-03:3 is activated in phase 79. Function is not used.
`PS Reli_Inv`	In phase 21 and phase 79 the relief valve at output X4-03:3 is de-energised and the air pressure switch is tested.

6.8.11 Extraneous light

Param & Display	Burner Control	Configuration	ConfigFlameDet	ReacExtranLight

Parameter `ReacExtranLight` determines the reaction if extraneous light is present in Standby (Phase 12).

Setting	Function
`Lockout`	Flame signal in phase 12 triggers a lockout.
`Startblock`	A flame signal in phase 12 leads to start prevention.

6.8.12 Repetition counter

Param & Display	Burner Control	Configuration	RepetitCounter

The parameters in menu `RepetitCounter` determine the number of safety shutdowns until shutdown with lockout is initiated. Changes in the repetition counter are only adapted after a reset or if the voltage supply has been interrupted.

Parameters	Function
`LossOfFlame`	Number of safety shutdowns due to missing flame signal. Range: (1 … **2**)
`HeavyOil`	Number of safety shutdowns caused by return temperature sensor for nozzle circulation not being released [ch. 3.3.10]. Range: (1 … **3** … 16[1])
`StartRelease`	Number of start preventions with display messages nozzle circulation [ch. 3.3.10]. Range: (1 … **10** … 16[1])
`SafetyLoop`	Number of safety shutdowns caused by the safety circuit not being released [ch. 3.3.2]. Range: (1 … **16**[1])

[1] Repetition value 16 means not limited, no shutdown with lockout is initiated.

6.9 Electronic compound

6.9.1 Actuator ramps

Param & Display	RatioControl	Times	OperatRampMod OperatRampStage Ramp

The ramps determine the speed of the actuators for a distance of 90°. The ramp times must not fall below the time of the slowest actuator, see actuator name plate.

Parameters	Function
OperatRampMod	Ramp time for modulating operation for phases 60 and 62. In operating position, all actuators operate at this speed.
OperatRampStage	Ramp time for multi-stage operation for phases 60 and 62. In operating position, all actuators operate at this speed.
Ramp	Ramp time outside the operating position for modulating and multi-stage operation. All actuators operate at this speed in pre-purge, ignition, post-purge and standby position.

Only in conjunction with frequency converter
The ramp time of the frequency converter must be less than the ramp time set in the W-FM (recommendation: 30 %).

6.9.2 Shutdown behaviour

Param & Display	RatioControl	ShutdownBehav	

Parameter ShutdownBehav determines the behaviour during lockout.

Setting	Function
Unchanged	The actuators remain in the position they were in at the time of the lockout.
PostpurgeP	If lockout occurs, the W-FM initiates a post-purge.
HomePos	If lockout occurs, the actuators drive to standby position.

6.9.3 Operating behaviour of frequency converter

Only possible with W-FM 200.

Param & Display	RatioControl	GasSettings OilSettings	VSD

Parameter `VSD` determines the operating behaviour of the frequency converter. The operating behaviour can be set individually for each fuel.

Setting	Function
`deactivated`	No frequency converter available. The inputs and outputs for variable speed drive are not activated.
`activated`	Only in conjunction with a frequency converter. The inputs and outputs for variable speed drive are activated.
`air influen`	Only in conjunction with a frequency converter. The inputs and outputs for variable speed drive are activated and the frequency converter is included in O_2 trim.

6.9.4 SpecialPositions

Param & Display	RatioControl	GasSettings OilSettings	SpecialPosi- tions	Home Pos PrepurgePos IgnitionPos PostpurgePos ProgramStop ResetIgnitPos

If the burners is in operating position (phases 60 and 62), the actuators and the speed are driven by the compound curves. Outside of the operating position, the actuators and the speed are driven according to the SpecialPositions .
In the special positions, the actuators can be set independently.
Special positions are fuel specific and must be set separately for each fuel on dual fuel burners.

Setting	Actuator
…PosGas:	Gas butterfly valve
…PosOil:	Oil quantity regulator
…PosAir:	Air dampers
…PosAux1:	Adjustable mixing head
…PosAux2:	Auxiliary actuator for special applications (W-FM 200 only)
…PosAux3:	Auxiliary actuator for special applications, damper for flue gas recirculation (W-FM 200 only)
…PosVSD:	VSD (only in conjunction with frequency converter, W-FM 200)

Standby positions

Parameter StandbyPos determines the positions for phases 00 to 22.

Pre-purge position

Parameter PrepurgePos determines the positions of the air influencing actuators for pre-purge in phases 30 to 34. The exception is the auxiliary actuator3 (flue gas recirculation), which only drives to pre-purge position from phase 32.

Ignition position

Parameter IgnitionPos determines the positions for the ignition process in phases 36 to 54.
Individual ignition positions can be deleted in parameter ResetIgnitPos . If a relevant ignition position is not defined, the W-FM initiates a start prevention at heat demand. Se installation and operating manual of burner for the ignition position.

Post-purge position

Parameter `PostpurgePos` defines the positions for post-purge in phases 74 to 78. The exception is auxiliary actuator 3 (flue gas recirculation), which only drives to the post-purge position after phase 76.
The speed `PostpurgePosVSD` must not be set below 10 %.

Program stop

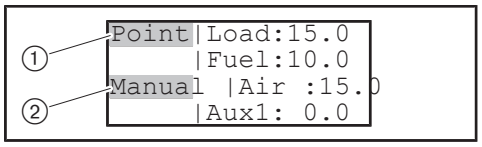
Using parameter `ProgramStop`, the program sequence can be stopped in defined phases. Parameter `ProgramStop` can also be called up in menu `Param & Display/RatioControl`.

Setting	Function
`deactivated`	No program stop
`24 PrePurgP`	Stop in phase 24, pre-purge position
`32 PrePFGR`	Stop in phase 32, auxiliary actuator3 in pre-purge position
`36 IgnitPos`	Stop in phase 36, ignition position
`44 Interv 1`	Stop in phase 44, flame signal
`52 Interv 2`	Stop in phase 52, ignition pilot valve OFF
`72 PostPPos`	Stop in phase 72, post-purge position
`76 PostPFGR`	Stop in phase 76, auxiliary actuator3 in post-purge position

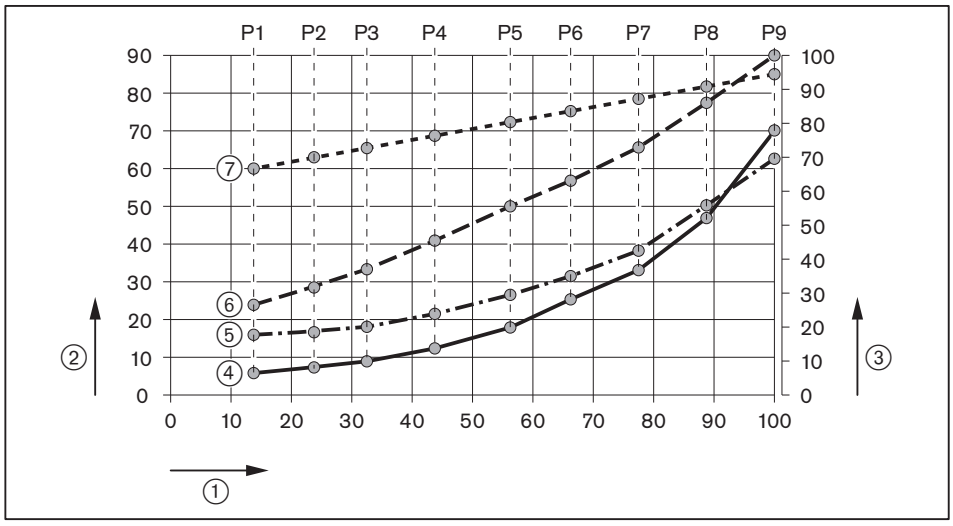
6.9.5 Creating load points, modulating operation

Param & Display	RatioControl	GasSettings OilSettings	CurveParams	Point Man

Depending on the load signal, the W-FM controls the actuators in compound in modulating operation. Each actuator has its own compound curve. The compound curves are formed from defined load points. 15 load points can be defined for the compound curves, a minimum of 5 load points are required. On dual fuel burners, the compound curves for each fuel can be set separately. In menu `Point` ①, load points can be adjusted or deleted to optimise combustion. In menu `Manual` ② new load points are set.



During initial commissioning, set load points up to full load. Once full load has been regulated, optimise combustion in load point 1. Load point 1 must be within the capacity graph and below below partial load. Now delete all load points between point 1 and full load. Starting at point 1, set new load points until full load is achieved. Optimise combustion in the current point before setting a new load point. To ensure an even speed characteristic curve, the speed of the new load points should not be altered.
To ensure that control is possible across the entire load range in conjunction with O_2 trim point 1 must be approx. 50% below partial load (point 2).

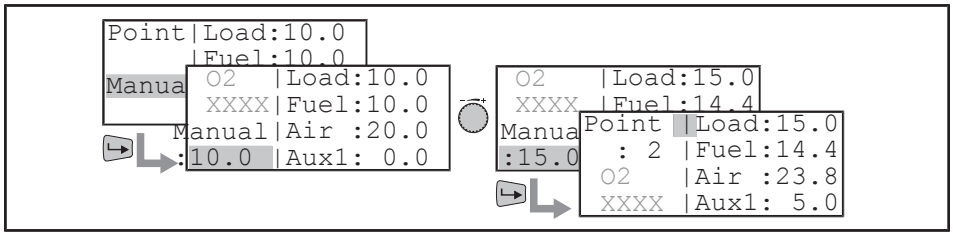


① Burner capacity in %
② Actuator position in degree of angle
③ Speed in %
④ Fuel `Fuel`
⑤ Air damper `Air`
⑥ Mixing head `Aux1`
⑦ Frequency converter `VSD`

Setting new load points

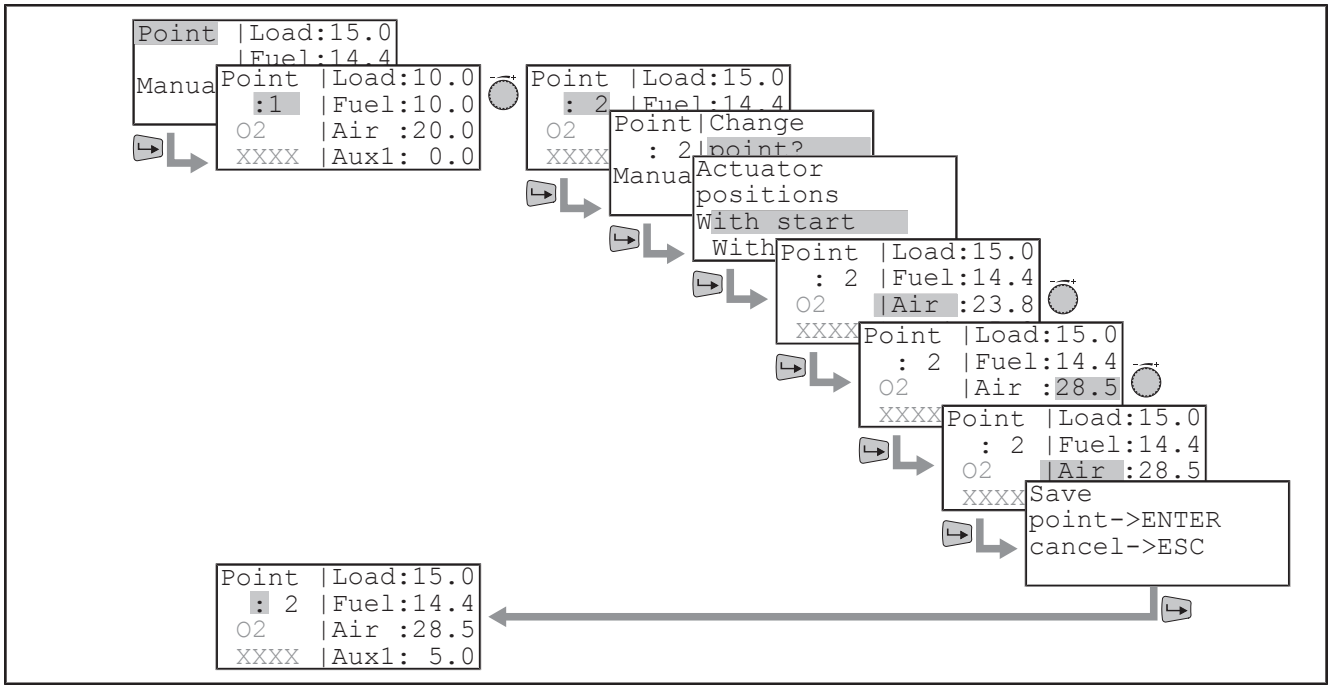
- ► Select `Manual` and confirm with [ENTER].
- ► Increase burner rating using dial knob whilst observing combustion values (excess air) and flame stability.
- ► Set load point using [ENTER] key if either:
  - the O_2 content in the flue gas increases to above 7 %,
  - the soot limit is reached,
  - the CO content increases,
  - the flame reaches the limit of stability.

The new load point is displayed in menu `Point` and can be adjusted.



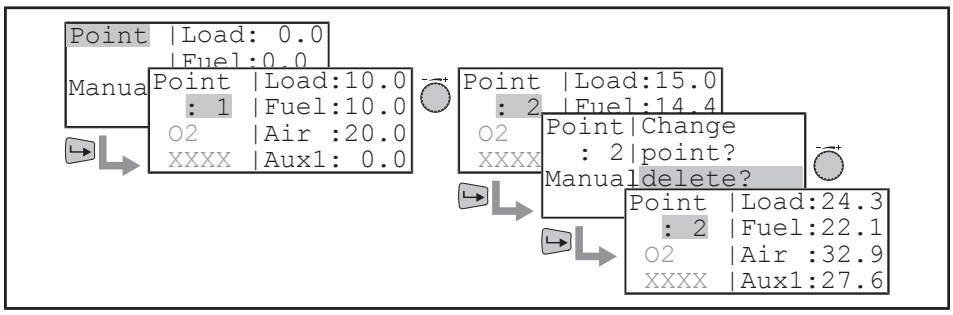
Editing load points

- ► Select `Point` and confirm with [ENTER].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ► Confirm query `Change point?` with [ENTER].
- ► Confirm query `With start` with [ENTER].
- ✓ The curve points can be changed and the actuators are synchronised.
- ► Select actuator using the dial knob and press [Enter].
- ► Change values using the dial knob and confirm with [ENTER].
- ► Once combustion has been optimised, exit point using [esc] and save with [Enter].



Deleting load points

- ► Select menu `Point` and confirm with [Enter].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ► Select `Delete point?` and confirm with [Enter].
- ✓ Load point is deleted.
- ✓ Load points above this will be renumbered. The display shows the next higher load point in the current numbering. If the last load point was deleted, the actuator positions show `XXXX` .



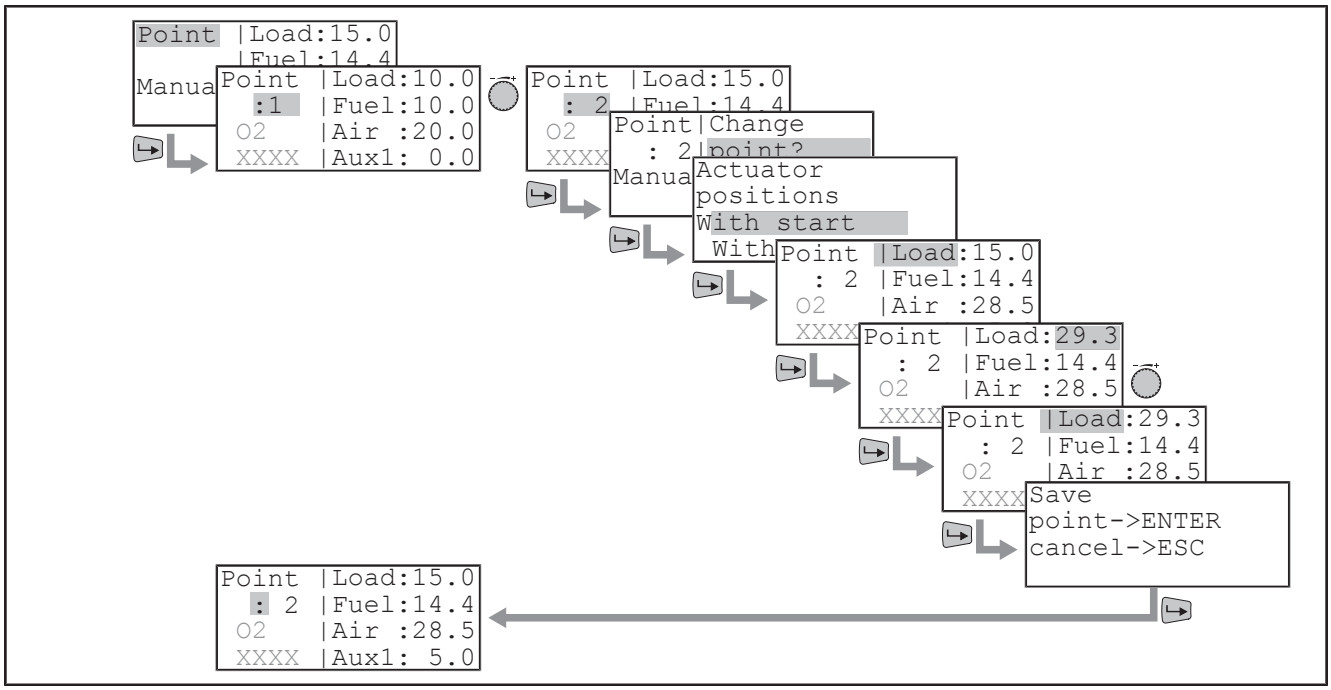
Ratings apportionment

The load points are automatically assigned relative to the capacity. Incorrect load distribution can cause operating problems during the load control.

- ► Assign capacity in % for load point using the following formula.
- ► Enter the calculated capacity for load point in `Load`.

$$\text{Load [\%]} = \frac{\text{Throughput load point}}{\text{Throughput full load}} \cdot 100$$

- ► Select `Point` and confirm with [ENTER].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ► Confirm query `Change point?` with [ENTER].
- ► Confirm query `With start` with [ENTER].
- ► Confirm line `Load` with [Enter].
- ► Calculate actual load.
- ► Set load using dial knob and confirm with [Enter].
- ► Exit point using [esc] and save with [ENTER].



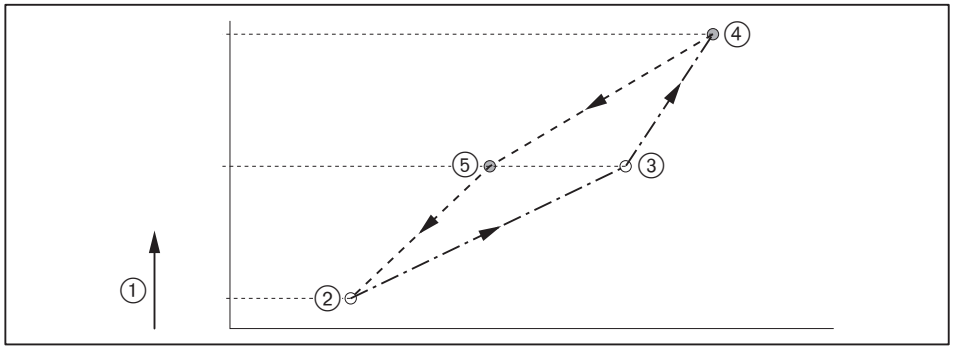
6.9.6 Operating and switch points, multi-stage operation

Param & Display | RatioControl | OilSettings | CurveParams | CurveSet

Two or three stage operation is specified depending on the burner execution. A three stage burner can also be operated two stage with low impact start or change-over release. The change-over behaviour between the operating stages is optimised via separate switch on and off points.

Operating stages BS1, BS2, BS3(1	Excess air for the relevant fuel quantity is set in the operating stages.
Switch-on points ES2, ES3(1	In the switch-on point, the air quantity for the change-over process into the next higher stage is set. If the switch-on point is exceeded, the solenoid valve of the next stage opens. If the switch-on point is activated directly the solenoid valve remains closed, only the air influencing actuators drive to the switch-on position and the flame stability can be checked prior to the change-over.
Switch-off points AS2, AS3(1	In the switch-off point, the air quantity for the change-over process into the next lower stage is set. If the switch-on point is not maintained, the solenoid valve of the previous stage closes. Switch-off points must not be activated directly, as the solenoid valve of the previous stage remains open and only the air influencing actuators drive to the switch off position. This leads to soot formation caused by insufficient air.

(1 BS3, ES3 and AS3 only with three stage operation



① Air damper position
② Operating stage 1 (BS1)
③ Switch-on point 2 (ES2), solenoid valve stage 2 opens above
④ Operating stage 2 (BS2)
⑤ Switch-off point 2 (AS2), solenoid valve stage 2 closes below

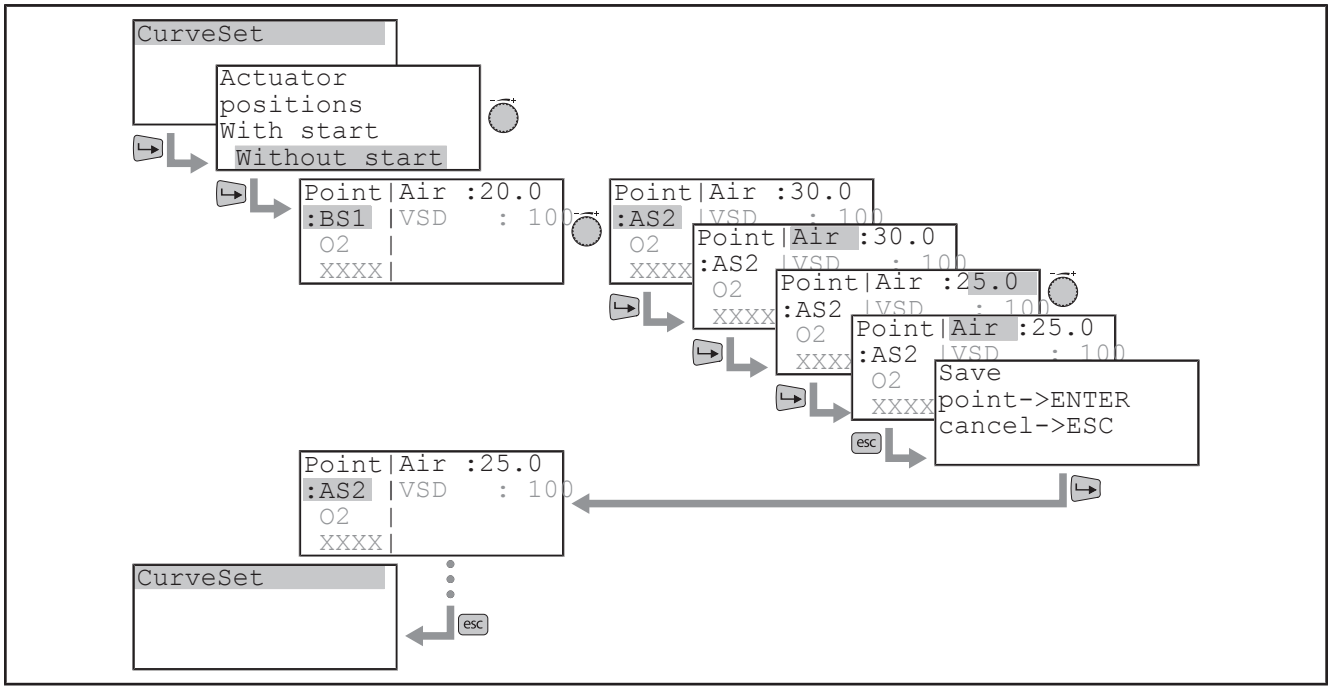
Two options are available fort he setting of the operating and switch points.

`With start`:
The actuator and frequency converter follow the current adjustment via dial knob. With this option, the operating stages and switch-on points are set during burner operation.
In the operating stages, the combustion is optimised.
In the switch-on points, the excess air for the change-over process to the next operating stage is determined. Excess air for the switch-on point is approx. 7 % O_2 residual content.
The switch-off points must not be activated during burner operation, as this leads to soot formation caused by insufficient air.

`Without start`:
With this option, the operating stages and change-over points can be pre-set without the actuator and frequency converter following. Pre-setting values see installation and operating manual of burner.

Setting operating and switch points

- Select menu `CurveSet` and confirm with [Enter].
- Choose appropriate option with the dial knob and confirm with [Enter].
  - `With start`: Optimise operating stages and switch-on points
  - `Without start`: Pre-set values and optimise switch-off points
- Select operating stage or switch point using dial knob and confirm with [Enter].
- Select `Air` actuator and confirm with [Enter].
  The selection option `VSD` only appears in conjunction with a frequency converter.
- Use dial knob to change the value and confirm with [Enter].
  Pre-setting values see installation and operating manual of burner.
- Exit entry using [esc] and save with [ENTER].
- Exit level using the [esc] key.



6.9.7 Load range

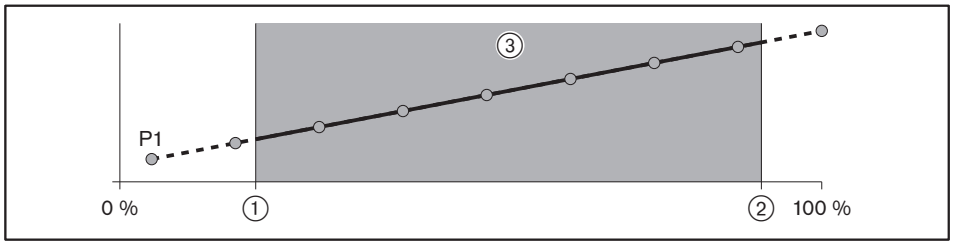
LoadLimits

Param & Display	RatioControl	GasSettings OilSettings	LoadLimits	MinLoad_… MaxLoad_…

In modulating operation, the load limits restrict the load range within the compound curves programmed. On dual fuel burners, the load limits for each fuel can be set separately.

Minimum load:
Parameter `MinLoad_…` limits the load range downward (partial load). Minimum load can not be set below load point 1, in conjunction with O_2 trim not below load point 2.

Maximum load:
Parameter `MaxLoad_…` limits the load range upwards (full load).



① Minimum load `MinLoad_…`
② Maximum load `MaxLoad_…`
③ Load range

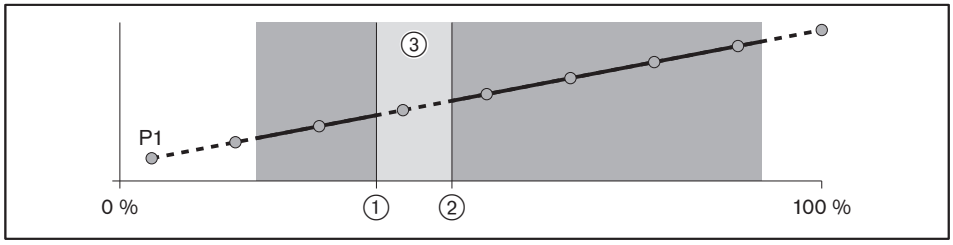
Fade-out partial range

Param & Display	RatioControl	GasSettings OilSettings	Load mask out	LoadMaskLowLimit LoadMaskHighLim

Parameter `Load Mask out` can be used to fade out part of the load range, which could lead to operating problems due to site conditions. On dual fuel burners, the partial range for each fuel can be set separately. The faded-out partial range can be driven through but not started directly. The burner drives from the bottom to the lower limit and passes through the partial range only when the load setpoint reached the upper limit. From the upper range, the burner remains at the upper limit and drives through the partial range only when the load setpoint has reached the lower limit.

Lower limit partial range:
Parameter `LoadMaskLowLimit` determines the lower limit. The lower limit can not be set above the upper limit.

Upper limit partial range:
Parameter `LoadMaskHighLim` determines the upper limit. The upper limit can not be set below the lower limit.



① Lower limit partial range `LoadMaskLowLimit`
② Upper limit partial range `LoadMaskHighLim`
③ Faded-out partial range

6.9.8 Load limit

Operation	User Maxload	User MaxLoadMod User MaxLoad Stg	

Parameters	Function
User MaxLoadMod	Load limit for modulating operation. Further restricts full load within the load limits [ch. 6.9.7].
User MaxLoadStg	Load limit for multi-stage operation. The burner drives only to the stage set.

6.9.9 Start point

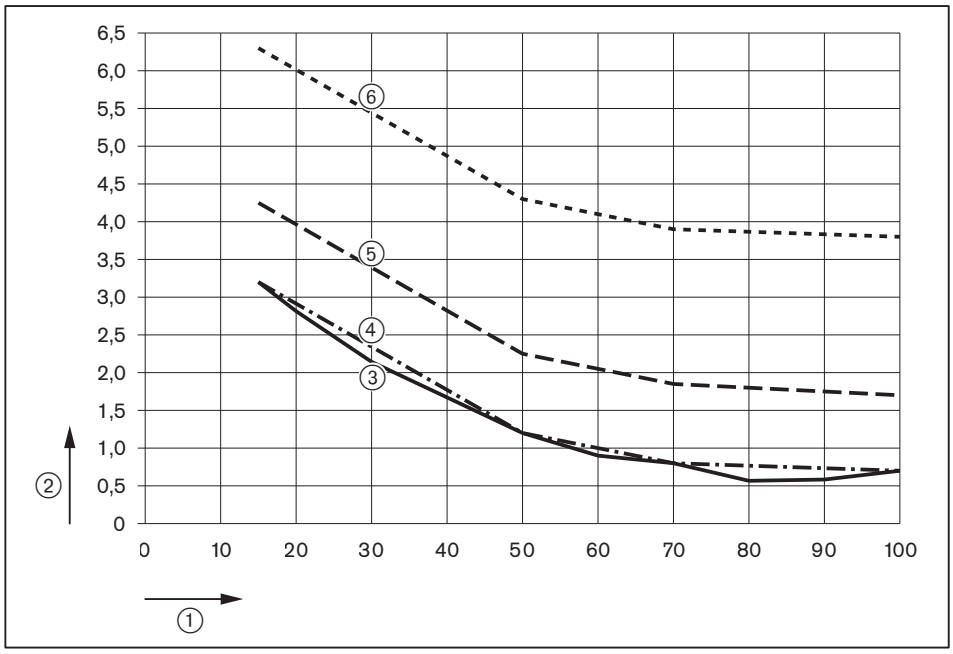
Param & Display	RatioControl	GasSettings OilSettings	StartPointOp

Parameter StartPointOp determines the load point for partial load position in phase 54. In phase 54, the burner drives to the load point set, when the load point is reached, the W-FM changes over to phase 60 and load control is released.

6.10 O2 controller

O_2 trim is only possible in modulating operation with W-FM 200 with O_2 module. O_2 trim is fuel specific and must be set separately for each fuel on dual fuel burners.

O_2 trim and O_2 monitor in conjunction with the O_2 residual content are at the combustion limit and the resulting O_2 compound curve.
An idealised minimum O_2 value is advantages for the control behaviour. When optimising the minimum O_2 value increase rather than decrease. In conjunction with CO control (accessory) the minimum O_2 value must be set to approx. 0.25 to 0.5 percentage points below the combustion limit.



① Burner capacity [%]
② O_2 content in the flue gas [%]
③ O_2 residual content at the combustion limit
④ Minimum O_2 value for O_2 monitor
⑤ O_2 setpoint for O_2 trim
⑥ O_2 compound, excess air in the load points 20 to 25 %

With frequency converter

On burners with frequency converter, parameter `VSD` can be used to determine if the frequency converter is to be included in O_2 trim [ch. 6.9.3].

Pre-control

The O_2 controller is equipped with a pre-control function. The pre-control calculates the air ratings reduction for the entire load range relative to the fuel on the basis of measured values during commissioning. If the load is changed, the air influencing actuators drive to the calculated position, whilst the fuel actuator drives to its load position. O_2 trim is only activated if temperature or air pressure deviations occur and and then drives the air influencing actuators.
To ensure the pre-control operates correctly, the load apportionment must match the fuel throughput in each load point [ch. 6.9.5].

6.10.1 O2 controller operating mode

Param & Display	O2Ctrl/Limit	GasSettings OilSettings	Operating mode
or			
Param & Display	SystemConfig	O2Ctrl/LimitGas O2Ctrl/LimitOil	

Using operating mode:
- the O_2 controller and O_2-monitor can be activated or deactivated,
- the behaviour when a fault occurs can be defined.

The operating mode can be set separately for each fuel.

Deactivating manually (`man deact`**)**

Parameter `man deact` deactivates the O_2 controller and O_2 monitor and the burner operates to the compound curves. This parameter is only used to create the compound curve during commissioning, it is not suitable for normal operation.

O_2 monitor only (`O2 Alarm`**)**

Parameter `O2 Alarm` only activates the O_2 monitor.

If the O_2 sensor has not reached the operating temperature at burner start, a start prevention is initiated. If the O_2 monitor is triggered or if an O_2 fault occurs, the W-FM initiates a controlled shutdown with single repetition, then lockout occurs.

O_2 controller and O_2 monitor (`O2Control`**)**

Parameter `O2Control` activates the O_2 controller and O_2 monitor.

If the O_2 sensor has not reached the operating temperature at burner start, a start prevention is initiated. If the O_2 monitor is triggered or if an O_2 fault occurs, the W-FM initiates a controlled shutdown with single repetition, then lockout occurs.

Automatically deactivate control (`conAutoDeac`**)**

Parameter `conAutoDeac` activates the O_2 controller and O_2 monitor.
The burner starts before the O_2 sensor has reached operating temperature. O_2 trim only starts once the operating temperature has been reached and the sensor test has been successfully carried out.

If the maximum O_2 monitor is triggered or if an O_2 fault occurs, the W-FM changes over to operating mode `auto deact`.

If the minimum O_2 monitor is triggered the W-FM drives back to the compound curves. After a time of 3 times Tau the O_2 content is tested again. The time constant Tau is determined automatically during standardisation [ch. 6.10.4].

- When the O_2 content exceeds the minimum limit the W-FM releases O_2 trim.
- If the O_2 content drops below the minimum limit, the W-FM initiates a safety shutdown with repetition. The number of repetitions can be set in parameter `NumMinUntilDeact` , see [ch. 6.10.2]. If the number of repetitions is exceeded, the W-FM changes over to operating mode `auto deact`.

Automatic deactivation (`auto deact`)

Do not select this operating mode.
Parameter `auto deact` is automatically activated when a fault occurs in operating mode `conAutoDeac` . The O_2 controller is deactivated and the burner operates to the compound curves. A fault message appears in the display. If the operating mode is changed over the fault message disappears [ch. 6.10.23].
The O_2 controller can also be deactivated via a signal at input X5-03:2 [ch. 6.8.9].

6.10.2 O2 monitor

Param & Display	O2Ctrl/Limit	GasSettings OilSettings	O2 Alarm	O2 Alarm O2 MaxValue NumMinUntilDeact

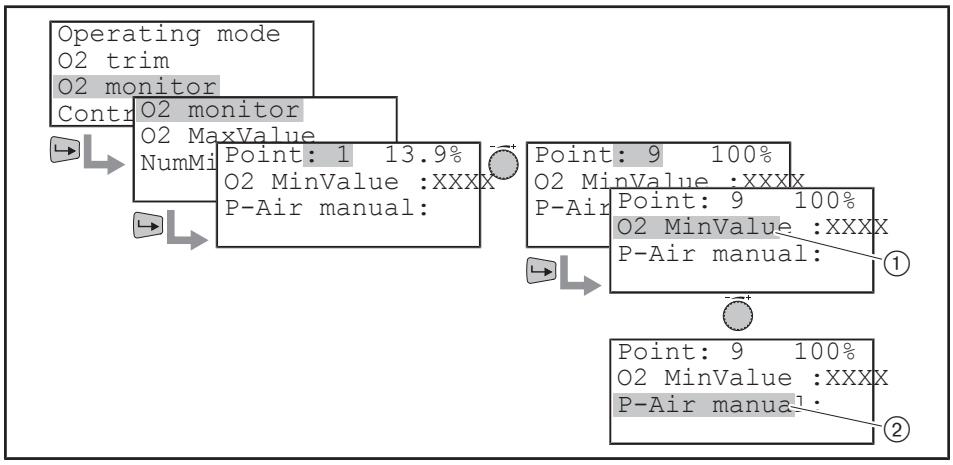
The W-FM monitors the O_2 content in the flue gas using a sensor on the O_2 module. The limit values for the O_2 alarm are defined using parameters `O2 MinValue` and `O2 MaxValue` .

O_2 minimum monitor

In parameter `O2 Alarm` , the setting under `O2 MinValue` stipulates the lower limit for the O_2 monitor.
If the O_2 content in the flue gas drops below this lower limit for more than 3 seconds, the W-FM reacts in accordance with the operating mode set [ch. 6.10.1].
An `O2 MinValue` has to be defined as the lower limit in each load point. The `O2 MinValue` results from the O_2 content in the flue gas at the combustion limit.

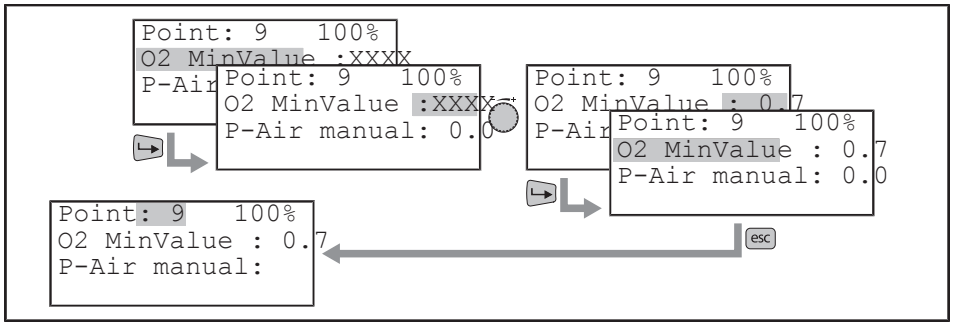
The `O2 MinValue` can be entered direct at each load point or can be determined by reducing the air rating:

- ► Select menu `O2 Alarm` and confirm with [Enter].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ► Select entry type ① or ②.

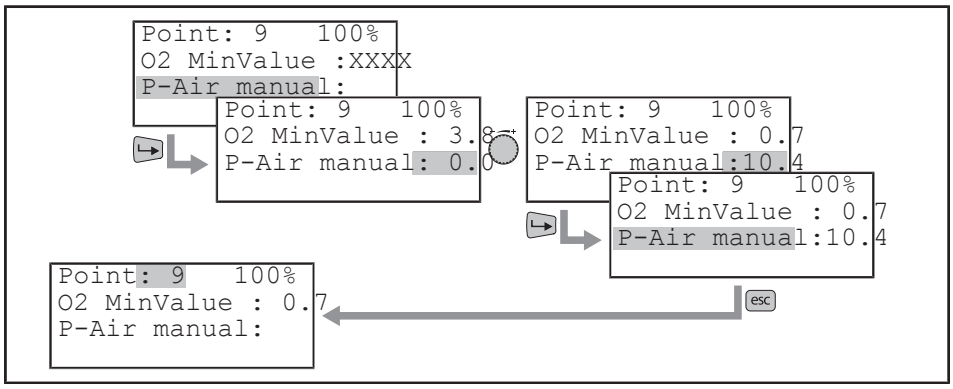


①	Direct entry (`O2 MinValue`) If the O_2 min value for the load point is known, the value can be assigned directly.
②	Determine O_2 min value (`P-Air Manual`) The air rating is reduced manually in the load point, the O_2 content is determined and saved as `O2 MinValue`.

Direct entry:
- ► Select O2 MinValue and confirm with [ENTER].
- ► Change values using the dial knob and confirm with [ENTER].
- ► Exit entry using [esc].



Determine O_2 min value:
- ► Select parameter P-Air Manual and confirm with [Enter].
- ✓ The display shows the current O_2 actual value and the burner drives to the load point.
- ► Reduce air rating using the dial knob until the combustion limit is reached (CO content approx. 100 ppm or smoke number approx. 1).
- ► Press [ENTER] to accept the O_2 actual value.
- ✓ The display shows the value determined as O2 MinValue.
- ► Exit entry using [esc].



O_2-maximum monitor

Parameter O2 MaxValue determines the upper limit value for the O_2 monitor. The limit value is valid across the entire load range. If the O_2 content in the flue gas exceeds this limit value for more than 3 seconds, the W-FM reacts in accordance with the operating mode set [ch. 6.10.1].

Repetition for O_2 minimum monitor

Parameter NumMinUntilDeact determines the number of repetitions until the O_2 controller is deactivated. The parameter is only relevant, if the operating mode is set to conAutoDeac, see [ch. 6.10.1].

If a rapid load change triggers the O_2 minimum monitor, increase parameter O2-ModOffset, see [ch. 6.10.4].

6.10.3 O2 trim

Param & Display	O2Ctrl/Limit	GasSettings OilSettings	O2 Control

The W-FM monitors the O_2 content in the flue gas using a sensor on the O_2 module.

With new sensors or if the sensor has been switched off for extended periods, moisture may form in the sensor and distort the measured value. A longer heat-up process through the internal sensor heating displaces this moisture.
► Heat up the sensor prior to adjusting the O_2 trim.

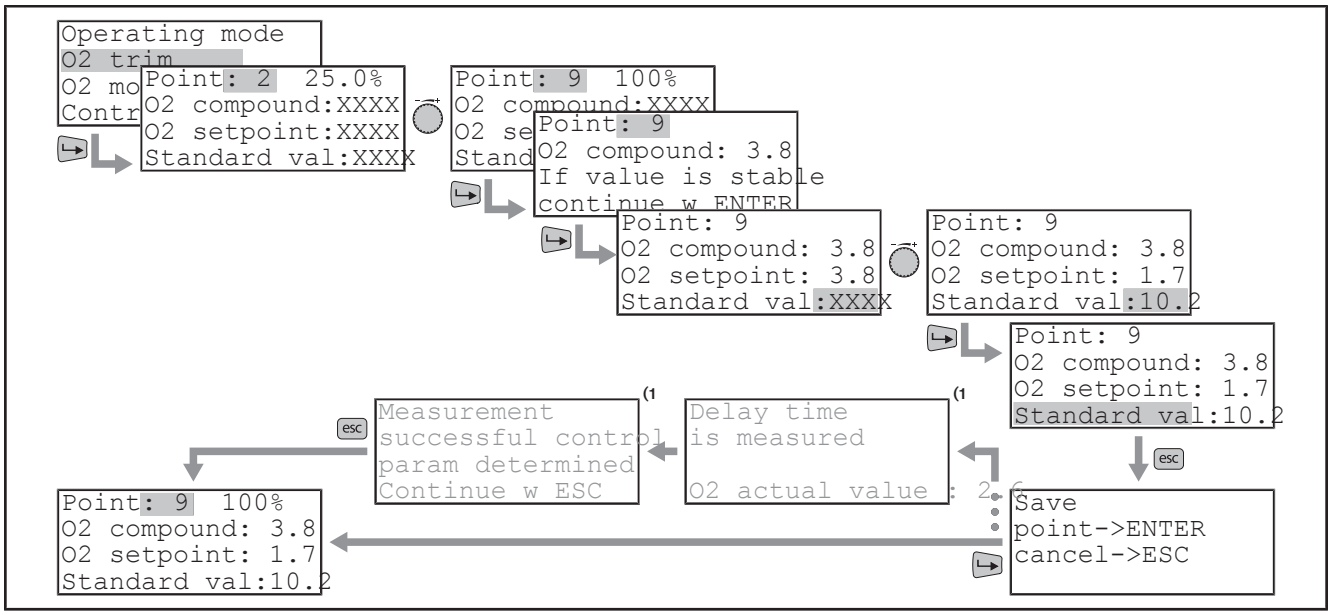
Parameter `LowFireAdaptPtNo` can be used to set from which load point O_2 trim is possible [ch. 6.10.4].
During commissioning, in parameter `O2 Control` standardisation is carried out at each point from the load point determined up to full load and the O_2 setpoint is determined. During standardisation the air influencing actuators drive open on the compound curve according to the standardised value and reduce the air quantity, the fuel quantity remains unchanged.
No standardisation is carried out in load point 1, the reference line between load point 1 and load point 2 only serves to reduce air. To ensure O_2 trim is possible across the entire load range, point 1 must be approx. 50 % below partial load (point 2).

In the load point set under `LowFireAdaptPtNo` and the last load point (full load) the W-FM carries out an adaption. In these two points, the W-FM drives back to the compound curve after saving. The delay time before the O_2 content at the sensor changes is saved as time constant Tau.

The setpoint for O_2 trim should be approx. 0.5 … 1 %point above the `O02 MinValue` of the O_2 monitor.
The O_2 value in the load points of the compound curve should be approx. 2 % points above the setpoint for O_2 trim.

Standardisation

- ► Select `O2 Control` and confirm with [Enter].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ✓ Burner drives to load point.
- ► Once the O_2 content has stabilised confirm with [ENTER].
- ► Turn dial knob to the right.
- ✓ The air-determining actuators drive open on the compound curve, reduce the air quantity and thus the O_2 content.
- ► Confirm standardised value with [ENTER].
- ► Exit entry using [esc] and save with [ENTER].
- ► Carry out standardisation in all points, point 2 to full load.



(1 Measurement of delay time (time constant Tau) only at 100 % and in the load point defined under `LowFireAdaptPtNo`.
If the measurement fails in the defined load point, select the next higher load point [ch. 6.10.4].

Avoid changing the load points in menu `CurveParams` once standardisation has been completed. If a load point is changed, the standardisation in this point is deleted and O_2 trim is no longer possible. In this case the standardisation for this load point has to be repeated.

6.10.4 O2 control parameters

Param & Display	O2Ctrl/Limit	GasSettings OilSettings	ControlParam

The control parameters are fuel specific and must be set separately for each fuel on dual fuel burners.

PI parameters and time constant Tau

This parameter influences the reaction behaviour of O_2 trim.

Parameters	Function
P Low-Fire P High-Fire	Proportional part of O_2 trim. The greater the value set, the faster the regulation will commence. If the value set is too great the controller tends to over-oscillate.
I Low-Fire I High-Fire	Integral part of O_2 trim. The smaller the value set, the faster the regulation will commence. If the value is set too small, the controller tends to oscillate.
Tau Low-Fire	The flue gas reaction time measured during standardisation in the point set under LowFireAdaptPtNo .
Tau High-Fire	The flue gas reaction time measured during standardisation at 100 % burner capacity.

Partial load adaption point (LowFireAdaptPtNo)

Parameter LowFireAdaptPtNo determines the load point at which Tau Low-Fire (flue gas reaction time) is measured. If the flue gas velocity in the current partial load adaption point is too low, the measurement fails and the next higher point has to be selected. O_2 trim is not possible below the partial load adaption point set.

O_2 controller limit (`O2 CtrlThreshold`)

If reliable O_2 trim is not possible in the lower capacity range, (e. g. flue gas velocity at the O_2 sensor insufficient), the O_2 control limit can be increased in parameter `O2 CtrlThreshold` .
At a burner capacity below the control limit O_2 trim is deactivated. Once the burner capacity increases again by 5 % points above the control limit, O_2 trim is reactivated. If the O_2 control limit is below the partial load adaption point, the O_2 control limit is ineffective.

The flue gas velocity at the O_2 sensor may not be sufficient for reliable regulation for capacities in the lower load range. Recognisable when the O_2 sensor reacts very slowly to changes in the O_2 content in the flue gas. In this case increase the O_2 regulating limit accordingly.

Flue gas velocity [v]:
- min: 1 m/s
- max: 10 m/s

Formula:

$$v = \frac{Q_B \cdot L \cdot \lambda \cdot \frac{t_A + 273}{273}}{d^2 \cdot 0.785 \cdot 3600}$$

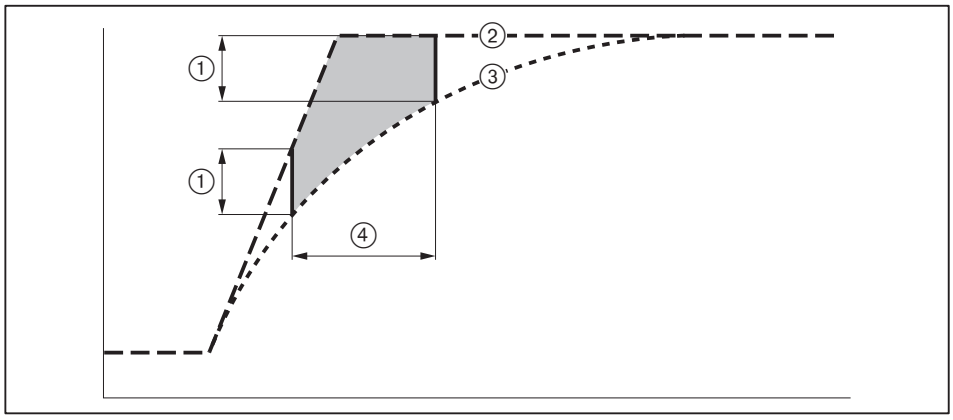
Rule of thumb:

$$v = \frac{Q_B \cdot 0.0046}{d^2} \cdot \frac{t_A + 273}{273}$$

v	Flue gas velocity [m/s]
Q_B	Fuel throughput [kg/h] [m^3/h]
L	Stoichiometric air requirement [m^3/kg] [m^3/m^3]
λ	Air number
t_A	Flue gas temperature [°C]
d	Flue gas pipe diameter [m]

Behaviour at load change (`LoadCtrlSuspend`)

Parameter `LoadCtrlSuspend` specifies the threshold at which the O_2 trim locks out when the load changes. With a change in load ② the W-FM calculates an adjusted burner capacity ③. If the difference of the reference line exceeds the value `LoadCtrlSuspend` ① O_2 trim is suspended ④ and parameter `O2ModOffset` is activated. If the difference is not maintained, the W-FM releases O_2 trim again after a delay time (2 x `Tau High-Fire`).
The lower the value set, the more often O_2 trim will be suspended and driven to the `O2ModOffset` set.



O_2-Offset (`O2ModOffset`)

Increase of the O_2 content in percentage points, if O_2 trim is suspended via parameter `LoadCtrlSuspend` when the load is changed. `O2ModOffset` ensures that the O_2 min value is maintained in case of `LoadCtrlSuspend`.
If the threshold value `LoadCtrlSuspend` is exceeded when the load is changed, the air influencing actuators operate and increase the O_2 content by the value set, then the fuel actuator operates.

In conjunction with CO trim the W-FM increases the O_2 setpoint by O_2 offset if the CO limit value has been exceeded.

Pre-control (`Type Air Change`)

Parameter Type Air Change influences the calculation procedure of the pre-control [ch. 6.10].

Parameters	Function
`like theory`	Recommended for fuel gas. Temperature and air pressure fluctuations influence the fuel throughput.
`like P air`	Recommended for fuel oil. Temperature and air pressure fluctuations do not influence the fuel throughput.
`LambdaFact1`	Not recommended. Only for burners with fuel/air ratio Lambda factor 1.

O_2 control variable limit

The control variable can be limited to ensure that O_2 trim reacts to faults during O_2 measurement (e. g. false air in the flue gas, O_2 sensor or air regulator blocked, etc.) and does not try to compensate for these.

- Upper limit: `O2MaxManVariable`
- Lower limit: `O2MinManVariable`

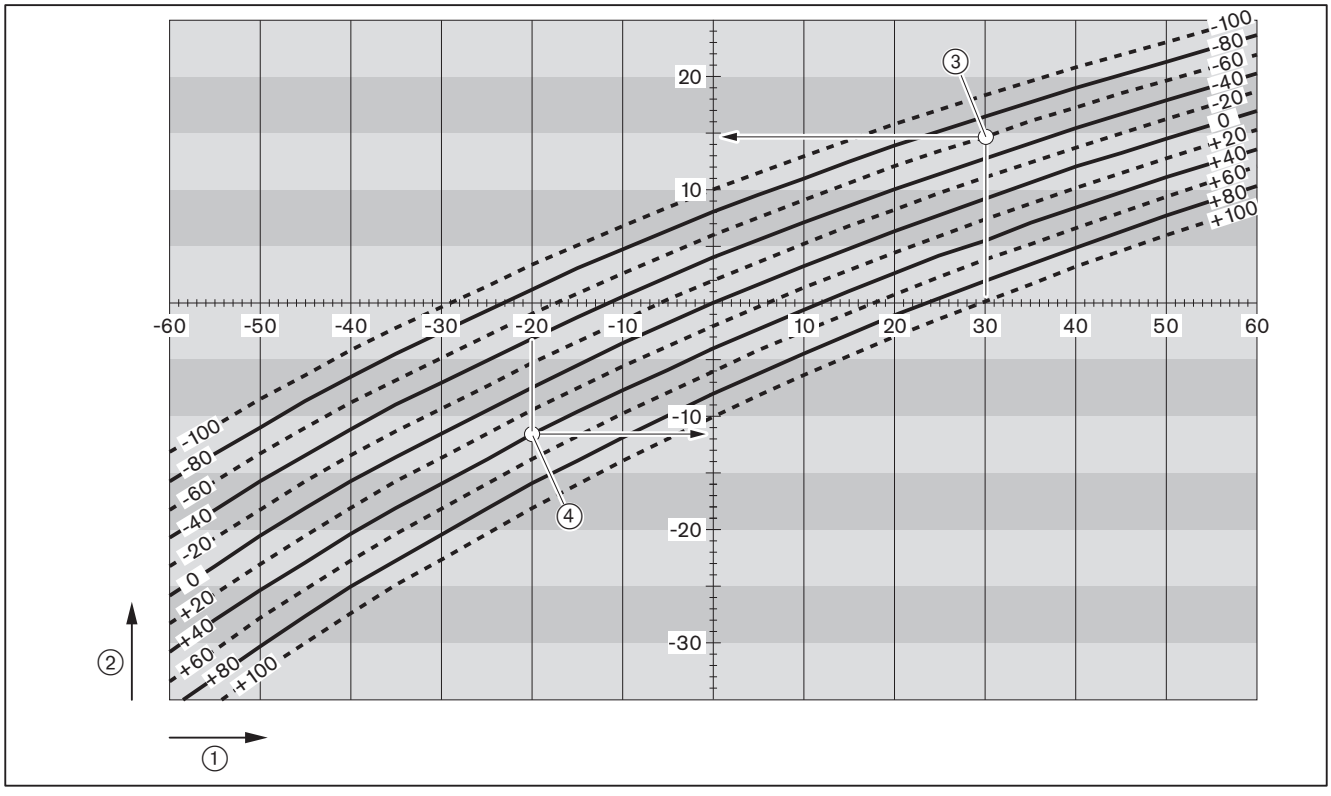
The reaction when the control variable limit is reached depends on the operating mode set [ch. 6.10.1].

Operating mode	Reaction
`O2 controller`	The W-FM carries out a safety shutdown with subsequent lockout.
`conAutoDeac`	The W-FM carries out a safety shutdown with subsequent repetition and deactivated O_2 controller. The burner operates to the compound curves.

The control variable limit results from the maximum expected temperature or air pressure fluctuations based on the conditions at the time of commissioning. If the control variable is set too low this will lead to a safety shutdown if climatic fluctuations are too great. The control variable limit can be determined using the following diagram.

	Example ③ `O2MaxManVariable`	**Example ④** `O2MinManVariable`
Expected temperature fluctuation(1 (-20 K … +30 K):	+30 K	-20 K
Expected air pressure fluctuation(1 (-60 mbar … +40 mbar):	-60 mbar	+40 mbar
Control variable limit from diagram:	14.7 %	-11.6 %

(1 Based on the air temperature and pressure during commissioning.



① Temperature fluctuation [K]
② Control variable limit [%]

6.10.5 O2 start mode

Param & Display	O2Ctrl/Limit	GasSettings OilSettings	Startmode

O_2 offset at burner start (`O2InitOffset`)

Parameter `O2InitOffset` is not used in the Weishaupt configuration and has no function.

Release O_2 trim (`NumberTauSuspend`)

Parameter `NumberTauSuspend` determines the factor for the calculation of O_2 block time.
O_2 block time = `Tau Low-Fire x NumberTauSuspend`

Due to the reaction and settling time of the O_2 sensor, the O_2 regulator is initially blocked at burner start. The O_2 block time starts in operating setting (phase 60). After the block time the W-FM initialises the O_2 regulator and releases O_2 trim after a further 4 x `Tau Low-Fire`.

As the two possible O_2 sensors differ in reaction and settling time, `Number-TauSuspend` depends on the sensor used.

O_2 sensor	**Recommended** `NumberTauSuspend`
QGO 20	approx. 10 … 20
QGO 21	greater than 40

The block time also applies to the function CO monitor and CO controller [ch. 6.11].
At burner start, the CO content is increased. Once the flame has formed and stabilised, the CO content drops. If the block time is too short, the increased CO content at burner start will trigger a safety shutdown.

Combustion air temperature during commissioning (`Adjust. Temp O2`)

Parameter `Adjust. Temp O2` determines the air temperature during commissioning in conjunction with a supply air sensor, this is not used in the Weishaupt configuration and has no function.

6.10.6 Type of Fuel

Param & Display	O2Ctrl/Limit	GasSettings OilSettings	Type of Fuel Fuel user-def

The fuel used must be defined in parameter `Type of Fuel` . If the fuel used is not available, set parameter `Type of Fuel` to `Fuel user-def` and set the fuel values in menu `Fuel user-def`.

The type of fuel is used to calculate:
- the pre-control
- the combustion efficiency

User defined fuel values

The fuel values have to be defined in menu `Fuel user-def` , if parameter `Type of Fuel` is set to `user def` .

`V_LNmin`	Stoichiometric air requirement (Lambda 1). [m^3 Air per m^3 Gas or kg Oil].
`V_afNmin`	Flue gas volume wet in stoichiometric combustion (Lambda 1). [m^3 Flue gas wet per m^3 Gas or kg Oil].
`V_atrNmin`	Flue gas volume dry in stoichiometric combustion (Lambda 1). [m^3 Flue gas dry per m^3 Gas or kg Oil].
`A2`	Fuel factor for the calculation of combustion efficiency.
`B/1000`	Fuel factor for the calculation of combustion efficiency. The parameter value corresponds to the resolution 1/1000. Example: A value of 7 set corresponds to 0.007.

6.10.7 O2 sensor

Param & Display	O2 module	Configuration	O2 sensor

Parameter `O2 sensor` activates the O_2 sensor connected.

Setting	Function
`no sensor`	No O_2 sensor fitted, O_2 trim not possible.
`QGO20`	QGO 20 fitted, for: ▪ Gas burner ▪ Oil burner (fuel oil EL) ▪ Dual fuel burner (fuel oil EL)
`QGO21`	QGO 21 fitted, for: ▪ Heavy oil burner (fuel oil MS and S) ▪ Dual fuel burner (fuel oil MS and S)

The O_2 sensor QGO 21 has an increased reaction and settling time. Due to this behaviour, the release of O_2 trim at burner start has to be delayed for longer. In conjunction with QGO 21, the factor has to be set to minimum `40` in parameter `NumberTauSuspend` , see [ch. 6.10.5].

6.10.8 Service interval for O2 sensor

Param & Display	O2 module	Configuration	O2SensServTim O2SensServTimRes

Setting the service interval

Parameter `O2SensServTim` stipulates the service interval in days for the the O_2 sensor. The interval is deactivated if the setting is "0".
The interval is compared with the total operating hours counter. If the interval has elapsed, a message appears in the ABE and O_2 trim reacts according to the operating mode set [ch. 6.10.1].

- O_2 trim is deactivated in operating mode `conAutoDeac`, the O_2 monitor remains activated.
- Lockout occurs in operating mode `O2 Alarm` or `O2 controller`.

Reset service interval

Parameter `O2SensServTimRes` resets the service interval.
If O_2 trim is set to `auto deact`, the operating mode has to be reset to `conAutoDeac`.

6.10.9 Define temperature sensor

Param & Display	O2 module	Configuration	SupAirTempSens FueGasTempSens

Parameter SupAirTempSens is used to define the combustion air sensor fitted [ch. 3.3.24].
Select Pt1000 in conjunction with CO control.

The flue gas sensor fitted is defined in parameter FueGasTempSens, see [ch. 3.3.23].

The sensors have no influence on O_2 trim, they are used to calculate combustion efficiency.

6.10.10 Flue gas temperature warning threshold

Param & Display	O2 module	Configuration	MaxTempFlGasGas MaxTempFlGasOil

Parameter MaxTempFlueGas… determines a warning threshold for the flue gas temperature. A flue gas temperature sensor has to be fitted for this function [ch. 3.3.23].
The threshold is determined separately for oil and gas. Set the threshold approx. 20 % above the maximum flue gas temperature measured during commissioning [ch. 6.10.19].

CAUTION

Damage to the O_2 sensor caused by overheating
Flue gas temperature above 300 °C can damage the O_2 sensor.
► Avoid flue gas temperatures above 300 °C at the O_2 sensor.

If the flue gas exceeds the temperature set, a message appears in the ABE.
The warning indicates an increased flue gas loss, the heat exchanger should be cleaned.

CO function

In conjunction with the CO function the input of the combustion air sensor is used for signal evaluation [ch. 6.11].
For the signal evaluation an apparent intake air temperature of up to 730 ° C is generated. To ensure that the W-FM does not detect implausible values, the warning threshold in conjunction with the CO function must be set to 850 °C in parameter FlueGas… .

6.10.11 Combustion efficiency

Param & Display	O2 module	Process Data	CombEfficiency
or			
Operation	O2 module	CombEfficiency	

Combustion efficiency

Parameter `CombEfficiency` shows the combustion efficiency.

The following sensors must be fitted and configured for the combustion efficiency to be shown:
- O_2 sensor [ch. 3.3.25]
- Combustion air sensor [ch. 3.3.24]
- Flue gas temperature sensor [ch. 3.3.23]

6.10.12 O2 controller control variable

Param & Display	O2Ctrl/Limit	Process Data	ManVar O2 Ctrl

Parameter `ManVar O2 Ctrl` shows the current control variable of the O_2 controller.

6.10.13 Status O2 controller

Param & Display	O2Ctrl/Limit	Process Data	Status O2 Ctrl

Parameter `Status O2 Ctrl` shows the current status of the O_2 controller.

deactivated	The O_2 controller is deactivated. The burner operates to the compound curves.
locked	The O_2 controller is blocked (sensor testing, partial load not achieved, …).
LockTStart	Blocked time in partial load elapses (`Tau Low-Fire` x `NumberTauSuspend`).
InitContr	Initialisation time elapses (4 x `Tau Low-Fire`).
LockTLoad	The O_2 controller is blocked due to a load adjustment.
activate	The O_2 controller is activated and controls to the O_2 set-point.
LockTCAct	The O_2 controller is blocked for a duration of 2 x Tau due a control input.
LockCOx	The CO limit value has been exceeded, the O_2 controller is blocked.

6.10.14 Air rating

Param & Display	O2Ctrl/Limit	Process Data	Air-related Load

Parameter `Air-related Load` shows the current air rating of the fuel air ratio.

6.10.15 Diagnostic code

Param & Display	O2Ctrl/Limit	Process Data	Diag Reg State

Parameter `Diag Reg State` shows the diagnostic code when the controller is blocked [ch. 9.4].

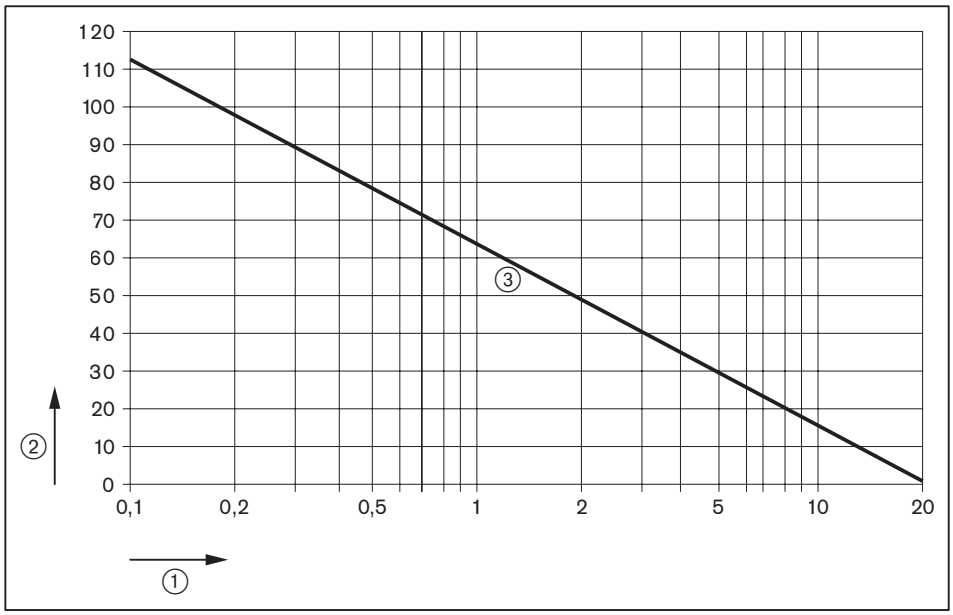
6.10.16 O2 content

Param & Display	O2 module	Process Data	Current O2 Value
or			
Operation	O2 module	Current O2 Value	

Parameter `Current O2 Value` shows the O_2 content currently measured in the flue gas.

Depending on the O_2 content in the flue gas and the temperature in the measuring cell the O_2 sensor generates Nernst voltage. The O_2 module calculates the O_2 content using the Nernst voltage and the sensor temperature.

It is possible for implausible values to be displayed whilst the sensor is being heated up to operating temperature (700 °C). The sensor will only operate on the reference line, which is required for an exact display once it has reached operating temperature.



① O_2 content [%]
② Nernst voltage [mV]
③ Reference line at 700 °C sensor temperature

6.10.17 O2 setpoint

Param & Display	O2 module	Process Data	O2 Setpoint
or			
Operation	O2 module	O2 Setpoint	

Parameter `O2 Setpoint` shows the O_2 setpoint set for the current burner capacity.
The O_2 setpoints are defined during commissioning.

6.10.18 Combustion air temperature / CO switching threshold

Param & Display	O2 module	Process Data	Supply air temperature
or			
Operation	O2 module	Supply air temperature	

Parameter `Supply air temperature` shows the combustion air temperature currently measured, if the relevant sensor is connected to the O_2 module.
In conjunction with CO monitoring, the parameter shows the status of the CO switching threshold [ch. 3.3.24].

6.10.19 Flue gas temperature

Param & Display	O2 module	Process Data	Flue gas temperature
or			
Operation	O2 module	Flue gas temperature	

If a flue gas temperature sensor is connected to the O_2 module, parameter `Flue gas temperature` shows the current flue gas temperature [ch. 3.3.23].

6.10.20 O2 sensor temperature

Param & Display	O2 module	Process Data	QGO SensorTemp

Parameter `QGO SensorTemp` shows the current temperature of the O_2 sensor. The temperature is detected by a thermocouple in the sensor, 700 °C corresponds to approx. 29.1 mV.

O_2 trim is activated at a sensor temperature of 700 °C (±15 °C). If the operating temperature is not achieved, the W-FM reacts according to the operating mode set [ch. 6.10.1].
If the temperature exceeds 750 °C, deactivate the sensor and check the electrical connection.

6.10.21 O2 sensor heating capacity

Param & Display	O2 module	Process Data	QGO HeatingLoad

Parameter `QGO HeatingLoad` shows the current heating capacity.

The percentage display indicates the impulse / pause ratio based on 2 seconds. 60 % corresponds to 1.2 seconds impulse ad 0.8 seconds pause.

Heat capacity

Start capacity up to 100 °C	approx. 13 %
Heat-up process	approx. 60 %
At operating temperature	approx. 17 %

6.10.22 O2 sensor wear and tear

Param & Display	O2 module	Process Data	QGO Resistance

Parameter `QGO Resistance` shows the internal resistance of the O_2 sensor. The internal resistance changes during the course of the operation. With an internal resistance of less than 5 Ω or greater than 150 Ω the sensor is subject to aging. If the parameter shows an internal resistance of 0 Ω, the W-FM has not yet carried out the sensor test.

Sensor test

The W-FM carries out a sensor test every 23 hours. The O_2 content must be constant for the test, e. g. in pre-purge or at a static load. If a constant O_2 content is not achieved within 24 hours, the W-FM freezes the load and carries out the test. If the burner is in standby, the W-FM carries out the test at the next burner start.

6.10.23 Activate / deactivate O2 controller

Operation	O2Ctrl activate	deactivated activated	

Parameter `O2Ctrl activate` activates or deactivates the O_2 controller manually.

6.11 CO monitor and CO controller

Refer to the manual of the measuring amplifier LT 3 and combination sensor KS1-D prior to commissioning. The manual is available to download from the Weishaupt Portal.

Components required for CO function:
- Combustion manager W-MF 200 in version with FGR and CO (LMV52.4…)
- O_2 module
  O_2 sensor QGO 20, for fuels Gas and fuel oil EL
- CO measurement amplifier LT3
- Combi sensor KS1-D for CO measurement
- Resistance board for connection CO measurement amplifier to O_2 module

The function CO monitor and CO controller must only be activated in conjunction with O_2 trim.

Depending on the combustion system it is possible that soot particles at the CO sensor can produce a false CO signal when using fuel oil EL. In this case, only use the function CO monitor or deactivate the CO function in the operating mode for oil. On dual fuel burners, there is no limitation for gas.

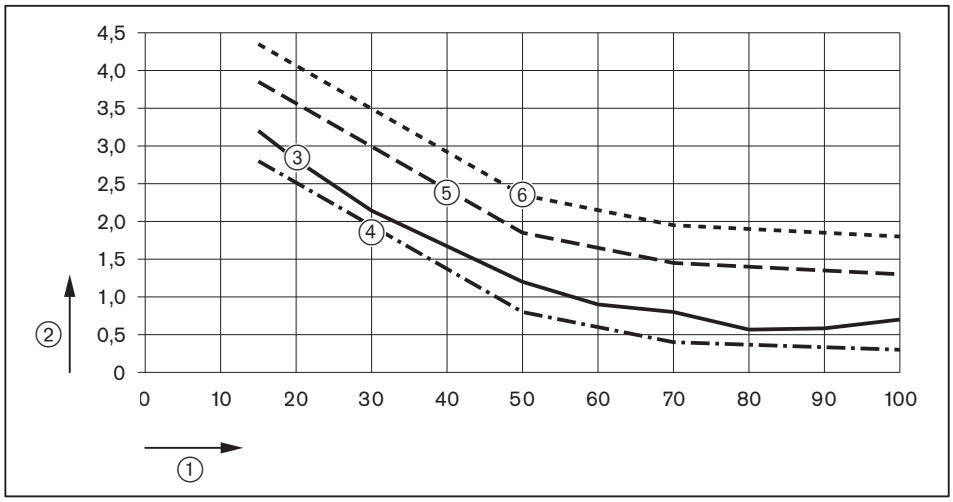
A CO sensor and a measurement amplifier with digital output for signal evaluation is required for CO detection. The digital output 3 (Out3) of the measurement amplifier is connected via a resistance board at the input of the combustion air sensor in the O_2 module [ch. 3.3.24].
Digital output 3 (Out3) is evaluated via the resistance board. In this case, the ABE shows the switching status of the measurement amplifier via the combustion air temperature.

Display	Description
approx. 730 °C	CO limit value exceeded. Digital output 3 (Out3) open, resistance at input approx. 3.6 kΩ.
approx. 370 °C	CO limit value not maintained. Digital output 3 (Out3) closed, resistance at input approx. 2.4 kΩ.

The following settings have to be made in the configuration of the O_2 module for signal evaluation:
- Set parameter `MaxTempFlGas…` to 850 °C [ch. 6.10.10]
- In parameter `SupAirTempSens` select sensor `Pt1000`, see [ch. 6.10.9].

A combustion air sensor is required for the calculation and display of the combustion efficiency. In conjunction with the CO function, the actual combustion air sensor is connected to input X60:3/4. Parameter `AirTempX60PT1000` (OEM level) must be set to `activated`.

CO control is an extension of the O_2 controller. The difference to the normal O_2 trim is that the `O2 MinValue` is set to approx. 0.25 … 0.5 percentage points below the combustion limit. If CO control is only used for one fuel on dual fuel burners, only the `O2 MinValue` for this fuel must be set below the combustion limit.



① Burner capacity [%]
② O_2 content in the flue gas [%]
③ O_2 residual content at the combustion limit
④ Minimum O_2 value for O_2 monitor
⑤ O_2 setpoint for O_2 trim
⑥ O_2 setpoint for O_2 trim + Offset (`O2ModOffset`)

The digital output 3 (Out3) in the measurement amplifier is is interrogated once after pre-purge. If the digital output is open, the W-FM carries out a safety shutdown with repetition.

Following the release of O_2 trim the digital output is permanently interrogated [ch. 6.10.5].
If the CO content exceeds the limit value, the digital output in the measurement amplifier opens and the value of the resistance board changes to approx. 3.6 kΩ. The W-FM recognises that the limit has been exceeded and increases the O_2 setpoint by the `O2ModOffset` set [ch. 6.10.4].
O_2 trim is suspended. The air influencing actuators drive open, the O_2 content increases and reduces the CO content in the flue gas.

If the CO content drops below the limit value before the time delay of the CO monitor `Time COx monitor` has elapsed, the digital output closes and O_2 trim is reactivated.
If the time delay is exceeded, the W-FM carries out a safety shutdown with repetition [ch. 6.11.2].

6.11.1 Operating mode CO function

Param & Display	O2Ctrl/Limit	COx	OptgMode COx Gas OptgMode COx Oil

On dual fuel burners, the CO monitor and CO controller can be activated or deactivated for each fuel separately.

Setting	Function
deactivated	CO controller and CO monitor are deactivate.
COx Alarm	Only the CO monitor is activated.
COx control	CO controller and CO monitor are activated.

6.11.2 Time delay limit value exceeded

Param & Display	O2Ctrl/Limit	COx	Time COx Alarm

Parameter Time COx Alarm determines the time delay until a safety shutdown with repetition is carried out if the CO limit value is exceeded. If the number of repetitions is exceeded, the W-FM initiates a lockout. The number of repetitions depend on the repetition counter of the O_2 monitor (NumMinUntilDeact). see [ch. 6.10.2].

If the CO content exceeds the limit value, the time delay must be long enough to allow the burner to drive to higher excess air.

6.12 Load controller

The W-FM 200 is equipped with an internal PID load controller as standard, with the W-FM 100 the internal load controller is optional.

6.12.1 Setpoint

Operation	BoilerSetpoint	SetpointW1 SetpointW2	
or			
Param & Display	LoadController	ControlParam	SetpointW1 SetpointW2

Two setpoints (W1/W2) can be specified for the internal load controller using parameters Setpoint … .
The setpoints can not be set via the temperature monitor TL_Thresh_Off , see [ch. 6.12.13].
A potential free contact at input X62 can be used to switch between the setpoints W1 and W2 or to switch from an external to the internal setpoint W1 [ch. 3.3.19].

6.12.2 Load controller operating mode

Param & Display	LoadController	Configuration	LC_OptgMode
or			
Param & Display	SystemConfig	LC_OptgMode	

The parameters in menu LC_OptgMode stipulates, wether the internal or an external load controller is used and which source specifies the setpoint.

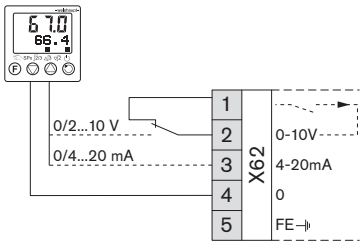
External load controller

Setting	Function
ExtLC X5-03	External load controller at input X5-03 [ch. 3.3.16].
ExtLC X62	External load controller with analogue load signal at input X62 [ch. 3.3.17]. Input X62 must be matched to the analogue signal in parameter Ext Inp X62 U/I , see [ch. 6.12.4]. The internal load controller converts the analogue signal into a digital load signal. This operating mode is not possible without the internal load controller.
ExtLC Bus	External load controller via Bus connection [ch. 3.3.18].

Internal load controller

Setting	Function
`IntLC`	Internal Load controller with setpoint input (W1/W2) via ABE. A contact at terminals X62:1/2 can be used to switch between setpoint W1 and W2 [ch. 3.3.19].
`IntLC Bus`	Internal load controller with setpoint input via Bus from the building management system. Parameters `Ext Min/MaxSetpoint`can be used to limit the setpoint range [ch. 6.12.6]. A contact at terminals X62:1/2 can be used to switch to the internal setpoint W1 [ch. 3.3.19].
`IntLC X62`	Internal load controller with analogue setpoint from the building management system at input X62 [ch. 3.3.17]. Input X62 must be matched to the analogue signal in parameter `Ext Inp X62 U/I` , see [ch. 6.12.4] The setpoint range results from the selected measuring range for the temperature sensor in parameter `Meas. range PtNi` [ch. 6.12.5]. Parameters `Ext Min/MaxSetpoint` can be used to limit the setpoint range [ch. 6.12.6]. A contact at terminals X62:1/2 can be used to switch to the internal setpoint W1 [ch. 3.3.19].

Changing over operating mode to internal load controller



A switch contact at terminal X62:1/2 can be used to switch over from an external load controller to the internal load controller `IntLC` . If the contact is closed, the internal load contactor is activated and controls on the internal `Setpoint W1`.

For the operating mode change-over to function, `LC_OptgMode` has to be set to `IntLC` and the internal load controller has to be adjusted. Then `LC_OptgMode` has to be set to the external operating mode (`ExtLC ...`) required.

6.12.3 Sensor selection (actual value)

Param & Display	LoadController	Configuration	Sensor select
or			
Param & Display	SystemConfig	TempLimiter	Sensor select

To determine the actual value for the internal load controller a sensor has to be connected to input X60 or X61 [ch. 3.3.20].
The sensor connected is defined in parameter `Sensor select`.

Setting	Function
`Pt100`(1	Pt100 sensor at terminal X60:1/2/4
`Pt1000`(1	Pt1000 sensor at terminal X60:3/4
`Ni1000`(1	Ni1000 sensor at terminal X60:3/4
`Pt100Pt1000`(1	Pt100 sensor at terminals X60:1/2/4 for temperature regulator function. Pt1000 sensor at terminals X60:3/4 for temperature monitor function.
`Pt100Ni1000`(1	Pt100 sensor at terminals X60:1/2/4 for temperature regulator function. Ni1000 sensor at terminals X60:3/4 for temperature monitor function.
`TempSensor`(2	Temperature sensor at input X61
`PressSensor`(2	Pressure sensor at input X61
`NoSensor`(2	No sensor connected to W-FM, e. g. external load setting without temperature monitor function.

(1 The internal temperature monitor function is activated.
(2 The internal temperature monitor function is deactivated.

6.12.4 Analogue inputs

Input X61

Param & Display	LoadController	Configuration	Ext Inp X61 U/I

If a sensor is connected to input X61, the input has to be matched to the sensor in parameter `Ext Inp X61 U/I` , see [ch. 3.3.20].
The voltage supply (20 V DC) on terminal X61:1 can not be changed.

Setting	Function
`4..20 mA`	Current signal with load monitoring
`0..20 mA`	Current signal without load monitoring
`2..10 V`	Voltage signal with load monitoring
`0..10 V`	Voltage signal without load monitoring

Input X62

Param & Display	LoadController	Configuration	Ext Inp X62 U/I
or			
Param & Display	SystemConfig	Ext Inp X62 U/I	

If an analogue setpoint or load signal is present at input X62, the input must be matched to the analogue signal in parameter `Ext Inp X62 U/I` see [ch. 3.3.17].

Setting	Function
`4..20 mA`	Current signal with load monitoring
`0..20 mA`	Current signal without load monitoring
`2..10 V`	Voltage signal with load monitoring
`0..10 V`	Voltage signal without load monitoring

6.12.5 Measuring range

Param & Display	LoadController	Configuration	MeasureRangePtNi[1] var.RangePtNi MRange TempSensor MRange PressSens

[1] Parameter MeasureRangePtNi can also be called up via Param & Display / System config. / Temp.Limiter.

The measuring range of the actual value sensor is specified in the parameters.

Temperature sensor (input X60)

The measuring range starts at 0 °C (32 °F) and can not be altered.

The values are available in parameter MeasureRangePtNi for the end of the measuring range:
- 150°C/302°F
- 400°C/752°F
- 850°C/1562°F (factory setting)

Parameter var.RangePtNi can be used to restrict the end of the measuring range as required. Prerequisite is that the value in parameter MeasureRangePtNi is set to 850°C/1562°F . The scaling of the resistance curve does not change.

Values approx. 10 % above the end of measuring range are interpreted as sensor short circuit.

Only required in conjunction with flue gas recirculation
If the sensor is used as FGR temperature sensor, parameter MeasureRangePtNi must be set to 850°C/1562°F and in parameter var.RangePtNi the maximum permissible FGR temperature must be set.

Sensor (input X61)

The measuring range starts at 0 °C (32 °F) or 0 bar (0 psi) and can not be altered. The end of the measuring range can be set in the relevant parameter.

- MRange TempSens: max 2000 °C (3632 °F)
- MRange PressSens: max 100 bar (1450 psi)

Values 10 % outside of the measuring range are interpreted as sensor short circuit or line break.

6.12.6 External setpoint

Param & Display	LoadController	Configuration	Ext MinSetpoint Ext MaxSetpoint

Parameters `Ext Min/MaxSetpoint` can be used to limit the external setpoint. Setpoints outside of the defined limits will not be included in the control by the internal load controller.

The limit applies only to operating mode:
- `IntLC Bus`
- `IntLC X62`

In operating mode `IntLC X62` , the analogue signal is switched at input X62 (`Ext Inp X62 U/I`), see [ch. 3.3.17]. The internal load controller converts the analogue setpoint signal in percentage to the measurement range [ch. 6.12.5] set for the actual value sensor and generates the setpoint for the load control.

Measurement range set `MeasureRangePtNi`	**Analogue signal** `Ext Inp X62 U/I`		**Setpoint load controller**
	Current	Voltage	
`0 … 150 °C`	0/4 mA	0/2 V	0 °C
	20 mA	10 V	150 °C
`0 … 400 °C`	0/4 mA	0/2 V	0 °C
	20 mA	10 V	400 °C
`0 … 850 °C`	0/4 mA	0/2 V	0 °C
	20 mA	10 V	850 °C
`0 … XX`(1 `°C/bar`	0/4 mA	0/2 V	0 °C
	20 mA	10 V	XX(1 °C/bar

(1 Limit value depends on the end of the measuring range [ch. 6.12.5] set in parameter:
- `var.meas.r. PtNi`
- `MRange TempSensor` or `MRange PressSens`

Example

Calculation `Ext MaxSetpoint`

Required upper setpoint limit:	80 °C
`MeasureRangePtNi` set:	150 °C
Analogue signal `Ext Inp X62 U/I`:	4 … 20 mA (analogue range 16 mA)
results in `Ext MaxSetpoint` =	80 °C / 150 °C ≈ 0.533 ≙ **53.3 %**
Corresponds to a setpoint signal:	16 mA x 0.533 + 4 mA_{Offset} ≈ 12.53 mA

6.12.7 Analogue output

Param & Display	LoadController	Configuration	Analog output
or			
Param & Display	SystemConfig	LC Analog Output	

The analogue output X63 is configured in menu `Analog Output`, see [ch. 3.4.10].

Stipulate output value (`OutValuSelection`)

Parameter `OutValuSelection` stipulates the value that is output as a current signal at output X63

Setting	Function
`Load`[1] `Load 0`	Load signal from internal load controller
`O2`	Residual oxygen content in flue gas

`Pos Air`
`Pos fuel`
`Pos Aux…`
	Position of the relevant actuator

`Speed VSD`	Setpoint speed
`Flame`	Flame Signal
`Temp Pt…` `Temp Ni1000`	Temperature sensor input X60
`Temp X61` `Press X61`	Temperature/ pressure sensor input X61

[1] Current range, output value and scaling are predefined and can not be changed [ch. 3.4.10].

Current range (`CurrMode 0/4mA 0/4mA`)

Parameter `CurrMode 0/4mA` defines the current range at output X63.

- `0..20mA`
- `4..20mA`

Output values

Defines the internal value (%, °C, bar or degree of angle) at which 20 mA flow at output X63.

Setting	Function
`Scale20mA prec`	Internal percentage value (0 ... 999.9 %) at 20 mA, valid for: ▪ `Load 0` ▪ `O2` ▪ `Speed VSD` ▪ `Flame`
`Scale20mA temp`	Temperature at input X60/X61 (0 ... 2000 °C) at 20 mA, valid for: ▪ `Temp Pt1000` / `Temp Ni1000` / `Temp Pt100` ▪ `Temp X61`
`Press X61`	Pressure sensor at input X61 (0 ... 99.9 bar) at 20 mA, valid for `Press X61`.
`Scale20mA angle`	Actuator position in degree of angle (0 ... 90°) at 20 mA, valid for: ▪ `Pos Air` ▪ `Pos fuel` ▪ `Pos Aux…`

Scaling (`Scale 0/4mA`)

Parameter `Scale 0/4mA` defines the internal value for the lower current limit. Depending on parameter `CurrMode 0/4mA` 4 mA or 0 mA flow at the value set. The relative value in percent refers to the output value set (`Scale20mA …` / `Press X61`).

6.12.8 Control parameters of internal load controller

Param & Display	LoadController	ControlParam	ContrlParamList	StandardParam P-Part (Xp) I-Part (Tn) D-Part (Tv)

To be able to use the internal load controller, it must be activated in parameter LC_OptgMode, see [ch. 6.12.2].

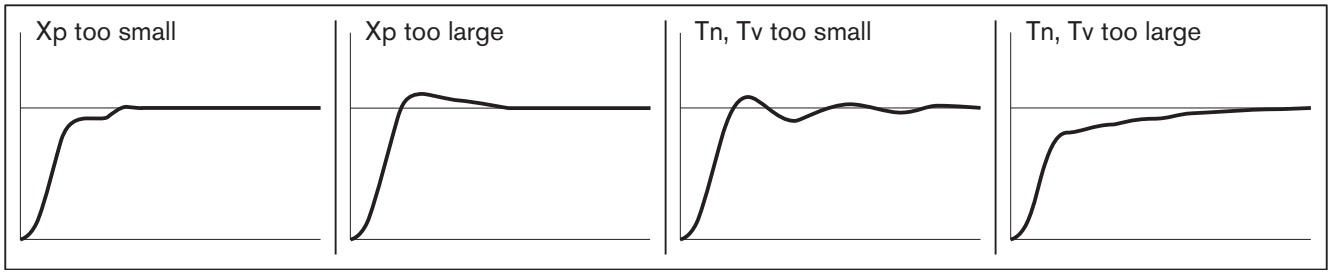
The control behaviour of the load controller is set in menu ControlParamList . Under StandardParam one of five standard parameter sets or the PID parameter set from the adaption can be selected.

Parameter set StandardParam	P-Part Xp [%]	I-Part Tn[s]	D-Part Tv [s]
Adaption	Values determined during adaption [ch. 6.12.15].		
very fast	42.5	68	12
fast	14.5	77	14
normal	6.4	136	24
slow	4.7	250	44
very slow	3.4	273	48

Adapting control parameters

The PID parameter can be altered manually.

Parameters	Function
P-Part (Xp)	Proportional part
I-Part (Tn)	Integral part (integral action time)
D-Part (Tv)	Differential part (derivative action time)



6.12.9 Control variable calming

Param & Display	LoadController	ControlParam	MinActuatorStep

In modulating operation, parameter `MinActuatorStep` determines the minimum correcting element step.
The minimum correcting element step is used as control variable calming. If the difference between the new control variable and the current control variable is less than `MinActuatorStep`, the current control variable is maintained. The actuators are less stressed due to the reduced drive impulses.
If the control variable calming is too great, the control becomes inaccurate or begins to oscillate.

6.12.10 Fault signal suppression

Param & Display	LoadController	ControlParam	SW_FilterTmeCon

Parameter `SW_FilterTmeCon` weakens actual value fault signals.

Actual value fault signals mainly affect the D part. If the filter time selected is too long it affects the actual value and negatively affects the control accuracy .
Set the filter time to 2 … 4 seconds for automatic adaption. If the time selected is too long the automatic adaption can be interrupt. On steam plants, increase the filter time after the adaption to 6 … 8 seconds.

6.12.11 Modulating switch differentials

Param & Display	LoadController	ControlParam	Sd_ModOn Sd_ModOff

Parameters for the On and Off switch points of the internal load controller for modulating operation.

Parameters	Function
Sd_ModOn	Switch-on point (controller ON)
Sd_ModOFF	Switch-off point (controller OFF)

The on and off switch points are given as a percentage value and relate to the current setpoint.

Example

On and off switch points at setpoint (W) = 70 °C	
Sd_ModOn:	–10 % (of 70 °C = –7 °C)
Sd_ModOff	+5 % (of 70 °C = 3.5 °C)
Controller ON	70 – 7 = 63 °C
Controller OFF	70 + 3.5 = 73.5 °C

With a positive switch differential Sd_ModOn the switch-on point is higher than the current setpoint.

6.12.12 Multi-stage switch differentials and switch thresholds

6.12.12.1 Multi-stage switch differentials

Param & Display	LoadController	ControlParam	Sd_Stage1On Sd_Stage1Off Sd_Stage2Off Sd_Stage3Off

Parameters for the On and Off switch points of the internal load controller for multi-stage operation.

Parameters	Function
Sd_Stage1On	Switch-on point (controller ON)
Sd_Stage1Off	Switch-off point stage 1 (controller OFF)
Sd_Stage2Off	Switch-off point stage 2
Sd_Stage3Off	Switch-off point stage 3

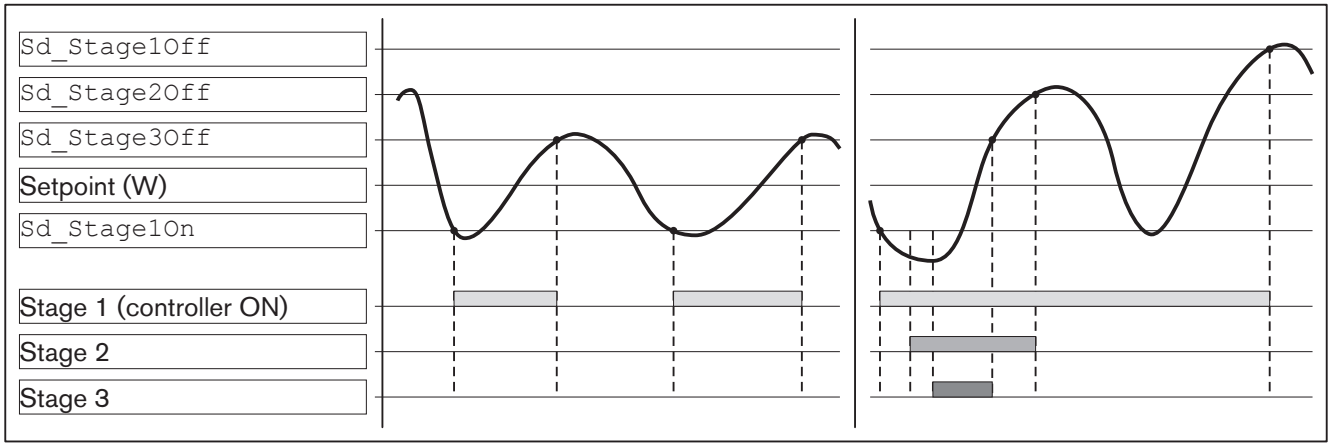
The on and off switch points are given as a percentage value and relate to the current setpoint.

Example

On and off switch points at setpoint (W) = 70 °C	
Sd_Stage1On =	−10 % (of 70 °C = −7 °C)
Sd_Stage1Off =	+5 % (of 70 °C = 3.5 °C)
Sd_Stage2Off =	+2 % (of 70 °C = 1.4 °C)
Sd_Stage3Off =	+1 % (of 70 °C = 0.7 °C)
Stage 1 (controller) ON	70 − 7 = 63 °C
Stage 1 (controller) OFF	70 + 3.5 = 73.5 °C
Stage 2 OFF	70 + 1.4 = 71.4 °C
Stage 3 OFF	70 + 0.7 = 70.7 °C

If stage 1 exceeds Sd_Stage3Off before stage 3 has switched, the controller switches off.

Threshold for stage 2 not achieved	**Threshold for stage 2 and 3 not achieved**
Stage 1 switches off at: Setpoint (W) + Sd_Stage3Off	Stage 1 switches off at: Setpoint (W) + Sd_Stage1Off

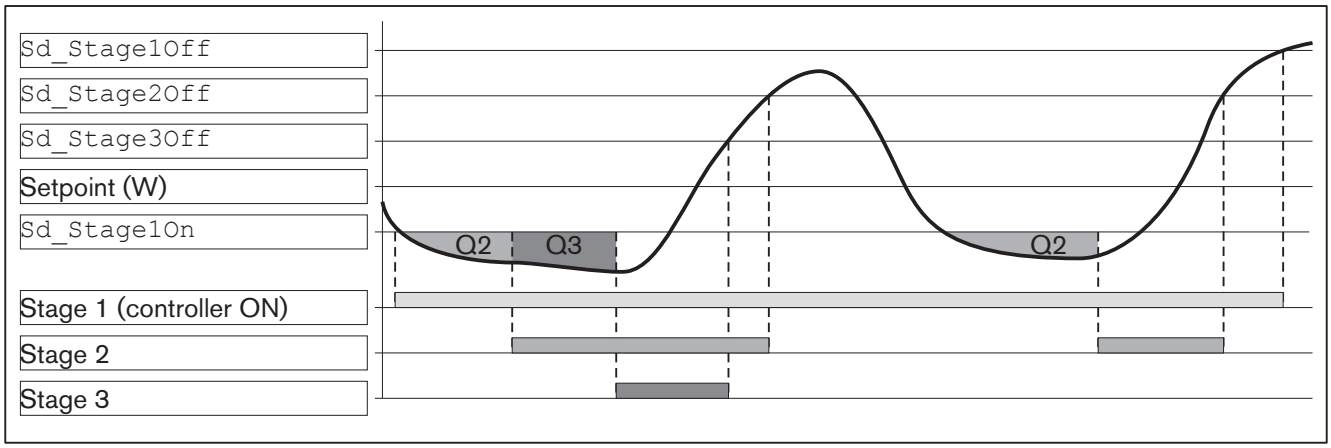


6.12.12.2 Multi-stage switch threshold

Param & Display	LoadController	ControlParam	ThreshStage2On ThreshStage3On

Parameter `ThreshStage…On` stipulates the switch threshold for stage 2 and stage 3. The switch threshold influences the switching of the stages.

If the actual value drops below `Sd_Stage1On` the W-FM forms the integral from control deviation x time. When the value reaches `ThreshStage2On` (Q2) stage 2 switches.
If the value reaches `ThreshStage3On` (Q3) before `Sd_Stage1On` is not achieved, stage 3 switches.



6.12.12.3 Low impact start

If a three stage burner is to be operated two stage with low impact start:

- Set parameter `Sd_Stage2Off` and `Sd_Stage1Off` to the same value. When `Sd_Stage2Off` is reached, the W-FM initiates a shutdown.
- Set parameter `ThreshStage2On` to 0.
  if the W-FM releases the load control, stage 2 switches immediately. Stage 3 only switches once the switch threshold (Q3) has been reached.

6.12.13 Temperature sensor

Param & Display	LoadController	ControlParam	TL_ThreshOff TL_SD_On
or			
Param & Display	SystemConfig	TempLimiter	TL_ThreshOff TL_SD_On

The temperature monitor is only activated in conjunction with the sensors Pt100, Pt1000 or Ni1000, see [ch. 6.12.3].

Parameter TL_ThreshOff stipulates the switch threshold for the temperature monitor.

Parameter TL_SD_On stipulates the switch-on hysteresis. The switch-on hysteresis is given as a percentage value and relates to the switch threshold for the temperature monitor.

Example

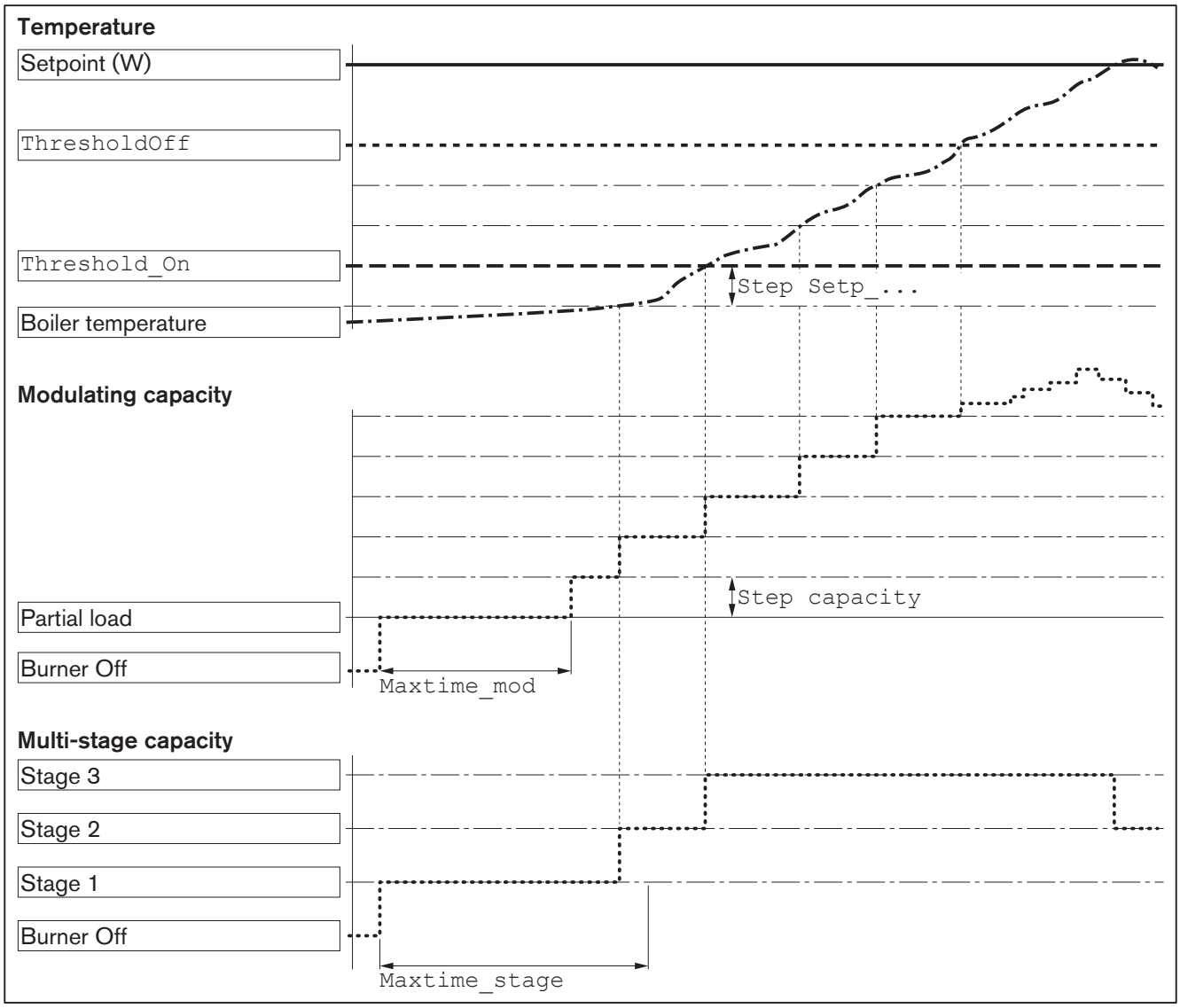
TL_ThreshOff = 80 °C	If the temperature exceeds the threshold, the W-FM initiates a shutdown and block the burner start.
TL_SD_On = –10 % 80 °C – (80 °C x 0.1) = 72 °C	If the temperature drops below the switch-on hysteresis, the W-FM removes the block.

6.12.14 Boiler cold start function

Param & Display	LoadController	ControlParam	ColdStart

The boiler cold start function reduces the thermal load of the boiler during burner start.

If the boiler cold start function is activated and if the boiler temperatures is below the switch-on threshold set for the boiler cold start function at burner start, the W-FM carries out a cold start sequence. The burner starts with the lowest burner capacity. The capacity is increased, either after the residence time set or when the boiler temperature exceeds the next setpoint step. When the boiler temperature reaches the switch-off threshold set, the W-FM stops the cold start sequence and the load control is activated.



Activate boiler cold start function (`ColdStartOn`)

Parameter `ColdStartOn` activates or deactivates the boiler cold start function.

Switch-on threshold (`ThresholdOn`)

Parameter `ThresholdOn` stipulates the switch-on threshold for the boiler cold start function.
If the boiler temperature is below the switch-on threshold at heat demand, the W-FM carries out the cold start sequence.

The switch-on threshold is given as a percent value and relates to the current setpoint W1 or W2. If an additional sensor is connected to input X60, the switch-on threshold relates to the setpoint set under `Setp AddSensor` .

Load stage (`StageLoad`)

Parameter `StageLoad` stipulates the stage for load increase in modulating operation.

When the boiler temperature reaches the next setpoint step `StageSetp_`..., the burner capacity increases by the percentage point set.
If the next setpoint step is not reached, the capacity increases after the residence time `Maxtme_`... set has elapsed.

Setpoint stage (`StageSetp_`...)

The parameters stipulate the step for the setpoint increase.

Parameters	Function
`StageSetp_Mod`	Setpoint step for modulating operation
`StageSetp_Stage`	Setpoint step for multi-stage operation

The setpoint step is given as a percentage value and relates to to current setpoint W1 or W2. If an additional sensor is connected to input X60, the switch-on threshold relates to the setpoint set under `Setp AddSensor` .
When the boiler temperature reaches the current cold start setpoint, the cold start setpoint increases by the step set.
In addition, the burner capacity in modulating operation increases by the load step, in multi-stage operation the next stage switches.

Residence time (`MaxTme_`...)

The residence time stipulates the minimum time after which the burner capacity is increased.
If the boiler temperature does not reach the current cold start setpoint after this time has elapsed, the burner capacity is increased and the time starts again. In modulating operation, the burner capacity increases by the load step set, in multi-stage operation the next stage switches.

Parameters	Function
`MaxTmeMod`	Minimum time for modulating operation after which the burner capacity is increased.
`MaxTmeStage`	Minimum time for multi-stage operation after which the next stage switches, provided that the stages have been released in parameter `Release Stages`.

Switch-off threshold (`ThresholdOff`)

Parameter `ThresholdOff` stipulates the switch-off threshold for the boiler cold start function.

The switch-off threshold is given as a percent value and relates to the current setpoint W1 or W2. If an additional sensor is connected to input X60, the switch-on threshold relates to the setpoint set under `Setp AddSensor` .
When the boiler temperature reaches the switch-off threshold set, the W-FM stops the cold start sequence and the load control is activated.

Additional sensor (`AdditionalSens`)

If a pressure sensor is connected to input X61, the cold start function requires an additional sensor at input X60 [ch. 3.3.20].

The additional sensor connected is defined in parameter `AdditionalSens` .
If the additional sensor has been defined, the setpoint set under `Setp AddSensor` is deemed as the reference value for the boiler cold start function.

Temperature at additional sensor (`Temp. ColdStart`)

Parameter `Temp. ColdStart` shows the current temperature at the additional sensor.

Setpoint for additional sensor (`Setp AddSensor`)

Parameter `Setp AddSensor` stipulates the setpoint for the boiler cold start function if an additional sensor is defined.

Release stages (`Release Stages`)

In parameter `Release Stages` , stage 2 and stage 3 can be blocked for boiler cold start function. The parameter is only effective in multi-stage operation.

Setting	Function
`No release`	Boiler cold start function is only carried out with stage 1. Stage 2 and stage 3 are blocked for the boiler cold start function. Parameters `MaxTmeStage` and `Stage-Setp_Stage` have no effect.
`Release`	The boiler cold start function starts in stage 1. The next stage switches, when the boiler temperature reaches the current cold start setpoint or the residence time is exceeded.

6.12.15 Adaption

Param & Display	LoadController	Adaption	StartAdaption AdaptionLoad

Start adaption

The load controller starts automatic adaption via parameter `StartAdaption`. During adaption, the load controller identifies the controlled system and generates the PID parameters from the data determined.

Adaption is only possible in modulating operation. It is possible to start in manual or automatic operation, independent of operating status (burner ON, OFF or Standby).
During adaption, the filter time `SW_FilterTmeCon` of fault signal suppression must be 2 … 4 seconds [ch. 6.12.10].
Automatic adaption passes through 4 phases.

Phase	Function
`Temp setback`	Reduces actual value to 5 % below setpoint.
`Stabilisation phase`	The course of the actual value is evaluated for 5 minutes. If severe fluctuations occur, the time increases to 10 minutes.
`Heating`	The course of the actual value during heat-up phase is determined.
`Adaption ok`	Adaption completed successfully, the PID parameters are calculated.

Adaption capacity

Parameter `AdaptionLoad` stipulates the burner capacity for automatic adaption.

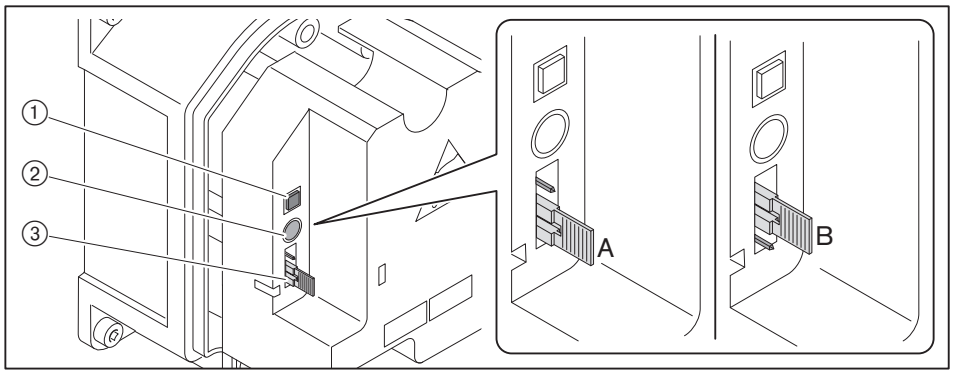
The adaption capacity should be chosen as large as possible. If the adaption in full load (100 %) is interrupted due to insufficient heat demand, the adaption capacity can be reduced by up to 40 %.
If the adaption capacity selected is insufficient, the setpoint temperature will not be reached and the adaption will be aborted.

6.13 Actuators

6.13.1 Addressing

Param & Display	Actuators	Addressing	

If only one actuator is replaced, the W-FM addresses the new actuator automatically.
If two or more actuators are replaced at the same time, each new actuator has to be addressed manually.



① Addressing key
② LED
③ Jumper
A without Bus termination
B with Bus termination

Bus termination

On the last actuator or at the O_2 module, the bus termination must be set via a jumper [ch. 5.1].

Addressing the actuator

- ► Remove actuator cover.
- ► In menu `Param & Display` / `Actuator` , select parameter `Addressing` and confirm with [Enter].
- ► Select the relevant actuator using the dial knob:
  - `1 AirActuator`: Air damper
  - `2 GasActuator (Oil)`: Gas butterfly valve
  - `3 OilActuator`: Oil quantity regulator
  - `4 AuxActuator`: Mixing head
  - `5 AuxActuator2`: Auxiliary actuator for special applications
  - `6 AuxActuator3`: Auxiliary actuator for special applications
- ► Confirm with [Enter].
- ✓ The text `Start address assignment with ENTER` appears.
- ► Start address assignment with [Enter].
- ✓ Text `Address assignment being carried out` changes to `Please press button on actuator` after approx. 5 seconds.
- ► Press addressing key on actuator.
- ✓ LED on actuator flashes continually.
- ✓ Text `Address assignment carried out successfully` appears.
- ✓ LED on actuator displays flashing codes.
- ► Exit address assignment using [esc]

Flashing codes

LED	Description
Continually ON	unaddressed actuator
Flashing continually	addressing being carried out
Flashing codes with pause	Actuator is addressed: ▪ 1 impulse: Air damper actuator ▪ 2 impulses: Gas butterfly valve actuator ▪ 3 impulses: Oil quantity regulator actuator ▪ 4 impulses: Mixing head actuator ▪ 5 impulses: Actuator Aux2 (W-FM 200 only) ▪ 6 impulses: Actuator Aux3

Delete addressing

► Press addressing key on actuator for 10 seconds.
✓ The LED on the actuator changes to continually ON.

6.13.2 Delete curves

Param & Display	Actuators	Rotational direction	DeleteCurves

Parameter `DeleteCurves` deletes the compound curves of all actuators, is required to change the rotation direction in the OEM level.

6.13.3 Position control

Param & Display	SystemConfig	Allowed Pot.diff	

Each actuator transmits two independent position signals to the W-FM. The W-FM compares the position signals to the setpoint position. The W-FM also compares the two position signals. Parameter `Allowed Pot.diff` stipulates the maximum permissible deviation between the position signals.

The W-FM initiates a lockout, if:
- an actuator does not reach the setpoint position,
- the position signals exceed the difference set under `Allowed Pot.diff` .

Recommended setting: `15` (equal to 1.5°)

6.14 VSD / Frequency converter

Only the W-FM 200 is equipped with a frequency converter module for variable speed control.

6.14.1 Frequency converter release contact

Param & Display	VSD module	Configuration	ReleasecontctVSD

The W-FM 200 is equipped with a release contact at output X73:1/2 for the frequency converter [ch. 3.4.11].
Parameter `ReleasecontctVSD` stipulates the switch condition for the idle position (0 %) in phase 10 (home run). The release contact closes from a setpoint speed greater than 0 %, regardless of the parameter setting.

Setting	Function
`closed`	The release contact closes at idle position (0 %) in phase 10 (home run), recommended setting.
`open`	The release contact opens at idle position (0 %) in phase 10 (home run), e. g. when using a DC brake.

6.14.2 Speed measurement

Param & Display	VSD module	Configuration	Speed	Num Puls perR

Parameter `Num Puls perR` stipulates the impulses per rotation at input X70 [ch. 3.3.21].

6.14.3 Speed standardisation

Param & Display	VSD module	Configuration	Speed	Standardisation StandardisedSp

Speed standardisation (`Standardisation`)

Parameter `Standardisation` starts the automatic speed standardisation, to do this set parameter to `activated` .

As a prerequisite for speed standardisation, the pre-purge position of the air influencing actuators must be set to 90° [ch. 6.9.4].
During the standardisation, the air influencing actuators drive to the pre-purge position and the W-FM issues a setpoint signal of 95 % (approx. 19.2 mA) to the frequency converter. The maximum frequency set at the frequency converter is therefore only achieved to 95% e. g. 52.5 Hz x 0.95 ≈ 50 Hz). The standardised speed is determined and saved in parameter `StandardisedSp` .
For the speed control, the standardised speed applies as 100 % value. If, during operation at 100% standardised speed is not reached, a reserve of 5% is available.

The burner requires re-commissioning after each standardisation.

Standardised speed (`StandardisedSp`)

In parameter `StandardisedSp` the speed saved during standardisation can be viewed and changed.

The burner requires re-commissioning after each change made to the standardised speed.

6.14.4 Actual speed

Param & Display	VSD module	Configuration	Speed	Absolute speed

or

Param & Display	VSD module	Process Data	Absolute speed	

`Absolute speed`Parameter `Absolute speed` indicates the current speed detected.

6.14.5 Setpoint output

Param & Display	VSD module	Configuration	Speed	Setpoint Output

Parameter `Setpoint Output` stipulates the current signal, which controls the frequency converter [ch. 3.4.11].
The current signal from the W-FM must be matched to the frequency converter.

Setting	Function
`4..20 mA`	Current signal with load monitoring (standard)
`0..20 mA`	Current signal without load monitoring

6.14.6 Speed deviation

Param & Display	VSD module	Process Data	

The process data can be found in the volatile memory and are reset during reset or power failure.

Parameters	Function
`Max Stat Dev`	Shows the maximum speed deviation when changing a control variable in modulating operation.
`Max Dyn Dev`	Shows the maximum speed deviation between actual speed and setpoint speed when accelerating.
`Num Dev >0.3%`	Number of speed deviations when changing a control variable with a difference greater than 0.3%.
`Num Dev >0.5%`	Number of speed deviations when changing a control variable with a difference greater than 0.5%.

6.15 Flue Gas Recirculation

Only the W-FM 200 type LMV52.4… is equipped with the flue gas recirculation (FGR) function.

Before the flue gas recirculation can be adjusted, burner commissioning with the FGR damper closed must be carried out.
On burners with separate combustion air fan, the air dampers (Aux2) in front of the FGR connection housing must also be slightly closed [ch. 6.15.1.2].

The FGR function is fuel specific and must be set separately for each fuel on dual fuel burners.

If the FGR function is only used for one fuel on dual fuel burners, the actuator position (Aux3) for the other fuel must be set to 0° (closed) in all load points and special positions.

6.15.1 FGR function

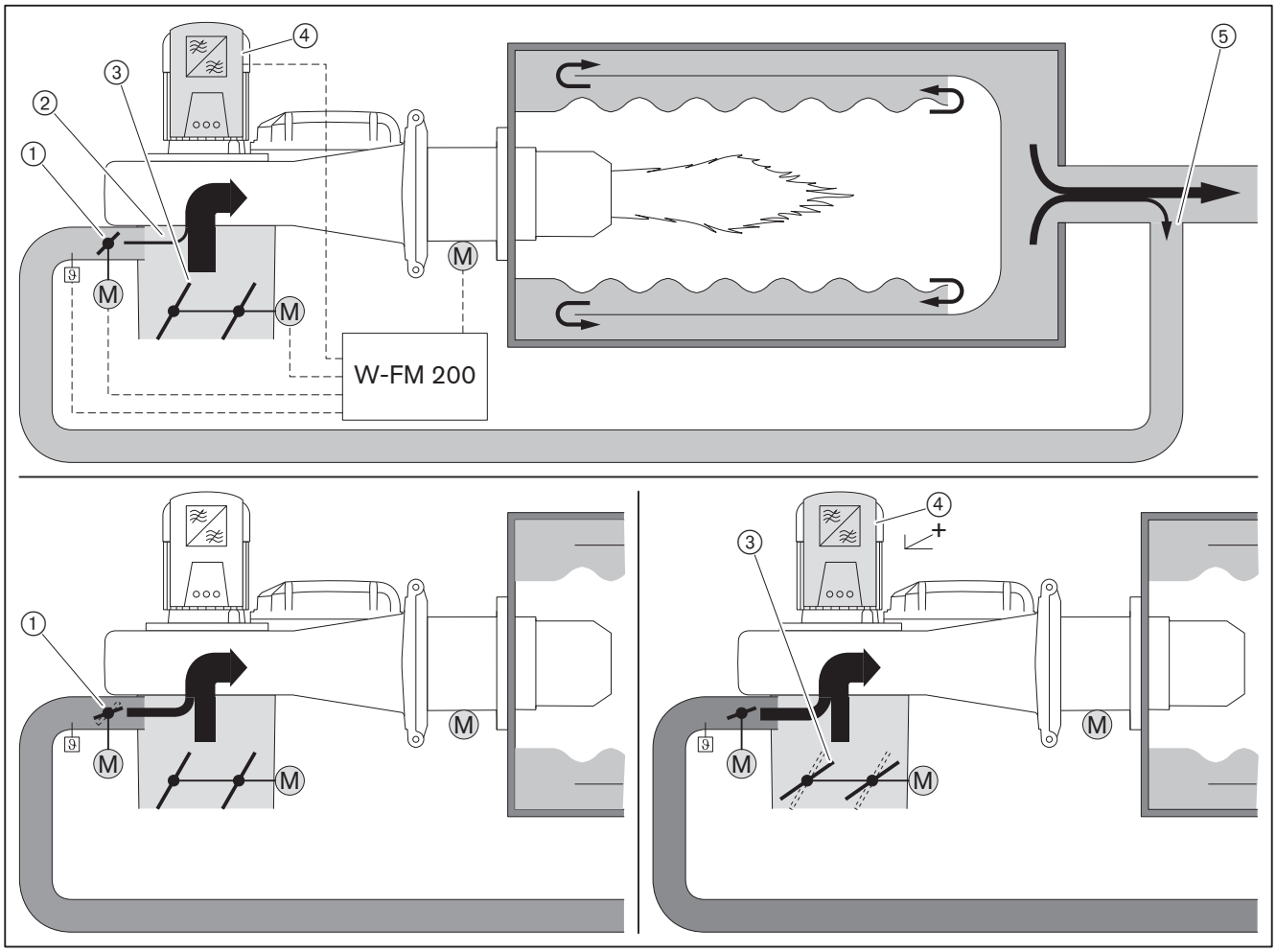
6.15.1.1 Fan on burner

Through a pipeline, the fan draws the flue gas from the flue gas pipe. A flue gas damper (FGR damper) ① in the pipeline meters the recirculated flue gas quantity. The FGR damper is driven load dependent, in compound by the actuator (Aux3).

The recirculated flue gas quantity dependents on the position of the FGR damper ①, the negative pressure in the air regulator② and the flue gas pressure at the extraction point ⑤. With sufficient negative pressure the FGR damper operates up to an opening angle of approx. 60° … 70°, above this the recirculated flue gas quantity increases marginally. If the recirculated flue gas quantity is insufficient to reach the NO_x content, the negative pressure in the air regulator has to be increased, to do this either:

- close air damper ③ further,
- increase speed ④.

The air quantity required for combustion must not be changed, to achieve this alternately change the actuator position and speed.



Example

Actuator	Change	Reaction
FGR damper	OPEN	more recirculated flue gas (+)
Air damper	CLOSED	decreased combustion air (–) increased negative pressure (+) more recirculated flue gas (+)
Speed	Increase	increased combustion air (+) increased negative pressure (+) more recirculated flue gas (+)

The position of the mixing head has little influence on the amount of recirculated flue gas.

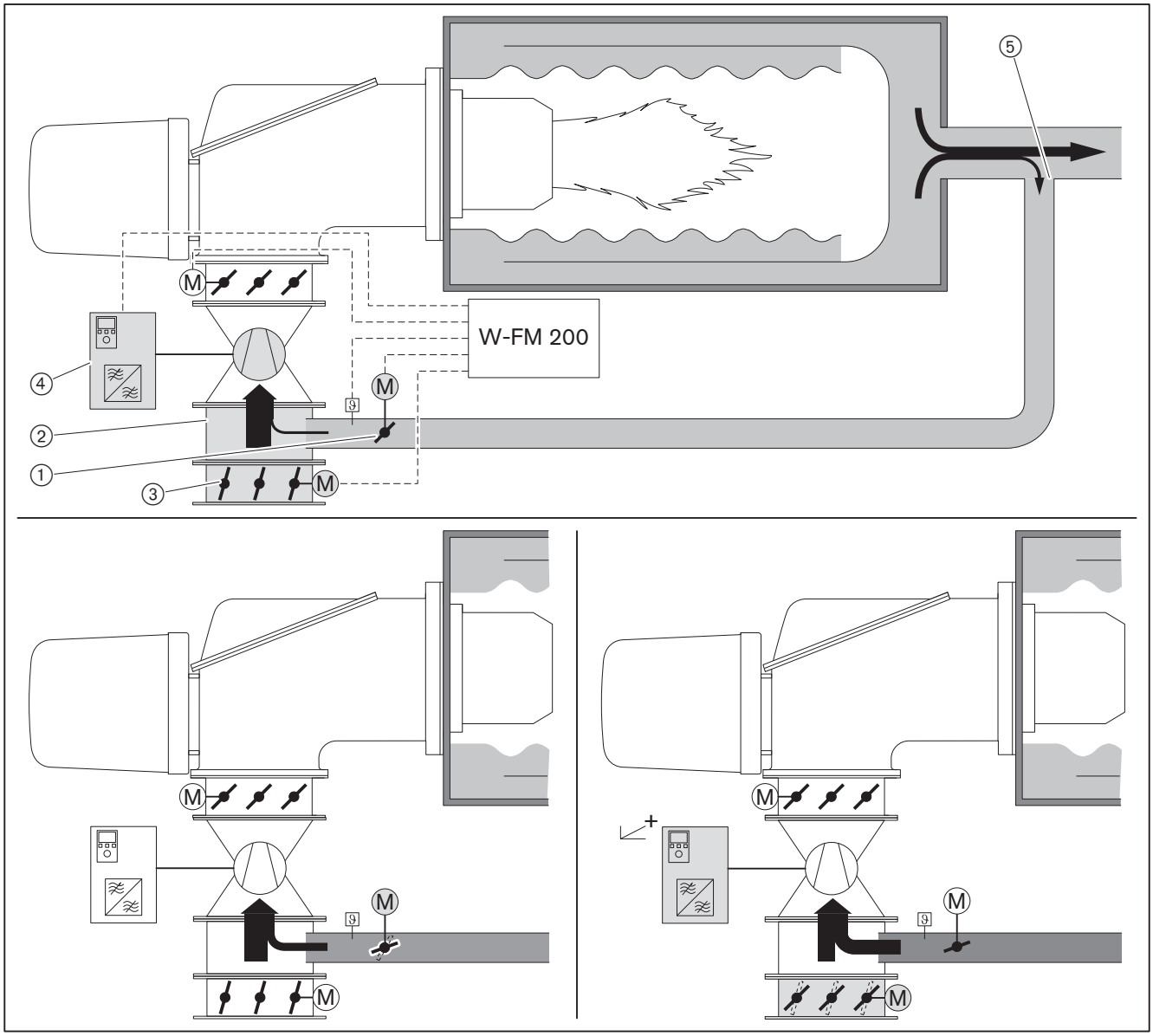
6.15.1.2 Separate fan

Through a pipeline, the fan draws the flue gas from the flue gas pipe. A flue gas damper (FGR damper) ① in the pipeline meters the recirculated flue gas quantity. The FGR damper is driven load dependent, in compound by the actuator (Aux3).

The recirculated flue gas quantity dependents on the position of the FGR damper ①, the negative pressure in the FGR suction chamber ② and the flue gas pressure at the extraction point ⑤. With sufficient negative pressure the FGR damper operates up to an opening angle of approx. 60°, above this the recirculated flue gas quantity increases marginally. If the recirculated flue gas quantity is insufficient to reach the NO_x content, the negative pressure in the FGR suction chamber has to be increased, to do this either:

- close air regulator (Aux2) ③ in front of the FGR suction chamber further,
- increase speed ④.

The air quantity required for combustion must not be changed, to achieve this alternately change the actuator position and speed.



Example

Actuator	Change	Reaction
FGR damper	OPEN	more recirculated flue gas (+)
Air regulator in front of FGR suction chamber	CLOSED	decreased combustion air (–) increased negative pressure (+) more recirculated flue gas (+)
Speed	Increase	increased combustion air (+) increased negative pressure (+) more recirculated flue gas (+)

The setting of the air damper (Air) on the burner and the position of the mixing head (Aux1) have little influence on the amount of recirculated flue gas.

Initial commissioning without FGR

To ensure sufficient negative pressure for flue gas recirculation, slightly close the air dampers in front of the FGR connector housing at each load point during the initial commissioning without FGR.

Once the combustion limit is determined and the excess air is set:

- ► Close air dampers in front of FGR connector housing (Aux2) until the O_2 content reduces by approx. 0.4 % points.
- ► Increase the O_2 content again to the previous value using the air influencing actuators, whilst observing the flame stability.

6.15.2 FGR Mode

Param & Display	Flue Gas Recirculation	FGR-Mode	

Parameter FGR-Mode stipulates how and when the actuator Aux3 is controlled during flue gas recirculation.

Setting	Function
Aux3onCurve	Actuator Aux3 drives on its programmed compound curve. Not recommended for FGR function. If there is no flue gas recirculation installed, select this setting if the actuator is to be used for another function.
Time	Actuator Aux3 initially remains in ignition position in phase 60 (operating position 1). Only once the residence time set under DelaytimeFGR... has elapsed will the actuator drive on the compound curve [ch. 6.15.5].
Temperature	Actuator Aux3 initially remains in ignition position in phase 60 (operating position 1). Once the FGR temperature sensor reaches the temperature set under ThresholdFGR... will the actuator drive on the compound curve [ch. 6.15.5]. Only for plant with FGR temperature sensor in the flue gas pipe.
Temp.comp.	Temperature compensated FGR function. Only with W-FM type LMV 52.4xx. During FGR commissioning the W-FM captures and saves the temperature at the temperature sensor at each load point. If, during operation, the FGR temperature differs from the saved temperature, the W-FM recalculates the position for actuator Auxs3. Deviating from the compound curve, the actuator drives to the calculated position and compensates the temperature deviation. How much the temperature deviation affects the actuator position can be set in parameter FactorFGR... . The FGR minimum position is always maintained [ch. 6.15.8]. In parameter DelaytimeFGR... the residence time for phase 60 (operating position 1) can be set [ch. 6.15.5]. If a sensor fault occurs, the combustion manager initiates a controlled shutdown.
TCautoDeact	Temperature compensated FGR function and automatic deactivation. Only with W-FM type LMV 52.4xx. Function as with Temp.comp., except for reaction in the event of a sensor fault. If a sensor fault occurs, the W-FM deactivates the the FGR function and the display shows a warning. Actuator Aux3 then drives to FGR minimum position [ch. 6.15.8].
deactMinpos	After ignition position, actuator Aux3 drives to FGR minimum position [ch. 6.15.8]. The temperature at the FGR temperature sensors is not recorded, the display shows xxxx. Operating mode for commissioning without FGR function, set FGR minimum position to 0° .
auto deact	Do not select this operating mode. Parameter auto deact is automatically activated when a fault occurs in operating mode TCautoDeact . Actuator Aux3 drives to FGR minimum position and a warning appears in the display.

6.15.3 Define temperature sensor

Param & Display	Flue Gas Recirculation	FGR-sensor	

The FGR sensor connected is defined in parameter `FGR-sensor` .

The FGR temperature sensor is connected to input X60 as standard [ch. 3.3.20]. For temperature compensated operation, the FGR temperature sensor should be positioned as close as possible to the FGR damper.

Parameters	Function
`X86PtNi1000`	The temperature sensor connected to the O_2 module is also used for the FGR function [ch. 3.3.23]. Not suitable for temperature compensated operation.
`X60 Pt1000`	Pt1000 sensor at terminal X60:3/4
`X60 Ni1000`	Ni1000 sensor at terminal X60:3/4 The corresponding sensor must not be defined in the menu `Sensor Select` of the load controller [ch. 6.12.3].

6.15.4 FGR sensor temperature

Param & Display	Flue Gas Recirculation	actTmpFGR-sensor	

Parameter `actTmpFGR-sensor` shows the current temperature at the FGR temperature sensor.

6.15.5 FGR release

Param & Display	Flue Gas Recirculation	ThresholdFGR… DelaytimeFGR…	

The parameters stipulate when the FGR function is released.
After entering phase 60 (operating position 1) actuator Aux3 initially remains in ignition position. if the release criteria is met, Aux3 drives on the compound curve.
Depending on the FGR operating mode set, release is either effective via the time or the temperature at the FGR sensor.
The release can be set separately for each fuel.

Parameters	Function
`ThresholdFGR Gas` `ThresholdFGR Oil`	When the FGR sensor reaches the temperature set, the W-FM releases the FGR function. For this, the FGR sensor must be placed in the flue gas pipe or the FGR damper must be slightly open in ignition position. Only for operating mode `Temperature`.
`DelaytimeFGR Gas` `DelaytimeFGR Oil`	The W-FM releases the FGR function in phase 60 once the time set has elapsed. The time depends on the the warm-up phase of the plant. Criteria for this is a constant flue gas temperature at a consistent capacity. For operating mode: ▪ `Time` ▪ `Temp.comp.` ▪ `TCautoDeact` recommended setting: 60 seconds

6.15.6 Temperature compensation

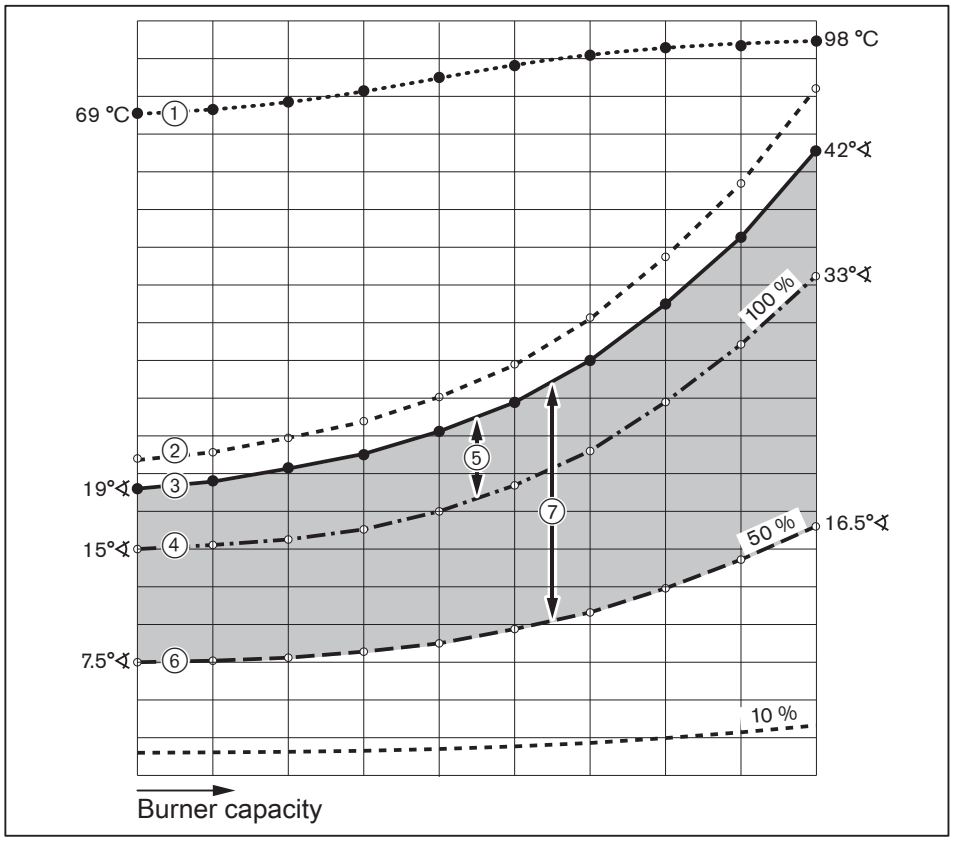
Param & Display	Flue Gas Recirculation	FGR Factor Gas FGR Factor Oil	

The parameter is only effective in operating modes:
- TCautoDeact
- Temp.comp.

When adjusting the flue gas recirculation, the required recirculation quantity is set at each load point via the flue gas damper (FGR damper). For the temperature compensation the combustion manager determines the FGR temperature at the FGR sensor for each setting of the FGR damper and saves this as the setpoint value. At the same time the combustion manager calculates a zero curve for the air damper based on a fictitious flue gas temperature of 0 °C.
If the FGR temperature deviates form the saved value during operation, the W-FM recalculates the position for the FGR damper.

If the FGR temperature exceeds the value saved, the FGR damper opens further. The opening angle is stipulated by parameter FGR MaxPos Fact , see [ch. 6.15.8].

If the FGR temperature drops below the value saved, the FGR damper closes further. Depending on the FGR temperature, the FGR damper drives to a position in the setting range between the compound curve and the zero curve and reduces the recirculated flue gas volume. The position of the zero curve and thus the setting range can be altered using the FGR Factor… .
The smaller the FGR Factor…, the greater the setting range and the smaller the opening angle.
With a factor of 100 % the zero curve remains unchanged.
A factor of 50% halves the opening angle of the zero curve.



① Setpoint temperature at FGR sensor
② Maximum FGR position `FGR MaxPos Fact` [ch. 6.15.8]
③ Flue gas damper (FGR damper) compound curve
④/⑤ Zero curve / setting range with factor 100 %
⑥/⑦ Zero curve / setting range with factor 50 %

Example

Flue gas damper (FGR damper) setting in full load

	Temperature deviation at FGR sensor			
	+30 °C	**0 °C**	**-15°C**	**-30° C**
Zero curve 100 %	45°∢	42°∢	38°∢	33°∢
Zero curve 50 %	45°∢	42°∢	29°∢	16.5°∢

6.15.7 Operating temperature

Param & Display	Flue Gas Recircula-tion	OperationTempGas OperationTempOil	

Parameter `OperationTemp …` shows the temperatures that were saved during temperature compensated commissioning.
The temperature can be displayed at each load point. Invalid values or non-configured operating points are displayed with `XXXX` .

6.15.8 Position limit FGR damper

The position limit restricts the setting of the flue gas damper up and down.

The Position limit is only effective in the temperature compensated operating modes:
- `Temp.comp.`
- `TCautoDeact`

FGR minimum position

Param & Display	Flue Gas Recircula-tion	FGR MinPos	

Parameter `FGR MinPos` limits the closing angle and ensures a minimum flow. The minimum position is an absolute value (degree of angle) and applies to the whole load range.

The FGR damper drives to minimum position if:
- the W-FM calculates a smaller closing angles for the temperature compensation then is defined in `FGR MinPos` ,
- the operating mode `deactMinpos` or `auto deact` is activated.

Recommended setting: 0°

FGR maximum position

Param & Display	Flue Gas Recircula-tion	FGR MaxPos Fact	

During temperature compensation, parameter `FGR MaxPos Fact` limits the opening angle upwards [ch. 6.15.6].
The maximum position is set in percent and relates to the current position of the compound curve (Aux3).

Maximum permissible setting: 10 %

6.16 Data backup

6.16.1 Backup copy

Updating	Param backup	BackupInfo LMV5x -> AZL AZL -> LMV5x	

Information for backup

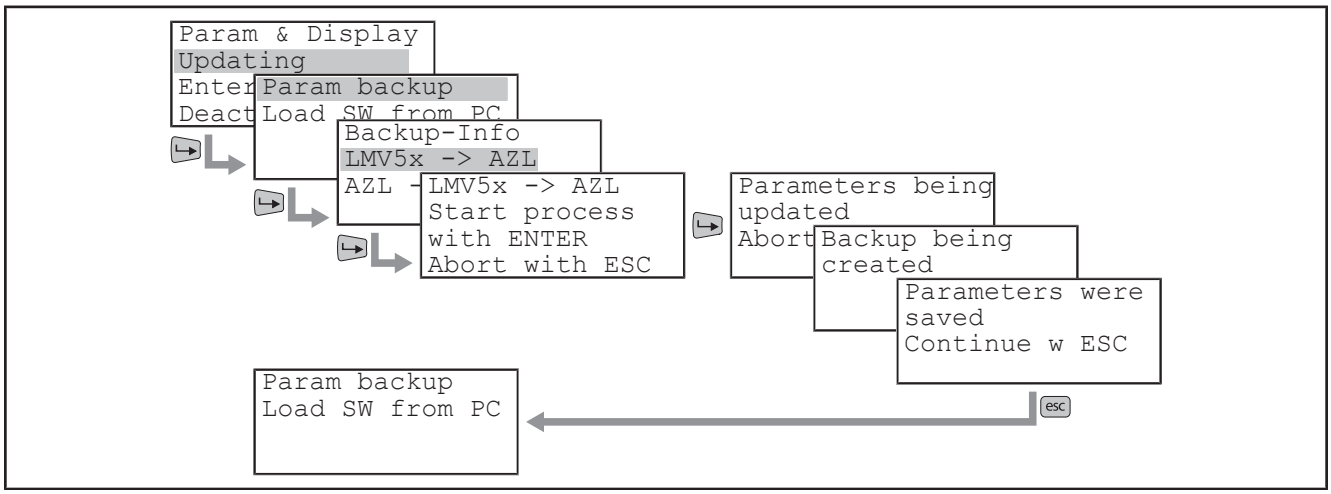
Menu `BackupInfo` displays the date, time and the contents of the last data backup.

Parameters	Function
`Date`	Date of the last backup copy.
`TimeOfDay`	Time of the last backup copy.
`BU included?`	Indicates whether the information from the W-FM has been transferred without errors.
`AZL included?`	Indicates whether a display and operating unit was connected during the last backup.
`ACT… included?`	Shows the actuators connected during the last data back-up.
`VSD included?`	Indicates whether a frequency converter module was saved in the backup copy.
`O2 included?`	Indicates whether an O_2 module was saved in the backup copy.

Creating a backup copy

Parameter `LMV5x -> AZL` creates a backup copy of the W-FM in the display and operating unit (ABE)
The existing data is overwritten.
The data from the W-FM can be backed up to any ABE.

- ▶ Select parameter `LMV5x -> AZL` and confirm with [ENTER].
- ▶ Start process with [Enter].
- ▶ Exit level using the [esc] key.

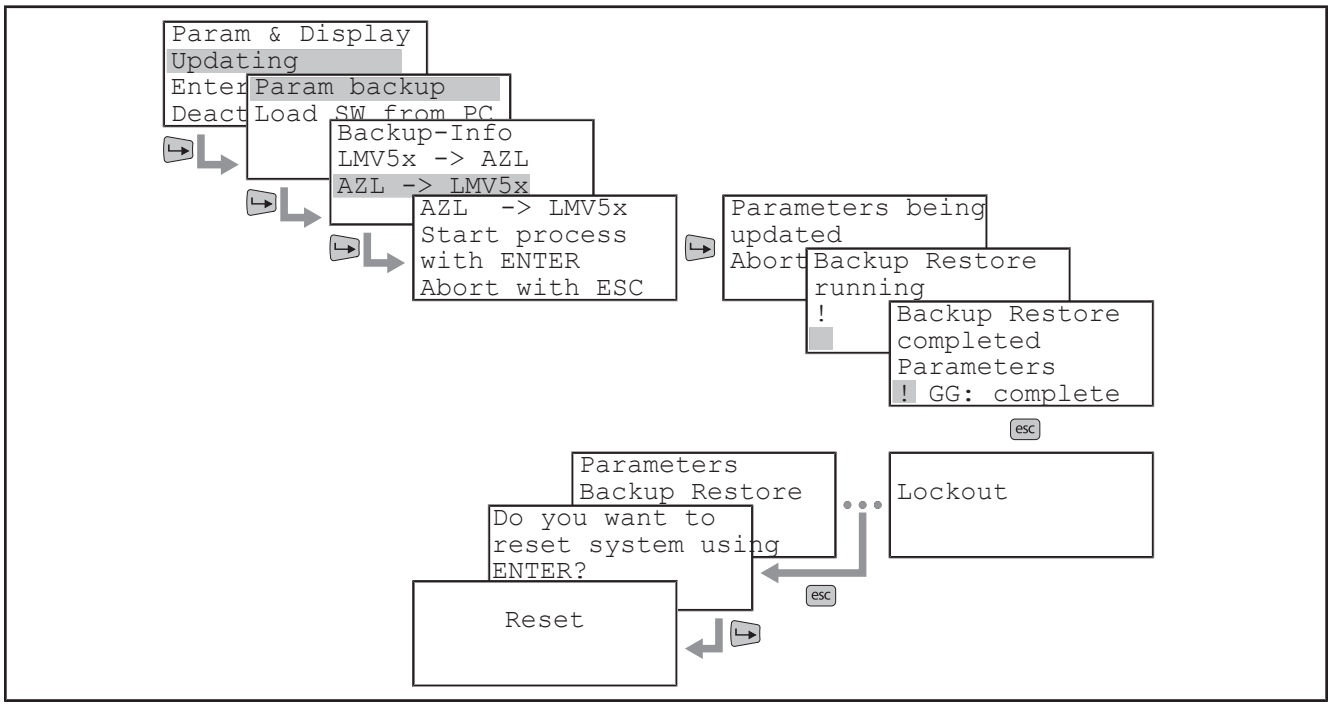


Load backup copy to W-FM

Parameter `AZL -> LMV5x` transfers the data of the display and operating unit (ABE) to the W-FM.
The existing data is overwritten.

The data can only be transferred to the W-FM if either:
- the burner identification is identical in the W-FM and in the backup copy (backup) [ch. 6.4.10],
- the W-FM does not contain a burner identification.

► Select parameter `AZL -> LMV5x` and confirm with [Enter].
► Start process with [Enter].
► Exit level using the [esc] key.
✓ The W-FM goes to lockout and displays the reason for the lockout.
► Exit display using the [esc] key.
► Reset burner using the [ENTER] key.



6.16.2 Updating software

Updating	Load_SW_from_PC		

Parameter`Load_SW_from_PC` updates the software of the display and operating unit (ABE). To do this, a PC with ASC450 Software must be connected at interface COM 1, see [ch. 6.6.1].
The current file is available from Weishaupt.

6.17 TÜV Test

6.17.1 Loss of flame

TÜV Test	LossFlameTest		

Parameter LossFlameTest interrupts the flame signal and it is possible to check if the W-FM initiates a lockout.

6.17.2 Safety temperature limiter

TÜV Test	SLT Test SLT-Testload Mod SLT-Testload Stg		

These parameters can be used to check if the safety temperature limiter (STL) responds.

Parameter SLT Test generates a heat demand, deactivates the internal temperature monitor and the burner drives to the load or stage set under SLT-Testload….

7 Commissioning

7.1 Prerequisite

Commissioning must only be carried out by qualified personnel.

Only correctly carried out commissioning ensures the operational safety.

Observe the prerequisites for commissioning in the installation and operating manual of the burner. This manual contains detailed information about:

- general installation regulations,
- nozzle selection,
- connecting measuring devices,
- replacing filter inserts,
- checking the gas connection pressure,
- carrying out soundness test,
- venting the gas valve train,
- setting the gas pressure regulator,
- pre-setting the pressure switch.

7.1.1 Adapting the motor to the frequency converter

Frequency converter fitted to burner

If the frequency converter is fitted to the burner motor, the parameters have been matched to the motor and motor adaption is therefore not required.

Separate frequency converter

On burners with separate frequency converter, the automatic motor adaptation must be carried out on the frequency converter. For this, the motor parameters in the frequency converter must match the specifications on the nameplate of the motor. Procedure for automatic motor adaptation see product manual for frequency converter.

Separate frequency converter, which have been supplied with the burner, contain a default parameter set a are supplied with a parameter list (MCT 10 Set-up Software …). Automatic motor adaptation also has to be carried out in this instance.

7.2 Adjusting the burner

In addition to this chapter, the information about adjustment in installation and operating manual of the burner should be observed. This manual contains detailed information about:

- speeds (in in conjunction with frequency converter),
- pump pressure,
- flow and return pressure,
- default settings,
- mixing pressure.

7.2.1 Preparatory measures

In addition to this chapter, the information about adjustment in installation and operating manual of the burner should be observed.

Prerequisite

- ► Remove mixing head drive rod (only on burners with adjustable mixing head).
- ► Set fuel selection switch to Gas (only on dual fuel burners with heavy oil).
- ► Switch on voltage supply.

1. Switch off burner

The ABE is in `OperationalStat` in the sub menu `NormalOperation` and displays current values.

- ► Exit level using the [esc] key.
- ► Select `ManualOperation`.
- ► Select `Autom/Manual/Off`.
- ► Set `Burner Off`.
- ✓ The burner switches off.
- ► Exit level using the [esc] key.

2. Enter password

- ► Select `Param & Display`.
- ► Select `Access with HE` (password for heating engineer).
- ► Enter HE password using dial knob and confirm with [ENTER] [ch. 6.2.1].

3. Check drive rod of mixing head

Only on burners with adjustable mixing head.

- ► Isolate fan motor from voltage supply.
- ✓ Prevents fan starting during this step.
- ► Select `RatioControl`.
- ► Select `GasSettings` or `OilSettings`.
- ► Select `SpecialPositions`.
- ► Select `HomePos`.
- ► select `HomePosAux1` and set `0.0°`.
- ► Refit drive rod and check stop (play 1 … 2 mm).
- ► Remove drive rod again.
- ► Select `HomePosAux1` and set `90.0°`.
- ► Refit drive rod and check stop (play minimum 1 mm).
- ► Return `HomePosAux1` to `0.0°` setting.
- ► Reconnect voltage supply to motor.
- ► Exit level using the [esc] key.

4. Select fuel

Dual fuel burners only.

Fuel can be selected via:
- external fuel selection switch,
- the display and operating unit (ABE),
- building management system (BMS).

The fuel selector switch has priority over fuel selection via the display and operating unit (ABE) or building management system (BMS).

Select fuel via ABE:
- ► Select `Operation`.
- ► Select `Fuel`.
- ► Select `FuelSelect`.
- ► Select `Fuel` using the dial knob and confirm with [ENTER].
- ► Exit level using the [esc] key.

7.2.1.1 Carry out speed standardisation

Only on burners which are equipped with separate frequency converter [ch. 6.14.3].
On dual fuel burner, standardisation should only be carried out during the commissioning of the first fuel. The burner requires re-commissioning after each standardisation.

Skip this step on burners without frequency converter.

- ► Select `Param & Display`.
- ► Select `VSD module`.
- ► Select `Configuration`.
- ► Select `Speed`.
- ► Select `Standardisation`.
- ► Select `activated` using the dial knob and confirm with [ENTER].
- ► Exit level using the [esc] key.

7.2.1.2 O2 module presetting

Only for burners which are equipped with an O_2 module.
Skip these steps on burners without O_2 module.

1. Check configuration of O_2 module

- ► Select `Param & Display`.
- ► Select `O2 Module`.
- ► Select `Configuration`.
- ► Check and if necessary set the following parameters.
  - `O2 Sensor`: Sensor used [ch. 6.10.7].
  - `SupAirTempSens`: Pt1000 or Ni1000, if connected [ch. 3.3.24],
  - `FlueGasTempSens`: Pt1000 or Ni1000, if connected [ch. 3.3.23],
  - `MaxTempFlGas...`: Pre-setting 400 °C [ch. 6.10.10].
- ► Exit `Configuration` level using [esc].

2. Check O_2 sensor temperature

Monitor sensor temperature regularly during heat up phase.

- ► Select `Process Data`.
- ► Select parameter `QGO SensorTemp` and check sensor temperature [ch. 6.10.20].
- ✓ Operating temperature: 700 ± 15 °C.
- ► Exit level `O2 Module` , press [esc] twice.

3. Deactivating O_2 trim

Deactivate the O_2 trim prior to commissioning the compound curves. Deactivate the O_2 trim for both fuels (oil and gas) [ch. 6.10.1].

- ► Select `O2Control/Alarm` .
- ► Select `GasSettings` or `OilSettings`.
- ► Select `OptgMode`.
- ► Select `man deact` using dial knob and confirm with [Enter].
- ► Exit level `OptgMode` using [esc].

4. Define fuel type

Define the fuel type for both fuels (gas and oil) on dual fuel burners [ch. 6.10.6].

- ► Select `GasSettings` or `OilSettings`.
- ► Select `Type of fuel`.
- ► Select Fuel using the dial knob and confirm with [ENTER].
- ► Exit level `O2Control/Alarm` , press [esc] three times.

7.2.1.3 Deactivate flue gas recirculation

Only in conjunction with flue gas recirculation.
Skip this step on burners without flue gas recirculation.

Deactivate flue gas recirculation prior to commissioning the compound curves [ch. 6.15.2].

- ▶ Select `Param & Display`.
- ▶ Select `Flue Gas Recirc.`.
- ▶ Select `FGR-Mode`.
- ▶ Select `deactMinpos` using dial knob and confirm with [ENTER].
- ▶ Exit level `FGR-Mode`using [esc].
- ▶ Select `FGR MinPos`.
- ▶ Set `0°` using dial knob and confirm with [ENTER].
- ▶ Exit level `Flue Gas Recirc.` , press [esc] three time.

7.2.2 Adjusting gas side

Prerequisite

- ▶ Open gas isolating valve.
- ✓ Pressure in gas valve train increases.
- ▶ Close isolating valve.

1. Check load limits

- ▶ Select `RatioControl`.
- ▶ Select `GasSettings`.
- ▶ Select `LoadLimits`.
- ▶ Select `MinLoadGas` and set `0.0%`.
- ▶ Select `MaxLoadGas` and set `100%`.
- ▶ Use [esc] key to return to the display `LoadLimits`.

2. Check ignition position

- ▶ Select `Special positions`.
- ▶ Select `IgnitionPos`.
- ▶ Select `IgnitionPosGas` (gas butterfly valve setting in ignition position).
- ▶ Check `IgnPosGas` , pre-setting values see installation and operating manual of burner.

Only in conjunction with adjustable mixing head:

- ▶ Select `IgnitionPosAux1` (auxiliary motor setting in ignition position).
- ▶ Check `IgnitionPosAux1`:
  - Standard: 0.0°
  - 3LN (WK, WKmono): 18.0°
  - 3LN (WM burners): 0.0°
  - 4LN: 0.0°

Only in conjunction with frequency converter:

- ▶ Select `IgnPosFC` (speed in ignition position).
- ▶ Check `IgnitionPosVSD` (70 %).
- ▶ Use [esc] key to return to the display `IgnitionPos`.

3. Check mixing pressure in ignition position

- ► Select `ProgramStop`.
- ► Select `36 IgnPos`.
- ► Use [esc] key to return to the display with `GasSettings`.
- ► Select `Autom/Manual/Off`.
- ► Select `Manual` (Burner On).
- ✓ The burner starts and stops in ignition position without flame formation
- ► Check rotation direction of fan wheel.
- ► Check mixing pressure in ignition position, see installation and operating manual of burner.
  - Standard: 1.0 … 2.0 mbar above combustion chamber pressure
  - 3LN (multiflam): 1.5 … 2 mbar above combustion chamber pressure
- ► If necessary, adjust mixing pressure via air damper setting:
  - Select `GasSettings`.
  - Select `SpecialPositions`.
  - Select `IgnitionPos`.
  - Select `IgnitionPosGas` and adjust.
- ► Use [esc] key to return to the display `IgnitionPos`.

4. Check gas valves

- ► Set new program stop:
  - without ignition gas: `44 Interv 1`
  - with ignition gas: `52 Interv 2`
- ► Ensure that the valves open and close correctly.
- ✓ The burner attempts to ignite.
- ✓ The low gas pressure switch reacts.

5. Ignition

- ► Open gas isolating valve.
- ✓ The burner restarts the sequence of operation.
- ✓ The burner ignites and the actuators stop in the ignition position.
- ► Preset setting pressure on pressure regulator taking the expected combustion chamber pressure into consideration.
- ► Determine combustion values at ignition position.
- ► Set O_2 content of approx. 4 … 5 % via gas butterfly valve setting (`IgnPosGas`).

6. Adjusting low gas pressure switch

DANGER

Risk of explosion due to falling gas supply pressure
Flame failure can lead to explosion.
- ► Set low gas pressure switch to 70 % of the setting pressure.

7. Set intermediate load points

- ► Set `ProgramStop` to `deactivated`.
- ► Use [esc] key to return to the display `SpecialPositions`.
- ► Select `CurveParams`.
- ► Press [ENTER].
- ✓ Point 1 is displayed.
- ► Check combustion values

Only in conjunction with O_2 trim
To ensure O_2 trim is possible across the entire load range, point 1 must be approx. 50 % below partial load (point 2).
Excess air in all load points must be 20 … 25 %.

- Press [ENTER] key.
- Select `Change point?`.
- Select `Actuator positions with start`.
- Call up and change values with dial knob and [ENTER].

Only in conjunction with frequency converter

- ► Reduce speed (`VSD`) step by step, whilst observing the combustion values and adjust via air damper setting (`Air`). Minimum speed (see table) must be maintained.

Burner version	Minimum speed
NR	40 %
LN, 1LN, 1SF, 3LN, 4LN	50 %

- ► Exit point 1 using [esc] key and save with [ENTER] key.
- ► Press [esc] key.
- ✓ The menu displays `Point`, `Manual` and the current actuator positions.
  - In menu `Point` all load points can be adjusted.
  - In menu point `Manual` the current burner capacity can be adjusted manually.
- ► Select `Manual` and confirm with [ENTER].
- ► Increase burner rating using dial knob whilst observing combustion values (excess air) and flame stability.
- ► Set load point using [ENTER] key if either:
  - the O_2 content in the flue gas increases to above 7 %,
  - the CO content increases,
  - the flame reaches the limit of stability.

The new load point is displayed in menu `Point` and can be adjusted.

- ► Correct combustion values via gas butterfly valve position (`Fuel`).
- ► Exit setting using [esc] and save with [ENTER].
- ► Exit load point using [esc].
- ► Repeat steps until full load (`Load: 100`) has been reached.

8. Adjust full load

When adjusting, the ratings data given by the boiler manufacturer and the capacity graph of the burner should be observed.

Only in conjunction with frequency converter
Select speed at full load as low as possible, but not less than 80 %. Observe flame stability.

If the burner is equipped with an adjustable mixing head:
- ► Set auxiliary actuator for mixing head (`Aux1`) to diagram, see installation and operating manual of burner.
  Alternately adapt combustion values via the air damper setting (`Air`) and if necessary the speed (`FC`).
- ► Calculate gas throughput (operating volume V_B) required [ch. 7.10].
- ► Set the position of the gas butterfly valve (`Burn`) to approx. `60.0 … 70.0°` in the full load point.
- ► Adjust setting pressure at the pressure regulator until gas throughput (V_B) is achieved.
- ► Check combustion values
- ► Determine combustion limit and set excess air [ch. 7.9].

Only in conjunction with flue gas recirculation
If the burner is later operated with flue gas recirculation, the recirculated flue gas reduces the excess air.
Set excess air 25 … 30 % above the combustion limit to ensure sufficient combustion air during the commissioning of the flue gas recirculation.
On burners with separate combustion air fan, the air dampers (Aux2) in front of the FGR connection housing must also be slightly closed [ch. 6.15.1.2].
- ► Set excess air 25 … 30 % above the combustion limit.
- ► Close air dampers in front of FGR connector housing (Aux2) until the O_2 content reduces by approx. 0.4 % points.
- ► Increase the O_2 content again to the previous value using the air influencing actuators, whilst observing the flame stability.

- ► Determine gas throughput again.
- ► If necessary adjust setting pressure at pressure regulator and reset excess air.

The setting pressure must not be altered once this work has been completed.

9. Re-define point 1

- ► Drive to point 1 in menu `Point`, whilst observing the combustion values.
- ► Check combustion values and correct if necessary.
- ► Carry out load apportionment [ch. 7.11].

To allow a reduction of `MinLoad` after commissioning, point 1 should be set below the required partial load.

10. Delete intermediate load points

Delete all load points except for point 1 and full load (`Load: 100`).

When an intermediate load point is deleted, all points above this intermediate load point are reduced by one number.

11. Set new intermediate load points

Starting at point 1, set new load points until full load is achieved.

A maximum of 15 load points can be programmed.
A minimum of 5 load points are required for modulating operation.

Only in conjunction with frequency converter
To ensure an even speed characteristic curve, the speed of the new load points should not be altered.

- ► Increase burner rating in menu `Manual`, whilst observing combustion values.
- ► Set new intermediate load point using [ENTER] key.
- ► Optimise combustion at intermediate load point via air damper setting (`Air`).
- ► Carry out load apportionment [ch. 7.11].
- ► Repeat steps until full load (`Load: 100`) has been reached.
- ► Exit level using the [esc] key.

12. Check start behaviour

- ► Switch off and restart burner.
- ► Check start behaviour and if necessary correct ignition position.

If the ignition position has been altered:
- ► Re-check start behaviour.

13. Define partial load

- ► Select `LoadLimits`.
- ► Select `MinLoad`.
- ► Define and set partial load whilst:
  - observing data provided by boiler manufacturer,
  - observing the burner capacity graph.

14. Set burner to automatic operation

► Exit level using the [esc] key.
► Select `Autom/Manual/Off`.
► Set `Automatic`.
► Exit level using the [esc] key.
► If necessary set load controller and O_2 trim.

15. Carry out data backup

► Exit level using the [esc] key.
✓ The display shows `Create parameter backup?`.
► Start data backup by pressing [ENTER] key.
✓ The display shows `Parameters are being updated` and the `Parameters have been saved`.
✓ The values have been backed up from the combustion manager to the ABE.
► Exit level using the [esc] key.

7.2.3 Adjust modulation oil side

Prerequisite for fuel oil EL

► Open oil shut off devices.

Prerequisite for medium and heavy fuel oil

DANGER

Danger of getting burned on oil carrying components
The oil carrying components are heat up by the line heating and hot oil and could cause burns if touched.
► Do not touch the components.

Observe the enclosed installation and operating manual for the oil preheater (Print No.18).

► Prior to adjusting ensure that:
  ▪ the oil supply is vented,
  ▪ all oil shut off devices are open,
  ▪ the oil supply has been preheated,
  ▪ ring main pressure and oil flow is available.
► Configure parameter C118 at the temperature regulator DR100 to wiring diagram specification and set setpoints (only in conjunction with oil preheater type WEV…).
► Commission oil preheater.

1. Check load limits

► Select `RatioControl`.
► Select `OilSettings`.
► Select `LoadLimits`.
► Select `MinLoadOil` and set `0.0%`.
► Select `MaxLoadOil` and set `100%`.
► Use [esc] key to return to the display `LoadLimits`.

2. Check ignition position

The setting of the oil quantity regulator in ignition position is pre-set when supplied (see burner data sheet).

► Select `SpecialPositions`.
► Select `IgnitionPos`.
► Select `IgnPosOil` (setting oil quantity regulator in ignition position).
► Check `IgnPosOil`. Pre-setting values see installation and operating manual of burner.

Only in conjunction with adjustable mixing head:
► Select `IgnitionPosAux1` (auxiliary motor setting in ignition position).
► Check `IgnitionPosAux1`:
  ▪ Standard: 0.0°
  ▪ 3LN (WK, WKmono): 18.0°
  ▪ 3LN (WM burners): 0.0°
  ▪ 4LN: 0.0°

Only in conjunction with frequency converter:
► Select `IgnPosFC` (speed in ignition position).
► Check `IgnitionPosVSD`:
  ▪ WM burners: `100%`
  ▪ WK… and industrial burners: `80%`
► Use [esc] key to return to the display `IgnitionPos`.

3. Check mixing pressure in ignition position

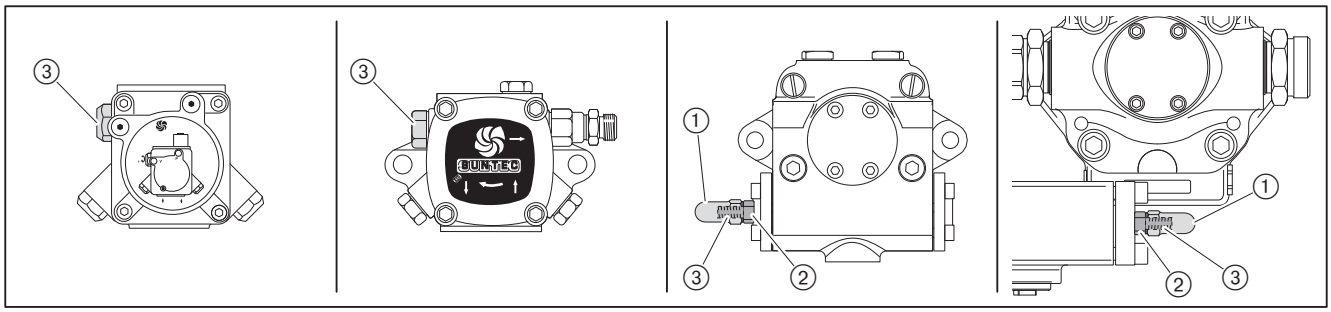
- ► Select `ProgramStop`.
- ► Select `36 IgnPos`.
- ► Use [esc] key to return to the display with `OilSettings`.
- ► Select `Autom/Manual/Off`.
- ► Select `Manual` (Burner On).
- ✓ The burner starts and stops in ignition position without flame formation
- ► Check rotation direction of fan wheel.
- ► Check mixing pressure in ignition position, see installation and operating manual of burner.
  - Standard: 2.5 … 5.0 mbar above combustion chamber pressure
  - 3LN (multiflam): 4.0 … 8.0 mbar above combustion chamber pressure
- ► If necessary, adjust mixing pressure via air damper setting:
  - Select `OilSettings`
  - Select `SpecialPositions`.
  - Select `IgnitionPos`.
  - Select `IgnitionPosGas` and adjust.
- ► Use [esc] key to return to the display `IgnitionPos`.

4. Check pump pressure

The pump pressure in ignition position must be approx. 1 … 4 bar less than that of the full load pressure, see burner data sheet.

On light oil burners with magnetic coupling between burner motor and oil pump or with separate oil pump, the pump pressure can only be set in the next step during ignition.

- ► Check pump pressure at pressure gauge.
- ► Remove closing cap ① (types T and TA only).
- ► Undo locknut ② (types T and TA only).
- ► Set pump pressure using pressure regulating screw ③.
  - increase pressure: clockwise rotation,
  - decrease pressure: anticlockwise rotation.



5. Ignition

- ► Set `Program stop` to `44 Interv 1`.
- ✓ The burner ignites and the actuators stop in the ignition position.
- ► Check combustion values in ignition position.
- ► Set O_2 content of approx. 5 % by positioning the oil quantity regulator (`IgnitionPosOil`) whilst observing the return pressure:
  - Fuel oil EL: min 8 bar
  - Heavy oil: min 12 bar

6. Set intermediate load points

- ► Set `ProgramStop` to `deactivated`.
- ► Use [esc] key to return to the display `SpecialPositions`.
- ► Select `CurveParams`.
- ► Press [ENTER].
- ✓ Point 1 is displayed.

Only in conjunction with frequency converter
In oil operation, the speed should only be reduced so far, that the pump pressure set at full load does not fall by more than 15 %.

Only in conjunction with O_2 trim
To ensure O_2 trim is possible across the entire load range, point 1 must be approx. 50 % below partial load (point 2).
Excess air in all load points must be 20 … 25 %.

Point 1 has been factory preset to a specific oil throughput, see burner data sheet.

- ► Check combustion values
- ► Adjust air damper setting (`Air`):
  - Press [ENTER] key.
  - Select `Change point?`.
  - Select `Actuator positions with start`.
  - Call up and change values with dial knob and [ENTER].

Only in conjunction with frequency converter
- ► Reduce speed (`VSD`) step by step, whilst observing the combustion values and adjust via air damper setting (`Air`). Minimum speed (see table) must be maintained.

Burner version	Minimum speed	
	Pump driven separately	Pump on burner motor
NR	50 %	70 %
LN, 1LN, 3LN	60 %	

- ► Exit point 1 using [esc] key and save with [ENTER] key.
- ► Press [esc] key.
- ✓ The menu displays `Point`, `Manual` and the current actuator positions.
  - In menu `Point` all load points can be adjusted.
  - In menu point `Manual` the current burner capacity can be adjusted manually.
- ► Select `Manual` and confirm with [ENTER].
- ► Increase burner rating using dial knob whilst observing combustion values (excess air) and flame stability.
- ► Set load point using [ENTER] key if either:
  - the O_2 content in the flue gas increases to above 7 %,
  - the soot limit is reached,
  - the CO content increases,
  - the flame reaches the limit of stability.

The new load point is displayed in menu `Point` and can be adjusted.

- ► Correct combustion values via oil quantity regulator position (`Burn`).
- ► Exit setting using [esc] and save with [ENTER].
- ► Exit load point using [esc].
- ► Repeat steps until full load (`Load: 100`) has been reached.

7. Adjust full load

When adjusting, the ratings data given by the boiler manufacturer and the capacity graph of the burner should be observed.

The burner has been factory pre-sized for a specific oil throughput, see burner data sheet.

Only in conjunction with frequency converter
Select speed at full load as low as possible, but not less than 80 %. Observe flame stability.

- ► Set pump pressure and oil quantity regulator position to the data given on the burner data sheet.
- ► Determine oil throughput, if necessary adjust position of oil quantity regulator (`Burn`) until the oil throughput required is achieved.

If the burner is equipped with an adjustable mixing head:

- ► Set auxiliary actuator for mixing head (`Aux1`) to diagram, see installation and operating manual of burner.
  Alternately adapt combustion values via the air damper setting (`Air`) and if necessary the speed (`FC`).
- ► Check combustion values
- ► Determine combustion limit and set excess air [ch. 7.9].

Only in conjunction with flue gas recirculation
If the burner is later operated with flue gas recirculation, the recirculated flue gas reduces the excess air.
Set excess air 25 … 30 % above the combustion limit to ensure sufficient combustion air during the commissioning of the flue gas recirculation.
On burners with separate combustion air fan, the air dampers (Aux2) in front of the FGR connection housing must also be slightly closed [ch. 6.15.1.2].

- ► Set excess air 25 … 30 % above the combustion limit.
- ► Close air dampers in front of FGR connector housing (Aux2) until the O_2 content reduces by approx. 0.4 % points.
- ► Increase the O_2 content again to the previous value using the air influencing actuators, whilst observing the flame stability.

The pump pressure must not be altered once this work has been completed.

8. Re-define point 1

- ► Drive to point 1 in menu `Point`, whilst observing the combustion values.
- ► Check combustion values and correct if necessary.
- ► Carry out load apportionment [ch. 7.11].

To allow a reduction of `MinLoad` after commissioning, point 1 should be set below the required partial load.

9. Delete intermediate load points

Delete all load points except for point 1 and full load (`Load: 100`).

When an intermediate load point is deleted, all points above this intermediate load point are reduced by one number.

10. Set new intermediate load points

Starting at point 1, set new load points until full load is achieved.

A maximum of 15 load points can be programmed.
A minimum of 5 load points are required for modulating operation.

Only in conjunction with frequency converter
To ensure an even speed characteristic curve, the speed of the new load points should not be altered.

- ► Increase burner rating in menu `Manual`, whilst observing combustion values.
- ► Set new intermediate load point using [ENTER] key.
- ► Optimise combustion at intermediate load point via air damper setting (`Air`).

If the burner is equipped with an adjustable mixing head, the combustion can be optimised by utilising the interaction between air damper (`Air`) and Mixing head (`Aux1`).

- ► Carry out load apportionment [ch. 7.11].
- ► Repeat steps until full load (`Load: 100`) has been reached.
- ► Exit level using the [esc] key.

11. Check start behaviour

- ► Switch off and restart burner.
- ► Check start behaviour and if necessary correct ignition position.

If the ignition position has been altered:
- ► Re-check start behaviour.

12. Define partial load

- ► Select `LoadLimits`.
- ► Select `MinLoad`.
- ► Define and set partial load whilst:
  - observing data provided by boiler manufacturer,
  - Maintain return pressure:
    - Fuel oil EL: min 8 bar
    - Heavy oil: min 12 bar
  - observing the burner capacity graph.

13. Set burner to automatic operation

► Exit level using the [esc] key.
► Select `Autom/Manual/Off`.
► Set `Automatic`.
► Exit level using the [esc] key.
► If necessary set load controller and O_2 trim.

14. Carry out data backup

► Exit level using the [esc] key.
✓ The display shows `Create parameter backup?`.
► Start data backup by pressing [ENTER] key.
✓ The display shows `Parameters are being updated` and the `Parameters have been saved`.
✓ The values have been backed up from the combustion manager to the ABE.
► Exit level using the [esc] key.

7.2.4 Adjust multi-stage oil side

Only in conjunction with frequency converter

When using a frequency converter please note:
- Ignition speed should be 100 %.
- It is recommended that the speed at the on and off switch points is 100 %
- Speed at operating point BS1 (and BS2 on three stage version) must only be reduced so far as to ensure safe operating behaviour whilst:
  - maintaining speed at 60 %,
  - maintaining minimum pump pressure, see installation and operating manual of burner.

Prerequisite for fuel oil EL

► Open oil shut off devices.

Prerequisite for medium and heavy fuel oil

DANGER

Danger of getting burned on oil carrying components
The oil carrying components are heat up by the line heating and hot oil and could cause burns if touched.
► Do not touch the components.

Observe the enclosed installation and operating manual for the oil preheater (Print No.18).

► Prior to adjusting ensure that:
  - the oil supply is vented,
  - all oil shut off devices are open,
  - the oil supply has been preheated,
  - ring main pressure and oil flow is available.
► Configure parameter C118 at the temperature regulator DR100 to wiring diagram specification and set setpoints (only in conjunction with oil preheater type WEV…).
► Commission oil preheater.

1. Select target rating

Target load is the load, which is started in manual operation with `Manual`.

► Select `ManualOperation`.
► Select `SetLoad`.
► Set `S1`.
► Exit level using the [esc] key.

2. Check presetting of points

► Select `Param & Display`.
► Select `RatioControl`.
► Select `OilSettings`.
► Select `CurveParams` and `CurveSet`.
► Select `Stepping motor positions Without Start`.
► Check presetting of points and adjust if necessary.

Value for operating points and on and off switch points see installation and operating manual of burner.

► Use [esc] key to return to the display with `CurveParams`.

3. Check mixing pressure in ignition position

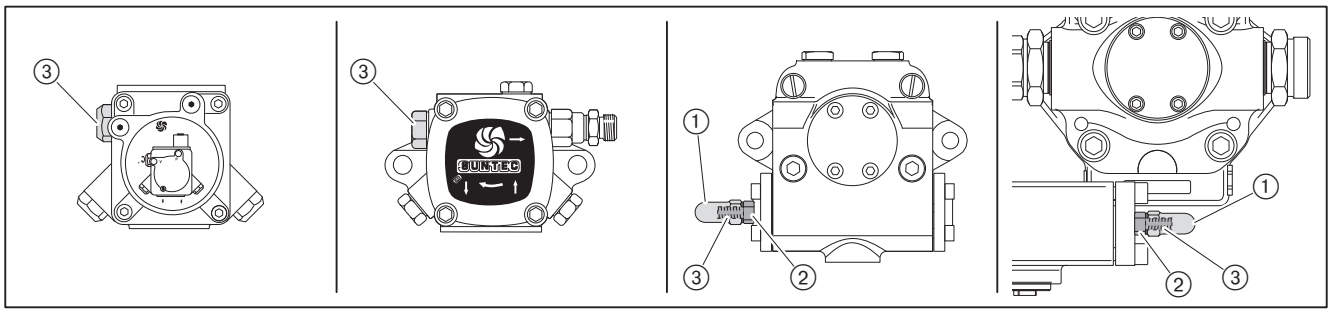
- ► Select `SpecialPositions`.
- ► Select `ProgramStop`.
- ► Select `36 IgnPos`.
- ► Use [esc] key to return to the display with `OilSettings`.
- ► Select `Autom/Manual/Off`.
- ► Select `Manual` (Burner On).
- ✓ The burner starts and stops in ignition position without flame formation
- ► Check rotation direction of fan wheel.
- ► Check mixing pressure in ignition position, see installation and operating manual of burner.
- ► If necessary, adjust mixing pressure via air damper setting:
  - Select `OilSettings`
  - Select `SpecialPositions`.
  - Select `IgnitionPos`.
  - Select `IgnitionPosGas` and adjust.
- ► Use [esc] key to return to the display `IgnitionPos`.

4. Check pump pressure

The pump pressure must be set according to the nozzle selected.

On light oil burners with magnetic coupling between burner motor and oil pump or with separate oil pump, the pump pressure can only be set in the next step during ignition.

- ► Check pump pressure at pressure gauge.
- ► Remove closing cap ① (types T and TA only).
- ► Undo locknut ② (types T and TA only).
- ► Set pump pressure using pressure regulating screw ③.
  - increase pressure: clockwise rotation,
  - decrease pressure: anticlockwise rotation.



5. Ignition

- ► Set `Program stop` to `44 Interv 1`.
- ✓ The burner starts and the stepping motor stops in ignition position.
- ► Check combustion values in ignition position.
- ► Set O_2 content of approx. 5 % via air damper setting (`IgnitionPosAir`) whilst observing the mixing pressure.

6. Pre-set points

- ► Set `ProgramStop` to `deactivated`.
- ► Use [esc] key to return to the display `SpecialPositions`.
- ► Select `CurveParams` and `CurveSet`.
- ► Select `Actuator positions With Start`.

Do not start switch-off points `AS2` and `AS3` , as this can lead to a deficiency of air.

7. Preset operating point BS1

- ► Select `BS1` with [ENTER].
- ✓ The burner drives to operating point BS1.
- ► Check combustion values and, if necessary, adjust via air damper setting (`Air`).
- ► Exit BS1 using [esc] key and save with [ENTER].

8. Preset switch-on point ES2

- ► Select `ES2`.
- ► Set excess air (O_2 content approx. 7 %) whilst observing flame stability.

For two stage burners only
Two stage burners do not have a switch-on point ES3 and no operating point BS3. Operating point BS2 is full load and should be adjusted as full loaf point BS3 (full load).

9. Pre-set operating point BS2

- ► Select `BS2`.
- ✓ Valve for nozzle 2 opens.
- ► Check combustion values and, if necessary, adjust via air damper setting (`Air`).

10. Pre-set switch-on point ES3

- ► Select `ES3`.
- ► Set excess air (O_2 content approx. 7 %) whilst observing flame stability.

11. Adjust operating point BS3 (full load)

- ► Select `BS3`.
- ✓ Valve for nozzle 3 opens.
- ► Determine oil throughput and if necessary adjust pump pressure.
- ► Check combustion values
- ► Determine combustion limit and set excess air [ch. 7.9].
- ► Use [esc] key to return to the display `CurveSet`.

The pump pressure must not be altered once this work has been completed.

12. Define switch-off points AS2 and AS3

- ► In menu `CurveSet` select option `Without start`.
- ► Select switch-off point `AS2`.
- ► Set air damper setting in switch-on point `ES2` .
- ► Select switch-off point `AS3`.
- ► Set air damper setting in switch-on point `ES3` .
- ► Use [esc] key to return to the display `CurveSet`.

13. Optimise operating points BS1 and BS2

Once full load has been adjusted and the pump pressure has been set to its final value, the operating points should be optimised.

- ► In menu `CurveSet` select option `With start`.
- ► Select `BS1`.
- ► Check combustion values and, if necessary, adjust via air damper setting (`Air`).
- ► Select `BS2` and also adjust.

14. Check switch points

- ► Activate operating points several times and observe switch-over behaviour.
- ► If necessary optimise operating behaviour:
  - Adjust switch-off point in menu `Without start` whilst increasing the air damper setting to avoid soot and CO formation
  - Adjust switch-on points in menu `With start`

15. Check start behaviour

- ► Switch off and restart burner.
- ► Check start behaviour and if necessary correct ignition position.

If the ignition position has been altered:

- ► Re-check start behaviour.

16. Set burner to automatic operation

- ► Exit level using the [esc] key.
- ► Select `Autom/Manual/Off`.
- ► Set `Automatic`.
- ► Use [esc] key to return to the display with `Param & Display`.
- ► Select `ManualOperation`.
- ► Select `SetLoad`.
- ► Set highest stage as the target load.
- ► Exit level using the [esc] key.
- ► If necessary adjust load controller.

17. Carry out data backup

- ► Exit level using the [esc] key.
- ✓ The display shows `Create parameter backup?`.
- ► Start data backup by pressing [ENTER] key.
- ✓ The display shows `Parameters are being updated` and the `Parameters have been saved`.
- ✓ The values have been backed up from the combustion manager to the ABE.
- ► Exit level using the [esc] key.

7.3 Load controller

The W-FM 200 is equipped with an internal PID load controller as standard, with the W-FM 100 the internal load controller is optional.

Commissioning must only be carried out by qualified personnel.

7.3.1 Configure load controller

1. Enter password

- ► Select `Param & Display`.
- ► Select `Access with HE` (password for heating engineer).
- ► Enter HE password using dial knob and confirm with [ENTER] [ch. 6.2.1].

2. Set operating mode

- ► Select `LoadController`.
- ► Select `Configuration`.
- ► Select `LC_OptgMode`.
- ► Set operating mode for the internal or external load controller using dial knob and confirm with [Enter] [ch. 6.12.2].
- ► Use [esc] key to return to the display `LC_OptgMode`.

3. Define sensors

For operating mode with internal load controller and temperature monitor function, the connected sensors must be defined [ch. 3.3.20].

- ► Select `Sensor Select`.
- ► Define connected sensor with the dial knob and confirm with [Enter [ch. 6.12.3].
- ► Use [esc] to return to the display `Sensor Select`.

To ensure the actual value is entered correctly, the measuring range of the sensors must be defined [ch. 6.12.5].

- ► Select menu for the sensor defined and confirm with [Enter].
  - Sensor: `MeasureRangePtNi / var.RangePtNi`
  - Temperature sensor: `MRange TempSens`
  - Pressure sensor: `MRange PressSens`
- ► Set end of measuring range using dial knob and confirm with [Enter].
- ► Use [esc] to return to the menu.

If a sensor is connected, input X61 has to be matched to the sensor [ch. 6.12.4].

- ► Select `Ext Inp X61 U/I`.
- ► Set analogue signal from the sensor.
- ► Use [esc] to return to the display `Ext Inp X61 U/I .`

4. Configuring analogue input X62

If an analogue setpoint or load signal is present at input X62, the input must be matched to the signal [ch. 6.12.4].

- ► Select `Ext Inp X62 U/I`.
- ► Match input to the analogue signal.
- ► Use [esc] to return to the display `Ext Inp X62 U/I .`

5. Limit external setpoint

It is possible to define limits for the setpoint for the operating mode with external setpoint.
With an analogue setpoint signal the limit value relates to the measuring range set [ch. 6.12.6].

- ► Select `Ext MinSetpoint` or `Ext MaxSetpoint` .
- ► Set the limit value using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the menu.

6. Determine internal setpoint

Two setpoints can be set for the operating mode with internal load controller [ch. 6.12.1].

- ► Select `LoadController`.
- ► Select `ControlParam`.
- ► Select `SetpointW1` .
- ► Set setpoint using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `ControlParam`.

If the second setpoint W2 is required:

- ► Repeat procedure for `SetpointW2`.

7. Set temperature sensor function

With an activated temperature monitor, the switch threshold and switch-on hysteresis can be set [ch. 6.12.13].

- ► Select `LoadController`.
- ► Select `TempLimiter`.
- ► Select `TL_ThreshOff`.
- ► Set threshold using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `TL_ThreshOff` .
- ► Select `TL_SD_On`.
- ► Set switch-on hysteresis using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `TempLimiter`.

7.3.2 Adjust load controller

7.3.2.1 Modulating load control

1. Set switch differentials

The switch differentials determine the on and off switch point [ch. 6.12.11].

The on and off switch points are given as a percentage value and relate to the current setpoint.

Set switch-on point (controller ON):
- ► Select `ControlParam`.
- ► Select `Sd_ModOn`.
- ► Set switch differential using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `Sd_ModOn` .

Set switch-off point (controller OFF):
- ► Select `Sd_ModOFF`.
- ► Set switch differential using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `ControlParam`.

2. Determine controller parameters

The control parameters can be determined in two ways:
- An automatic adaption identifies the controlled system and forms the PID parameters [ch. 6.12.15].
- One PID parameter set can be selected from five standard parameter sets [ch. 6.12.8].

Identifying the controlled system via adaption:
- ► Select `ControlParam`.
- ► Select `SW_FilterTmeCon` using the dial knob and confirm with [Enter].
- ✓ The filter time must be 2 … 4 seconds [ch. 6.12.10].
- ► Use [esc] to return to the display `ControlParam`.
- ► Select `Adaption` .
- ► Select `AdaptionLoad`.
- ► Check adaption load and adjust if necessary.
- ✓ If possible, the adaption load should be 100 % [ch. 6.12.15].
- ► Use [esc] to return to the display `AdaptionLoad`.
- ► Select `StartAdaption` using dial knob and confirm with [Enter].
- ✓ The display shows `Start adaption with ENTER`.
- ► Confirm with [Enter].
- ✓ Adaption starts, the display shows the individual phases:
  - `Temp setback`
  - `Stabilisation phase`
  - `Heating`
  - `Adaption ok`
- ► Use [esc] to return to the display `Adaption`.

Select PID parameter set immediately:
- ► Select `ControlParam`.
- ► Select `ContrlParamList`.
- ► Select`StandardParam` .
- ► Select PID parameter set using dial knob and confirm with [Enter] [ch. 6.12.8].
- ► Use [esc] to return to the display `StandardParam`.

3. Edit controller parameters

The PID parameters can be edited individually and the control behaviour can be optimised [ch. 6.12.8].

- ► Observe control behaviour over a longer period and optimise if necessary.
- ► Select `P-`, `I-` or `D-Part`.
- ► Change values using the dial knob and confirm with [Enter] [ch. 6.12.8].
- ► Use [esc] to return to the display `ContrlParamList`.

4. Check fault signal suppression

- ► Select `SW_FilterTmeCon`.
- ► Check filter time [ch. 6.12.10]:
  - Temperature sensor (Pt100): 2 … 4 seconds
  - pressure sensor (steam plant): 6 … 8 seconds
- ► Use [esc] to return to the display `ControlParam`.

7.3.2.2 Modulating load control

1. Set switch differentials

The switch differentials determine the on and off switch points [ch. 6.12.12.1].

The on and off switch points are given as a percentage value and relate to the current setpoint.

Set switch-on point (controller ON):
- ► Select `ControlParam`.
- ► Select `Sd_Stage1On .`
- ► Set switch differential using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `Sd_Stage1On .`

Set switch-off point stage 1 (controller OFF):
- ► Select `Sd_Stage1Off`.
- ► Set switch differential using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `Sd_Stage1Off`.

Set switch-off point stage 2:
- ► Select `Sd_Stage2Off`.
- ► Set switch differential using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `Sd_Stage2Off`.

Set switch-off point stage 3:
- ► Select `Sd_Stage3Off`.
- ► Set switch differential using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `Sd_Stage3Off`.

2. Set switch thresholds

The switch threshold specifies from which control deviation the W-FM activates the next stage [ch. 6.12.12.2].

Set switch threshold stage 2:
- ► Select `ThreshStage2On .`
- ► Set threshold using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `ThreshStage2On .`

Set switch threshold stage 3:
- ► Select `ThreshStage3On .`
- ► Set threshold using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `ControlParam`.

7.3.2.3 Boiler cold start function

The boiler cold start function reduces the thermal load of the boiler during burner start [ch. 6.12.14].

1. Activate boiler cold start function

- ► Select `ColdStart`.
- ► Select `ColdStartOn`.
- ► Select `activated` using the dial knob and confirm with [ENTER].
- ► Use [esc] to return to the display `ColdStartOn`.

2. Define additional sensor

- ► Only if an additional sensor for boiler cold start function is connected (e. g. steam plant):
- ► Select `AdditionalSens`.
- ► Define the sensor connected with the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `AdditionalSens`.
- ► Select `Setp AddSensor`.
- ► Set setpoint using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `Setp AddSensor`.

3. Set switch thresholds

The switch thresholds relate to the current setpoint or if an additional sensor is connected to `Setp AddSensor`.

ON threshold:

- ► Select `ThresholdOn` .
- ► Set threshold using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `ThresholdOn` .

OFF threshold:

- ► Select `ThresholdOff`.
- ► Set threshold using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `ThresholdOff`.

4. Set StageLoad

Determines the load increase in modulating operation.

- ► Select `StageLoad`.
- ► Set StageLoad using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `StageLoad`.

5. Set setpoint step

For modulating operation:
- ► Select `StageSetp_Mod`.
- ► Set setpoint step using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `StageSetp_Mod`.

For multi-stage operation:
- ► Select `StageSetp_Stage`.
- ► Set setpoint step using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `StageSetp_Stage`.

6. Set residence time

For modulating operation:
- ► Select `MaxTmeMod` .
- ► Set setpoint step using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `MaxTmeMod`.

For multi-stage operation:
- ► Select `MaxTmeStage`.
- ► Set setpoint step using the dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `MaxTmeStage`.

7. Carry out data backup

- ► Exit level using the [esc] key.
- ✓ The display shows `Create parameter backup?`.
- ► Start data backup by pressing [ENTER] key.
- ✓ The display shows `Parameters are being updated` and the `Parameters have been saved`.
- ✓ The values have been backed up from the combustion manager to the ABE.
- ► Exit level using the [esc] key.

7.4 O2 controller

O_2 trim is only possible in modulating operation with W-FM 200 with O_2 module. O_2 trim is fuel specific and must be set separately for each fuel on dual fuel burners.

To ensure O_2trim is possible across the entire load range when commissioning the compound curves:
- point 1 must be approx. 50 % below partial load (point 2),
- excess air in all load points must be 20 … 25 %.

With new sensors or if the sensor has been switched off for extended periods, moisture may form in the sensor and distort the measured value. A longer heat-up process through the internal sensor heating displaces this moisture.
► Heat up the sensor prior to adjusting the O_2 trim.

7.4.1 Set O2 monitor

The O_2 limit values are defined in the O_2 alarm [ch. 6.10.2].
The operating mode of O_2 trim must be set to `man deact` .

1. Select fuel

► Select `Param & Display`.
► Select `O2 Contr/Alarm`.
► Select `GasSettings` or `OilSettings`.
► Select `O2 Alarm` and confirm with [ENTER].

2. Set O_2 minimum monitor

An `O2 MinValue` has to be defined as the lower limit in each load point, either by:
- driving to combustion limit and take over the value determined,
- direct input, only possible if the O_2 minimum value at the combustion limit is known.

Driving to combustion limit and take over the value determined:
► Select `O2 Alarm`.
► Select load point using dial knob and confirm with [ENTER] key.
► Select `P-Air Manual` and confirm with [ENTER].
✓ The display shows the current O_2 actual value and the burner drives to the load point.
► Reduce air rating using the dial knob until the combustion limit is reached (CO content approx. 100 ppm or smoke number approx. 1).
► Press [ENTER] to accept the O_2 actual value.
✓ The display shows the value determined as `O2 MinValue`.
► Note down `O2 MinValue` and load point, required in the later stages.
► Repeat procedure in each load point.
► Use [esc] to return to the display `O2 Alarm`.

Direct entry:
► Select `O2 Alarm`.
► Select load point using dial knob and confirm with [ENTER] key.
► Select `O2 MinValue` and confirm with [ENTER].
► Change values using the dial knob and confirm with [ENTER].
► Exit entry using [esc].
► Repeat procedure in each load point.
► Use [esc] to return to the display `O2 Alarm`.

7.4.2 Set O2 trim

Standardised values must be defined for O_2 trim from a pre-determined load point [ch. 6.10.3].

1. Select fuel

- ► Select `Param & Display`.
- ► Select `O2 Contr/Alarm`.
- ► Select `GasSettings` or `OilSettings`.

2. Define O_2 setpoints

The setpoint for O_2 trim should be approx. 0.5 … 1 %point above the `O02 Min-Value` of the O_2 monitor.
The O_2 value in the load points of the compound curve should be approx. 2 % points above the setpoint for O_2 trim.

- ► Select `O2 Control` and confirm with [ENTER].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ✓ Burner drives to load point.
- ► Once the O_2 content has stabilised confirm with [ENTER].
- ► Turn dial knob to the right.
- ✓ The air-determining actuators drive open on the compound curve, reduce the air quantity and thus the O_2 content.
- ✓ The `O2 Setpoint` should be approx. 0.5 … 1 % points above the `02 Min-Value` at the combustion limit.
- ► Confirm standardised value with [ENTER].
- ► Exit entry using [esc] and save with [ENTER].
- ✓ In the load point set under `LowFireAdaptPtNo` and the last load point (full load) the W-FM carries out an adaption.
  If the measurement fails in the specified load point, select the next higher load point [ch. 6.10.4].
- ► Carry out standardisation in all points, point 2 to full load.

7.4.3 Check and optimise O2 trim

1. Bridge load control

In order to monitor the O_2 value via display and operating unit, the load must be influenced manually via an external signal (e. g. 3 pole switch at input X5-03).

It is preferential to monitor O_2 trim with software ACS450.

- ▶ Switch off burner and isolate W-FM from voltage supply.
- ▶ Connect 3 pole switch to input X5-03.
- ▶ Switch on voltage supply.
- ▶ Set load controller operating mode to `ExtLC X5-03`, see [ch. 6.12.2].
- ▶ Use [esc] to return to the display `LoadController`.

2. Set operating mode

- ▶ Select `O2 Contr/Alarm`.
- ▶ Select current fuel `GasSettings` or `OilSettings`.
- ▶ Select `OptgMode`.
- ▶ Set `conAutoDeac` using the dial knob and confirm with [ENTER].
- ▶ Use [esc] to return to the display `Param & Display`.

3. Set burner to automatic operation

- ▶ Select `ManualOperation`.
- ▶ Select `Autom/Manual/Off`.
- ▶ Set `Automatic` using dial knob and confirm with [ENTER].
- ▶ Use [esc] to return to the display `Autom/Manual/Off`.
- ▶ Use [info] to return to `OperationalStat`.
- ▶ Select `NormalOperation`.

4. Check O_2 trim

- ▶ Close control circuit and drive to full load via 3 pole switch.
- ▶ Check control behaviour whilst monitoring O_2 value in the display and operating unit.
  - The burner drives on the compound curves to full load.
  - Once the O_2 sensor has reached operating temperature and the blocking time has elapsed, the W-FM goes to pre-control [ch. 6.10].
    Only the air influencing actuators are operating, the fuel actuator remains in its position and the O_2 actual value approaches the O_2 setpoint.
  - If O_2 setpoint is not reached via the pre-control, O_2 trim reacts and controls the O_2 actual value.
- ▶ Change load using the 3 pole switch.
  - O_2 trim is suspended and the burner drives to the new load.
    Pre-control is activated and the compound almost maintains the O_2 setpoint.
  - If no changes were made to the load before the blocking time has elapsed, O_2 trim is activated and controls the O_2 actual value.
- ▶ Drive through the entire load range and monitor the control behaviour.
- ▶ If necessary, optimise O_2 trim via the settings in menu `ControlParam`, see [ch. 6.10.4].

Observation	Action
O_2 actual value fluctuates, at constant load	Change parameter `PI` see [ch. 6.10.4]. In the lower load range: ▪ Increase `I Low-Fire` or reduce `P Low-Fire` . In the upper load range: ▪ Increase `I High-Fire` or decrease `P High-Fire`.
O_2 sensor reacts very slowly to changes in the O_2 content in the flue gas.	Increase O_2 regulating limit [ch. 6.10.4].
O_2 trim remains suspended, despite a prolonged period of constant load.	Check status of O_2 controller [ch. 6.10.13]. Increase parameter `LoadCtrlSuspend`, see [ch. 6.10.4].
O_2 monitor reacts to load change.	Check setting of O_2 monitor [ch. 7.4.1]. Increase parameter `O2ModOffset` .

5. Set flue gas temperature warning threshold

- ► Drive to full load.
- ► Check flue gas temperature.
- ► Select `O2 Module`.
- ► Select `Configuration`.
- ► Select `MaxTempFlGas…` .
- ► Set threshold 20 % above the measured temperature using the dial knob and confirm with [ENTER].
- ► Exit level using the [esc] key.

6. Set next fuel (dual fuel burners only)

In modulating operation for both fuels:

- ► Repeat setting for second fuel [ch. 7.4.1].

7.5 CO controller

Refer to the manual of the measuring amplifier LT 3 and combination sensor KS1-D prior to commissioning. The manual is available to download from the Weishaupt Portal.

The release of level 2 in the measuring amplifier is password protected.

Password: `8F3W`

7.5.1 Set measurement amplifier LT3

The handheld operating unit is required for the settings on the measurement amplifier LT3. For detailed information, see instructions Lambda Transmitter LT3 and combination sensor KS1-D.

Setting the language:
- ► Select language in main menu F3.

Enter password:
- ► Select `Enter Password` in main menu F3.
- ► Enter password `8F3W` and confirm.

Set CO limit value:
- ► Select `Config LimitValue` in main menu F3.
- ► Select `Config LimitValue 1`.
- ► Select `LV fuel 1` .
- ► Select `Config fixed value` and set `100 ppm` .
- ► Return to main menu F3

Set standby position of digital output 3 (Out3):
- ► Select `Digital Outputs` in main menu F3.
- ► Select `Digital Output 3` .
- ► Select `Standby` and set `activated` .
- ► Return to main menu F3

Set trip delay for CO limit value:
- ► Select `Config LimitValue` in main menu F3.
- ► Select `Config LimitValue 1`.
- ► Select `Trip delay` and set `03 s`.
- ► Return to main display.

7.5.2 Set CO control

Commissioning of the O_2 controller must be completed for the CO control.

1. Define combustion air sensors

- ► Select `Param & Display`.
- ► Select `O2 Module`.
- ► Select `Configuration`.
- ► Select `SupAirTempSens`.
- ► Select `Pt1000` using dial knob and confirm with [Enter].
- ► Exit display using the [esc] key.

2. Set flue gas temperature warning threshold

- ► Select`MaxTempFlueGas … .`
- ► Set `850` °C using dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `O2 Module`.

On dual fuel burners, set both `MaxTempFlGasGas` and `MaxTempFlGasOil`.

3. Set blocking time

To ensure that an increased CO content during burner start does not initiate a safety shutdown, the factor for the blocking time must be set to a minimum of 10 [ch. 6.10.5].

- ► Select `O2 Contr/Alarm`.
- ► Select `GasSettings` or `OilSettings`.
- ► Select `NumberTauSuspend`.
- ► Set a minimum of `10` using dial knob and confirm with [Enter].
- ► Use [esc] to return to the display `O2 Module`.

On dual fuel burners repeat procedure.

7.6 Flue gas recirculation (temperature compensated)

Prerequisite

- ► Prior to adjusting ensure that:
  - the insulation measures on the FGR line have been completed,
  - the burner was initially adjusted with FGR damper closed,
  - excess air in each load point without FGR is approx. 25 … 30 %,
  - the FGR duct is not blocked,
  - the FGR sensor is connected and defined.

1. Enter password

- ► Select `Param & Display`.
- ► Select `Access with HE` (password for heating engineer).
- ► Enter HE password using dial knob and confirm with [ENTER] [ch. 6.2.1].

2. Set operating mode

- ► Select `Flue Gas Recirc.`.
- ► Select `FGR-Mode`.
- ► Set operating mode `TCautoDeact` using dial knob and confirm with [ENTER].

3. Set release time

The time depends on the the warm-up phase of the plant [ch. 6.15.5].

- ► Select `DelaytimeFGR …` for the relevant fuel.
- ► Set operating mode `60s` using dial knob and confirm with [ENTER].
- ► Use [esc] to return to the display `Flue Gas Recirc` .

4. Editing load points

- ► Select `CurveParams`.
- ► Press [ENTER].
- ✓ The menu displays `Point`, `Manual` and the current actuator positions.
- ► Select `Point` and confirm with [ENTER].
- ► Select load point using dial knob and confirm with [ENTER] key.
- ► Confirm query `Change point?` with [ENTER].
- ► Confirm query `With start` with [ENTER].

5. Set NO_x required

- ► Select `Aux3` using dial knob and confirm with [Enter].
- ✓ The display shows the current temperature at the FGR sensor under `FGR-T` .

Once the temperature and the NO_x value in the load point have stabilised, the recirculated flue gas quantity can be set.

- ► Open the flue gas damper (`Aux3`) using the dial knob whilst monitoring combustion values (excess air min 15 %) and flame stability.
- ► Confirm with [ENTER] when:
  - the required NO_x value has been reached,
  - the FGR temperature is stable.
- ► Exit point using [esc] and save with [ENTER].

The recirculated flue gas quantity dependents on the position of the FGR damper and the negative pressure in the air regulator. If the recirculated flue gas quantity is insufficient, increase the negative pressure in the air regulator [ch. 6.15.1].

- ► Increase VSD (`FC`), only in conjunction with frequency converter.
- ► Close air damper (`Air`).

6. Check stability limit

If load changes occur, the recirculated flue gas quantity can briefly increase and adversely affect the flame stability. For reliable operation, increase the flue gas quantity manually at each point and check flame stability.

- ► Select `Aux3` using dial knob and confirm with [Enter].
- ► Open flue gas damper (`Aux3`) using the dial knob and reduce NO_x by approx. 2 ppm.
- ► Check operating behaviour:

If the temperature deviates greatly from the value noted down:

- ► Exit point using [esc] and save with [ENTER].
- ✓ ▪ Current temperature is saved in the point

If the temperature deviates only minimally from the value noted down:

- ► Exit point without saving, press [esc] twice.

7. Edit next load point

- ► Repeat procedure in each load point.

8. Set next fuel (dual fuel burners only)

In modulating operation for both fuels:

- ► Repeat setting for second fuel.

7.7 Set pressure switches

Observe chapter 'Set pressure switches' in the installation and operating manual of the burner.

Air pressure switch for variable speed drive and O_2 trim

On burners with variable speed drive and O_2 trim the air pressure switch is set differently to the standard method.

O_2 trim regulates the O_2 content in the flue gas using the combustion air quantity. As a result, positions below partial load are possible for the air-determining actuators. To determine the lowest differential pressure, the burner must drive to the combustion limit in point 2.
On dual fuel burners the setting should be carried out with fuel Gas.

- ► Call up function `O2 Alarm`, see [ch. 6.10.2].
- ► Select menu `O2 Alarm` and confirm with [Enter].
- ► Select load point `2` using dial knob and confirm with [Enter] key.
- ► Select parameter `P-Air Manual` and confirm with [Enter].
- ✓ The display shows the current O_2 actual value and the burner drives to the load point.
- ► Rotate setting cam on air pressure switch to the right, until the W-FM triggers a lockout.
- ► Turn back setting cam by approx. 1 mbar.
- ► Exit level using the [esc] key.
- ► Reset burner using the [ENTER] key.

7.8 Concluding work

Observe chapter Concluding work in the installation and operating manual of the burner.

7.9 Check combustion

Determine excess air

- ► Slowly close air damper(s) in the relevant operating point, until the combustion limit is reached (CO content approx. 100 ppm or smoke number approx. 1).
- ► Measure and document O_2 content.
- ► Read air number (λ).

Increase air number to ensure sufficient excess air:
- by 0.15 … 0.2 (equates to 15 … 20 % excess air),
- by more than 0.2 for more difficult conditions, such as:
  - dirty combustion air,
  - fluctuating intake temperature,
  - fluctuating chimney draught.

Example

$$\lambda + 0.15 = \lambda^*$$

- ► Set air number (λ*), do not exceed CO content of 50 ppm.
- ► Measure and document O_2 content.

Check flue gas temperature

- ► Check flue gas temperature.
- ► Ensure that the flue gas temperature complies with the data provided by the boiler manufacturer.
- ► If necessary adjust flue gas temperature, e g.:
  - Increase burner capacity in partial load to avoid condensation in the flue gas ducts, except on condensing units.
  - Reduce burner capacity in full load to improve efficiency.
  - Adjust heat exchanger to the data provided by the manufacturer.

Determine flue gas losses

- ► Drive to full load.
- ► Measure combustion air temperature (t_L) near the air damper(s).
- ► Measure oxygen content (O_2) and flue gas temperature (t_A) at the same time at one point.
- ► Determine flue gas losses using the following formula:

$$q_A = (t_A - t_L) \cdot \left(\frac{A_2}{21 - O_2}\right) + B$$

q_A Flue gas losses [%]

t_A Flue gas temperature [°C]

t_L Combustion air temperature [°C]

O_2 Volumetric content of oxygen in dry flue gas [%]

Fuel factors	Natural Gas	Liquid Petroleum Gas	Fuel oil
A2	0.66	0.63	0.68
B	0.009	0.008	0.007

7.10 Calculate gas throughput

Formula symbol	Explanation	Example values
V_B	Operating volume [m^3/h] Volume measured at gas meter at current pressure and temperature (gas throughput).	–
V_N	Standard volume [m^3/h] Volume gained by gas at 1013 mbar and 0 °C.	–
f	Conversion factor	–
Q_N	Heat rating [kW]	6000 kW
η	Boiler efficiency (e. g. 92 % ≙ 0.92)	0.92
H_i	Calorific value [kWh/m^3] at 0 °C and 1013 mbar	10.35 kW/m^3 (Natural Gas E)
t_{Gas}	Gas temperature at gas meter [°C]	10 °C
P_{Gas}	Pressure at gas meter [mbar]	250 mbar
P_{Baro}	Barometric air pressure [mbar], see table	500 m ≙ 955 mbar
V_G	Gas throughput determined at gas meter	18.2 m^3
T_M	Measuring time [seconds]	120 seconds

Calculate normal volume

► Calculate the normal volume (V_N) using the following formula.

$$V_N = \frac{Q_N}{\eta \cdot H_i} \qquad V_N = \frac{6000\ kW}{0.92 \cdot 10.35\ kW/m^3} = 630.1\ m^3/h$$

Calculate conversion factor

► Determine gas temperature (t_{Gas}) and pressure (P_{Gas}) at gas meter.
► Determine barometric air pressure (P_{Baro}) from table.

Height above sea level [m]	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
P_{Baro} [mbar]	1013	1001	990	978	966	955	943	932	921	910	899	888	877	866

► Calculate conversion factor (f) using the following formula.

$$f = \frac{P_{Baro} + P_{Gas}}{1013} \cdot \frac{273}{273 + t_{Gas}} \qquad f = \frac{955 + 250}{1013} \cdot \frac{273}{273 + 10} = 1.148$$

Calculate operating volume (gas throughput) required

$$V_B = \frac{V_N}{f} \qquad V_B = \frac{630.1\ m^3/h}{1.148} = 548.9\ m^3/h$$

Determine current operating volume (gas throughput)

► Measure gas throughput (V_G) at gas meter, measuring time (T_M) should be a minimum of 60 seconds.
► Calculate operating volume (V_B) using the following formula.

$$V_B = \frac{3600 \cdot V_G}{T_M} \qquad V_B = \frac{3600 \cdot 18.2\ m^3}{120\ s} = 546.0\ m^3/h$$

7.11 Ratings apportionment

The load points are automatically assigned relative to the capacity. Incorrect load distribution can cause operating problems during the load control.

- ► Assign capacity in % for load point using the following formula.
- ► Enter the calculated capacity for load point in `Load`.

$$\text{Load [\%]} = \frac{\text{Throughput load point}}{\text{Throughput full load}} \cdot 100$$

8 Servicing

8.1 Notes on servicing

DANGER

Risk of explosion due to leaking gas
Improper service work can lead to escaping gas and explosion.
- ► Close fuel shut off devices prior to starting work.
- ► Care should be taken when dismantling and assembling gas carrying components.
- ► Close the screws on the test points ensuring the tests points are sealed.

DANGER

Risk of electric shock
Working on the device when voltage is applied can lead to electric shock.
- ► Isolate the device from the power supply prior to starting any work.
- ► Safeguard against accidental restart.

WARNING

Danger of getting burned on hot components
Hot components can lead to burns.
- ► Allow components to cool.

Servicing must only be carried out by qualified personnel. The combustion plant should be serviced annually. Depending on site conditions more frequent checks may be required.

Components, which show increased wear and tear or whose design lifespan is or will be exceeded prior to the next service should be replaced as a precaution.

The design lifespan of the components is listed in the service plan [ch. 8.2].

Weishaupt recommends a service contract is entered into to ensure regular inspections.

The following components must only be replaced and must not be repaired:
- combustion manager
- flame sensor
- actuator
- gas valve
- oil solenoid valve
- nozzle head (shut off needle),
- pressure regulator
- pressure switch

Prior to every servicing

- ► Inform the operator about the extent of service work to be carried out.
- ► Switch off mains switch of installation and safeguard against accidental reactivation.
- ► Close fuel shut off devices.

Following servicing

- ► Check tightness of oil and gas carrying components.
- ► Check function of:
  - adjustable mixing head,
  - ignition,
  - flame monitoring,
  - gas carrying components (gas connection pressure and setting pressure),
  - oil pump (pump pressure and suction resistance),
  - pressure switch
  - safety interlock circuit.
- ► Check combustion values, if necessary re-adjust the burner.
- ► Enter combustion values and settings in the commissioning record and/or test sheet.

8.2 Service plan

For detailed information see installation and operating manual of burner.

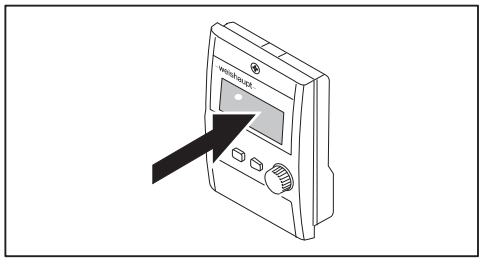
9 Troubleshooting

9.1 Procedures for fault conditions

- ► Check prerequisites for operation:
  - Voltage supply available.
  - Heating switch is set to On.
  - Temperature regulator or pressure regulator on heat exchanger has been set correctly.
  - Boiler or heating circuit control is functioning and set correctly.

The combustion manager recognises irregularities of the burner and displays these on the display and operating unit (ABE).

The following conditions can occur:
- Fault [ch. 9.2]
- Lockout [ch. 9.3]



Reset

`OperationalStat`	`Status/Reset`		

The display and operating unit alternately shows the shutdown behaviour and the fault diagnosed as a plain text display.

WARNING

Damage resulting from incorrect fault repair
Incorrect fault repair can cause damage to the equipment and injure personnel.
- ► Do not carry out more than 2 lockout resets successively.
- ► Faults must be rectified by qualified personnel.

If the ABE displays a fault:
- ► Exit display using the [esc] key.
- ► Reset burner using the [ENTER] key.

If the [esc] key has been pressed twice, reset can only be carried out via the menu.
- ► Select `Operating display`.
- ► Select `Status/Reset`.
- ✓ Current lockout is displayed.
- ► Exit display using the [esc] key.
- ► Reset burner using the [ENTER] key.

Via reset key on input X4-01:4:
- ► Press reset key.
- ✓ The burner has been reset.

Exchanging the unit

If the combustion manager or the ABE are replaced:
- ► Select and check fault history and lockout history and include a copy when returning the unit for exchange.

9.1.1 Deactivating an alarm

OperationalStat	Alarm act/deact		

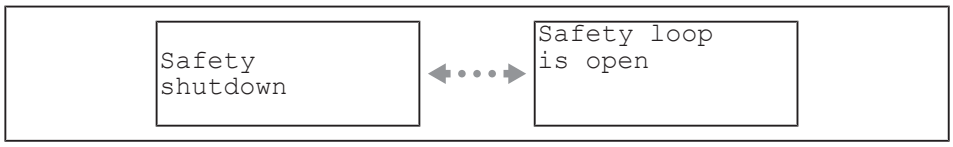
Parameter `Alarm act/deact` deactivates or activates the alarm output X3-01:2.
A reset or a burner start automatically resets the deactivation and the alarm output is ready for use again.

9.2 Fault

If a fault occurs, the combustion manager initiates a controlled shutdown.

The display and operating unit alternately shows the shutdown behaviour and the fault diagnosed as a plain text display.

Example



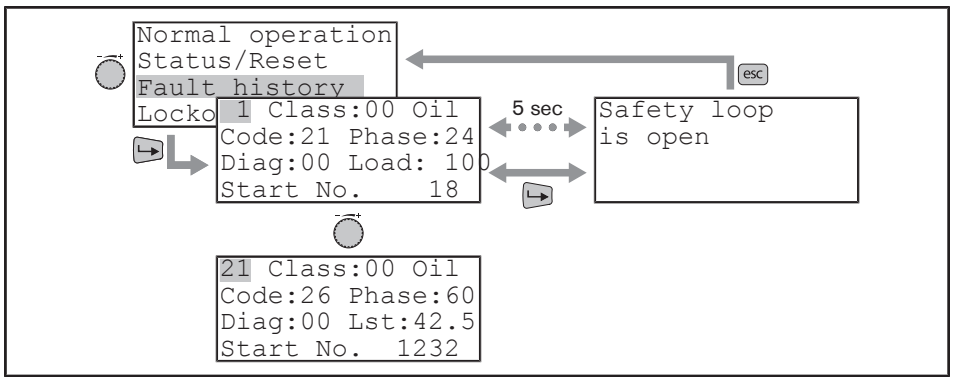
The burner restarts automatically as soon as the fault condition has been rectified.

Fault history

OperationalStat	FaultHistory		

Parameter `FaultHistory` alternately shows the last 21 faults as plain text or diagnostic display [ch. 9.4].

- ► Select History using dial knob and confirm with [Enter].
- ► Browse history with the dial knob.
- ✓ The display changes every 5 seconds between plain text and diagnostic display. The [Enter] key can be used to manually change the display.
- ► Exit History using [esc] key.



The diagnostic display provides information about:

- Fault number (`1 … 21`)
- Fault class (`Class:`)
- Current fuel when fault occurred (`Oil` or `Gas`)
- Fault code (`Code:`)
- Operating phase when fault occurred (`Phase:`)
- Diagnostic code (`Diag:`)
- Load setting or stage when fault occurred (`Load:`)
- Number of burner starts (`Start No.`)

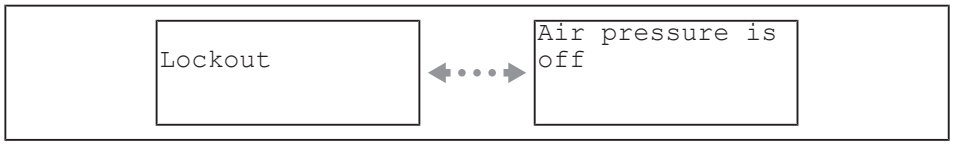
9.3 Lockout

If a lockout condition occurs, the combustion manager initiates a fault shutdown and burner lockout.

The display and operating unit alternately shows the shutdown behaviour and the fault diagnosed as a plain text display.

Once the fault has been rectified, the combustion manager has to be reset for re-start.

Example

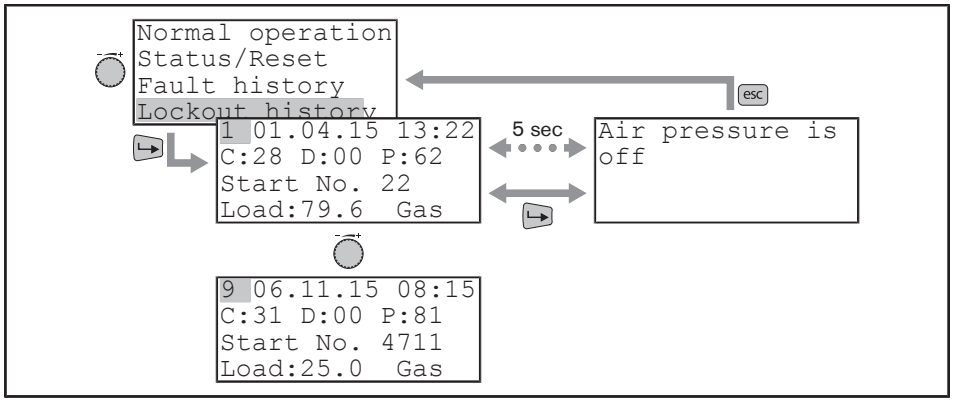


Lockout history

OperationalStat	LockoutHistory		

Parameter `LockoutHistory` alternately displays the last 9 faults as plain text or diagnostic display [ch. 9.4].

- ► Select History using dial knob and confirm with [Enter].
- ► Browse history with the dial knob.
- ✓ The display changes every 5 seconds between plain text and diagnostic display. The [Enter] key can be used to manually change the display.
- ► Exit History using [esc] key.



The diagnostic display provides information about:

- Fault number (`1 … 21`)
- Date when fault occurred (`dd.mm.yy`)
- Time when fault occurred (`hh.mm`)
- Fault code (`C:`)
- Diagnostic code (`D:`)
- Operating phase when fault occurred (`P:`)
- Number of burner starts (`Start No.`)
- Load setting or stage when fault occurred (`Load:`)
- Current fuel when fault occurred (`Oil` or `Gas`)

9.4 Rectifying faults

Fault codes	Diagnostic code	Cause	Rectification
01	01	ROM error	Internal fault(1
02	01 … 07	RAM error	Internal fault(1
03	01 … 60	Error during internal data comparison	Internal fault(1
04	–	Synchronisation error	Internal fault(1
05	01 … 03	Error flame signal amplifier test	► Check electrical connection ► Replace flame sensor
06	01 … 04	Error internal hardware test	Internal fault(1
10	01 … 1B	Error on input or output	The diagnostic code indicates which input or output is affected.
	01	Load controller external on / off	► Check neutral conductor to W-FM. ► Check electrical connection ► Check if a capacitive load is connected. A fault could be triggered if the internal relay switches off and the capacitive load delays the voltage drop by 10 ms. Internal fault(1 * Depending on the operating phase an impermissible voltage signal is present at the corresponding output. This could be triggered by reverse voltage caused by an operating signal (e. g. during a lamp test).
	02	Fan contactor contact	
	03	Fuel selection Oil	
	04	Fuel selection Gas	
	05	Reset	
	06	Max. oil pressure switch	
	07	Minimum oil pressure switch	
	08	Valve proving gas pressure switch	
	09	Anti syphon valve / safety valve Oil SV return signal X6-03*	
	0A	Fuel valve Oil V1 return signal X8-02 / X8-03*	
	0B	Fuel valve Oil V2 return signal X7-01*	
	0C	Fuel valve Oil V3 return signal X7-02*	
	0D	Safety valve Gas SV return signal X9-01:1*	
	0E	Fuel valve Gas V1 return signal X9-01:4*	
	0F	Fuel valve Gas V2 return signal X9-01:3*	
	10	Ignition gas valve PV return signal X9-01:2*	
	11	Safety circuit, burner flange limit switch	
	12	Internal safety relay return signal	
	13	Low gas pressure switch	
	14	High gas pressure switch	
	15	Ignition return signal	
	16	Air pressure switch	
	17	Start release Oil	
	18	Heavy oil immediate start	
	19	External load controller open	
	1A	External load controller closed	
	1B	Start release Gas	
11	01	Contact return signal network short circuit	Internal fault(1

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
15	03 … 7F	Actuator position or speed not achieved	If several faults occur, the diagnosis codes are add up.
	01	Position error air actuator	► Check mechanics after the actuator for freedom of movement. Internal fault(1
	02	Position error fuel actuator	
	04	Position error auxiliary actuator1	
	08	Position error auxiliary actuator2	
	20	Position error auxiliary actuator3	
	10	Speed not achieved	► Check ramp time [ch. 6.9.1]. ► Check signal line between W-FM and frequency converter. ► Check signal line of speed measurement [ch. 3.3.21]. ► Check speed standardisation [ch. 6.14.3].
	40	Speed difference between setpoint and actual has exceeded tolerance	
16	00	Fault compound curve air actuator	► Check compound curve of relevant actuator, if necessary adjust [ch. 6.9.5].
	01	Fault compound curve fuel actuator	
	02	Fault compound curve auxiliary actuator1	
	03	Fault compound curve auxiliary actuator2	
	04	Fault compound curve auxiliary actuator3	
	05	Fault compound curve frequency converter	
	0A	P- part outside of permissible range	Check O_2 control parameters, if necessary adjust [ch. 6.10.4].
	0B	I- part outside of permissible range	
	0C	Tau outside of permissible range	
	0D	O_2 setpoint outside of permissible range	► Check values, if necessary readjust O_2 trim [ch. 6.10.2].
	0E	O_2 min value outside of permissible range	
	0F	O_2 compound value outside of permissible range	
	13	Presetting of ABE outside of permissible range	Internal fault(1
	14	Standardisation value outside of permissible range	► Check values, if necessary readjust O_2 trim [ch. 6.10.2].
	20	Exceeding permissible setpoint position range	Internal fault(1
	21	Presetting of ABE outside of permissible range	
	22	None of the def. cases were met during switch instruction	
	23	No defined ELR phase detected during switch instruction	
	40	Implausible setpoint position	
17	01	Timeout during program run synchronisation prior to data transfer	Internal fault(1
	02	Timeout during data transfer	
	03	CRC error during data transfer	
	3F	Difference detected during data comparison.	

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Fault codes	Diagnostic code	Cause	Rectification
18	–	Invalid value in a compound curve	▶ Check compound curves. ▪ Valid load range: 0 … 100 % ▪ Valid position range: 0 … 90° ▪ Valid speed range: 0 … 100 % During initial commissioning: ▶ Correct value. After previously correct operation: ▶ Replace W-FM.
19	01 … 2F	Actuator error during comparison between potentiometer channel A and B	If several faults occur, the diagnosis codes are add up.
	01	Air actuator fault	▶ Set `allowed Pot.diff` to `15`, see [ch. 6.13.3]. ▶ Check CAN Bus connection [ch. 5.1]. Internal fault(1
	02	Fuel actuator fault	
	04	Auxiliary actuator1 fault	
	08	Auxiliary actuator2 fault	
	20	Auxiliary actuator3 fault	
1A	1	Curve gradient between two load points too great. Maximum permissible gradient at 0.1 % load change: ▪ 3.6° (with 30 s ramp time) ▪ 1.8° (with 60 s ramp time) ▪ 0.9° (with 120 s ramp time)	▶ Change load assignment in the load points to fall below the maximum permissible gradient [ch. 6.9.5].
1B	–	The burner shuts down during the setting of the compound curves due to lack of heat demand.	▶ Set compound curves in `Manual` operating mode [ch. 6.7]. ✓ Prevents shutdown by the load controller. Shutdown only occurs if the temperature monitor responds. The current load point being adjusted can still be saved.
1C	01 … 3F	Ignition position for the relevant actuator is missing.	If several faults occur, the diagnosis codes are add up.
	01	Air actuator ignition position missing	▶ Set ignition position [ch. 6.9.4].
	02	Fuel actuator ignition position missing	
	04	Auxiliary actuator1 ignition position missing	
	08	Auxiliary actuator2 ignition position missing	
	10	Frequency converter ignition position missing	
	20	Auxiliary actuator3 ignition position missing	
1D	01 … 3F	Run time fault actuators / frequency converter	If several faults occur, the diagnosis codes are add up.
	01	Air actuator run time fault	▶ Check mechanics after the actuator for freedom of movement. ▶ Check actuator voltage supply. ▶ Check actuator ramp time [ch. 6.9.1]. ✓ Ramp time should not be less slowest actuator
	02	Fuel actuator run time fault	
	04	Auxiliary actuator1 run time fault	
	08	Auxiliary actuator2 run time fault	
	10	Frequency converter run time fault	
	20	Auxiliary actuator3 run time fault	

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Fault codes	Diagnostic code	Cause	Rectification
1E	01 … 3F	At least one actuator has not reached the specified special position.	If several faults occur, the diagnosis codes are add up.
	01	Air actuator has not reached the special position	▶ Check mechanics after the actuator for freedom of movement. ▶ Check actuator voltage supply.
	02	Fuel actuator has not reached the special position	
	04	Auxiliary actuator1 has not reached the special position	
	08	Auxiliary actuator2 has not reached the special position	
	10	Frequency converter has not reached the special position	
	20	Auxiliary actuator3 has not reached the special position	
	40	Speed has not reached the special position	▶ Check ramp time [ch. 6.9.1]. ▶ Check signal line between W-FM and frequency converter. ▶ Check signal line of speed measurement [ch. 3.3.21]. ▶ Check speed standardisation [ch. 6.14.3].
1F	01	Internal test of frequency converter module failed	Internal fault(1
	02	Rotational direction of fan incorrect	▶ Check rotation direction of motor. ▶ Check transmitter disc for speed measurement [ch. 3.3.21]. ▶ Check rotational direction of frequency converter.
	03	Impulse fault during speed measurement	▶ Check transmitter disc and proximity switch for speed measurement [ch. 3.3.21].
	04	Speed is not stable during speed standardisation	▶ Check motor. ▶ Check transmitter disc and proximity switch for speed measurement [ch. 3.3.21].
	05	Air actuator has not reached pre-purge position	▶ Check mechanics after the actuator for freedom of movement. ▶ Check actuator voltage supply.
	06	Internal speed test failed	Internal fault(1
	07	Safety circuit not closed during speed standardisation	▶ Check safety circuit
21	–	Safety circuit not closed	▶ Check safety circuit
22	–	Threshold of temperature monitor exceeded	▶ Check temperature of plant. ▶ Check setting of temperature limiter [ch. 6.12.13].

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

9 Troubleshooting

Fault codes	Diagnostic code	Cause	Rectification
23	00 … 03	Extraneous light during start-up	▶ Find and eliminate extraneous light source ▶ Check flame sensor ▶ Fuel valves leaking, check
	01	Extraneous light flame sensor QR…	
	02	Extraneous light ionisation electrode	
	03	Extraneous light flame sensor QR… and ionisation electrode	
24	00 … 03	Extraneous light during shutdown	
	01	Extraneous light flame sensor QR…	
	02	Extraneous light ionisation electrode	
	03	Extraneous light flame sensor QR… and ionisation electrode	
25	00 … 03	No flame at the end of the safety time	▶ Check ignition ▶ Check burner setting ▶ Check flame sensor ▶ Check fuel valves
	01	No flame ionisation electrode	
	02	No flame flame sensor QR…	
	03	No flame flame sensor QR… and ionisation electrode	
26	00 … 03	Flame failure during operation	▶ Check burner setting ▶ Check fuel supply ▶ Check flame signal [ch. 6.4.7]
	01	No flame ionisation electrode	
	02	No flame flame sensor QR…	
	03	No flame flame sensor QR… and ionisation electrode	
27	–	Impermissible ON signal from air pressure switch	▶ Check air pressure switch [ch. 3.3.4]. ▶ Check pressure switch release [ch. 3.4.4].
28	–	Impermissible OFF signal from air pressure switch	
29	–	Impermissible ON signal from fan contactor contact	▶ Check electrical connection and fan contactor contact [ch. 3.3.5]. ▪ Supply for contactor contact X3-02:1
2A	–	Impermissible OFF signal from fan contactor contact	
2B	–	Impermissible ON signal from FGR air pressure switch	
2C	–	Impermissible OFF signal from FGR air pressure switch	
2D	–	Impermissible ON signal at input start release Gas	
2E	–	Impermissible OFF signal at input start release Gas	
2F	–	Low gas pressure switch has reacted	▶ Check gas connection pressure ▶ Check gas pressure switch
30	–	High gas pressure switch has reacted	
31	–	Valve proving gas pressure switch has reacted, contact open, V1 leaking or V2 does not open.	▶ Check gas pressure switch ▶ Check double gas valve
32	–	Valve proving gas pressure switch has dropped out, contact closed, V2 or ignition gas valve leaking or V1 does not open.	

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
33	–	Unexpected oil pressure, min. oil pressure switch has triggered, contact closed	
34	–	Min. oil pressure switch has not reacted, contact open	▶ Check pump pressure. ▶ Check oil supply ▶ Check min. oil pressure switch.
35	–	Max. oil pressure switch has triggered, contact closed	
36	–	No signal at input start release Oil [ch. 3.3.9]	
37	–	No signal at input heavy oil immediate start [ch. 3.3.10]	
38	–	Low gas programme activated	▶ Check gas connection pressure
39	–	Internal safety time error	
3A	–	No burner identification is saved in the W-FM.	▶ Transfer data from the ABE [ch. 6.16.1].
3B	–	No HE password defined	
40	–	Internal safety relay fault	
41	–	Internal ignition contact setting fault	▶ Check electrical connection at output.
42	01 … FF	Internal fuel valve relay contact setting fault	If several faults occur, the diagnosis codes are add up.
	01	Anti syphon valve / safety valve Oil SV X6-03*	▶ Check electrical connection at output. Depending on the operating phase an impermissible voltage signal is present at the corresponding output. This could be triggered by reverse voltage caused by an operating signal (e. g. during a lamp test).
	02	Fuel valve Oil V1 X8-02 / X8-03	
	04	Fuel valve Oil V2 X7-01	
	08	Fuel valve Oil V3 X7-02	
	10	External solenoid valve Gas / safety valve Gas SV X9-01:1	
	20	Fuel valve Gas V1 X9-01:4	
	40	Fuel valve Gas V2 X9-01:3	
	80	Ignition gas valve PV X9-01:2	
43	01	No fuel or both selected via input X4-01	▶ Check electrical connection [ch. 6.4.2].
	02	Fuel supply without compound curves	▶ Set fuel.
	03	Variable "Supply" not defined	▶ Transfer data from the ABE [ch. 6.16.1].
	04	Variable "Fuel" not defined	▶ Check fuel selection [ch. 6.4.2].
	05	Undefined operating mode with load controller	▶ Check operating mode [ch. 6.12.2].
	06	Pre-purge time Gas too short	Internal fault(1
	07	Pre-purge time Oil too short	
	08	Safety time 1 Gas too long	
	09	Safety time 1 Oil too long	
	0A	Time ignition Off greater than safety time 1 Gas	
	0B	Time ignition Off greater than safety time 1 Oil	
	0C	Safety time 2 Gas too long	
	0D	Safety time 2 Oil too long	

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

9 Troubleshooting

Fault codes	Diagnostic code	Cause	Rectification
44	01 … 04	Deactivated input connected.	▶ Activate input or connect nothing.
	01	Load controller input X62	Some inputs can only be activated in the OEM level.
	02	Air pressure switch input X3-02	
	03	Fan contactor contact input X4-01:3	
	04	Low gas pressure switch input X9-03:4	
	05	High gas pressure switch input X9-03:3	
	06	Min. oil pressure switch input X5-01	
	07	Max. oil pressure switch input X5-02	
	08	Start release Oil input X6-01:1	
	09	Heavy oil immediate start input X6-01:3	
	0A	Start release Gas input X7-03:2	
	0B	Safety temperature monitor for high temperature input X6-01:3	
45	–	Safety shutdown during safety temperature limiter test	
46	01 … 07	Program stop is activated, the program sequence stops in the defined phase	▶ Deactivate the program stop if it is no longer required [ch. 6.9.4].
	01	Stop in phase 24, pre-purge position	
	02	Stop in phase 32, auxiliary actuator3 in pre-purge position	
	03	Stop in phase 36, ignition position	
	04	Stop in phase 44, flame signal	
	05	Stop in phase 52, ignition pilot valve OFF	
	06	Stop in phase 72, post-purge position	
	07	Stop in phase 76, auxiliary actuator3 in post-purge position	
47	–	Signal start release Gas input X7-03:2 missing	
48	00	2 flame signals instead of one present	
49	01	External flame detector connected via contact and flame sensor	If an external flame detector is connected to X6-01:3, no flame sensor must be connected to X10.
	02	External flame detector for high temperature connected via contact and 2 flame sensors	If an external high temperature monitor is connected to X6-01:3, only one flame sensor may be connected to X10 for low-temperature operation.
50	00 … 07	Error in key value test	Internal fault(1
51	00 … 07	Time block overrun	Internal fault(1
52	00 … 03	Stack fault	Internal fault(1
53	01	Incorrect reset condition	Internal fault(1

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
57	00 … 05	Prohibited setting "and not" (`&/`)	The diagnostic code indicates the appropriate parameter.
	00	In `SensExtranlGas`	▶ Change setting (OEM level).
	01	In `SensExtranlOil`	
	02	In `SensPilotPhGas`	
	03	In `SensPilotPhOil`	
	04	In `SensOperPhGas`	
	05	In `SensOperPhOil`	
57	06	FGR mode `temp.contr.` is not permitted	Function is only available for type LMV52.4…
	07	Prohibited setting `HTempGuard`	▶ Change setting (OEM level).
	08	Prohibited setting `ext.FlameGd`	
	09	FGR mode deviating from `Aux3onCurve` is not permitted	▶ Set `Aux3onCurve`.
	0A	Prohibited setting in `AuxActuator`, VSD and Aux3 not permitted	▶ Change setting (OEM level).
	0B	Config X5-03 `CoolFctStby` is not permitted	▶ Change setting [ch. 6.8.9].
	0C	Double assignment input X5-03	▶ Change `LC_OptgMode` or `Config X5-03`, see [ch. 6.8.9].
	0D	Prohibited setting `HT/FG-RedCo`	▶ Change setting (OEM level).
	0E	Prohibited setting in `COx` , `OptgMode COx Gas` and `OptgMode COx Oil` are deactivated unequally	▶ Change setting [ch. 6.11.1]. Function is only available for type LMV52.4…
58	–	Parameter set is corrupted	▶ Reset W-FM, see [ch. 9.1].
59	–	Parameter set is corrupted	If the error occurred during a parameter change: ▶ Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ▶ Load data from the ABE [ch. 6.16.1].
5A	–	Parameter set is corrupted	
5B	–	Parameter set is corrupted	
5C	–	Data from the ABE was transferred to the W-FM	▶ Reset W-FM, see [ch. 9.1].
5D	–	Internal fault W-FM	▶ Reset W-FM, see [ch. 9.1].
5E	–	Internal fault W-FM	If the error occurred during a parameter change: ▶ Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ▶ Load data from the ABE [ch. 6.16.1].
5F	–	Data backup was interrupted	▶ Repeat data backup [ch. 6.16.1].

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

9 Troubleshooting

Fault codes	Diagnostic code	Cause	Rectification
60	–	Internal fault W-FM	▶ Reset W-FM, see [ch. 9.1].
61	01 … 23	Internal fault W-FM	If the error occurred during a parameter change: ▶ Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ▶ Load data from the ABE [ch. 6.16.1].
70	01 … 04	Failed to restore lockout information	Internal fault(1
71	–	W-FM locked out manually via input X4-01:4	▶ Reset W-FM, see [ch. 9.1].
72	01 … 04	Implausible fault entry	Internal fault(1
80	01 … 03	Prohibited condition auxiliary actuator3	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
81	01 … 03	Prohibited condition air actuator	
82	01 … 03	Prohibited condition fuel actuator Gas	
83	01 … 03	Prohibited condition fuel actuator Oil	
84	01 … 03	Prohibited condition auxiliary actuator1	
85	01 … 03	Prohibited condition auxiliary actuator2	
86	01 … 03	Prohibited condition internal load controller	Internal fault(1
87	01 … 03	Prohibited condition ABE	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
88	01	Plausibility fault actuators	Internal fault(1
	02	Plausibility fault load controller	
	03	Plausibility fault ABE	
	04	Plausibility fault frequency converter module	
	05	Plausibility fault O_2 module	
90	–	ROM-CRC error auxiliary actuator3	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
91	–	ROM-CRC error air actuator	
92	–	ROM-CRC error fuel actuator Gas	
93	–	ROM-CRC error fuel actuator Oil	
94	–	ROM-CRC error auxiliary actuator1	
95	–	ROM-CRC error auxiliary actuator2	
96	–	ROM-CRC error auxiliary actuator2	Internal fault(1
97	–	ROM-CRC error ABE	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
98	–	At least two actuators with the same address on the CAN-Bus	Check address [ch. 6.13.1].
99	–	CAN-Bus connection error	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
9A		CAN-Bus connection error, error often occurs when a bus user is connected or disconnected	
9B		Queue overflow CAN-Bus	

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
A0	01 … 1F	Auxiliary actuator3 has signalled a fault	► Check CAN Bus and Bus connection [ch. 5.1].
	01	CRC error during ROM test	Internal fault(1
	02	CRC error during RAM test	
	04	Error in key value test	
	05	Time block overrun	
	07	Synchronisation or CRC error	
	08	Cycle counter error	
	09	Error during stack test	
	0C	Temperature in the actuator too high	Check housing temperature (max. 60°C), if necessary supply with cooling air.
	0D	Rotational direction of actuator incorrect	► Check mechanics after the actuator for freedom of movement. ► Check rotation direction, change if required (OEM level).
	0E	Ramp time for path insufficient	► Check actuator ramp time [ch. 6.9.1]. ✓ Ramp time should not be less slowest actuator ► Reduce path between special positions.
	10	Timeout during analogue to digital conversion	Internal fault(1
	11	Error during test analogue to digital converter	
	12	Error during analogue to digital conversion	
	13	Actuator position outside of permissible range (0 … 90°)	► Check actuator position, if necessary turn back mechanically.
	15	CAN-Bus connection error	► Check CAN Bus connection [ch. 5.1].
	16	CRC error of parameter page	
	17	Page was open too long	► Reset W-FM, see [ch. 9.1].
	18	Page has been corrupted	If the error occurred during a parameter change: ► Check parameter that was last changed for plausibility.
	19	Invalid access to parameters	
	1B	Error when copying a parameter page	If the reset does not achieve a fault free condition: ► Load data from the ABE [ch. 6.16.1]. If none of the actions listed leads to a fault free condition: ► Replace W-FM.
	1E	Invalid position range in drive command	► Check SpecialPositions. ✓ Valid position range: 0 … 90°
	1F	Internal plausibility fault	► Optimise EMC measures.
A1	See A0	Air actuator has signalled a fault	See A0
A2	See A0	Fuel actuator Gas has signalled a fault	See A0
A3	See A0	Fuel actuator Oil has signalled a fault	See A0
A4	See A0	Auxiliary actuator1 has signalled a fault	See A0
A5	See A0	Auxiliary actuator2 has signalled a fault	See A0

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

9 Troubleshooting

Fault codes	Diagnostic code	Cause	Rectification
A6	10 … 32	Internal load controller has signalled a fault	Internal fault(1
	10	No actual value gradient	
	12	Invalid proportional part (Xp)	Check O_2 control parameters, if necessary adjust [ch. 6.10.4]. Internal fault(1
	13	Invalid integral part (Tn)	
	14	Invalid delay time (Tu)	
	15	Invalid differential part (Tv)	
	16	Timeout during observation phase of automatic adaption	Internal fault(1
	17	Boiler cold start function is activated	
	18	Timeout during automatic adaption	
	22	Setpoint exceeds limit value	
	30 … 32	Internal memory fault	
A6	33	CRC error during data transfer	► Reset W-FM, see [ch. 9.1]. ► Repeat data backup [ch. 6.16.1].
A6	34 … 3B	Internal load controller fault	Internal fault(1
A6	40	Page was open too long	► Reset W-FM, see [ch. 9.1]. If the error occurred during a parameter change: ► Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ► Load data from the ABE [ch. 6.16.1]. If none of the actions listed leads to a fault free condition: ► Replace W-FM.
A6	41 … 43	Internal load controller fault	Internal fault(1
A6	41 … 46	Error in the data set from the internal load controller	
	44	Page was set to ABORT	► Reset W-FM, see [ch. 9.1]. If the error occurred during a parameter change: ► Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ► Load data from the ABE [ch. 6.16.1]. If none of the actions listed leads to a fault free condition: ► Replace W-FM.
	45	Page was set to RESTO	
	46	Page has invalid status	
A6	4A … 4E	Internal load controller connection error CAN-Bus	Internal fault(1

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
A6	50 … 5A	Load controller input error	The diagnostic code indicates which input is affected.
	50	Short circuit at input X60:1/4	► Check electrical connection and sensor.
	51	Break at input X60:1/4	
	52	Break at input X60:2/4	
	53	Short circuit at input X60:3/4	
	54	Break at input X60:3/4	
	55	Short circuit at input X60:3/4	
	56	Break at input X60:3/4	
	57	Excess voltage at input X61	
	58	Break or short circuit at input X61	
	59	Excess voltage at input X62	
	5A	Break or short circuit at input X62	
A6	5B	The output value is not available for output X63 in the current configuration.	► Change setting [ch. 6.12.7].
A6	5C	FGR sensor is not available in the current configuration.	► Change setting [ch. 6.15.3].
A6	60 … 6F	Internal load controller fault	Internal fault(1
A6	70 … 77	Load controller input signals fluctuate too much	The diagnostic code indicates which input is affected [ch. 3.3.20].
	70	Signal fluctuation input X60:1/4	► Check electrical connection ► Check signal (ripple voltage).
	71	Signal fluctuation input X60:2/4	
	72	Signal fluctuation input X60:3/4	
	73	Signal fluctuation PWM	
	74	Signal fluctuation U-input X61:2	
	75	Signal fluctuation I-input X61:3	
	76	Signal fluctuation U-input X62:2/4	
	77	Signal fluctuation I-input X62:3/4	
A6	78 … 7F	Load controller input signals too great or incorrect polarity.	The diagnostic code indicates which input is affected [ch. 3.3.20].
	78	Excess voltage or incorrect polarity input X60:1/4	► Check electrical connection ► Check voltage or current.
	79	Excess voltage or incorrect polarity input X60:2/4	
	7A	Excess voltage or incorrect polarity input X60:3/4	
	7B	Excess voltage or incorrect polarity PWM	
	7C	Excess voltage or incorrect polarity input X61	
	7D	Current flow is too high or incorrect polarity input X61	
	7E	Excess voltage or incorrect polarity input X62	
	7F	Current flow is too high or incorrect polarity input X62	
A6	80 … A6	Internal load controller fault	Internal fault(1
A6	A7	Incorrect or no additional sensor for boiler cold start function defined.	► Change setting [ch. 6.12.14].
A6	B0 … FF	Internal load controller fault	Internal fault(1

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
A7	01 … 08	Internal fault ABE	► Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
	09	Burner is locked out via OFF function of ABE.	► Reset W-FM, see [ch. 9.1].
	0A	Internal fault ABE	
	0B	Service message through burner starts	► Carry out service, reset start counter [ch. 6.4.4].
	0C	Save parameters failed	
	0D	`OilSettings` was selected in the menu, the fuel selection is set to Gas.	Select fuel Gas [ch. 6.4.2].
	0E	`GasSettings` was selected in the menu, the fuel selection is set to Oil.	Select fuel Oil [ch. 6.4.2].
	15 … 1A	Internal fault ABE	Internal fault(1
	1B	Error during data backup	► Reset W-FM, see [ch. 9.1]. ► Repeat data backup [ch. 6.16.1].
	1C … 28	Internal fault ABE	
	30	Bus communication error	► Check connection and settings [ch. 6.6.2].
	38	Interface mode could not be completed [ch. 6.6.1]	
	40	Configuration error via software (PC tool)	
	88 … 8A	Internal fault ABE	

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
A9	01 … 1F	Internal frequency converter module has signalled a fault	
	01 … 09	Internal frequency converter module fault	Internal fault(1
	0A	Speed or fuel meter not plausible, interference on the line	► Check line installation. ✓ Use screened line. Internal fault(1
	0C	Signal from frequency converter at alarm input X73:3 [ch. 3.4.11]	► Read fault code from frequency converter
	0D	Frequency converter module can not compensate the speed difference	► Check current signal for frequency converter [ch. 6.14.5]. ✓ The current signal of the W-FM must be matched to the frequency converter. ► Carry out speed standardisation [ch. 7.2.1.1]. The burner requires re-commissioning after each standardisation.
	0E	Error internal speed calculation	Internal fault(1
	15	CAN-Bus connection error	► Check CAN Bus and Bus connection [ch. 5.1].
	16	CRC error of parameter page	► Reset W-FM, see [ch. 9.1]. If the error occurred during a parameter change: ► Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ► Load data from the ABE [ch. 6.16.1]. If none of the actions listed leads to a fault free condition: ► Replace W-FM.
	17	Page was open too long	
	18	Page has been corrupted	
	19	Invalid access to parameters	
	1B	Error when copying a parameter page	
	1E	Invalid position range in drive command	► Check SpecialPositions. ✓ Valid position range: 0 … 100°
	1F	Internal plausibility fault	Internal fault(1

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

9 Troubleshooting

Fault codes	Diagnostic code	Cause	Rectification
AB	01 … 3F	O_2 module has signalled a fault	
	01 … 0A	Internal O_2 module fault	Internal fault(1
	10	Nernst voltage of O_2 sensor outside of permissible range	► Check electrical connection [ch. 3.3.25].
	12	Voltage thermocouple of O_2 sensor outside of permissible range	
	13	Voltage temperature compensation of O_2 sensor outside of permissible range	
	15	Temperature combustion air sensor outside of permissible range (-20 … +800°C)	► Check electrical connection and sensor [ch. 6.10.9]. ► Check temperature.
	16	Temperature flue gas temperature sensor outside of permissible range (-20 … +800°C)	
	17 … 1F	Internal fault O_2 module in test phase	Internal fault(1
	20	Sensor temperature of O_2 sensor too low	► Check voltage supply and unit fusing of internal O_2 module. ► Check voltage supply sensor heating (Q4/Q5) [ch. 3.3.25].
	21	Sensor temperature of O_2 sensor too high	Check sensor temperature [ch. 6.10.20].
	22	Errors during calculation test	Internal fault(1
	23	Internal resistance of O_2 sensor less than 5 Ω or greater than 150 Ω	► Check electrical connection [ch. 3.3.25]. ► Replace O_2 sensor [ch. 6.10.22].
	24	Reaction time of O_2 sensor greater than 5 seconds	► Check installation position of O_2 sensor [ch. 4.1]. ► Clean O_2 sensor. ► Replace O_2 sensor (sensor ageing). ► If necessary increase O_2 control limit.
	25	Error during sensor test [ch. 6.10.22]. O_2 value fluctuates, flow too low.	
	30	CAN-Bus connection error	► Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
	31	CRC error of parameter page	► Reset W-FM, see [ch. 9.1]. If the error occurred during a parameter change: ► Check parameter that was last changed for plausibility. If the reset does not achieve a fault free condition: ► Load data from the ABE [ch. 6.16.1]. If none of the actions listed leads to a fault free condition: ► Replace W-FM.
	32	Page was open too long	
	33	Page has been corrupted	
	34	Invalid access to parameters	
	38	Error when copying a parameter page	
	3E	Invalid external default	
	3F	Internal plausibility fault	Internal fault(1
B0	01, 02	Fault during output test	Internal fault(1
B1	01	Error in short circuit testing of inputs to outputs	Internal fault(1

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
B5	01	O_2 min. value not maintained [ch. 6.10.2]	▶ Check setting of compound curve [ch. 6.10.3]. ▶ Increase O_2 Offset [ch. 6.10.4]. ▶ increase distance O_2 min. value to O_2 set-point value [ch. 6.10].
	02	At least one O_2 min. value is missing	▶ Check O_2 min. values [ch. 6.10.2].
	03	At least one O_2 setpoint is missing	▶ Check O_2 setpoints [ch. 6.10.3].
	04	Adaption error in the load point defined under `LowFireAdaptPtNo` or in full load	▶ Repeat standardisation in both load points [ch. 6.10.3]. ▶ Increase `LowFireAdaptPtNo`, see [ch. 6.10.4].
	05	No valid O_2 value for at least 3 seconds	▶ Check connection of O_2 module and O_2 sensor.
	06	Air oxygen content not achieved in pre-purge (20.9 % ± 2 %)	▶ Fully open air influencing actuators in pre-purge [ch. 6.9.4]. ▶ Increase pre-purge time [ch. 6.8.1]. ▶ Replace O_2 sensor (sensor ageing).
	07	O_2 max. value not maintained [ch. 6.10.2]	▶ Check installation position and connection of O_2 sensor [ch. 4.1].
	08	O_2 min. value or O_2 max. value is missing [ch. 6.10.2]	▶ Check O_2 max. value. ▶ Check O_2 min. value at each load point
		Flue gas reaction time (Tau) is missing in the load point defined under `LowFireAdapt-PtNo` or in full load [ch. 6.10.4]	▶ Repeat standardisation in the relevant load point [ch. 6.10.3].
	09	Test time for O_2 monitor missing	▶ Change setting (OEM level).
	0A	Internal W-FM fault in conjunction with O_2 trim	Internal fault(1
B6	01	CO signal outside of the permissible range [ch. 6.11]	Check CO resistance circuit board connection [ch. 3.3.24].
	02	Prohibited setting `Time COx Alarm`	Check setting [ch. 6.11.2].
	03	Flue gas reaction time (Tau) is missing in the load point defined under `LowFireAdapt-PtNo` or in full load [ch. 6.10.4]	▶ Repeat standardisation in the relevant load point [ch. 6.10.3].
	04	CO limit value in operation exceeded	▶ Check combustion ▶ Check CO limit value of measurement transducer LT3 [ch. 7.5.1]. ▶ Increase `O2ModOffset`, see [ch. 6.10.4]. ▶ Increase `NumberTauSuspend`, see [ch. 6.10.5].
	05	CO limit value in pre-purge exceeded	▶ Fully open air influencing actuators in pre-purge [ch. 6.9.4]. ▶ Increase pre-purge time [ch. 6.8.1].
B7	00 … 3F	Error message from O_2 module, no valid CO signal	Check CO resistance circuit board connection [ch. 3.3.24].
	41	Connection between W-FM and O_2 module interrupted	▶ Check CAN Bus connection [ch. 5.1].
	42	Connection error CAN Bus between W-FM and O_2 module	▶ Check CAN Bus connection [ch. 5.1].
BA	01	O_2 module has aborted test of O_2 sensor	Internal fault(1
BB	00	Service interval for O_2 sensor expired	▶ Clean or replace O_2 sensor. ▶ Reset service interval [ch. 6.10.8].

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

9 Troubleshooting

Fault codes	Diagnostic code	Cause	Rectification
BE	00	Operating mode O_2 controller `co-nAutoDeac` is not permitted when `X86PtNi1000` is selected as FGR sensor.	▶ Connect FGR sensor to input X60 and define accordingly [ch. 6.15.3]. ▶ Set operating mode O_2 controller to `O2-Control` or `O2 Alarm`, see [ch. 6.10.1].
	01	Current start mode of O_2 trim is not permitted in conjunction with the CO function	▶ Deactivate CO function [ch. 6.11.1]. ▶ Set start mode to `standard` (OEM level).
BF	–	Fault in conjunction with O_2 trim or O_2 monitor. The fault history shows the cause just before fault "BF" (an error number in advance)	▶ Read fault history and rectify fault.
C5	01 … 2F	The ABE has detected outdated versions whilst comparing the Software of individual devices.	If several faults occur, the diagnosis codes are add up.
	01	W-FM software version not current	▶ Restart system and wait approx. 1 min until the display `Parameters are being updated` disappears. ▶ Reset W-FM, see [ch. 9.1]. If the reset does not achieve a fault free condition: ▶ Carry out software update of ABE. ▶ Replace relevant component.
	02	Load controller software version in the W-FM not current	
	04	ABE software version not current	
	08	Actuator software version not current	
	10	Frequency converter module software version in the W-FM not current	
	20	Software version of O_2module not current	
D1	01 … 03	Prohibited condition of frequency converter module in the W-FM	Internal fault(1
D3	01 … 03	Prohibited condition O_2 module	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
E1	–	ROM-CRC error frequency converter module in the W-FM	Internal fault(1
E3	–	ROM-CRC error O_2 module	▶ Check CAN Bus and Bus connection [ch. 5.1]. Internal fault(1
F0	–	Internal plausibility fault	Internal fault(1
F1	01 … 07	Calculate internal fault during pre-control for O_2 trim	▶ Check compound curves [ch. 6.10]. ▶ Check fuel type setting [ch. 6.10.6].
F2	07	Invalid value of O_2 module	
	08	Warning threshold for flue gas temperature exceeded	▶ Check flue gas temperature [ch. 6.10.19]. ▶ Check warning threshold for flue gas temperature [ch. 6.10.10].
	0A	O_2 sensor has not yet reached operating temperature [ch. 6.10.20]	▶ Wait until the O_2 sensor has reached operating temperature.

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

Fault codes	Diagnostic code	Cause	Rectification
F3	01	O_2 trim PI parameter missing	▶ Check PI parameter [ch. 6.10.4].
	02	No values defined for O_2 control variable limit	▶ Define O_2 control variable limit [ch. 6.10.4].
	03	O_2 control variable limit has been activated	▶ Check O_2 content in the flue gas and O_2 sensor [ch. 6.10.16]. ▶ Check O_2 control variable limit [ch. 6.10.4]. ▶ ▶ Check O_2 trim setting [ch. 6.10.2].
	04	Curve parameters for O_2 trim incomplete	▶ Check curve points for O_2 trim [ch. 6.10.2]. ▪ O_2 compound values ▪ O_2 setpoints ▪ O_2 min. values ▪ Standardisation values
	05	Internal fault W-FM	
	06	Supply air temperature present is not valid when setting O_2 trim	▶ Check supply air temperature sensor. ▶ Check combustion air temperature during commissioning [ch. 6.10.5].
	07	Blocking time for the O_2 sensor QGO 21 insufficient	▶ Increase factor `NumberTauSuspend`, see [ch. 6.10.5].
	08	O_2 value above 135 during controller initialisation in phase 60	▶ Check O_2 sensor (malfunction, secondary air). ▶ Increase factor `NumberTauSuspend`, see [ch. 6.10.5].
F4	01	Connection error CAN Bus between W-FM and O_2 module	▶ Check CAN Bus connection [ch. 5.1].
	15	Temperature combustion air sensor outside of permissible range (-20 … +800°C)	▶ Check electrical connection and sensor [ch. 6.10.9]. ▶ Check temperature.
	16	Temperature flue gas temperature sensor outside of permissible range (-20 … +800°C)	
F5	–	Load controller return signal fault	▶ Check CAN Bus connection [ch. 5.1]. Internal fault(1
F6	01	FGR function was automatically deactivated The fault history shows the cause just before fault "F6" (an error number in advance)	▶ Read fault history and rectify fault.
	02	Operating mode FGR `TCautoDeact` is not permitted when `X86PtNi1000` is selected as FGR sensor.	▶ Connect FGR sensor to input X60 and define accordingly [ch. 6.15.3]. ▶ Set FGR mode to `temp.contr.`, see [ch. 6.15.2].

(1 If occurring sporadically: Optimise EMC measures. If occurring continuously replace defective component.

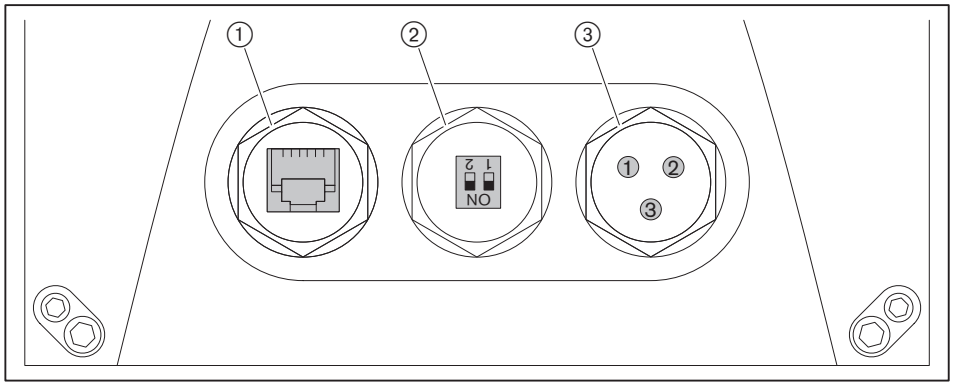
10 Technical documentation

10.1 Frequency converter

Detailed information see Frequency converter CD.

The construction and arrangement of diagnostic LEDs is dependent on the size of the frequency converter.

10.1.1 Frequency converter Nord size I … III



① Interfaces
② DIP switches
③ Diagnostic LED's

Interface

The interface is used to access the frequency converter via a PC.
The Software required can be found on the Frequency Converter CD.
A connection cable RJ12 to SUB-D9 is required for the connection (Order No. 743 361). A readily available USB interfaces converter USB to RS232 is also required for the connection to the USB port.

DIP switches

The analogue inputs AIN1 and AIN2 are configured via setting of the DIP switches.

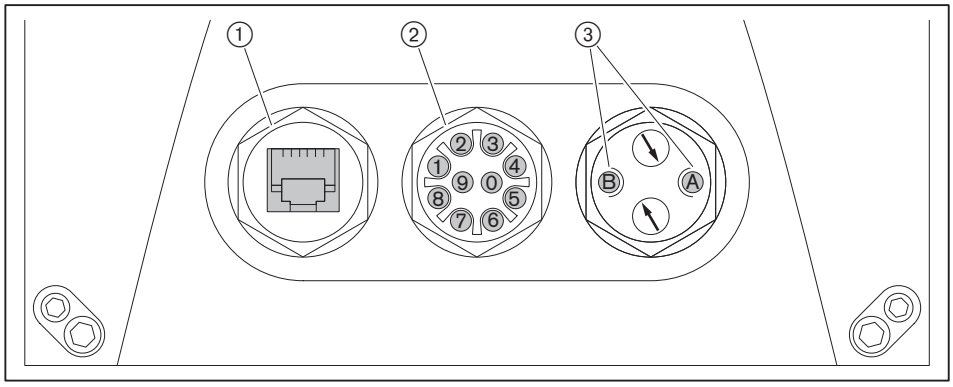
Factory setting (4 … 20 mA):
- Switch 1: ON
- Switch 2: ON

Diagnostic LED's

LED	Signal		Description
1 (BUS-S)	–		System bus status (not used)
2 (BUS-E)	–		System bus fault (not used)
3 (DS)	OFF		No mains voltage and no control voltage
	Green		Operation, FC operating
	Flashing green	0.5 Hz(1	Ready for operation
		4 Hz(1	Start blocked
	Flashing red/green	4 Hz(1	Warning
		1 … 25 Hz(1	Intensity overload
	Flashing red Number ≙ flashing codes		Fault, flashing codes see Frequency converter CD

(1 1 Hz ≙ once per second

10.1.2 Frequency converter Nord size IV



① Interfaces
② Diagnostic LED's
③ Status LED's

Interface

The interface is used to access the frequency converter via a PC.
The Software required can be found on the Frequency Converter CD.
A connection cable RJ12 to SUB-D9 is required for the connection (Order No. 743 361). A readily available USB interfaces converter USB to RS232 is also required for the connection to the USB port.

Diagnostic LED's

LED	Signal	Description
1 (DOUT1)	yellow	Alarm from frequency converter (digital output 1)
2 (DOUT2)	yellow	Signal at digital output 2
3 (BRAKE)	yellow	Mechanical brake
4 (TEMP)	yellow	Excess temperature at motor
5 (DIN4)	yellow	Signal at digital input 4
6 (DIN3)	yellow	Signal at digital input 3
7 (DIN2)	yellow	Signal at digital input 3
8 (DIN1)	yellow	Frequency converter start release (digital input 1)
9 (BUS-S)	OFF	No Bus communication (system bus)
	Green	Bus communication
	Flashing green	Bus warning
0 (BUS-E)	OFF	System bus is operating correctly
	Flashing red	Monitoring fault
	red	No system bus

Status LED's

LED	Signal		Description
A (AS-i)	–		Status AS interface (not used)
B (DS)	OFF		No mains voltage and no control voltage
	Green		Operation, FC operating
	Green ON + red flashing		Frequency converter not ready for operation, control voltage applied but no mains voltage
	Flashing green	0.5 Hz(1	Ready for operation
		4 Hz(1	Start blocked
	Flashing red/green	4 Hz(1	Warning
		1 … 25 Hz(1	Intensity overload
	Flashing red Number ≙ flashing codes		Fault, flashing codes see Frequency converter CD

(1 1 Hz ≙ once per second

11 Key word index

Symbols

A

B

C

D

11 Key word index

11 Key word index

–weishaupt–

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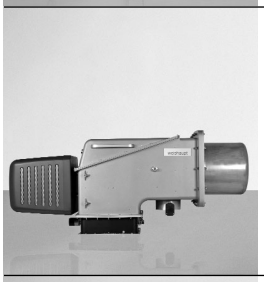

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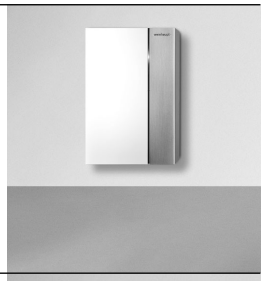

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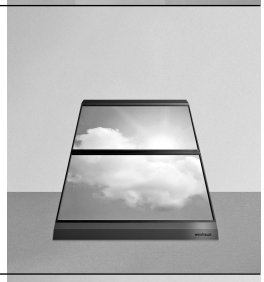

Solar systems

The stylish flat-plate collectors are the ideal complement for any Weishaupt heating system. They are suitable for solar water heating and for combined heating support. With versions for on-roof, in-roof and flat roof installations, solar energy can be utilised on almost any roof.

Water heaters/Energy storage

The diverse program of potable water and energy storage for various heat sources includes storage volumes of 70 to 3,000 litres. In order to minimize storage losses, potable water cylinders from 140 to 500 litres are available with highly efficient insulation using vacuum insulation panels.

Heat pumps **up to 180 kW**

The heat pump range offers solutions for the utilisation of heat from the air, the soil or ground water.
Some systems are also suitable for cooling buildings.

Geothermal probe drilling

With its daughter company, BauGrund Süd, Weishaupt also offers geothermal probe and well drilling. With the experience of more than 10,000 systems and more than 2 million meters of drilling, BauGrund Süd offers a comprehensive service program.