

Section 5 Troubleshooting

Common Problems 5-1

The most frequent source of problems concerning the LMV5 is wiring errors, followed closely by parameter setting errors.

This section details the most commonly seen problems, along with the most common solutions to these problems. Section 5-2 includes a list of error codes that have associated corrective actions.

CANBus Wiring

The majority of all wiring errors are related to the CANBus.

The CANBus system includes: the AGG5.210 transformer, the two 12VAC fuses in the LMV5, the AZL5, the special CANBus cable, the actuators, additional transformers (if required), and the O2 module (if equipped).

If an error occurs with any CANBus connected device, the following 5 items should be checked:

- 1) The wiring on the AGG5.210 transformer, specifically how the four pin connector X52 is wired to the LMV5. Most problems occur on Pins 3 and 4 of the transformer. Pin 3 on the transformer and terminal X52.4 on the LMV5 should be wired to PE (Protective Earth or Panel Ground). Pin 4 on the transformer should be wired to X52.3. (See Wiring, Section 3)
- 2) The connections of 12VAC1, 12VAC2, CANL, CANH and GND. Ensure that the heavier wires of the CANBus cable (16 AWG) are used for the 12VAC terminals and the lighter (24 AWG) twisted pair is used for CANL and CANH terminals. Make sure that the color convention used at the LMV5 CANBus Connection (X51 for actuators) is consistent throughout. Typically 12VAC1 = Red, 12VAC2 = Black, CANH = Blue, CANL = White, GND = Green. Ensure that no wire strands from adjacent pins on the CANBus plugs make contact. No conductors, only insulation should be visible when viewing a properly terminated CANBus green plug.
- 3) The shielding of the special CANBus cable. The shielding of this cable is immediately under the plastic sheathing of the cable and the shielding encircles all the conductors. All shielding, on all segments, of the CANBus cable must have continuity with terminals X51.1 (for the actuators, O2 module) or X50.1 (for the AZL). This can be checked with a multi-meter connecting one probe on the shielding clip attached to terminal X50.1, and one probe on the last device of the CANBus. Shielding clips (AGG5.110) are required (one for X51 and if not using a pre-made AZL cord, one for X50) to mount and terminate the shield of the CANBus cable on the LMV5 end. The continuity of the shield is maintained thru each of the actuators and / or O2 module by using the metal shielding clamps provided on each device.
(See wiring, Section 3)
- 4) CANBus fuses, FU2 and FU3, located on the right hand side of the LMV5. Check that these fuses are not blown. If any are blown, check the wiring for incorrect terminations. Also check the area of the cable where the sheathing was stripped. It is possible that a knife was used to cut the sheathing, and that the knife penetrated through the cable sheath, the shielding, and the insulation on 12VAC1 or 12VAC2. If the shield makes contact with either 12VAC1 or 12VAC2 a short will result. This will blow fuses, and can damage actuators or O2 module.
- 5) Electrical loading of the CANBus. The 12VAC1 and 12VAC2 power is supplied by the AGG5.110 transformer connected to the LMV5. The output of one transformer is sufficient for many applications, but some may require two transformers. CANBus loading can be determined using of the CANBus loading table, found in Section 3-1.
Wiring of the second transformer can be found in Section 3-3.

CANBus Wiring “AZL not on Bus”

When the AZL5 displays “AZL not on Bus”, or is stuck in “System Test”, this typically means that there is a voltage problem on the CANBus. This usually does not mean that the AZL5 needs to be replaced. Make sure that the neutral and chassis ground are bonded, meaning having no electrical potential (voltage) between them. The 5 points mentioned on the previous page should also be checked, especially points 1, 2 and 4.

It is possible that one or more actuators are being overloaded and are consuming too much power from the CANBus. Voltage should be checked by probing the CANBus terminals.

There should be 12 volts AC between 12VAC1 and GND.

There should also be 12 volts AC between 12VAC2 and GND.

Voltage between 12VAC1 and 12VAC2 should measure 24VAC.

If the voltage is significantly less than these values, the CANBus is overloaded, a short exists, a fuse is blown, or some part of the CANBus is improperly wired.

It is much easier to troubleshoot the CANBus in pieces rather than all devices at once.

When a CANBus problem is discovered, all actuators and the O2 module can be disconnected, so that ONLY the AZL5 is connected to the LMV5.

The actuators / O2 Module can then be connected one by one, to see when the CANBus fault appears. This method is easy to perform since the actuators / O2 Module have plugs that can be connected and disconnected with ease.

Grounding

The second largest category of wiring problems concerns the grounding and the shielding of LMV5 components.

The LMV5 has three different types of ground, each with a different function. The three types are:

- 1) Protective earth or chassis ground (PE)**
- 2) Functional Earth or Shield (FE)**
- 3) Reference Ground (Labeled as 0, M, or GND, hereafter labeled as 0)**

All PE's that exist on the forward facing plugs (white plugs) of the LMV5 are bonded together.

All 0's that exist (green plugs) are internally bonded.

FE's are bonded to one another on the individual internal circuit boards of the LMV5, and are then bonded to the 0's with capacitors on each individual board.

At the 12VAC transformer's 4 pin SEK2 plug, Pins 2 and 3 are tied together, thus connecting 0 and FE directly on the circuit board that has the CANBus connectors. It is highly recommended that SEK2 Pin 3 on the transformer, and X52.4 are connected to chassis ground (PE), effectively connecting 0 to chassis ground (PE). This also connects 0 and PE directly to FE, on the CANBus board only. FE on other boards is isolated from 0 with capacitors.

In short, FE are exclusively for cable shields, 0 is the reference ground for all low voltage sensors, and PE should be connected to the main grounding lug (main chassis ground).

Note: The main step down (480VAC to 120 VAC) transformer must have the neutral and chassis ground bonded together on the low voltage (120VAC) side.

All other devices connected to the LMV5 (such as a VSD and blower motors) must also be grounded to chassis ground.

Load Controller Modes & Sensors

The LMV51.140 and LMV52 both have a load controller that can read press / temp directly. The LMV51.040 must be used with a floating/bumping external load controller, such as a RWF40.

When the LMV5 load controller is configured, different inputs are expected on different terminals:

If an analog press/temp sensor is used, Input 2, Term X61.2 or X61.3 is required.

If remote setpoint / remote modulation is used, Input 3, Term X62.2 or X63.3 is required.

If RTD temp sensor(s) are used, Input 1, Term X60.1, or Input 4 Term X60.3 is required.

If an analog signal does not exist on the previously motioned terminals when the mode is selected (0 mA when 4-20mA is selected, for example) the LMV5 will fault. See section 3-3 for wiring.

If the incorrect mode of load controller is selected for the connected instrumentation or analog signal, the LMV5 will fault.

Figure 5-1.1 details which terminals should have sensors wired for the given load controller mode.

Figure 5-1.1 Required sensors for Load Controller mode

| Mode | Label | Description | Expected Input Terminals (See Section 3-3) |
|------|-------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | ExtLC X5-03 | External Load Control Floating / Bumping | X5-03.02 and X5-03.03 |
| 2 | IntLC | Internal Load Control Temp. or Press. sensor connected to LMV5 | Temperature X60.1, X60.2, X60.3, X60.4 OR Pressure X61.1, X61.2, X61.3, X61.4 |
| 3 | Int LC bus | Internal Load Control Temp. or Press sensor connected to LMV5 remote setpoint via Modbus | Temperature X60.1, X60.2, X60.3, X60.4 OR Pressure X61.1, X61.2, X61.3, X61.4 ALSO Modbus Connection |
| 4 | Int LC X62 | Internal Load Control Temperature or Pressure sensor connected to LMV5 remote setpoint via analog input | Temperature X60.1, X60.2, X60.3, X60.4 OR Pressure X61.1, X61.2, X61.3, X61.4 ALSO Analog input X62.2, X62.3, X62.4 |
| 5 | ExtLC X62 | External Load Control analog signal connected to X62 | Analog input X62.2, X62.3, X62.4 |
| 6 | ExtLC Bus | External Load Control via ModBus | Modbus Connection |

On a steam boiler, a temperature sensor can be used in addition to the pressure sensor, for the cold start function.

In this case, an input is expected for both, a pressure sensor and a temperature sensor in modes 2 thru 4.

Load Controller General

If faults occur with the load controller, first consult Figure 5-1.1 to ensure that there are not mode sensor or signal conflicts.

- 1) Next, check to see that the wiring of the sensors is in accordance with Section 3-3.
- 2) If this fails to cure the problem, verify the analog signal to the LMV5.
- 3) Replace the sensors if necessary.

Note: On some older LMV5 units, if the load controller is in mode 5 or mode 6 (ExtLC modes), the load controller cannot be accessed by parameter path:

Params & Display > Load Controller > Controller > Configuration > LC_OptgMode

To change the load controller settings, the following path must be used:

Params & Display > System Config > LC_OptgMode

The load controller can then be accessed and put back into any of the IntLC modes.

If the load controller is in any of the IntLC modes use path:

Params & Display > Load Controller > Controller > Configuration > LC_OptgMode

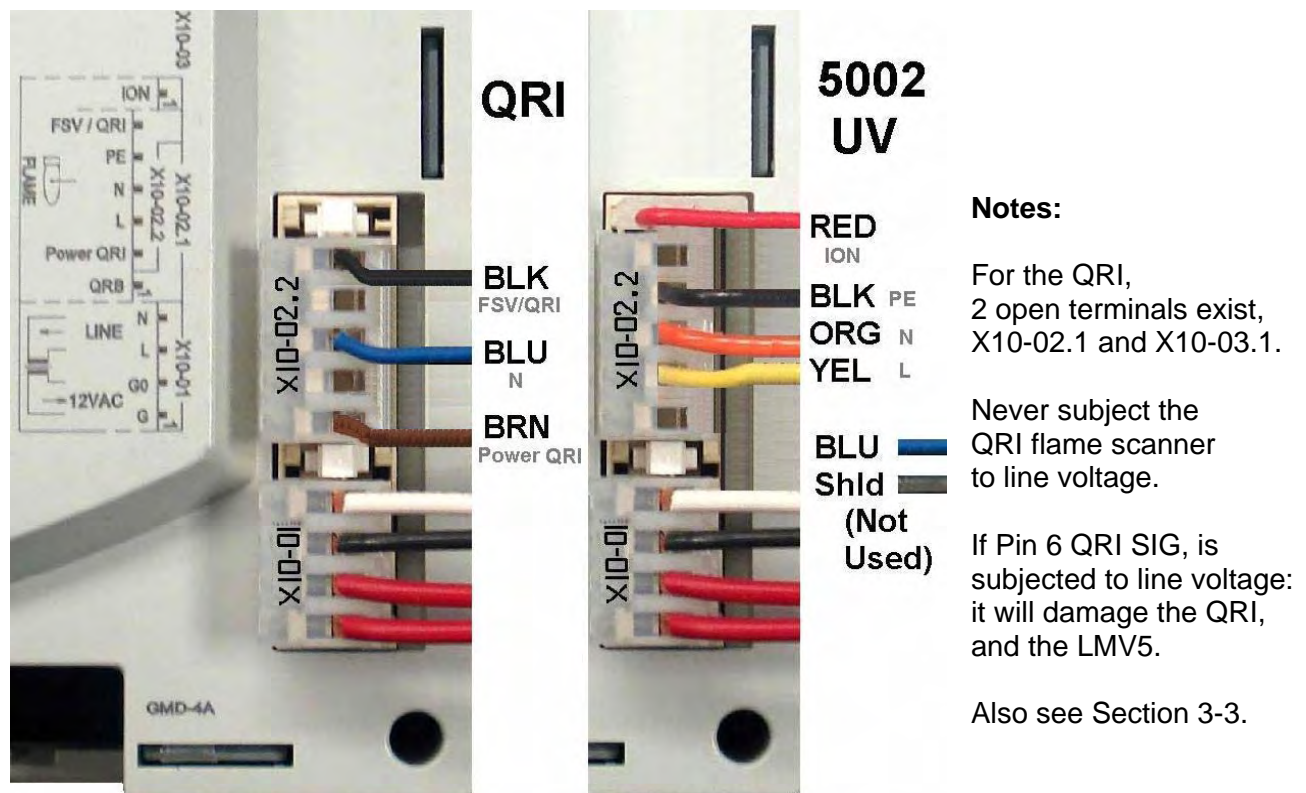
Flame Detector

The flame detector wiring is typically another frequent source of wiring errors.

These errors are due a misunderstanding of the markings on plug X10-02.2, and the LMV5 terminals.

The plug that is typically furnished with the LMV5 only covers terms X10-02.2 to X10-02.6. Terminal X10-02.1 and terminal X10-03.1 are not included in the X10-02.2 plug.

Figure 5-1.2 Plug X10-02.2 as it would be seen plugged into an LMV5



Safety loop

The safety loop wired between terminals X3-04.2 and X3-04.1 is meant for safety limits only, such as auxiliary low water cut out and the high limit.

- 1) On occasion, operating (cycling) switches are wired into this loop - this is incorrect. If a cycling switch is placed in this loop, the LMV5 will lockout every time the burner cycles off.
- 2) If an external load controller (such as a RWF40) is used, or the LMV5 load controller is in any external load controller modes (ExtLC modes 1, 5, 6), then a cycling switch should be put in series with the burner on /off switch wired to X5-03.1.
- 3) If any of the internal load controller modes are used (IntLC modes 2, 3, 4) then a cycling switch wired to X5-03.1 is not necessary, since this is done automatically in the LMV5.

Note: The parameter *InputController* can activate or deactivate terminal X5-03.1.

See section 4-2

If this terminal is deactivated, no action will be taken, when terminal X5-03.1 is energized or de-energized.

Other Common Errors

- 1) If the LMV5 is not in alarm and will not start, (stays in phase 12) check the following:
 - a. Terminal X5-03 Pin 1 has line voltage.
The burner on / off switch is usually wired to this terminal.
 - b. The LMV5 is set to “*automatic*” or “*burner on*” under manual operation.
If set to automatic, make sure that the setpoint is higher than the actual value.
Also check the setting on SDModOn, SDModOff.
 - c. Ignition positions are defined for all activated actuators, including VSD on a LMV52.
- 2) If a low or high gas pressure fault occurs every time the gas valves attempt to open, it is possible that the commons to the high and low gas pressure switches are wired through the proof of closure switches on the gas valves. Thus, power will be removed from the high and low gas pressure switch commons when the gas valves open.
- 3) If a burner flange (oil drawer) switch is not used, a jumper must be placed between terminals X3-03.1 and X3-03.2. If this is not done, a fault will occur stating that the safety loop is open.
- 4) If terminal X4-01.4 (alarm) is energized when a fault does not exist on the LMV5, this will cause a manual lockout of the LMV5.
- 5) If indication of the gas and / or oil valve is desired, terminals X8.01.1 (gas) and X8.02.2 (oil) must be used for this function. Indicator lamps and other devices must not be wired directly to the gas valve and / or oil valve terminals.
- 6) If a single lamp is used such as “main burner on”, a relay (or switch) must be used that changes state with the fuel selector switch, so that only X8.01.1 is connected to the indicator when firing gas and X8.01.2 is connected to the indicator when firing oil.

Oxygen Monitor / Trim / Efficiency Calculation

The LMV52 has the capability of integrated O2 trim and / or O2 monitoring. The O2 trim system includes the PLL52 module and the QGO20 O2 sensor as well as optional stack / ambient temperature sensors that can be used for an efficiency calculation. Common problems and the related solutions include:

O2 sensor is not reading

Displayed as “XXXX” on the AZL screen, or is reading incorrectly check the following:

- 1) Ensure that the QGO20 O2 sensor is activated.
This can be done under:
Params & Display > O2 Module > Configuration > O2 sensor.
- 2) If the QGO20 is activated, check the temperature of the QGO20 sensor.
The sensor will not sense % O2 if the sensor is below 1202 °F.

The PLL52 module controls the QGO20 sensor's heater to achieve a sensor temperature of approximately 1292 °F.

The temperature can be checked under:

Params & Display > O2 Module > Displayed Values > QGO SensorTemp.

The sensor heating load can also be viewed under the Displayed Values menu.

Maximum heating load is 60%. If the heating load is at 60% and the QGO20 is not at least above 1202 °F after initial heat up, stack velocity may be too high, thus cooling the sensor. Maximum stack velocity is 33 ft / second.

(See Section 2 for mounting restrictions on the QGO20 Sensor)

Note: The QGO20 sensor can take up to two hours to achieve operating temperature on the first start-up.

Anytime the LMV5 system / PLL52 has power and parameter O2 sensor is set to activated, the PLL52 will try to maintain the QGO20 at approximately 1292 °F.

O2 sensor reading grossly high or low

Check the following:

- 1) The milli-volt signal from the QGO20 to the PLL52 could have interference.
Ensure that the high and low voltages wires that run from the PLL52 to the QGO20 are in separate conduits.
- 2) The wires for the QGO20 heating element are high voltage (120 VAC), and the wires for the O2 signal and thermocouples are very low voltage (200 mV max).
Interference is almost sure to result if the high and low voltages are run in the same conduit.

Note: The QGO20 sensor reads %O2 wet.

Most combustion analyzers read %O2 dry, so the O2 number that appears on the AZL5 is typically at least 1% O2 lower than the combustion analyzer.

See table in Section 6 for approximate values.

O2 sensor reads but responds very slowly

Check the following:

- 1) Ensure that the QGO20 sensor is clean. This can be done by shutting off the power to the LMV52, and removing the QGO20 from the stack.
- 2) **Be Careful !!** The sensor is likely to be very hot.
After the QGO20 is removed from the stack,
let it cool for at least an hour (it will cool with power off to the LMV52).

After this time, the sensor can be blown out using low pressure (less than 15 PSIG) compressed air.

If this blowout is done when the QGO20 sensor is hot, the ceramics inside the sensor will most likely be cracked and the sensor will need to be replaced.

- 3) Check the orientation of the QGO20 sensor and the collector.
The one notch on the collector's flange should be between the two notches on the sensor's flange.

Also, ensure that the bevel of the collector is pointed into the flow.
(See Section 2 for details on proper sensor / collector orientation)

- 4) Check the internal resistance of the QGO20 sensor.

This can be read under:

Params & Display > O2 Module > Displayed Values > QGO Resistance

This value increases as the sensor ages. As the internal resistance increases, the response time of the sensor also increases. Absolute maximum resistance is 140 ohms.

Temperature sensor(s) reading incorrectly or not at all

If one or both of the temperature sensors wired into the PLL52 module for the ambient temperature and stack temperature are not reading, (displayed as "XXXX" on the AZL screen) or the sensor are reading incorrectly.

Check the following:

- 1) Ensure that the sensors wired into the PLL52 module correctly, and are two wire 1000 ohm RTD.

The Supply air temperature and the stack gas temperature sensor, are configurable for 1000 ohm platinum RTD and 1000 ohm Nickel RTD.

Typically a platinum 1000 Ohm RTD is used in the stack, and a Nickel 1000 ohm RTD is used for the supply air.

- 2) Check to see that the sensors are activated and properly configured under:

Params & Display > O2 Module > Configuration > SupAirTempSens or FlueGasTempSens

Note: The supply air temperature sensor and the stack gas temperature sensor are not necessary for O2 trim.

However, if one input or both inputs are configured for a sensor, (set to Ni1000 or PT1000) and that sensor is not wired in or is not reading, the O2 trim will not activate.

O2 Module not active or not Available

When attempting to go under:

Params & Display > O2 Module,

the following is displayed “O2 Module not active or not Available”.

Check the CANBus wiring to the PLL52 Module.

If this wiring is not correct the LMV5 will not auto detect the PLL52 Module.

Point must lie 0.5 % O2 above O2 Monitor Curve

When setting the O2 Control Curve, messages are received that say “*Point must lie 0.5 % O2 above O2 Monitor Curve*” or “*Point must lie 1.0% O2 below Ratio Control Curve*”.

Check the following:

- 1) Ensure that there is an absolute minimum of 1.6 % O2 between the O2 monitor curve and the O2 ratio control curve.
- 2) Also ensure that the %O2 that is to be set is at least 0.5% O2 above the O2 Monitor Curve and 1.0% O2 below the O2 ratio control curve.
- 3) In practice, it is much easier to make the %O2 gap between the curves larger than the absolute minimum.

Depending on the burner characteristic, doing this may also lead to more trouble free operation.

- 4) If possible:

It is preferable to have a 1 to 1.5% gap,
between the O2 Monitor curve and the O2 Control Curve.

It is also preferable to have a 1.5% gap,
between the O2 Ratio control curve and the O2 Control Curve.

- 5) Please see Section 6 for more information in these curves.

Note: When setting up the three O2 curves,
these curves must be set using the %O2 values displayed on the AZL5.

These values are %O2 on a wet basis.

A separate combustion analyzer (which typically measures dry %O2)
is useful for reference and to monitor CO and NOx production,
but should not be used to set the three O2 curves.

Measurement of Delay time Unsuccessful

When setting Point 2 or the high fire point (typically Point 10) on the O2 control curve, messages are received that say words to the effect of:
“*Measurement of Delay time Unsuccessful*”.

Check the following:

- 1) Make sure that parameter *OptgMode* is set to *man deact*.
This setting can be found under :
Params & Display > O2ControlGualrd > Gas / Oil Settings
- 2) This typically occurs at low fire when the velocity of the combustion gasses through the boiler is relatively slow. The delay time is defined as the length of time it takes a change in the air damper position to be detected by the O2 sensor. This time is longer at low fire and shorter at high fire due to gas velocity.

When the points on the O2 control curve are set, the LMV5 will prompt at every point with “*press enter after the O2 value has stabilized*”.

Pressing enter then sets the %O2 for the O2 ratio control curve.

This problem is typically cured by waiting at least 30 seconds after the LMV5 asks “*press enter after the O2 value has stabilized*”, since the problem is typically caused by a non-representative %O2 value for the O2 ratio control curve.

Please see Section 6 for additional information.

O2 trim automatically deactivated

The LMV5 gives warnings that the O2 trim has been automatically deactivated. There are many different problems that can cause an auto deactivation of the O2 trim system.

The most common are:

- 1) Go into the fault history. If the LMV5 faulted on error code B5 diagnostic code 01, this states that the sensed % O2 value has gone below the O2 Monitor curve for more than 3 seconds and the trim deactivated.

The most common solutions to this problem are increasing the % O2 gap between the O2 control curve and the O2 monitor curve at and around the point (can be determined by the load-stamp on the fault) where the fault occurred.

Also, Parameters O2 Offset Gas or O2 offset Oil can be increased in 0.5% increments. Parameter LoadCtrlSuspend can also be decreased in 1% increments.

See Section 4-2 for more information on these parameters

- 2) If the LMV5 faulted on error code AB diagnostic code 15 or 16, check the configuration of the ambient (supply air) sensor and the stack (flue) gas sensor. If these sensors are activated and are not wired in or are not functioning correctly, the O2 trim will automatically deactivate immediately after it is reactivated.
- 3) If the LMV5 faulted on error code AB, diagnostic code 20, check the temperature of the QGO20 sensor.

This can be found under:

Params & Display > O2 Module > Displayed Values > QGO SensorTemp.

The temperature should be at least 1202 °F.

If the temperature falls below this value during prepurge or anytime during operation, the QGO20 sensor may be mounted improperly, or gas velocity may be too high or too low. See Section 2 for proper QGO20 mounting

VSD Control

The LMV52 has the ability to control different types of VSD (variable speed drive).

The most common type of VSD used with the LMV52 is the VFD (variable frequency drive), and the most common type of motor used with the VFD is the so called “synchronous” AC induction motor.

For a more in depth overview of this application, please see the first few pages of Section 7-1.

Common problems and the related solutions include:

VFD will not operate

If the VFD will not operate the blower (blower will not spin) when the LMV52 parameter standardize is activated. Consider the following:

- 1) Verify that the following:
 - a. The 0 / 4-20mA signal from the LMV52 to the VFD is wired correctly (LMV52 terminals X73.4 and X73.2).
 - b. The run / stop contact is wired to the VFD correctly (LMV52 terminals X73.1 and X73.2)
 - c. The VFD parameters are set for the motor that it driving.
 - d. The VFD is spanned so that 0 or 4mA equals 0Hz and 20mA = 63Hz (60 Hz grid frequency). The reason for this is explained in Section 7.
 - e. VFD is in remote mode so that it looks for a 0 / 4-20mA signal, and run / stop contact. Closing the contact should cause the VFD to operate the motor.
 - f. Verify that the three-phase wiring between the VFD and motor is correct.
- 2) Disconnect the analog signal and run / stop contact wires between the VFD and the LMV52. Use a handheld 0 / 4-20mA source and a toggle switch to verify that the VFD responds to a contact closure and a varying 0 / 4-20mA signal.

If the VFD does not respond, check / correct the configuration of the VFD.

If the VFD responds to the contact closure and the varying 0 / 4-20mA signal, then go to the next step.

- 3) With the wires between the LMV52 and VFD still disconnected, use a multi-meter to verify that the LMV52 outputs about 19.5mA during the standardization, (see note below) and that the run-stop contact (dry contact) in the LMV52 closes, and remains closed during the standardization.

If the analog signal is not output and the contact does not close, verify that the VSD is set to activated under : *Params & Display > Ratio control > Gas / Oil settings VSD*.

Also ensure that the safety loop (X3-04 Pin 1 and Pin 2), and the burner flange (X3-03 Pin 1 and 2) are closed.

The LMV5 will not standardize if an alarm is present.

- Note:** When standardization is activated in the LMV52, the air actuator should drive to prepurge position before the run / stop contact closes and the LMV52 puts out 19.5mA. This is done so that the blower motor has a representative load (blower moves air) during standardization.

If this does not happen automatically, make sure that the air actuator is set to air influenced and the safety loop is closed.

Depending upon what air actuator is used and what parameter “*TimeNoFlame*” is set to, the actuator could take up to 120 seconds to reach prepurge position.

- 4) If the VFD responds to a contact closure and a 0 / 4-20mA source, the VFD should be configured correctly.
If the LMV52 closes the run / stop contact and produces 19.5mA when put into standardize mode, then the LMV52 should be configured correctly.
Thus, the LMV52 / VFD / motor combination should operate properly, and standardize when wired back together.

VSD Standardizing

A successful standardization can be done under:

Params & Display > VSD Module > Configuration > Standardized Sp

If a number is recorded under this parameter that is close to the full speed of the motor (typically 3585 RPM, +/- 100 RPM), the standardization is successful.

If the VFD operates the blower during standardization but does not standardize successfully, consider the following:

- 1) Verify the following:
 - a. The speed wheel is installed on the blower motor correctly (see Section 2) and the gap between the inductive sensor and the speed wheel is correct.
 - b. The inductive sensor is wired to the LMV52 correctly, on terminals (X70.1, X70.2 and X70.3)
 - c. The yellow LED on the back of the inductive sensor should blink every time a speed wheel “finger” passes by the nose of the sensor.
If it does not blink, the sensor is wired incorrectly or is defective.
 - d. If everything is correct with the speed sensor, the real time RPM can be read under:
Params & Display > VSD Module > Absolute Speed
For troubleshooting purposes, the RPM can be read here during the standardization process.

- 2) Check to ensure that the air damper opens when the standardization is activated.
If this does not happen automatically, make sure that the air actuator is set to air influenced, the safety loop is closed, and that the LMV52 is not in an alarm.

- 3) Check the ramp time on the LMV52 and the VFD.
The ramp time on the VFD must be faster than the ramp rate on the LMV52.
If the VFD ramp time is set at 30 seconds, the LMV52 ramp time should be set at least 40 seconds.
The LMV52 ramp rates can be found under:
Params & Display > Ratio Control > Times

Both the *TimeNoFlame* parameter and the *OperatRampMod* parameter should be set to at least 40 seconds for a VFD ramp time of 30 seconds.

In general, the VFD ramp time should be set about 25% faster than the LMV52 ramp time.

- 4) Monitor the RPM of the blower motor during the standardization process.
After standardization is activated, the real time RPM can be read under:
Params & Display > VSD Module > Absolute Speed
During standardization, the indicated RPM should rise up to a peak value and hold steady at that value for a few seconds, and then drop back to zero or near zero.

This peak value that is seen should be recorded automatically under:
Params & Display > VSD Module > Configuration > Standardized Sp

If this doesn't happen, it's likely that there's a problem with the VFD or the speed wheel.

Fan speed not reached or Control range limitation VSD Module

Typically, if the LMV52 / VFD / Motor standardize successfully this system will operate correctly. However, if the standarization is successful but problems are encountered during burner operation, consider the following:

- 1) Ramp times. Faster ramp times on both the VFD and the LMV52, create a more demanding application for the VFD. Simply put, a faster ramp time (20 seconds instead of 40 seconds) will cause the VFD to draw or absorb much more amperage for a given change in blower speed, since the change in speed occurs more quickly.

Ramp times that are faster than the VFD can handle can lead to over current faults on the VFD as well as error messages on the LMV52 stating "*Fan speed not reached*" or "*Control range limitation VSD Module*".

Increasing ramp times typically helps these problems.

Please see the next point for details on these two most common LMV52 error messages.

- 2) If "*Fan speed not reached*" or "*Control range limitation VSD Module*" frequently appear on the AZL5, this indicates that the LMV52 has shifted the 0 / 4-20mA as far as possible from the standardized signal and the RPM of the blower motor as read by the speed wheel is still to low or too high.

"*Fan speed not reached*" indicates that the blower speed is still to low, even though the LMV52 has increased the 0 / 4-20mA signal as far as possible.

This shows up as a warning on the AZL5 for the first 2 seconds, and if the blower speed does not increase in this time a lockout will occur.

Conversely, "*control range limitation VSD Module*" indicates that the blower speed is too high even though the LMV52 has decreased the 0 / 4-20mA signal as far as possible.

This also shows up as a warning on the AZL5 for about 5 seconds, and if the blower speed does not decrease in this time a lockout will occur.

If "*Fan speed not reached*" occurs when the blower is ramping up, and "*control range limitation VSD Module*" occurs when the blower is ramping down, there is a good chance that the VFD is not able to accelerate or decelerate the blower wheel quickly enough for the given ramp times.

As was previously mentioned, extending the ramp times will help this situation.

- 3) Inertia of the rotating assembly (blower motor wheel and motor armature). As the mass and inertia of the blower wheel and motor armature increase, the power needed to accelerate (increase RPM) and decelerate (decrease RPM) increases.

Large blower motors connected to large heavy blower wheels, typically require longer ramp times and / or VFD with high over current capability, so that "*Fan speed not reached*" or "*Control range limitation VSD Module*" lockouts do not occur.

- 4) The alarm input into the LMV52 from the VFD.

The LMV52 has an alarm input terminal from the VFD, so that if the VFD is having a problem, the LMV52 can sense this and shut the burner down.

If an Error code A9 Diagnostic code 0C is encountered, then this means that the VFD caused the LMV52 to alarm by energizing terminal X73.3 on the LMV52 with 24 VDC.

Typically, this happens due to an over current in the VFD itself.

VSD faults Phase 10

If VSD faults are occurring in Phase 10 (home position), check the setting of Parameter “ReleaseContctVSD”.

If this is set to open, the LMV52 will simply open the run / stop contact after postpurge is complete.

If this is set to closed, the LMV52 will keep the run / stop contact closed after postpurge is complete.

- 1) Depending on how the VFD is configured, opening the run / stop contact after postpurge could engage a DC brake in the VFD to slow down the blower rapidly.
If the VFD does not have this capability, opening the run / stop contact will let the blower freewheel and coast down after postpurge is complete.
If the run / stop contact is kept closed after postpurge is complete, the VFD should bring the bower RPM down to the home position in a controlled manner.
- 2) Whichever option is selected, the goal is to have the blower motor RPM correct at home position, which is phase 10. Typically, home position is set to 0% VSD. If this is the case, this means that the blower must be spinning at less than 8% of the standardized RPM by the end of Phase 10 (8% of 3585 RPM = 287 RPM). The LMV52 will wait approximately 20 seconds in Phase 10 for the proper speed (if set to a percent grater than 0 % VSD) or the less than 8% speed (if set to 0 % VSD) to be reached before locking out.
- 3) If this problem is occurring, verify that “ReleaseContctVSD” is set to closed.
If this does not help, reducing the blower speed and / or opening the air damper further in postpurge will help slow the blower.
If the problem is still encountered, setting “ReleaseContctVSD” to open and adding DC braking on the VFD typically cures the problem.

Random error codes or AZL not on bus

If random error codes occur or if “AZL not on bus” problems occur when operating the VFD, check the following:

- 1) Ensure that the LMV52, the VFD, and the three phase motor are grounded to chassis ground.
Also ensure that Pin 3 of the AGG5.210 transformer, and Pin X52.4 of the LMV52, are grounded to chassis ground.
- 2) Ensure that the wires between the VFD and the blower motor are in some type of metal conduit (flex or hard conduit).
This is important since these wires are a rich source of EMF (Electromagnetic Field) and can adversely affect the LMV52, causing many different error codes.
Metal conduit will contain the vast majority of the EMF.

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-------------------------------------------|-----------------------------------|--------|---------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| 01 | 01 | LMV5 | Internal Fault Basic Unit | ROM error | Electromagnetic compatibility (EMC) Improving EMC is avoiding electrical interference effects Typically this means: 1) Check grounding (most often the cause) 2) Check shielding 3) Check for loose connections 4) Check for wiring that is too close to high voltage |
| 02 | Any # | LMV5 | Internal Fault Basic Unit | RAM error | |
| | 01 | | | RAM error in register bank 0 (LMV51...) | |
| | 02 | | | RAM error in IDATA area (LMV51...) | |
| | 03 | | | RAM error in XDATA area (LMV51...) | |
| | 04 | | | RAM error of variables used | |
| | 05 | | | RAM error variable consistency | |
| | 06 | | | RAM error reading back test pattern | |
| | 07 | | | Error RAM test code run | |
| 03 | Any # | LMV5 | Internal Fault Basic Unit | Error in connection with data comparison (internal communication) between μ C1 and μ C2 | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 01 | | | TimeOut during program run synchronization prior to data transmission | |
| | 02 | | | TimeOut during data transmission | |
| | 03 | | | CRC error during data transmission | |
| | 05 | | | TimeOut during program run synchronization with initialization | |
| | 10 | | | Error counter "Flame intensity outside tolerance" has elapsed | Check flame detector signal. If ok, and fault re-occurs, replace LMV5 |
| | 11 | | | Error counter "Target phase unequal" has elapsed | If fault occurs continuously, replace LMV5 |
| | 12 | | | Error counter "Reset-lockout input unequal" has elapsed | |
| | 40 | | | Fuel train unequal | |
| | 41 | | | Relay control word unequal | |
| | 42 | | | ROM-CRC signature unequal | |
| | 43 | | | Phase unequal | |
| 44 | (Key + main loop counter) unequal | | | | |
| 04 | | | | Unsuccessful synchronization of the 2 μ Cs | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|----------------------------|-----------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH FLAME SCANNER (QRI) OR BASE UNIT (LMV5)</i> | | | | | |
| 05 | Any # | LMV5 / Flame Dec. | Fault Flame Detector Test | Fault during test of the flame signal amplifier | If fault occurs sporadically: Improve shielding / isolation of flame detector wires. High LMV5 temperatures can also cause this fault. If fault occurs constantly: Lower LMV5 temperature, replace flame detector or replace LMV5 |
| | 01 | | | Fault during test of the flame signal amplifier | |
| | 02 | | | Crosstalk fault between test pin and flame signal amplifier channel (with LMV52 FSVchannel QRI... / QRB...) | |
| | 03 | | | Crosstalk fault between test pin and FSV channel ION (Only LMV52) | |
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| 06 | Any # | LMV5 | Internal Fault Basic Unit | Fault internal hardware tests | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 01 | | | Fault during test of the ignition relay | |
| | 02 | | | Fault during test of the safety relay | |
| | 03 | | | Fault during voltage supervision test | |
| | 04 | | | Relay voltage not switched off after reset | |
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5)</i> | | | | | |
| 10 | Any # | Devices conn. To LMV5 | Internal Fault Basic Unit | Basic unit has detected an improper circuit at one of the outputs, a faulty diode, or a short-circuit in the power supply of the contact feedback network. The diagnostic codes indicates the input affected | 1) Check connections of the neutrals to all of the connected switches, valves, etc... 2) Check for capacitive loads that cause voltage to be present on the terminal after the LMV deenergizes the terminal. If voltage exists on an output terminal, such as a fuel valve, after the LMV denenergizes the terminal, this will cause a fault. Voltage must drop to zero on the terminal within about 10 ms after the terminal is de-energized. |
| | 01 | | | Load controller on / off | |
| | 02 | | | Fan contact | |
| | 03 | | | Selection of oil-firing | |
| | 04 | | | Selection of gas-firing | |
| | 05 | | | Reset | |
| | 06 | | | Pressure switch oil maximum | |
| | 07 | | | Pressure switch oil minimum | |
| | 08 | | | Pressure switch valve proving | |
| | 09 | | | Safety valve oil feedback | |
| | 0A | | | Fuel valve 1 oil feedback | |
| | 0B | | | Fuel valve 2 oil feedback | |
| | 0C | | | Fuel valve 3 oil feedback | |
| | 0D | | | Safety valve gas feedback | |
| 0E | Fuel valve 1 gas feedback | | | | |
| 0F | Fuel valve 2 gas feedback | | | | |
| 10 | Fuel valve 3 gas feedback | | | | |
| 11 | Safety chain burner flange | | | | |
| 12 | Safety relay feedback | | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|-------------------|----------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5)</i> | | | | | |
| 10 | 13 | | | Pressure switch gas minimum | 1) Check connections of the neutrals to all of the connected switches, valves, etc... 2) Check for capacitive loads that cause voltage to be present on the terminal after the LMV deenergizes the terminal. If voltage exists on an output terminal, such as a fuel valve, after the LMV denenergizes the terminal, this will cause a fault. Voltage must drop to zero on the terminal within about 10 ms after the terminal is de-energized. |
| | 14 | | | Pressure switch gas maximum | |
| | 15 | | | Ignition transformer feedback | |
| | 16 | | | Fan pressure switch | |
| | 17 | | | Start release oil | |
| | 18 | Devices conn. To LMV5 | Internal Fault Basic Unit | Heavy oil direct start | |
| | 19 | | | Load controller open | |
| | 1A | | | Load controller closed | |
| 1B | Start release gas | | | | |
| 11 | 01 | | | Basic unit has detected a short-circuit in the contact feedback network | |
| <i>FAULT WITH CONNECTED ACTUATORS OR VSD</i> | | | | | |
| 15 | Any # | Act. / VSD Control | Fault Positioning Actuator or Fan Speed not reached | LMV5 has detected a positioning error on one or several actuators. Could also be the VSD module if equipped | If error occurs on one actuator only : 1) Ensure torque requirements of dampers / valves is less than Actuator output. 2) Verify that no damper / valve is bound. 3) If 1 and 2 do not solve the problem: Replace actuator. |
| | 01-3F | | Fault Positioning Actuator | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) Indicated that more than one actuator / VSD has problems. | |
| | 01 | Positioning fault air actuator | | If error occurs on multiple actuators (01-3F) : 1) Verify that the CanBus wiring is correct. 2) Verify that shields (screens) on CanBus cable are connected properly. | |
| | 02 | Positioning fault fuel actuator | | | |
| | 04 | Positioning fault auxiliary actuator 1 | | | |
| | 08 | Positioning fault auxiliary actuator 2 | | | |
| | 10 | VSD module | Fan Speed Not Reached | The fan in combination with the VSD has not reached the required speed | If error occurs on VSD : 1) Check speed sensor on motor for correct installation, especially gap between sensor and wheel. 2) Check for filters, damping and or delays on the input signal to the VSD. The VSD should respond to the input signal in a linear fashion. Extend VSD and LMV5 ramp times. |
| | 20 | Aux3 Act. | Fault Positioning Actuator | Positioning fault auxiliary actuator 3 | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|--------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) RATIO CONTROL, O2 TRIM, VSD</i> | | | | | |
| 16 | Any # | LMV5 | Internal Fault Basic Unit | Basic unit has detected a plausibility fault in the ratio control system. The diagnostic code describes the cause of the fault. | |
| | 00 | | | Ratio curve of the air actuator is not fully defined | Insure that actuators that are addressed and activated have their positions defined. Check curve points to see if correct values have been entered for the actuator or VSD. Readjust the ratio curve, if required |
| | 01 | | | Ratio curve of the fuel actuator is not fully defined | |
| | 02 | | | Ratio curve of auxiliary actuator 1 is not fully defined | |
| | 03 | | | Ratio curve of auxiliary actuator 2 is not fully defined | |
| | 04 | | | Ratio curve of auxiliary actuator 3 is not fully defined | |
| | 05 | | | VSD curve is not fully defined | |
| | 0A | | | Calculated P-part outside the permissible range | |
| | 0B | | | Calculated I-part outside the permissible range | |
| | 0C | | | Calculated system delay time outside the permissible range | |
| | 0D | | | Calculated O2 setpoint outside the permissible range | The O2 control curve must be 1% O2 lower than the % O2 measured at the ratio control curve, and 0.5% above the O2 guard curve. Readjust curves. |
| | 0E | | | Calculated O2 min. value outside the permissible range | |
| | 0F | | | Calculated O2 ratio value outside the permissible range | |
| | 03 | | | The load / point number predefined by the AZL... lies outside the permissible range | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 14 | | | Calculated standardized value lies outside the permissible range | Check if the correct values have been entered for the standardized values. Readjust O2 trim control, if required, or repeat the settings |
| | 20 | | | With hysteresis compensation: Permissible target positioning range exceeded | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 21 | | | The load / point number predefined by the AZL... lies outside the permissible range | |
| 22 | With a switch instruction, none of the defined cases was satisfied | | | | |
| 23 | With the switch instruction, no defined ratio control phase has been identified | | | | |
| 40 | Unplausible target positions | | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-----------------------------------------------------|------------|--------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| 17 | Any # | LMV5 | Internal Fault Basic Unit | (Internal) communication error of ELV | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 3F | | | Detection of different data when making the data comparison | |
| | 01 | | | Timeout with program synchronization prior to data transmission | |
| | 02 | | | Timeout with data transmission | |
| | 03 | | | CRC fault during data transmission | |
| 18 | Any # | Invalid Curve Data | Corruption in the combustion curve data | Vaules on curve should be within 0.0 % - 100.0 % for load and VSD, 0.0° - 90.0° for actuators. If possible, adjust curve values back into the valid range. If this fault occurs on a unit that was functioning correctly after commisioning, replace LMV5 | |
| <i>FAULT WITH ACTUATOR OR CANBUS CABLING</i> | | | | | |
| 19 | Any # | Act. | Internal Fault Actuator | Basic unit (ratio control system) has detected a fault when comparing potentiometer channels A and B. Diagnostic code shows on which actuator the fault occurred. See diagnostic code | 1) If fault occurs constantly: Replace actuator according to diagnostic code. After actuator(s) are replaced, make sure that the actuators do not "hunt" during operation. This can be done by adjusting Paramter "MinActuatorStep" and the PID loop. |
| | 01..2F | | | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) | |
| | 01 | Air Act. | | Fault occurred on the indivudual actuator (see diagnostic code) when comparing potentiometer channels A and B | |
| | 02 | Active Fuel Act. | | | |
| | 04 | Aux 1 Act. | | | |
| | 08 | Aux 2 Act. | | | |
| | 20 | Aux 3 Act. | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH ACTUATOR (VSD) POSITIONING, ACTUATOR (VSD) RUN TIME</i> | | | | | |
| 1A | 01 | LMV5 | Slope too steep | A section of actuator curve is too steep. | Check maximum slope sections of actuator curves. Maximum allowable slopes are as follows: - 3.6° per 0.1 % Load (30 sec ramp) - 1.8° per 0.1 % Load (60 sec ramp) - 0.9° per 0.1 % Load (120 sec ramp) If these maximums are exceeded, adjust curve section below these maximum slopes. |
| 1B | Any # | | Operation in Parameter Setting Mode Quit | Curve Parameters (actuator curves) programming mode is still active in Phase 62 (drive to low fire and shutdown) and the target positions (normal operation) have not been reached. | When setting the curve parameters, the plant should be operated in manual mode with "Burner on". This prevents the internal load controller from triggering the change to shutdown. Response of the internal Temperature Limiter can trigger this same fault. However, the curve point currently being set can still be stored in standby or lockout. |
| 1C | Any # | | Ignition Pos not defined | Ignition positions for activated actuators (or VSD) have not been set. See diagnostic code to indicate the faulted actuator. | |
| | 01..3F | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) | | | |
| | 01 | Ignition position for air actuator not set. | | | |
| | 02 | Ignition position for active fuel actuator not set. | | | |
| | 04 | Ignition position for aux1 actuator not set. | | | |
| | 08 | Ignition position for aux2 actuator not set. | | | |
| | 10 | Ignition position for VSD not set. | | | |
| | 20 | Ignition position for aux3 actuator not set. | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|------------|---------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH ACTUATOR (VSD) POSITIONING, ACTUATOR (VSD) RUN TIME</i> | | | | | |
| 1D | Any # | LMV5/ Act./ VSD | Fault Running Time | Running time fault of actuators or VSD. | 1) Check parameters (TimeNoFlame) and (OperatRampMod). These should be set to values greater than the ramping time of the attached actuators or VSD. 2) Check connected actuators to determine if their torque rating is being exceeded (stuck damper or valve etc...) 3) Check the two 12V fuses located under black covers on the right side of the LMV5 4) Check the CANBus power supply (blue or black transformer) Pin 1 and Pin 4 should have 12VAC to reference ground which is pin 2. Voltage between Pin 1 and Pin 4 should be 24VAC. |
| | 01..3F | | | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) | |
| | 01 | Act. / LMV5 | Fault Running Time Air Actuator | Running time fault of air actuator | |
| | 04 | | Fault Running Time Aux Actuator | Running time fault of auxiliary actuator 1 | |
| | 08 | | Fault Running Time Aux Actuator | Running time fault of auxiliary actuator 2 | |
| | 10 | VSD / LMV5.. | Fault Running Time VSD | Running time fault of VSD | |
| | 20 | Act. / LMV5 | Fault Running Time Aux Actuator | Running time fault of auxiliary actuator 3 | |
| 1E | Any # | Act. / LMV5.. / VSD | Special Pos not reached | Basic unit has detected that 1 / several actuators (incl. VSD module) has / have not reached the special position pertaining to the Phase | 1) Check connected actuators to determine if their torque rating is being exceeded (stuck damper or valve etc...) 2) Check the two 12V fuses located under black covers on the right side of the LMV5 3) Check the CANBus power supply (blue or black transformer) Pin 1 and Pin 4 should have 12VAC to reference ground which is pin 2. Voltage between Pin 1 and Pin 4 should be 24VAC. 4) If a VSD is being used, check for filters, damping and or delays on the input signal to the VSD. The VSD should respond to the input signal in a linear fashion. See Error Code 15 |
| | 01..3F | Act. | | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) | |
| | 01 | | | Positioning fault of air actuator | |
| | 02 | | | Positioning fault of fuel actuator | |
| | 04 | | | Positioning fault of auxiliary actuator 1 | |
| | 08 | | | Positioning fault of auxiliary actuator 2 | |
| | 10 | VSD Sys. | | VSD has not reached the speed | |
| | 20 | Act. | | Positioning fault of auxiliary actuator 3 | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|------------|-------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH VSD MODULE</i> | | | | | |
| 1F | Any # | VSD Sys. | Code for VSD Module Fault | Basic unit has detected a fault in connection with the VSD module | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 01 | VSD Module | Speed Acquisition faulty | Internal VSD module test was not successful | |
| | 02 | | Wrong Direction of Rotation | Fan rotates in the wrong direction | 1) Check to see if the motor's direction of rotation is correct. Reverse if necessary 2) Check to see if the arrow on the speed wheel points in the correct direction of rotation. Reverse if necessary. |
| | 03 | | Speed Acquisition faulty | Pulse sequence and length at the speed input were different from those anticipated | 1) Check and or adjust the gap between the speed wheel and the sensor. The gap should be about 1/16" of an inch (2mm) or about two turns out. 2) Check the wiring of the speed sensor. Ensure reference ground is connected. |
| | 04 | | Standardization canceled because of VSD | Fan was not able to keep the standardized speed at a constant level | |
| | 05 | | VSD Sys. | Standardization canceled because of Air Actuator | Air actuator (or air influenced actuator) has not reached the prepurge position. For this reason, speed standardization is not possible |
| 06 | | Speed Test was not successfully completed | Internal VSD module speed test was not successful | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 | |
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5)</i> | | | | | |
| 21 | Any # | Devices conn. To LMV5 | Safety Loop open | Limit switches wired into the safety loop have opened (such as low water or High Limit) | Check all switches wired into the safety loop circuit. This also includes the burner flange circuit. |
| 22 | Any # | | Internal Temp Limiter has responded | Internal TL has switched off because parameterized value has been exceeded | Check the burner / boiler temperature, sensor located on Input 1 and / or Input 4 |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|-------------|--------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5)</i> | | | | | |
| 23 | Any # | LMV5 / Flame Dect. | Extraneous Light on Startup | Basic unit has detected extraneous light during startup | 1) Ensure that the source of extraneous light is not a flame. If it is a flame, take corrective action immediately. 2) If the QRI scanner is used, ambient light can cause an extraneous light error. Ensure sensor is viewing a dark area such as the inside of a boiler. 3) If the QRI scanner is used, check for glowing refractory. If glowing refractor is the cause, the afterburn time may need to be lengthened or a UV scanner may have to be used. |
| | 00 | | Extraneous Light on Startup | Basic unit has detected extraneous light during startup | |
| | 01... 03 | | Extraneous Light on Startup | (LMV52 only) Basic unit has detected extraneous light during startup 0 = QRI, 1 = ION or UV, 2 = Both | |
| 24 | Any # | LMV5 / Flame Dect. | Extraneous Light on Shutdown | Basic unit has detected extraneous light during shutdown | |
| | 00 | | Extraneous Light on Shutdown | Basic unit has detected extraneous light during shutdown | |
| | 01... 03 | | Extraneous Light on Shutdown | (LMV52 only) Basic unit has detected extraneous light during shutdown 0 = QRI, 1 = ION or UV, 2 = Both | |
| 25 | Any # | Devices conn. To LMV5/ Flame Detect. | No Flame at End of Safety Time | No flame detected at the end of safety time TSA1 | 1) With a piloted gas train, this means that the pilot did not light. Check wiring of ignition transformer and pilot valve. 2) Check manual shutoff valves for the pilot gas. 3) Check position of air damper. Close further if necessary. Pilot may be blowing out. 4) Check flame detector for signal in the presence of flame using a flame source. Replace if detector does not generate the anticipated signal. |
| | 00 | | No Flame at End of Safety Time | No flame detected at the end of safety time TSA1 | |
| | 01... 03 | | No Flame at End of Safety Time | (LMV52 only) No flame detected at the end of the safety time. 0 = QRI, 1 = ION or UV, 2 = Both | |
| 26 | Any # | Devices conn. To LMV5/ Flame Detect. | Loss of Flame | Loss of flame during normal operation (Phase 60-62) | 1) Check flame detector for signal in the presence of flame using a flame source. Replace if detector does not generate the anticipated signal. 2) Check for flame signal "decay" as burner refractory heats up. If this happens a UV scanner may be needed. |
| | 00 | | | Loss of flame during normal operation (Phase 60-62) | |
| | 01... 03 | | | (LMV52 only) Loss of flame during operation detected. 0 = QRI, 1 = ION or UV, 2 = Both | |
| 27 | Any # | Devices conn. To LMV5 / LMV5 | Air Pressure on | Air pressure = on, but should have been off | 1) Make sure blower starts in Phase 22, Shuts off in Phase 78 or 83. (See sequence diagrams) 2) Check setpoint on air pressure switch. Raise setpoint if necessary. Switch should open after Postpurge. 3) If a FCC fault occurs in Phase 70, call a siemens representative. A quecharc may be necessary. |
| 28 | | | Air Pressure off | Air pressure = off, but should have been on | |
| 29 | | | Fan Contactor Contact is on | FCC signal = on, but should have been off | |
| 2A | | | Fan Contactor Contact is off | FCC signal = off, but should have been on | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
|------------------------------------------------------------------------------|------------|-----------------------------|-----------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5)</i> | | | | | | |
| 2B | Any # | Devices conn. To LMV5 | Flue Gas Recirculation Pressure Switch on | FGR-PS = on, but should have been off | 1) Check setpoint on FGR pressure switch. Adjust if necessary. 2) If a FGR-PS fault occurs in Phase 70, call a siemens representative. | |
| 2C | | | Flue Gas Recirculation Pressure Switch off | FGR-PS = off, but should have been on | | |
| 2D | Any # | | Valve not open | | Closed Position Indicator (CPI) = on, but should have been off | 1) Check wiring to the fuel valves. With manual shutoff valves closed, ensure that the fuel valves are opening in the proper phase (see sequence diagrams) 2) Ensure CPI (POC) switches are opening when the valve opens. If this does not happen check wiring, adjust switch, or replace fuel valve actuator. |
| | 00 | | | | (Only LMV52) CPI via terminal StartRelease_Gas Closed Position Indicator (CPI) = on, but should have been off | |
| 2E | Any # | | Valve or Closed Position Indicator (CPI) open | | Closed Position Indicator (CPI) = off, but should have been on | 1) Check wiring to the fuel valves. Ensure fuel valves are wired to the correct terminal (see wiring diagram) With manual shutoff valves closed, ensure that the fuel valves are opening in the proper phase (see sequence diagrams). 2) Check wiring of the CPI (POC) switches. See wiring diagram. |
| | 00 | | | | (Only LMV52) CPI via terminal StartRelease_Gas Closed Position Indicator (CPI) = off, but should have been on | |
| 2F | Any # | | Gas Pressure has dropped below minimum Limit | Low Gas Pressure switch is open | 1) Check gas supply and / or manual shutoff valves. 2) Check setpoint and or wiring of Low Gas Presure Switch. | |
| 30 | | | Gas Pressure has exceeded maximum Limit | High Gas Pressure switch is open | 1) Check pressure regulators for ruptured diaphragms. 2) Check setpoint and / or wiring of High Gas Presure Switch. | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------------|------------|-----------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5)</i> | | | | | |
| 31 | Any # | Devices conn. To LMV5 | Gas Pressure w Valve proving: Valve on Gas Side leaking | PS(M)-VP (Pressure Switch Valve Proving) has detected pressure between the gas valves during the atmospheric test. Switch opened when should have been closed. | 1) Bubble test gas valve to ensure that the upstream valve is not leaking. If leaking, replace. 2) Ensure that the setpoint of the PS(M)-VP is 50% of the pressure upstream of V1 (upstream valve) |
| 32 | | | No Gas Pressure Valve Proving: Valve on Burner Side leaking | PS(M)-VP (Pressure Switch Valve Proving) has detected the absence of pressure between the gas valves during the pressure test. Switch closed when should have been open. | 1) Bubble test gas valve to ensure that the downstream valve is not leaking. If leaking replace. 2) Ensure that the setpoint of the PS(M)-VP is 50% of the pressure upstream of V1 (upstream valve) |
| 33 | | | Oil Pressure on although Oil Pump off | Low oil pressure switch is closed when oil pump is not running. | 1) Configure oil train so that low oil pressure switch is off when the oil pump is not running. 2) Check to ensure switch is wire Normally Open. |
| 34 | | | Oil Pressure below Minimum | Low oil pressure switch is open when oil pump is running. | 1) Ensure oil pressure exists at the switch when the oil pump is running. Adjust pressure reg. if needed. 2) Check to ensure switch is wired Normally Open. Check setpoint of switch. |
| 35 | | | Oil Pressure above Maximum | High Oil Pressure switch is open. | 1) Ensure excess oil pressure is not present at the switch. Adjust pressure reg. if needed. 2) Check to ensure switch is wired Normally Closed. Check setpoint of switch. |
| 36 | | | No Start Release for Oil | Switches wired to the start release oil terminal (typically the atomizing media PS) are not closed when anticipated | 1) Check setpoint of switches. 2) Ensure switches are closing and opening at the correct times (see sequence diagram) |
| 37 | | | No direct Heavy Oil Start | Switches wired to the direct start heavy oil terminal are not closed when anticipated | |
| 38 | | | Lack of Gas Program | Shortage-of-gas program in progress | 1) If repition counter enabled (outside north america) the LMV is wating for gas pressure to return. |
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| 39 | Any # | LMV5 | Internal Fault Basic Unit | Parameter of max. safety time faulty | If fault occurs continuously, replace LMV5 |
| | 01 | | | Fault with timer1 | |
| | 02 | | | Fault with timer2 | |
| | 03 | | | Fault with timer3 | |
| 3A | Any # | No Burner ID defined | No burner identification defined | Enter a unique burner Identification. Typically the burner SN. | |
| 3B | Any # | No Service Password defined | No service password defined | Enter a valid service password | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-------------------------------------------|-------------------------------|------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| 40 | Any # | LMV5 | Internal Fault Basic Unit | Wrong contact position of SR relay | If fault occurs sporadically: Improve EMC |
| 41 | Any # | | | Wrong contact position of ignition | Check wiring on igniton transformer |
| | Any # | | | Wrong contact position of BV relay | |
| 42 | 01..FF | | | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) | 1) Check to see if any source is feeding back voltage onto the input. If so eliminate the voltage source. 2)Check for switches in the saftey loop that are opening and closing again very quickly. This could be a pressure switch or a low water cut-out that is on the edge of opening and is "chattering". All outputs are powered through the saftey loop, so the microprocessor that monitors the outputs can detect this, resulting in a fault. |
| | 01 | | | Contact position fault SV-oil | |
| | 02 | | | Contact position fault V1-oil | |
| | 04 | | | Contact position fault V2-oil | |
| | 08 | | | Contact position fault V3-oil | |
| | 10 | | | Contact position fault SV-gas | |
| | 20 | | | Contact position fault V1-gas | |
| | 40 | | | Contact position fault V2-gas | |
| 80 | Contact position fault V3-gas | | | | |
| 43 | Any # | LMV5 | Internal Fault Basic Unit | Fault in connection with plausibility check. For cause of fault, refer to diagnostic code | If fault occurs sporadically: Improve EMC |
| | 01 | | | No fuel selection | Select a fuel externally (by energizing or de-energizing terminals) or selct a fuel through the AZL. |
| | 02 | | | No defined fuel train parameterized or undefined type of fuel | Select the proper fuel trains for gas and or oil (see section 4) |
| | 03 | | | Variable "Train" not defined | Select a fuel externally (by energizing or de-energizing terminals) or selct a fuel through the AZL. |
| | 04 | | | Variable "Fuel" not defined | |
| | 05 | | | Operating mode with LC not defined | |
| | 06 | | | Prepurge time gas too short | The time defined by PrepurgeTmeGas(Oil) is less than the time defined by parameter MinT_PrepurgeGas(Oil). Change so that PrepurgeTmeGas(Oil) is longer than MinT_PrepurgeGas(Oil). See section on settings. |
| | 07 | | | Prepurge time oil too short | The time defined by Max SafteyTGas(Oil) is less than the time defined by parameter SafteyTmeGas(Oil). Parameter Max SafteyTGas(Oil) can only be changed by Siemens. Lengthen SafteyTmeGas(Oil). |
| | 08 | | | Safety time 1 gas too long | |
| | 09 | | | Safety time 1 oil too long | |
| | | | | 0A | Ignition off time > TSA1 gas |
| | 0B | Ignition off time > TSA1 oil | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|----------------------------------------------------------------------------------------------------|------------|--------|--------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH DEVICES OR WIRING CONNECTED TO THE BASE UNIT (LMV5) / OR BASE UNIT (LMV5)</i> | | | | | |
| 43 | 0C | | Internal Fault Basic Unit | Safety time 2 gas too long | The time defined by Max SafteyTGas(Oil) is less than the time defined by parameter SafteyTmeGas(Oil). Parameter Max SafteyTGas(Oil) can only be changed by Siemens. Lengthen SafteyTmeGas(Oil). |
| | 0D | | | Safety time 2 gas too long | |
| 44 | Any # | LMV5 | | Fault at deactivated inputs | Check inputs according to the diagnostic code. Disconnect wires or activate inputs for the specific application. Information concerning the configuration of the terminals can be found in section 4. |
| | 01 | | Controller connected but deactivated | Controller input (burner on / off switch) connected but deactivated, Terminal X5-03.01 | |
| | 02 | | Air Press Switch connected but deactivated | APS connected but deactivated, Terminal X3-02.01 | |
| | 03 | | FCC / FGR – APS connected but deactivated | FCC / FGR – PS connected but deactivated, Terminal X4-01.03 | |
| | 04 | | Gas Pressure min connected but deactivated | Low gas pressure switch connected but deactivated, Terminal X9-03.04 | |
| | 05 | | Gas Pressure max connected but deactivated | High gas pressure switch connected but deactivated, Terminal X9-03.03 | |
| | 06 | | Oil Pressure min connected but deactivated | Low oil pressure switch connected but deactivated, Terminal X5-01.02 | |
| | 07 | | Oil Pressure max connected but deactivated | High oil pressure switch connected but deactivated, Terminal X5-02.03 | |
| | 08 | | Start Signal Oil connected but deactivated | Start release oil connected but deactivated, Terminal X6-01.01 | |
| | 09 | | HO Start connected but deactivated | HO start connected but deactivated, Terminal X6-01.03 | |
| | 0A | | Start Signal Gas connected but deactivated | Start signal gas connected but deactivated, Terminal X4-03.03 | |
| 45 | Any # | | Locked by SLT | Shutdown via SLT test | SLT was activated and safety shutdown was triggered (usually by the Saftey Loop Opening) |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
|------------------------------------|------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| FAULT WITH BASE UNIT (LMV5) | | | | | | |
| 46 | Any # | LMV5 | Programstop active | Program stop was activated. System has stopped at the parameterized position | Deactivate the program stop if no longer required. | |
| | 01 | | | Program stop in Phase 24 (driving to Prepurge position) active. | | |
| | 02 | | | Program stop in Phase 32 (Prepurge) active | | |
| | 03 | | | Program stop in Phase 36 (Ignition position) active | | |
| | 04 | | | Program stop in Phase 44 (Interval 1) active | | |
| | 05 | | | Program stop in Phase 52 (Interval 2) active | | |
| | 06 | | | Program stop in Phase 72 (driving to Postpurge position) active | | |
| | 07 | | | Program stop in Phase 76 (Postpurge) active | | |
| 47 | | No Start Release for Gas | Start release gas = off | Check the configuration of Terminal X7-03.02. Deactivate terminal if not used. See section 4 as a guide for configuration of the terminal. | | |
| 48 | Any # | 2 Flame Signals with 1 Detector Operation | System parameterized for 1-detector operation but 2 flame signals present | Check flame detector wiring. If two detector operation is desired, configure the LMV52 for this type of operation. See section 4. | | |
| 50 | 00..07 | LMV5 | Internal Fault Basic Unit | Fault during key value check | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 | |
| | | | | Number of time block in which the fault was detected | | |
| Time block overflow | | | | | | |
| 51 | 00..07 | | | Number of time block in which the fault was detected | | |
| | | | | Stack error | | |
| 52 | Any # | | | Stack overflow | | |
| | | | | 01 | | Value dropped below preset minimum limit |
| | | | | 02 | | Test values in stack range exceeded |
| 53 | 01 | 03 | Faulty reset state has occurred | | | |
| | | 58 | | Internal communication (μ C1 <> μ C2) | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters from the AZL to the LMV5 4) Replace the LMV5 | |
| 59 | Any # | Parameter Set damaged | After initialization, EEPROM page is on ABORT (last parameterization was possibly interrupted due to a power failure) | | | |
| | | | 59 | Page number | | |
| 5A | | | CRC error of a parameter page | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
|-------------------------------------------|-------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | | |
| 5A | Any # | LMV5 | Parameter Set damaged | Page number | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 4) Replace the LMV5 | |
| 5B | | | | Page is on ABORT | | |
| 5B | | | | Page number | | |
| 5C | | | Parameter Backup Restore | Page is on WR_RESTO. A backup restore was made | | 1) Reset the LMV5 |
| | | | | Page number | | |
| 5D | | | Internal Fault Basic Unit | Page open too long | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 4) Replace the LMV5 | |
| | | | | Page number | | |
| 5E | | | | Page has an undefined status | | |
| | | | Page number | | | |
| 5F | | | Parameter Set damaged | Last backup restore invalid (was interrupted) | Repeat parameter set download (from AZL to LMV5) | |
| 60 | | | 61 | Internal Fault Basic Unit | Fault when copying a parameter page | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 4) Replace the LMV5 |
| | | | | | Number of parameter page | |
| | | | | | Fault in connection with EEPROM initialization | |
| | | | | | Fault during initialization of EEPROM | |
| | | | | | Number of write attempts exceeded | |
| | EEPROM was busy when accessed | | | | | |
| | Comparison of EEPROM and RAM area revealed dissimilarity | | | | | |
| | Page area of EEPROM exceeded during write process | | | | | |
| | Access conflict $\mu C1 \leftrightarrow \mu C2$ (aritation) | | | | | |
| | Fault when calling the "ParAccess()" function | | | | | |
| | Written EEPROM block unequal RAM block | | | | | |
| | CRC of page is faulty | | | | | |
| | Matching fault $\mu C1, \mu C2$ when saving the error page | | | | | |
| 70 | Any # | Fault during restoring of lockout information | If fault occurs sporadically improve EMC. If fault occurs continously, replace LMV5 | | | |
| | 01 | When reading from EEPROM (initialization) | | | | |
| | 02 | When test writing in the initialization | | | | |
| | 03 | No write access to error page in init. | | | | |
| | 04 | Rep. counter "Internal fault" has elapsed | | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|----------------------------------------------|------------|----------------------------|-----------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| 71 | Any # | LMV5 | Manual Lockout | Lockout was made manually via contact | This lockout occurs when escape and enter on the AZL are pressed simutanously. This lockout also occurs when the remote reset X4-01.4 is energized when a alarm condition does not exist. |
| 72 | 01 | | Internal Fault Basic Unit | | |
| | 02 | Fault in "seterr()" | | | |
| | 03 | Fault in "seterr()" | | | |
| | 04 | Fault in "error_manager()" | | | |
| | | | | Fault in "storeerr()" | |
| <i>FAULT WITH CONNECTED ACTUATORS</i> | | | | | |
| 80 | Any # | Aux 3 Act. | Fault Feedback Aux Actuator 3 | Basic unit has detected wrong state of the Aux 3 actuator | 1) This fault occurs when a un-addressed actuator is connected to the CANBus. It is normal to see this fault when a un-addressed actuator is connected to the CANBus. Addressing the actuator should eliminate the fault. 2) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 3) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 4) If fault occurs sporadically: Improve EMC. 5) If fault occurs constantly: Replace actuator according to diagnostic code. |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 81 | Any # | Air Act. | Fault Feedback Air Actuator | Basic unit has detected wrong state of the air actuator | |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 82 | # | Gas / Oil Act. | Fault Feedback Gas (Oil) Actuator | Basic unit has detected wrong state of the gas actuator | |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 83 | Any # | Oil Act. | Fault Feedback Oil Actuator | Basic unit has detected wrong state of the oil actuator | |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 84 | Any # | Aux 1 Act. | Fault Feedback Aux Actuator 1 | Basic unit has detected wrong state of the auxiliary actuator | |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 85 | Any # | Aux 2 Act. | Fault Feedback Aux Actuator 2 | Basic unit has detected wrong state of the auxiliary actuator | |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|---------------------------------------------------|------------|----------------|-----------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) OR AZL5</i> | | | | | |
| 86 | Any # | LMV5 | Fault Feedback Load Controller | Basic unit has detected wrong state of the internal load controller | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 87 | Any # | AZL5 | Fault Feedback AZL | Basic unit has detected wrong state of the AZL... | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) If fault occurs sporadically: Improve EMC. 4) Replace AZL5... |
| | 01 | | | CRC error | |
| | 02 | | | Key error main loop counter | |
| | 03 | | | No feedback for max. number | |
| 88 | Any # | All | | Plausibility fault NMT | If fault occurs constantly: Replace defective AZL5...(see diagnostic code) or basic unit |
| | 01 | Air Act. | Fault Feedback Actuator | Undefined fault class of SA | |
| | 02 | LMV5 | Fault Feedback Load Controller | Undefined fault class of LC | |
| | 03 | AZL5 | Fault Feedback AZL | Undefined fault class of AZL | |
| | 04 | VSD module | Fault Feedback VSD Module | Undefined fault class of VSD module | |
| | 05 | O2 Mod. | Fault Feedback O2 Module | Undefined fault class of O2 module | |
| <i>FAULT WITH CONNECTED ACTUATORS</i> | | | | | |
| 90 | Any # | Aux 3 Act. | Fault Feedback Aux Actuator 3 | Basic unit has detected a ROM-CRC error on the air actuator when checking its feedback signal | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) If fault occurs sporadically: Improve EMC. 4) If fault occurs constantly: Replace actuator according to diagnostic code. |
| 91 | | Air Act. | Fault Feedback Air Actuator | Basic unit has detected a ROM-CRC error on the air actuator when checking its feedback signal | |
| 92 | | Gas / Oil Act. | Fault Feedback Gas (Oil) Actuator | Basic unit has detected a ROM-CRC error on the gas actuator when checking its feedback signal | |
| 93 | | Oil Act. | Fault Feedback Oil Actuator | Basic unit has detected a ROM-CRC error on the oil actuator when checking its feedback signal | |
| 94 | | Aux 3 Act. | Fault Feedback Aux Actuator 1 | Basic unit has detected a ROM-CRC error on the auxiliary actuator when checking its feedback signal | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH CONNECTED ACTUATORS, BASE UNIT (LMV5), OR AZL</i> | | | | | |
| 95 | Any # | Aux 3 Act. | Fault Feedback Aux Actuator 3 | Basic unit has detected a ROM-CRC error on the auxiliary actuator when checking its feedback signal | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) If fault occurs sporadically: Improve EMC. 4) If fault occurs constantly: Replace actuator or AZL5. according to diagnostic code. |
| 96 | | LMV5 | Fault Feedback Load Controller | Basic unit has detected a ROM-CRC error on the load controller when checking its feedback signal | |
| 97 | | AZL5 | Fault Feedback AZL | Basic unit has detected a ROM-CRC error on the AZL... when checking its feedback signal | |
| 98 | | All | Internal Fault Basic Unit | Fault two equal Addresses | |
| 99 | CAN is in bus off | | | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) If fault occurs sporadically: Improve EMC. 4) If fault occurs constantly: Replace AZL5., LMV5 | |
| 9A | CAN warning level. Fault probably occurred when connecting or disconnecting a CAN bus user | | | | |
| 9B | 01 | | | | Overrun of RX queue |
| | 02 | Overrun of TX queue | | | |
| A0 | See A1 | | | | |
| A1 | Any # | Air Act. | Internal Fault Air Actuator | Air actuator has detected own fault and reported it to the basic unit. Type of fault: See diagnostic code | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) If fault occurs sporadically: Improve EMC. 4) If fault occurs constantly: Replace air actuator |
| | 01 | | | CRC fault during ROM test | |
| | 02 | | | CRC fault during RAM test | |
| | 04 | | | Fault during key value check | |
| | 05 | | | Error code for time block overflow | |
| | 07 | | | Sync fault or CRC fault | |
| | 08 | | | Error code for main loop counter | |
| | 09 | | | Fault during stack test | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|----------------------------------------------|------------|----------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH CONNECTED ACTUATORS</i> | | | | | |
| A1 | 0C | Air Act. | Overtemperature Air Actuator | Temperature warning and shutdown | Check the housing temperature of the Air actuator. Max housing temperature 140 F |
| | 0D | | Internal Fault Air Actuator | Actuator turns in the wrong direction | Verify that the air damper is not bound. A bound air damper will cause the actuator to trip on overcurrent. During this short trip the actuator can be momentarily pushed backwards by torsional effects. |
| | 0E | | Ramp time too short Air Actuator | Actuator operates with too short a ramp time, or with an angular rotation that is too long for the ramp time | 1) Match ramp time to the slowest connected actuator (SQM48.4 30 sec, SQM48.6 60sec.) 2) Check the CanBus power supply. Verify fuses FU2 and FU3 are ok. Verify CanBus is not overloaded. (See Section 3) |
| | 10 | | Internal Fault Air Actuator | Timeout during A/D conversion | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace Air Actuator. |
| | 11 | | | Fault during ADC test | |
| | 12 | | | Fault during A/D conversion | |
| | 13 | | Position Fault Air Actuator | Actuator is outside the valid angular rotation (0-90°) or linearization data are faulty | Check to see if actuator is within the valid positioning range (0-90°) When the actuator is not powered, it could be moved out of the valid positioning range. Take power off the actuator and position shaft back within the valid positioning range. |
| | 15 | | Internal Fault Air Actuator | CAN fault | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) |
| | 16 | | | CRC fault of a parameter page | |
| | 17 | | | Page too long open | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 4) Replace the LMV5 |
| | 18 | | | Page disrupted | |
| | 19 | | | Invalid parameter access | |
| | 1B | | | Fault during copying of parameter page | |
| | 1E | | | External plausibility fault. This type of fault covers possible faults occurring due to invalid presettings in the drive commands. In response, the presettings will be ignored | 1) Check the paramters related to special positions. The special positions of each activated actuator should be programmed between 0 to 90 degrees. |
| | 1F | | | Internal plausibility fault. This type of fault covers possible faults that can occur due to strong EMC impact | 1) If fault occurs sporadically: Improve EMC. |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|--------------------------------------------------------------------|----------------------------------------------------|-------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH CONNECTED ACTUATORS</i> | | | | | |
| A2 | | | | See diagnostic codes for A1 error codes. These diagnostic codes are identical, except they apply to the Gas / Oil Actuator. | |
| A3 | | | | See diagnostic codes for A1 error codes. These error codes are identical, except they apply to the Oil Actuator. | |
| A4 | | | | See diagnostic codes for A1 error codes. These error codes are identical, except they apply to the Aux 1 Actuator. | |
| A5 | | | | See diagnostic codes for A1 error codes. These error codes are identical, except they apply to the Aux 2 Actuator. | |
| <i>FAULT WITH BASE UNIT (LMV5) INTERNAL LOAD CONTROLLER</i> | | | | | |
| A6 | Any # | LMV5 Load Cont. Mod. | | Internal load controller has detected a fault. Type of fault: See diagnostic code | |
| | 10 | | No actual Value Slope at End of Identification | | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 12 | | Adaption invalid | Invalid XP identified | |
| | 13 | | | Invalid TN identified | |
| | 14 | | | TU longer than identification time | |
| | 15 | | | Invalid TN identified | |
| | 16 | | Timeout with Adaption | Timeout during observation time | PV (Process Variable) is not changing in response to firing rate during the adaption time. Adaption times out due to lack of change in the measured PV. Check sensor and thermal system. |
| | 17 | | Cold Start thermal Shock Protection active | A warning indicating that the Cold Start Thermal Shock Protection (CSTP) is activated | This can be deactivated, if desired. See parameters concerning the load controller in section 4. |
| | 18 | | Timeout with Adaption | Timeout during delivery of adaption rate and while process is being watched | PV (Process Variable) is not changing in response to firing rate during the adaption time. Adaption times out due to lack of change in the measured PV. Check sensor and thermal system. |
| | 22 | | Setpoint Temp Controller above maximum Limit | The current setpoint (W1, W2, W3) is above the value of the Internal temperature limiter. | Raise the value of the internal temperature limiter or decrease current setpoint. |
| | 30 | | Internal Fault Load Controller | EEPROM does not respond within the expected period of time | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 31 | | | Max. number of EEPROM attempts exceeded | |
| | 32 | | | Fault during opening of page | |
| | 33 | | | Invalid CRC when reading a page | Reset the unit. Restore parameters from AZL. |
| | 34 | | | Page cannot be set to FINISH | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 35 | | | No access to PID after identification | |
| 36 | No access to PIDStandard after identification | | | | |
| 37 | No reading of EEPROM write access for PID possible | | | | |
| 38 | No EEPROM write access for PID possible | | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|---------------------------------------------------------------------------------------------|------------|----------------------|-------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) INTERNAL LOAD CONTROLLER</i> | | | | | |
| A6 | 39 | LMV5 Load Cont. Mod. | Internal Fault Load Controller | No EEPROM write access for PIDStandard possible | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 3A | | | No access if reception via COM | |
| | 3B | | | Invalid page access | |
| | 40 | | Internal Fault Load Controller | Page too long open | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 4) Replace the LMV5 |
| | 41 | | Internal Fault Load Controller | Invalid phase during parameterization of the safety-related page P_TW | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 42 | | | Invalid phase during parameterization of the safety-related page P_STATUS | |
| | 43 | | | Invalid phase during parameterization of the safety-related page P_SYSTEM | |
| | 44 | | Parameter Set damaged | Page has been set to ABORT | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Download parameters form the AZL to the LMV5 4) Replace the LMV5 |
| | 45 | | Parameter Backup Restore | Page has been set to RESTO | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 46 | | Internal Fault Load Controller | Page has an invalid status | |
| | 4A | | | CAN error | |
| | 4B | | | CAN error | |
| | 4C | | | CAN error | |
| | 4D | | | CAN error | |
| 4E | CAN error | | | | |
| <i>FAULT WITH SENSORS CONNECTED TO INTERNAL LOAD CONTROLLER, IN BASE UNIT (LMV5)</i> | | | | | |
| A6 | 50 | LMV5 Load Cont. Mod. | Short-circuit Pt100 Sensor | Short-circuit sensor PT100 Terminals X60.1, X60.4 | Check temperature sensors connected to X60 terminals. Check wiring and sensor. Re-wire or replace sensors if necessary. |
| | 51 | | Open-circuit Pt100 Sensor | Open-circuit sensor PT100 Terminals X60.1 X60.4 | |
| | 52 | | Open-circuit Pt 100 Sensor (Line Compens) | Open-circuit compensation line of sensor PT100 Terminals X60.2 X60.4 | |
| | 53 | | Short-circuit Pt1000 Sensor | Short-circuit sensor PT1000 Terminals X60.3, X60.4 | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|---------------------------------------------------------------------------------------------|-------------------------------------|----------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH SENSORS CONNECTED TO INTERNAL LOAD CONTROLLER, IN BASE UNIT (LMV5)</i> | | | | | |
| A6 | 54 | LMV5 Load Cont. Mod. | Open-circuit PT1000 Sensor | Open-circuit sensor PT1000 Terminals X60.3, X60.4 | Check temperature sensors wired to X60, and pressure sensors wired to X61. Check wiring and sensor. Re-wire or replace sensors if necessary. |
| | 55 | | Short-circuit Ni1000 Sensor | Short-circuit sensor Ni1000 Terminals X60.3, X60.4 | |
| | 56 | | Open-circuit Ni1000 Sensor | Open-circuit sensor Ni1000 Terminals X60.3, X60.4 | |
| | 57 | | Overvoltage at Input 2 | Overvoltage at input 2 Terminals X61 | |
| | 58 | | Open-circuit / Short-circuit at Input 2 | Open-circuit / short-circuit input 2 Terminals X61 Boiler sensor (7MF) could be seeing a vacuum | |
| | 59 | | Overvoltage at Input 3 | Overvoltage at input 3 Terminals X62 | |
| | 5A | | Open-circuit / Short-circuit at Input 3 | Open-circuit / short-circuit input 3 Terminals X62 | |
| <i>FAULT WITH BASE UNIT (LMV5) INTERNAL LOAD CONTROLLER</i> | | | | | |
| A6 | 60 | LMV5 Load Cont. Mod. | Internal Fault Load Controller | Timeout during calibrate_ADC | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 61 | | | Timeout during read_conversion | |
| | 62 | | | Timeout during calibrate_ADC | |
| | 63 | | | Fault during RedInv reading from A/D converter | |
| | 64 | | | Fault internal A/D converter | |
| | 65 | | | Gain register has been changed | |
| | 66 | | | Offset register has been changed | |
| | 67 | | | Too great / small gain for self-calibration of A/D converter | |
| | 68 | | | Too great / small offset for self-calibration of A/D converter | |
| | 69 | | | Fault internal A/D converter | |
| | 6A | | | Fault during PWM test | |
| | 6B | | | Faulty reference voltage | |
| | 6C | | | Fault transmitter power supply | |
| | 6D | | | Fault analog output, voltage deviation too great | |
| | 6E | | | Fault during resistance test PT100 input (X60) | |
| 6F | Fault during diode test PT100 input | | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|---------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH SENSORS CONNECTED TO INTERNAL LOAD CONTROLLER, IN BASE UNIT (LMV5)</i> | | | | | |
| A6 | 70 | LMV5 Load Cont. Mod. | External Fault Load Controller | Measured value varies too much: PT100 sensor (Terminals X60) | 1) Check wiring and sensor. Re-wire or replace sensors if necessary. 2) Use shielded cable on sensor wiring. 3) Make sure that sensor wiring is not run next to high voltage AC wiring. 4) If the diagnostic code indicates excessive voltage, check input with meter. Trace voltage source. |
| | 71 | | | Measured value varies too much: PT100 line (Terminals X60) | |
| | 72 | | | Measured value varies too much: PT1000 (Terminals X60) | |
| | 73 | | | Measured value varies too much: PWM | |
| | 74 | | | Measured value varies too much: Voltage measurement input 2 (Terminals X61) | |
| | 75 | | | Measured value varies too much: Voltage measurement input 2 (Terminals X61) | |
| | 76 | | | Measured value varies too much: Voltage measurement input 3 (Terminals X62) | |
| | 77 | | | Measured value varies too much: Current measurement input 3 (Terminals X62) | |
| | 78 | | | Excessive voltage value or wrong polarity PT100 sensor (Terminals X60) | |
| | 79 | | | Excessive voltage value or wrong polarity PT100 line (Terminals X60) | |
| | 7A | | | Excessive voltage value or wrong polarity PT1000 (Terminals X60) | |
| | 7B | | | Excessive voltage value or wrong polarity PWM | |
| | 7C | | | Excessive voltage value or wrong polarity voltage measurement input 2 (Terminals X61) | |
| | 7D | | | Excessive voltage value or wrong polarity current measurement input 2 (Terminals X61) | |
| | 7E | | Excessive voltage value or wrong polarity voltage measurement input 3 (Terminals X62) | | |
| | 7F | | Excessive voltage value or wrong polarity current measurement input 3 (Terminals X62) | | |
| | 80 | | Internal Fault Load Controller | Fault during internal multiplexer test PT100 sensor | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 81 | | | Fault during internal multiplexer test PT100 line | |
| | 82 | | | Fault during internal multiplexer test PT100 | |
| | 90 | | | Number of maximum sync failures exceeded | |
| 91 | Wrong CRC during SYNC message | | | | |
| 92 | Wrong CRC during PDO message | | | | |
| 93 | Main loop counter does not agree with basic unit | | | | |
| 96 | Fault during multiplexer test | | | | |
| 97 | Paraccess with FINISH unsuccessful | | | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-------------------------------------------------------------|------------|-------------------------------|-----------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------|
| FAULT WITH BASE UNIT (LMV5) INTERNAL LOAD CONTROLLER | | | | | |
| A6 | 9B | LMV5 Load Cont. Mod. | Internal Fault Load Controller | Fault PageAccess, invalid access status | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | 9C | | | Fault voltage monitor test | |
| | 9E | | | Fault during readout of PDO message | |
| | A0 | | | XP smaller than min. value | |
| | A1 | | | XP larger than max. value | |
| | A2 | | | TN smaller than min. value | |
| | A3 | | | TN larger than max. value | |
| | A4 | | | TV smaller than min. value | |
| | A5 | | | TV larger than max. value | |
| | A6 | | | Parameter outside the permissible range | |
| | A7 | | | Inadmissible Selection aux Sensor Cold Start | |
| | B0 | | Internal Fault Load Controller | Red/Inv fault with float variables | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 |
| | B1 | | | Red/Inv fault of a Red/Inv variable | |
| | B2 | | | Fault during key value check | |
| | B4 | | | Fault in fault routine | |
| | B5 | | | Step to invalid interrupt vector | |
| | B6 | | | Time block too long: Time block 0 | |
| | B7 | | | Time block too long: Time block 1 | |
| | B8 | | | Time block too long: Time block 2 | |
| | B9 | | | Time block too long: Time block 3 | |
| | BA | | | Time block too long: Time block 4 | |
| | BB | | | Time block too long: Time block 5 | |
| | BC | | | Time block too long: Time block 6 | |
| | BD | | | Time block too long: Time block 7 | |
| | C0 | | | CRC fault in page | |
| | E0 | | | Identpower | |
| | E1 | | | Controller parameter KP | |
| | E2 | | | Scanning time | |
| | EA | | | Invalid branch in eeprom module() | |
| | EB | | | Invalid branch in eeprom module() | |
| | EC | | | Invalid branch in eeprom module() | |
| | ED | | Invalid branch in eeprom module() | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
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| <i>FAULT WITH BASE UNIT (LMV5) INTERNAL LOAD CONTROLLER</i> | | | | | | |
| A6 | EE | LMV5 Load Cont. Mod. | Internal Fault Load Controller | Invalid branch in eeprom module() | If fault occurs sporadically improve EMC. If fault occurs continuously, replace LMV5 | |
| | EF | | | Invalid branch in eeprom module() | | |
| | F0 | | | Fault during ROM test | | |
| | F1 | | | Fault during RAM test | | |
| | F2 | | | Fault during RAM test, register bank 0 | | |
| | F3 | | | Fault during RAM test, IDATA range | | |
| | F4 | | | Fault during RAM test, XDATA range | | |
| | F5 | | | Stack pointer does not point at stack | | |
| | F6 | | | Stack overflow | | |
| | FE | | | Fault messages in fault management | | |
| | FF | | | Fault messages in fault management | | |
| | <i>FAULT WITH AZL5...</i> | | | | | |
| A7 | Any # | AZL | Internal Fault AZL | AZL5...has detected a fault. | <p>1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x...</p> <p>2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug)</p> <p>3) If fault occurs sporadically: Improve EMC.</p> <p>4) If fault occurs constantly: Replace AZL5...</p> | |
| | 01 | | | CRC fault during ROM test | | |
| | 02 | | | CRC fault during RAM test | | |
| | 04 | | | Fault during key value check | | |
| | 05 | | | Time block overflow | | |
| | 07 | | | Sync fault or CRC fault | | |
| | 08 | | | Fault main loop counter | | |
| | 09 | | | Manual Lockout AZL | | Fault message for emergency off function via AZL... |
| | 0A | | Internal Fault AZL | Invalid AZL5... page | | <p>1) If fault occurs sporadically: Improve EMC.</p> <p>2) If fault occurs constantly: Replace AZL5...</p> |
| | 0B | | >250,000 startups, service required | 250,000 Cycles have been exceeded. Internal parts in the LMV5.. Are close to the end of their life. | | Replace LMV5 |
| | 0C | | Internal Fault AZL | Save fault parameter | | <p>1) If fault occurs sporadically: Improve EMC.</p> <p>2) If fault occurs constantly: Replace AZL5...</p> |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
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| <i>FAULT WITH AZL5...</i> | | | | | | |
| A7 | 0D | AZL | Menu for Oil. Current Fuel is Gas | Fuel changeover from oil to gas when a "oil only" menu is being viewed. | Escape out of current menu, or change the fuel that is selected. | |
| | 0E | | Menu for Gas. Current Fuel is Oil | Fuel changeover from gas to oil when a "gas only" menu is being viewed. | | |
| | 15 | | Internal Fault AZL | CAN queue fault | CAN overflow fault | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace AZL5... |
| | 16 | | | | | |
| | 17 | | Internal Fault AZL | CAN busoff | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) Check the wiring of the CANBus power supply (12 VAC Transformer). Ensure that Fuses FU2 and FU3 are not blown. Ensure that the CANBus power supply is not overloaded (too many actuators on CanBus) | |
| | 18 | | CAN warning level | EEPROM fault | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace AZL5... | |
| | 1A | | | | | |
| | 1B | | No valid Parameter Backup | Fault during copying of a parameter page | 1) Back up LMV5 parameters to AZL. A prompt for this comes up when exiting the parameters & display menu. | |
| | 1C | | Internal Fault AZL | Page in EEPROM was disrupted, has been restored | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace AZL5... | |
| | 20 | | | Display fault | | |
| | 22 | | | RTC is locked, permanently busy | | |
| | 24 | | | Buffer for page copies too small | | |
| | 28 | | | Time stamp could not be sent | | |
| | 30 | | Fault Communication eBUS | Fault in connection with eBUS communication | Check wiring on RJ45 connector, located on the underside of the AZL5.. | |
| | 38 | | Internal Fault AZL | Interface mode could not be terminated | Reset the unit. | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
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| <i>FAULT WITH AZL5...</i> | | | | | |
| A7 | 40 | | Communication AZL with PC tool | Parameterization fault PC tool. Disclosed by key value check in AZL | Check cable between AZL and PC. A null modem adapter must be used on the 9 pin connector if the cable does not have this internally. A USB to serial adapter is OK to use when connecting the AZL to a laptop. |
| | 88 | | Internal Fault AZL | RAM fault with redundant inverse variables | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace AZL5... |
| | 89 | AZL | | Program run fault, execution of program code that will probably never be executed | |
| | 8A | AZL | | Unintentional watchdog reset | |
| <i>FAULT WITH BASE UNIT (LMV5) VSD MODULE</i> | | | | | |
| A9 | Any # | LMV5 VSD module | Internal Fault VSD Module | | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace LMV5 |
| | 01 | | | CRC fault during ROM test | |
| | 02 | | | CRC fault during RAM test | |
| | 04 | | | Fault during key value check | |
| | 05 | | | Error code for time block overflow | |
| | 07 | | | Sync fault or CRC fault | |
| | 08 | | | Error code for main loop counter | |
| | 09 | | | Fault during stack test | |
| | 0A | | | | |
| | 0C | | | Alarm from VSD | Fault has been triggered by the VSD. |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|------------------------------------------------------|------------|---------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) VSD MODULE</i> | | | | | |
| A9 | 0D | LMV5 VSD module | Control Range Limitation VSD Module | VSD module could not offset speed differential within its control limits | 1) This indicates that that the LMV5 has decreased its signal to the VSD as much as possible and the motor RPM is still to high. Increase VSD / LMV52 ramp times. Also increase VSD braking if possible. 2) Re-standardize the speed. Ensure that the air damper is at purge position for the standardization (should do this automatically if the air damper is set to air-infulencing) 3) Be sure to check combustion after the re-standardization. |
| | 0E | VSD module | Internal Fault VSD Module | Fault during the speed calculation test | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace LMV5 |
| | 15 | | | CAN bus fault, disturbed CAN bus transmissions | 1) Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... 2) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) 3) Check terminating resistors for correct position. |
| | 16 | | | CRC fault of a parameter page | 1) Reset the LMV5 |
| | 17 | | | Page too long open | 2) If fault occurred after changing a parameter, check the parameters that were last changed. |
| | 18 | | | Page disrupted | 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 |
| | 19 | | | Invalid access to parameters | 4) Replace the LMV5 |
| | 1B | | | Fault when copying a parameter page | |
| | 1E | | | Internal Fault VSD Module | External plausibility fault. This type of fault covers possible faults occurring due to invalid presettings in the drive commands. In response, the presettings will be ignored. |
| | 1F | Internal Fault VSD Module | Internal plausibility fault. This type of fault detects faults that cannot practically occur... | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace LMV5 | |
| <i>FAULT WITH O2 MODULE (PLL5..)</i> | | | | | |
| AB | Any # | PLL5.. | Fault O2 Module | The PLL5... has detected a fault. | |
| | 01 | | Internal Fault O2 Module | CRC fault during ROM test | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace PLL5.. |
| | 02 | | | CRC fault during RAM test | |
| | 04 | | | Fault during key value check | |
| | 05 | | | Error code for time block overflow | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
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| <i>FAULT WITH O2 MODULE (PLL5..) OR OXYGEN SENSOR (QGO2..)</i> | | | | | | |
| AB | 07 | PLL5.. | Internal Fault O2 Module | Sync fault or CRC fault | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace PLL5.. | |
| | 08 | | | Error code for main loop counter | | |
| | 09 | | | Fault during stack test | | |
| | 0A | | | Feedback values invalid | | |
| | 10 | | Unplaus Value Nernst Voltage O2 Module | Nernst voltage outside the valid range | 1) Check the wiring between the O2 Module and the O2 sensor. Ensure high and low voltage are in separate conduits. 2) Check the power supply to the O2 Module 3) Check fuse in the O2 Module 4) Check the heating control on the O2 Sensor 5) Check the temperature inside the O2 Sensor terminal box. Should be between -13 and 248° F | |
| | 12 | | Unplaus Value Thermocouple O2 Module | Thermocouple voltage outside the valid range | | |
| | 13 | | Unplaus Value Compensation Element | Compensation element voltage outside the valid range | | |
| | 15 | | Unplaus Value Flue Gas Temp O2 Module | Temperature of combustion air sensor outside the valid range (-20...+400 °C) | 1) Check the wiring between the O2 Module and the O2 sensor. 2) Check the ambient / Flue gas temperature. Compare to valid range. | |
| | 16 | | Unplaus Value Flue Gas Temp O2 Module | Temperature of flue gas sensor outside the valid range (-20...+400 °C) | | |
| | 17 | | Internal Fault O2 Module | Internal Fault O2 Module | Fault during combustion air temperature sensor test | 1) Check the wiring between the O2 Module and the O2 sensor. 2) If fault occurs constantly, Replace O2 Sensor and / or Module |
| | 18 | | | | Fault during thermocouple test | |
| | 19 | | | | Fault during compensation element test | |
| | 1A | | | | Fault during channel comparison of O2 signal | |
| | 1B | | | | Fault ADC test voltages | |
| | 20 | | O2 Sensor Temp too low | Temperature of QGO measuring cell too low | 1) Check the temperature of heated sensor (can be viewed on AZL) Minimum operating temperature is 1202 F, Maximum 1382 F. If the O2 sensor could take up to 20 minutes to reach temperature. 2) Ensure O2 sensor is installed properly (see section 2) and that stack gas velocity is correct. Min =3.2 ft / sec Max = 32 ft/ sec. 3) Check the power supply to the O2 Module 4) Check fuse in the O2 Module | |
| 21 | O2 Sensor Temp too high | Temperature of QGO measuring cell too high | | | | |
| 22 | Internal Fault O2 Module | Internal Fault O2 Module | Fault during calculation test | If fault occurs constantly, Replace O2 Sensor and / or Module | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH O2 MODULE (PLL5..) OR OXYGEN SENSOR (QGO2..)</i> | | | | | |
| AB | 23 | PLL5.. | Unplaus Value Ri O2 Measuring Cell | Measured internal resistance of the QGO measuring cell is smaller than 5 Ohm or greater than 150 Ohm | 1) Check the wiring between the O2 Module and the O2 sensor. 2) O2 Sensor may have reached the end of its service life (Check Resistance through AZL) If greater than 140 - 150 ohms, replace sensor. |
| | 24 | | Response Time O2 Measuring Cell too long | Measured response time of the QGO measuring cell exceeds 5 s | 1) Check mounting position / oientation of O2 sensor. 2) Check to see if O2 sensor is dirty. Do Not blow out with compressed air when hot! Cool, then blow out with low pressure compressed air. 3) O2 Sensor may have reached the end of its service life (Check Resistance through AZL) If greater than 140 - 150 ohms, replace sensor. |
| | 25 | | O2 Sensor Test aborted by O2 Module | Fault occurred during O2 sensor test | Check (through the AZL) to see if the measured O2 value is fluctuating. |
| | 30 | | Internal Fault O2 Module | CAN fault | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace PLL5.. |
| | 31 | | | CRC fault of a parameter page | 1) Reset the LMV5 2) If fault occurred after changing a parameter, check the parameters that were last changed. 3) If fault cannot be rectified by the reset: Restore parameters form the AZL to the LMV5 4) Replace the LMV5 |
| | 32 | | | Page too long open | |
| | 33 | | | Page disrupted | |
| | 34 | | | Invalid access to parameters | |
| | 38 | | | Fault during copying of a parameter page | |
| | 3E | | | External plausibility fault. This type of fault covers possible faults occurring due to invalid presettings in the drive commands. In response, the presettings will be ignored. | |
| 3F | Internal plausibility fault. This type of fault detects faults that cannot practically occur... | | | | |
| <i>FAULT WITH BASE UNIT (LMV5)</i> | | | | | |
| B0 | Any # | LMV5.. | Internal Fault Basic Unit | Fault during test of port outputs | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace LMV5 |
| | 01 | | | Fault when resetting the set outputs | |
| | 02 | | | Fault during ZR test | |
| B1 | 01 | | | Fault during short-circuit test between inputs and outputs | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|---------------------------------------------------------------------|------------|--------|---------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) OR OXYGEN SENSOR (QGO2..)</i> | | | | | |
| B5 | Any # | LMV5.. | | O2 monitor | |
| | 01 | | Below O2 Min Value | O2 value has dropped below O2 min. value | 1) Check the %O2 between the O2 guard curve and the O2 setpoint curve. Increase the %O2 "gap" between these two curves at the load point where the the fault is occurring. 2) Check for mechanical lash (slop) between actuators and dampers / valves. Also check dampers for worn bearings. Change to zero lash flexible couplings if necessary. 3) If necessary, adjust parameters O2 OffsetGas(oil) and / or O2CtrlThreshold |
| | 02 | | O2 Min Values undefined | Invalid O2 min. value | Set a point for the O2 min Value curve (or O2 Guard Curve) for each point set up on the ratio control curve (12 points on ratio control = 12 points on O2 min Value curve) |
| | 03 | | O2 Setpoints undefined | Invalid O2 setpoint | Set a point for the O2 setpoints curve (or O2 Control Curve) for each point set up on the ratio control curve (12 points on ratio control = 12 points on O2 setpoints curve) |
| | 04 | | O2 Delay Time undefined | Invalid O2 delay time | The dealy time has not been measured sucessfully at Point 2 or the highest curve point. See Section 5-1 under O2 trim for possible causes. |
| | 05 | | Actual O2 Value invalid | No valid actual O2 value in operation for >= 3 s | 1) Check the wiring between the O2 Module and the O2 sensor. 2) Check the power supply to the O2 Module |
| | 06 | | O2 Value Prepurging not reached | During prepurging, the parameterized air oxygen content of +-2 % was not reached | 1) Check the parameter "O2 content air". This %O2 must be reached within +/- 2% during prepurge. 2) Check prepurge time. The time that is set may not be long enough to completely purge the boiler. 3) Sensor may be dirty. Do Not blow out with compressed air when hot! Cool, then blow out with low pressure compressed air. 4) O2 Sensor may have reached the end of its service life (Check Resistance through AZL) If greater than 140 - 150 ohms, replace sensor. |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action | |
|---------------------------------------------------------------------|------------|----------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) OR OXYGEN SENSOR (QGO2..)</i> | | | | | | |
| B5 | 07 | LMV5.. | O2 Value in Operation too high | O2 value of 15 % in operation was exceeded | 1) Check mounting of O2 sensor. Ensure no air in entering the stack upstream of the sensor. 2) Verivy that the O2 level in the stack is not 15% during operation. | |
| BA | 01 | | O2 Sensor Test aborted | O2 sensor test was not successful. E.g. reset of O2 module during probe test | If fault occurs constantly: Replace PLL5.. | |
| BF | Any # | | O2 Control and Limiter automatic deactivated | Fault occurred in connection with O2 trim control or with the O2 monitor. It led to automatic deactivation of O2 trim control or the O2 monitor | See B5 Error codes. The will detail the reason for the automatic deactivation. | |
| <i>FAULT WITH BASE UNIT (LMV5) OR CONNECTED COMPONENTS</i> | | | | | | |
| C5 | Any # | # | Version Conflict | When comparing the versions of the individual units, the AZL5... has detected old versions | Before replacing any units, start the system and wait about 1 minute (until, after entering the parameter level, the display "Parameters will be updated" disappears). Then, reset. Replace the unit only if the fault message does not disappear. Replace the relevant units by new versions | |
| | 01..2F | # | | The diagnostic value is made up of the following faults or their combinations (the individual diagnostic codes are added up in hexadecimal format) | | |
| | 01 | LMV5.. | | Software of the basic unit too old | Replace the unit(s) called out in the diagnostic code. Be sure that the new unit has up to date software. | |
| | 02 | | | Software of the load controller too old | | |
| | 04 | AZL | | Software of the AZL5... too old | | |
| | 08 | Actuator | | Software of 1 or several actuators too old | | |
| | 10 | LMV5.. | | Software of VSD module too old | | |
| | 20 | PLL5.. | | Software of O2 module too old | | |
| D1 | Any # | LMV5.. | Fault Feedback VSD Module | Basic unit has detected a wrong state of the VSD module. Corresponds to the "8x"-faults with the other CAN users | | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace LMV5 3)Check CANBus cabling. Ensure that all cable shields (screens) which are located in the cable sheath are terminated correctly at each actuator, O2 module, and at the LMV5x... |
| | 01 | | | CRC error | | |
| | 02 | | | Key error main loop counter | | |
| | 03 | | | No feedback for max. number | | |
| D3 | Any # | PLL5.. | Fault Feedback O2 Module | Basic unit has detected a wrong stage of the O2 module | 4) Check each CANBus Connector to ensure proper termination (no conductors exposed on the back of the plug) | |
| | 01 | | | CRC error | | |
| | 02 | | | Key error main loop counter | | |
| | 03 | | | No feedback for max. number | | |

| Error code | Diag. code | Device | Display | Meaning for the LMV5x system | Corrective action |
|-------------------------------------------------------------------|------------|---------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <i>FAULT WITH BASE UNIT (LMV5) OR CONNECTED COMPONENTS</i> | | | | | |
| E1 | Any # | PLL5.. | Fault Feedback O2 Module | Basic unit has detected a ROM-CRC fault in the VSD module when checking its feedback signal | 1) If fault occurs sporadically: Improve EMC. 2) If fault occurs constantly: Replace LMV5 |
| E3 | --- | | | Basic unit has detected a ROM-CRC fault in the O2 module when checking its feedback signal | |
| F0 | --- | LMV5.. | Internal Fault Basic Unit | Plausibility fault during calculation of interpolation values | |
| F1 | Any # | | | Internal fault during calculation of precontrol | |
| | 01 | | | | |
| | 02 | | | | |
| | 03 | | | | |
| | 04 | | | | |
| | 05 | | | | |
| | 06 | | | Internal fault calculation of precontrol. Undefined value in the curves used for the calculation | |
| | 07 | | | | |
| F2 | Any # | | | Code for faulty temperature values from O2 module when calculating the air rate change | |
| | 07 | O2 module has delivered invalid value | If fault occurs constantly: Replace LMV5 | | |
| | 08 | Flue Gas Temp too high | Flue gas temperature outside the permissible value range | Check flue gas temperature to ensure that it is in the permissible range. Range is 32 to 752 F | |
| | 0A | QGO in Heating-up Phase | QGO probe not yet sufficiently heated up | Check the temperature of the O2 Sensor (can be viewed through the AZL). The sensor needs to be a minimum of 1202 F to operate properly. Wait up to 20 minutes for sensor to reach operating temperature. | |