SIEMENS

RVW26.000B27
Electronic Air / Fuel Ratio Control System
Basic Documentation

The RVW26... and this Basic Documentation are intended for use by OEMs which integrate the ratio control system in their products!

CC1P7873.1en
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Siemens Building Technologies
HVAC Products

Contents

1 Safety notes

1.1 Warning notes

To avoid injury to persons, damage to property or the environment, the following warning notes should be observed!

Do not open, interfere with or modify the unit!

- Before performing any wiring changes in the connection area of the RVW26…, completely isolate the unit from the mains supply (all-polar disconnection)
- Ensure protection against electric shock hazard by providing adequate protection for the connection terminals
- Prior to commissioning and after changing fuses, check wiring, programming and all safety functions
- Fall or shock can adversely affect the safety functions. Such units may not be put into operation, even if they do not exhibit any damage

To ensure the safety and reliability of the electronic air / fuel ratio control system, the following points must also be observed

- Condensation and other effects of humidity must be avoided. Should they occur, the unit must be allowed to completely dry before switching on again
- Static charges must be avoided as they can destroy the unit's electronic components

Recommendation: Use ESD equipment

1.2 Mounting notes

Ensure that the relevant national safety regulations are complied with.

1.3 Installation notes

- Installation work and settings must be carried out by qualified staff
- When making the electrical wiring, observe an adequate distance between the AC 230 V side and the protective low-voltage section to ensure protection against electric shock hazard

1.4 Commissioning notes

- Commissioning work must be carried out by qualified staff
- After commissioning, check the flue gas values across the entire output range

1.5 Norms and standards

Conformity to EEC directives	
– Electromagnetic compatibility EMC (immunity)	89 / 336 EEC
– Directive for gas appliances	90 / 396 EEC

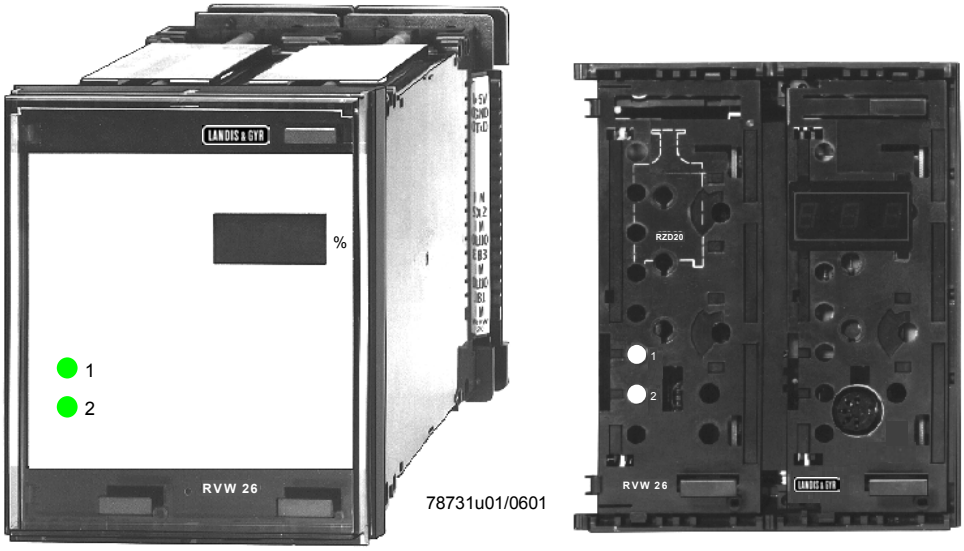
1.6 Service notes

- Maintenance work must be carried out by qualified staff
- Each time a unit has been replaced, check to ensure that wiring is in an orderly state and that the wires are firmly connected

1.7 Disposal notes

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

2 Front view and basic design



Unit front with front plate removed

Fig. 1 Font view and basic design of the RVW26...

All units of the RVW2... range are of plug-in design and used with the following types of housings: **ARG61.040** or **ARG61.010**.

A socket for connecting the handheld terminal AZW20.20 is located behind the aluminium front plate.

The front plate can be sealed.

Abbreviations and designations used in this document

A	End switch «Fully open» (used with actuators)	LR	Load controller
Aux	Auxiliary function	P	Potentiometer (used with actuators)
FA	Burner control	SA	Actuator
FU	Variable speed drive	TG	Tacho-generator
Load	Burner output	Z	End switch «Fully closed» (used with actuators)

3 General

Short description

The electronic control units RVW25... and RVW26... are designed for air / fuel ratio control in connection with modulating burners.
They use a variable speed drive for controlling the fan motor, actuators for driving the fuel control valve and – optionally – an additional actuating device, depending on the required burner output.
The RVW25... and RVW26... ensure that the air / fuel ratio and the position of the auxiliary actuator (AUX) correspond to the programmed curves across the burner's entire working range.

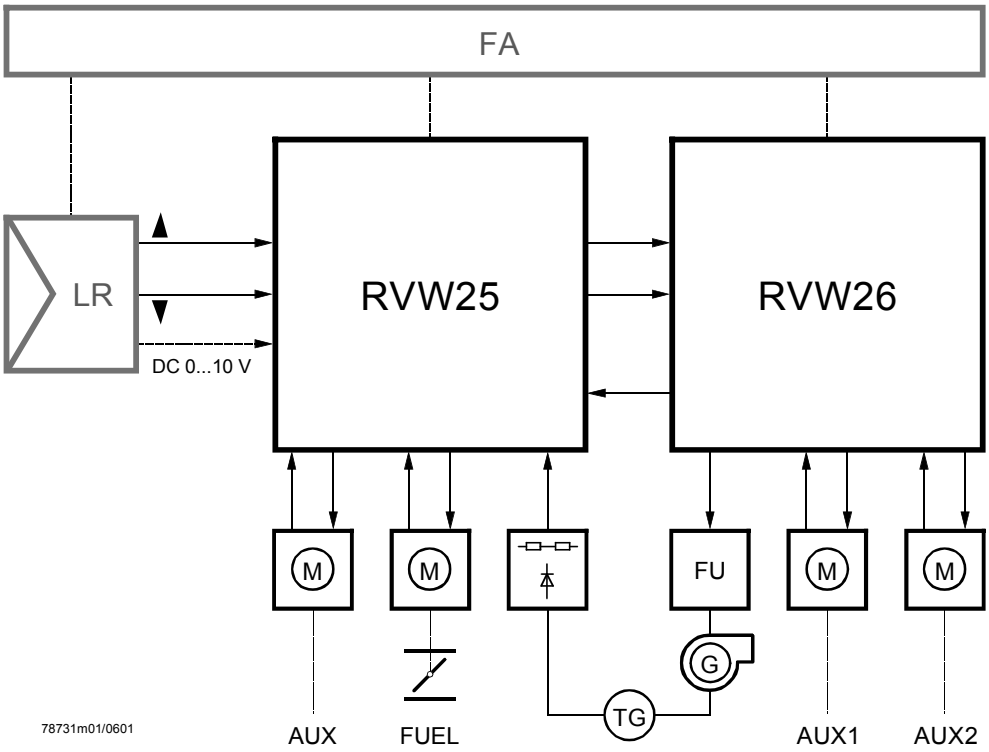


Fig. 2 Basic diagram of burner control, load controller, RVW25... and RVW26...

The RVW26... must **always** be used in connection with a burner control, an RVW25... and a load controller that delivers either a 3-position or DC 0…10 V control signal.
Both burner startup and burner shutdown are controlled by the burner control.
The RVW26… is designed specifically for use with our burner controls, for safety reasons, the control sequence of the signals must be fully adhered to.
When commissioning the burner, the RVW26… can be matched to the burner plant by making the relevant parameter settings.
The parameters are set with the help of the handheld terminal AZW20.20.
Outputs «AUX1» and «AUX2» can be used to control an additional actuating device, such as a primary air damper, an adjustable head, or a flue gas damper.

3.1 Application

The electronic control units RVW25... and RVW26... are designed for use with **modulating** single- or dual-fuel burners.

The RVW26... can control the following devices:

- 1 variable speed drive as defined by the RVW25... for controlling the fan speed
- 1 or 2 auxiliary actuators for auxiliary functions «AUX1 (1) / AUX1 (2) (SA5 / SA6)»
- 1 auxiliary actuator «AUX2» for auxiliary functions (SA7)

The auxiliary actuators can be used for control tasks where an actuating device responds to changes in burner output, for example:

- Throttling damper in the flue gas recirculation
- Adjustable burner head
- Flue gas damper for combustion chamber pressure control
- Primary air damper with burners using staged air supply

The following illustrations show a choice of applications:
In all application examples, actuators «SA2...SA4» are controlled by the RVW25... and actuators «SA5...SA7» are controlled by the RVW26...
The variable speed drive is controlled by the RVW26... as defined by the RVW25...

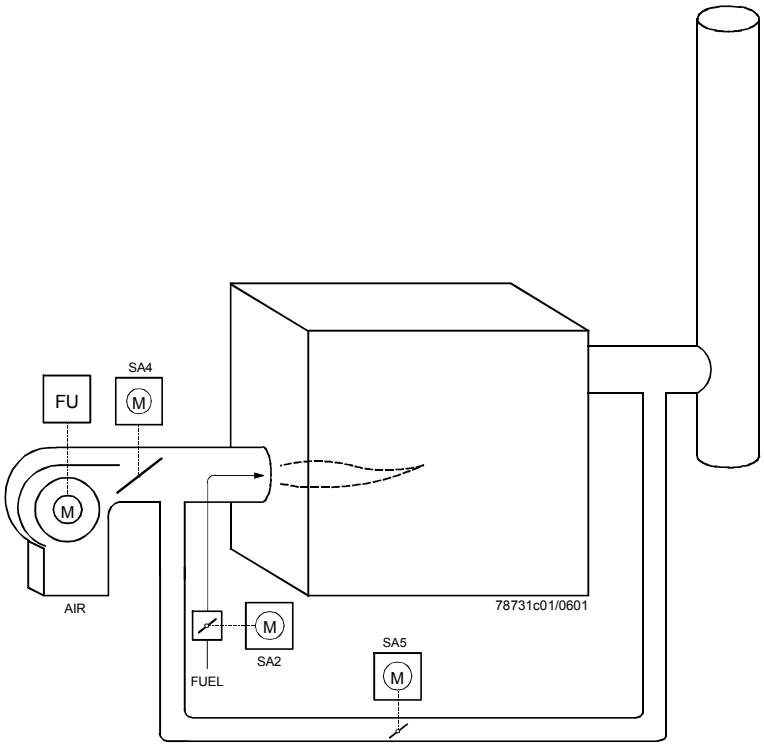


Fig. 3 Single-fuel burner with no auxiliary functions

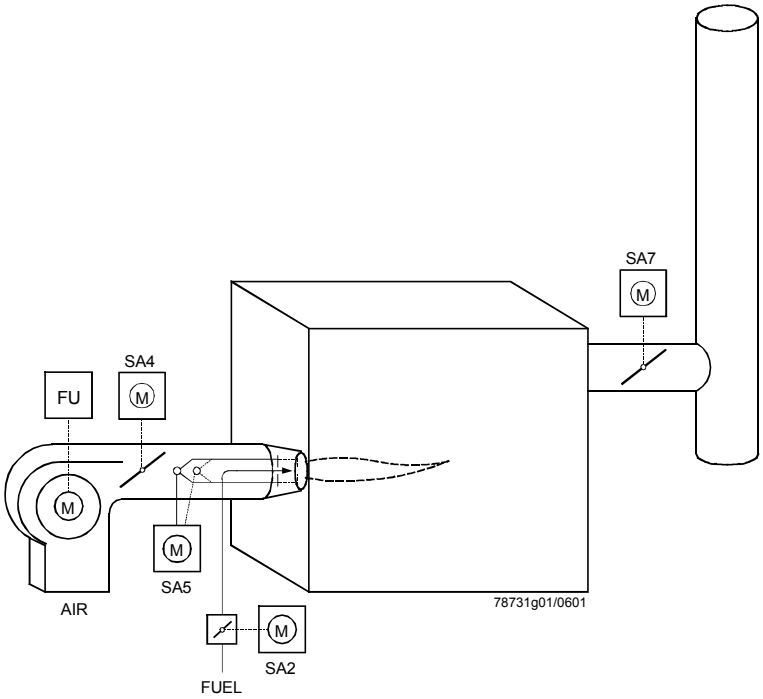


Fig. 4 Single-fuel burner with adjustable head and flue gas damper

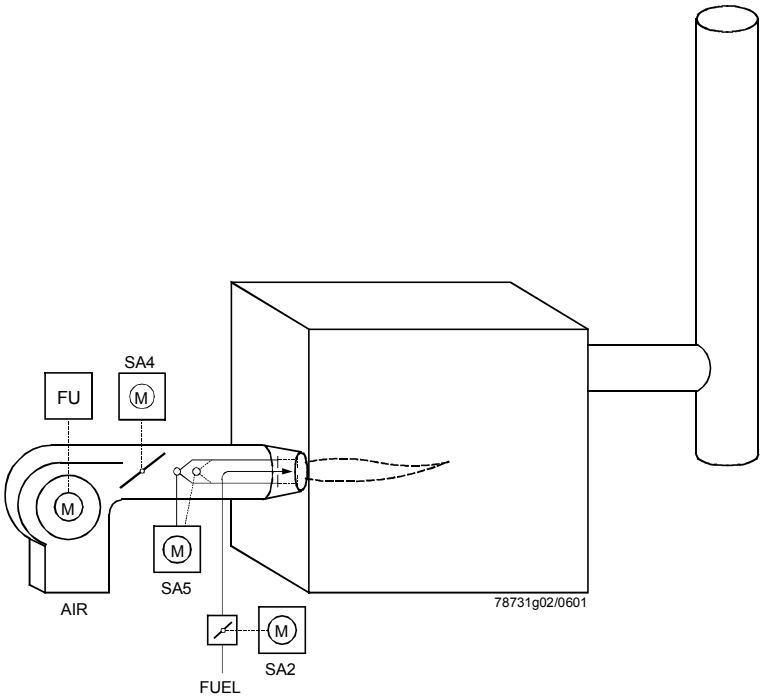


Fig. 5 Single-fuel burner with adjustable head

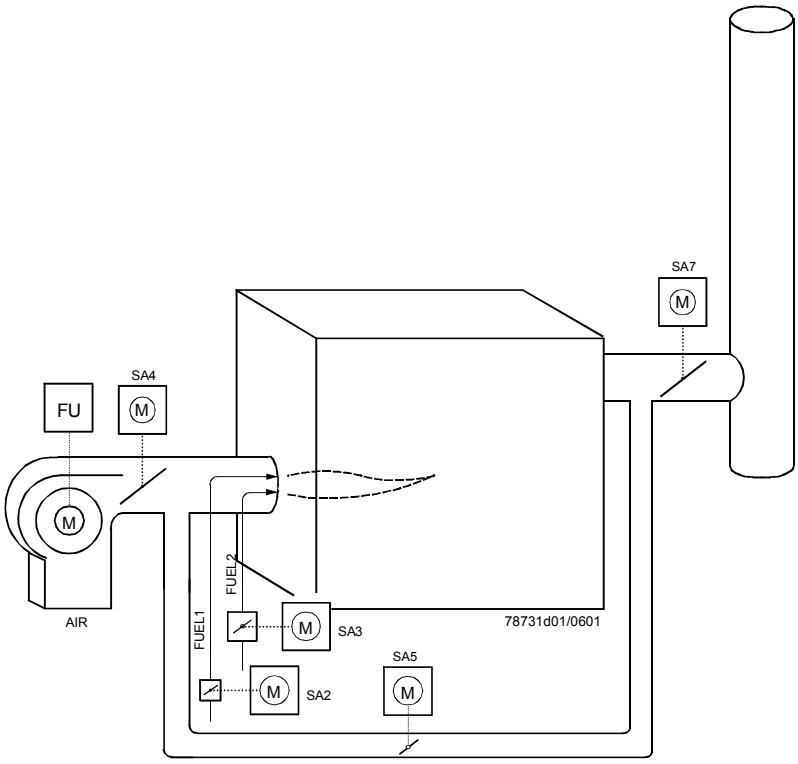


Fig. 6 Dual-fuel burner with flue gas recirculation and flue gas damper

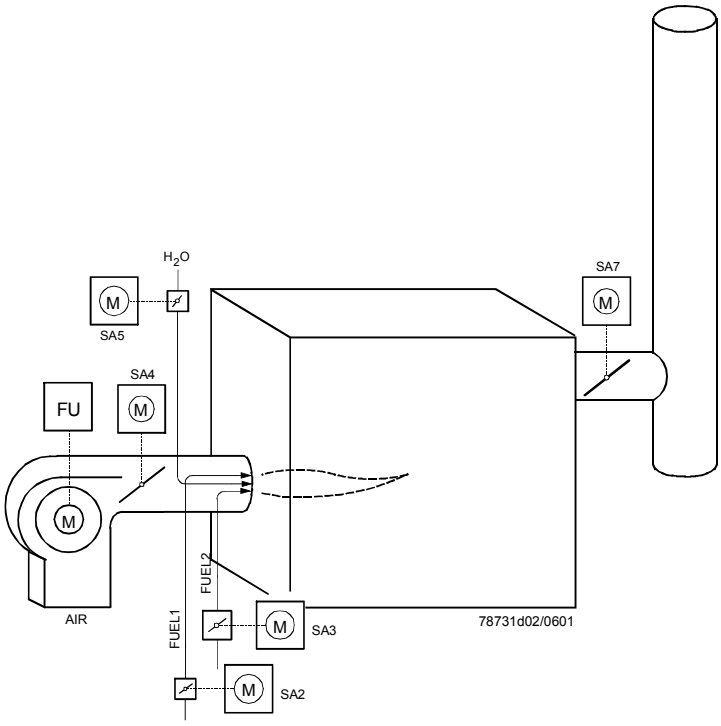


Fig. 7 Dual-fuel burner with flue gas damper and water injection

All combinations shown above can also be used in connection with O_2 trim control. In all cases, O_2 trim control acts on the fan motor that is controlled by the variable speed drive. On the applications according to Figures 4 and 5, the airflow resistance (volumetric airflow) also changes depending on actuator «SA5» of the RVW26... To ensure that «SA5» can also be influenced by O_2 trim control, parameter «Disturb» on programming level 4 must be set to the same value as with the RVW25...

4 Product range overview

Units and accessories

Electronic air / fuel ratio control unit **RVW20.000E27**
(without housing)
Standard version for use with electric actuators
(refer to Basic Documentation CC1P7871.2en)

Electronic air / fuel ratio control unit **RVW20.001E27**
Same as the RVW20.000…, but with changeover of fuel during operation and greater impact of correcting variables on O_2 trim control
(refer to Basic Documentation CC1P7871.2en)

Electronic air / fuel ratio control unit **RVW25.000B27**
Same as the RVW20.001E27, but with control of a variable speed drive for control of the fan speed
(refer to Basic Documentation CC1P7872.1en)

Electronic air / fuel ratio control unit **RVW26.000B27**
Extension of the RVW25… by 2 output channels

Housing for wall mounting **ARG61.040**

Housing for flush panel mounting **ARG61.010**

Tacho-generator interface **AGK34.000**

Handheld terminal **AZW20.20**
(with 2 m cable, KF8859) for use with all ECOGYR units RVW2... and RPO2...

Data storage module (exchangeable) **RZD20**

Cable of 2 m (for use with the AZW20.20) **KF8859**

Separate cable for handheld terminal (20 m long) **KF8860**

Exchangeable relay board (plug-in type)
- For use with the RVW20... of series C or higher **4 668 9846 0**
- For use with the RVW25... and RVW26... **4 668 9913 0**

Additional units required for controlling the burner

Burner controls	**LAL1..., LAL2...** **LGK16..., LOK16...** **LFL1..., LEC1...**
Actuators	**SQM54..., SQM30...[1]), SQN31...[1])**
Single potentiometer for use with actuators SQM..., SQN...90° / 1000 Ω	**ASZ12.803**
Single potentiometer 135° / 1000 Ω	**ASZ12.833**
Double potentiometer 90° / 1000 Ω	**ASZ22.803**
Double potentiometer 135° / 1000 Ω	**ASZ22.833**
Load controller	**RWF40...**

[1]) After a certain number of operating hours, the backlash of the geartrain of these actuators can reach levels that do not allow the RVW2... to achieve precise positioning, especially in the case of constant loads with the nominal torque or in heavy duty environments.
In that case, shutdown can occur, requiring the actuators to be replaced.

5 Description of functions

5.1 Burner startup

The startup and shutdown sequence is determined by the burner control.
The RVW26… identifies this control sequence from the burner control's output signals.
Conversely, the RVW26… indicates to the burner control when certain actuator positions are reached (Quit).
Burner startup and shutdown take place in phases (0...7 and 8...0) that appear on the display of the RVW26…

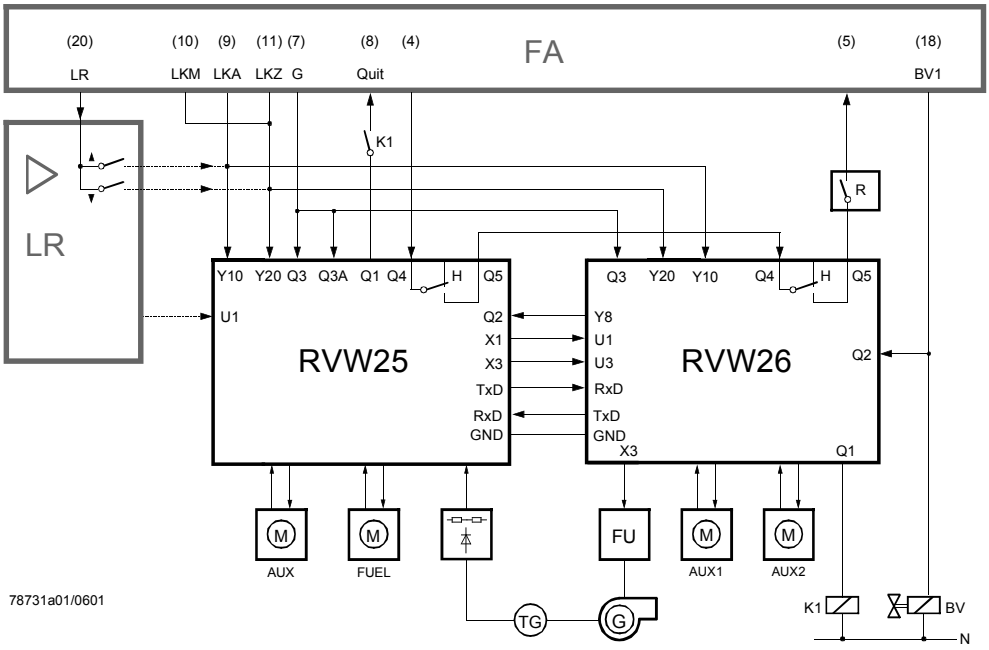
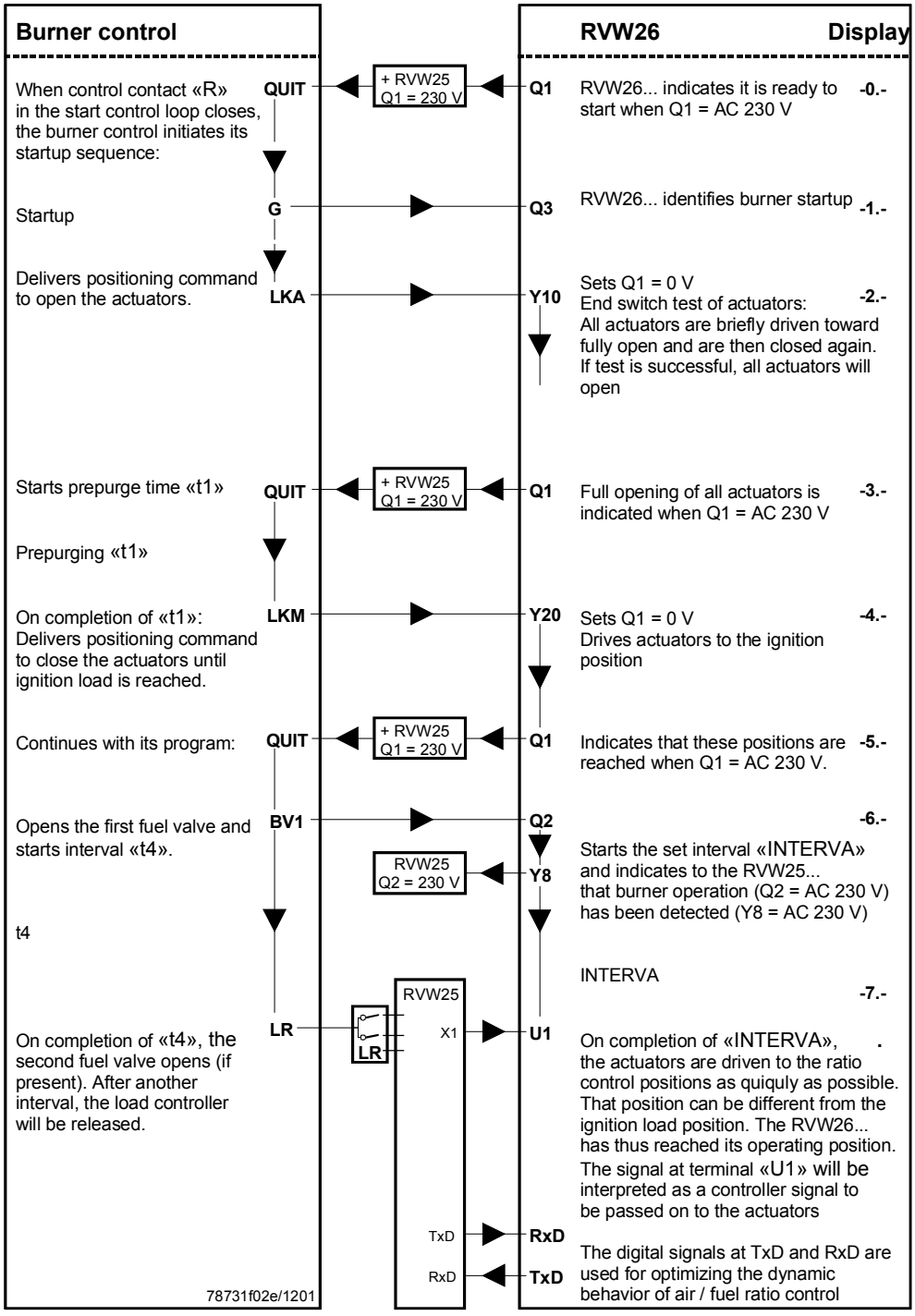


Fig. 8 The numbers in parentheses give the terminal markings of the LAL2..., LFL..., LGK... and LOK... (--- = analog or 3-position control signal)

The burner control's start control loop includes control contact «R» (e.g. RWF40...) and readiness contact «Q4...Q5».
The RVW26... detects burner startup from the signal received at input «Q3», which is connected to the burner control's fan output.
For safety reasons, fuel valve «BV» **may not be connected in parallel** to the RVW25... and RVW26..., but only to the RVW26...
The «Q2» signal for the RVW25... is generated by output «Y8» of the RVW26...
The tables on the following pages show the startup and shutdown sequences.

5.2 Startup


Burner control
RVW26
Display
When control contact «R» in the start control loop closes, the burner control initiates its startup sequence:
QUIT
+ RVW25 Q1 = 230 V
Q1
RVW26... indicates it is ready to start when Q1 = AC 230 V
-0.-
Startup
G
Q3
RVW26... identifies burner startup
-1.-
Delivers positioning command to open the actuators.
LKA
Y10
Sets Q1 = 0 V
End switch test of actuators:
All actuators are briefly driven toward fully open and are then closed again.
If test is successful, all actuators will open
-2.-
Starts prepurge time «t1»
QUIT
+ RVW25 Q1 = 230 V
Q1
Full opening of all actuators is indicated when Q1 = AC 230 V
-3.-
Prepurging «t1»
On completion of «t1»: Delivers positioning command to close the actuators until ignition load is reached.
LKM
Y20
Sets Q1 = 0 V
Drives actuators to the ignition position
-4.-
Continues with its program:
QUIT
+ RVW25 Q1 = 230 V
Q1
Indicates that these positions are reached when Q1 = AC 230 V.
-5.-
Opens the first fuel valve and starts interval «t4».
BV1
Q2
-6.-
RVW25 Q2 = 230 V
Y8
Starts the set interval «INTERVA» and indicates to the RVW25... that burner operation (Q2 = AC 230 V) has been detected (Y8 = AC 230 V)
t4
INTERVA
-7.-
RVW25
On completion of «t4», the second fuel valve opens (if present). After another interval, the load controller will be released.
LR
LR
X1
U1
On completion of «INTERVA», the actuators are driven to the ratio control positions as quiquly as possible. That position can be different from the ignition load position. The RVW26... has thus reached its operating position. The signal at terminal «U1» will be interpreted as a controller signal to be passed on to the actuators
TxD
RxD
RxD
TxD
The digital signals at TxD and RxD are used for optimizing the dynamic behavior of air / fuel ratio control
78731f02e/1201

5.3 Burner operation

Set load

To generate the set load signal, the reliable «X1» signal (DC 0...10 V) of the RVW25... is used.
To offset tolerances, the set load signal is also delivered via digital interface «TxD» and «RxD» of the RVW25.000B27 to the RVW26.000B27.
The fan speed will be changed as demanded by the RVW25...

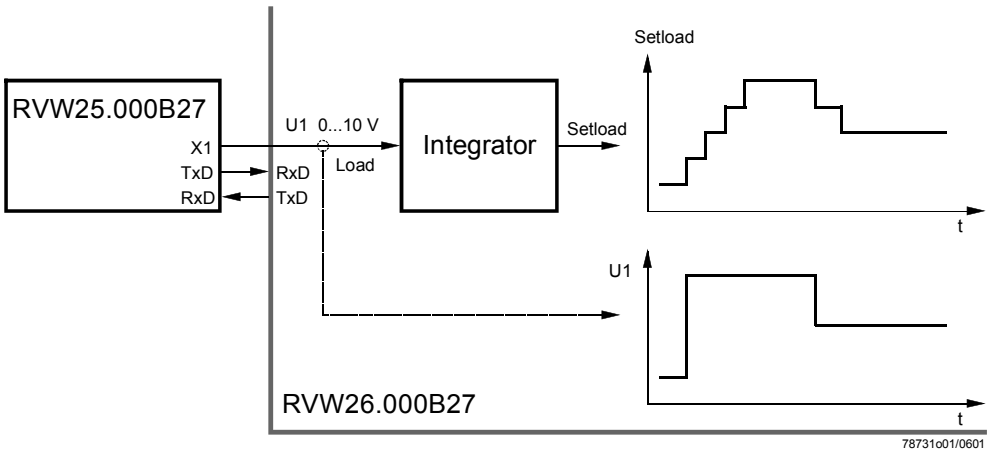


Fig. 9 Set load

The actuators must be able to follow the fan motor with no delay.
As a basic rule, the running time of the actuators should be 50 % of the variable speed drive's ramp time.
This means that the rate of load change is largely dependent on the ramp time of the variable speed drive.
Should the RVW26.000B27 not be able to follow the load change of the RVW25.000B27, a stop signal will be sent to the RVW25.000B27, which stops the load change until the RVW26.000B27 delivers a go signal again.
The actuator positions are determined via the programmable load / position curves and the set load signal.
In the operating position, this signal is available as an analog DC 0...10 V signal at output terminal «X1» for external use (also refer to section «Load signal output X1»).

Note:
The possibility of stopping the RVW25... in normal operation via the data interface works reliably only if the AZW20...is **not** connected.

Control of the actuator positions

For each actuator and each type of fuel, the RVW26… allows load / position curves to be programmed (refer to chapter «Programming»).

This means that a total of 4 curves can be programmed on the RVW26...

AUX1(1) Curve for auxiliary actuator «SA5» with fuel 1
AUX1(2) Curve for auxiliary actuator «SA5» or «SA6» with fuel 2
AUX2(1) Curve for auxiliary actuator «SA7» with fuel 1
AUX2(2) Curve for auxiliary actuator «SA7» with fuel 2

Auxiliary actuator «AUX2» can be deactivated via a parameter. For every output, burner output «Load» is assigned a position via its curve. According to the fuel selection made at «F1» or «F2», a maximum of 2 curves is thus selected (also refer to section «Selection of fuel»).

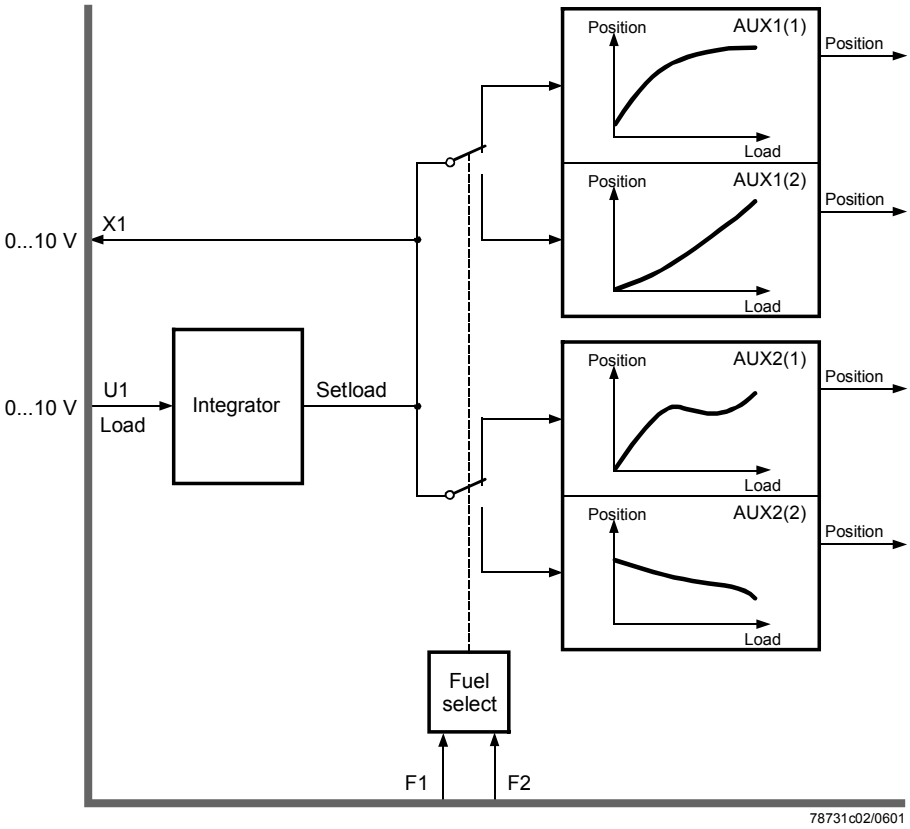


Fig. 10 Load settings

Setload Output as defined by the integrator (internal signal) with a value of between 0...100 %
Load **Current** burner output as predefined by the RVW25... with a value of between 0...100 %
Position Position of the actuators with a value of between DC 0.4...9.6 V

The load / position curves can be programmed across the entire burner output range (0...100 %).

On the **RVW25**..., 2 load limits can be set, separately for each type of fuel:
- «MinLoad» is the burner's minimum ouptut (low-fire)
- «MaxLoad» is the burner's maximum output (high-fire)

During normal burner operation, the current «Load» is available at terminal «X1» as a DC 0...10 V signal.

Control of the actuators

The programmed curves define the actuators' **required positions** depending on the current «Load». Each actuator has a feedback potentiometer «P» that delivers the **actual position** signal.

The cables of the feedback potentiometers must be screened.
On the RVW26…, the shield must be connected to terminal **«M»**.
The shield may never be connected to «PE».

The 3-position converters compare the setpoint with the actual value and pass appropriate positioning commands to the actuators.

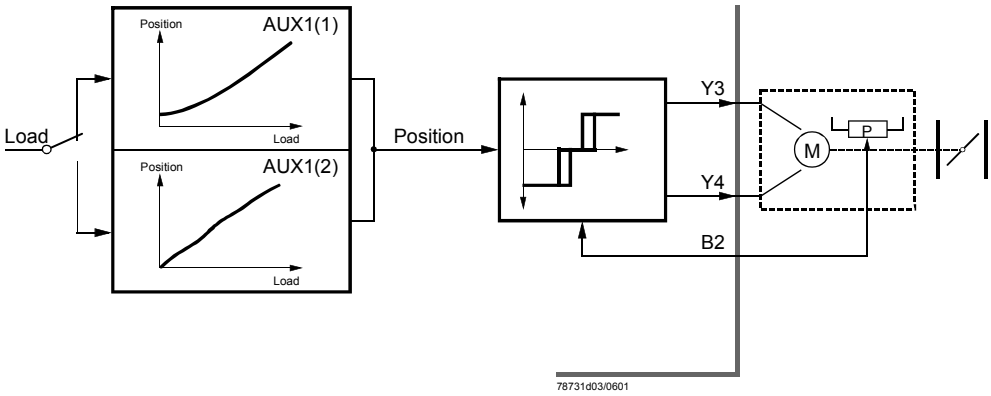


Fig. 11 Control of the actuators

Note:
The positioning accuracy (neutral zone) of the 3-position converter is 40 mV.
The RVW26… selects the smallest positioning pulse such that the actuator makes a movement of 40 mV (Δ position = 40 mV).

Readiness contact

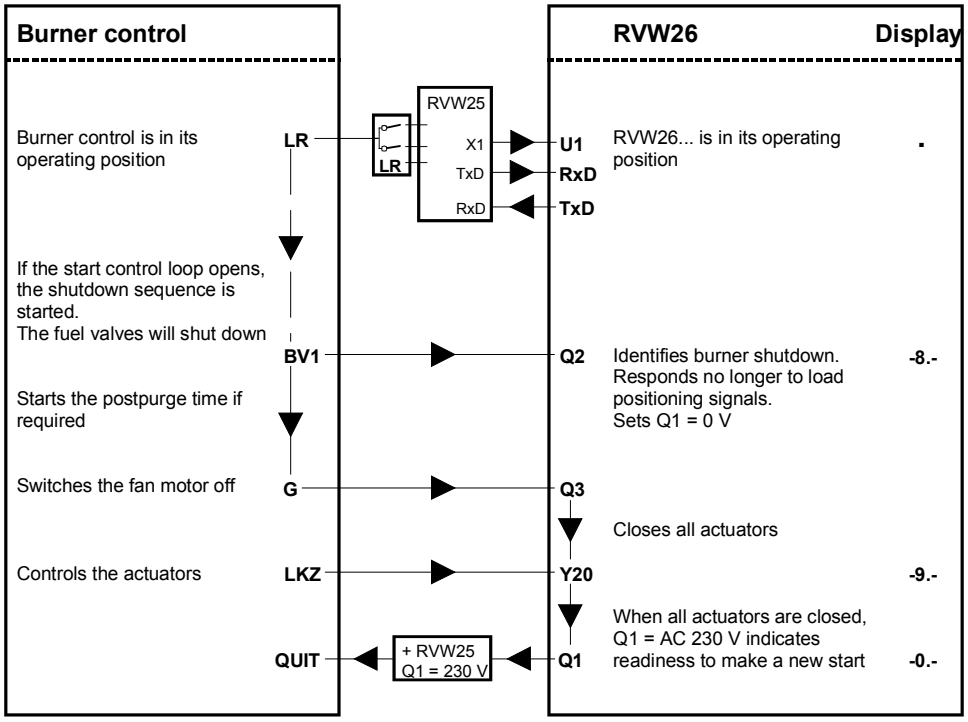
During normal burner operation and burner off periods, readiness contact «Q4 - Q5» is closed.

Readiness contact «Q4 - Q5» opens:
- When the RVW26… detects inadmissible states at its inputs or outputs
- When the RVW26… detects a fault while performing the self-tests
- When the RVW26… is not live
- After a reset or after switching on the RVW26… as long as the unit performs the self-tests

This contact must be included in the burner control's control loop, thus ensuring that the burner can be started only when no fault is signaled by the RVW26...
If the plant shall **lock** itself when the RVW26... detects a fault, the readiness contact must be included in the burner's locking loop (refer to chapter «Functional readiness and faults»).

Note:
When readiness contact «Q4 - Q5» is open, «Q4» is connected to «H» and signals nonreadiness or a fault of the RVW26… when contact «H» is sensed. After resetting the RVW26… by a short removal of power, contact «H» remains active for about 2 seconds. During this period of time, the RVW26… makes a self-test. If successful, «Q4 - Q5» closes (also refer to section «Function description of power ON and reset»).

5.4 Shutdown



▪ = display of burner output on the RVW26...

Note:
The RVW26… identifies the burner control's startup and shutdown sequence from the control commands.
This control sequence takes place according to a fixed basic pattern (burner control program).
Departures from this basic pattern will not be accepted by the RVW26… and lead to lockout.
Do not include contactor or relay contacts in the signal lines!
If this is not possible, make certain that such contacts – **due to delayed signals** – **do not adversely affect the correct functioning of the unit.**

5.5 Function description of power ON and reset

When power is switched off, readiness contact «Q4-Q5» is open and «Q4-H» closed.
Each time power is switched on, the RVW26… makes internal tests for about 2 seconds.
During this period of time, the unit's display shows «88.8», both LEDs are lit, readiness contact «Q4-Q5» remains open and «Q4-H» closed.
On successful completion of these tests, readiness contact «Q4-Q5» closes and the display returns to normal operation.
At this point in time, the RVW26… tests the end switches of the actuators by driving them briefly toward «Fully open» and then immediately toward «Fully closed».
Brief switching off and on of mains voltage (reset) resets the RVW26… after a lockout.
As long as the cause of the fault is not removed, the RVW26… will again go to lockout and display the corresponding error code.

Note:
The RVW26… can be reset after a lockout by briefly switching power off.
When doing planning work, it is recommended to include a push button in the line, enabling the unit to be reset.

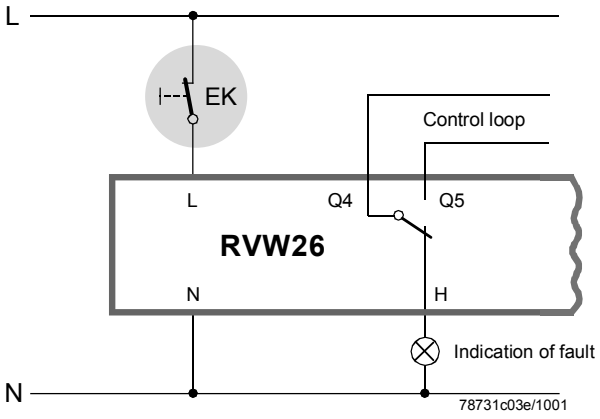


Fig. 12 Connection of lockout reset button «EK» (example)

5.6 Selection of type of fuel

The RVW26… is designed for use with single- or dual-fuel burners.
The load / position curves and a number of other parameters (such as ignition load, etc.) depend on the type of fuel and must be changed when the type of fuel is changed.
This change is accomplished with the 2 fuel selection inputs «F1» and «F2».
Changeover of the type of fuel immediately activates the parameters of the fuel selected.

Signals at terminals «F1» and «F2»:

Signal at terminal «F1»	Signal at terminal «F2»	Meaning
AC 0 V	AC 230 V	**Fuel 2** is selected, that is, the curves and parameters for fuel 2 are active
AC 230 V	AC 230 V	**Inadmissible state**; lockout occurs after about 4 seconds
AC 230 V	AC 0 V	**Fuel 1** is selected, that is, the curves and parameters for fuel 1 are active
AC 0 V	AC 0 V	This state is tolerated in phases 8, 9 and 0. **In all other phases, this is an inadmissible state;** lockout occurs after about 4 seconds

(AC 230 V corresponds to AC 195...265 V; AC 0 V corresponds to AC 0...50 V)

Note:
Fuel changeover with the handheld terminal AZW20.20 is not possible!
The type of fuel is **always selected externally** via terminals «F1» and «F2».
For this reason, prior to setting the fuel-related parameters (curves, ignition load, etc.), the required type of fuel must first be selected externally.

Applications with 1 or 2 auxiliary actuators «AUX1»

With dual-fuel burners, 2 actuating devices (only «AUX1») can be controlled

- either jointly with 1 actuator, or
- each with 1 actuator

Which of the 2 choices is used depends on the type of burner construction.
The selected mode must be set on the RVW26… (refer to «Programming»).

Connection of the auxiliary actuators

Version 1	Version 2
(1 actuator) The potentiometer's feedback signal is fed to terminal «B2». The auxiliary actuator is automatically positioned according to the «AUX1(1)» or «AUX1(2)» curve.	(2 actuators) The potentiometers' feedback signals are fed to terminals «B2» and «B3». Both actuators can be switched externally with an auxiliary contact of the fuel selector. The inactive actuator should be driven to the end switch position «Fully closed».

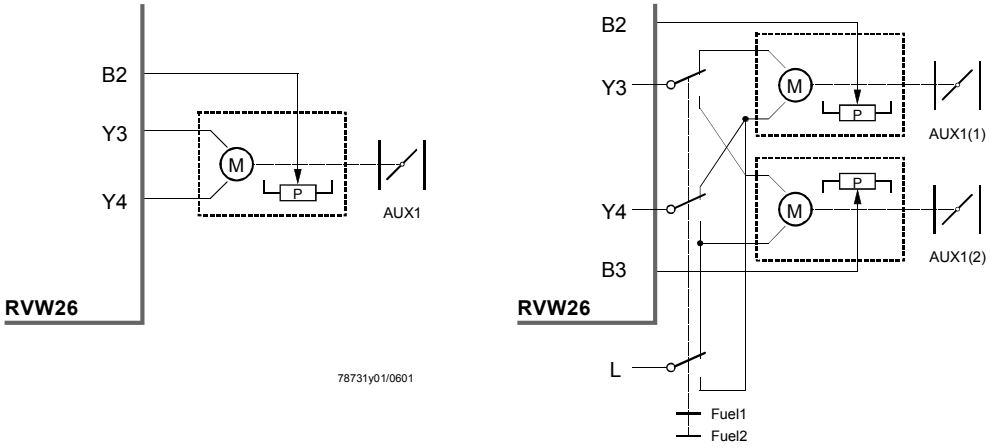


Fig. 13 Connection of the auxiliary actuators

5.7 Compensation of hysteresis

Reasons for hysteresis

Mechanical play occurs in the actuator, in the mechanical link to the actuating device and in the actuating device itself.
After a certain period of time, this mechanical play or hysteresis will increase due to mechanical wear.
Function «Compensation of hysteresis» provided by the RVW26… is used to offset the mechanical play within certain limits.

Effect of hysteresis

As a result of the hysteresis, one and the same **desired position** of an actuator has 2 different **actual positions**:

- One actual position when approaching the desired position from below (output adjustment toward «OPEN»)
- One actual position when approaching the desired position from above (output adjustment toward «CLOSED»)

Fig. 31 illustrates this:

1) The burner's output shall be increased from ① to ②, which means that the actuator will have to travel along the curve from «**a**» to «**b**».
2) Then, the burner's output shall be reduced again to ①, which means that the actuator will have to travel from «**b**» to «**a'**». For the same output 0, there is thus a difference «**H**» in the actuator's position.

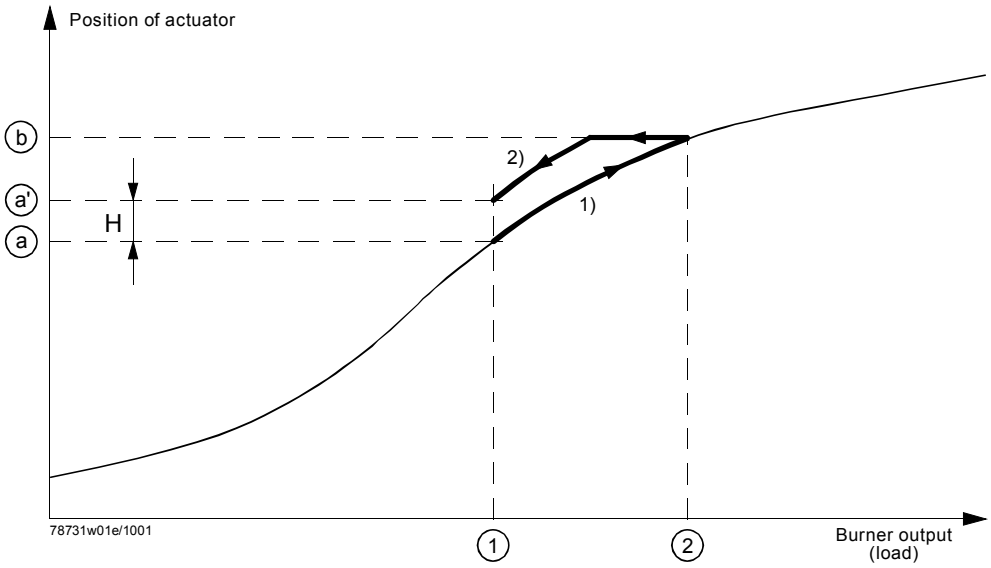


Fig. 31 Effect of hysteresis

Due to the mechanical play, there is thus a difference between the actuators' real position and the position ascertained by potentiometer «P».

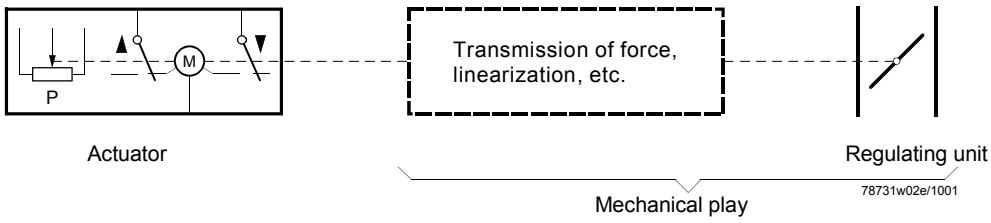


Fig. 32 Basic diagram of hysteresis

The hysteresis can have a significant adverse effect on the combustion process.
It can lead to lack of air (formation of CO and soot) or to extreme amounts of excess air (waste of energy).

Mode of operation of automatic compensation of hysteresis

With automatic compensation of the hysteresis, the required actuator position is always approached from the same side, that is, from below.
This means that compensation of the hysteresis must always be made after a reduction in output.
If there is no further reduction in output during that period of time, compensation will take place. The extent of compensation of the hysteresis is programmable.
The extent of compensation to be programmed should be ascertained when the burner plant is commissioned for the first time (refer to «Commissioning notes for burners»).

Sequence of operations with compensation of hysteresis:
1. The reduction in output is made.
2. The required position of the actuator is decreased by «H».
3. The required position of the actuator is increased by «H».

H = selected value of hysteresis in [V]

Note:
If a curve is programmed that decreases the position of the actuator when the output increases, compensation of the hysteresis does **not** work.
When used in connection with O_2 trim control, compensation of the hysteresis can be disabled.
Important is the stability of O_2 trim control that is reached with and without compensation.
Vibrations of the actuator must be avoided since they can have an adverse effect on the combustion process, due to the mechanical play.

5.8 Application of a correcting variable

General

Application of a correcting variable represents a possibility to interfere in the operation of the RVW26…, aimed at **optimizing the combustion process**.
For instance, using the correcting variable input of the RVW26..., an O_2 trim control system RPO25… can be employed in conjunction with the air / fuel ratio control system.
Using the oxygen value as a reference, practically all disturbance factors that affect the combustion process will be taken into account.

Function

An analog DC 0…10 V signal can be fed to the correcting variable input «X2».
This correcting variable signal acts either only on the auxiliary actuator (AUX1) or, optionally, on both auxiliary actuators (AUX1 and AUX2) (refer to «Programming»).
A correcting variable signal **reduces** the position of the auxiliary actuators that determine the amount of air, and thus always the amount of excess air for the combustion process.
When using operation with an impact from both auxiliary actuators, the readjustment of the O_2 valve is made in parallel.

This readjustment of the O_2 value is made proportionally to the current burner otuput and to the influencing factor «DISTURB»:

$$\text{Setload}' (\%) = \text{Setload} (\%) - \frac{\text{Correcting variable X2 (V)} \times \text{DISTURB} (\%)}{\text{10 (V)} \times \text{100} (\%)} \times \text{Setload} (\%)$$

Legend

Setload	Load signal without the correcting variable
Setload´	Load signal with influence of the correcting variable
X2	Correcting variable
DISTURB	Programmable influencing factor (maximum correction)

The relative effect on the amount of air ensures that a certain correcting signal has nearly the same impact on the amount of excess air, irrespective of burner output. This is true only if the load / position curves are programmed such that the LOAD graduation is proportional to the actual output of the burner (refer to «Commissioning notes for burners»).

When used in connection with the RPO25... and RVW25..., the impact of the correcting variable must be set to the maximum value, since the RPO25... provides O_2 trim control in this application.
If, for some reason, the impact of the correcting variable must be restricted, the following table can be used:

ΔO_2	DISTURB
≈ 1 %	5 %
≈ 2 %	10 %
≈ 4 %	20 %
≈ 5 %	30 %
≈ 8 %	50 %

Fig. 14 shows how a correcting variable signal at «X2» produces a change in fan speed via the «AUX1» curve.

Legend

Load	Load signal without the correcting variable
Load´	Load signal for the fan speed
Position	Position of auxiliary actuator with correcting variable «X2 = 0»
∆ Pos	Change of actuator position due to correcting variable «X2 > 0»
X2	Correcting variable
DISTURB	Programmable influencing factor (maximum correction)
Setload	Load signal without the correcting variable
Setload´	Load signal for the actuator position

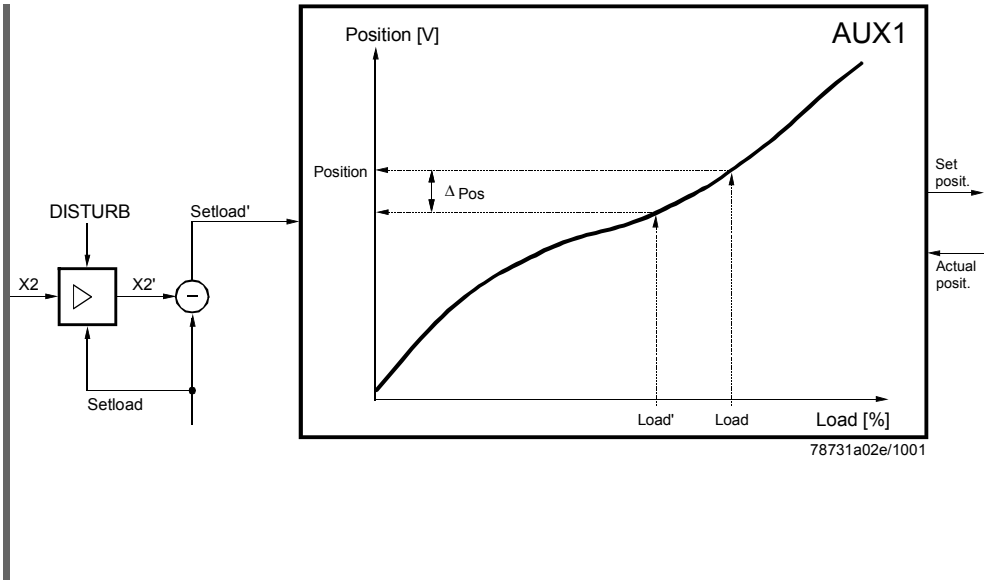


Fig. 14 Impact of the correcting variable signal on the actuator position

Note:
To ensure the impact of the correcting variable on the volumetric airflow is large enough, the load displayed by the RVW25... **must** correspond to the real burner output.

Impact of the correcting variable on the amount of excess air

Correcting variable signal at «X2»	**Impact on excess air**
«X2» not connected	No impact = maximum amount of excess air
«X2» = 0 V	No impact = maximum amount of excess air
«X2» rises	Impact increases, amount of excess air diminishes
«X2» = 9.8 V	Maximum impact = minimum amount of excess air
«X2» = 10 V	Maximum impact, but will be interpreted as a fault after 30 seconds, which automatically sets the impact to 0 (= maximum amount of excess air)

Note:
If the value of the correcting variable signal «X2» **constantly** exceeds 9.8 V for more than 30 seconds, the RVW25… and RVW26… interprete this as a fault (e.g. short-circuit). In that case, the correcting variable is not taken into consideration, which means that a maximum amount of excess air will be delivered. However, readiness contact «Q4 - Q5» **does not** open, so that **no** lockout will be initiated. As a warning, the display of the unit will flash. If steep slopes and / or a large correcting effect is programmed on the RVW26…, lockout with code «-56» can occur. The correcting variable becomes active again when the voltage «X2» drops below 8 V. When feeding a correcting variable signal to «X2», screened cable should be used, whereby **one** end of the screen must be connected to terminal «M» of the RVW25...

5.9 Load signal output «X1»

An analog signal is available at terminal «X1» of the RVW26... It corresponds to the burner output ascertained at «U1».

6 Sequence of functions

6.1 RVW25... and RVW26... with the burner control

The startup and shutdown sequence of the burner is determined by its burner control.
For safety reasons, the RVW26… demands a defined sequence that is matched to our burner controls.
For this reason, certain output signals of the burner control are fed to the RVW26…
The functional sequence of startup and shutdown is monitored by the RVW26… and must be in accordance with the sequence diagram.
With other actions (e.g. opening the control loop during the burner startup sequence or lockout of burner control), other events can trigger the change from one phase to another.

6.2 Explanations relating to the sequence diagram

The program sequence of the RVW26… is divided into a number of **phases**.
The sequence diagram shows the normal sequence of burner startup, operation and shutdown.
A certain event is always required for a phase to change to the next (e.g. an input signal, a specific position of an actuator, etc.).
The events required by a phase to change are identified by a circle in the following diagram.
Phase numbers 0…9 appear on the display.
During running phase «R», the display shows the burner's current output.

- Phase «0» is the waiting phase (standby). During this period of time, there is **no** signal to demand burner startup
- Phases 1…7 belong to the burner's startup sequence
- Phases 8 and 9 belong to the burner's shutdown sequence (and after power ON)

These phase numbers also appear on the display of the handheld terminal AZW20.20.

6.3 Sequence diagram

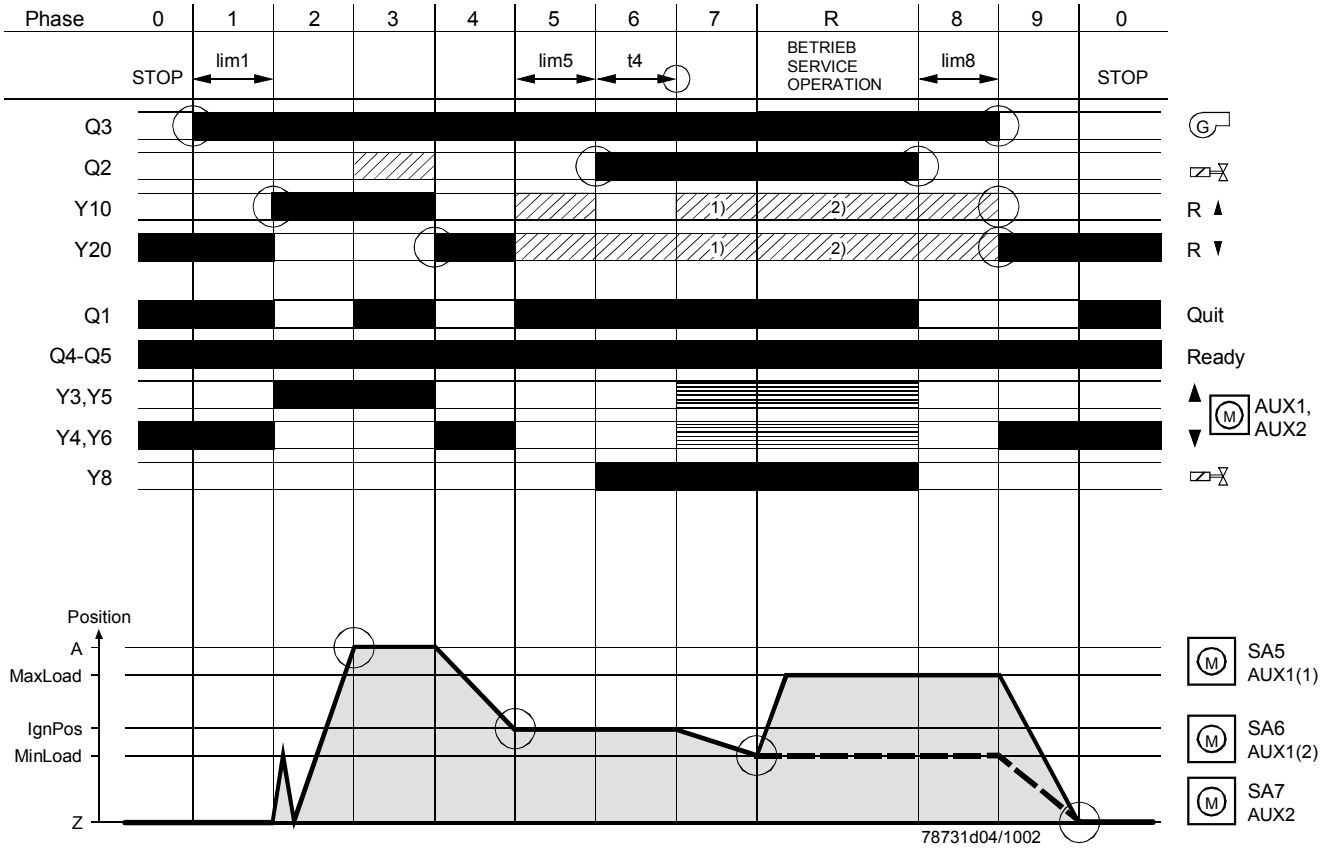


Fig. 15 Sequence diagram

Legend

■	Signal must be present or output is under voltage
□	Signal must not be present or output is not under voltage
▨	Signal can be present
▤	Output controlled
○	Condition for transition to the next phase
lim	Duration of phase is limited. If there is no change of phase when the preset time is reached, lockout will be initiated
lim1	= 30 s
lim5	= 150 s
lim8	= 30 s

1) Signals at «Y10» or «Y20» only act on output «X1»

2) RVW26...follows the signal at «U1» for controlled operation

t4 Interval

7 Basic diagram

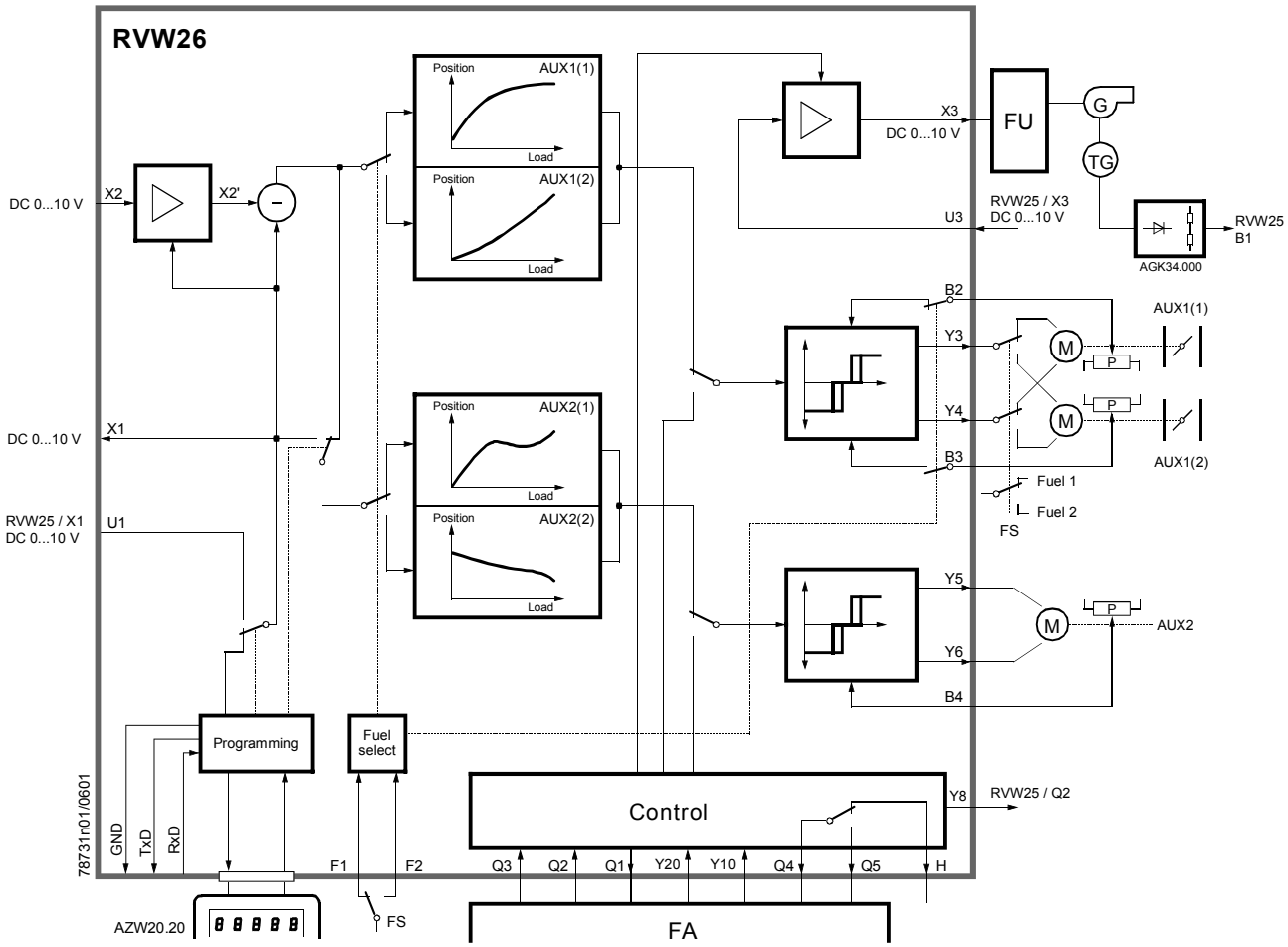


Fig. 16 Basic diagram

8 Block circuit diagram

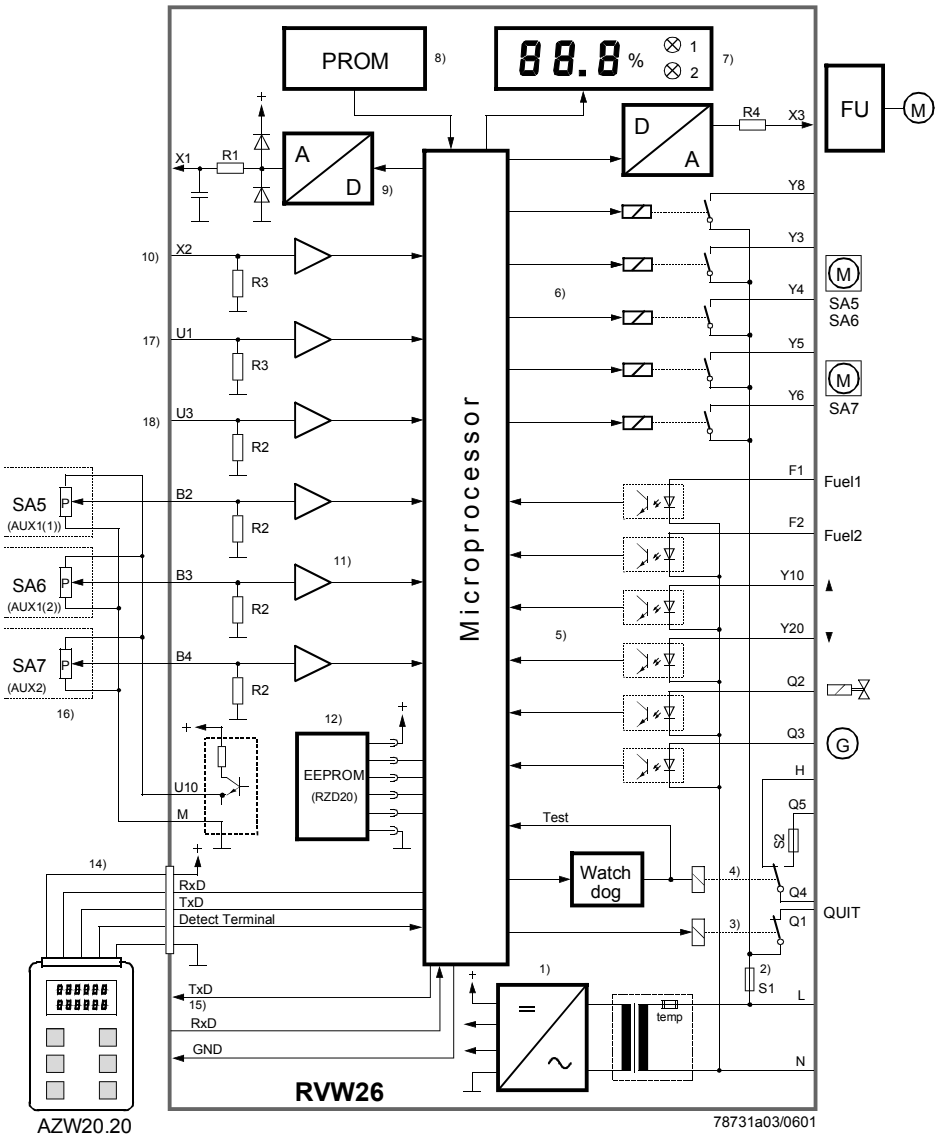


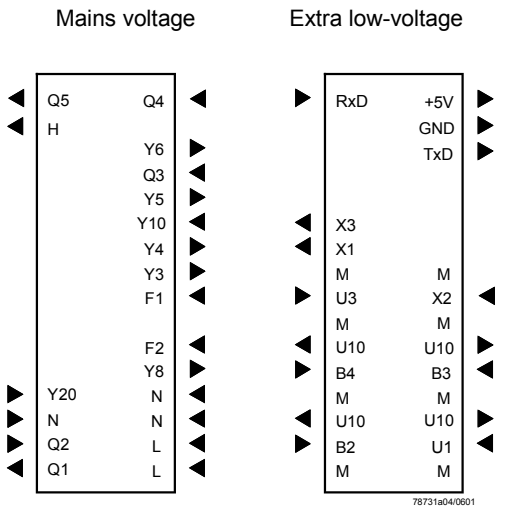
Fig. 17 Block circuit diagram

Legend

1) Mains transformer with built-in thermal cutout
2) Fuse «S1» for outputs «Y3...Y4» and «Q1»
3) Acknowledge relay with contact «Q1»
4) Readiness relay with readiness contact «Q4...Q5», «H» and fuse «S2»
5) Mains voltage inputs with optocoupler
6) Control outputs
7) Display on the front of the unit
8) Program memory
9) Signal output «X1» (burner output DC 0...10 V) with D / A converter
10) Signal input «X2» (correcting variable DC 0...10 V, e.g. O_2 trim control)
11) Inputs from feedback potentiometers (inputs «B2» and «B3» are switched internally, according to the type of fuel currently burnt)
12) Data memory as an exchangeable plug-in module
14) Socket for the handheld terminal AZW20.20
15) Interface output for RVW25.000B27
16) Actuators «SA5...SA7» with feedback potentiometer
17) Signal input «U1» DC 0...10 V for controlling the burner output
18) Signal input «U3» DC 0...10 V for the required speed of the speed controller of the RVW25...

9 Assignment of terminals and description of inputs / outputs (I / O)

9.1 Assignment of terminals



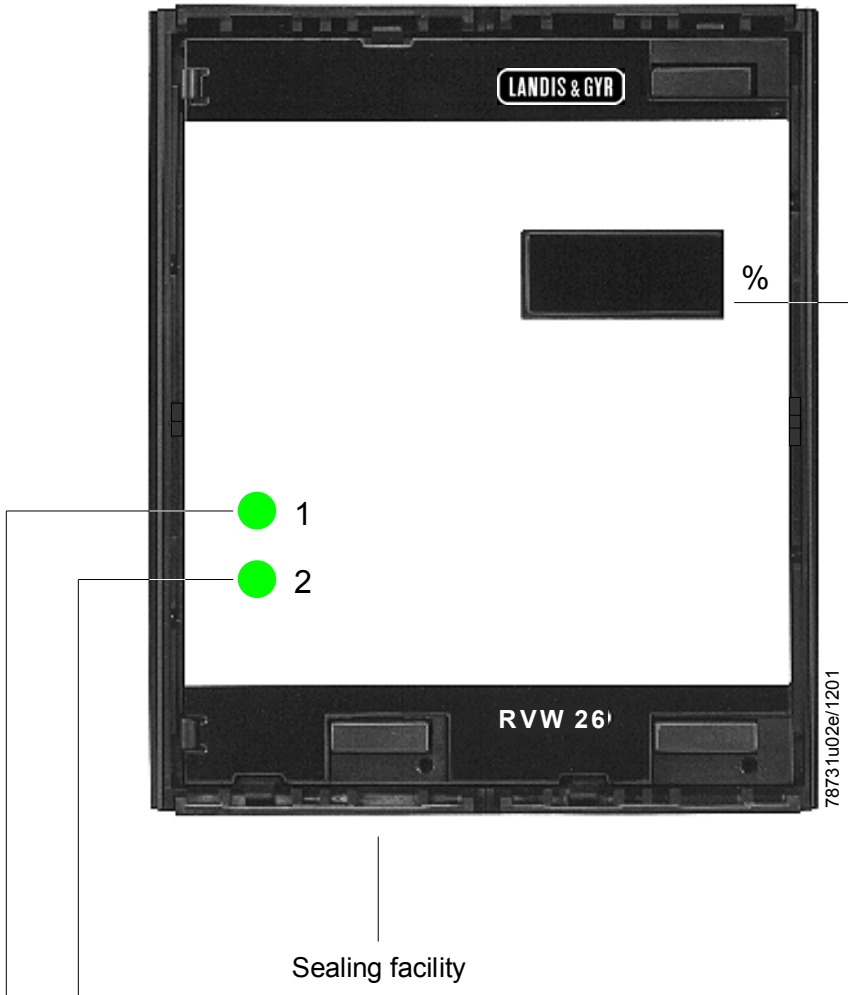
RVW26...

Fig. 20 Assignment of connection terminals of the ARG61.040

9.2 Description of the inputs / outputs

Terminal	Input / output	Voltage	Description
B2	I	DC 0...10 V	Potentiometer (wiper) from auxiliary actuator (AUX1(1))
B3	I	DC 0...10 V	Potentiometer (wiper) from auxiliary actuator (AUX1(2))
B4	I	DC 0...10 V	Potentiometer (wiper) from auxiliary actuator (AUX2)
F1	I	AC 230 V	Fuel selection: Fel 1
F2	I	AC 230 V	Fuel selection: Fuel 2
L	I	AC 230 V	Live for internal power supply, actuator outputs and «Q1»
N	I		Neutral conductor for internal power supply, reference potential for the mains voltage inputs (all N-terminal are **internally** interconnected)
M			Reference potential for all low voltage inputs / outputs and for the screening (all M-terminals are **internally** interconnected)
Q1	O	AC 230 V	Acknowledge signal: Indicates to the burner control when certain actuator positions are reached
Q2	I	AC 230 V	Signal from burner control: First fuel valve on / off
Q3	I	AC 230 V	Signal from burner control: Fan on / off
Q4 – Q5 / H	O	potential free	Readiness contact / control loop: Indicates operational readiness of the RVW26...
TxD	O		Interface for the RVW25.000B27
RxD	I		Interface for the RVW25.000B27
GND			Reference potential for the interface
U1	I	DC 0...10 V	Signal input for analog burner output control
U3	I	DC 0...10 V	Signal input for predefined speed from the RVW25...
U10	O	DC 10 V	Power supply for potentiometers (all «U10» terminals are **internally** interconnected)
X1	O	DC 0...10 V	Burner load signal
X2	I	DC 0...10 V	Correcting variable signal from O2 trim control of the RPO25...
X3	O	DC 0...10 V	Predefined speed for the variable speed drive
Y3	O	AC 230 V	Positioning signal (open) for actuator «AUX1»
Y4	O	AC 230 V	Positioning signal (close) for actuator «AUX1»
Y5	O	AC 230 V	Positioning signal (open) for actuator «AUX2»
Y6	O	AC 230 V	Positioning signal (close) for actuator «AUX2»
Y8	O	AC 230 V	Positioning signal for the RVW25..: valve «ON / OFF»
Y10	I	AC 230 V	Signal for prepurging from the burner control
Y20	I	AC 230 V	Signal for ignition position and «CLOSE» position from the burner control
+5 V	O	DC 5 V	Auxiliary voltage, max. 1 mA

10 Display on the control unit



LED is lit with fuel selection **«FUEL2»**, flashes in programming mode

LED is lit with fuel selection **«FUEL1»**, flashes in programming mode

Display	Meaning
88.8	Self-test after power ON
-0.-	Burner switched off («Standby»)
-1.-	Fan starts to run, end switch test
-2.-	Actuators open for prepurging, fan runs up to maximum speed
-3.-	Prepurging
-4.-	Actuators travel to the ignition position
-5.-	Waiting for fuel valve
-6.-	Interval
-7.-	Actuators travel to minimum output
XX.X	Burner in operation (burner output in %)
-8.-	Fuel valve closed, postpurging
-9.-	Actuators close
-XX.	Fault code in the event of fault (flashing)

11 Handheld terminal AZW20.20

The AZW20.20 is used to set all parameters of the RVW26…
It is connected to the socket of the RVW26… which is located behind the hinged aluminium front plate.
The AZW20.20 is powered via the connecting cable.
When using the connecting cable, the AZW20.20 allows the flame to be adjusted and viewed up to a distance of 20 m between the burner and the RVW26…
The handheld terminal features a display with 4 lines each comprising 16 characters, and 6 buttons.

Fig. 20 Handheld terminal AZW20.20 with connecting cable KF8859

The handheld terminal may only be used during commissioning and when doing service work.

12 Data storage module RZD20

All setting values of the RVW26… are stored in both the microcomputer's memory **and** in the exchangeable data storage module RZD20.
In both, the data are stored in nonvolatile memory.

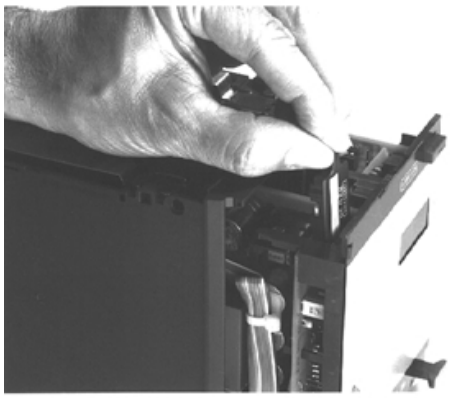


Fig. 21 Removal of the data storage module RZD20

Using the data storage module, it is possible to

- **adopt settings made on the control unit:** When changing the RVW26…, the relevant settings can be transferred by plugging the module into units of the same series
- **duplicate settings made on the control unit:** Settings can be copied to any number of data storage modules and be used as a basic setting for other units of the same series
- easily set the parameters of **replacement control units** that use exactly the same settings

The transfer of data between the RZD20 and the internal data storage is accomplished with the «Get_Par» and «SavePar» commands on programming level 7 (refer to «Programming»).

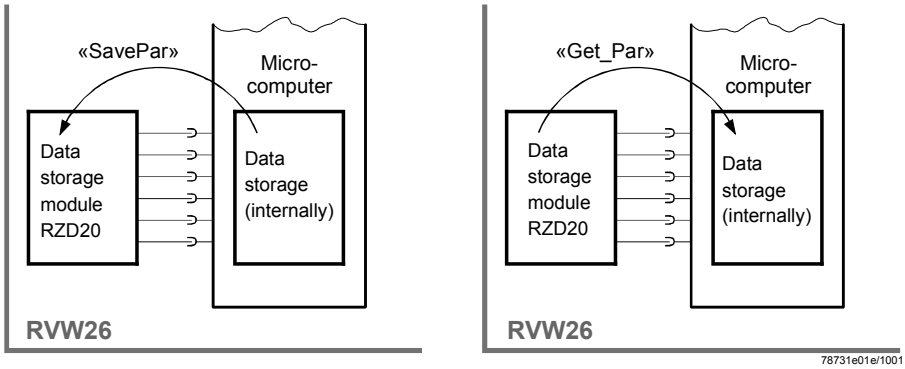


Fig. 23 Data transfer between the RZD20 and the internal data storage

Note:
The setting values in the internal and external data storage are cyclically checked to make certain they are identical. **If they are not identical, the unit will initiate lockout.** This means that when adopting the data of another unit via the RZD20, there must always be a transfer of data to the internal data storage (command «Get_Par»).

When changing a parameter, that parameter will automatically be stored in both the internal data storage and the data storage module RZD20.

12.1 Procedure for replacing the RVW26...

If, due to a defect or fault, the RVW26… must be replaced, the settings previously made can be transferred to the replacement unit by taking the following steps:

1. Remove the data storage module from the «old» unit.
2. Plug the data storage module into the «new» unit.
3. Insert the «new» unit into the housing and switch on mains voltage.
4. Plug in the handheld terminal AZW20.20.
5. Execute command «Get_Par» on programming level 7.
6. Execute command «ClrErro» on programming level 7.
7. Measure again the end switch positions on programming level 2.
8. The «new» unit is now ready to operate.

13 Functional readiness and faults

The RVW26… conducts a number of tests at regular intervals:

- Checking the input signals (permissible combinations, valid range, etc.)
- Internal tests (checking both hardware and software)

In the event of fault, the following actions will be triggered:

a) Fault in operation

«Q4...Q5» opens and shuts the burner down,
«Q4 - H» closes, thus indicating **«Error»**.

The unit's display shows a **flashing error code** (refer to section «Table of error codes»).
If several faults occur at the same time, the individual error codes change cyclically.
If the handheld terminal is connected, its display shows the respective **error message in clear text.**
The RVW26… initiates lockout and must be reactivated by making a reset or by using the handheld terminal.

b) Fault in programming mode

Same as under a), but the display of the handheld terminal only shows an «E» in the first column of the fourth line.
The parameters can still be set, however.
The error message can be displayed in clear text by changing to programming level «F» (fault protocol).

Resetting a fault (reset)

The RVW26... is reset by switching the power supply off.
Readiness contact «Q4 - Q5» closes after about 2 seconds and «Q4 - H» opens.
In programming mode, it is also possible to make a reset by executing command «ClrErro» on programming level 7.

Exception:
If parameters are set outside the permissible range, the RVW26… will deliver an error message as described above.
That fault will automatically disappear when the respective parameter is changed back to within the permissible range.

14 Error codes and rectification of faults

14.1 Types of faults and troubleshooting

A distinction is made between «external» and «internal» faults.

External faults are:
- Invalid combinations of input signals
- Inadmissible values of input signals
- Defective peripheral components, such as actuators or potentiometers

Internal faults are:
- Faults detected by the RVW26... when testing the hardware
- Faults detected by the RVW26... when testing its program and data memories
- Inadmissible programming

Since each and every fault can have consequences from a safety point of view, the RVW26… rates both types of faults equal:
If a fault occurs, the control unit will always initiate lockout!

Note:
For diagnostic purposes, it may be helpful to note the error code displayed by the RVW26... and the time the fault occurred before making the reset (e.g. in the burner's Operating Manual).

The following table gives a detailed description of the individual faults and contains hints on troubleshooting.

14.2 Error code table with hints on troubleshooting

Error code displayed by the unit	Text displayed by the hand-held terminal	Hints on the cause of the fault	Hints on troubleshooting
-01	range ignit	Curvepoints of the ignition position are outside the end switch positions.	Reprogram the ignition position. Check end switch position. If required, readjust and measure the end switches.
-03 -04	range aux1 pts range aux2 pts	Curvepoints of «AUX1 / AUX2» curve are outside the end switch positions.	Check curve. If required, readjust and measure the end switches. Note compensation of hysteresis!
-05 -06 -07	par not ident param internal param external	When comparing the parameters in the internal data storage with those in the RZD20, a difference was discovered. This code also appears when the RZD20 is replaced!	Check if the RZD20 is correctly plugged in. Trigger copy process to / from the RZD20 to the external / internal storage (programming level 7 «SavePar» / «GET_PAR»). Check parameters and reset them if necessary. Also refer to chapter «Replace data storage module RZD20».
-08	sign FA incorr	The signals between burner control or load controller and RVW26… have an inadmissible signal combination.	Check connecting wires between burner control and RVW26… for false wiring, loose wires, short-circuits or inadmissible contactor contacts. Measure voltages at «Y10» and «Y20». If one of the voltages is inside the inadmissible range (50...187 V), the outputs of the load controller must be decoupled with relays.
-09	change sign FA	Signal combinations inadmissible in terms of time were detected on the signal lines to the burner control, or an inadmissible signal transition was detected.	Check wiring between burner control and RVW26… Check correct functioning of burner control. Check compatibility of burner control and RVW26... Also refer to fault code «-08».
-10	pha - 1 - > 30 s	Phase 1 in the program sequence of the RVW26… was longer than 30 s. Signal «LK-AUF» at terminal «Y10» of the RVW26… was not present after 30 s.	Check wiring between burner control and RVW26…, especially the connecting lines to terminals «Q3» and «Y10» of the RVW26… Check correct functioning of the burner control.
-11	pha - 5 - > 150 s	Phase 5 in the program sequence of the RVW26… was longer than 150 s. Signal «Fuel valve» at terminal «Q2» of the RVW26… was not present after 150 s.	Check wiring between burner control and RVW26, especially the connecting line to terminal «Q2» of the RVW26… Check correct functioning of the burner control.
-13	fuel not def	Signal statuses at terminals «F1» and «F2» were not unambiguous during phases 1…7 and «Run». In phases 0, 8 or 9, «F1» and «F2» are at AC 230 V.	Check wiring at terminals «F1» and «F2». Admissible statuses are described in section «Selection of fuel».

Error code displayed by the unit	Text displayed by the hand-held terminal	Hints on the cause of the fault	Hints on troubleshooting
-14	disturb > 9.8	The signal at the correcting variable input «X2» was > 9.8 V for more than 30 s. The RVW26... interprets this as a fault and the correcting variable is no longer considered for the fan speed (→ excess air). **There will be no lockout.**	Fault disappears as soon as «X2» reaches a level of < 8 V. Possible causes: • Air curve programmed with too much excess air • Setting of influencing factor «DISTURB» (programming level 4) too low • O_2 sensor or stack is leaking. Burner is supplied with additional air (extraneous); O_2 trim control / RVW25… and RVW26… do not sufficiently affect the O_2 value.
-16 -17	stopswi aux1 stopswi aux2	The RVW26... measures and stores the potentiometer position regarding the end switch positions of the «AUX1 / AUX2» actuator. The current value does not agree with the stored values (deviation > 200 mV).	Check end switch positions. Measure the end switches again (programming level 2 of the RVW26...). It must be observed that the end switch measurement always refers to the selected type of fuel. Check whether the actuator can approach the end switches with a reproducibility of < ±200 mV at the potentiometer. Fault can also occur if the RZD20 has been replaced.
-19 -20	range pos aux1 range pos aux2	The feedback signal of the «AUX1 / AUX2» actuator is outside the limits of 0.4...9.6 V.	Check wiring of the feedback potentiometer and feedback potentiometer itself. Replace it, if necessary.
-22 -23	act slow aux1 act slow aux2	The RVW26... monitors the change on the feedback potentiometer when a positioning step is made. The change in position measured was smaller than expected.	Check whether the set actuator running time agrees with the real running time. Check the potentiometer. Geartrain of actuator may have too much backlash or throttling unit does not easily travel.
-25 -26	act inver aux1 act inver aux2	The RVW26... monitors the changes on the feedback potentiometer when a positioning step is made. The change in position measured was inverse to what it should have been.	Check if the potentiometer is correctly connected (may be terminals «M» and «U10» are mixed up). Check if the actuator is correctly connected.
-28 -29	act fast aux1 act fast aux2	The RVW26... monitors the change on the feedback potentiometer when a positioning step is made. The change in position measured was greater than expected.	Check whether the set actuator running time agrees with the real running time. Check the potentiometer. Check smooth and jerk-free movement of the actuator drive shaft and potentiometer when the end switches are measured (programming level 2).
-56	ratio fail	The RVW26... monitors the link between fan and actuators. The set position and the actual position of one of the actuators were different for more than 10 s.	Check if slope of the actuators is too steep. Check digital communication. Remove AZW... from the RVW25...
-57	load fail	The RVW26... monitors the lower load limit (5 % «MinLoad» on the RVW25...) to detect broken wires of load input «U1».	Check connections «X1» of the RVW25... to «U1» of the RVW26... and «M» of the RVW25... to «M» of the RVW26...

Notes on errors -05 through -07

If these faults occur repeatedly, the fault may be caused by electromagnetic fields and / or line-related faults generated for instance by powerful radio transmitters, variable speed drives, welding machines, etc.

Remedy: Take action at the source of the problem, use EMC filters.

Notes on errors -22 through -29 and -32 through -36

These faults can also occur if the transfer resistance of the potentiometer exceeds a certain level, caused for instance by dirt or local welding.
This is the case when the problem always occurs in the same potentiometer position.

Remedy: Replace the potentiometer.

These faults can also occur when there are inadmissible hum voltages on the potentiometer lines.

Remedy: Check shielding of the lines to the feedback potentiometers (screen may at no point be connected to «PE»).

Notes on errors -22 through -23 and -28 through -29

These faults can occur when the actuator running time on programming level 1 is incorrectly set. **For examples of determining the running time, refer to «Programming the RVW26…»!**
These faults can also occur if the shielding of the potentiometer lines is not correctly connected.

Remedy: Check shielding of the lines to the feedback potentiometers.

Error code displayed by the unit	Text displayed by the hand-held terminal	Hints on the cause of the fault	Hints on troubleshooting
-30	lin ad-convert	These are faults the RVW26… has detected when testing its software and hardware.	**Reset the RVW26...** • If the fault occurs sporadically, it may be caused by EMC problems. In that case, the source of the problem must be identified and the wiring checked • Are the cables to the feedback potentiometers screened and is the screen connected exclusively to the ground of the RVW26... (terminal «M»)*? **The screen may never be connected to «PE»!** • The cables to terminals «X1» and «X2» must also be screened • If the fault occurs again after a short period of time and if electromagnetic interference can be excluded, the RVW26... must be replaced
-31	superpos load		
-32	superpos aux1		
-33	superpos aux2		
-34	pos contr load		
-35	pos contr aux1		
-36	pos contr aux2		
-37	disturb check		
-38	controll rel 1		
-39	controll rel 2		
-40	line input-bit		
-41	supply voltage		
-42	2nd contr rel 1		
-43	under voltage		
-44	CPU error		
-45	RAM error		
-46	ROM error		
-47	undef interrup		
-48	value conf reg		
-49	range Bx_0V		
-50	range Bx_10V		
-51	range NBx_10V		
-52	range U_5V		
-53	range UT_x		
-54	fuel changed		
-55	process timing		

15 Programming the RVW26...

The RVW26... is programmed (setting the parameters and matching the unit to the specific plant conditions) with the help of the handheld terminal AZW20.20.
The RVW26.00B27 is switched from operating mode (programming level 0) to programming mode with the help of the AZW20.20, using buttons «🡐 / 🡒».
The change can only take place in phases 0, 8, 9 and «R».
In all other phases, the buttons of the handheld terminal are inactive.
It is not possible to change parameters.
The display of the AZW20.20 shows the burner's output and the positions of the actuators.
In programming mode, the parameters of the RVW26... can be changed.
The RVW26… indicates the programming mode by letting its fuel LED flash.
If the unit is switched to programming mode (phase «R») while the burner is running, the burner continues to run like in normal operation.
Positioning signals of the RVW25… are executed to ensure the burner continues to operate together with air / fuel ratio control (output adjustments with the handheld terminal on programming level 5 are not possible).
To set the curves in this mode, 2 AZW20.20 are required (one for the RVW25… and one for the RVW26…).
The operator is now in control of the burner and the programmed load positions can be changed by him.
When, during burner off times (phase «0») or during the shutdown sequence (phases 8, 9), a change is made to programming mode, the RVW26… deenergizes terminal «Q1», in which case the burner can no longer be started up.
This operating state can be used to make the basic burner parameter settings.
After programming, the programming level must be changed to store the data.
Also, in programming mode, the RVW26… stores its data automatically at 20-second intervals.
During the storage process, the display shows the current programming level «X».

Note:
Having set the parameters of the RVW26... in programming mode while the burner is off, a change to operating mode (programming level 0) must first be made to start the burner.
When the burner is running (phase «R»), a change to programming mode can be made again to optimize the settings.

The setting choices of the RVW26... are assigned to programming levels.
Each programming level represents a display window of the AZW20.20.
The programming level can be changed by pressing buttons ⇐ / ⇒.

There is a total of 9 programming levels available:

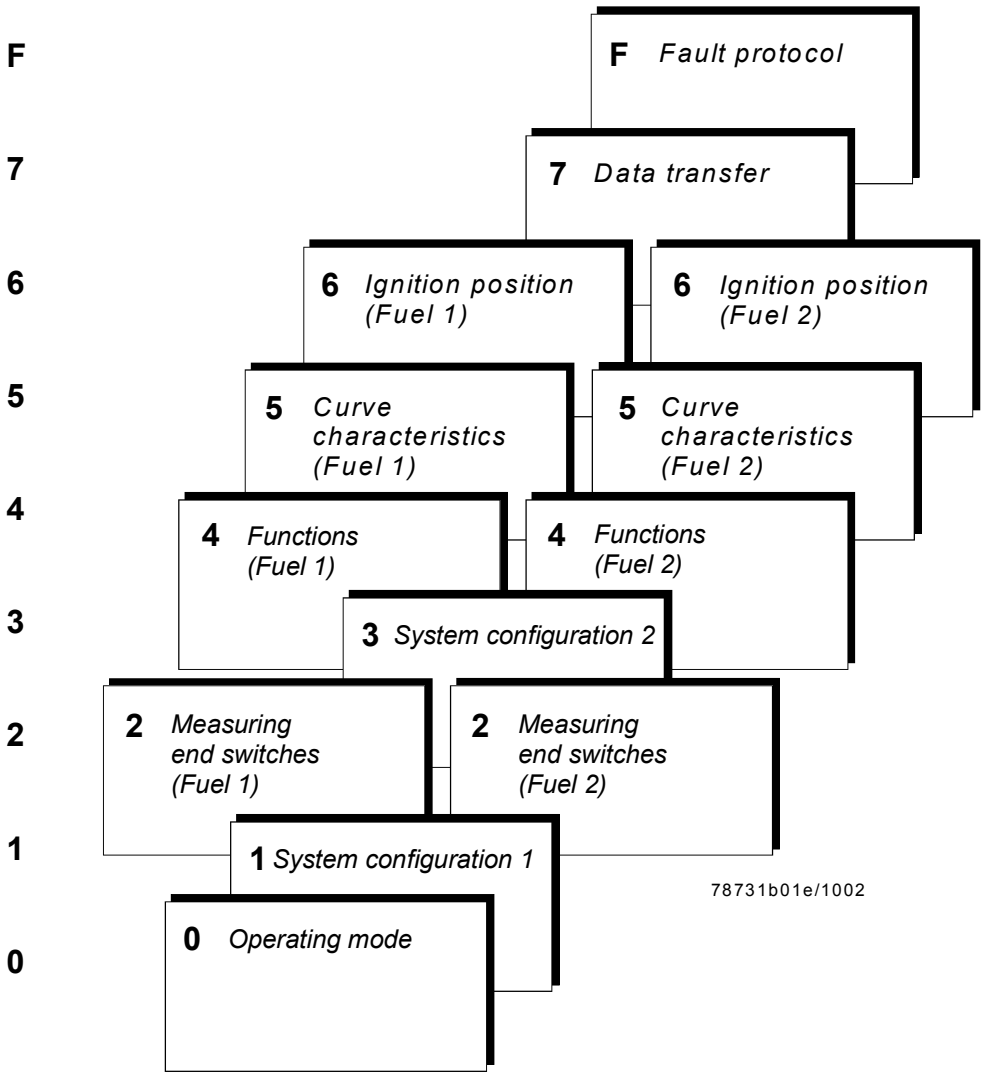


Fig. 23 Structure of the programming levels

Within each programming level, buttons «∆» and «∇» are used to select the required parameter.
Buttons «+» and «-» are used to change the selected parameters.
The first column on the display continuously indicates the current programming level, the program phase of the RVW26..., and the type of fuel currently burnt.
It should be noted that a number of parameters must be set separately for each type for fuel.
The type of fuel cannot be selected with the handheld unit. This must be done externally via terminals «F1» and «F2».
Fig. 24 on the next page shows the display in detail.

15.1 Structure of the display

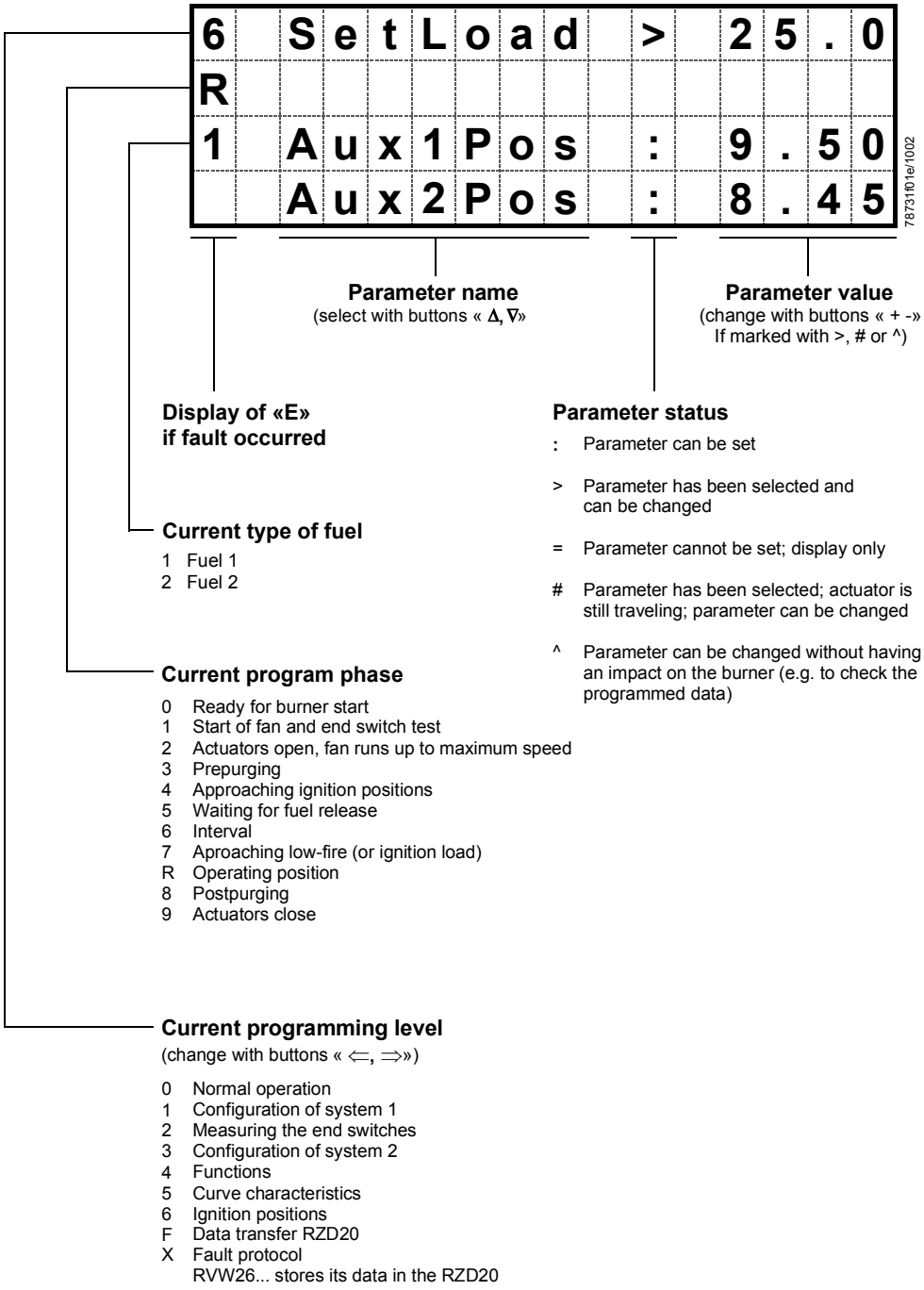


Fig. 24 Display of the handheld terminal AZW20.20

Programming level 0 **Operating mode**

Display

0		L	o	a	d					=			0	.	0
0		A	u	x	1	P	o	s		=		0	.	6	7
1		A	u	x	2	P	o	s		=		0	.	5	3

Interpretation

Parameter	Meaning
Load	Current burner output in %
Aux1Pos	Position of auxiliary actuator «AUX1»
Aux2Pos	Position of auxiliary actuator «AUX2»

Note:
Deviations of the «Load» value from the RVW25... over a longer period of time is an indication of a fault of the digital info channel.

Programming level 1 **Configuring the system**

Display

1		A	u	x	1	A	c	t		:					1
9		A	u	x	2	A	c	t		:				o	n
1		A	u	x	1	T	i	m		:				3	0
		A	u	x	2	T	i	m		:				3	0

Interpretation

Parameter	Meaning
Aux1Act	Number of auxiliary actuators at the first extension channel (refer to chapter «Selection of fuel») Setting range: 1 / 2 Factory setting: 1
Aux2Act	Auxiliary actuator at the second extension channel yes / no If «Aux2Act» has been set to «off», **no more** «Aux2» parameters will appear on the other programming levels Setting range: on / off Factory setting: off
Aux1Tim	Running time of auxiliary actuator 1 [1]) Setting range: 30...60 s Increment: 5 s Factory setting: 30 s
Aux2Tim	Running time of auxiliary actuator 2 [1]) Setting range: 30...60s Increment: 5 s Factory setting: 30 s

[1]) The running time to be set is the period of time the actuator would require to move the potentiometer from 0 V to 10 V. This means that the running time is defined by the speed of the actuator and the electrical angle of the potentiometer. The running time is always to be rounded up to the next higher practical value. The actuator running times of «Aux1 / Aux2» may differ.

Example 1: actuator: SQM54.482A2 running time: 30 s / 90°
potentiometer: ASZ12.803 R / °: 1000 Ω / 90°

$$\text{Running time to be set} = \frac{90° \times 30\ s}{90°} = \mathbf{30\ s}$$

Example 2: actuator: SQM54.482A2 running time: 30 s / 90°
potentiometer: ASZ12.833 R / °: 1000 Ω / 135°

$$\text{Running time to be set} = \frac{135° \times 30\ s}{90°} = \mathbf{45\ s}$$

Programming level 2 **Measuring the end switches / interval**

Display

2		S	t	o	p	S	w	i		^		o	p	e	n
9		A	u	x	1	P	o	s		=		9	.	7	5
1		A	u	x	2	P	o	s		=		9	.	3	0

Interpretation

Parameter	Meaning
StopSwi	Select end switch to be measured The RVW26... automatically measures at what feedback potentiometer value the end switches have reached their «Fully open» and «Fully closed» position. This value is checked each time the burner is started up. The measured value of the end switches is stored as soon as the feedback signal does not change anymore. If 2 fuel actuators are used, the measurement must be made with both types of fuel. The end switch values currently stored can be displayed by pressing «+» and «-». If «Δ» or «∇» is pressed, the status character changes from «^» to «#». The selected end switch positions «Open» or «Close» will be approached and stored. Once the values are stored, the status character changes to «>». The other end switch position can now be measured by pressing «+» or «-». Settings: open / close
Aux1Pos	End switch of auxiliary actuator 1 (Aux1) in Volt Factory setting close: 1 V Factory setting open: 9 V
Aux2Pos	End switch of auxiliary actuator 2 (Aux2) in Volt Factory setting close: 1 V Factory setting open: 9 V

Programming level 3 **System configuration2**

Display

3		I	n	t	e	r	v	a		:					5
9		L	i	n	e	F	r	e		:				5	0
1															

Interpretation

Parameter	Meaning
Interva	Interval «t4» Interval «INTERVA» corresponds to the time «t4» of burner controls. Setting range: 5...15 s Increment: 1 s Factory setting: 5 s
LineFre	Mains frequency Setting: 50 / 60 Hz Factory setting: 60 Hz

Programming level 4 **Functions**

Display

4		S	e	t	P	t	s			:				9
9		D	i	s	t	u	r	b		:				1	5
		A	u	x	2	D	i	s		:			o	f	f
		H	y	s	t	e	r			:		0	.	2	0

Interpretation

Parameter	Meaning
SetPts	Number of breakpoints per curve Settings: 5 / 9 / 17 Factory setting: 9 Parameter «SetPts» is used to select whether 5, 9 or 17 breakpoints shall be programmed. «SetLoad» (programming level 5) is then used to approach the individual curvepoints. The positions of the auxiliary actuators can now be adjusted for every curvepoint. If the RVW26... is switched from programming mode to operating mode, parameter «SetPts» automatically changes to 9. Each time a curvepoint is changed with setting 5 or 9, the intermediate values will be calculated by the RVW26...
Disturb	Impact of the correcting variable (refe to chapter «Application of a correcting variable») Setting range: 0...50 % Increment: 1 Factory setting: 0
Aux2Dis	Impact of correcting variable on auxiliary actuator 2 Parameter «Aux2Dis» must be set to «on» only if the auxiliay actuator acts on the main airflow. This is the case with an additional air damper or an adjustable head. The impact on the auxiliary actuator poosition is that described in chapter «Application of a correcting variable». Settings: on / off Factory setting: off
Hyster	Extent of compensation of hysteresis Setting range: 0.00...0.50 V Increment: 0.1 V Factory setting: 0

Programming level 5 **Curve characteristic**

Display

5		S	e	t	L	o	a	d		^		2	5	.	0
9															
1		A	u	x	1	P	o	s		:		1	.	2	4
		A	u	x	2	P	o	s		:		1	.	8	8

For both types of fuel, a specific load / position curve can be programmed.
The coarse setting of the different curves for «Aux1« and «Aux2» can be made with the 5 or 9 breakpoints (programming level 4).
Here, various error messages can occur near the end switch positions.
To rectify the causes, the curves must be moved into the permissible range using mode «17 points».
The fine adjustment is then made in the position «17 breakpoints».
Now, **no** change should be made back to a lower number of breakpoints since the manually set values will be overwritten, due to automatic calculation of the intermediate points.
When the burner is in operation, the curves of the RVW25... and RVW26... should be optimized at the same time if possible.
For that purpose, 2 AZW20.20 (1 for the RVW25... and 1 for the RVW26...) or a changeover switch KF8879 are required.
To ensure a correct link of the actuators, the RVW26... follows the load signal of the RVW25... in programming mode also.
To optimize a curvepoint, it must be approached with the RVW25... (e.g. with the help of an AZW20.20) and can only then be correctly set with the RVW26...
If the breakpoint lies outside the load limits, the actuators will be driven to the positions of the load limits.
At least one point must be programmed outside each load limit.

Interpretation

Parameter	Meaning
SetLoad	Burner output at the respective curvepoint Setting range: 0...100 % Increment: SetPts = 5 25 % = coarse setting SetPts = 9 12.5 % = coarse setting SetPts = 17 6.25 % = fine-tuning The increments depend on the number of curvepoints selected on programming level 4.
Aux1Pos	Position of auxiliary actuator 1 Setting range: end switch_closed + end switch_tolerance + hysteresis end switch_open – end switch_tolerance Increment: 0.04 V Factory setting: 0 V
Aux2Pos	Position of auxiliary actuator 2 Setting range: end switch_closed + end switch_tolerance + hysteresis end switch_open – end switch_tolerance Increment: 0.04 V Factory setting: 0 V

Programming level 6 **Ignition position**

Display

6		I	g	n	i	t	L	o		:			3	5
9														
1		A	u	x	1	P	o	s		:		2	.	6	4
		A	u	x	2	P	o	s		:		9	.	0	0

To facilitate burner startup, a fuel / air mixture other than the basic setting can be selected on this programming level.
This setting only acts on burner startup. During normal operation, the burner works with the curves set on programming level 5.

Interpretation

Parameter	Meaning
IgnitLo	Ignition load Setting range: 5 %...MaxLoad Increment: 1 % Factory setting: 0 %
Aux1Pos	Position of auxiliary actuator 1 Setting range: end switch_closed + end switch_tolerance + hysteresis end switch_open – end switch_tolerance Increment: 0.04 V Factory setting: 0 V
Aux2Pos	Position of auxiliary actuator 2 on ignition Setting range: end switch_closed + end switch_tolerance + hysteresis end switch_open – end switch_tolerance Increment: 0.04 V Factory setting: 0 V

Programming level 7 **Data transfer**

Display

7		G	e	t	_	P	a	r		:			o	f	f
9		S	a	v	e	P	a	r		:			o	f	f
1		C	l	r	E	r	r	o		:			o	f	f

Interpretation

Parameter	**Meaning**
Get_Par	Loading data from the external data storage module (refer to chapter «Data storage module RZD20») Settings: on / off Factory setting: off
SavePar	Storing data to the external data storage module (refer to chapter «Data storage module RZD20») Settings: on / off Factory setting: off
ClrErro	Deleting entries in the fault report Settings: on / off Factory setting: off

The respective action is triggered by pressing button «+».
When the action is completed, the display returns to «off».
After lockout, the RVW26… can be reset with «ClrErro».

Programming level F **Fault report**

Display

F		E	r	r	o	r			=			-	-	-	
9															
1		n	o		e	r	r	o	r	s					

Interpretation

Parameter	Meaning
Error	Fault code (refer to chapter «Fault code table with hints on troubleshooting»). If several faults are present at the same time, they will be displayed one by one. The order of their occurrence cannot be read off. Line 3 of the display gives a brief description of the fault in English.

16 Applications

16.1 Basic diagram of a plant with a modulating burner (one type of fuel)

(Using the LAL..., LFL1..., LGK16... or LOK16... as a burner control and the RWF40... as a load controller)

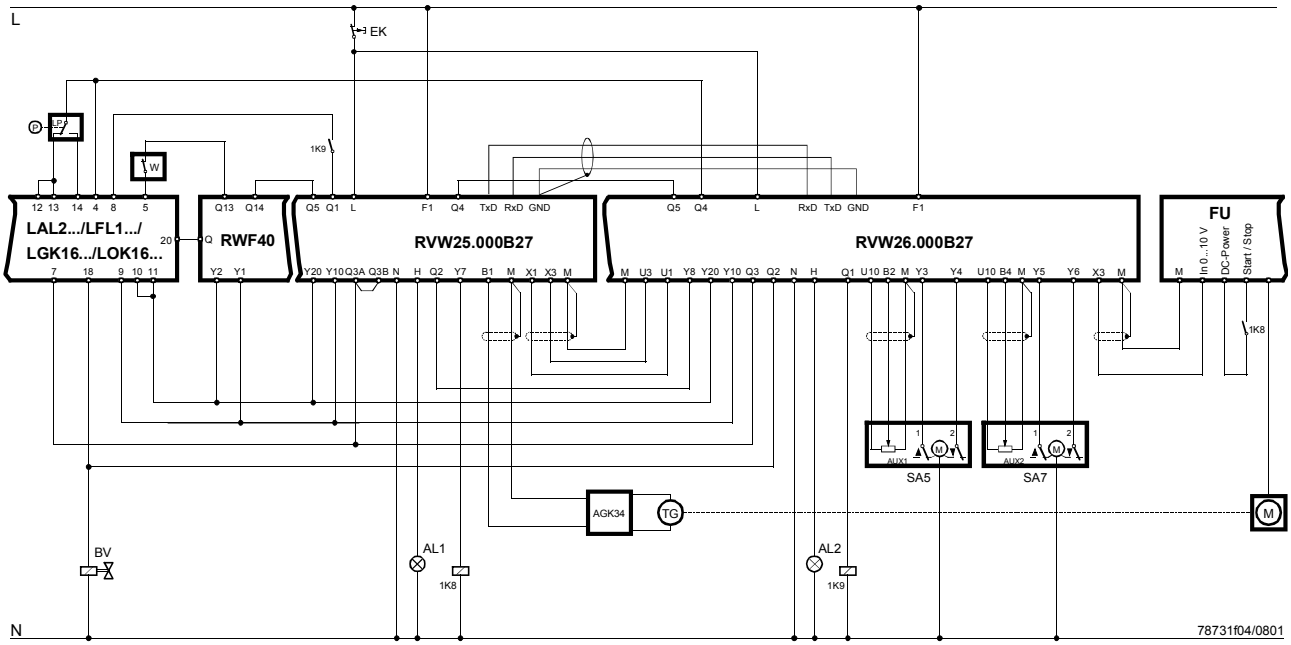


Fig. 26 Basic diagram with a modulating burner

Legend

AL	Indication of nonreadiness	LP	Air pressure switch
BV	Fuel valve	M	Fan motor
EK	Lockout reset button	SA...	Actuator of … damper
FU	Variable speed drive	TG	Tacho-generator
		W	Limit thermostat or pressure switch

The following contacts are included in the burner control's start control loop (terminals 4..5):

- Readiness contact «Q4...Q5» of the RVW25... and RVW26…
- The burner's on / off contact «Q13...Q14» of the load controller
- Limit thermostat «W» or gas pressure switch

In the event of lockout, the RVW25... and the RVW26… can be reset by pressing lockout reset button «EK» in the supply line. Fuel selector «F1» is connected to the line. Terminal «F2» is not used so that the curves and parametes for fuel 1 are permanently selected. The variable speed drive acts on the fan speed, «SA2» on the fuel valve. «SA4», «SA5» and «SA7» are optional auxiliary actuators that can be installed if required. Signal lamp «AL» can be used for indicating faults of the RVW25... and RVW26... With power ON of the RVW25... and RVW26... (during the self-test) the lamp lights up for a short moment.

When sensing terminal «H» with a programmable logic controller, it must be taken into account that with power ON or after a reset of the RVW25… and RVW26…, nonreadiness or a fault of the RVW25... and RVW26… will be signaled for about 2 seconds.

16.2 Basic diagram of a plant with a modulating burner (one type of fuel)

(Using the LAL..., LFL1..., LGK16... or LOK16... as a burner control and the RWF40... as a load controller with O_2 trim control)

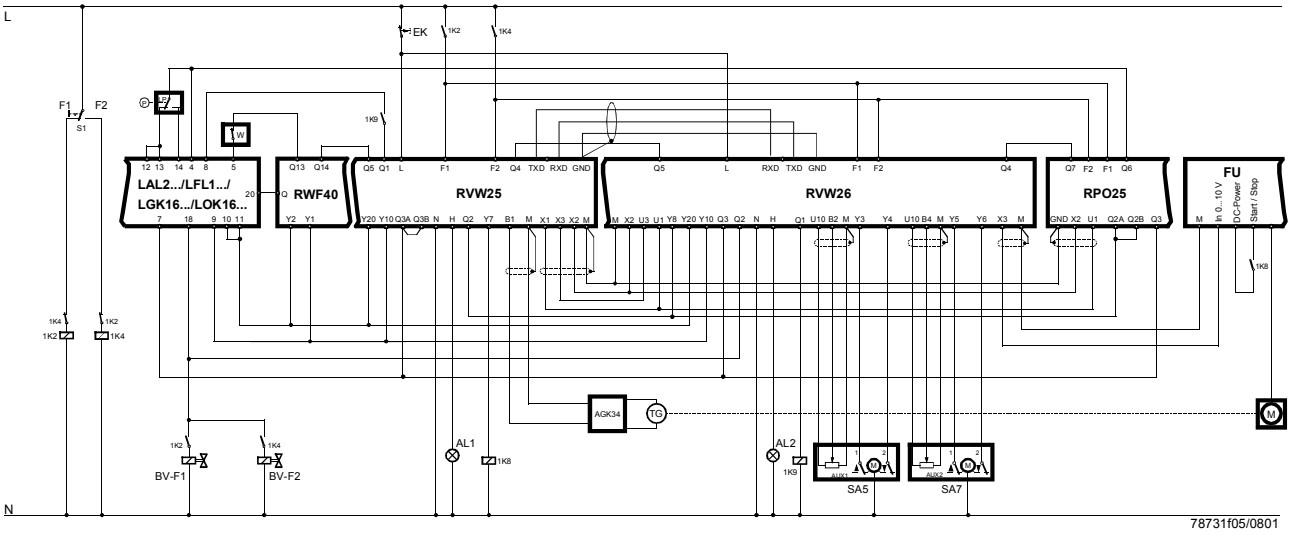


Fig. 27 Basic diagram with O_2 trim control

The following contacts are included in the burner control's start control loop:
The on / off contact of the load controller (Q13...Q14), the readiness contact of the RVW25... and RVW26… (Q4...Q5), the readiness contact of the RPO25... (Q6...Q7), and the limit thermostat.

17 Engineering notes

17.1 Requirements placed on burner design

The mechanical connection between actuator and actuating device must be **rigid with no mechanical play**.
This means that the transmission of forces may not take place due to friction.

Rigid mechanical connections are:
- Key groove with key
- Split pin
- Spindle with flat surface and matching member
- Gear wheels

The mechanical link between actuator spindle and feedback potentiometer must also be rigid, with no mechanical play.
Where possible, slipper valves should be used.
They allow the actuator to be fitted directly to the valve, thus eliminating the need for intermediate linkage.
The total running time of the actuators (corresponding to DC 0...10 V at the feedback potentiometer) must be in the range between 20 and 120 seconds, but the running times of the individual actuators may vary.
It is of advantage to use valves and dampers with a characteristic as close as possible to **equal-percentage**.
The ramp time (corresponding to the full speed range from standstill to maximum speed) for the fan motor must lie between 60 and 240 seconds.
The ramp time must be at least twice the running time of the slowest actuator.

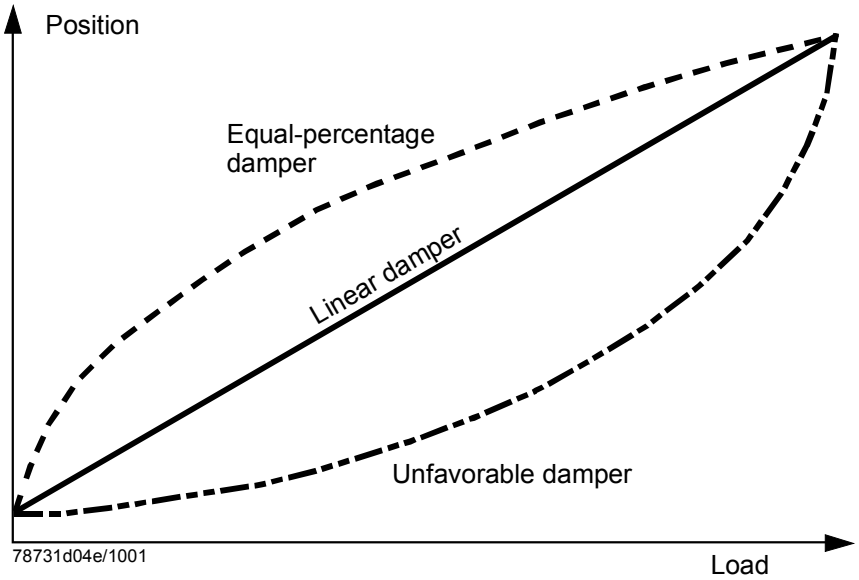


Fig. 35 Air damper characteristic

If should be noted here that the positioning accuracy is 40 mV.
If, for example, the gas damper has an extremely **unfavorable characteristic**, the positioning accuracy (neutral zone) will lead to **inaccuracies** in terms of gas flow rate.

Example of a linear gas damper:
40 mV at 20 % output = 2 % accuracy in terms of gas throughput, with appropriate impact on the combustion process and the O_2 value.

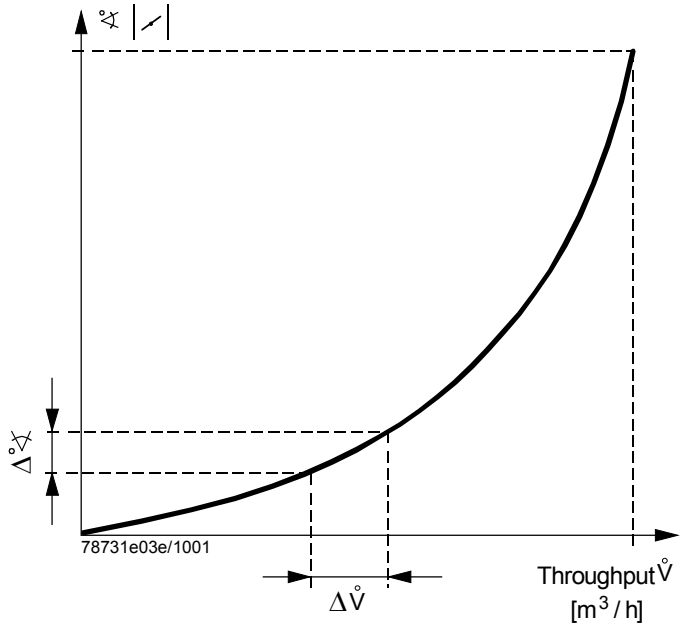


Fig. 36 Gas damper characteristic

Usually, when close to low-fire operation, the regulating units' slope is overproportional. Also, when the burner's output is small, a certain change in air volume (Δ V) leads to a large percentage change in air volume.

This may lead to problems in connection with O_2 trim control.
When installing the actuators according to the wiring diagrams released by this products, the actuators are in their «Fully closed» position when the burner is shut down.

If an actuator shall be in its **«Fully open»** position when the burner is shut down:

- The control outputs (on / off) must be interchanged
- The potentiometer connections (U10 / M) must be interchanged

Note:
This changes the assignment of the potentiometer voltage to the damper position.

Position	**Feedback voltage from potentiometer**
Fully closed	High voltage
Fully open	Low voltage

In this case, the end switch measurement «Fully open» measures the «Fully closed» position, and vice versa.

17.2 Engineering

Separate cables must be used for low voltage lines on the one hand and mains voltage lines on the other.
Low voltage lines should not be run parallel to mains voltage lines when long distances are involved (disturbances).
The lines to the feedback potentiometers in the actuators must be shielded (including those in the control panel).
The shielding must be connected on only one side, namely to terminal «M» of the RVW26...
It must **never be connected** on the actuator side.
There must be **no electrical** connection between terminals «N» and «M» and between «M» and «PE».
The maximum permissible line length is 100 m.
The lines to terminal «X2» (application of correcting variable) and to terminal «U1» (analog input for burner output) should also be shielded, with the shielding connected to terminal «M» of the RVW26...
The RVW26... should be mounted such that its display is visible (error code, etc.).
The actuator running times must lie between 30 and 60 seconds..

17.3 Requirements placed on the actuators and potentiometers

The electronic control unit RVW26... is designed to provide air / fuel ratio control, or in other words, to ensures precise positioning of the correcting members for air and fuel.
To accomplish this, the actuating devices and feedback potentiometers, which are used for signaling the actual position, must satisfy stringent requirements.
For this reason, we have developed suitable actuators and potentiometers for use with the RVW26...
To ensure reliable operation over long periods of time, we recommend to make use of this range of products.
Inspections and approvals of RVW2... air / fuel ratio control systems are **only** valid in connection with our actuators and potentiometers.

If other brands of actuators are used, they must meet the same stringent requirements. In that case, a separate approval procedure is required.

Requirements placed on the actuators

- The mechanical link between actuator spindle and feedback potentiometer must be rigid, with no mechanical play
- The reproducibility of the end switch position must be better than < ±2 % of the positioning range
- The backlash of the actuator's geartrain must be less than 2 % of the positioning range (< ±2 % of the positioning range correspond to ±1.8° in the case of a 90° actuator)
- The tolerance of the feedback potentiometer's voltage value in the end switch positions due to backlash and end switch reproducibility **must be less than 0.2 V**

If should be noted that a geartrain's backlash increases with the number of operating hours. Also, higher ambient temperatures and vibrations generally have an adverse effect on the backlash. This should be taken into consideration when doing planning work.

Requirements placed on the feedback potentiometers

- The total resistance must be in the range of 800 Ω < R < 1500 Ω (nominal value 1000 Ω)
- The characteristic's tolerance must be no more than ±1 %

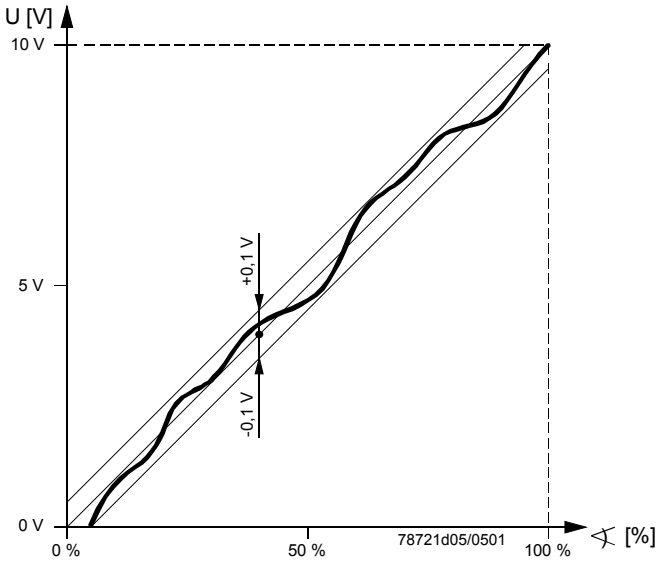


Fig. 37 Required linearity of the feedback potentiometer

- With a change of 0.4 %, the change in voltage over the entire angular rotation must be 40 mV ±10 mV

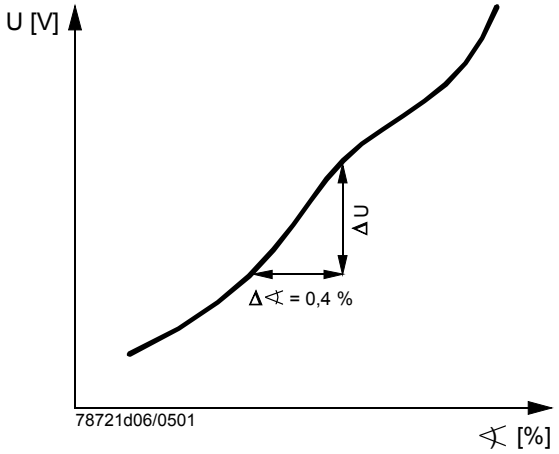


Fig. 38 Required microlinearity of the feedback potentiometer

- The potentiometer wiper must be able to carry a current of ≤ 0.1 mA. The electrical contact must also be suited for very small currents

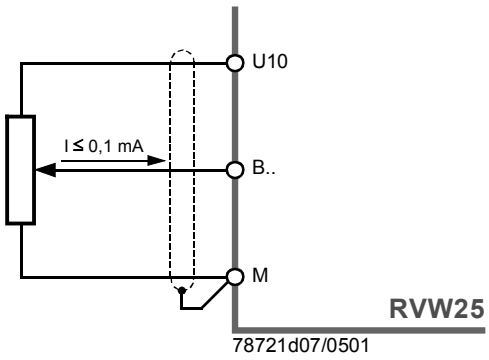


Fig. 39 Required contact rating of the potentiometer wiper

- The potentiometer should be capable of exceeding 1 million cycles

Since the above requirements cannot be met with wire potentiometers, this products uses **special conductive plastic potentiometers** of high quality.
If potentiometers of other manufacture are used, it is **recommended to always install** conductive plastic potentiometers.

17.4 Requirements placed on the variable speed drive and the fan speed feedback signal

The variable speed drive controls the amount of combustion air via the fan speed. Based on the feedback signal received, the RVW26... controls the fan speed.
To ensure constant and steady combustion, accurate fan variable speed drive is very important.

To provide control, the variable speed drive must have the following inputs:

- Analog input DC 0...10 V
- Start / stop

18 Notes on the commissioning of a burner

- **Check the actuators and adjust the end switches**
  Make certain the correct potentiometer is used (1000 Ω / 90° or 1000 Ω / 135°, depending on the required mechanical angular rotation).
  Check (rigid) connection between regulating unit and actuator.

  Adjust the end switches and potentiometers:
  Adjust the end switches «Fully closed» and «Fully open» such that the actuating devices will be able to travel at least over the required mechanical angular rotation.

  Adjust potentiometers and end switches so that there is a voltage of < 0.4 V in the «Fully closed» position and a voltage of < 9.6 V in the «Fully open» position.
  The voltage can also be measured directly with the AZW20.20.
  If the end switch measurement is selected on programming level 2, the display will show the current voltage.

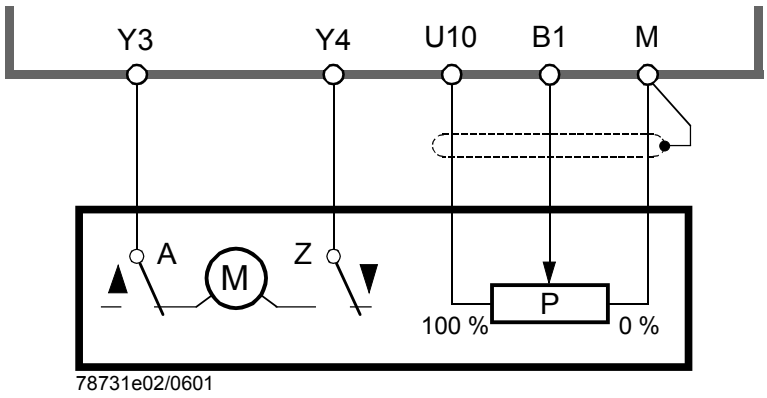


Fig. 28 Actuator with feedback potentiometer

Careful and correct adjustment of the end switches and potentiometers is extremely important.
The steps indicated below are useless if this work has not been carried out correctly.

- Connect the handheld unit AZW20.20 and switch the RVW26... to programming mode
- Plants with O_2 trim control (or with application of a correcting variable at «X2»). For the moment, switch the correcting variable off (that is, set «Disturb» on programming level 4 to «0»)
- Select the required type of fuel (terminals «F1 / F2»)
- Make the settings on programming levels 1...6 according to the specific plant requirements. For the moment, select 5 curvepoints (programming level 4, «SetPts = 5»)
- Measure the end switches. On programming level 2, trigger automatic measurement of the end switches. Check if the measured values lie in the range of 0.4...9.6 V. When using 2 types of fuel, the last 4 steps must be made for **both** types of fuel
- **On programming level 5, set the 5 curvepoints for all actuators.** This is the basic setting used to enable burner startup. The fine-tuning will be made later when the burner is running, including measurement of the emissions

- **On programming level 6, set the ignition load and ignition positions.** Then, on programming level 7, store the set parameters with «SavePar» in the RZD20 and cancel the fault messages. When changing from programming mode to operating mode, an automatic interpolation with 17 curvepoints is always made. Missing curvepoints will automatically be calculated by the RVW26...
- **Start the burner.** To do this, quit the programming mode (change 0 on the programming level). When the burner is in operation (RVW26... in phase «R»), it is possible to change back to the programming mode, allowing the burner settings to be optimized on programming level 5

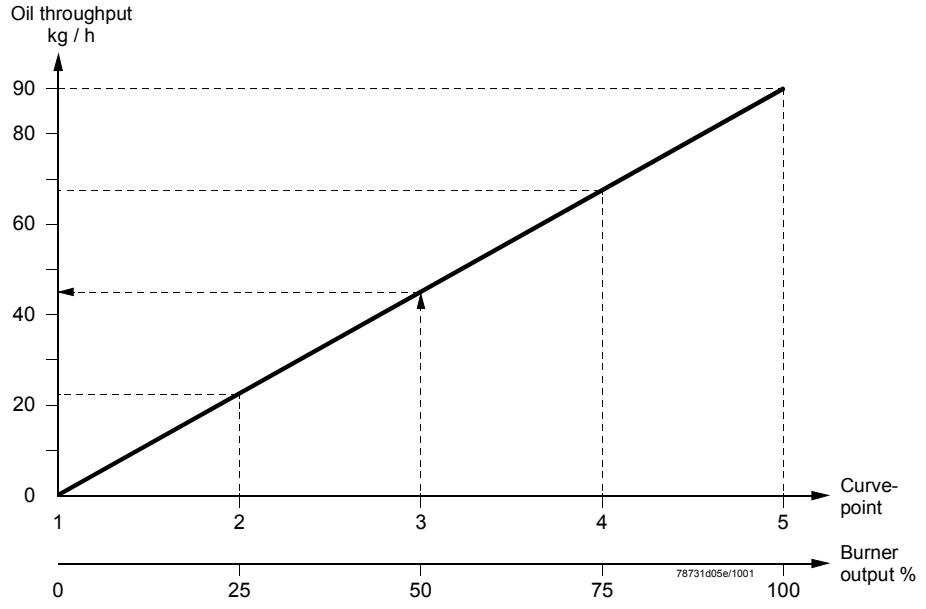


Fig. 29 Graph for adjustment of the curve

For example:
A burner for light oil has a capacity of 1 MW.
This output requires an oil throughput of 90 kg / h.
With the help of a graph, the required oil throughput can be ascertained for each curvepoint.
At each curvepoint, the fuel actuator is now to be set for the respective amount of fuel.
Then, the air damper actuator is to be set to produce the required amount of excess air (e.g. with CO_2, O_2 or CO measurements).
The setting should be made such that the actual burner output corresponds to the display of the RVW26...
When used in connection with O_2 trim control, this burner setting must be made with sufficient amounts of excess air.
Take into account that application of a correcting variable (O_2) will reduce the amount of excess air to the optimum level.
But the excess air volume can never become greater than the burner's basic setting.

- Make optimum ignition settings on the programming level
- When using 2 types of fuel, change to the second fuel now (terminals «F1 / F2») and make the above settings for the second fuel also
- In the case of a plant with O_2 trim control, start the plant and set the «Disturb» factor such that the RVW25... and RVW26… will be able to compensate all effects (supply air temperature, calorific value, etc.).

18.1 Setting instructions for the RVW26...

All programmed curvepoints of the RVW26... are related to the burner's output.
After setting the RVW26..., the curvepoints of the RVW26... should correspond to those of the burner load.
This is especially important in connection with O_2 trim control!

In case the burner is started with a coarse preadjustment, there are 2 different ways to adjust the curves for the air and fuel value in relation to the burner load:

A. **Curve adjustment by determining the amount of fuel**
(accurate but complex)

Procedure:
1. Determine the amount of fuel at maximum burner output.
2. Calculate the amount of fuel for each load point.
3. Start the burner with the basic adjustment.
4. First adjust the required load point for the calculated amount of fuel. Then, adjust the amount of air until the desired flue gas values are attained. Check the flue gas values with a flue gas analyzer.
5. Repeat step 4 until all programmable curvepoints are adjusted down to the low-fire position values.
6. Interpolate the curvepoints below the low-fire position value (e.g. 0 %).

B. **Curve adjustment by O_2 value with the help of an auxiliary table** (e.g. for 17 curvepoints, see below)
(less accurate, but quicker)

Procedure (e.g. highlighted table column)

1. Determine the amount of fuel at maximum burner output and set it. Set the fan speed to the required O_2 setpoint (e.g. 2.20 %).
2. Set the RVW25... and the RVW26… to the next lower loadpoint (93.7 %) while maintaining the positions for fuel and air. Here, warning «-58 / Monoton fail») will be delivered. Ignore this message when making the next settings.
3. Reduce the amount of fuel until the O_2 value (3.37 %) listed in the table for this load point (93.7 %) is reached.
4. Reduce the air volume until the demanded O_2 setpoint is reached. This can be either the O_2 value of the table column used until now (2.2 %) or the value of another column (e.g. 2.40 %). Warning «-58») must now disappear within 20 to 30 seconds.
5. Repeat steps 2 through 4 until the minimum burner output is reached.
6. Interpolate the curvepoints below the low-fire position values (e.g. 0 %).

O_2 setpoint [%]	4.00	3.80	3.60	3.40	3.20	3.00	2.80	2.60	2.40	2.20	2.00
Number (λ)	1.24	1.22	1.21	1.19	1.18	1.17	1.15	1.14	1.13	1.12	1.11
Output (P) [%]											
100	4.00	3.80	3.60	3.40	3.20	3.00	2.80	2.60	2.40	2.20	2.00
93.75	5.06	4.87	4.68	4.49	4.31	4.12	3.93	3.74	3.56	3.37	3.18
87.50	5.13	4.94	4.75	4.57	4.38	4.19	4.01	3.82	3.63	3.46	3.26
81.25	5.21	5.02	4.84	4.65	4.46	4.28	4.09	3.91	3.72	3.54	3.35
75.00	5.30	5.12	4.93	4.75	4.56	4.38	4.19	4.01	3.82	3.64	3.45
68.75	5.41	5.23	5.04	4.86	4.68	4.49	4.31	4.13	3.94	3.76	3.58
62.50	5.54	5.35	5.17	4.99	4.81	4.63	4.45	4.26	4.08	3.90	3.72
56.25	5.69	5.51	5.33	5.15	4.97	4.79	4.61	4.43	4.25	4.07	3.89
50.00	5.88	5.70	5.52	5.34	5.17	4.99	4.81	4.63	4.46	4.28	4.10
43.75	6.11	5.94	5.76	5.59	5.41	5.24	5.06	4.89	4.71	4.54	4.36
37.50	6.41	6.24	6.07	5.90	5.73	5.56	5.39	5.21	5.04	4.87	4.70
31.25	6.82	6.65	6.48	6.32	6.15	5.98	5.82	5.65	5.48	5.32	5.15
25.00	7.38	7.22	7.06	6.90	6.74	6.58	6.42	6.26	6.10	5.94	5.78
18.75	8.23	8.08	7.93	7.78	7.63	7.48	7.33	7.18	7.03	6.87	6.73
12.50	9.63	9.50	9.37	9.23	9.10	8.97	8.83	8.70	8.57	8.43	8.30

Creating the auxiliary table

Procedure:

1. Consider the admissible range of curvepoints
2. Calculate the O_2 table values:

$$O_2new = 20.9\ \% - \left[\frac{Pnew}{Pold} \times (20.9\ \% - O_2\ setpoint)\right]$$

3. Calculate the air number (λ):

$$\lambda = \frac{20.9\ \%}{(20.9\ \% - O_2\ setpoint)}$$

Legend

O_2 setpoint	O_2 table value of the load (P = 100 %)
O_2new	O_2 value after fuel reduction
Pnew	Required load value after fuel reduction
Pold	Current load value before fuel reduction

Example:

1. Set the maximum burner output (100 %) with an O_2 value of 2 %.
   The positions are: «Air_Pos» = 9.40 and «FuelPos» = 8.32 .
2. Reduce burner output to 93.7 % using the AZW....
   For the moment, set «Air_Pos» = 9.40 and «FuelPos» = 8.32 for this load point.
3. Reduce «FuelPos» until the O_2 value of 3.18 % is reached (column with the O_2 setpoint of 2.00 % in the table). The O_2 setpoint is reached at «FuelPos» = 7.92.
4. Reduce «Air_Pos» until the O_2 value of 2 % is reached. This is the case at «Air_Pos» = 8.92.
5. Reduce burner output to 87.5 % using the AZW...
   For the moment, set «Air_Pos» = 8.92 and «FuelPos» = 7.92 for this load point.
6. Reduce «FuelPos» until the O_2 value of 3.26 % is reached. The O_2 value is reached at «FuelPos» = 7.18.
7. Reduce «Air_Pos» until the O_2 value of 2.2 % is reached because the level of excess air shall be higher. This is the case at «Air_Pos» = 8.40. With the next setting, the column with the O_2 setpoint of 2.20 % applies.
8. Set the load points until the minimum output is reached, following the same procedure.
9. The curvepoints below the minimum output should be interpolated and then set.

18.2 Permissible range of curvepoints

Legend

Z	End switch position «Fully closed»
A	End switch position «Fully open»
T	End switch tolerance ±200 mV
Disturb	Impact of correcting variable
MinLoad / IgnitLo	Minimum load / ignition load
Load	Output signal with no correcting variable
MaxLoad	Maximum burner output

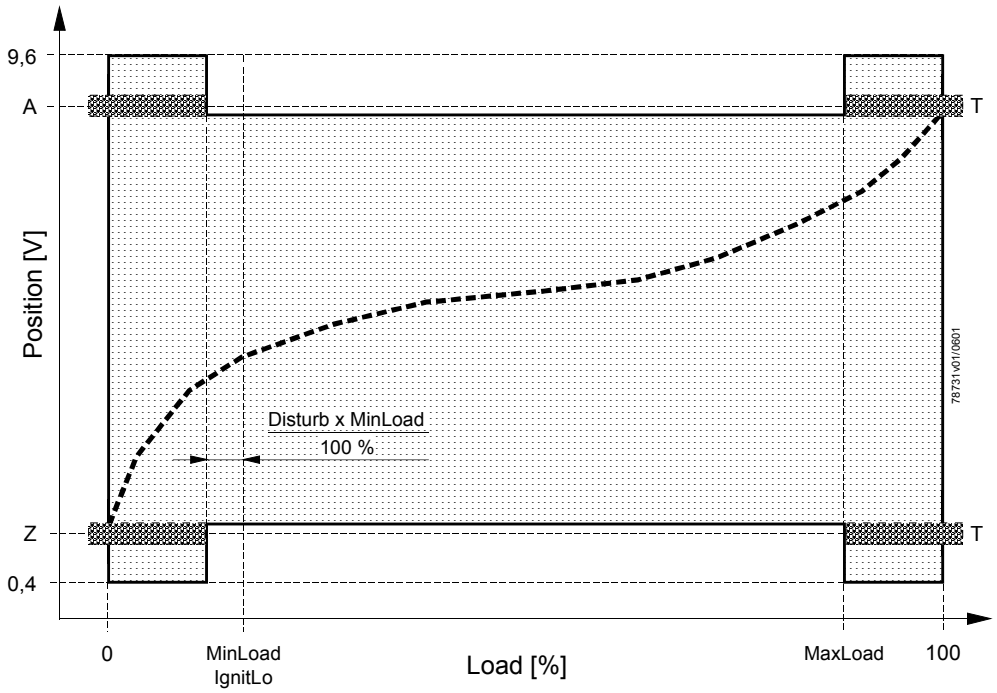


Fig. 30 Permissible range of curvepoints

18.3 Setting report

Plant: .....

Date: .....

Fuel 1: ..... Fuel 2: .....

	Fuel 1	**Fuel 2**
Number of auxiliary actuators *	Aux1Act..... (½)	
Second auxiliary actuator (Y5 / Y6) *	Aux2Act..... (on / off)	
Interval t4 *	Interva ..... (s)	
Running time of auxiliary actuator 1 (AUX1)	Aux1Tim ..... (s)	.....(s)
Running time of auxiliary actuator 2 (AUX2) *	Aux2Tim ..... (s)	
Position of end switches «Fully closed» (Close) *	Aux1Pos..... (V) Aux2Pos..... (V)	.....(V)
Position of end switches «Fully open» (Open) *	Aux1Pos..... (V) Aux2Pos..... (V)	.....(V)
Compensation of hysteresis	Hyster..... (V)	.....(V)
Impact of correcting variable	Disturb..... (%)	.....(s)
Impact of correcting variable on actuator (AUX2)	Aux2Dis..... (on / off)	.....(on / off)

* Settings also apply to fuel 2

Curve characteristics **Fuel 1**

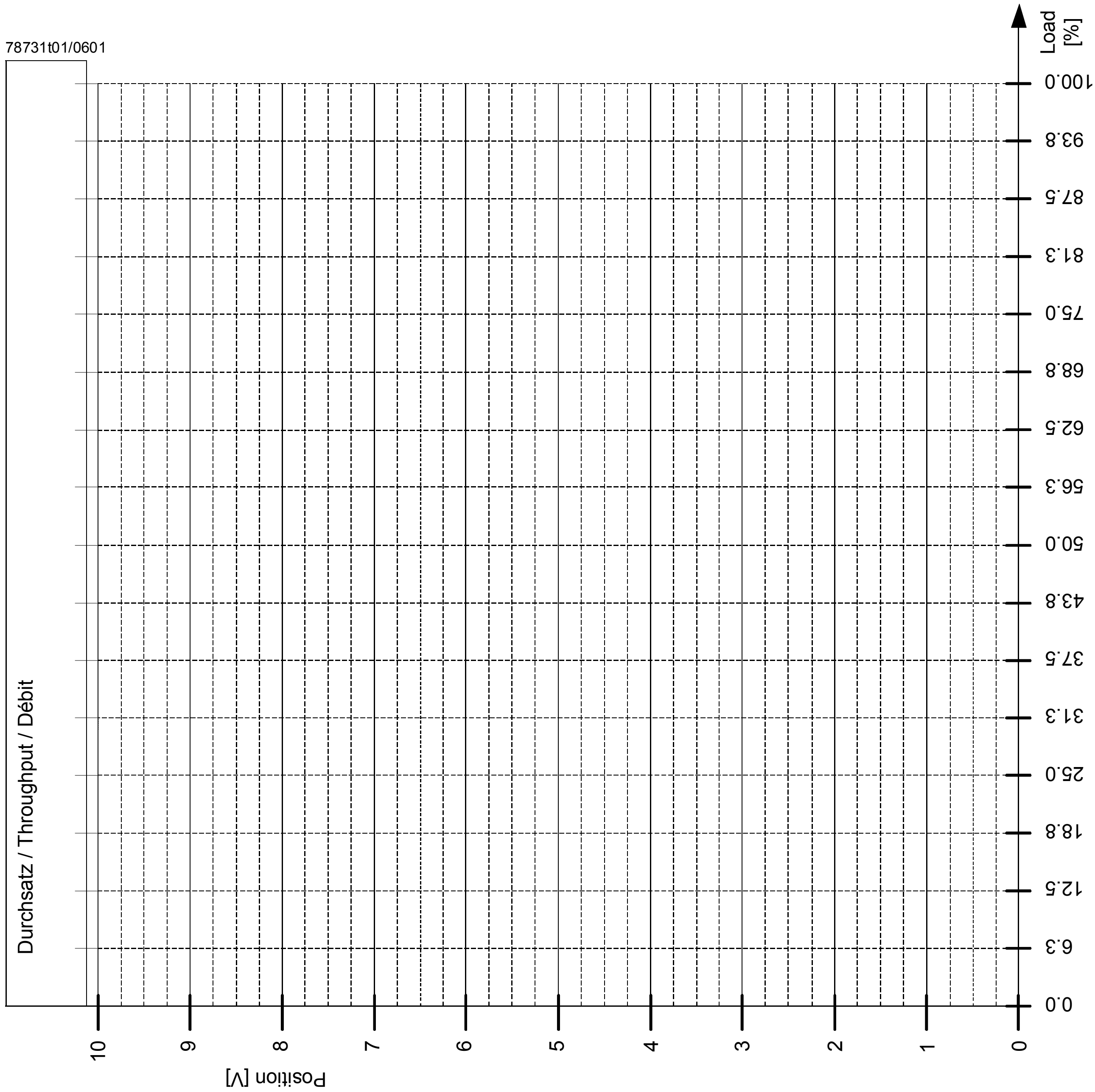
Load [%] (Burner output)	**Air_Pos [V]** (Position air)	**FuelPos [V]** (Position fuel)	**Aux_Pos [V]** (Position auxiliary actuator)
0.0			
6.3			
12.5			
18.8			
25.0			
31.3			
37.5			
43.8			
50.0			
56.3			
62.5			
68.8			
75.0			
81.3			
87.5			
93.8			
100			

Ignition load IgnitLo ..... [%]
Position of auxiliary actuator 1 on ignition Aux1Pos ..... [V]
Position of auxiliary actuator 2 on ignition Aux2Pos ..... [V]

Fuel 2

Load [%] (Burner output)	**Air_Pos [V]** (Position air)	**FuelPos [V]** (Position fuel)	**Aux_Pos [V]** (Position auxiliary actuator)
0.0			
6.3			
12.5			
18.8			
25.0			
31.3			
37.5			
43.8			
50.0			
56.3			
62.5			
68.8			
75.0			
81.3			
87.5			
93.8			
100			

Ignition load IgnitLo ..... [%]
Position of auxiliary actuator 1 on ignition Aux1Pos ..... [V]
Position of auxiliary actuator 2 on ignition Aux2Pos ..... [V]



Anlage:
Plant:
Installation:

Brennstoff:
Fuel:
Combustible:

Regelorgan:
Regulating unit:
Organ de réglage:

Datum:
Date:
Date:

Example

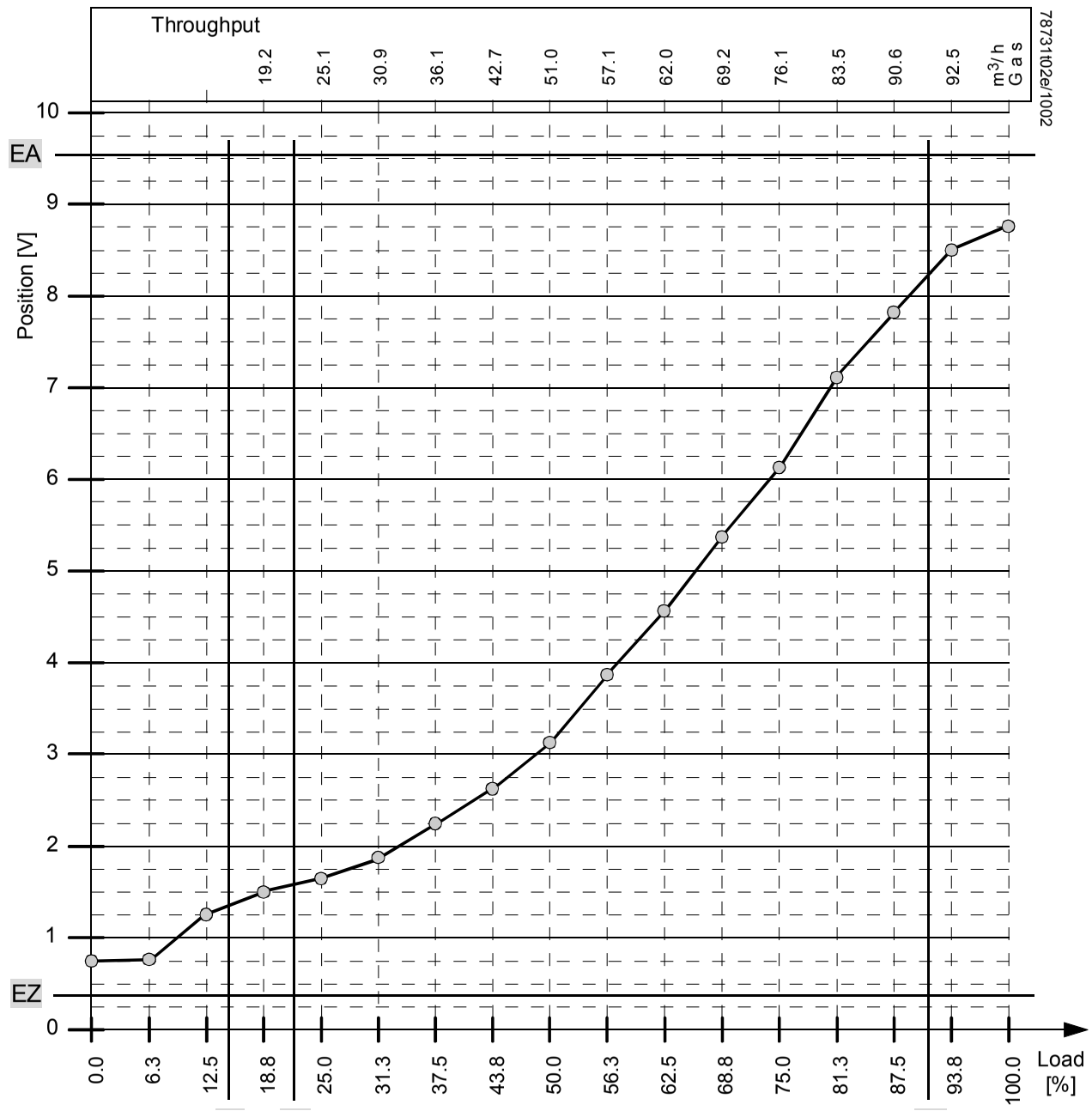
Plant: *Heating plant Landis & Staefa*

Fuel: *Gas*

Actuating device: *Gas damper*

Date: *April 2000*

EZ End switch «fully closed»
EA End switch «fully open»
ZL Ignition load
KL Low-fire
NL High-fire



19 Technical data

General data

Operating voltage	AC 230 V ±15 %
Frequency	50 / 60 Hz ±6 %
Power consumption	< 15 VA
Protection standard of housing	
- Front	IP 42 DIN 40050
- Base	IP 10 DIN 40050
Insulation class	II VDE 0631
Mounting position	optional
Switching capacity of relay «L-Q1»	
• Voltage	operating voltage
• Current	2 A
Switching capacity of relay «Q4...Q5 / H»	AC 24...265 V
• Voltage	at AC 230 V: 0.005...2 A
• Current	at AC 24 V: 0.02...2 A
Switching capacity of control outputs «Y3...Y6, Y8»	
• Voltage	operating voltage
• Current	5...150 mA_{eff}
Control inputs «Q2, Q3, Y10, Y20, F1, F2»	
• Voltage ON	
• Voltage OFF	AC 187...265 V
• Current ON	< AC 50 V approx. 0.4 mA
Signal inputs «B1...B4, U1»	
• Voltage	DC 0...10 V
• Impedance	130 KΩ
• Perm. humming voltage	max. AC 50 mV
Signal output «X2 / U3»	
• Voltage	DC 0...10 V
• Impedance	25 KΩ
Signal output «U10»	
• Voltage	DC 10 V
• Current	max. 50 mA
Signal output «X1»	
• Voltage	DC 0...10 V
• Impedance	100 Ω
Signal output «X3»	
• Voltage	DC 0...10 V
• Impedance	470 Ω
Signal output +5 V	auxiliary voltage; max. load 1 mA
Suitable feedback potentiometers	1000 Ω total resistance (perm. 800...1500 Ω) (refer to «Product range overview»)
Actuator running times	30...60 s (the various actuators may have different running times, refer to «Product range overview»)

	Cable specifications	
	• Lines to the actuators	
	– Length	max. 100 m
	– Cross section	min. 0.75 mm²
	• Lines to the potentiometers	
	– Length	max. 100 m
	– Cross section	Li2YCY 2 x 2 x 0.2 or LiFYCY 2 x 2 x 0.2

Environmental conditions	**Transport**	DIN EN 60 721-3-2
	Climatic conditions	class 2K2
	Mechanical conditions	class 2M2
	Temperature range	-25...+70 °C
	Humidity	< 95 % r.h.
	Operation	DIN EN 60 721-3-3
	Climatic conditions	class 3K5
	Mechanical conditions	class 3M2
	Temperature range	0...+60 °C
	Humidity	< 95 % r.h.

⚠ **Condensation, formation of ice and ingress of water are not permitted!**

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