SIEMENS

Presentation example LME7

LME71.901A2
LME71.901A2 burner control with program sequence

User Documentation

Application:

- **Modulating, directly ignited forced draft burners**
- **Integrated PWM fan motor control via 3-position controller or analog signal for burners with pneumatic ratio control**
- **Integrated valve proving (can be parameterized)**
- **E.g., for burners to EN 676**

LME7 and this User Documentation are intended for original equipment manufacturers (OEMs) using the LME7 in or on their products

☞ Note!
This documentation is only valid together with LME7 Basic Documentation (P7105)!

Software version V02.03
From production date 210310xxxx

Smart Infrastructure

CC1A7105.6en
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Contents

1 Supplementary documentation

Product type	Designation	Type of documentation	Documentation number
LME	Burner control	Environmental Product Declaration	E7105 *)
LME7	Burner control	Data Sheet	N7105
LME	Burner control	Product Range Overview	Q7101
LME7	Burner control	Basic Documentation	P7105

*) On request

Note
This document only refers to the product type – not the *product designation*. See the table below for details.

Product type	Product designation
ACS410	PC software
AZL2	Display and operating unit
ION	Ionization probe
LME7	Burner control
QRA	UV flame detector
QRB	Photo resistive detector
QRC	Blue-flame detector

2 Warning notes

Warning!
All the safety, warning, and technical notes given in the basic documentation for the LME7 (P7105) also apply to this document in full.

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

The LME7 is a safety device! Do not open, interfere with or modify the unit. Siemens does not assume responsibility for damage resulting from unauthorized interference!

When the fan operates on permanent phase, it must be ensured that there is a safe electrical separation between mains voltage and PWM/Hall input/output. Failure to observe this information poses a risk of damaging the safety functions and a risk of electric shock.

Warning!
On the OEM access level of the LME7, it is possible to make parameter settings that differ from application standards. When setting the parameters, it is important to ensure that the application will run safely in accordance with legal requirements. Failure to observe this information poses a risk of damaging the safety functions.

Warning!
Risk of damage to the switching contacts!
If the external primary fuse (Si) is blown due to overload or short-circuit at the terminals, the LME7 must be replaced.

3 Typographical conventions

3.1 Safety notes

This User Documentation contains notes which must be observed to ensure your personal safety and to protect the product and the connected equipment. The instructions and notes are highlighted by warning triangles or a hand symbol and are presented as follows, depending on the hazard level:

Warning means that death, severe personal injury or substantial damage to property **can** occur if adequate precautionary measures are not taken.

Note draws your attention to **important information** on the product, on product handling, or to a special part of the documentation.

3.2 Qualified personnel

Only **qualified staff** are allowed to install and operate the unit. Qualified staff in the context of the safety-related notes contained in this user documentation are persons who are authorized to commission, ground and label units, systems and electrical circuits in compliance with established safety practices and standards.

3.3 Correct use

Note the following:

The device may only be used for the applications described in the technical documentation and only in connection with devices or components from other suppliers that have been approved or recommended by Siemens.

The product can only function correctly and safely if shipped, stored, set up and installed correctly, and operated and maintained as specified.

4 LME71.901A2 program sequence

→ For fuel trains **G** without/with valve proving

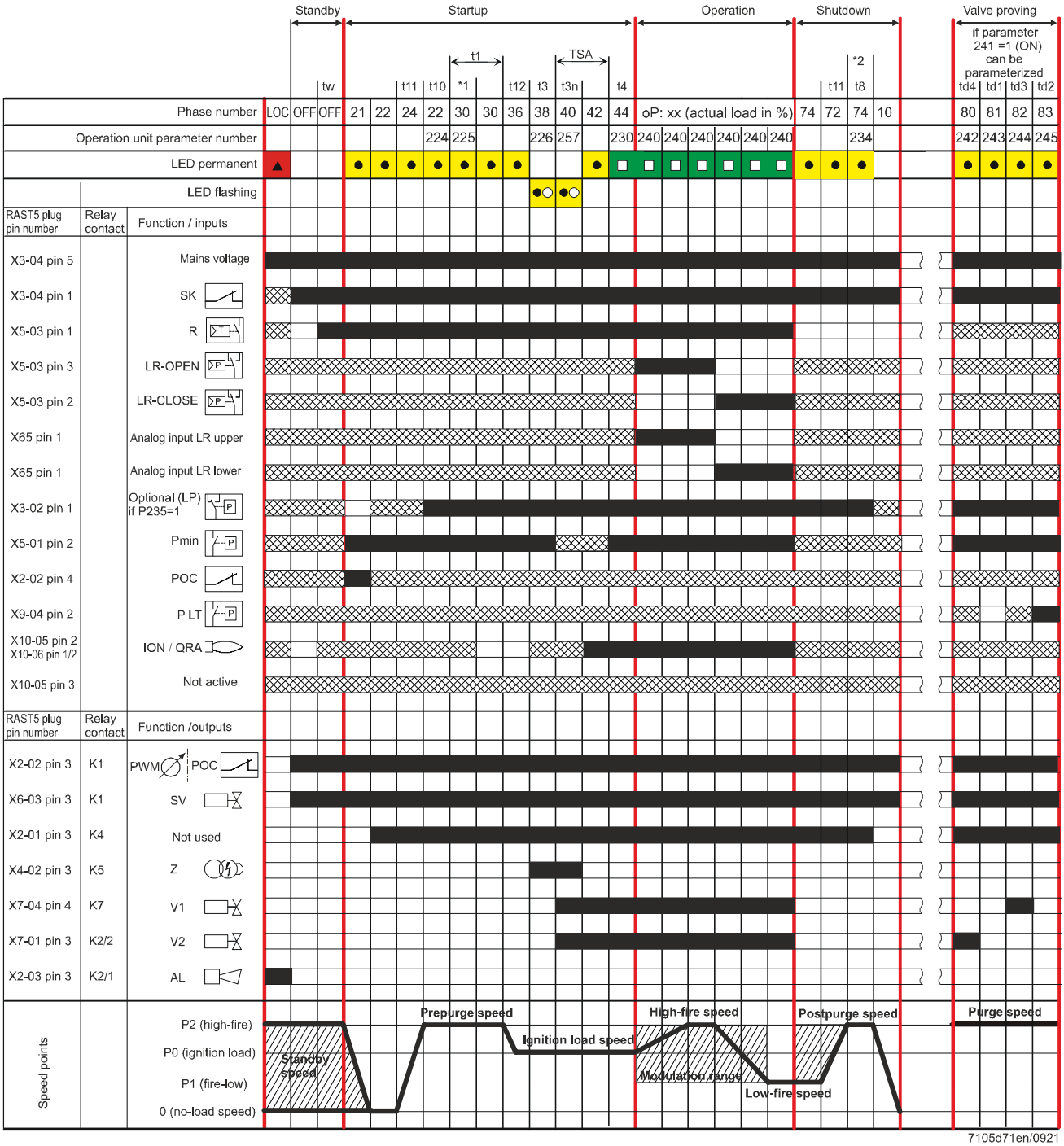


Figure 1: Program sequence for fuel trains **G** without/with valve proving

5 List of phase display

Phase number display		LED	Function
7-segment	**AZL2**		
LOC	LOC	Red	Lockout phase
Standby			
OFF	OFF	OFF	Standby, waiting for heat request
P08	Ph08	OFF	Power ON/test phase (e.g., detector test)
Startup			
P21	Ph21	Yellow	Safety valve ON, air pressure switch in no-load position Test if POC closed (timeout/lockout after 5 seconds) Fan motor speed reduced to 0
P22	Ph22	Yellow	Part 1: Fan motor ON Part 2: Specified time air pressure switch Message (timeout), stabilization air pressure switch
P24	Ph24	Yellow	Stabilization time, fan motor prepurge speed
P30	Ph30	Yellow	Part 1: Prepurge time without extraneous light test *1 Part 2: Prepurging with extraneous light test (2.1 seconds)
P36	Ph36	Yellow	Speed stabilization time, fan motor ignition load speed
P38	Ph38	Yellow flashing	Preignition time
P40	Ph40	Yellow flashing	Postignition time
P42	Ph42	Green	Flame detection
P44	Ph44	Green	Interval: End of safety time and load controller release
Operation			
xx	oP:xx	Green	Operation (modulation), display of actual value in percent (%)
Shutdown			
P10	Ph10	OFF	Home run
P72	Ph72	Yellow	Speed stabilization time, fan motor postpurge speed
P74	Ph74	Yellow	Postpurge time *2
Valve proving			
P80	Ph80	Yellow	Test space evacuating
P81	Ph81	Yellow	Test time atmospheric pressure
P82	Ph82	Yellow	Test space filling
P83	Ph83	Yellow	Test time gas pressure
Safety shutdown phases			
P01	Ph01	Yellow / red	Under voltage / over voltage
P02	Ph02	Yellow	Safety shutdown (e.g., open safety loop) → Non-volatile lockout
P04	Ph04	Green / red	Extraneous light in standby
P90	Ph90	Yellow	Gas pressure switch-min open → Safety shutdown and start prevention

*1	Valve proving during prepurging, if - parameter 241.00 = 1 and parameter 241.02 = 1 or - parameter 241.00 = 1 and parameter 241.01 = 0 or - parameter 234 (postpurge time) = 0 seconds
*2	Valve proving during postpurging, if - parameter 241.00 = 1 and parameter 241.02 = 1 or - parameter 241.00 = 1 and parameter 241.01 = 1 and - parameter 234 (postpurge time) >0 seconds

6 Fuel trains (examples)

6.1 Gas direct ignition (G), 1-stage

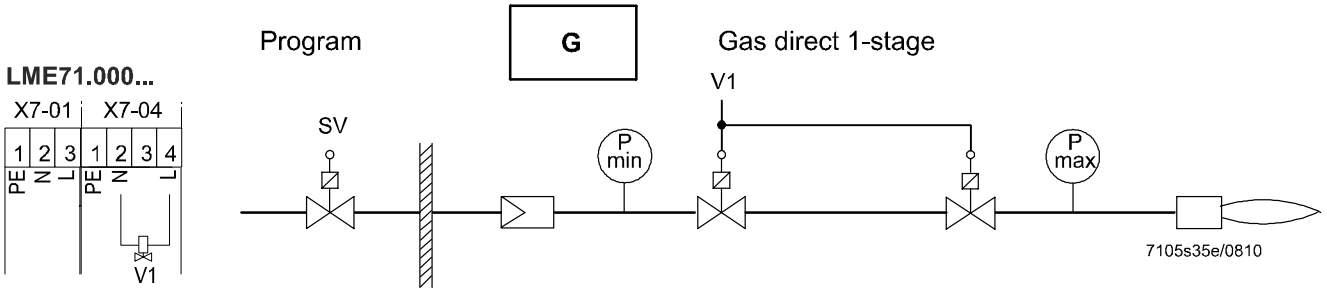


Figure 2: Fuel train gas direct ignition (G), 1-stage

6.2 Gas direct ignition (G), 1-stage, with valve proving

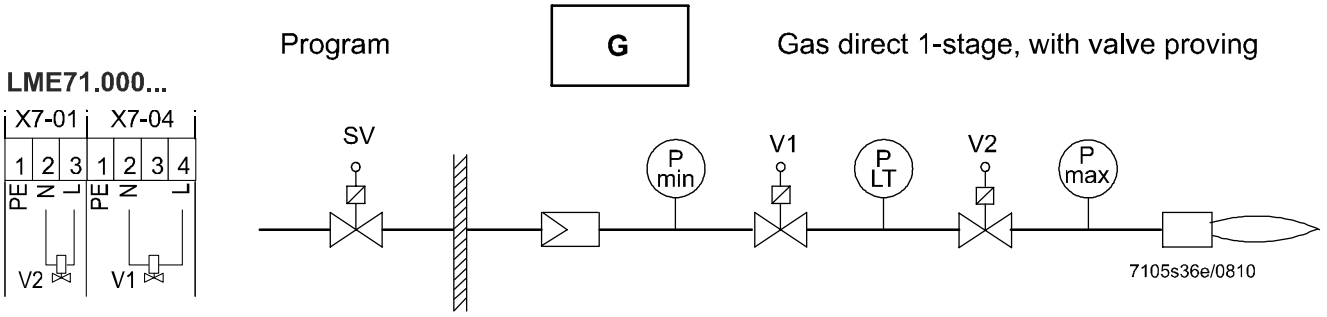


Figure 3: Fuel train gas direct ignition (G), 1-stage, with valve proving

Note!
When valve proving is activated (e.g., on shutdown), the load on the valve's terminals is restricted.

Fuel valves V1 terminal X7-04 pin 4/fuel valve V2 terminal X7-01 pin 3

• Rated voltage	120 V AC	230 V AC
	50/60 Hz	50/60 Hz
• Rated current	1 A	1 A
• Power factor	cosφ >0.4	cosφ >0.4

7 Gas valve proving

Valve proving is dependent on parameter 241. Valve proving is employed to detect leaking gas valves and, if necessary, to prevent the gas valves from opening or ignition from being switched on. A non-volatile lockout will be initiated in these cases.

Valve proving with separate gas pressure switch

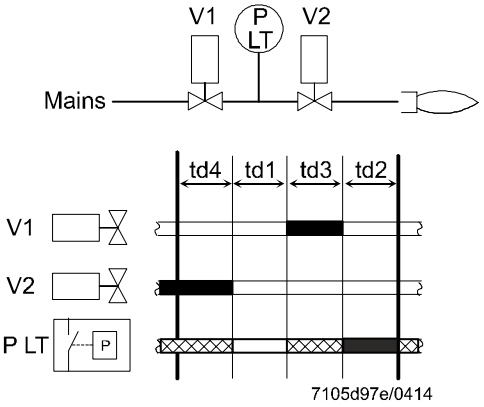


Figure 4: Valve proving with separate gas pressure switch

Step 1: td4 – test space evacuating
Gas valve on the burner side is opened to bring the test space to atmospheric pressure.

Step 2: td1 – test time atmospheric pressure
When the gas valve has closed, the gas pressure in the test space must not exceed a certain level.

Step 3: td3 – test space filling
Gas valve on the mains side opens to fill the test space.

Step 4: td2 – test time gas pressure
When the gas valve has closed, the gas pressure in the test space must not drop below a certain level.

Legend	
td1	Test time atmospheric pressure
td2	Test time gas pressure
td3	Test space filling
td4	Test space evacuating
Vx	Fuel valve
P LT	Pressure switch valve proving
■	Input/output signal 1 (ON)
□	Input/output signal 0 (OFF)
▨	Permissible signal 1 (ON) or 0 (OFF)

Query logic of gas pressure switch for valve proving:
- Gas pressure present ➔ gas pressure switch closed
- Gas pressure not present ➔ gas pressure switch open

Valve proving can be parameterized to take place on startup, shutdown, or both.

Recommendation:
Perform valve proving on shutdown.

No.	Parameter
241.00	Valve proving 0: OFF 1: ON [1])
242	Valve proving – test space evacuating
243	Valve proving – test time atmospheric pressure
244	Valve proving – test space filling
245	Valve proving – test time gas pressure

[1]) Valve proving during postpurging, if parameter 234 >0 (postpurge time) and parameter 241.01 = 1

Program sequence with valve proving

During startup

Valve proving during startup is performed only after a reset from the lockout position, after power ON, and when parameter 234 = 0 seconds. In that case, valve proving takes place at the same time as prepurging. This means that the prepurge time corresponds to at least the sum of all 4 valve proving parameters (242, 243, 244, 245).

During shutdown

Valve proving during shutdown is performed only if the postpurge time >0 (parameter 234 >0). If no postpurge time is parameterized, valve proving takes place during startup when prepurging. During shutdown (heat request OFF), it is checked if parameter 241 = 1 (valve proving ON) and parameter 234 ≠ 0 seconds before the fuel valves close. This means that, first, fuel valve V1 is closed. Fuel valve V2 remains open. This is so that the remaining gas in the test space can be burned. The postpurge time runs at the same time as valve proving. This means that the postpurge time corresponds to at least the sum of all 4 valve proving parameters (242, 243, 244, 245).

During valve proving, the prepurge speed / postpurge speed remains at the value set for parameter 503.01.

Note!
If valve proving is parameterized to take place *on startup and shutdown*, the gas valves must run through additional switching cycles. As a result, strain (wear) on the gas valves and the relay increases.

Warning!
The OEM must set the evacuation, filling and test times for atmospheric or mains pressure on every plant in compliance with the requirements of EN 1643. If not observed, there is a risk of impairment of safety functions.

It must be ensured that the 2 test times are correctly set. It is to be checked whether the gas required for the test may be fed into the combustion chamber (in the relevant application). The test times are safety-related. After a reset and in the case of aborted or prevented valve proving, the LME7 will perform valve proving the next time it is started up (only when valve proving is activated). In the case of valve proving, prepurging is active during the startup phase, even if it has been deactivated.

Examples of aborted valve proving:
When the safety loop input or the start release gas input (containing gas pressure switch-min) opens during valve proving.

Valve proving – calculation of leakage rate

$$t_{Test} = \frac{(P_G - PW) \bullet V \bullet 3600}{Patm \bullet Q_{Leak}}$$

Q_{Leak}	in l/h	Leakage rate in liters per hour
P_G	in mbar	**Overpressure** between the fuel valves at the beginning of the test phase
PW	in mbar	Overpressure set on the gas pressure switch (normally 50% of the gas inlet pressure)
Patm	in mbar	**Absolute air pressure** (1013 mbar normal pressure)
V	in l	Volume between the fuel valves (test volume) including valve volume and pilot path if present
t_{Test}	in s	Test time

8 Input gas pressure switch-min

Behavior in the event gas pressure switch-min fails (terminal X5-01 pin 2 and 3)	If gas pressure switch-min fails, safety shutdown is triggered and startup prevented until gas pressure switch-min closes again. During start prevention, the yellow LED is lit and the safety loop is active. LME7 operates in phase 90.

9 Time table and settings

Type	Times in seconds														
LME71.901A2 Article no.: S55333-B205-A100	tw	TSA max.	t1 P225 4) min.	t3 P226 min.	t3n P257 approx.	t4 P230 min.	t8 P234 5) min.	t10 P224 approx.	t11 approx.	t12 approx.	1)	2)	3)	td1 P243 td2 P245 min.	td3 P244 td4 P242 max.
Specification	2.5	3	30	3	3.5	15	20	15	60	60	---	---	---	10	3
Factory setting	---	t3n+0.45	29.106+2.1	3.087	3.087+0.3	15.582	24.255	13.818	58.212	58.212	---	---	---	10.29	2.646
Max.	2.5	15	1237+2.1	37.485	13.23+0.3	74.97	1237	13.818	---	---	1	0.45	0.45	37.485	2.646
Min.	---	---	0+2.1	1.029	0+0.3	3.234	0	0	---	---	0.3	0.3	---	1.029	0
Increment	---	---	4.851	0.147	0.147	0.294	4.851	0.294	---	---	---	---	---	0.147	0.147

Parameter number	Function	Factory setting
235	Air pressure switch input 0: Inactive 1: Active	1
240.00	Restart in the event of loss of flame during operation <2: None 2: 1 x restart	0
240.01	Restart in the event of no flame at the end of safety time <2: None 2: 1 x restart 3: 2 x restart 4: 3 x restart	0
241.00	Valve proving 0: OFF 1: ON	0
241.01	Valve proving 0: During prepurge time 1: During postpurge time	0
241.02	Valve proving 0: According to parameter 241.01 1: During prepurge time and postpurge time	0

Legend

tw Waiting time
TSA Safety time
t1 Prepurge time
t3 Preignition time
t3n Postignition time parameter 257 +0.3 seconds
t4 Interval: End of safety time – load controller release
t8 Postpurge time
t10 Specified time air pressure switch message (timeout)
t11 Maximum time to reach the prepurge or postpurge speed
t12 Maximum time to reach the ignition load speed

td1 Test time atmospheric pressure
td2 Test time gas pressure
td3 Test space filling
td4 Test space evacuating

1) Reaction time to a change of signal at the air pressure switch contact (opens) and flame-out response time in the event of loss of flame
2) Reaction time to a change of signal at the inputs (e.g., gas pressure switch-min)
3) Flame detection time
4) Minimum time td1 + td2 + td3 + td4 if: parameter 241.00 = 1 (ON), after power ON, with a non-volatile lockout, parameter 234 (postpurge time) = 0 (postpurging) or parameter 241.01 = 0
5) Minimum time td1 + td2 + td3 + td4 if: Parameter 241.00:1 (ON) and parameter 234 (postpurge time) >0 (postpurging) and parameter 241.01: 1

10 Inputs and outputs / internal connection diagram

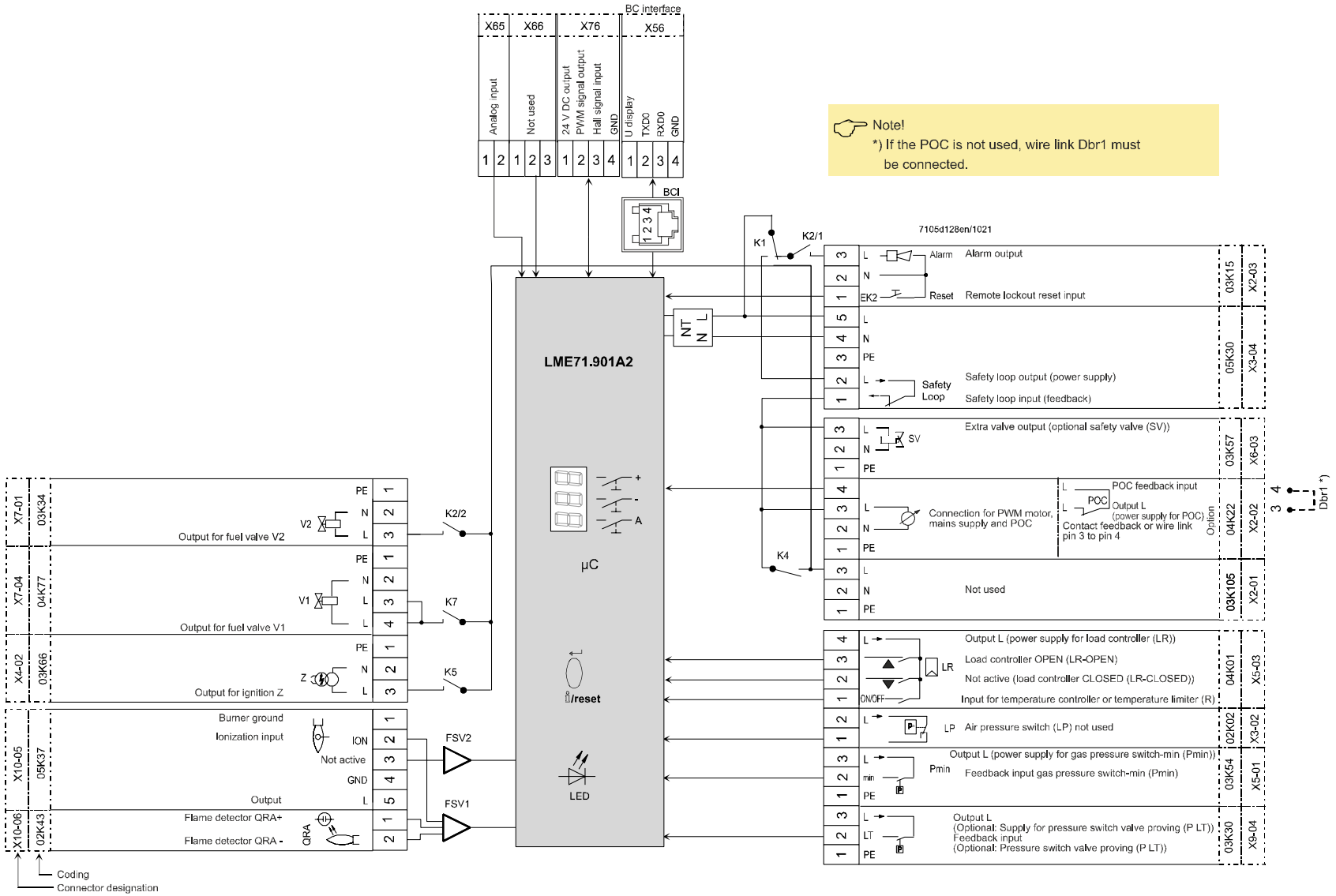


Figure 5: Inputs and outputs / internal connection diagram

11 Parameter list (AZL2)

Abbreviations for password level:	
HF	Heating engineer
OEM	Manufacturer of the original product

Parameter number	Parameter	Edit	Value range Min.	Value range Max.	Increment	Factory setting	Password level reading from level	Password level writing from level
000	**Internal parameters**							
041	Heating engineer (HF) password (4 characters)	Edit	xxxx	xxxx	---	---	---	OEM
042	OEM's password (5 characters)	Edit	xxxxx	xxxxx	---	---	---	OEM
060	Backup/restore	Edit	Restore	Backup	---	---	---	SO (HF)
100	**General**							
102	Identification date	Read only	---	---	---	---	Info	---
103	Identification number	Read only	0	9999	1	0	Info	---
113	Burner identification	AZL2: Read ACS410: Edit	0	99999999	1	--------	Info	OEM via ACS410
120	Basic unit: Program module type (ASN)	Read only	xxxxx.xxxxx	xxxxx.xxxxx	---	0000000000	Only via ACS410	---
140	Mode display for the 7-segment display 1: Standard (program phase) 2: Flame 1 (QRA/ION) 3: Flame 2 (QRB/QRC) ⇨ not used 4: Active power (power value)	Edit	1	4	1	4	SO (HF)	SO (HF)
164	Number of startups resettable	Resettable	0	999999	1	0	Info	Info
166	Total number of startups	Read only	0	999999	1	0	Info	---
170.00	Switching cycles relay contact K12 ⇨ not active	Read only	0	99999999	1	0	Info	---
170.01	Switching cycles relay contact K11 ⇨ not active	Read only	0	99999999	1	0	Info	---
170.02	Switching cycles relay contact K2	Read only	0	99999999	1	0	Info	---
170.03	Switching cycles relay contact K1	Read only	0	99999999	1	0	Info	---
171	Signaling of “Switching cycle exceeded” for one of the relay contact counters (parameters 170.00 to 170.03) → not active	Read only	0	99999999	1	1000000	Info	---

Parameter number	Parameter	Edit	Value range Min.	Value range Max.	Increment	Factory setting	Password level reading from level	Password level writing from level
200	**LME7 burner control**							
224	Specified time air pressure switch	Edit	0 s	13.818 s	0.294 s	13.818 s	SO (HF)	OEM
225	Prepurge time +2.1 seconds	Edit	0 s	1237 s	4.851 s	29.106 s	SO (HF)	OEM
226	Preignition time	Edit	1.029 s	37.485 s	0.147 s	3.087 s	SO (HF)	OEM
230	Interval (t4): End of safety time – load controller release	Edit	3.234 s	74.97 s	0.294 s	15.582 s	SO (HF)	OEM
234	Postpurge time	Edit	0 s	1237 s	4.851 s	24.255 s	SO (HF)	OEM
235	Air pressure switch input 0: Inactive 1: Active	Edit	0	1	1	1	SO (HF)	OEM
240.00	Restart in the event of loss of flame during operation <2: None 2: 1 x restart	Edit	0	2	1	0	SO (HF)	OEM
240.01	Restart in the event of no flame at the end of safety time <2: None 2: 1 x restart 3: 2 x restart 4: 3 x restart	Edit	0	4	1	0	SO (HF)	OEM
241.00	Valve proving 0: OFF 1: ON	Edit	0	1	1	0	SO (HF)	OEM
241.01	Valve proving 0: During prepurge time 1: During postpurge time	Edit	0	1	1	0	SO (HF)	OEM
241.02	Valve proving 0: According to parameter 241.01 1: During prepurge time and postpurge time	Edit	0	1	1	0	SO (HF)	OEM
242	Valve proving – test space evacuating	Edit	0 s	2.646 s	0.147 s	2.646 s	SO (HF)	OEM
243	Valve proving – test time atmospheric pressure	Edit	1.029 s	37.485 s	0.147 s	10.290 s	SO (HF)	OEM
244	Valve proving – test space filling	Edit	0 s	2.646 s	0.147 s	2.646 s	SO (HF)	OEM
245	Valve proving – test time gas pressure	Edit	1.029 s	37.485 s	0.147 s	10.290 s	SO (HF)	OEM
257	Postignition time +0.3 seconds	Edit	0 s	13.23 s	0.147 s	3.087 s	SO (HF)	OEM
400	**Ratio control (operation)**		Dependent on:					
403.00	Fan speed: Ignition load speed (P0)	Edit	Parameter 516.00	Parameter 516.01	10 rpm	1600 rpm	SO (HF)	SO (HF)
403.01	Fan speed: Low-fire speed (P1)	Edit	Parameter 517.00	Parameter 517.01	10 rpm	1500 rpm	SO (HF)	SO (HF)
403.02	Fan speed: High-fire speed (P2)	Edit	Parameter 518.00	Parameter 518.01	10 rpm	4800 rpm	SO (HF)	SO (HF)

Parameter number	Parameter	Edit	Value range		Increment	Factory setting	Password level reading from level	Password level writing from level
			Min.	Max.				
500	**Ratio control**							
503.00	No-flame speeds PWM fan: Standby speed	Edit	0 rpm	16500 rpm	10 rpm	0 rpm	SO (HF)	SO (HF)
503.01	No-flame speeds PWM fan: Prepurge speed / postpurge speed	Edit	800 rpm	16500 rpm	10 rpm	4800 rpm	SO (HF)	SO (HF)
516.00	Speed limit ignition load P0: Minimum limit	Edit	800 rpm	16500 rpm	10 rpm	800 rpm	SO (HF)	OEM
516.01	Speed limit ignition load P0: Maximum limit	Edit	800 rpm	16500 rpm	10 rpm	2700 rpm	SO (HF)	OEM
517.00	Speed limit low-fire P1: Minimum limit	Edit	400 rpm	16500 rpm	10 rpm	400 rpm	SO (HF)	OEM
517.01	Speed limit low-fire P1: Maximum limit	Edit	800 rpm	16500 rpm	10 rpm	2700 rpm	SO (HF)	OEM
518.00	Speed limit high-fire P2: Minimum limit	Edit	800 rpm	16500 rpm	10 rpm	800 rpm	SO (HF)	OEM
518.01	Speed limit high-fire P2: Maximum limit	Edit	800 rpm	16500 rpm	10 rpm	15000 rpm	SO (HF)	OEM
519	Maximum fan speed	Edit	3000 rpm	16500 rpm	10 rpm	4800 rpm	SO (HF)	OEM
522	Ramp-up low-fire → high-fire	Edit	2.058 s	74.970 s	0.294 s	20.286 s	SO (HF)	OEM
523	Ramp-down high-fire → low-fire	Edit	2.058 s	74.970 s	0.294 s	20.286 s	SO (HF)	OEM
558	Mode: UDS status information 0: PC tool mode	Read only	---	---	---	0	SO (HF)	---
559	PWM mode 0: Control 1: PID control 2: Safety mode (PWM limits)	Edit	0	2	1	1	SO (HF)	OEM
560	Pneumatic combustion control 1: PWM fan/analog modulation	Read only	---	---	---	1	SO (HF)	---

Parameter number	Parameter	Edit	Value range		Increment	Factory setting	Password level reading from level	Password level writing from level
			Min.	Max.				
600	**Power setting**							
644	Number of pulses per revolution	Edit	2	5	1	3	SO (HF)	OEM
646	Settling time for speed assessment	Edit	1.029 s	5.145 s	0.147 s	5.145 s	SO (HF)	OEM
650.00	Speed tolerance band: Speed shutdown	Edit	1%	20%	1%	5%	SO (HF)	OEM
650.01	Speed tolerance band: Quick speed shutdown	Edit	1%	30%	1%	10%	SO (HF)	OEM
654	Analog input (ASZxx.3x feedback required) 0: 3-position step input 1: 0...10 V 2: 0...135 Ω 3: 0...20 mA 4: 4 to 20 mA with a non-volatile lockout at I < 4 mA 5: 4...20 mA	Edit	0	5	1	1	SO (HF)	SO (HF)
658.00	PWM values fan: Startup PWM	Edit	1%	100%	1%	25%	SO (HF)	OEM
658.01	PWM values fan: Min. PWM operating range	Edit	0%	20%	1%	0%	SO (HF)	OEM
658.02	PWM values fan: Max. PWM operating range	Edit	80%	100%	1%	100%	SO (HF)	OEM
659.00	Ramp time of fan: Min. low-fire to high-fire	Read only	---	---	---	2.058 s	SO (HF)	---
659.01	Ramp time of fan: Max. low-fire to high-fire	Read only	---	---	---	74.970 s	SO (HF)	---
659.02	Ramp time of fan: Min. high-fire to low-fire	Read only	---	---	---	2.058 s	SO (HF)	---
659.03	Ramp time of fan: Max. high-fire to low-fire	Read only	---	---	---	74.970 s	SO (HF)	---
660	Tolerance time speed deviation	Read only	---	---	---	4.998 s	SO (HF)	---
674	Neutral band (permitted control offset)	Edit	0 rpm	255 rpm	1 rpm	40 rpm	SO (HF)	OEM
675.00	PWM: Minimum PWM in prepurging, SEC	Edit	0%	100%	1%	60%	SO (HF)	OEM
675.01	PWM: Maximum PWM in ignition load, SEC	Edit	0%	100%	1%	40%	SO (HF)	OEM
676	P-part of the PID speed control for the PWM fan motor (amplification factor)	Edit	0	255	1	112	SO (HF)	OEM
677	I-part of the PID speed control for the PWM fan motor (integral action time)	Edit	0 s	37.485 s	0.147 s	0.441 s	SO (HF)	OEM
678	D-part of the PID speed control for the PWM fan motor (derivative action time)	Edit	0 s	37.485 s	0.147 s	0 s	SO (HF)	OEM
679.00	Time constant Pt1 speed control: Lower speed range high-fire to low-fire	Edit	0 s	37.485 s	0.147 s	10.143 s	SO (HF)	OEM
679.01	Time constant Pt1 speed control: Medium speed range high-fire to low-fire	Edit	0 s	37.485 s	0.147 s	10.143 s	SO (HF)	OEM
679.02	Time constant Pt1 speed control: Upper speed range high-fire to low-fire	Edit	0 s	37.485 s	0.147 s	10.143 s	SO (HF)	OEM
679.03	Time constant Pt1 speed control: Total speed range low-fire to high-fire	Edit	0 s	37.485 s	0.147 s	10.143 s	SO (HF)	OEM
680.00	Speed range for Pt1 time constant: Threshold upper speed range	Edit	800 rpm	16500 rpm	10 rpm	4000 rpm	SO (HF)	OEM
680.01	Speed range for Pt1 time constant: Threshold lower speed range	Edit	800 rpm	16500 rpm	10 rpm	2000 rpm	SO (HF)	OEM

Parameter number	Parameter	Edit	Value range		Increment	Factory setting	Password level reading from level	Password level writing from level
			Min.	Max.				
700	**Error history**							
701	Current error: 00: Error code 01: Startup meter reading 02: MMI phase 03: Power value	Read only	 2 0 --- 0%	 255 999999 --- 100%	 1 1 --- 1	---	Service	---
702	Latest error in the history 00: Error code 01: Startup meter reading 02: MMI phase 03: Power value	Read only	 2 0 --- 0%	 255 999999 --- 100%	 1 1 --- 1	---	Service	---
•								
•								
•								
711	Oldest error in the history 00: Error code 01: Startup meter reading 02: MMI phase 03: Power value	Read only	 2 0 --- 0%	 255 999999 --- 100%	 1 1 --- 1	---	Service	---
900	**Process data**							
920	Current PWM signal fan	Read only	0%	100%	1%	---	Service	---
936	Normalized speed	Read only	0%	100%	1%	---	Service	---
951	Mains voltage	Read only	0 V	350 V	1 V	---	Service	---
954	Flame intensity	Read only	0%	100%	1%	---	Service	---

12 PWM settings

12.1 Relevant parameters

Note!
Initial parameter settings (also see chapter *Initial PWM parameter settings*)!
Display depends on program.

Parameter	Meaning
P0	Ignition load speed (parameter **403**:[0] in ACS410): Corresponds to the ignition load speed in revolutions per minute (rpm). Prerequisite: **P0** ≥ **P0**min (parameter **516.00**), **P0** ≤ **P0**max (parameter **516.01**)
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
P1	Low-fire speed (parameter **403**:[1] in ACS410): Corresponds to the low-fire speed in revolutions per minute (rpm). Prerequisite: **P1** ≥ **P1**min (parameter **517.00**), **P1** ≤ **P1**max (parameter **517.01**)
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
P2	High-fire speed (parameter **403**:[2] in ACS410): Corresponds to the high-fire speed in revolutions per minute (rpm). Prerequisite: **P2** ≥ **P2**min (parameter **518.00**), **P2** ≤ **P2**max (parameter **518.01**)
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
503.00	Standby speed: Corresponds to the standby speed in revolutions per minute (rpm), delivered as a PWM value in standby (OFF) or lockout position 1! This means that a connected PWM fan ensures purging at this speed in standby (OFF) or, when using a mains-powered fan, in lockout position 1 as well. In that case, it is essential to observe the connection diagrams of the PWM fan! When using mains-powered fans, it is essential to observe the following: • In terms of the mains supply, the fan is no longer connected to the LME7 and, in the event of fault/lockout, it will not be disconnected from the mains supply • The PWM interface integrated in the fan must ensure safe electrical separation from the mains (e.g., via an optocoupler or similar) • No PWM signal is delivered in lockout position 0 (**Loc 10**). The PWM fan does not provide purging in this lockout position.
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
503.01	Prepurge speed / postpurge speed: Corresponds to the speed in revolutions per minute (rpm) used by the fan for pre- and/or postpurging and/or valve proving.
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
516.00	Minimum limit speed ignition load **P0**: Corresponds to the minimum speed for ignition load **P0** in revolutions per minute (rpm) at which the burner can still be securely ignited. Prerequisite: Parameter **516.00** ≤ **P0**
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm

Parameter	Meaning
516.01	Maximum limit speed ignition load **P0**: Corresponds to the maximum speed for ignition load **P0** in revolutions per minute (rpm) at which the burner may still be securely ignited. Prerequisite: Parameter **516.01** ≥ **P0**
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
517.00	Minimum limit speed low-fire **P1**: Corresponds to the minimum speed for low-fire **P1** in revolutions per minute (rpm) at which the burner still operates safely in the low-fire range. Prerequisite: Parameter **517.00** ≤ **P1** fan speed
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
517.01	Maximum limit speed low-fire **P1**: Corresponds to the maximum speed for low-fire **P1** in revolutions per minute (rpm) at which the burner still operates safely in the low-fire range. Prerequisite: Parameter **517.01** ≥ **P1**
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
518.00	Minimum limit speed high-fire **P2**: Corresponds to the minimum speed for high-fire **P2** in revolutions per minute (rpm) for the burner operating in the high-fire range. Prerequisite: Parameter **518.00** ≤ **P2**
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
518.01	Maximum limit speed high-fire **P2**: Corresponds to the maximum speed for high-fire **P2** in revolutions per minute (rpm) at which the burner may operate. Prerequisite: Parameter **518.01** ≥ **P2**
	Note! Speed increments when making the setting with AZL2: 10 rpm Speed increments when making the setting with ACS410: 1 rpm
519	Max. speed fan Corresponds to the maximum fan speed (see supplier's Data Sheet).
644	Number of pulses per revolution Corresponds to the number of (Hall signal) pulses per revolution the fan feeds back to the control (see supplier's Data Sheet).
658.00	Startup PWM PWM value the PWM fan needs as a minimum to start from standstill (see supplier's Data Sheet).
658.01	Minimum operating limit of the PWM Represents the minimum limit value of PWM, which fan speed control does not cross.
658.02	Maximum operating limit of the PWM Represents the maximum limit value of PWM, which fan speed control does not cross.

12.2 PWM control parameters

Parameter	Meaning
522	Ramp-up Ramp time control parameter – the preset time in seconds (s) within which the PWM signal reaches the setpoint with a positive setpoint step (0 rpm to high-fire rpm). Factory setting approx. 20.286 seconds
523	Ramp-down Ramp time control parameter – the preset time in seconds (s) within which the PWM signal reaches the setpoint with a negative setpoint step (high-fire rpm to 0 rpm). Factory setting approx. 20.286 seconds
646	Settling time for speed assessment The current speed must lie within tolerance band 1 (parameter **650.00**) of the required speed for this period of time before the target speed is considered reached (speed release).
650.00	Tolerance band 1 (speed shutdown) Factory setting: 1% If the current speed leaves value range “Required speed ± set tolerance band 1” for a period of time exceeding the time set with parameter **646**, a non-volatile lockout **Loc 83** will be initiated.
650.01	Tolerance band 2 (quick speed shutdown) Factory setting: 3% If the current speed leaves value range “Required speed ± set tolerance band 2”, a non-volatile lockout **Loc 83** will be initiated.
660	Tolerance time speed deviation A speed deviation outside tolerance band 1 (parameter **650.00**) will be tolerated for the period of time set. If the deviation lasts longer, a non-volatile lockout **Loc 83** will be initiated.
674	Neutral band Minimum speed change in revolutions per minute. Factory setting 40 rpm Protection from speed oscillations. Only control offsets with speed changes above the setting value will be corrected (dead band).
676	P-part of the PID speed control for the PWM fan motor (amplification factor) Factory setting: 112
677	I-part of the PID speed control for the PWM fan motor (integral action time) Factory setting: 0.441 seconds
678	D-part of the PID speed control for the PWM fan motor (derivative action time) Factory setting: 0 seconds
679.00	Time constant Pt1 controller for speed control in the upper speed range high-fire to low-fire.
679.01	Time constant Pt1 controller for speed control in the medium speed range high-fire to low-fire.
679.02	Time constant Pt1 controller for speed control in the lower speed range high-fire to low-fire.
679.03	Time constant Pt1 controller for speed control in the entire speed range low-fire to high-fire.
680.00	Threshold between upper and medium speed range for control parameters **679.02** and **679.01**.
680.01	Threshold between medium and lower speed range for control parameters **679.01** and **679.00**.

12.3 PWM safety parameters

Note!
Also see chapter *Initial PWM parameter settings*.

Parameter	Meaning
559	PWM mode control Determines the behavior of PWM control, delivering a PWM signal proportional to the preset output (analog/3-position step input). Control: Controls the PWM speed proportional to the output preset via the analog or 3-position step input. Safety mode: Control for defining the PWM safety parameters.
675.00	Minimum PWM in prepurging, **SEC** Minimum PWM signal in percent for prepurging.
675.01	Maximum PWM in ignition load, **SEC** Maximum PWM signal in percent for ignition load.
920	(Current) PWM signal fan PWM signal in percent. Readable on the service level with AZL2 (press Info button for >3 seconds).

12.4 Initial PWM parameter settings

12.4.1 Initial settings of PWM basic parameters

Note!
The initial settings of the PWM basic parameters are made exclusively on the OEM level.

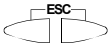
Prerequisite

- AZL2 for setting the parameters is connected
- LME7 is wired up in accordance with the proposed application
- Mains voltage present
- Safety loop closed
- Heat request OFF, LME7 in standby (**OFF**)
- Fan parameters such as maximum speed and Hall signal (pulses per revolution) are known
- With unprogrammed LME7 (initial settings), AZL2 displays **OFF UPr**
- With unprogrammed LME7 (initial settings), the internal operating unit of the LME7 displays **UPr**

Operating steps

- Select programming mode for the OEM
- Press A and F for <5 seconds simultaneously.
  Display shows **CodE**
- Enter the password for the OEM via +, -, and i/reset.
  Also refer to the *Entering the password* chapter in the LME7 Basic Documentation (P7105).
- Display briefly switches from **PArA** to **400: SEt**
- Press +
- Display: Parameter group **500: PArA**, **500** flashes
- Press i/reset for >1 second
- Use + or - to select parameter **519**

Parameter	Function
519	Maximum fan speed

- Press  for >1 second
- Pressing + or - can adjust the speed in increments of 10 rpm. Set the maximum speed for the connected fan here (also refer to the fan manufacturer's data sheet)
- Press  for >1 second. The setting value is transferred to the internal memory
- Press  1x (press + and - simultaneously)
- Display: Parameter **519** flashes
- Press  1x (press + and - simultaneously)
- Display: Parameter group **500** flashes
- Press + and select parameter group **600**
- Display: Parameter group **600** flashes
- Press  for >1 second
- Display: Parameter **644** flashes

Parameter	Function
644	Pulses per revolution

- Press  for >1 second
- Pressing + or - allows the number of (Hall signal) pulses per revolution that the fan feeds back to the control to be set (refer to the fan manufacturer's data sheet)
- Press  for >1 second. The setting value is transferred to the internal memory
- Press  1x (press + and - simultaneously)
- Display: Parameter **644** flashes
- Press + and select parameter **658**
- Parameter **658** flashes

Parameter	Function
658.00	Startup PWM

Note!
It is not normally necessary to set the parameter!

- Press i/reset for >1 second
- Subindex **00** flashes
- Press i/reset for >1 second
- Pressing + or - can set the PWM values that the PWM fan in use requires as a minimum to start from a standstill (refer to the fan manufacturer's data sheet)
- Press i/reset for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 1x (press + and - simultaneously)
- Subindex **00** flashes
- Press + to select the next subindex
- Subindex **01** flashes

Parameter	Function
658.01	Minimum operating limit of the PWM

Note!
It is not normally necessary to set the parameter!

- Press i/reset for >1 second
- Pressing + or - can set the minimum limit value of the PWM that the fan speed control must not fall below (refer to the fan manufacturer's data sheet)
- Press i/reset for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 1x (press + and - simultaneously)
- Subindex **01** flashes
- Press + and select subindex **02**
- Subindex **02** flashes

Parameter	Function
658.02	Maximum operating limit of the PWM
	Note! It is not normally necessary to set the parameter!

- Press i/reset for >1 second
- Pressing + or - can set the maximum limit value of the PWM that the fan speed control must not exceed (refer to the fan manufacturer's data sheet)
- Press i/reset for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 1x (press + and - simultaneously)
- Subindex **02** flashes
- Press ESC - + 1x (press + and - simultaneously)
- Display: Parameter **658** flashes
- Press ESC - + 1x (press + and - simultaneously)
- Display: Parameter group **600: PArA**, **600** flashes
- Press -
- Display: Parameter group **500: PArA**, **500** flashes
- Press i/reset
- Display: Parameter **503** flashes

Parameter	Function
503.00	Standby speed:

Note!
It is not normally necessary to set the parameter!

Corresponds to the standby speed in revolutions per minute (rpm), delivered as a PWM value in standby (OFF) or lockout position 1! This means that a connected PWM fan ensures purging at this speed in standby (OFF) or, when using a mains-powered fan, in lockout position 1 as well. In that case, it is essential to observe the connection diagrams for the PWM fan!

When using mains-powered fans, it is essential to observe the following:

- In terms of the mains supply, the fan is no longer connected to the LME7 and, in the event of fault/lockout, it will not be disconnected from the mains supply
- The PWM interface integrated in the fan must ensure safe electrical separation from the mains (e.g., via an optocoupler or similar)
- No PWM signal is delivered in lockout position **0** (**Loc 10**). The PWM fan does not provide purging in this lockout position.

Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Press i/reset for >1 second
- Display: Subindex **00** flashes
- Press +
- Display: Subindex **01** flashes

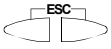
Parameter	Function
503.01	Prepurge speed / postpurge speed

- Press  for >1 second
- Display shows the prepurge speed. Also refer to the *Setting parameters with index, with or without direct display* chapter in the LME7 Basic Documentation (P7105).
- Pressing  or  can adjust the speed in increments of 10 rpm.
- Set the required minimum prepurge speed here

Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Press  . The setting value is transferred to the internal memory
- Press  3x (press  and  simultaneously)
- Display: Parameter group **500: PArA**, **500** flashes
- Press 
- Display: Parameter group **600: PArA**, **600** flashes
- Press 
- Press  or  and select parameter **675.00**
- Display: Parameter **675** flashes

Parameter	Function
675.00	Minimum PWM in prepurging, **SEC**

- Press  for >1 second
- Display: Subindex **00** flashes
- Press 
- Press  or  and set the value for **LABORTESTS** to **0%**
- Press  for >1 second. The setting value is transferred to the internal memory
- Press  1x (press  and  simultaneously)
- Display: Subindex **00** flashes
- Press 
- Display: Subindex **01** flashes

Parameter	Function
675.01	Maximum PWM in ignition load, **SEC**

- Press ↵/reset
- Press + or - and set the value for **LABORTESTS** to **100%**
- Press ↵/reset for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 3x (press + and - simultaneously)
- Display: Parameter group **600: PArA**, **600** flashes

Warning!
In the case of burner components (PWM fan) with voltage-related behavior, it is recommended to read out the value (current PWM signal, parameter **920**) for the prepurge phase (phase 30) with the minimum permissible prepurge speed close to the **undervoltage limit**, and for the ignition phases (phase 38, 40, and 44) with the maximum permissible ignition speed close to the **overvoltage limit**. **Failure to observe this information poses a risk of the safety functions being impaired.**

Note!
It is not normally necessary to set the following parameters!

Parameter	Function
522	Ramp-up
523	Ramp-down
646	Settling time for speed assessment
650.00	Tolerance band 1 (speed shutdown)
650.01	Tolerance band 2 (quick speed shutdown)
660	Tolerance time speed deviation
674	Neutral band
676	P-part of the PID speed control for the PWM fan motor (amplification factor)
677	I-part of the PID speed control for the PWM fan motor (integral action time)
678	D-part of the PID speed control for the PWM fan motor (derivative action time)
679.00	Time constant Pt1 controller for speed control in the upper speed range high-fire to low-fire.
679.01	Time constant Pt1 controller for speed control in the medium speed range high-fire to low-fire.
679.02	Time constant Pt1 controller for speed control in the lower speed range high-fire to low-fire.
679.03	Time constant Pt1 controller for speed control in the entire speed range low-fire to high-fire.
680.00	Threshold between upper and medium speed range for control parameters **679.02** and **679.01**.
680.01	Threshold between medium and lower speed range for control parameters **679.01** and **679.00**.

- Press - as far as parameter group **400: SEt**
- Display: Parameter group **400: SEt**, **400** flashes
- Press ↵/reset for >1 second
- Display: Subindex **P0** flashes

Parameter	Function
P0	Fan speed: Ignition load speed (**403.00**)

Ignition load speed (parameter **403**:[0] in ACS410):
Corresponds to the ignition load speed in revolutions per minute (rpm).
Prerequisite: **P0** ≥ **P0**min (parameter **516.00**), **P0** ≤ **P0**max (parameter **516.01**)

Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Press and hold A
- Display switches to **0A**
- Ignition speed **3000** flashes
- Pressing + or - allows the speed to be changed in increments of 10 rpm within the predefined limits (**P0**max, **P0**min)
- Release A . The set value is adopted
- Display: Parameter **P0** flashes
- Press +
- Display: Parameter **P1** flashes

Parameter	Function
P1	Fan speed: Low-fire speed (**403.01**)

Low-fire speed (parameter **403**:[1] in ACS410):
Corresponds to the low-fire speed in revolutions per minute (rpm).
Prerequisite: **P1** ≥ **P1**min (parameter **517.00**), **P1** ≤ **P1**max (parameter **517.01**)

Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Press and hold A
- Display switches to **1A**
- Low-fire speed **1200** flashes
- Pressing + or - allows the speed to be changed in increments of 10 rpm within the predefined limits (**P1**max, **P1**min)
- Release A . The set value is adopted
- Display: Parameter **P1** flashes
- Press +
- Display: Parameter **P2** flashes

Parameter	Function
P2	Fan speed: High-fire speed (**403.02**)

High-fire speed (parameter **403**:[2] in ACS410):
Corresponds to the high-fire speed in revolutions per minute (rpm).
Prerequisite: **P2** ≥ **P2**min (parameter **518.00**), **P2** ≤ **P2**max (parameter **518.01**)

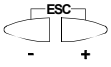
Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Press and hold A
- Display switches to **2A**
- High-fire speed **5700** flashes
- Pressing + or - allows the speed to be changed in increments of 10 rpm within the predefined limits (**P2**max, **P2**min)
- Release A . The set value is adopted
- Display: Parameter **P2** flashes
- Press ESC - + 1x (press + and - simultaneously)
- Display: Parameter group **400: SEt**, **400** flashes
- Press +
- Display: Parameter group **500: PArA**, **500** flashes
- Press i/reset for >1 second
- Press + or - and select parameter **516.00**
- Display: Parameter **516** flashes

Parameter	Function
516.00	Minimum limit speed ignition load **P0**:

- Press  for >1 second
- Display: Subindex **00** flashes
- Press  for >1 second

Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Pressing + or - can adjust the speed in increments of 10 rpm. Set the required minimum limit speed for the ignition load position at which the burner can still be safely ignited
- Press  for >1 second. The setting value is transferred to the internal memory
- Press  1x (press + and - simultaneously)
- Display: Subindex **00** flashes
- Press 
- Display: Subindex **01** flashes

Parameter	Function
516.01	Maximum limit speed ignition load **P0**:

- Press  for >1 second

Note!
Speed increments when making the setting with AZL2: 10 rpm
Speed increments when making the setting with ACS410: 1 rpm

- Pressing + or - can adjust the speed in increments of 10 rpm. Set the required maximum limit speed for the ignition load position at which the burner can still be safely ignited
- Press  for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 2x (press + and - simultaneously)
- Display: Parameter **516** flashes
- Press +
- Display: Parameter **517** flashes

Now proceed as described above for the following parameters:
- **P1** low-fire position **517**
- **P2** high-fire position **518**

Parameter	Function
517.00	Minimum limit speed low-fire **P1**
517.01	Maximum limit speed low-fire **P1**
518.00	Minimum limit speed high-fire **P2**
518.01	Maximum limit speed high-fire **P2**

- Press ESC - + 2x (press + and - simultaneously)
- Display: **OPErAtE** appears briefly and switches to **OFF**

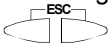
12.4.2 Reading the value of parameter 920 in the prepurge phase (Ph30) and ignition load phase (Ph38, Ph40, and Ph44)

Operating steps

Press i/reset for >3 second

- Display: **InFo**
- Display: **SEr**

- Release i/reset
- Display: Parameter **701.00**, **701** flashes
- Press + or - and select parameter **920**
- Switch on the burner
- Read the value of parameter **920** in the prepurge phase (**Ph30**) and ignition phase (**Ph38**, **Ph40**, and **Ph44**). Make a note of the values. They will be required as a basis for setting safety parameter **675.00**



- Press - + 1x (press + and - simultaneously)
- Display: **OPErAtE** appears briefly
- Display: Parameter **0P: xxx** (value display)
- Switch off the burner
- Display: Wait for **OFF**

12.4.3 Final settings for PWM safety parameters

Note!
PWM control by the LME7 makes use of the Hall signal for feedback. This Hall signal is used to calculate the manipulated variable of the PWM control process. To prevent the calculation of incorrect manipulated variables in the event of incorrect Hall signals, the working range of the PWM control must be restricted via parameter **675.00** / **675.01**. For that purpose, the burner is operated in special test mode (parameter **559**).

Warning!
For burner components (PWM fan) with voltage-dependent behavior, we recommend reading out the value (current PWM signal parameter **920**) for the prepurge phase (**Ph30**) with the minimum permissible prepurge speed near the **overvoltage limit** and the value for the ignition phases (**Ph38**, **Ph40** and **Ph44**) with the maximum permissible ignition speed near the **undervoltage limit**. **Failure to observe this information poses a risk of the safety functions being impaired.**

Procedure

Select test mode (parameter **559**) and check the prepurge speed under worst-case conditions close to the undervoltage limit, or check the ignition load speeds under worst-case conditions close to the overvoltage limit:

Note!
In test mode (parameter **559**, setting value 2), the normalized PWM signal (parameter **675.00**) for the prepurge phase or the PWM signal (parameter **675.01**) for the ignition phase is output as a fixed value. Start the burner and check the speed, air flow or air pressure under these worst-case conditions by taking appropriate measures while ensuring compliance with the relevant standards (e.g., EN 676).

Note!
If the internal operating unit of the LME7 changes from phase display (e.g., **Ph30**) to **SEC** at 1-second intervals, or if the LME7 locks out (**Loc: 225**), the difference between the actually required PWM value (parameter **936**) and safety parameter **675.00** or **675.01** is too small. Reduce value **675.00** (parameter **920 -1%**) or increase value **675.01** (parameter **920 +1%**). Reduce the value until **SEC** disappears from the display.

- Set safety parameter **675.00** to the value previously determined by parameter **920** in the prepurge phase (**Ph30**) **-1%** and safety parameter **675.01** to the value of parameter **920** in the ignition phase (**Ph38**, **Ph40**, and **Ph48**) **+1%**

Operating steps

- Select programming mode for the OEM
- Press A and F for <5 seconds simultaneously
- Display: **CodE**
- Enter the password for the OEM via +, -, and reset. Also refer to the *Entering the password* chapter in the LME7 Basic Documentation (P7105).
- Display: **PArA** appears briefly and switches to **400: SEt**
- Press + and select parameter group **500: PArA**
- Display: Parameter group **500: PArA**, **500** flashes
- Press reset for >1 second
- Press + or - and select parameter **559**

Parameter	Function
559	PWM mode 0: Control 1: PID control 2: Safety mode (PWM limits)

- Press reset for >1 second
- Press + or - and set the value (test mode 2)
- Press reset for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 2x (press + and - simultaneously)
- Display: Parameter group **500: PArA**, **500** flashes
- Press + and select parameter group **600: PArA**
- Display: Parameter group **600: PArA**, **600** flashes
- Press reset for >1 second
- Press + or - and select parameter **675.00**

Parameter	Function
675.00	PWM: Minimum PWM in prepurging, **SEC**

- Display: Parameter **675** flashes
- Press  for >1 second
- Display: Subindex **00** flashes
- Press  for >1 second
- Press + or - and set the previously determined value **-1%** of parameter **920** (prepurge phase (**Ph30**))
- Press  for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 1x (press + and - simultaneously)
- Display: Subindex **00** flashes
- Press +
- Display: Subindex **01** flashes

Parameter	Function
675.01	PWM: Maximum PWM in ignition load, SEC

- Press  for >1 second
- Press + or - and set the previously determined value **+1%** of parameter **920** (ignition phase (**Ph38**, **Ph40**, and **Ph44**))
- Press  for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 4x (press + and - simultaneously)
- Display: **OPErAtE** appears briefly and switches to **OFF**

Note!
Test mode is indicated by the internal 7-segment display changing from **SEC** to the relevant program phase at 1-second intervals.

Checking prepurging

- To check the prepurge speed, set the required worst-case conditions close to the **undervoltage limit**
- Start the burner and check the speed, air flow, or air pressure by taking appropriate measures while ensuring compliance with the relevant standards (e.g., EN 676) in the prepurge phase (**Ph30**)
- If the worst-case requirements are not satisfied, change safety parameter **675.00** accordingly

Checking the ignition load

- To check the ignition load speed, set the required worst-case conditions close to the **overvoltage limit**
- Start the burner and check the speed, air flow, or air pressure by taking appropriate measures while ensuring compliance with the relevant standards (e.g., EN 676) in the ignition phase (**Ph38**, **Ph40**, or **Ph44**)
- If the worst-case requirements are not satisfied, change safety parameter **675.01** accordingly

On successful completion of the test, reset parameter **559** to control as described above (setting value 1).

Note!
To store the settings in the LME7, a manual backup is required. Also see chapter *Manual backup* in LME7 Basic Documentation (P7105).

12.4.4 Setting safety parameters 675.00 / 675.01 and checking the safety settings under *worst-case* conditions

Procedure

Select test mode (parameter **559**) and check the prepurge speed under worst-case conditions close to the undervoltage limit, or check the ignition load speeds under worst-case conditions close to the overvoltage limit:

- Switch on the burner and perform a test

Note!
In test mode (parameter **559**, setting value 2), the normalized PWM signal (parameter **675.00**) for the prepurge phase or the PWM signal (parameter **675.01**) for the ignition phase is output as a fixed value. Start the burner and check the speed, air flow or air pressure under these worst-case conditions by taking appropriate measures while ensuring compliance with the relevant standards (e.g., EN 676).

Checking prepurging

- To check the prepurge speed, set the required worst-case conditions close to the **undervoltage limit**
- Start the burner and check the speed, air flow, or air pressure by taking appropriate measures while ensuring compliance with the relevant standards (e.g., EN 676) in the prepurge phase (**Ph30**)
- If the worst-case requirements are not satisfied, change safety parameter **675.00** accordingly

Checking the ignition load

- To check the ignition load speed, set the required worst-case conditions close to the **overvoltage limit**
- Start the burner and check the speed, air flow, or air pressure by taking appropriate measures while ensuring compliance with the relevant standards (e.g., EN 676) in the ignition phase (**Ph38**, **Ph40**, or **Ph44**)
- If the worst-case requirements are not satisfied, change safety parameter **675.01** accordingly
- Switch on the burner and perform a test
- Display: **OPErAtE** appears briefly and switches to **OFF**

On successful completion of the test, reset parameter **559** to control as described above (setting value 1).

Operating steps

- Select programming mode for the OEM
- Press A and F for <5 seconds simultaneously
- Display: **CodE**
- Enter the password for the OEM via +, -, and reset. Also refer to the *Entering the password* chapter in the LME7 Basic Documentation (P7105).
- Display **PArA** appears briefly and switches to **400: SEt**
- Press + and select parameter group **500: PArA**
- Press reset for >1 second
- Display: Parameter **503** flashes
- Press + or - and select parameter **559**

Parameter	Function
559	PWM mode 0: Control 1: PID control 2: Safety mode (PWM limits)

- Press reset for >1 second
- Press - and set the value (test mode 1)
- Press reset for >1 second. The setting value is transferred to the internal memory
- Press ESC - + 3x (press + and - simultaneously)
- Display: **OPErAtE** appears briefly and switches to **OFF**

Note!
To store the settings in the LME7, a manual backup is required. Also see chapter *Manual backup* in LME7 Basic Documentation (P7105).

12.4.5 Matching the working points Speeds for low-fire (P1), ignition load (P0), and high-fire (P2) to the application for the heating engineer

Prerequisite

- Initial settings for the PWM basic parameters are made at OEM level
- LME7 is wired up in accordance with the proposed application
- Mains voltage present
- Safety loop closed
- Heat request OFF, LME7 in standby (**OFF**)

12.4.5.1 … via AZL2

- Start the programming mode for the heating engineer
- Press A and F for <5 seconds simultaneously.
- Display: **Code**
- Enter the password for the heating engineer via +, -, and i/reset. Also refer to the *Entering the password* chapter in the LME7 Basic Documentation (P7105).
- Display **PArA** appears briefly and switches to **400: SEt**
- Press i/reset
- Display: **run**
- Press i/reset to start the setting mode for low-fire (**P1**), ignition load (**P0**), and high-fire (**P2**)
- Display: **OFF** flashes
- Heat request ON (temperature controller)
- LME7 is started and runs through the startup phase. The LME7 then runs through the respective program phases in accordance with the program sequence and the program phases appear flashing
- The LME7 proceeds to the end of the prepurge phase (**Ph30**), goes to the start load position and then displays **P0** (ignition load speed). The display changes to **P0** of the speed indication
- Display: Parameter **P0** flashes
- Press and hold A
- Display: Parameter **0A**, speed flashes
- Press + or - and adjust the speed in increments of 10 rpm within the limits specified by the OEM (**P0**max, **P0**min)

Note!
The setting value for **P0** must be greater than the setting value for **P1**. The LME7 checks the setting values. If setting rules are violated, the LME7 goes into lockout position and displays error message **Loc: 255**.

- Release A. The setting value is transferred to the internal memory
- Display: Parameter **P0** flashes
- Press i/reset
- The startup phase proceeds. The burner is ignited. The program continues in low-fire position **P1**
- Display: Parameter **P1** flashes
- Press and hold A
- Display: Parameter **1A**, Speed flashes
- Press + or - and adjust the speed in increments of 10 rpm within the limits specified by the OEM (**P1**max, **P1**min)
- Release A. The setting value is transferred to the internal memory
- Press i/reset
- Display: Parameter **oP: P1** is displayed briefly
- The fan speed changes to the value for high-fire **P2**
- Display: Parameter **P2** flashes
- Press and hold A
- Display: Parameter **2A**, Speed flashes

- Press + or - and adjust the speed in increments of 10 rpm within the limits specified by the OEM (**P2**max, **P2**min)
- Release A . The setting value is transferred to the internal memory
- Display: Parameter **P2** flashes
- Press i/reset
- Display: Parameter **oP: P1** is displayed briefly
- The fan speed changes to the value for low-fire **P1**
- Display: Parameter **P1**, Speed indication flashes
- From here, the low-fire speeds **P1** or high-fire speeds **P2** can be changed again as described above
- Press ESC - + 2x (press + and - simultaneously)
- Display: **OPErAtE** is displayed briefly
- The setting process is ended and the burner changes to the operating position
- In the operating position, the output predefined by the external load controller applies

Note!
To store the settings in the LME7, a manual backup is required. Also see chapter *Manual backup* in LME7 Basic Documentation (P7105).

12.4.5.2 … via the internal operating unit of the of the LME7

Note!
Restricted display and setting of speeds!
Speeds above 9990 rpm are no longer displayed via the internal operating unit in the LME7 (- - -). Speeds over 9990 rpm can only be set with AZL2 or ACS410. This concerns the setting and display of speeds for the ignition load (**P0**) (parameter **403.00**), low-fire (**P1**) (parameter **403.01**), and high-fire (**P2**) (parameter **403.02**).

- Keep A and + or − simultaneously depressed for >5 seconds.
- Display: **OFF** flashes.

Note!
If there is no operating action for >30 seconds, the LME7 changes automatically to standard mode. This means that adaptation of the working points must be started again.

- Heat request (temperature controller) ON
- LME7 is started and runs through the startup phase. The LME7 runs through the respective program phases in accordance with the program sequence and the numbers appear flashing
- The LME7 proceeds to the end of the prepurge phase (**Ph30**), goes to the start load position and then displays **P0** (ignition load speed). In the process, the display shows alternately **P0** and a 3-digit number

Note!
The 3-digit number shows the setting value for parameter **P0**/**P1** or **P2** as the speed and must be multiplied by 10.

- By pressing A and + or − the speed can be changed in step sizes of 10 rpm within the limits predefined by the OEM (**P0**max, **P0**min)

Note!
The setting value of **P0** must be greater than the setting value of **P1**. The LME7 checks the setting values. If setting rules are violated, the LME7 goes to lockout and displays error message **Loc: 225**.

- Press Info ↵ to transfer the setting value to the internal memory
- The startup phase proceeds. The burner is ignited. The program proceeds to low-fire position **P1**. In the process, the display shows alternately **P1** and the speed
- By pressing A and + or − the speed can be changed in step sizes of 10 rpm within the limits predefined by the OEM (**P1**max, **P1**min)
- Press Info ↵ to transfer the setting value to the internal memory
- The burner proceeds to high-fire position **P2**. In the process, the display shows alternately **P2** and the speed
- By pressing A and + or − the speed can be changed in step sizes of 10 rpm within the limits predefined by the OEM (**P2**max, **P2**min)
- Press Info ↵ to transfer the setting value to the internal memory
- By pressing ESC (press + and − simultaneously) the setting process is ended and the burner changes to the operating position

- In the operating position, the output predefined by the external load controller applies

Note!
To store the settings in the LME7, a manual backup is required. Also see chapter *Manual backup* in LME7 Basic Documentation (P7105).

12.5 Overview of PWM fan parameters (value range refers to LME71.901A2)

Parameter number	Designation	Value range		Increment *)	Conditions
		Min.	Max.		
403.00	Fan speed: Ignition load speed (P0)	[1])	[1])	10 rpm	Factory setting 1600 rpm
403.01	Fan speed: Low-fire speed (P1)	[2])	[2])	10 rpm	Factory setting 1500 rpm
403.02	Fan speed: High-fire speed (P2)	[3])	[3])	10 rpm	Factory setting 4800 rpm
503.00	No-flame speeds PWM fan: Standby speed	0	16500	10 rpm	0 up to max. speed
503.01	No-flame speeds PWM fan: Prepurge speed / postpurge speed	800	16500	10 rpm	< max. speed
516.00	Speed limit ignition load P0: Min. limit	800	16500	10 rpm	P1min < P0min < P1max
516.01	Speed limit ignition load P0: Max. limit	800	16500	10 rpm	P0max < P1max
517.00	Speed limit low-fire P1: Min. limit	400	16500	10 rpm	---
517.01	Speed limit low-fire P1: Max. limit	800	16500	10 rpm	P1max < P2min
518.00	Speed limit high-fire P2: Min. limit	800	16500	10 rpm	P2min > P1max
518.01	Speed limit high-fire P2: Max. limit	800	16500	10 rpm	P2max > P2 min
519	Max. speed fan	3000	16500	10 rpm	Factory setting 4800 rpm
522	Ramp-up low-fire → high-fire	2.058	74.970	0.294 s	Factory setting approx. 20.286 seconds
523	Ramp-down high-fire → low-fire	2.058	74.970	0.294 s	Factory setting approx. 20.286 seconds
559	PWM mode 0: Control 1: PID control 2: Safety mode (PWM limits)	0	2	1	Factory setting 1 (control)
560	Mode: Pneumatic ratio control 0: OFF 1: PWM fan 2: Air damper actuator	---	---	---	Factory setting 1 (PWM fan)
644	Number of pulses per revolution	2	5	1	Factory setting 3 (Hall pulses/rev)
646	Settling time for speed assessment	1.029	2.058	0.147 s	Factory setting 5.145 seconds
650.00	Speed tolerance band: Speed shutdown	1	20	1%	Factory setting 5%
650.01	Speed tolerance band: Quick speed shutdown	1	30	1%	Factory setting 10%
658.00	PWM values fan: Startup PWM	1	100	1%	Factory setting 25%
658.01	PWM values fan: Min. PWM	0	20	1%	Factory setting 0%
658.02	PWM values fan: Max. PWM	80	100	1%	Factory setting 100%

*) Speed increments when making the setting with ACS410: 1 rpm

[1]) Dependent on factory setting of parameter 516
[2]) Dependent on factory setting of parameter 517
[3]) Dependent on factory setting of parameter 518

Parameter number	Designation	Value range		Increment *)	Conditions
		Min.	Max.		
659.00	Ramp time of fan: Min. low-fire to high-fire	---	---	---	Factory setting 2.058 seconds
659.01	Ramp time of fan: Max. low-fire to high-fire	---	---	---	Factory setting 74.970 seconds
659.02	Ramp time of fan: Min. high-fire to low-fire	---	---	---	Factory setting 2.058 seconds
659.03	Ramp time of fan: Max. high-fire to low-fire	---	---	---	Factory setting 74.970 seconds
660	Tolerance time speed deviation	---	---	---	Factory setting 4.998 seconds
674	Neutral band (permitted control offset)	0	255	1 rpm	Factory setting 40 rpm
675.00	PWM: Minimum PWM in prepurging, *SEC*	0	100	1%	Factory setting 60%
675.01	PWM: Maximum PWM in ignition load, **SEC**	0	100	1%	Factory setting 40%
676	P-part of the PID speed control for the PWM fan motor (amplification factor)	0	255	1	Factory setting 112
677	I-part of the PID speed control for the PWM fan motor (integral action time)	0	37.485	0.147 s	Factory setting 0.441 seconds
678	D-part of the PID speed control for the PWM fan motor (derivative action time)	0	37.485	0.147 s	Factory setting 0 seconds
679.00	Time constant **Pt1** speed control: Lower speed range high-fire to low-fire	0	37.485	0.147 s	Factory setting 10.143 seconds
679.01	Time constant **Pt1** speed control: Medium speed range high-fire to low-fire	0	37.485	0.147 s	Factory setting 10.143 seconds
679.02	Time constant **Pt1** speed control: Upper speed range high-fire to low-fire	0	37.485	0.147 s	Factory setting 10.143 seconds
679.03	Time constant **Pt1** speed control: Entire speed range low-fire to high-fire	0	37.485	0.147 s	Factory setting 10.143 seconds
680.00	Speed range for **Pt1** time constant: Threshold upper speed range	800	16500	10 rpm	Factory setting 4000 rpm
680.01	Speed range for **Pt1** time constant: Threshold lower speed range	800	16500	10 rpm	Factory setting 2000 rpm
920	Current PWM signal fan	0	100	1%	Service parameter

*) Speed increments when making the setting with ACS410: 1 rpm

¹) Dependent on factory setting of parameter 516
²) Dependent on factory setting of parameter 517
³) Dependent on factory setting of parameter 518

13 Error code list

Error code		Clear text	Possible cause
AZL2	**LED display** (alternating)		
Loc: 2	Loc 2	No establishment of flame at the end of safety time	• Faulty or soiled fuel valves • Defective, soiled or incorrectly connected flame detector • Poor adjustment of burner, no fuel • Faulty ignition equipment
Loc: 3	Loc 3	Air pressure faulty (air pressure switch welded in no-load position, decrease after specified time) (air pressure switch flame-on response time)	Air pressure switch faulty • Loss of air pressure after specified time • Air pressure switch welded in no-load position
Loc: 4	Loc 4	Extraneous light	Extraneous light during burner startup
Loc: 5	Loc 5	Air pressure faulty, air pressure switch welded in working position	Time supervision air pressure switch • Air pressure switch welded in working position
Loc: 7	Loc 7	Loss of flame	Too many losses of flame during operation (restart limitation) • Faulty or soiled fuel valves • Faulty or soiled flame detector • Poor adjustment of burner
Loc: 10	Loc 10	Non-volatile lockout with alarm output switched on at terminal X2-03 pin 3 (fault lamp ON)	Wiring error or internal error, other errors
Loc: 10	Loc 10	Non-volatile lockout with alarm output switched off at terminal X2-03 pin 3 (fault lamp OFF)	Output contact error (welded contact of an output relay)
Loc: 12	Loc 12	Valve proving	Fuel valve V1 leak
Loc: 13	Loc 13	Valve proving	Fuel valve V2 leak
Loc: 14	Loc 14	POC error	Error valve closure control POC
Loc: 22	Loc 22	Safety loop open	• Gas pressure switch-max open • Safety limit thermostat cut out
Loc: 60	Loc 60	Analog power source 4...20 mA, $I < 4$ mA	Wire breakage
Loc: 83	Loc 83	Faulty PWM fan	• PWM fan does not reach the target speed within the preset period of time, or • After reaching the target speed, the PWM fan leaves the tolerance band again (parameter 650) for a time exceeding the tolerance time speed deviation (parameter 660)
Loc: 138	Loc 138	Restore process successful	Restore process successful
Loc: 167	Loc 167	Manual locking	Manual locking
Loc: 206	Loc 206	AZL2 incompatible	Use the latest version

Error code		Clear text	Possible cause
AZL2	**LED display** (alternating)		
Loc: 225	Loc 225	Faulty PWM fan	• Fan speed dropped below the minimum prepurge PWM (parameter 675.00) after reaching the prepurge speed, or • The maximum ignition load PWM (parameter 675.01) has been exceeded after reaching the ignition load speed.
Loc: 226	Loc 226	Faulty PWM fan	Parameterization error • Low-fire speed > high-fire speed, or • Low-fire = 0 rpm, or • Maximum speed = 0 rpm
Loc: 227	Loc 227	Faulty PWM fan	One or more parameters are violating the minimum/maximum limit

14 Legend

AL	Alarm device
Dbr...	Wire link
 /reset (EK1)	Lockout reset button (info button)
EK2	Remote lockout reset button
FSV	Flame signal amplifier
ION	Ionization probe
Kx	Relay contact
LED	3-color signal lamp
LP	Air pressure switch
LR	Load controller
LR-OPEN	Load controller OPEN position
LR-CLOSED	Load controller CLOSED position
M	Fan motor
NT	Power supply unit
P LT	Pressure switch valve proving
Pmax	Gas pressure switch-max
Pmin	Gas pressure switch-min
POC	Valve closure control (proof of closure)
 PWM	PWM motor power supply
QRA	Flame detector
R	Control thermostat or pressurestat
SK	Safety loop
SV	Safety valve
V1	Fuel valve
V2	Fuel valve
Z	Ignition transformer
	Input/output signal 1 (ON)
	Input/output signal 0 (OFF)
	Permissible signal 1 (ON) or 0 (OFF)

15 List of figures

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