

## Betriebs- und Rüstanleitung Me 109 mit Motor DB601, Messerschmitt AG

This is more of a technical instruction, with just the bare minimum of information on flying the aircraft. Just about better than nothing. Use this as a kind primer on the early 109s – some later – more flying oriented documents – should be consulted.

(....)

**h. Starting the engine**

1. Close canopy (Canopy lever is position „closed“). Open right side canopy window.
2. Landing gear switch in position „Rest“ (locked).
3. Switch on electric master switch (right side button behind the pilot seat)
4. Switch fuel cock lever (Brandhahnhebel) to open
5. Set throttle to „idle“. Change fuel tank pressure selector to „Tank entlüftet“ (bleed ?)
6. Use fuel pump to increase pressure to at least 0.5 atue (Fuel pressure)
7. Have the inertia starter wound up; the crank handle is in the baggage compartment, the shaft is at the right top side. (of the engine cowling)
8. Prime the engine pushing the Fuel Injection Pump with two or three pushes (four or five pushes in cold weather). With a warmed up engine use only one or two pushes.
9. After removing the starter crank, put key into into ignition lock and switch to „M1 and M2“ (magnetos)
10. Pull and hold the grip for ignition control (Zündverstellung); This grip cannot be locked.
11. Pull ignition grip
12. After the engine starts let go on both grips.
13. Check the oil pressure: With a cold engine, the pressure should rise between 6 and 8 atue within three to five seconds; if not stop the engine immediately.
14. Fasten the crank handle in the baggage compartment. Move off the wing to the rear. Do not step on the flaps.

If the engine does not start: Wait a few minutes before reattempting to start the engine.

CAUTION ! Do not try tu turn the air screw ! Live hazard !

**i. Warming up the engine:**

1. Open radiator flaps as required (crank is located right side of pilot seat); the position indicator for the radiator flaps position is located on the wing (indicator down: Flaps open)
2. In cold weather, close the oil cooler shutter (lever to the left of the pilot seat)
3. After the engine has started, increase engine rpm, when the oil pressure starts to fall off, until engine rpm has reached 1000 rpm. The oil pressure should be kept between 5 and 6 atue during the process.

Checks while warming up:

1. Check the ignition system, by turning the ignition key into different positions at various rpm (checking the magnetos in RAF parlance). Check for smooth running of the engine.
2. Check the fuel pump at about 1400 rpm: Switch the fuel cock for 30 seconds into position „P1“ and „P2“ each and watch out for large changes of fuel pressure and a rough running engine.

Check the electrical system at about 1900 rpm: Turn the master switch to „off“ (main panel), switch on electrical systems (switchboard top right). After the check, switch of the individual systems and re-engage the electrical system (Bordnetz) – button behind the pilot seat.

(„j“ omitted for clarity as in many German documents of the time.)

**k. Engine run-up check (Abbremsen des Motors)**

A full power engine check is required only if more than two hours have elapsed between flights. Caution ! Trim the aircraft elevator to full nose up (schwanzlastig), turn the the aircraft into the wind fully. If possible, weight down the tail of the aircraft.

1. Make sure the canopy is closed and secured.
2. Change the prop pitch setting to the 12 o'clock position.
3. Open the radiator flaps. Leave the oil radiator shutter closed at lower oil temperatures.
4. Run-up the engine if a minimum of 30 deg. C of is reached at the oil-inlet side (press button of the instrument) and a maximum of 80 deg C of coolant temperature is not exceeded at commencement of test.
5. Pull the stick fully back and hold it there.
6. Push the power lever forward evenly.
7. Read the instrument indications.

Expected instrument readings at full power:

RPM for 12 o'clock prop setting – 2200 to 2250 RPM

Boost (Manifold pressure for the US chaps) – 1.35 ata

Oil pressure – 2.5 to 6 atue (normal 3.5)

Coolant temp – 94 deg C maximum

Oil temp – minimum 30 deg C

Fuel pressure – 1.1 to 1.5 atue

8. Re-check the ignition system. RPM should not vary more than 50 rpm (switching magnetos that is)
9. Take special note of the engine running smoothly.
11. Ease the throttle back smoothly.

Caution ! If the coolant temperature exceeds 94 deg C change from full power to 1100 rpm immediately, until temperature falls back.

## **I. Shutting off the engine**

1. Power lever to idle.
- 2 Cool off the engine by running the engine in idle for about 3 minutes, turn the ignition switch to „M1“ and „M2“ alternatively and then to „0“ (off). Coolant temperature should not be more than 80 deg C
3. Close fuel cock, after engine has stopped.
4. Switch off electric system.

## **II. Procedure after flight (...)**

### *The Pilot*

#### **I. Preparations for take-off**

Starting, warming up, run-up and stopping of engine: see above.

1. Close canopy (Canopy lever is position „closed“)

Caution ! Make sure, the canopy is fully secured.

Making quick Checks:

2. Fuel cock is on „tank fully bleed“ (Behälter entlüftet)
3. Radiator flaps and oil-cooler shutters in open position.
4. Electrical mains is in „on“.
5. Temperature and pressure gauges are at minimum.
6. Propeller setting is at 12 o'clock
7. Landing gear lamps show „green“ - double check with mechanical indicator.
8. Elevator trim is set to „0“ (neutral) or +1 (check the hand wheel indication – left side).
9. Under conditions of high humidity or outside temperatures lower than 0 deg C, switch on pitot-tube heater.

**II. Taxiing**

1. Flaps in neutral
3. Coolant temperature should not exceed 94 deg C .
3. For tight turns, apply power while running straight, commence turn by using brake and reduce power.

**III. Take off**

1. Apply 20 deg of flaps, use flaps wheel to your left, check outside indicator.
2. Take off (err yeah)
3. Attain the best climb speed at ground level (about 250 km/h)
4. Retract landing gear (...) and lock in retracted position. The landing gear indicator should show red lights. (...)
5. Retract flaps completely. Retrim while retracting ! (Indicator is outside the cockpit located on the left side flap). Both hand wheels (Flaps and trim) can be operated simultaneously.

Note: If the fuel pump fails, it is not possible to use the emergency full pump.

**VI. Flight****a. Limitations**

Speeds not to be exceeded  
 using flaps – 250 km/h  
 Flaps full down – 250 km/h  
 gear down – 350 km/h  
 while extending or retracting – 220 km/h  
 in a dive – 750 km/h

**b. Best rate of climb at altitude**

altitude (m) -	0	1000	2000	3000	4000	5000	6000	7000
IAS (km/h) -	250	243	236	229	222	215	208	200

Caution: If fuel pressure drops below 1 atue at higher altitudes, switch on fuel tank pressure system.

**c. Airscrew pitch settings**

Air screw pitch settings should be selected according to the table given below

**d. Operating numbers**

Engine RPM and boost

	RPM	Boost
Maximum short term	2486	1.45 ata
Cruise	2366	1.35 ata
Maximum continuous	2326	1.30 ata

Oil temperatures

Temperature	inlet	outlet maximum
Continuous	30 to 75 deg C	95 deg C
Short term	80 deg C	105 deg C

Oil pressure: Minimum 2.5 atue, maximum 6 atue

Coolant temperature: 60 deg C minimum at ground level.

Maximum temperatures at altitude:

Altitude in km	0	2	4	6	9	10
deg C	100	95	91	87	82	78

Fuel pressure: Minimum 1.1 atue, maximum 1,5 atue

#### **e. Fuel remaining in flight**

Fuel gage on the instrument panel.

Accurate indication in level flight only. After the „reserve“ warning light goes „on,“ gas reserves are down to about 10 minutes flight at cruise speeds.

#### **f. Radiator flaps**

At normal outside temperature conditions, radiator flaps are supposed to be set at half open. If the prescribed coolant temperatures start to drop, close the flaps accordingly.

After changing the radiator flap settings, re trimming of the airplane is required.

Note: The speed of the aircraft depends on the setting of the radiator flaps. To reach the maximum speeds, make sure the radiator flaps are set to not exceed the maximum permissible temperatures.

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### **V. Landing**

1. Reduce speed to 220 km/h IAS
  2. Select the 12 o'clock setting for propeller pitch
  3. Extend landing gear. (...) You will get an aural warning, if flaps are extended when the gear is not extended
  4. Extend flaps to the full down position (40 deg). Retrim the aircraft ! Both handwheels can be operated – to some extent – simultaneously. While extending the flaps, the warning horn is not suppose to keep sounding. Else the landing gear is not fully extended.
- Caution ! Remember the maximum speed of 250 km/h with extended flaps.
- Approach speed is about 150 km/h IAS. At this speed the airplane is in a very pronounced nose down attitude with a steep glide angle. At a less steep glide, like in the flare or when cutting power, the aircraft will loose airspeed very fast. (..)

### **VI. Special Flight conditions**

#### **a. Diving**

1. Trim the aircraft to such extend, that it can be held in the dive by light forward pressure This attitude can be attained, by trimming the aircraft from the cruise speed setting by ½ deg of tail-heavy trim. If the forward pressure on the stick lessens during the dive, stop the dive immediately.
2. Cut power to idle.
3. Make sure, Oil- and Coolant temperatures will not go below 40 deg C. Close radiator flaps as required.
4. Set airscrew to 9.30 o'clock

(...)