DG Aviation GmbH

FLIGHTMANUAL FOR THE SAILPLANE

DG-1000S

Type: DG-1000
Variant: DG-1000S
Data Sheet No.: LBA 413, EASA.A.072
Date of Issue: March 2002



Owner:

Ser. No.:

Registration:

Pages as indicated by "App." are approved by:
(Signature)

(Authority)

(Stamp)

(Original date of approval) - 07. MRZ. 2002 -

This sailplane is to be operated in compliance with information and limitations contained herein.

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DG Aviation
Otto Lilienthalweg 2
76646 Bruchsal
www.dg-aviation.de
Spare part- and material sales:

Telefon (07251) 3020-0
Telefax (07251) 3020-200
info@dg-aviation.de
Tel. 07251/3020-270
spareparts@dg-aviation.de

Warnings

- All sailplanes 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 Aviation.
- 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-aviation.de/en. There you will find the latest technical notes and service information for your glider: Home/ Service/ Technical Documentation
  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 send a mail to info@dg-aviation.de with subject "DG Newsletter please" to receive this service free of charge.

Rev. No.	Affected Pages/ section	Description	Issue Date	EASA Approval Date
18	0.2a, 0.4, 0.5, 4.8, 7.1, 7.13	TN1000/42 Canopy lock, rear locking rods	July 2019	17.09.2019
19	0.2a, 0.5, 9.1, 9.2, 9.16-9.18	Manual rudder control TN1000/36 Revision 2	May 2020	approval under the authority of DOA Ref. EASA.21J.530 4.06.2020
20	Title, 0.0, 0.2a, 0.3, 0.4, 1.2, 1.4 - 1.6, 2.5, 2.12, 4.3, 5.4, 6.3, 6.9	TN1000/45 Manual revision, raised max. TOW, optional 20 m wing tips with neo Winglets	October 2021	8th June 2022

0.2 List of effective pages

Section		page	issued	replaced	replaced	replaced
		Title	March 2002	Oct. 2021		
0		0.0	March 2002	Oct. 2021		
		0.1	see manual amendments			
		0.2		"		
		0.2a		"		
		0.3		"		
		0.4		"		
		0.5		"		
		0.6	March 2002			
1		1.1	"			
		1.2	"	Oct. 2021		
		1.3	"			
		1.4	"	Febr. 2011	Febr. 2016	Oct. 2021
		1.5	"	Febr. 2011	Oct. 2014	Febr. 2016
				Oct. 2021		
		1.6	"	Febr. 2016	Oct. 2021	
2	App.	2.1	March 2002	Sept. 2003		
	"	2.2	"			
	"	2.3	"			
	"	2.4	"			
	"	2.5	"	May 2008	Oct. 2021	
	"	2.6	"	Febr. 2016		
	"	2.7	"	January 2005	Oct. 2014	Dec. 2018
				May 2019		
	"	2.8	"	Febr. 2016		
	"	2.9	"	Sept. 2003	May 2008	Oct. 2014
			Febr. 2011			
	"	2.10	"	Febr. 2011		
	"	2.11	"	Sept. 2003		
	"	2.12	"	May 2004	May 2008	Febr. 2016
				Dec. 2018	May 2019	Oct. 2021
3	"	3.1	March 2002			
	"	3.2	"	May 2004	Oct. 2004	
	"	3.3	"			
	"	3.4	"			
	"	3.5	"	January 2005		
4	"	4.1	March 2002	January 2005		
	"	4.2	"			
	"	4.3	"	May 2004	Febr. 2011	Febr. 2016
				Oct. 2021		
	"	4.4	"			

0.2 List of effective pages (cont.)

Section		Page	issued	replaced	replaced	replaced
4	App.	4.5	March 2002	Sept. 2003	June 2004	
			Febr. 2011			
	"	4.6	"	Febr. 2011	Oct. 2014	Febr. 2016
		4.7		July 2019		
	"	4.8	"	Febr. 2011	Oct. 2014	July 2019
	"	4.9	"	Febr. 2008	Febr. 2011	
	"	4.10	"			
	"	4.11	"			
	"	4.12	"	Febr. 2011		
	"	4.13	"	Febr. 2008	Febr. 2016	
	"	4.14	"			
	"	4.15	"			
	"	4.16	"			
	"	4.17	"	January 2005		
	"	4.18	"	Oct. 2014		
	"	4.19	"			
	"	4.20	"			
	"	4.21	"	Febr. 2016		
	"	4.22	"			
	"	4.23	"			
	"	4.24	"			
5	"	5.1	March 2002			
	"	5.2	"	Oct. 2014		
	"	5.3	"			
	"	5.4	"	Sept. 2003	Oct. 2014	Febr. 2016
				Oct. 2021		
	App.	5.5	"	Febr. 2016		
		5.6	"			
		5.7	"			
6		6.1	March 2002			
		6.2	"			
		6.3	"	Sept. 2003	Febr. 2011	Oct. 2021
		6.4	"	Febr. 2011	Oct. 2014	Dec. 2018
				May 2019		
		6.5	"	Sept. 2003	Febr. 2011	May 2019
		6.6	"	Febr. 2011	Dec. 2018	
		6.7	"	Oct. 2014	May 2019	
		6.8	"	May 2019		
		6.9	"	Oct. 2021		
		6.10	"	Sept. 2003		
		6.11	"	Febr. 2011		

1.1 Introduction

The sailplane flight manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the DG-1000S glider.

This manual includes the material required to be furnished to the pilot by JAR Part 22. It also contains supplemental data supplied by the glider manufacturer.

1.2 Certification basis

This type of sailplane has been approved by the Luftfahrt-Bundesamt (LBA) in accordance with:

Airworthiness requirements:
JAR Part 22 „*Sailplanes and powered sailplanes*“, change 5, issued 28th October 1995.

The Type Certificate No. 413 has been issued on March 12. 2002.

Category of Airworthiness: "Utility" or
„Aerobatic“ with 18m span only without winglets and with 17,2 m span both without waterballast and if the required equipment is installed.

1.4 Descriptive data

The DG-1000S is a two-place high performance sailplane for training and cross country flying and in addition for aerobatic training.

The wings of the DG-1000S are made of carbon fibre reinforced plastics with a parting at y= 8,6m, there are four types of wing tips available with different spans:

A) Wing elongations with 20 m span with winglets **up to ser. No. 10-275**
B) Wing tips with 18 m span without winglets
C) Wing tips with 18 m span with winglets
D) End plates for 17,2 m span
E) Wing elongations with 20 m span with neo Winglets, **from ser. No. 10-276 on** only these elongations will be delivered instead of A)

Note: The wing tips with neo Winglets may be retrofitted to earlier ser. No.s.:

- Automatic hook ups for all controls.
- Comfortable seating and modern cockpit design similar to the DG-single-seaters - safety cockpit.
- Large 2 piece canopy for very good in-flight vision.
- Draught free canopy demist and 1 adjustable swivel air vent for each pilot.
- Sealed airbrake and landing gear boxes.
- Controls in each cockpit.
- All controls are operated with the left hand, which enables the right hand to remain on the control stick.

The DG-1000S is available with 3 different versions of the undercarriage:

A) Very high spring mounted retractable main wheel with disc-brake, tail wheel.
B) High spring mounted retractable main wheel with disc-brake, tail wheel and nose wheel
C) Fixed spring mounted main wheel with disc-brake, tail wheel and nose wheel.
   The main undercarriages versions B and C are interchangeable.

Other characteristics:

Waterballast in the wings and in the fin are optional with 18m span and standard with 20m span.

Standard: A ballast-box is installed in the fin. It can be used to compensate the mass of the rear pilot and as a trim-possibility for heavy pilots.
Max. ballast capacity: 12 kg.

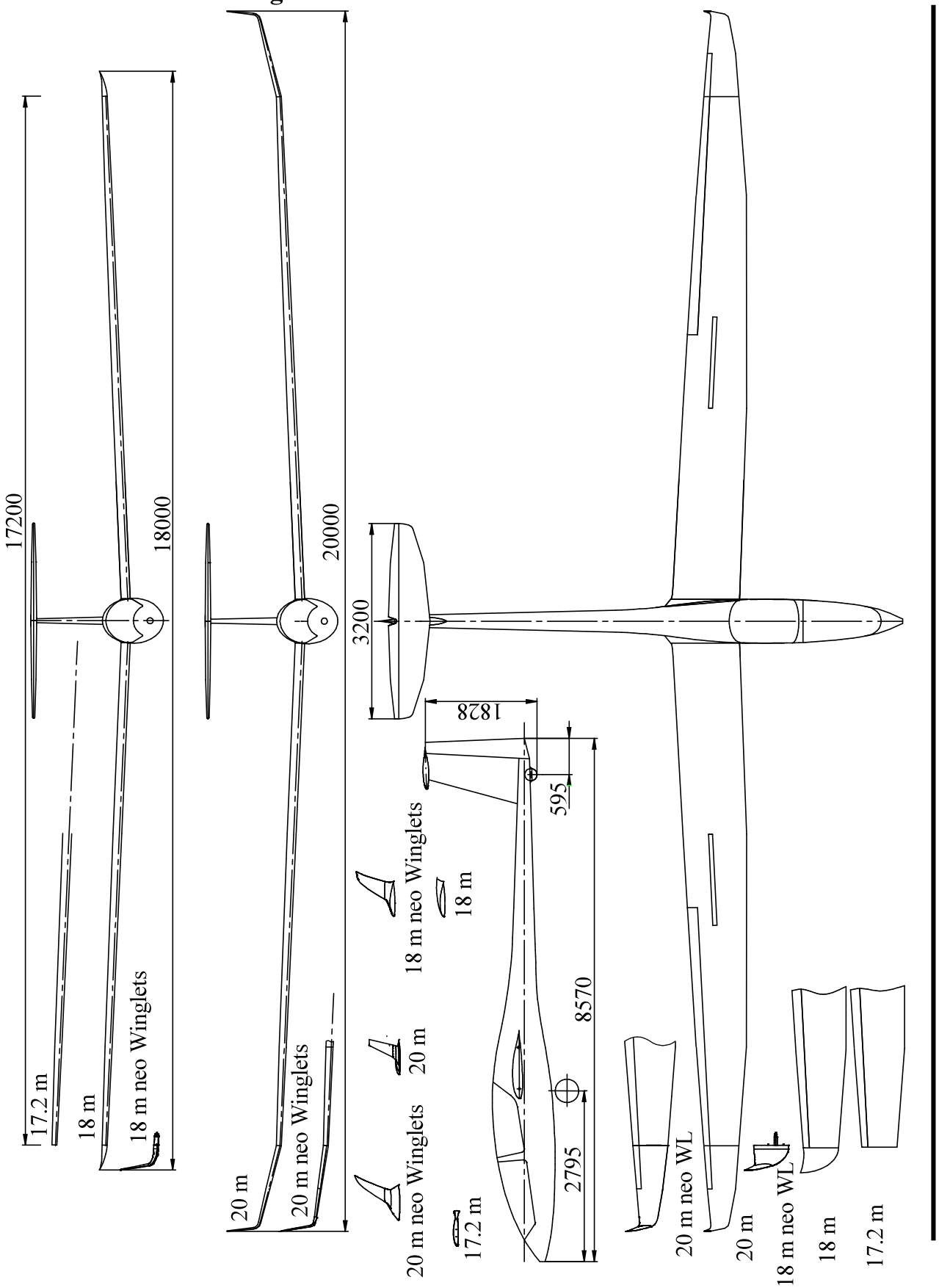
Option: 2 ballast boxes in the front cockpit. The trim-weights used for the trim-ballast box in the fin also fit into these ballast boxes.

Technical data

Span	m	17,2	18	20
Wing area	m^2	16,3	16,72	17,53
Aspect ratio	/	18,15	19,38	22,82
Length	m		8,57	
Fuselage height	m		1,0	
Fuselage width	m		0,73	
Span of the horizontal tailplane	m		3,2	
Waterballast Wings	max. kg (l)		160	
Waterballast fin	max. kg		6,2	
Trim ballast fin	max. kg		12	
Empty mass with basic instruments*	approx. kg	407	411	415
Wing loading (with one Pilot 80kg)	approx. kg/m²	29,9	29,4	28,2
max. take off mass (max. TOW)	kg	750	750	790
max. wing loading	kg/m²	46,0	44,9	45,1
Aerobatics		unlimited Category „A“	unlimited Category „A“ (without winglets)	simple
max. TOW for aerobatics (cat. A)	kg	630	630	
max. speed	km/h	270	270	270

*Options will increase the empty mass accordingly!

1.5 three view drawing



2.4 Mass (weight)

Category A „Aerobatic“

Maximum take off weight:	630 kg	1389 lbs.
Maximum landing weight:	630 kg	1389 lbs.

Category „Utility“:
with waterballast:

Maximum take off weight with 17.2 and 18 m span:	750 kg	1653 lbs.
Maximum landing weight with 17.2 and 18 m span:	750 kg	1653 lbs.
Maximum take off weigh with 20 m span:	790 kg	1742 lbs.
Maximum landing weigh with 20 m span:	790 kg	1742 lbs.

without waterballast: Maximum take-off and landing mass = $W_{NLP} + W_{wings}$

W_{NLP} = Maximum mass of the non lifting parts (see below)

W_{wings} = actual mass of the wings

Maximum weight of the non lifting parts = 469 kg 1034 lbs.

Caution: It is recommended to dump the waterballast before landing on airfields. Dump the ballast before an outlanding in any case.

Maximum mass in baggage compartment: 15 kg 33 lbs.

Caution: Heavy pieces of baggage must be secured to the baggage compartment floor (screwing to the floor or with belts). The max. mass secured on one half of the floor (left and right of fuselage centre line) should not exceed 7,5kg (16.5 lbs.).

Ballast

1. Maximum waterballast

in the wings:	160 kg	353 lbs.
in the fin	6,2 kg	13.7 lbs.

2. Maximum mass in the trim-ballast box in the fin: 12 kg 26.5 lbs.

The max. take off mass is not to be exceeded with 1. and 2. together.

Warning: Follow the loading procedures see section 6.

2.17 Limitations placards

DG Aviation GmbH
Type: DG – 1000S Serial No.: 10- S
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

Approved aerobatic manoeuvres, only without waterballast:
Pos. Loop, Chandelle, Spin, Stall turn
In addition Category A:
Only with 17,2m or 18 m span without winglets, without water ballast:
Half loop and half roll, half roll and half loop, slow roll, inverted flight, half positive flick roll from normal flight with half loop, half negative flick roll from inverted flight
Maximum mass:

Category A	630 kg	1389 lbs.
Category U 17.2 m and 18 m span	750 kg	1653 lbs.
Category U 20 m span	790 kg	1742 lbs.
Category U without waterballast	kg	lbs.

Loading chart

Cockpit load	front seat		rear seat		(Parachute
maximum	105 kg	231 lbs.	105 kg	231 lbs.	included)
or maximum	110 kg	242 lbs.	90 kg	198 lbs.	
minimum	kg	lbs.	/	/	

The load in the front and in the rear seat may be increased to max. 110 kg (242 lbs,) per seat. To accomplish this the mass of the rear pilot must be compensated by ballast in the ballast box in the fin.
With lower pilot weight necessary ballast must be added.

Cockpit 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. Fin ballast tank emptied or correct amount filled in?
10. Trim ballast box in the fin, correct amount filled in? Locking device completely engaged?
11. Trim?
12. Both canopies locked?
13. Runway free?

limits for use of the waterballast tank

minimum ground temperature	°C	13.5	17	24	31	38
	°F	56	63	75	88	100
maximum flight altitude above GND	m	1500	2000	3000	4000	5000
	ft.	5000	6500	10000	13000	16500

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

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 2,5 bar
Tyre pressure 36 psi
Main wheel

Reifendruck 2,5 bar
Tyre pressure 36 psi
Nose wheel (if installed)

Ballast box in the fin
Min. load in the front seat
kg **box empty** **box filled** kg

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

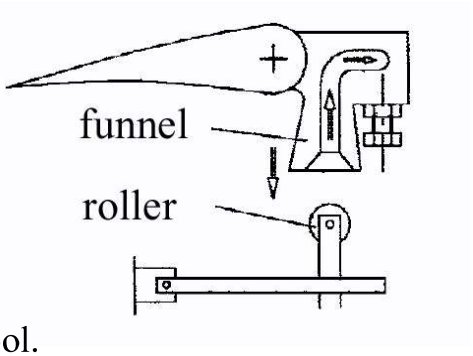
4. Rigging of the stabilizer
   Install the battery Z110 or a ballast weight of 5.5kg (12.1 lbs.) in the battery box in the fin, connect the battery. Exemption for extremely light pilots, see section 6.8.4.

Caution: Rigging of the horizontal tailplane is only permitted with **nose down** trim-setting. Therefore operate the trim release lever and push the control stick forward, then release the lever to engage the trim (don't operate the trim control knob, the trim should not be pushed to the most nose down position).

Screw the tool W 38/2 into the securing plate (near the top of the left surface of the fin). Pull out the securing plate with the tool, move it downwards to engage in the rigging position. Set the stabilizer on, so that the roller at the fuselage side push rod is inserted into the funnel at the elevator.

Watch carefully the procedure!

When the stabilizer is set down and laying on the fin, push it aft. The roller will engage and slide forward in the funnel if you hold the elevator in the pertinent position.



Release the securing device by pulling out with the tool and engage the securing device by lifting the tool. The securing plate must be flush with the surface of the fin. Screw out the tool.

Check for correct elevator connection by looking from the rear into the gap at the right hand side of the rudder.

5. Rigging of the outboard wing panels (20m wing extensions or 18m or 17,2m wing tips): Insert the wing tip extensions into the wing. Press in the locking pin with your finger.
   Insert the wing tip as far as the aileron connector starts to slide onto the aileron. Strike firmly with the palm of your hand on to the wing tip to lock in the wing tip extension.

Caution: Due to flutter reasons it is not allowed to mount additional masses (e.g. cameras) at the winglets!

6. Tape the gaps of the wing-fuselage junction and at the wing joint.

7. Execute a positive control check, one helper to hold firmly the control surfaces is needed.

5.2.2 Stall speeds

The given speeds are the minimum achievable speeds during level flight in km/h and (kts.).

Airbrakes retracted 20m span								
mass kg	470	500	550	600	650	700	750	790
mass lbs.	1036	1102	1213	1323	1433	1543	1653	1742
W/S kg/m²	26,8	28,5	31,4	34,2	37,1	39,9	42,8	45,1
W/S lbs./ft.²	5.5	5.84	6.43	7.01	7.59	8.18	8.76	9.42
V km/h	62.9	64.9	68.0	71.1	74.0	76.8	79.5	81.6
V kts.	34	35	36.7	38.4	40	41.5	42.9	44.1
Airbrakes retracted 18m span								
W/S kg/m²	28.1	29.9	32.9	35.9	38.9	41.9	44.9	
W/S lbs./ft.²	5.76	6.12	6.43	7.35	7.96	8.57	9.18	
V km/h	64.4	66.4	69.7	72.8	75.8	78.6	81.4	
V kts.	34.8	35.9	37.6	39.3	40.9	42.4	44	
Airbrakes retracted 18m span with winglets								
V km/h	62.2	64.1	67.3	70.2	73.1	75.9	78.5	
V kts.	33.6	34.6	36.3	37.9	39.5	41.0	42.4	
Airbrakes retracted 17.2m span								
W/S kg/m²	28.8	30.7	33.7	36.8	39.9	42.9	46.0	
W/S lbs./ft.²	5.91	6.28	6.91	7.54	8.17	8.80	9.42	
V km/h	65.2	67.2	70.5	73.6	76.6	79.5	82.3	
V kts.	35.2	36.3	38.1	39.7	41.4	42.9	44.4	
Airbrakes extended 20m span								
mass kg	470	500	550	600	650	700	750	790
V km/h	67.4	69.5	72.9	76.2	79.3	82.3	85.1	87.3
V kts.	36.4	37.5	39.4	41.1	42.8	44.4	46.0	47.1
Airbrakes extended 18m span								
V km/h	69.0	71.2	74.7	78.0	81.2	84.2	87.2	
V kts.	37.3	38.4	40.3	42.1	43.8	45.5	47.1	
Airbrakes extended 18m span with winglets								
V km/h	67.5	69.6	73.0	76.3	79.4	82.4	85.3	
V kts.	36.5	37.6	39.4	41.2	42.9	44.5	46.1	
Airbrakes extended 17.2m span								
V km/h	69.8	71.9	75.5	78.8	82.0	85.1	88.1	
V kts.	37.7	38.8	40.7	42.6	44.3	46.0	47.6	

The loss of height for stall recovery is approximately 50 m (160 ft) if recovered immediately.

6.5 Mass of all non-lifting parts (WNLP)

The max. mass of all non-lifting parts is 469 kg (1034 lbs.).

WNLP is to be determined as follows:
WNLP = WNLP empty + cockpit load (pilots, parachute, baggage, trim ballast, waterballast in the fin, removable items of equipment etc.).
WNLP empty = Total empty weight incl. permanently installed equipment minus weight of the wings.

6.6 Max. mass (weight)

Category A „Aerobatic“

Maximum take off weight:	630 kg	1389 lbs.
Maximum landing weight:	630 kg	1389 lbs.

Category „Utility“:
with waterballast:

Maximum take off weight with 17.2 and 18 m span:	750 kg	1653 lbs.
Maximum landing weight with 17.2 and 18 m span:	750 kg	1653 lbs.
Maximum take off weigh with 20 m span:	790 kg	1742 lbs.
Maximum landing weigh with 20 m span:	790 kg	1742 lbs.

without waterballast: Maximum take-off and landing mass = $W_{NLP} + W_{wings}$

W_{NLP} = Maximum mass of all non lifting parts (see above)
W_{wings} = actual mass of the wings

6.7 Useful loads

Max. load **without** waterballast
= max. weight without waterballast - empty weight

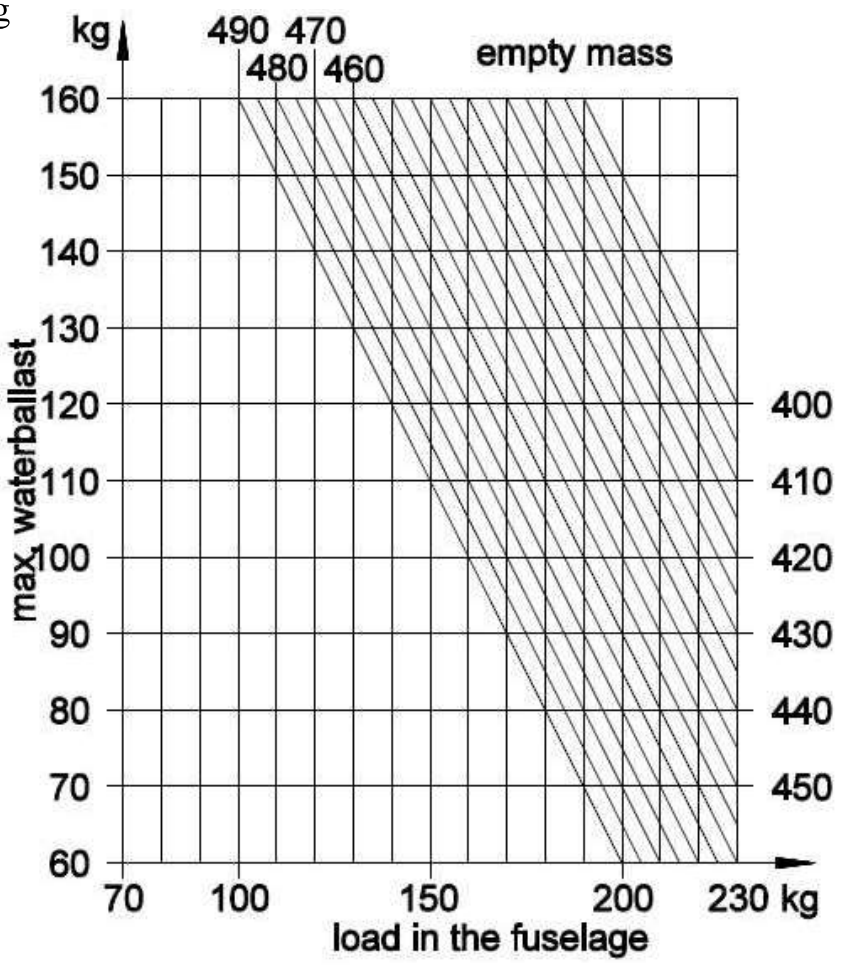
Max. load **with** waterballast
= max. weight with waterballast - empty weight

The data is recorded on page 6.7.

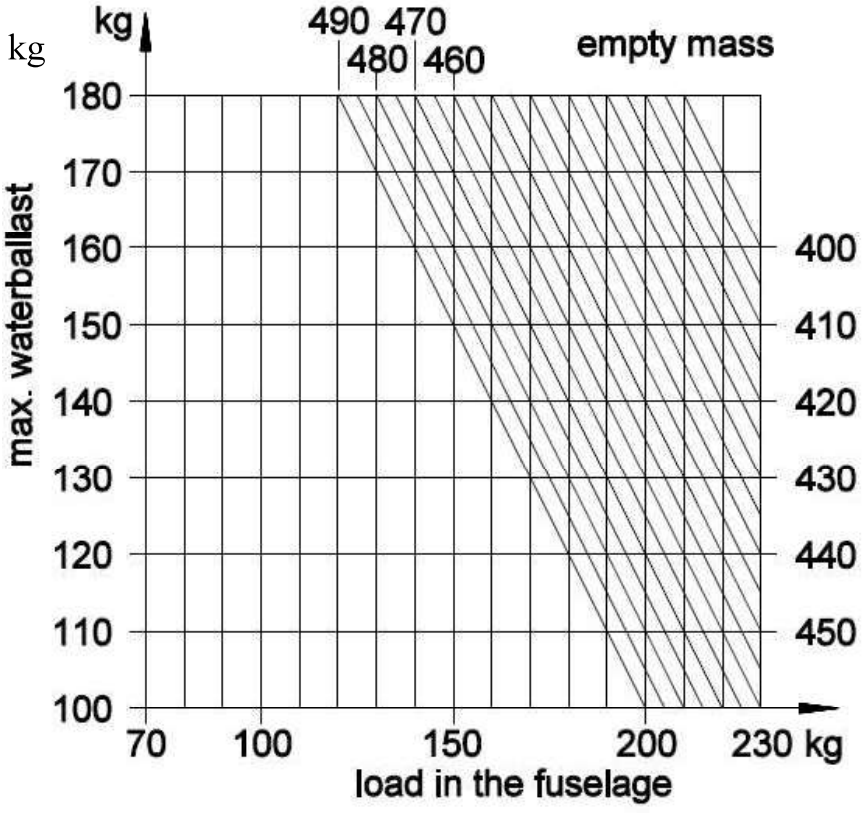
6.8.10 DG-1000 ballast chart (for 6.8.5)

To determine the max. allowable waterballast in the wing tanks for:

max. take off weight 750kg
17,2 and 18 m wing span



max. take off weight 790 kg
20 m wing span



1 kg = 2.2046 lbs.
3.785 kg (l) = 1 US gal.