




2.4 Power-plant, fuel and oil

Engine manufacturer:	SOLO Kleinmotoren GmbH
Engine model:	SOLO Typ 2350
Max. power, take-off:	<i>Not applicable</i>
Max. engine rpm, take-off:	<i>Not applicable</i>
Max. power, continuous:	24 PS / 18kW
Max. engine rpm, continuous:	5400 rpm
Max. cylinder head temperature:	275°C
Fuel:	2-stroke mixture from AVGAS 100LL or unleaded MOGAS 95 ROZ
Oil grade:	Fuel-oil mixture 1:40 2-stroke oil Castrol RS 2T, Castrol Super TT, Castrol TTS or Castrol Go!2T. If none of these oils is available, alternatively two stroke oil with the designation JASO FC can be used.
Total quantity of usable fuel	10,5 Ltrs in the fuselage tank
Propeller manufacturer:	Alexander Schleicher GmbH & Co
Propeller model:	AS2F1-3/L100-56-N2

2.5 Power-plant instrument markings

The following table explains the meaning of the different lights of the power plant instrument:

Symbol	Green light	Yellow light	Red light
RPM	4400 to 5200 rpm	5200 to 5400 rpm	> 5400 rpm, continuous alarm, ignition is switched off

BAT	Flashes red: Battery voltage below 11,5 V
	Green light: power-plant is extended
	Flashes red, alarm sound: pay attention to LCD display! (also see section 3.7) "EXTRACT": Engine lever was moved further than „Extract“- position without the engine being completely extended. "SWITCH R" or "SWITCH E": Time for extension or retrac- tion was too long, probably an end switch is faulty. "INS_TANK": Connection to fuel tank sensor is broken; probably the fuel tank is not fitted in properly. "FUSE": Circuit breaker of the jackscrew disconnected
	Green light: power plant is retracted

A continuous alarm sound points to a limit being violated (rpm, fuel capacity, fuse, jackscrew runtime). A pulsing alarm points to an handling error ("Extract"). See LCD display for explanation.

3.6 Spiral Dive Recovery

Depending on the aileron position in a spin with forward C.G. positions (i.e. the C.G.- range with the ASW 27-18 not more sustaining a steady spin) it will immediately or after a few turns develop a spiral dive, or a slipping turn similar to a spiral dive.

In contrast to a spin, a spiral dive is characterized by high g-loads. Therefore do not pull further, but

- ① release stick
- ② reduce bank angle with rudder and aileron against direction of turn
- ③ gently pull out of the dive


3.7 Engine Failure


Failure at safe Altitude

Check the following points:

- Error message from power-plant instrument?
- Engine lever on foremost position
- Fuel content in fuselage tank?

If the above points check out correctly, the fault cannot be rectified in flight. Retract power-plant according to checklist and continue flight as pure sailplane.

If the red light on the power-plant instrument next to  flashes, an alarm sounds and the LCD-display shows the following:

EXTRACT: Move the engine lever back to position **EXTEND** until the green light  beams. Start engine according to checklist.

SWITCH E: While the engine was being extracted, the power-plant instrument did not get a signal from the end switch for too long. Possible causes are a weak battery or a defective gas spring. Pressing the white button on the power plant instrument restarts the extraction.

Otherwise, if the pilot is absolutely sure, the engine is completely extended (and the end-switch is defective), he can switch off the power-plant instrument with the main switch and start the engine without it.

INS_TANK: The electric connection to the tank sensor is broken. This alone is no reason for a engine failure (as long as the tank is on board and the fuel lines are connected)

WARNING: *Trying to start an incompletely extended engine can result in severe damage of the glider and power-plant.*

CAUTION: *Do not fly faster than 120 km/h (65 kts) in an emergency situation without working power-plant instrument, because there is no control of rpms any more.*

FUSE: The circuit breaker of the jackscrew has disconnected. Pressing the white button on the power-plant instrument stops the alarm sound, and – if the power-plant lever is on position **EXTEND** or **RETRACT** – resets the circuit breaker.

Failure at low Altitude

If no terrain suitable for a safe landing can be reached any more, the power-plant should be retracted as far as possible:

- ① Reduce airspeed (85 – 90 km/h, 46 – 49 kts)
- ② Let propeller slow down and engage propeller-stopper
- ③ Close fuel valve
- ④ When propeller vertical, place engine-lever to “Retract”
- ⑤ Prior to touch-down, toggle main switch off

Retracting the engine not only improves gliding performance but also reduces the risk in case of a crash landing.

Heavy Vibrations of the Power-Plant

Shut down and retract the engine as normal. The propeller has possibly been damaged, causing an imbalance. Do not re-start the power-plant

Low Engine Battery Voltage

When the BAT-light on the power-plant instrument starts to flash there is usually enough energy left to retract the engine. The power consumption of the power-plant instrument is also very low.

CAUTION: *With an empty engine battery the engine does not cease running. But since there is no control for the rpms any more, a speed of 120 km/h (65 kts) must not be exceeded. Bring yourself to a safe terrain for landing, because the engine cannot be retracted any more.*

WARNING: *A stopped power-plant, not retractable any more, decreases the glide ratio dramatically.*

Power-Plant Main Switch

The main switch is located in the instrument panel, and is labelled “Engine Master switch”.

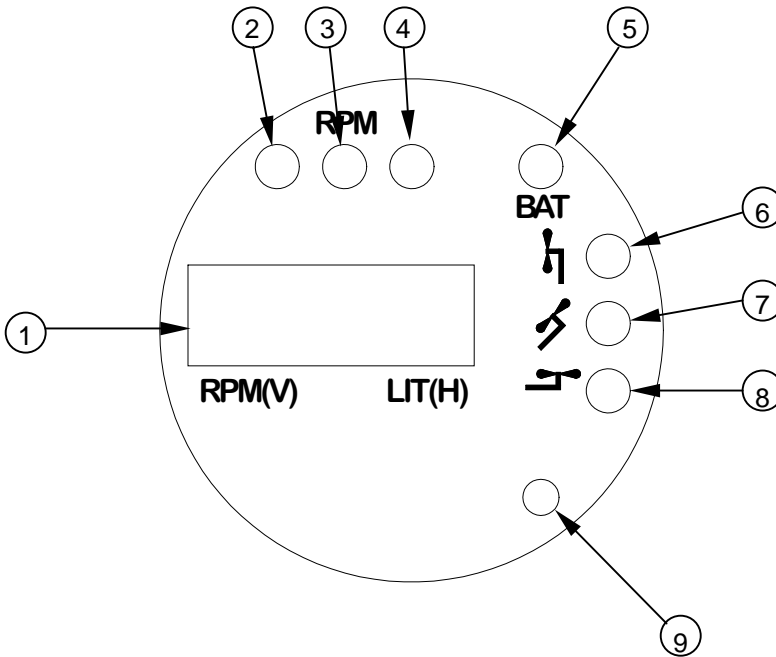
Power-Plant Instrument

The power-plant instrument of the ASW 27-18E fits in a Ø52mm housing in the instrument panel. It has several governance, monitoring and display functions:

- ① It controls the electric jackshaft, when the power-plant lever is placed in the corresponding position.
- ② It influences the ignition. Independently from the power-plant lever it shuts down the ignition, whenever the engine is not completely extended or the rotational speed exceeds the maximum permissible RPM.
- ③ It displays the state of the power-plant (retracted or extended, rotational speed, fuel quantity, voltage, elapsed time) and supplies warnings in case of limit exceedance or maloperation.
- ④ It checks the fuel quantity in the fuel tank and controls a electric fuel pump when starting the engine.

For few seconds after power on, the instrument switches all LEDs and the alarm sound on.

IMPORTANT NOTE: *Continuous alarms (=Caution) resound if limits are exceeded or undershot (rotational speed, fuel quantity, voltage, jackscrew runtime, fuse). Pulsing alarms (=Handling advise) resound in connection with handling errors. See LCD display for explanation (see page 7.25).*

Front-display of the power-plant instrument:

- 1 LCD Display
- 2 LED green, for green rotational speed range
- 3 LED yellow, for yellow rotational speed range
- 4 LED red, for maximum rotational speed
- 5 LED red, for low voltage
- 6 LED green, for fully extended power-plant
- 7 LED red, for error messages
- 8 LED green, for fully retracted power-plant
- 9 Button for display selection

Numbers in brackets in the text refer to the numbers of this figure.

Control of electric jackscrew

To extend or retract the power-plant, bring the power-plant lever in the corresponding position (see fig 7.12-1).

The green light (6) indicates, that the power-plant is fully extended. The green light (8) indicates the power-plant is completely retracted.

If the power-plant is not fully extended, but the power-plant lever is moved beyond position **EXTEND**, the red light (7) flashes, a pulsing alarm tone sounds and the LCD (1) displays the word **EXTRACT**.

If the power-plant lever does not receive a signal from the end-switch for an unusual long time, it stops the jackscrew. The red light (7) flashes, an alarm sound sets in, and the LCD (1) displays **SWITCH R** respectively **SWITCH E**. The possible fault may be either a faulty end-switch, a jammed engine mount or low voltage. The alarm can be acknowledged with button (9), restarting the jackscrew again. As long as there is no signal from the end-switch saying "fully extended", the ignition is blocked. (see section 3.7)

Concerning the message **FUSE**, see section 7.14

Influence on ignition

The power-plant instrument features own relays to block ignition independently from the pilot's ignition switch. It blocks ignition as long as the power-plant is not fully extended and as soon as the maximum rotational speed is exceeded.

IMPORTANT NOTE: *If the current supply of the power-plant instrument is interrupted, it cannot block the ignition.*

Control of the electric fuel pump

To support the pneumatic fuel pump for the start, the power-plant instrument activates the electric fuel pump under the following conditions:

- The engine is completely extended
- The power-plant lever is forward of position **EXTEND**
- The rotational speed is below 4200RPM

Display of power-plant status

Section 2.5 describes the modes of the LCD-Display (1).

A sensor at the magnetic flywheel measures the rotational speed. It is displayed in the permanent display at the left side. When the engine runs with its target speed the green LED (2) lights. The yellow LED (3) warns of approaching the maximum RPM. When reaching the maximum rotational speed, the ignition is switched off and the red LED (4) beams.

The red LED (5) lights, whenever the battery voltage falls below 11,5V.

Fuel monitoring

A sensor monitors the content of the fuselage tank. The display is calibrated for flight attitude. Therefore, on ground, it deviates from the actual fuel quantity. Also in flight the angle of attack varies, thus a calibration more accurate than for half a liter (0.13 US Gal.) is not reasonable. The scale on the fuselage itself is calibrated for ground attitude.

When the fuel quantity of the fuselage tank sinks below 2,5Ltrs (0.66 US Gal) for over 5s, an alarm resounds and the display starts to blink. The alarm can be turned down with button (9) for four minutes.

The calibration of the fuel sensor was done with fuel-oil mixture based on AVGAS 100LL. Mixtures based on other fuel qualities may lead to deviating indications. Thereby the deviation is largest with full tank and zero with empty tank.

The power-plant instrument can be set to other qualities. The fuel tank must be filled full and the power-plant retracted. Press button (9) four times until **Calibr. ?** appears at the display. Then keep button (9) pressed for five seconds to perform the calibration.

After the calibration, the power-plant instrument assumes that the signal from the fuel sensor corresponds a full tank. With a full tank, the difference between flight and ground attitude is small.

Display- and warning-ranges of the power-plant instrument:

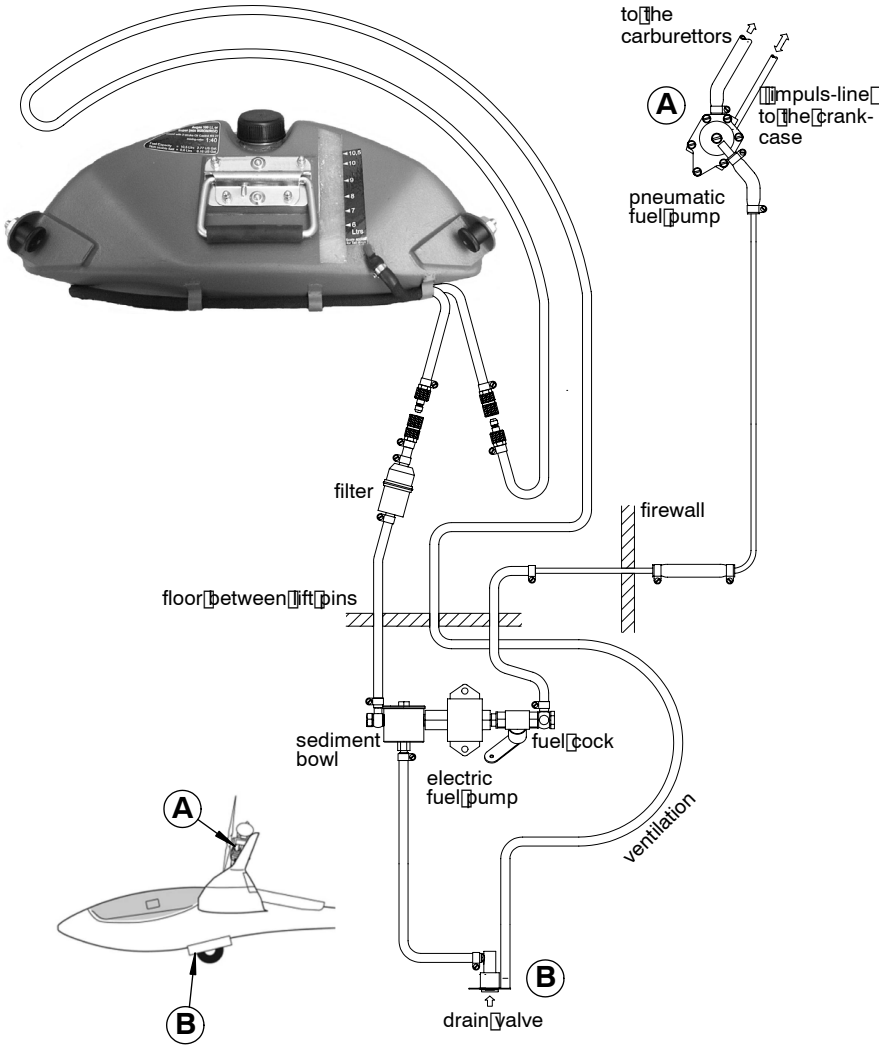
Type	Display-range	Optical	Acoustic
Rotational speed	400 – 9990 rpm	See section 2.5	> 5400 rpm permanent alarm
Battery voltage	10 – 15V	< 11,5V LED (5) blinks	< 11,5V permanent alarm
Fuel quantity	0 – 10,5Ltrs	< 2,5Ltrs LCD blinks	< 2,5Ltrs permanent alarm
Elapsed time counter	Counts above 2000 rpm		
Electric fuel pump	Runs under certain conditions, see above		
Prop brake open and engine not fully extended	LCD displays: “EXTRACT”	LED (7) blinks	Pulsed alarm
Running time of jackscrew	LCD displays: “SWITCH R” or “SWITCH E”	> 20s LED (7) blinks	> 20s Permanent alarm
Circuit breaker of jackscrew dis-engaged	LCD displays: “FUSE”	LED (7) blinks	Permanent alarm
Missing signal of fuel sensor	LCD displays: “INS_TANK”	LED (7) blinks	Permanent alarm

Rear-view mirror

A rear-view mirror in the cockpit is necessary to check the correct position of the propeller before retracting the power-plant.

7.13 Fuel System

Fig. 7.13-1 Overview of the fuel system:



The fuel system consists of a fuselage tank for 10,5Ltrs (2,77 US Gal.), lasting for approximately 1 hour of powered flight. The fuel tank is located between headrest and spar stubs and can be removed for rigging and refuelling.

In the left fuselage side there are a sediment bowl, the electric fuel pump, and the fuel cock. The sediment bowl is connected to the drainer below the left landing gear door. The tank ventilation also ends there. The electric fuel pump runs automatically, when the engine is started.

Removing the Fuel Tank

Behind the backrest, there is a clamp at the sidewall, where the hose couplings are affixed. Free the hoses from this clamp. Pull both locking pins, which secure the fuel tank and pull the tank so that the pins do not snap back any more. Grab the fuel tank at its handle and pull it out.

The hoses are long enough, so that it can be laid onto the seat pan or can be hooked to the canopy frame.

Reintegrating the Fuel Tank

Place the tank onto the plane in the centre of the tank compartment. Grab the heads of the locking pins, pull them and push the tank into its position.

Do not forget to reconnect the hoses again, if they were separated. Take care that there are no kinks in the lines.

Refuelling

With a funnel, the glider can be refuelled without removing the fuel tank. The tank can also be hooked to the canopy frame and be filled with a funnel. But it is also possible to disconnect the fuel and ventilation hose and take the tank to the fuel station.

The couplings automatically close when they are separated. The hoses are long enough, so that single drops can comfortably be caught with a piece of cloth.

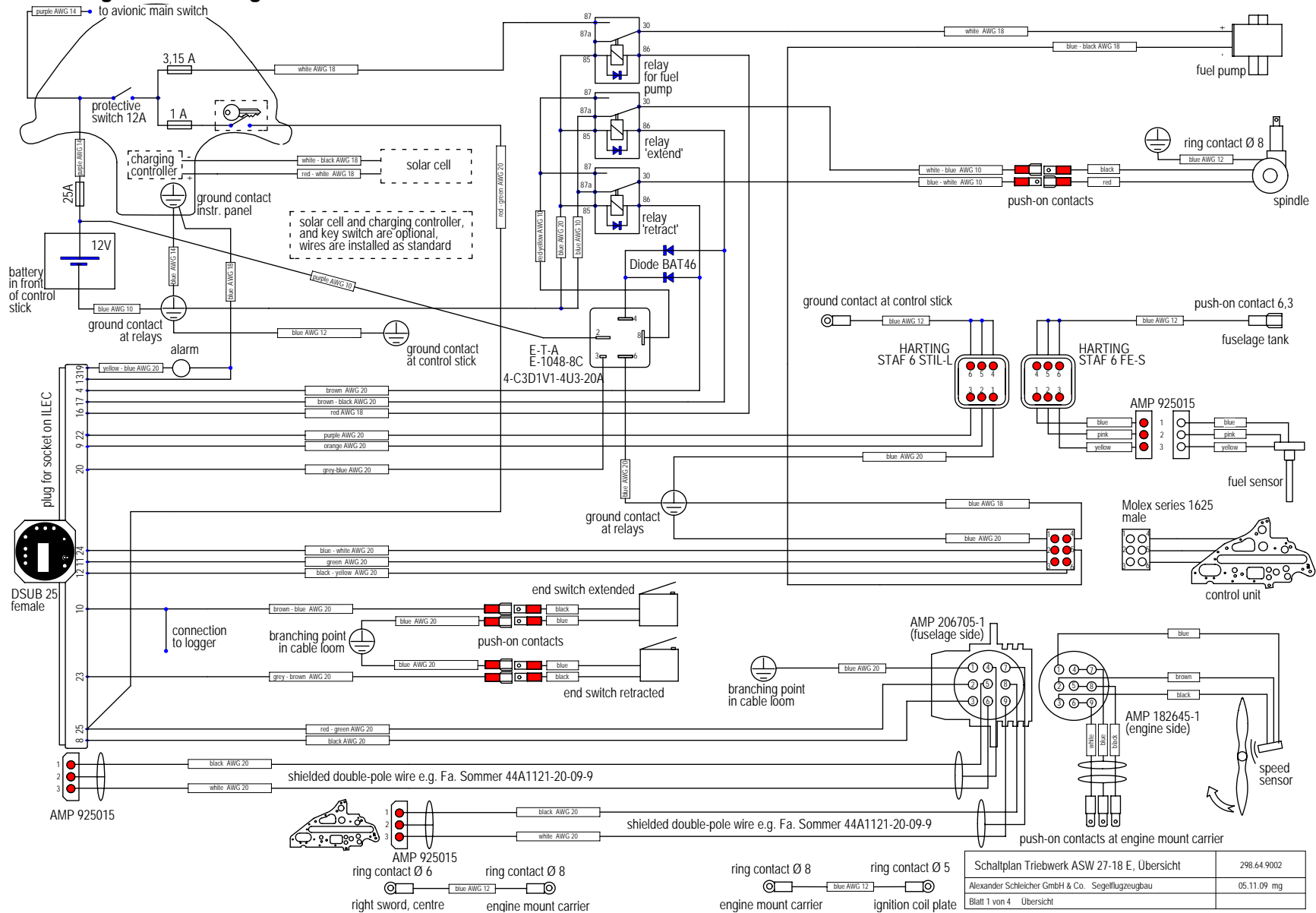
7.14 Electrical System of the Power-plant

The electrical system of the power-plant is fed by a 12V-battery located below the seat-pan between aero-towing-hook and control-column. A 25A fuse is located immediately at the battery. This battery supplies the power-plant system (via the main switch) and it can be selected for the avionics with the avionic main switch.

The supply of the jackscrew branches off directly from the power-plant battery. The electric line and the jackscrew are protected by an automatic circuit breaker. This circuit breaker is located at the relays under the seatpan, and it is remote controlled by the power-plant instrument.

When the circuit breaker disconnects, the red light (7) blinks, an alarm sound sets in, and the word "FUSE" appears on the display (1). The alarm can be acknowledged with button (9). If the power-plant lever is on position **EXTEND** or **RETRACT** – the power-plant instrument will then also try to reset the circuit breaker and to restart the jackscrew.

Fig. 2.13.1-2 Engine Circuit Diagram



Schaltplan Triebwerk ASW 27-18 E, Übersicht	298.64.9002
Alexander Schleicher GmbH & Co. Segelflugzeugbau	05.11.09 mg
Blatt 1 von 4 Übersicht	