

Flight Manual DG-1000M

Warnings and hints

- All motorgliders are very complex technical devices. If you don't use yours as it is intended and within the certified operating limitations or if you fail to carry out proper maintenance work, it may harm your health or place your life in danger.
- Prior to flying the aircraft read all manuals carefully and regard especially all warnings, caution remarks and notes given in the manuals.
- Never take-off without executing a serious pre-flight inspection according to the flight manual!
- Always respect the relevant safety altitudes!
- Respect the stall speeds and always fly with a safety margin above the stall speed according to the flight conditions, especially at low altitudes and in the mountains.
- Use only the battery chargers as specified in the flight manual.
- Don't execute yourself any work on the control system except for greasing.
- Repairs and maintenance work should only be accomplished by the manufacturer or at certified repair stations rated for this type of work. A list of stations which have experience with DG aircraft may be obtained from DG Flugzeugbau.

In the U.S., a properly certificated individual may also perform repairs and maintenance work.

- Even if no annual inspections are required in your country, have your aircraft checked annually, see maintenance manual section 2.
- Please pay attention to our web-site www.dg-flugzeugbau.de. There you will find the latest technical notes and service information for your glider: <http://www.dg-flugzeugbau.de/en/maintenance-service-aircraft/technical-notes>

The „DG Pilot Info“ informs you immediately by e-mail about the publication of new technical notes and service information.

If you don't receive this info service, please click on the DG website on “News, Newsletter” Subscription to receive this service free of charge.

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0 Revisions

0.1 Record of revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved sections endorsed by the responsible airworthiness authority.

The new or amended text in the revised page will be indicated by a black vertical line in the right hand margin, and the under lying document for the revision and the date will be shown on the bottom of the page.

Rev. No.	Affected Pages/section	Description	Issue Date	EASA Approval Date	Inserted Date Signature
1	Title, 0.1, 0.2, 0.4÷0.7, 1.5, 2.5, 2.7, 2.10, 2.11, 2.13, 2.14, 3.2, 4.7, 4.9 ÷4.11, 4.14, 4.15, 4.21, 4.24, 4.29, 4.33, 5.1, 5.4 ÷ 5.12, 6.1 ÷ 6.3, 6.5, 6.7, 6.9 ÷ 6.15, 7.2, 7.6, 7.9, 7.12, 7.25 ÷ 7.28, 7.30, 8.3	Manual revision TN1000/22	October 2012	10. Dec. 2012	
2	0.2, 0.4 ÷ 0.6, 2.5, 2.6, 4.33, 7.19, 7.30	Manual revision TN1000/23	July 2014	7 August 2014	
3	0.2, 0.4, 0.5, 4.15	Manual revision TN1000/27	July 2015	10. August 2015	
4	0.1, 0.2, 0.4-0.6, 2.14, 4.10, 4.11, 4.12, 4.16, 6.6, 7.2, 7.30	Manual revision TN1000/32	July 2017	10.08.2017	

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0.2 List of effective pages

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0	Title	October 2010	October 2012		
	0.1	see manual amendments			
	0.2	"			
	0.3	"			
	0.4	"			
	0.5	"			
	0.6	"			
	0.7	"			
	0.8	October 2010			
1	1.1	October 2010			
	1.2	March 2011			
	1.3	October 2010			
	1.4	October 2010			
	1.5	October 2010	October 2012		
	1.6	October 2010			
2	EASA-app.	2.1	October 2010		
	"	2.2	October 2010		
	"	2.3	October 2010		
	"	2.4	October 2010		
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2.20 Limitations placards

DG Flugzeugbau GmbH		
Type: DG – 1000M	Serial No.:	10- M
Year of construction:		
Maximum airspeeds	km/h	kts.
Winch launching	150	81
Aero-tow	185	100
Manoeuvring V_A	185	100
Rough air	185	100
Maximum speed V_{NE}	270	146
Powerplant extended	185	100
Powerplant extension-retraction	100	54
Approved aerobatic manoeuvres, approved up to a max. mass of 683 kg /1506 lbs:		
<i>Pos. Loop, Chandelle, Spin, Stall turn</i>		
Maximum mass: 790 kg /1742 lbs.		

Other cockpit placards
see section 7

Gepäck max. 15 kg
baggage max. 33 lbs.

Sollbruchstelle 10000 N
rated load 2200 lbs.

Reifendruck 4 bar
Tyre pressure 58 psi

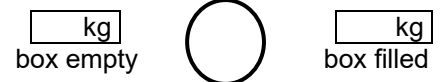
Tail wheel

Reifendruck 3 bar
Tyre pressure 43.5 psi

Main wheel

Ballast box in the fin

Min. load in the front seat



At the control-light in the front instrument panel

Warning:

Rigging of the horizontal tailplane is only permitted with nose down trim-setting!

at the upper left hand side of the fin

LG ext.-retr. up to 185 km/h 100 kts.

Below the controls and control lights for the electrically operated landing gear

Benzin min. 95 Okt. 50:1 **Zweitaktöl 40 I**
petrol min. 95 ROZ. two stroke oil

On top of main bulkhead left hand side and at fuel filler (Option)

Loading chart					
Cockpit load	front seat		rear seat		(Parachute included)
maximum	110 kg	242 lbs.	90 kg	198 lbs.	
or maximum	105 kg	231 lbs.	105 kg	231 lbs.	
minimum	kg	lbs.	/	/	without fin battery
minimum	kg	lbs.	/	/	With fin battery

With lower pilot weight necessary ballast must be added.
Warnung: Um die vordere Schwerpunktlage einzuhalten, dürfen schwere Piloten die DG-1000M doppelsitzig nur betreiben, wenn Sie die Masse von vorderem und hinterem Piloten siehe FHB Abschnitt 6.8.7 austrimmen.

Pre-flight Check

1. Lead ballast (for under weight pilot)?
 2. Parachute worn properly?
 3. Safety harness buckled?
 4. Front seat: pedals adjusted?
Rear seat: seating height adjusted?
 5. All controls and knobs in reach?
 6. Altimeter?
 7. Dive brakes cycled and locked?
 8. Positive control check ? (One person at the control surfaces).
 9. Trim ballast box in the fin, correct amount filled in?
Locking device completely engaged?
 10. Battery in the fin? Loading chart regarded?
 11. Trim?
- In addition for self launching
12. Fuel level?
 13. Fuel cock open?
 14. Canopy open, propeller circle clear?
 15. After engine start close and lock both canopies.
 16. Check max. engine RPM, min. 5900RPM.
 17. Check both ignition circuits (4000 RPM)
 18. Check emergency system (4000 RPM)
 19. Runway free?

Altitude in [m]	0-3000	4000	5000	6000	7000	8000
V_{NE} IAS km/h	270	256	243	230	217	205
Altitude in [ft]	0-10000	13000	16000	20000	23000	26000
V_{NE} IAS kts.	146	138	131	124	117	111

Note: Engine limitations are printed on the DEI-NT (see section 7.4).

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- l) Check the extension-retraction mechanism by operating it in both directions. The extension time should not exceed 10 seconds!
Extend the engine halfway;
 - m) Check the brake fluid level, the reservoir is located left hand side above and behind the main-spar connection;
 - n) Check the fuel level by the DEI-NT.
3. C.G. Tow hook:-
- a) Check the ring muzzle of the C.G. hook for wear and function;
 - b) Check for cleanliness and corrosion;
4. Main landing gear
- a) Check the struts, the gear box, the gear doors and the tyre for wear; dirt in the struts can hinder the landing gear from locking over centre the next time!;
Check the tyre pressure: 3.0 bar – 43.5 psi;
 - b) Check wheel brake and hose for wear and function;
5. Left wing:-
- a) Check locking of the outboard wing;
 - b) Check the aileron for excessive free play;
 - c) Check airbrake- and box and control rod for wear and free play. It must be possible to retract the airbrake, even if it is pressed backwards in direction of flight. If there is any water in the airbrake box this has to be removed;
 - d) Check the locking of the rear wing attachment pin.
6. Powerplant
- Extend the powerplant via the manual switch (ignition off)
- a) Check the connection of spindle drive and gas strut to engine and fuselage. To accomplish this extend the engine only so far, that you still can see the connection to the engine mount. Check especially for cracks in the spindle drive fork.
 - b) Check both bolts of the front engine mount, these bolts are responsible for the correct drive belt tension;
- Note:** The rear bolt takes over the loads of the drive belts, the front bolt acts as securing device in case the rear bolt fails.
- c) Check V-belts for wear and correct tension, sudden loss of tension indicates damage of the bolt see item b);
 - d) Check ignition system incl. wires and the spark plug connectors for tight fit
 - e) Fully extend the powerplant;
 - f) Check the propeller mount for cracks, especially at the welding seams.

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- g) Check all screwed connections and their securing;
 - h) Check the propeller stopper
 - i) Check the rear engine suspension (lower side of engine);
 - j) Check engine retaining cable and its connections in the engine compartment and at the engine;
 - k) Check function of throttle operation;
 - l) Check fuel lines, electrical wires, Bowden cables and structural parts for wear and kinks.
 - m) Check exhaust muffler, propeller mount, radiator, coolant pump and accessories for tight fit and any cracking.
Check especially the rubber mounts of the radiator.
 - n) Check especially the cable which lifts the muffler during engine extension.
 - o) To check the water pump and the fuel pump of the normal system, switch on the ignition. You should hear a buzz. After some seconds as soon as fuel pressure is built up, the fuel pump should stop running;
 - p) Apply strong pressure to the propeller mount in forward, backward and sideways directions to check the rubber engine mounts;
Check the rubber buffer which limits the tilt of the engine against the drive mount due to the engine torque.
 - q) Visual check of the propeller
 - r) Turn the propeller 1 revolution by hand and listen for abnormal sounds which may indicate engine damage
 - s) Drain condensed water from the fuel tank. The drainer is located in the main wheel box on the rear wall on the right hand side.
 - t) Check the outlet of the fuel tank ventline for cleanliness, the outlet is located behind the landing gear box;
 - u) Check the coolant level in the radiator by removing the radiator screw cap. Press down on cap for easier handling. The radiator must be filled up to approx. 25mm (1 in.) below its top.
 - v) Check the coolant hoses visually for leaks and any defects of the outer surface.
7. Tail wheel:-
Check for wear, free play and excessive dirt in the wheel box. Remove excessive dirt prior to take off;
Check tyre pressure: 4 bar -58 psi;
8. Rear end of the fuselage:-
Check the lower rudder hinge and the connection of the rudder cables for wear, free play and correct securing;
Check the bulkhead and fin trailing edge shear web for cracks and delamination;

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9. Fin - horizontal tail:-

- a) Check the upper rudder hinge for wear and free play;
- b) Check the elevator for free play and correct control hook-up , look from the rear into the gap at the right hand side of the rudder;
- c) Check the securing of the stabilizer;
- d) Check the horizontal tail for free play;
- e) Check the TE or Multiprobe for correct insertion and fix it with tape
- f) Check the trim-weight box, correct number of weights, locking device completely engaged, cover plate secured with tape?
- g) Check if a fin battery is installed: If the ends of the locking bow are visible on both sides in the fairings at the upper end of the fin this is the indication that no battery is installed.

Caution: When changing the trim ballast check condition and correct gluing of the foam rubber rings to the mounting plate of the optical sensors in the trim-weight box. Without rings an indication error of the control lamp in the front instrument panel might occur. Replace missing rings according to Service Info 67-07(attached to the maintenance manual).

10.Right wing see item 5.

11.Fuselage nose

- a) Check the ports for the static pressure and the pitot pressure and for the PC pressure (at the lower fuselage side) for cleanliness.
- b) If the motorglider was parked in rain, you have to empty the static ports by sucking out the water at the ports.
- c) Check the nose hook for cleanliness and corrosion.

4.5.2 Engine starting, taxiing procedures

4.5.2.1 Engine starting on the ground

- a. Check if the fuel cock is open.
- b. Master switch on.
- c. Extend the powerplant:

There are two methods:

1. Extension via the manual switch which is located on the instrument panel. Hold the manual switch up until the extension procedure stops. The powerplant will be raised to its operating position. If you release the switch during the procedure the switch jumps back to the centre position and the extension stops.
2. Switch on the ignition switch in the DEI-NT (the toggle has to be pulled out for switching). The engine will be raised to its operating position automatically. Switch off the ignition, press the manual switch up to switch off the automatic system, otherwise the engine will immediately be retracted automatically.

Warning: When extending the engine via the ignition switch the starter motor may start cranking the engine in case the starter switch got stuck. Caution at the propeller.

- d) Prior to the first engine start of the day turn the propeller min. 1 rotation by hand.
- e) Extend the airbrakes and engage the parking brake.
- f) Switch on the ignition in the DEI-NT, the engine will be extended automatically to its operating position, unless it's already in this position.
- g) Throttle in idle position.
- h) Check that the propeller circle is clear.
- i) Push the starter button until the engine runs.

Thanks to the electronic fuel injection the correct amount of fuel will be delivered to the engine. No further action by the pilot is necessary.

Caution: Operating the starter motor is only possible with a battery voltage higher than 11V prior to the starting attempt, see section 8.8 item 2..

- j) As soon as the engine fires move the throttle slowly forward until the engine runs smoothly.
- k) Adjust the engine RPM to approx. 4000 and check the ignition circuits (magnetos), but not before the engine runs smoothly. A max. drop of 300 RPM is permissible. Do not check longer than for 5 seconds per circuit, otherwise a failure message will appear.
- l) With engine RPM approx. 4000 switch over to the emergency system.. A short RPM drop will occur, thereafter the engine should run with approx. the same RPM as with the normal system.
- m) Switch over to the normal system again.

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Warning: When flying solo the ballast box must be emptied, except see section 6.8.7.2! Otherwise you will fly with a dangerous C.G. position.

If the ballast box is filled up, the min. cockpit load in the front seat is raised by 35 kg (77 lbs.).

The resulting value (min. cockpit load in front seat from weighing without ballast + 35 kg) must be entered in the table on page 6.7 as value XX and also on the placard at the indication lights for the fin tank on the front instrument panel.

6.8.7.2 Trim-possibility for heavy pilots:

The ballast box may be used for this purpose too.

One trim weight of 1.2 kg raises the min. load in the front seat by 3.5 kg (7.7 lbs.).

One trim weight of 2.4 kg raises the min. load in the front seat by 7 kg (15.4 lbs.).

Example for combination of 6.8.7.1 and 6.8.7.2

(1 kg= 2.2046 lbs):

Min. cockpit load of the glider:	70 kg	permissible amount of trim weights
Mass of the front pilot:	84 kg	2 x 2.4 kg
Mass of the rear pilot:	65 kg	3 x 2.4 kg or 2 x 2,4 kg and 2 x 1,2 kg
Total amount of trim ballast:		12 kg

This means that the ballast box can be filled completely for this example. Higher pilot masses can't be compensated.

Caution: Heavy pilots when flying the DG-1000M two-seated must compensate the mass of the front and the rear pilot.

Don't exceed the max. mass of 790 kg (1742 lbs.).

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7.1 Introduction

This section provides description and operating of the motorglider and its systems.

M.M. = Maintenance manual

Refer to section 9 "Supplements" for details of optional systems and equipment.

7.2 Airframe

The DG-1000M is a two-place high performance motorglider with 20 m span and permanently installed winglets

Construction

Wings	CFRP-foam-sandwich-shell with CFRP-roving spar caps
ailerons	CFRP-foam-sandwich-shell
Rudder	GFRP-foam sandwich-shell
Horizontal stabilizer	GFRP-foam sandwich-shell with CFRP-roving spar caps
Elevator	GFRP-shell
Fuselage	GFRP-shell, fuselage boom sandwich-shell with Tubus core, Carbonfibre reinforcement in engine bay area

Canopy

Two canopies hinged at the right hand fuselage side.

Canopy transparencies made from Plexiglas clear GS 241 or optionally green GS Green 2942.

Tailplane

T-Tail with conventional stabilizer-elevator and spring trim.

Colours

Airframe: white
registration numbers: grey RAL 7001 (Pantone 444)
or red RAL 3020 (Pantone 485)
or blue RAL 5010 (Pantone 301)
or blue RAL 5012 (Pantone 307)
or green RAL 6001 (Pantone 349)
or similar colours

7.17.5 Battery in the baggage compartment with battery selector switch

An additional battery Z73/4 (sealed lead acid) or Z73/3 (LiFePO) with holder Z72 or Z01/7 (sealed lead acid) or Z01/5 (LiFePO) with holder Z200 (both batteries are available in) may be installed in the baggage compartment.

In this case a battery selector switch must be installed in the front instrument panel.

Selector positions:

up = internal battery centre position = off down = additional batteries
Preferably the gliding computers and loggers shall be connected to this switch.

The battery fuse is installed at the battery, type: G fuse G 250 V 5 x 20 / 4 A fast.

Caution: It is not permissible to operate a LiFePO type battery in an electric circuit together with other batteries. Therefore you have to install at a suitable place in the cockpit a further selector switch to switch over from LiFePO battery to another battery or to the fin battery. This switch incl. wiring is included in the wiring plan 10E202 from issue h on (in aircraft log) named auxiliary battery selector.

7.17.6 Battery in the fin

A battery may be installed in the fin.

Section 4.2.5 and the loading chart see section 6.8.4 must be regarded.

Only the use of the factory supplied battery Z110 (12 V, min. 12 Ah, mass 5.5 kg (12.1 lbs.) is permitted.

The battery fuse is installed at the battery, type: G fuse G 250 V 5 x 20 / 4 A fast.

The wiring for this battery is in parallel to the battery in the baggage compartment.

7.17.7 Radio installation with automatic commutation

If the factory approved radio installation set is installed, the radio will be switched automatically from "normal" mode to "engine on" mode with the engine extended. With "normal mode" only the goose neck microphones are working.

With "engine on" mode the intercom system is working. Only the microphones of the headsets are working.

The loudspeaker and the speakers of the headsets are working together in both modes.

Note: Some modern radios (e.g. Becker AR 6201) enable operation of headsets with standard microphones together with the gooseneck-microphones which are equipped with dynamic microphones.

To use headsets with standard microphones one V-adaptor 10E109 must be installed per headset. In gliding mode the standard microphones of the headsets will not be switched off.