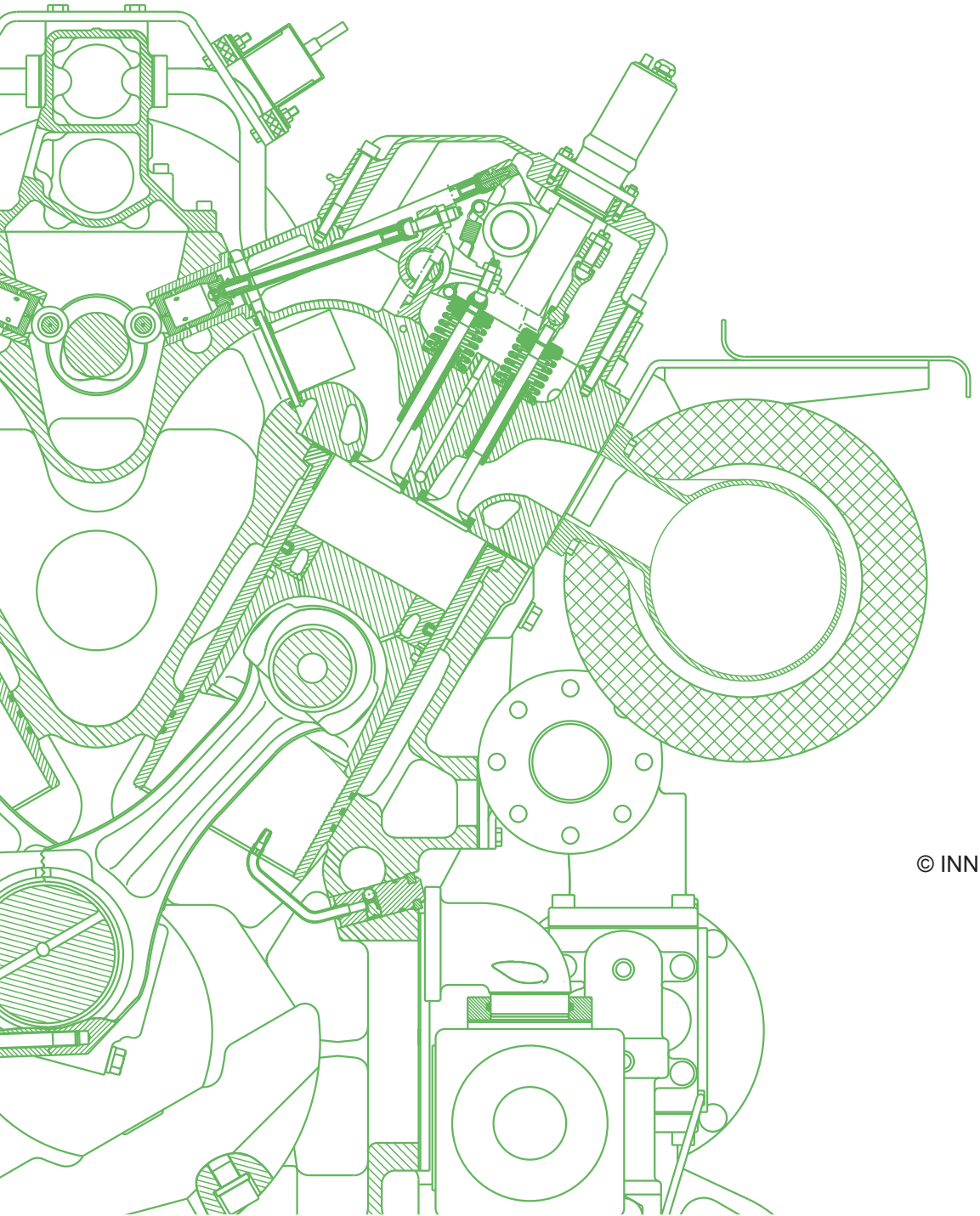
JENBACHER

TA 1531-0010

Technical Instruction

Homix-System Lambda = 1 engines (as from year of delivery 1991)



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1 Installation instructions

1.1 Ratio suction controller

The ratio suction controller is installed in the gas line with the spring dome downwards. The inlet and outlet piping lengths are 5 D. If a reducer is necessary between the ratio suction controller and the gas mixer, this must be installed immediately upstream of the gas mixer. The piping from the ratio suction controller to the gas mixer must be designed so that no unnecessary pressure drops occur. With the G165-150 (flange) ratio suction controller, the impulse line (gas) must be connected externally. The impulse line is connected 5 D after the controller output. The control line (air) connection is connected for all sizes to the connection at the side of the gas mixer air inlet. When the plant is operating at full load, the inlet pressure must be 5 - 15 mbar (see Fig. 3).

Ambient temperature:	-15 °C to +60 °C
Max. intake-side pressure p_i:	200 mbar
Max. differential pressure between inlet and outlet:	100 mbar

1.2 Gas mixer

The gas mixer must be mounted so that it is free of vibrations. It can be mounted vertically or horizontally (vertically is preferable). The gas and air inlet can be rotated in 45 ° increments around its axis.

An adaptor of ≥ 1.5 D with a shape as conical as possible must be provided immediately at the mixture outlet from the gas mixer.

1.3 Thermocouple

The thermocouple is installed near the lambda probe in the exhaust line between the engine and catalytic converter and must be fitted so that it projects into the middle of the exhaust pipe (see Fig. 2).

1.4 Lambda probe

The lambda probe is also installed in the exhaust gas line between the engine and catalytic converter. Make sure that the active part of the probe projects fully into the exhaust gas flow (see Fig. 2). The insulation on the exhaust gas pipe must be cut away to a funnel shape at the installation site of the lambda probe. The lambda probe must be installed in the exhaust pipe in such a way that ambient air convection flows around the lambda probe housing.

Operating temperatures	**Permanent**	**Transient**
Ceramic tip	350 - 850 °C	930 °C
Housing (hexagonal)	550 °C	600 °C
Joint ring at the cable outlet	230 °C	500 °C

2 Test information

2.1 Testing the lambda control unit

Check the direction of rotation of the stepper motor before commissioning the plant. To do this, set the manual / automatic switch to manual and remove the plastic cap on the stepper motor. The plastic cam must move in a counter-clockwise direction when the ▽ (lean) key is pressed, and clockwise when the △ (rich) key is pressed. If this is not the case, change over wires 9 and 10. Set the manual/automatic switch to automatic. The potential-free contact (plant ON, terminals 12 and 13) must be connected so that the contact closes as soon as the plant is under load. The contact must open before the load is taken off the plant (plant OFF command). If the plant is shut down due to a fault, the contact must open immediately. If

the red alarm lamp lights up, one of the two limit switches has responded (open). The limit switch at the level of the terminal strip is for the "lean" limit. The limit switch under the level of the terminal strip is for the "rich" limit.

2.2 Checking the basic settings

Table 1:

Mixer [Type]	Gas aperture [diam]	Arc [°]	Air gap [mm]	Ratio suction controller set point spring [diam]
HMS G 15	0.25	90	± 0	15
HMS G 30	0.4	140	± 0	15
HMS G 60	0.6	220	± 0	15
HMS G 120	1.0	360	± 0	15
HMS G 240	1.25	450	± 0	15
HMS G480				

The basic settings are all based on L natural gas and maximum mixer performance.

In the event of lesser performance or other gas types, the basic settings must be adapted accordingly.

2.3 Checking the gas aperture

Check the gas aperture as follows:

Detach the complete drive unit (black plastic housing including aluminium mounting plate) from the mixer by undoing the two mounting screws (3 mm hexagon socket head).

Insert a screwdriver (size 6 or so) in the blind hole this reveals and turn it counter-clockwise until resistance is felt (the gas aperture is now closed). The arc through which the screwdriver turns must comply with the information in Table 1 (mixer basic setting). If the arc is not the same as the set value, rotate the blind hole (gas cone) clockwise into the desired position. Before the drive unit can be refitted, the flat on the drive shaft must be rotated with the aid of the lambda control unit (manual/automatic switch set to manual, press the manual key) so that the shaft fits in the blind hole and the mounting screws can be tightened.

The drive motor can also be mounted offset by 180°.

If one of the limit switches responds when positioning the flat correctly (red LED lights up permanently), adjust the cam with an Allen key (2 mm) until the limit switch is released.

2.4 Checking the air gap

The air gap is checked through the air inlet. The air gap is ±0 when the underside of the mixer head (aluminium) and the top of the mixer pipe (brass) are at the same level. Adjustment is effected by turning the screw upwards (air gap smaller -) or downwards (air gap larger +).

2.5 Checking the ratio suction controller

To adjust the set-point spring of the ratio suction, first turn the adjusting screw left with a 6 mm Allen key as far as the stop, and then turn it 15 rotations to the right.

3 Setting information

3.1 Setting the air gap

When the plant is started, the engine is operated with the largest possible gas flow.

If the operating point (largest possible gas flow) is not reached even with the throttle valve fully open, the pressure drop across the gas mixer must be reduced. To do this, rotate the mixer pipe (brass) clockwise, using an adjusting pin inserted through the air inlet. The pressure drop across the mixer (Fig. 3, suction mixer measuring nozzles) must be chosen so that the throttle valve is not quite fully open with the largest possible gas flow.

If the throttle valve is only partly open at the operating point (largest possible gas flow), turn the mixer pipe (brass) counter-clockwise. The pressure drop must be adjusted here as well so that the throttle valve is not quite fully open.

3.2 Setting the ratio suction controller

The setting of the ratio suction controller is checked by lowering the plant power output from 100% to approximately 50% load. The lambda voltage must increase as a result (max. 50 mV).

If the lambda voltage increases by more than 50 mV, the set point spring needs to be released.

If the lambda voltage drops compared to its actual value, the set point spring must be retightened.

Repeat this adjustment process until the desired lambda voltage change is obtained.

Make sure that the lambda voltage is in the lambda window before lowering the load.

3.3 Description of the lambda control unit

L1: Plant "ON".

L1 lights up when terminals 12 and 13 are connected by an external potential-free contact (make contact).

L2: Temperature limit

L2 lights up as soon as the exhaust gas temperature exceeds approx. 350 °C

L3: Control action

After L1 and L2 have lit up and a period of 40 seconds has elapsed, the control action is enabled (L3 lights up).

L4: Exhaust temperature compensation

L4 lights up as soon as the exhaust gas temperature is higher than the set compensation enable value.

L5: Fault

(provided that L1 is illuminated)

L5 flashes if the lambda window is not reached with approx. 20 minutes.

A potential-free contact (make contact) is available at terminals 19 and 20 for external fault messages.

The fault message can be cleared by setting the manual/automatic switch to manual and running up to the lambda window using the manual key (L7 lights up). Continued automatic operation is then possible, but not before.

Limit switch

LED 5 has a dual function. It indicates the fault as described above and lights up permanently as soon as either of the two limit switches ("Open" or "Closed") has responded. The "Limit switch responded" message has priority over the "Lambda window not reached" message.

L6: Lean operation indicator

L7: Neutral setting (the lambda voltage is in the lambda window)

L8: Rich operation indicator

K1: Manual enrichment key

K2: Manual leaning key

S2: Manual/automatic switch

In the "Manual" setting the stepper motor can be adjusted in the richer of leaner direction by pressing the appropriate key.

S1: Rotary stepping switch

● + position: set-point display of the upper voltage value of the lambda window.

● - position: set-point display of the lower voltage value of the lambda window.

● probe position: actual value display of the lambda probe

Exhaust temp. position: actual value display of the exhaust upstream of the catalytic converter

Temperature limit position: The control unit is enabled after the temperature limit has been exceeded (approx. 350 °C) and a time delay has elapsed.

Exhaust temperature compensation position: As soon as the exhaust temperature is higher than the temperature displayed in this setting, the exhaust temperature compensation is enabled.

3.4 Setting the lambda control unit

3.4.1 Setting the lambda window

Rotary stepping switch S1	● + position
DVM display	set the desired voltage with P4
Rotary stepping switch S1	● - position
DVM display	set the desired voltage with P5

The lambda window should be set to a voltage difference of 10 - 20 mV.

The lambda window is set in the factory to 800 mV and 780 mV.

3.4.2 Setting the monostable vibrator flop time to compensate the gearing slippage

If the lambda voltage periodically fluctuates around the lambda window, reduce the monostable vibrator flop time with potentiometer P6 (turn to the right)

Rotary stepping switch S1 ➔ exhaust temperature compensation position

Manual/automatic switch ➔ "Manual" setting

Set the desired switch-on value with potentiometer P9.

The compensation must be adjusted again (Section 3.4.4) every time the switch-on value is changed.

3.4.3 Balancing the compensation

Manual/automatic switch ➔ "Manual" setting

Remove the bridge (x14, signal card).

Rotary stepping switch S1 ➔ λ + position

Insert jumper x1 in the left-hand position, apply the mV voltage from the internal mV transmitter / bridge terminals 11 and 6 (-).

(Turn to the left > mV voltage) increase with potentiometer P13 until L4 lights up.

When L4 lights up, the λ + value on the DVM changes. Set the previous λ +- value with P7. Repeat the procedure until the λ + value remains stable at the switching point of L4d.

Plug in the bridge (x14, signal card).

Connect the thermocouple to terminals 5 (+) and 6 (-).

Manual/automatic switch ➔ "Automatic" setting

3.4.4 Adjusting the compensation factor

The compensation factor is determined by jumper x11.

The adjustment range of potentiometer P7 is determined by jumper x10.

Table 2

Compensation factor mV/°C	x11	x10
0.50	right	middle
0.78	fourth from the left	middle
1.1	middle	middle
1.4	second from the right	middle
1.95	left	middle *)

*) If balancing is not possible, proceed as described in the function description (x10).

Manual/automatic switch ➔ "Manual" setting

Change the setting of jumper x11 depending on the desired compensation factor. (Table 2).

The compensation must be balanced as described in Section 3.4.4 every time x11 is changed. If the compensation cannot be balanced with potentiometer P7, change the setting of jumper x10 as well.

x10 left for a lower balancing range

x10 right for a higher balancing range.

3.5 Setting the electrical limit switches

After adjusting the mixer, the ratio suction controller and the lambda control unit, the electrical limit switches must be set (2 mm hexagon socket head screw) so that a control range of approx. 15 ° is possible in both directions (rich, lean) (distance from the pressure roller to the start of the cam is approx. 10 mm). The limit switch at the level of the terminal strip is for the minimal "lean or closed" setting.

The limit switch at the other end of the terminal strip is for the maximum "rich" or "open" setting.

The upper (+) and lower (-) set points for the lambda window are set

with the aid of a pollutant measurement (NO_x and CO).

After the lambda probe has been changed, the set points should be determined again.

4 Figures

4.1 Lambda control unit terminal diagram

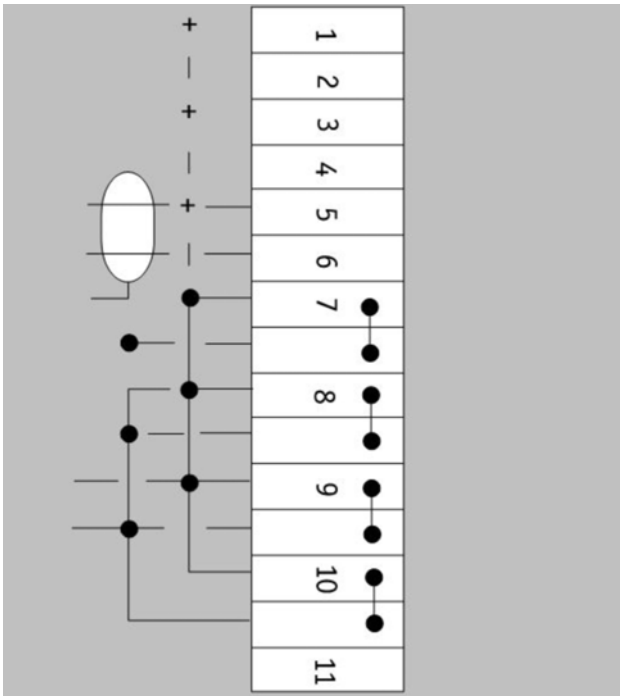
Comp. recorder 0-20 mA
(Burden < 470 Ohms)

Lambda probe 0-1000 mV
(Lean probe 0-100 mV)

Thermocouple NiCr-Ni shield connected to terminal 32 only (never to PE and not ever with the element earthed)

Stepper motor 1
(Stepper motor 2)

Thermocouple voltage
lambda voltage simulator output



Plant – ON
(external contact, potential-free)

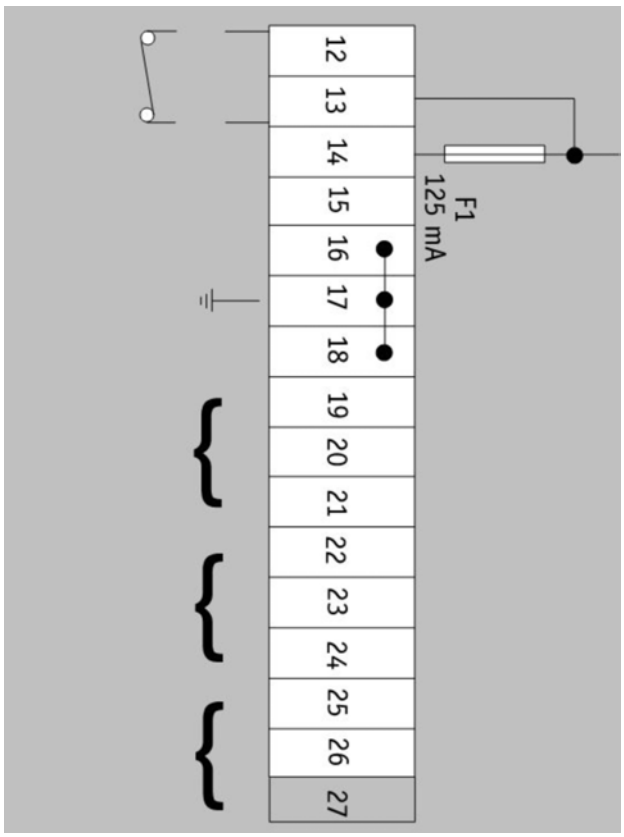
L 220 V / 50 Hz
N 220 V / 50 Hz

Stepper motor shield
PE
lambda probe shield

Group alarm

Lambda voltage above message (rich)

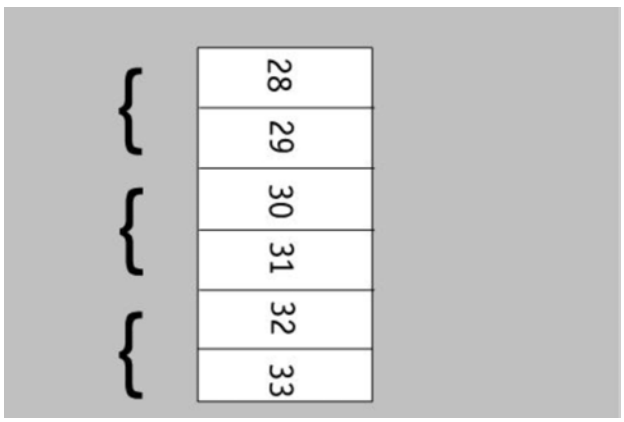
Lambda voltage below message (lean)



Limit switch below (lean)

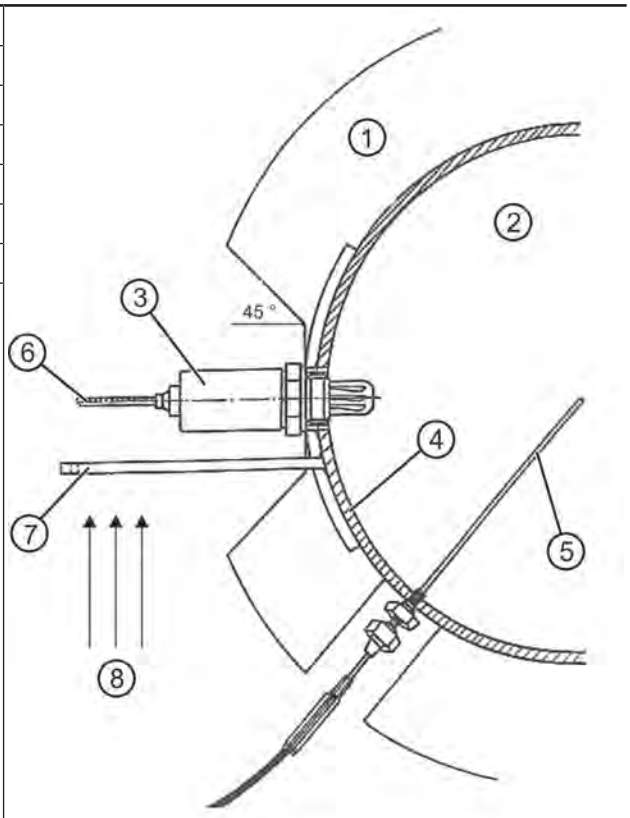
Limit switch above (rich)

Thermocouple shield and limit switch GND

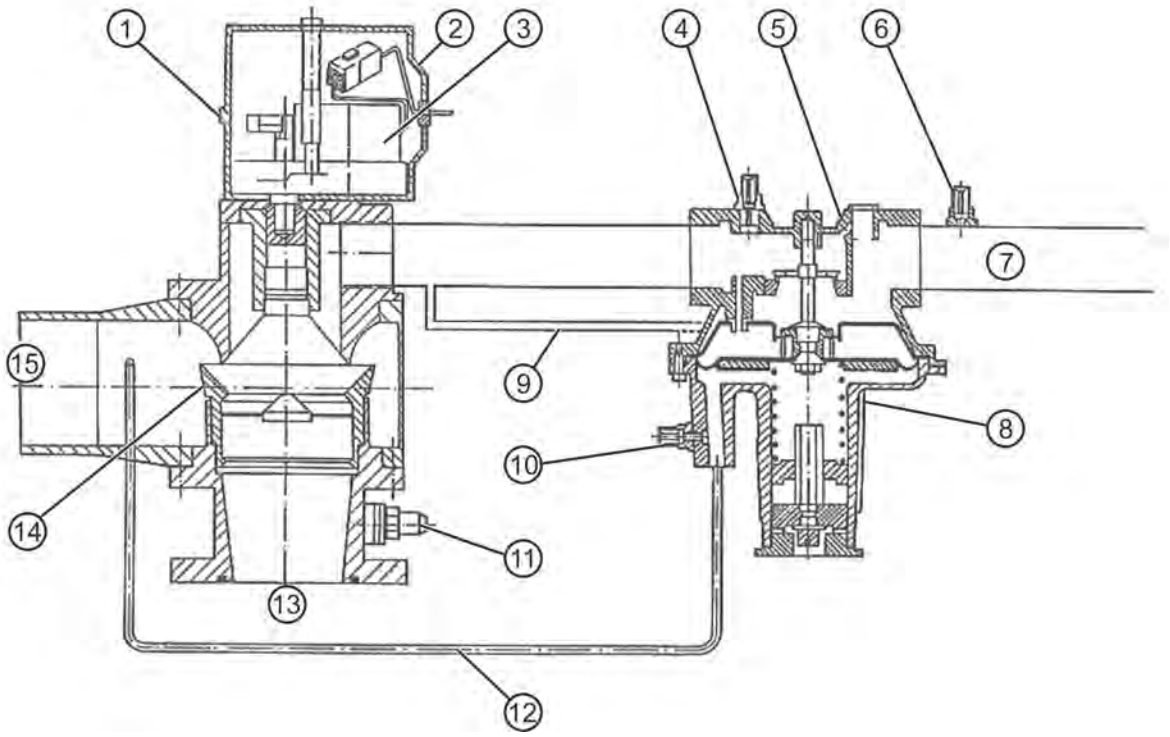


4.2 Thermocouple and lambda probe installation

① Insulation
② Exhaust pipe
③ λ probe
④ Heat-insulating jacket
⑤ NiCr-Ni thermocouple
⑥ Positive pole
⑦ Negative pole
⑧ Convection

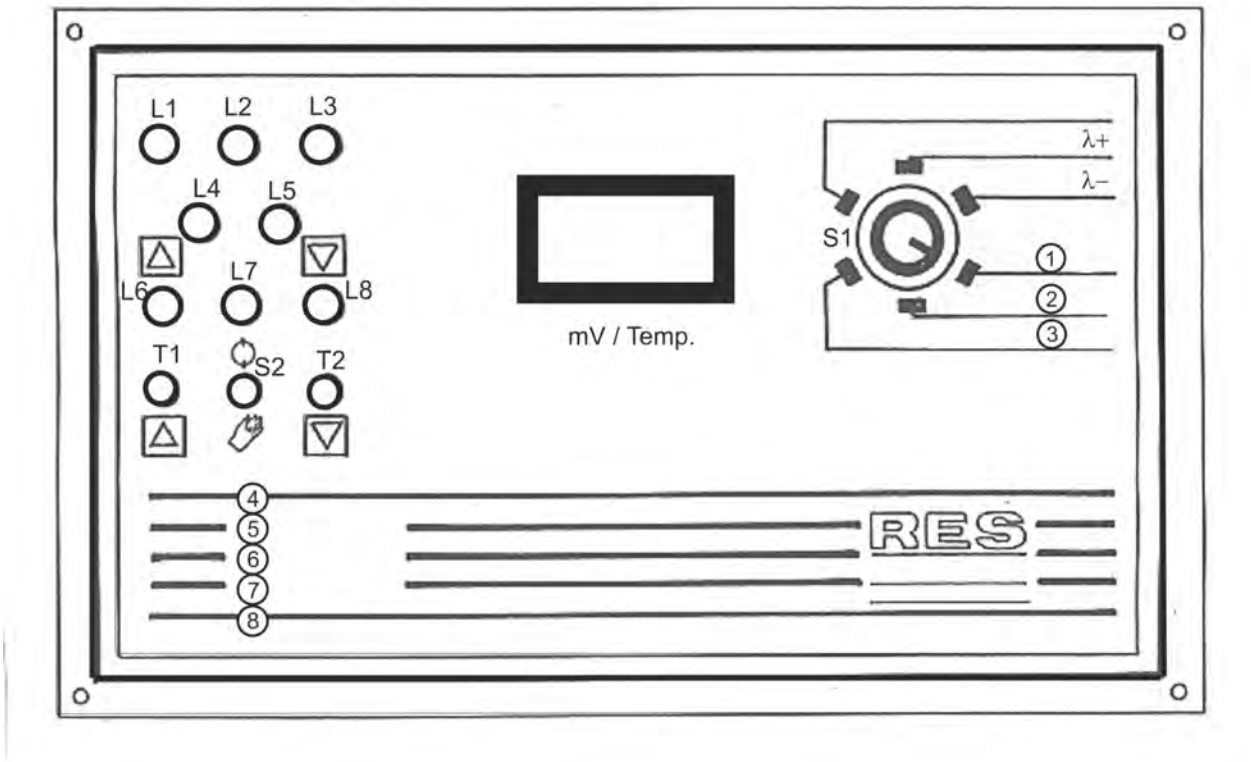


4.3 Sectional drawing of the mixer



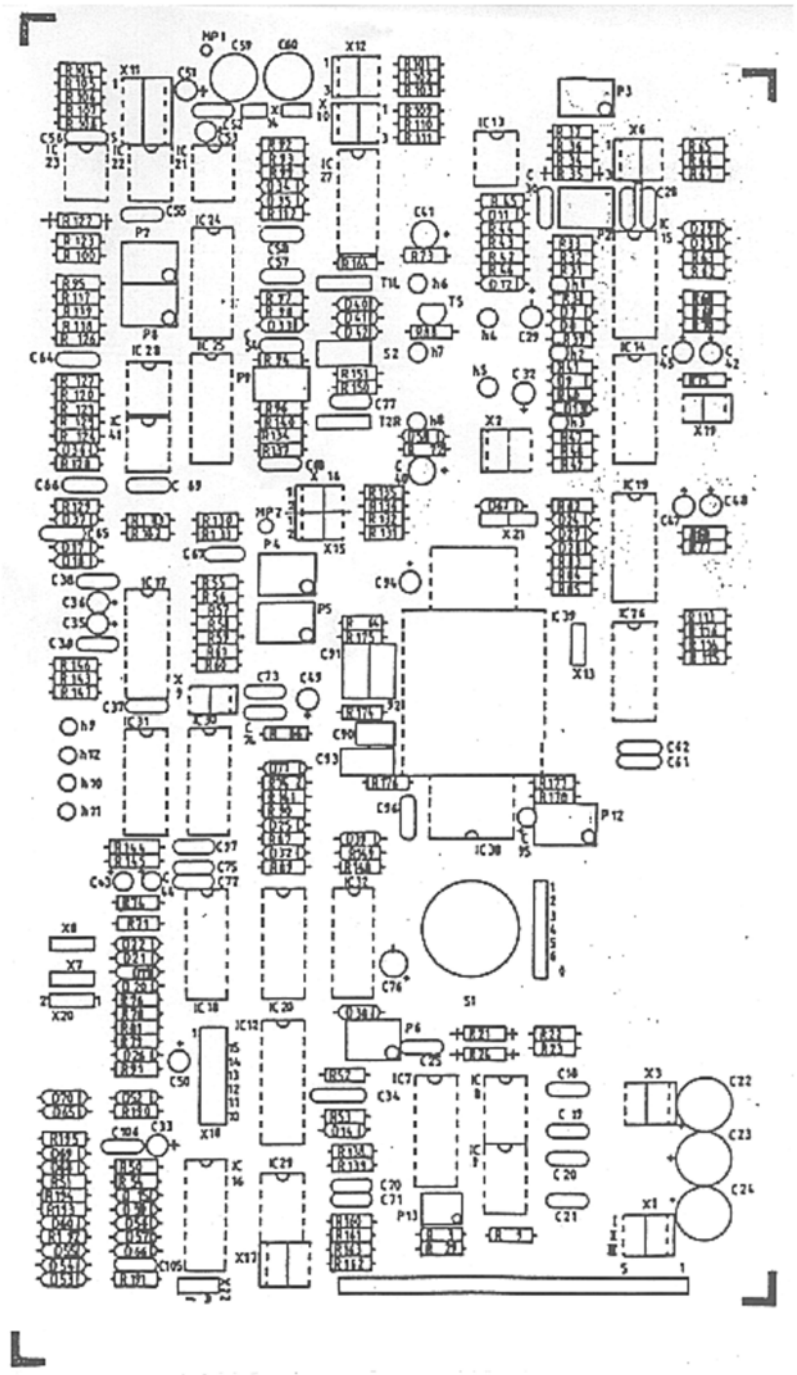
①	Mechanical limit switch
②	Gearbox
③	Stepper motor
④	Gas suction measuring nozzle
⑤	Bypass only with gas line ¾" -1½"
⑥	Gas line prepressure measuring nozzle
⑦	Gas intake
⑧	Pressure adjustment range 5 - 15 mbar, max. pressure fluctuations ±1 mbar
⑨	Impulse line with gas line 65 150
⑩	Air suction measuring nozzle
⑪	Mixer suction measuring nozzle
⑫	Control line
⑬	Mixture outlet
⑭	Air gap adjustment (adjusting pin)
⑮	Air inlet

4.4 Front view of the lambda control unit

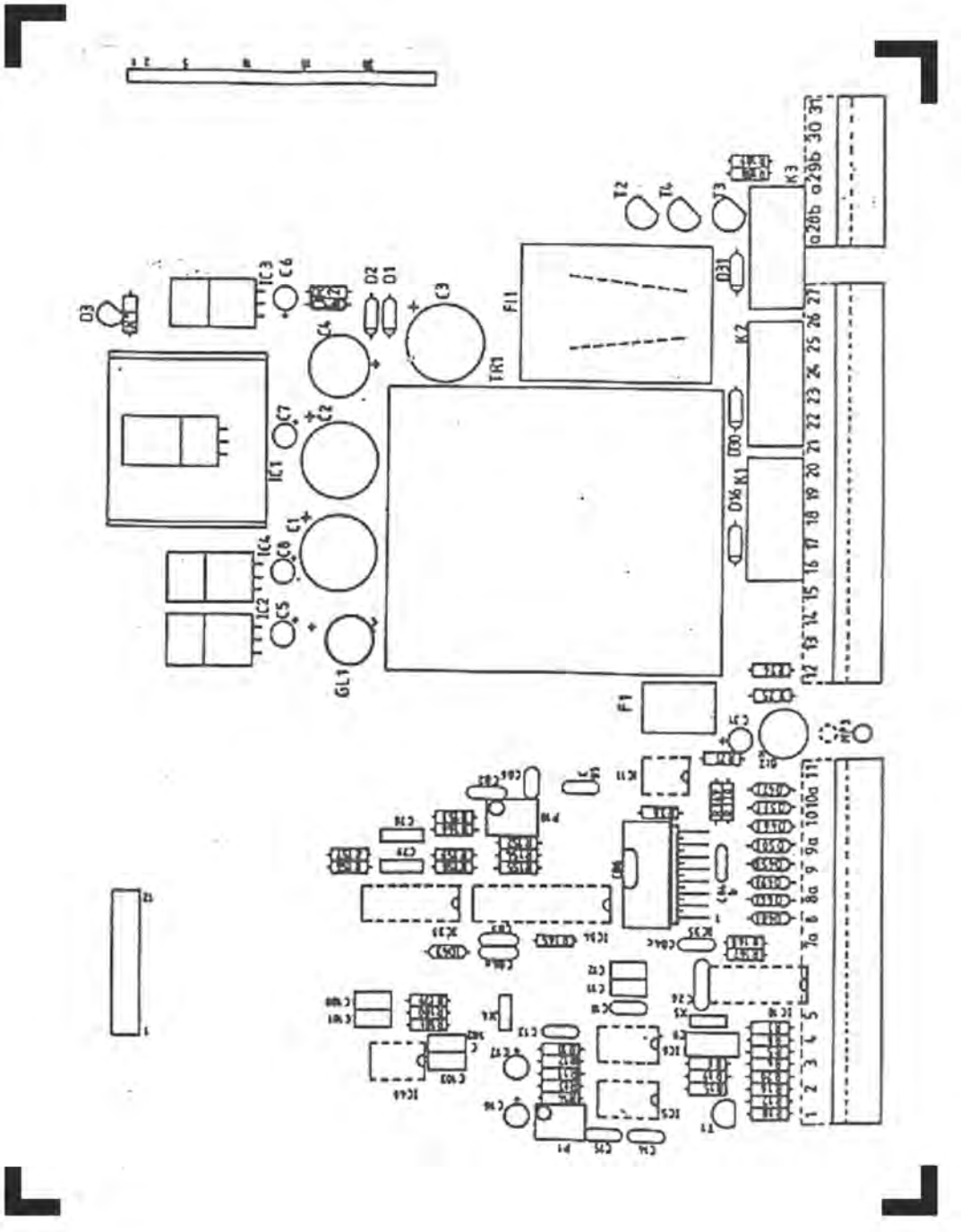


①	λ probe
②	Exhaust temperature
③	Temperature limit
④	Plant "ON".
⑤	Temperature limit
⑥	Control action
⑦	Exhaust temperature comp.
⑧	Fault

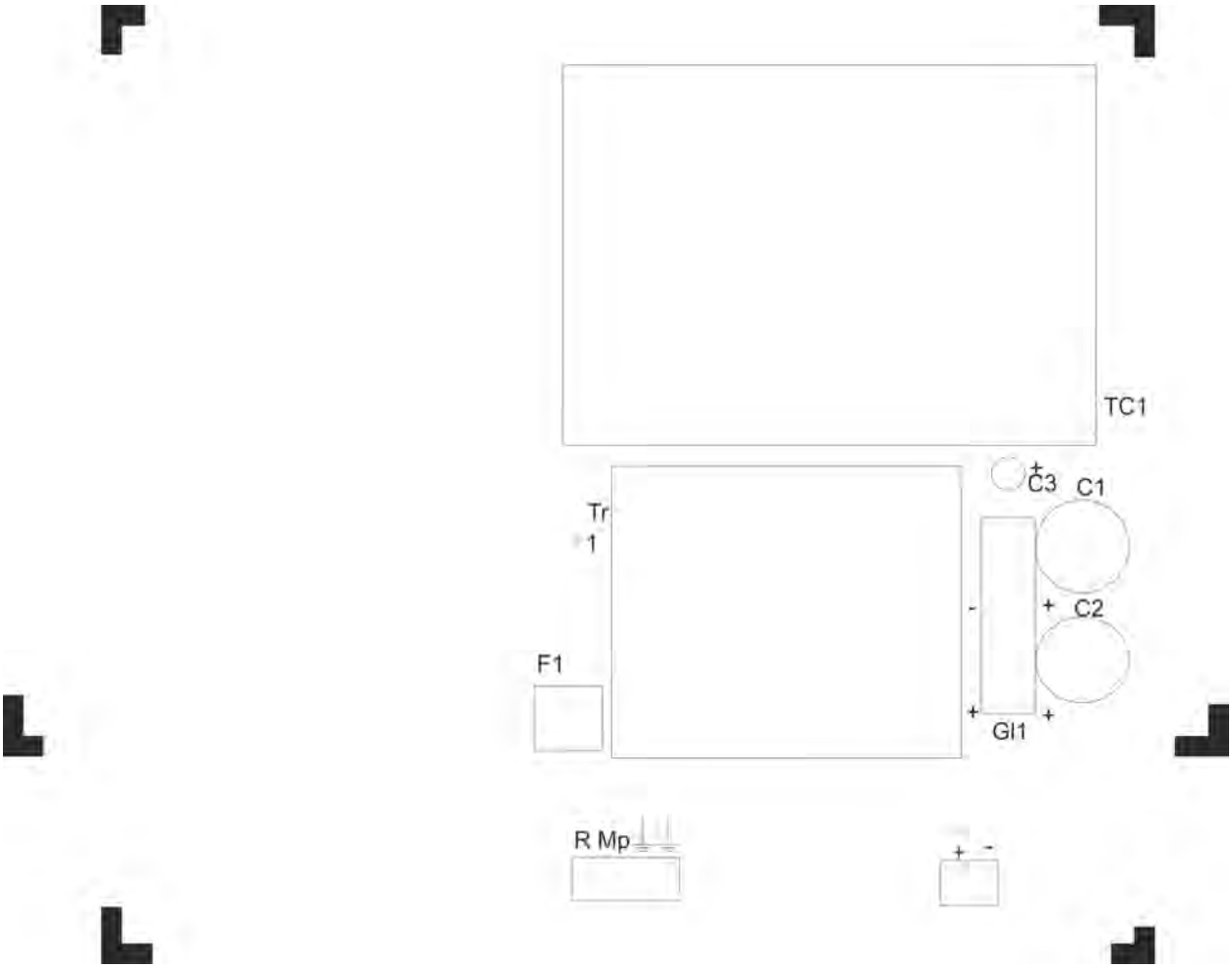
4.5 Lambda control unit components layout



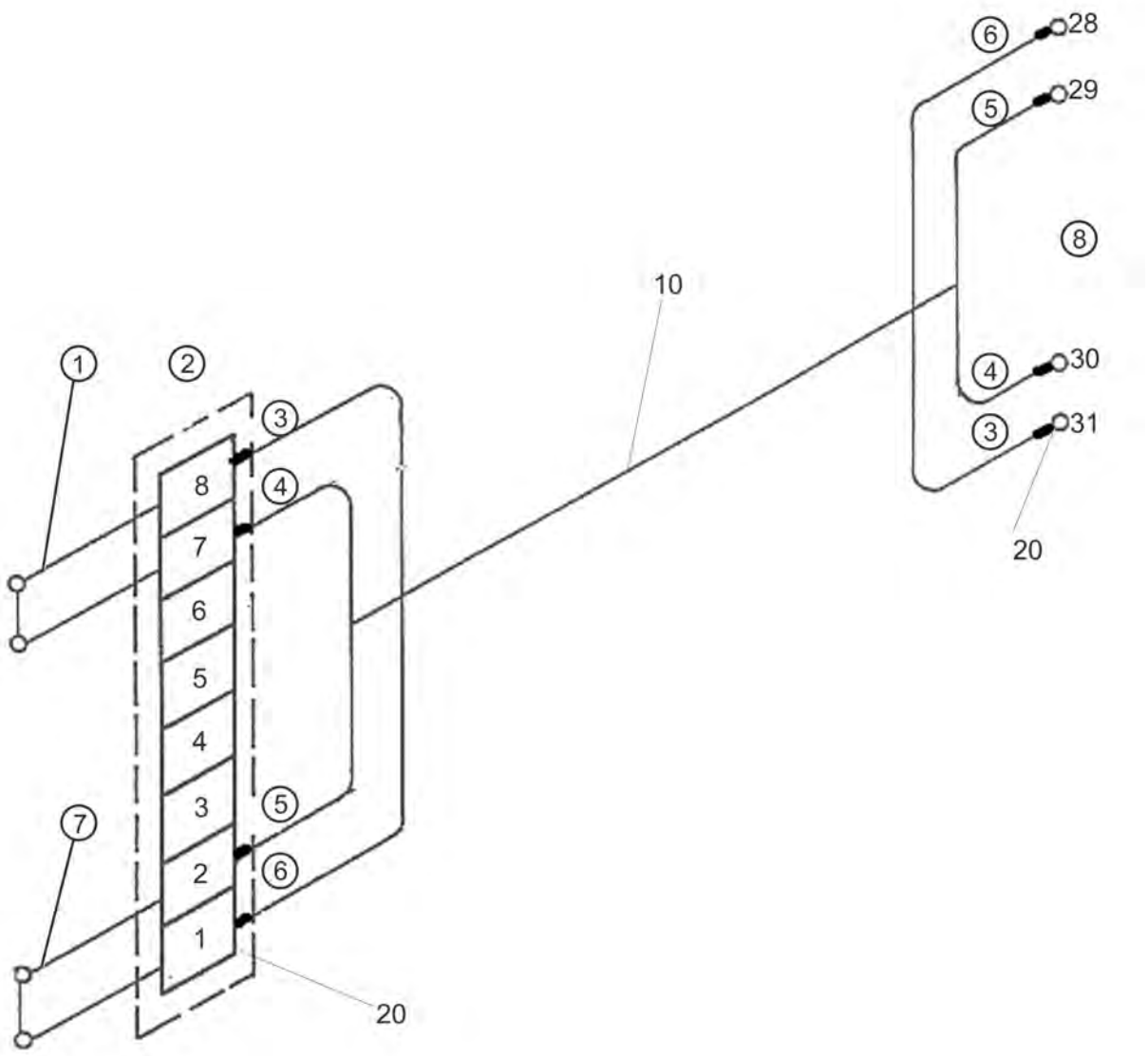
4.6 Additional PCB layout



4.7 Layout of PSU for lambda probe heating

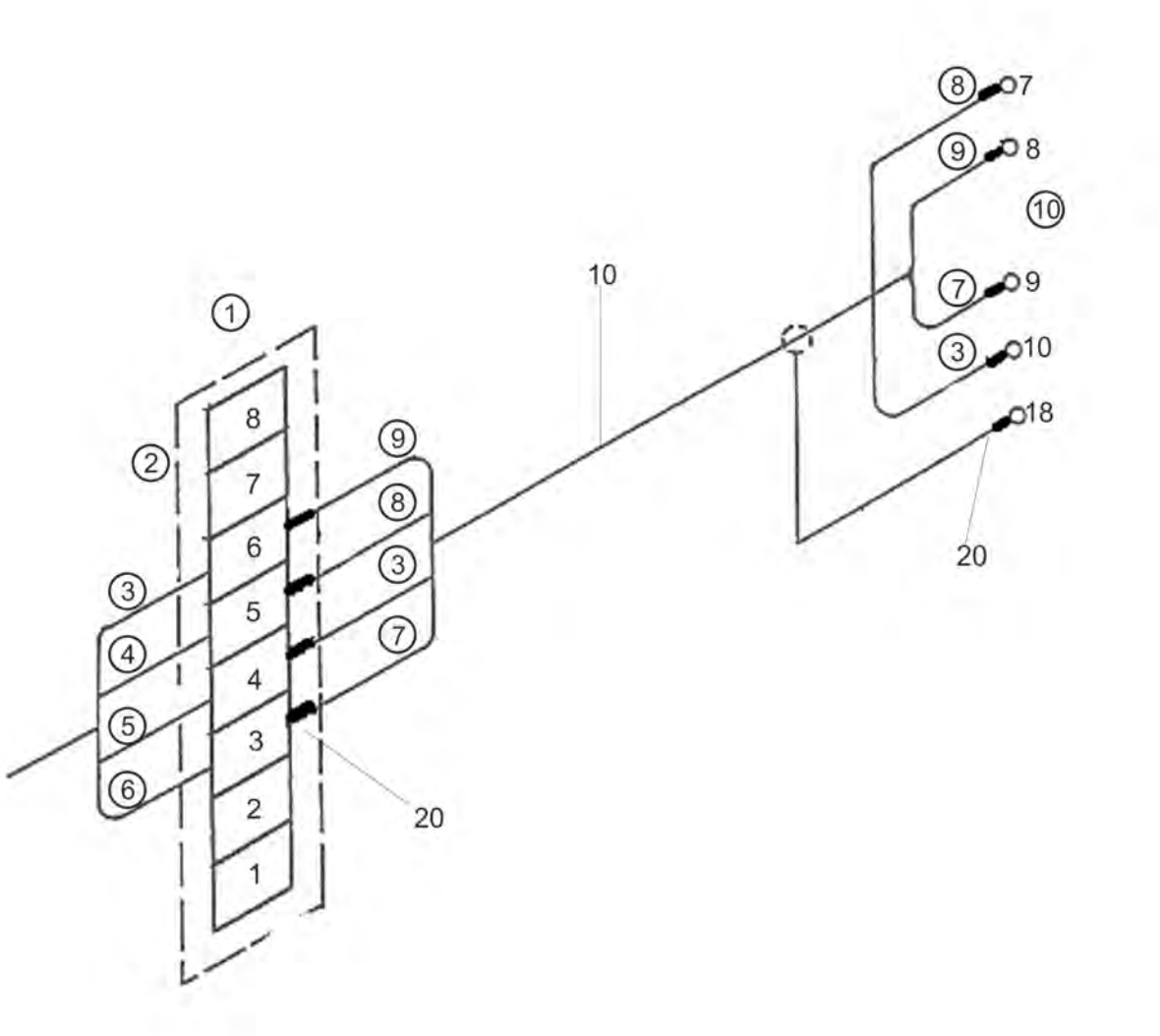


4.8 Connecting cable and diagram for limit switches



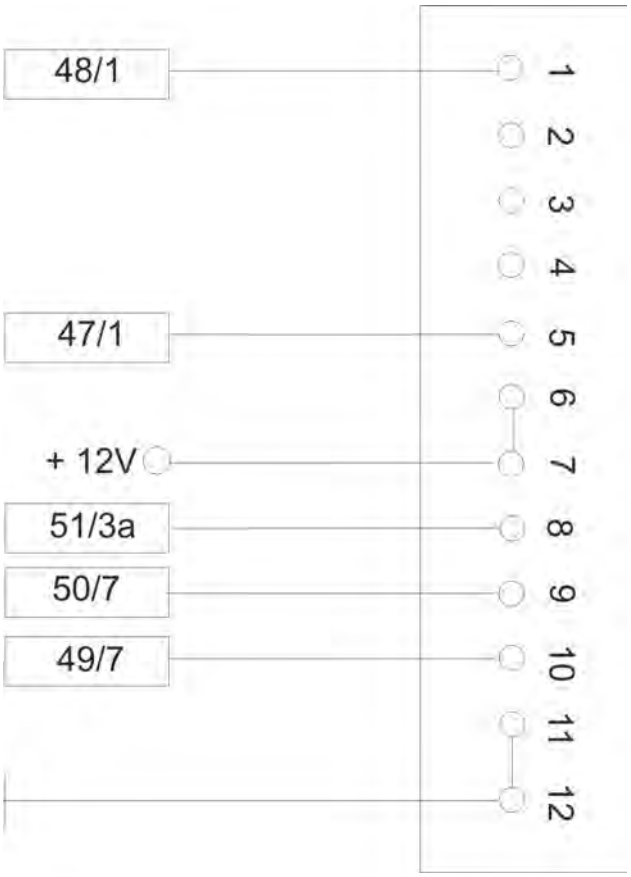
①	"Rich" limit switch under the terminal strip
②	Terminal strip in the stepper motor housing
③	Green
④	Yellow
⑤	Brown
⑥	White
⑦	"Lean" limit switch at the level of the terminal strip
⑧	Terminal strip in the lambda control unit

4.9 Connecting cable and diagram for stepper motor



①	Terminal strip in the stepper motor housing
②	Stepper motor
③	Green
④	Red
⑤	Black
⑥	Grey
⑦	Brown
⑧	Yellow
⑨	White
⑩	Terminal strip in the lambda control unit

4.10 Additional PCB connector pin assignment



5 Revision code

Revision history

Index	Date	Description / Revision summary	Expert *Auditor*
2	15.04.2019	GE durch INNIO ersetzt / GE replaced by INNIO	**Opoku** *Pichler R.*
1	19.08.2014	Umstellung auf CMS / Change to **C**ontent **M**anagement **S**ystem ersetzt / replaced Index: **a**	**Kecht** *Hillen*