

Maintenance manual DG-500MB

Manual amendments

No.	Page	Description	Date	Signature
1	2, 3, 4, 34, 57, 63, 64, 93, drawing W57	Engine, powerplant drive belt tension, DEI- circuit breaker, manual revision TN 843/13	Oct. 1999	
2	2, 3, 4, 11, 19, 27, 45, 47, 48, 49, 51, 62, 71, 79, 91, wiring diagram 5E101, drawing W40	Greasing schedule, new attachment of the throttle cable from ser.no 5E213 on, manual revision TN 843/16	Jan. 2001	
3	2, 3, 4, 5, 23 - 28, 30 - 34, 36a, 37, 49 - 51, 54, 72, 73, 78, 79, 84, 91, 93, wiring schemes 5E101 issues G and H, 5E218	Engine control, manual extension and retraction control, carburettors, engine doors rubber cord, manual revision TN 843/17	July 2002	

Issued: see last item

Maintenance manual DG-500MB

Content	Page	LBA approved
0	Airworthiness limitations	5 6 July 02 Nov. 98
1.	<b>System description and adjustment data</b>	<b>issued</b>
1.1	Wing and tailplane setting data	7 Nov. 98
1.2	Elevator control and trim system	8 " "
	" "	9 " "
1.3	Rudder control	10 " "
1.4	Aileron and wing flaps control	11 Jan. 01
	" "	12 Nov. 98
	" "	13 " "
1.5	Airbrake control and wheel brake	14 " "
1.6	Undercarriage	15 " "
	" "	16 " "
1.7	Tow hooks	17 " "
1.8	Water ballast system	18 " "
1.9	Massbalance and weights of control surfaces	19 Jan. 01
1.10	Fore and aft play of the wings	20 Nov. 98
1.11	Power plant	21 " "
	" "	22 " "
	" "	23 July 02
1.12	Retraction-extension mechanism	24 " "
1.13	Fuel system	25 " "
	" "	26 " "
	" "	27 " "
	" "	28 " "
	" "	29 Nov. 98
1.14	Electrical system	30 July 02
	" "	31 " "
	" "	32 " "
	" "	33 " "
	" "	34 " "
	" "	35 Nov. 98
	" "	36 " "
1.15	Canopy operating handles	36a July 02
2.	<b>Inspections</b>	
2.1	Daily inspection	37 July 02
2.2	Regular inspections	37 " "
	" "	38 Nov. 98
2.3	Inspection after a heavy landing	39 " "
	" "	40 " "
	" "	41 " "
2.4	Inspection procedure for increase of service time	42 43 " "

Issued: July 2002

TN 843/17

**Maintenance manual DG-500MB**

<b>Content</b>	<b>Page</b>	<b>issued</b>
<b>3. Maintenance</b>		
3.1 General maintenance	44	Nov. 98
3.2 Maintenance of the airframe	45	Jan. 01
3.3 Greasing programme	45	Nov. 98
3.4 Damage of the airframe	46	" "
3.5 Servicing the engine	47	Jan. 01
" "	48	" "
" "	49	July 02
" "	50	" "
" "	51	" "
" "	52	Nov. 98
<b>4. Detailed instructions for assembly and servicing work</b>		
4.1 Water ballast system	53	" "
4.2 Replacement of control circuit cables	54	July 02
4.3 Adjustment and servicing of the control circuit	54	" "
4.4 Removal and installation of the undercarriage (main wheel)	55	Nov. 98
4.5 Filling and bleeding the hydraulic disc brake	56	" "
4.6 Steerable nose wheel	57	Oct. 99
4.7 Working instructions for heat-shrink tubing	58	Nov. 98
4.8 Securing with Loctite	59	" "
4.9 Section not effective	60	" "
4.10 Replacement of wing fuel tanks	(61)	" "
4.11 Mounting and tensioning of the drive belt	62	Jan. 01
" "	63	Oct.99
" "	64	" "
4.12 Replacing the bearings of the upper drive Belt pulley	65	Nov. 98
4.13 Section not effective	66	" "
4.14 Replacement of the engine retaining cable	(67)	" "
4.15 Filling and bleeding the cooling system	68	" "
4.16 Installation and removal of the powerplant	69	" "
" "	70	" "
" "	71	Jan. 01
" "	72	July 02
" "	73	July 02
" "	74	Nov. 98
" "	75	" "
4.17 Removal and assembly of the engine doors	76	" "
4.18 Securing the propeller bolts	77	" "
4.19 Checking the ignition unit and the generator	78	July 02
" "	79	" "
" "	80	Nov. 98
4.20 Calibration of the fuel display in the DEI	81	" "
" "	82	" "
4.21 Further DEI calibrations	83	" "
4.22 Installation and removal of the ext./retract. unit	84	July 02
4.23 Reserved for further instructions	(85)	---

Issued: July 02                      TN 843/17

**Maintenance manual DG-500MB**

<b>Content</b>	<b>Page</b>	<b>issued</b>
5 <b>Weight and balance</b>	86	Nov. 98
" "	87	" "
6. <b>Instrumentation and accessories list</b>	88	" "
" "	89	" "
7. <b>List of special tools</b>	90	" "
8. <b>Partslist</b>	91	July 02
" "	92	Nov. 98
" "	93	July 02
<b>Diagrams</b>		<b>issued</b>
1 Elevator control , trim		April 90
2 Rudder control		" "
3 Aileron, wing flap and spoiler controls in the fuselage		" "
4 Aileron, wing flap and spoiler controls in the wings		" "
5 Tow releases		" "
6 Water ballast system		" "
7 Landing gear, hydraulic wheel brake		" "
8 Systems for static and total pressure		" "
9 Placards		Sept. 98
10 Steerable nose wheel		April 90
11 Powerplant		Sept. 98
12 Powerplant		" "
13 Extension-retraction mechanism		" "
14 Fuel system		" "
14a Installation of the fuel filter		" "
15 Propellerbrake		" "
16 Engine door control		" "
17 Retaining cable		" "
<b>Enclosures</b>		<b>issued</b>
Equipment list	(94)	Nov. 98
Checklist for checks and maintenance work	(95)	Nov. 98
5EP31 Installation Dräger oxygen system		08.10.90
5EP50 Installation ELT ACK		07.12.98
5E101 Wiring scheme issue G (without TN843/17 instr. 5)		21.03.02
5E101 Wiring scheme issue H (with TN843/17 instr. 5)		22.03.02
5E102 Wiring plan DIN A 1 (in aircraft log)		02.02.99
5E218 Amendment to the wiring plan 5E102 (TN 843/17)		22.03.02
Instructions for inspection 500/20		July 1995
Questionnaire for TN 348/4		" "
Working instruction No. 1 for TN 348/4		Oct. 1994
Working instruction No. 2 for TN 348/4		" "
Tool for airbrake adjustment		14.10.94
Drawing W40		30.11.99
Drawing W51		20.11.96
Drawing W57		10.09.99
Drawing 8E210		22.05.97
Drawing 5M110		04.02.98

Issued: July 2002                      TN 843/17

Instructions for continued airworthiness

0 **Airworthiness limitations**

0.1 **Repairs:**

Repair or replace damaged parts prior to next flight. Follow the instructions of the DG-500MB repair manual. Repairs outside the scope of DG-500 MB repair manual and major repairs must be accomplished at a certified repair station or by a certified mechanic rated for composite aircraft structure work in accordance with DG repair methods.

Use only genuine parts for all repairs.

0.2 **Life time of the airframe**

The maximum allowable operating time for composite sailplanes is 12000 flight hours. Therefore inspections according to sect. 2.4 of this manual have to be executed at 3000 h, 6000 h and every 1000 hours following thereafter.

0.3. **Life time of components**

- a) The following components of the power plant have to be replaced after 400 engine hours.
  - 1. All nuts and bolts on the engine
  - 2. The bearings of the upper drive belt pulley
- b) All flexible fuel lines and the gasket for the drainer valve have to be exchanged after 6 years.
- c) The **hoses of the cooling system** have to be exchanged after 6 years.
- d) The **drive belt** has to be exchanged after 50 engine hours.
- e) The **spark plugs** have to be exchanged after 25 engine hours.
- f) The **fabric straps of the safety harness** have to be exchanged after 12 years.
- g) The rubber cords in the elevator control system see sect. 1.2.6 and in the wing flap control system see sect. 1.4.6 have to be replaced at least every 6 years.
- h) **Other components**  
All other components like tow hook, wheels, gas struts, control system parts, bolts, pins etc. have no life time limitation, but should be replaced when worn, damaged or disqualified by excessive corrosion.
- i) **Flexible fuel bags in the wings (option)**  
These have to be exchanged after 10 years.

1.11.10 **Tightening torques and locking:**

a) All bolts on the engine which are not secured by selflocking nuts should be tightened according to the following:

M 10	-	40 N m ( 29 ft lb)
M 8	-	20 N m ( 15 ft lb)
M 6	-	12 N m ( 9 ft lb)

They should also be secured with Loctite 243. All locked and secured bolts are marked with red paint which also marks the respective component at that particular point. Whenever a bolt has to be tightened or taken off, the red paint should also be removed and only renewed after the bolt is once again securely attached with Loctite.

b) Cylinder head nuts	20 N m (15 ft lb)
CHT probe	15 N m (11 ft lb)
spark plugs	20 N m (15 ft lb)
propeller	20 N m (15 ft lb)
magneto flywheel	80 N m (58 ft lb)
lower drive belt pulley	100 N m (73 ft lb)

1.11.11 **Fire warning light**

The probe is located at the engine bay side wall opposite to the carburetors. There is a fuse 0.2 A for the „fire“ probe in the wiring near the engine master switch.

To check its function you may heat the probe up to 160° C. Use a fan heater with a thin terminal to heat the probe only. The red light „fire“ on the instrument panel must shine.

**Warning:** Don't execute this test without measuring the temperature close to the probe. 160° C must not be exceeded.

**Note:** There is a self test function installed so that the check with 160°C is not necessary. When switching on the main switch the fire warning light must flash once.

## 1.12. Retraction - extension mechanism

1.12.1 **Layout** see diagram 13 or diagram 13a

1.12.2 **The retraction-extension mechanism** (spindle drive) consists of a 12 V electrically driven sealed ball screw shaft.

1.12.3 **Extension time of the spindle drive**

The time for extension is approx. 12-13 seconds. If the extension takes longer than 15 seconds the spindle drive must be replaced.

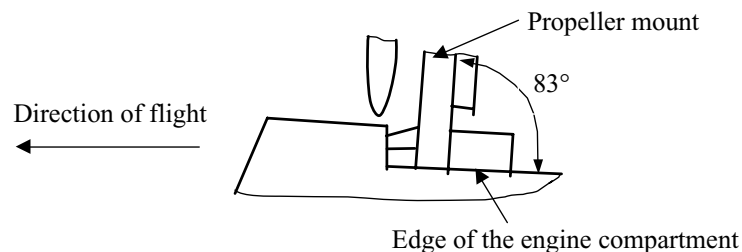
1.12.4 **Adjusting the maximum extension of the powerplant**

The maximum extension of the power plant is limited by the length of the retaining cable. When the cable is replaced, the new one has to be stretched with 500 daN (1125 lbs.) before installation. With the cable fully tensioned, the propeller mount should be 83° to the upper edge of the engine compartment, see sketch. For adjustment see also sect. 1.12.6.

**Ser.no. B1-B15 with instruction 5 from TN 843/17 not executed:** For measuring extend the powerplant carefully via the manual switch until the cable is fully tensioned, as with automatic extension the system will be switched off shortly before reaching the max. position.

**Ser.no. B1-B15 with instruction 5 from TN 843/17 executed, ser.no B16 and on:** For measuring extend the powerplant via the manual switch or the ignition switch. Due to the automatic system the spindle drive stops shortly before the cable is fully tensioned. To reach the fully extended position the propeller mount top must be pressed forward by hand until the cable is tight (you should feel and hear that the cable comes to its stop).

Adjustment of the length of the retaining cable is via the adjustment screw at the rear engine bay bulkhead, see diagram 17.

1.12.5 **Position switches**

Position engine retracted: via a switch actuated by the propeller mount

Position engine extended: via a switch actuated by the muffler frame

1.12.6 **Adjustment of the powerplant positions****Position engine extended for operation:**

Extend the engine to its max. extended position see sect. 1.12.4. Install a mark (tape) to the engine retaining cable 25mm (1 in.) above the point where the cable comes out of the tube at the rear end of the engine compartment. Now retract the engine by these 25mm. In this position the green control light engine extended must be switched off.

**Position engine retracted:**

When the propeller mount touches the stop (at the upper part of the propeller mount) the spindle drive should not be switched off, but should move the powerplant backwards for another 5mm (.2 in.) before the position switch is actuated. This prevents the powerplant from moving upwards with negative g-loads (flexibility of the rubber mounts).

1.13 **Fuel system**

1.13.1 **Layout** see diagram 14

1.13.2 **Tanks**

The fuselage tank is permanently fixed and has 40 litres (10.6 US gal.) capacity which can be used down to at least 1 l (0.26 US gal.). The tank can be drained via a drainer located in the landing gear box at its rear wall. The tank can be flushed after removing the drainer. The vent outlet of the fuselage tank is at the bottom of the fuselage.

In addition fuel bags may be installed in the wings, see section 1.13.9.

After opening the respective valve the content of the bag can be drained into the fuselage tank.

Filling the fuselage tank may be done with an electric fuel pump system (permanently installed (optional) or separate Z02/2).

A pressure switch (connected with a T-fitting to the outlet of the fuel tank) switches off the electric power to the pump system when the fuel tank is filled completely.

In case of automatic switch off the fuel tank will be filled completely only in the nose down attitude of the fuselage (the nose wheel must contact the ground).

Filling is also possible via the fuel filler opening on the fuselage exterior surface.

**1.13.3 Fuel pumps**

- 1) Electric fuel pump mounted in the fuselage centre section. This pump operates as soon as the ignition is switched on. In case the electric power is switched off via the master switch with running engine, the pump will receive electric power directly from the generator.  
Min. fuel flow at the electric pump: 40 l / hour (8.2 U.S.gal. /hour). The fuel flow can be determined by disassembling the fuel supply line at the carburettor and flowing 1 litre (.26 U.S.gal.) of fuel into a container. Max. time for 1 litre: 90 seconds. (The fuselagetank should contain at least 10 l (2.6 U.S. gal.) of fuel for the measurement). Should the flow rate be lower, then the filter could be dirty or there could be an obstruction elsewhere in the fuel system.
- 2) In line with the pump described above, a second pump is installed. An excess fuel line with build in restriction limits the fuel pressure. This pump receives its electric power only from the generator, so it operates only with the engine running. It is secured by a separate fuse located in a housing in the control unit, so that this pump operates even if the DEI circuit breaker is in "off" position. Via a press button located in the instrument panel, the first pump can be switched off with the engine running to check the function of the second pump.

**1.13.4 Fuel cock**

The fuel cock is mounted on the fuselage floor between the tank and the electric fuel pump. The cock is controlled by a dia. 2 mm (0.08 in.) pianowire from the cockpit. The stops are located directly at the lever of the fuel cock.

**1.13.5 Fuel filter**

The filter is installed between fuel cock and electric fuel pump. The filter is visible in the baggage compartment.

**Warning:** Use only transparent filters with a mesh as filter element, type see page 91. Paper type filters may cut off the fuel flow suddenly.

There is an additional fuel filter for the primer valve integrated in part 8M288 which is installed in the fuel line to the primer valve (see diagram 14). Maintenance of the filter see sect. 3.5.1.6.

**1.13.6 Fuel quantity indication**

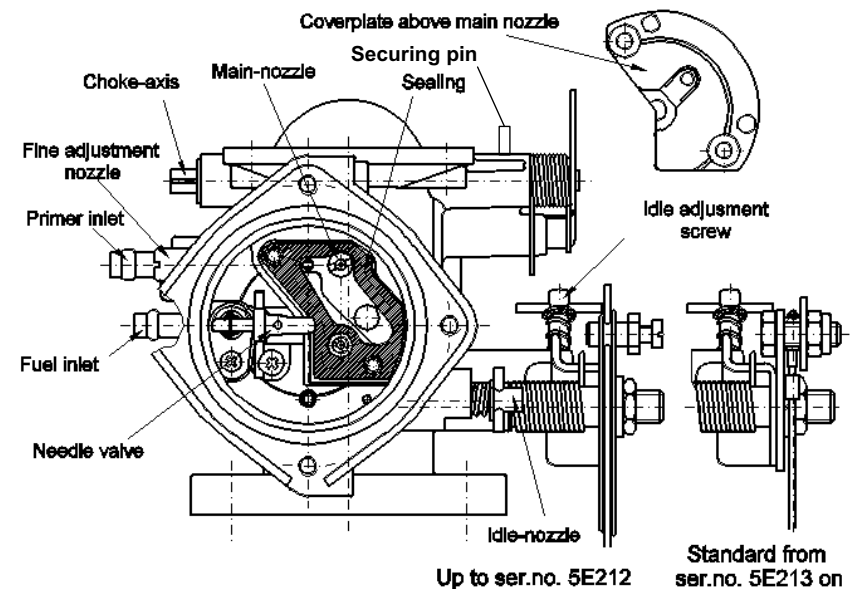
The fuel quantity measuring system in the fuselage tank is by two electric float gauges.

The aircraft's attitude hardly affects the readout.

After replacement of a gauge or of the DEI you have to execute a fuel gauge calibration according to sect. 4.20.

**1.13.7 Carburettor****a) Type Mikuni Membrane carburettor BN 38, 2 pieces**

Instead of a choke a fuel injection (primer) is installed.



Normal position of the fine adjustment nozzle is fully anticlockwise (open). For high altitude operation the nozzle may be turned in clockwise direction (closed).

**b) Cleaning**

To clean the carburettor you should execute items 1 to 3. Switch on the ignition to clean the carburettor by the electric fuel pump.

**Cleaning cont.**

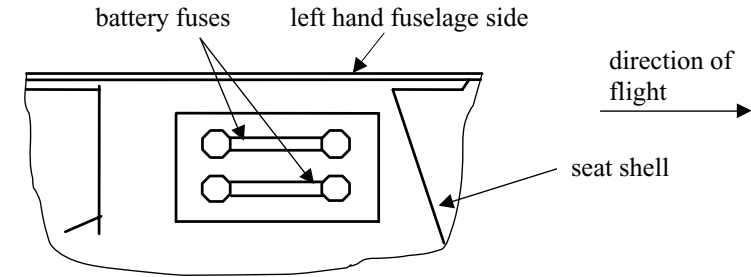
If the carburettor is clean, a jet of fuel will spurt out. In addition, the openings for idle and main nozzle have to be cleaned with compressed air.

**Warning:** Don't bend the levers which actuate the needle valves.

1. **Removal of the needle valve:** Unscrew the carburettor cover and remove together with the membrane. Loosen the mounting screw and remove the lever, axle and needle valve as one unit. Be careful not to loose the return spring.
2. **Removal of the main nozzle:**  
Loosen the 2 screws and lift off the cover plate with the rubber sealing Screw out the main nozzle.  
If it is necessary to remove the Tommy screw for cleaning you have to lift off the fine adjustment screw which covers the Tommy screw. Screw in the Tommy screw first to note the number of turns. Then remove the Tommy screw.
3. **Removal of the idle nozzle:**  
The nozzle is located in the same compartment as the main nozzle below the main nozzle. If it is necessary to remove the Tommy screw for cleaning you have screw in the Tommy screw first to note the number of turns (approx. 1/2 to 1 turn). . Then remove the Tommy screw.
4. **Reassembling:**  
Reassembling is the reverse of disassembling.  
Use lockwashers to secure the screws of the carburettor cover.  
All measures should be executed carefully and cleanly.
5. **Carburettor setting**  
Adjust the idle RPM by the idle adjustment screw to approx. 2900-3000 RPM with warm engine, so that the engine is running at constant RPM.  
**Note:** With optional EGT probes the setting of the carburettor main nozzles can be checked by the EGT values. Check that the EGT values on the ground don't exceed  $610^{\circ}\text{C} \pm 10^{\circ}\text{C}$  at full power with the engine warmed up. This value is valid with the fine adjustment screw open at 100m above MSL. If the adjustment is to be done at higher altitude  $2.5^{\circ}\text{C}$  must be deducted from the EGT value per 100m altitude.  
If the EGT values are not in the limits correct the nozzle settings. Therefore you have to lift off the fine adjustment screw and adjust the Tommy screw see item 2.
6. **Intake air filter**  
An airfilter is mounted on each carburettor. Operation without air filter is prohibited except for conservation of the engine see engine manual section 5.

1.14 **Electrical system**

**Note:** Before doing any work on the electrical system, isolate the power supply by switching off the main switch. The batteries should also be disconnected before working in the compartment where the main switch is installed. This is done by removing the battery fuses. The fuses are located in the left hand side console of the rear cockpit, see the sketch below.



1.14.1 **Layout** see wiring scheme and wiring plan enclosed to this manual.

1.14.2 **Batteries**

- The installed battery-pack consist of 4 batteries 6V, 10 or 12 Ah with screwed terminals. The batteries are wired in series and parallel to supply 12V, 20 or 24Ah. The two 12V packs (wired parallel) are protected by fuses against discharging each other when defective and against over current.  
Location: Two batteries are placed in the cockpit floor behind the rear instrument column. Two batteries are placed behind a cover on the left hand fuselage side in the rear cockpit floor.
- The batteries are charged by a generator installed in the engine.
- Recharging is via the socket 12 V in the rear cockpit. Therefore switch on the main switch. Switch off all other consumers incl. the engine master switch. You don't need to remove the batteries for charging.
- **Warning:** Use only automatic chargers suitable for sealed liquid acid batteries. To charge the batteries to their max. capacity such a charger with a max. output voltage of 14.4 V is required (most chargers supply only 13.8 V). A suitable charger Z 08 is supplied by DG Flugzeugbau.
- For periodical recharging the "power independent" unit is suitable. This unit is available from DG Flugzeugbau too.
- After charging, switch off the main switch, as with the main switch on there is a small power consumption (less than 1 mA).
- **Note:** Don't charge longer than for 1 week.

**1.14.3 Control unit**

This aluminium box is located in the rear instrument panel. The control unit incorporates the following functions:

1. Control of the extension-retraction procedure. The extension-retraction relays are also mounted inside the unit.
2. Regulator/generator, supplies also power to the fuel- and coolant-pumps with the masterswitch off.
3. Startermotor control: The starter motor is actuated by a power electronic, no relays. This applies to the normal engine start (ignition on) and also the slow turning of the propeller into retraction position (ignition off). Activation via the starter button.
4. A fuse holder for the fuse of the second fuel pump is installed in the housing. Resettable fuses for the following circuits are installed in the control unit: Proximity switch, coolant pump (when powered by the generator, otherwise protected via the DEI circuit breaker)

**Warning:** With the connector plug removed from the control unit, don't switch on the master switch.

**Caution:** When you plug in the connector plug, check by pulling at the plug, that the locking devices at both sides have engaged. Then secure the locking devices with a ty-rap 4.8 x 360 mm.

**1.14.4 Generator - Regulator**

The generator is located in the ring gear housing and is incorporated with the ignition / timing sensors. It is connected to a voltage regulator and can provide a maximum charging current of 10 Amp. The regulator is located in the control unit see sect. 1.14.3. The generator supplies electrical power to the fuel and water pumps, even with the main switch off.

**1.14.5 Master Switches**

The aircraft is supplied with a main switch and an engine master switch. The engine master switch supplies in **on** position electrical power to all engine controls and to the socket for the external electric fuel pump system.

**1.14.6 Engine elapsed - time indicator**

The engine time indicator is incorporated in the DEI and is connected directly to the regulator and therefore counts only the pure engine running time.

**1.14.7 Electric pumps**

The coolant pump and the first fuel pump are switched on and off by the ignition switch and receive power from the batteries (protection via the DEI circuit breaker). With the engine running the coolant pump in addition is powered directly from the generator (protection via a resettable fuse in the control unit).

In line to the fuel pump described above, a second fuel pump is installed. This pump receives its electric power only from the generator. It is secured by a separate fuse located in a housing in the control unit.

**1.14.8 12 V Socket**

The socket is located in the fuselage main-bulkhead (behind the pilots right hand shoulder).

It is used for:

- battery charging (master switch in on-position, engine master switch in off position, all instruments off
- to provide power for external accessories.

Required plug see partlist sect. 8.2.

Connection of the socket terminals: centre pin is positive.

**1.14.9 Power plant extension-retraction mechanism**

See also sect. 1.12 The automatic extension and retraction is controlled by the control unit see sect. 1.14.3.

The extension-retraction motor will be switched off at the end limits by position switches see sect. 1.12.5.

**Caution:** If the proximity switch (see sect. 1.14.15) is defective (short circuit) a safety interlock in the control unit prevents the engine from being retracted automatically with the propeller not in the correct position. The retraction of the engine must be done with the manual switch. The DEI will display **000** instead of the engine RPM. The proximity switch must be exchanged prior to the next engine start.

#### 1.14.10 **Manual extension-retraction switch, switch for electric propeller brake**

This switch unit consists of 2 switches. If you lift the red cover you operate the first switch which cuts off the automatic extension - retraction.

**Ser.no. B1-B15 with instruction 5 from TN 843/17 not executed:** The second switch below the red cover plate activates the extension/retraction motor directly, bypassing the control unit and the safety functions in the DEI.

**Ser.no. B1-B15 with instruction 5 from TN 843/17 executed, ser.no. B16 and on:** The second switch below the red cover plate activates the extension/retraction relays in the control unit directly, bypassing the safety functions in the DEI.

Behind the manual extension-retraction switch a switch to switch off the electric propeller brake is installed. This switch must be installed such that its toggle shows to the front in the position propeller brake off. In this position it should not be possible to move the red cover plate to its down position

#### 1.14.11 **Starter Press Button**

The starter press button is located in the centre of the throttle handle and activates the starter relay via the interlock in the DEI and the control unit see sect. 1.14.3.

#### 1.14.12 **Wiring**

- Wires from battery to master switch and to control unit: LN 9251 white 9 mm<sup>2</sup> => AWG 8.

Starter motor wiring: MIL 22759 14 mm<sup>2</sup> => AWG 6

- Power cables: LN 9253 A white 1.2 mm<sup>2</sup> => AWG 16 and 2 mm<sup>2</sup> => AWG 14.

- Control wiring: LN 9253 A white and red 0.4 mm<sup>2</sup> => AWG 22, in the engine compartment MIL 22759 0.4mm<sup>2</sup> => AWG 22.

- Ignition and measuring cables: LN 29871 outer cover white, inner cable blue and red, 2 x 0.4 mm<sup>2</sup> => 2 x AWG 22.

Wiring located at the engine: flexible wires 94F8128 1 mm<sup>2</sup>.

- Measuring wires for the coolant temperature probe: coaxial RG 316/U.

Instead of wires from the LN specifications mentioned above suitable wires approved for aircraft use from other aircraft or MIL specifications may be used.

Operating range min.:55°C up to 105°C (-67°F - 220° F), in the engine compartment up to 150°C (300°F), operating voltage 600 V.

#### 1.14.13 **Circuit breakers and fuses**

1. In the console of the front instrument panel:

- a) circuit breaker 10 A for the generator and the control unit
- b) circuit breaker 2 A for the electric variometer
- c) circuit breaker 3 A for the radio
- d) circuit breaker 3 A spare for turn- and bank indicator or horizon
- e) circuit breaker 4 A for the 12 V socket
- f) circuit breaker 5 A for the DEI, secures also the first fuel pump and the coolant-pump (only when operated via the battery)
- g) circuit breaker 15 A for the engine extension - retraction motor

2. The battery main fuses are located in the left hand side console of the rear cockpit: 2 pieces 60 A.

3. Fuse 250V 0.2A 5x20 m for the fire warning light located in the wiring near the master switch.

4. In the control unit (located in the lower end of the rear instrument column):

- a) Fuse 250V 2A 5x20 m for the second fuel pump installed in the housing of the control unit.
- b) Resettable fuses inside the control unit for the following circuits: proximity switch (0,2A) and coolant pump (4A) for power supply from the generator.

1.14.14 **Position switches** for the powerplant see sect. 1.12.5 and 1.12.6.

#### 1.14.15 **Proximity switch**

The proximity switch at the engine receives the switching pulses by the steel pins located at the upper drive belt pulley (see drawing 5M110 enclosed to this manual).

The proximity switch effects the following functions:

1. Activation of the retraction mechanism and indication in the DEI
2. Pulses for the RPM measurement
3. Electric propeller brake

The switch must be adjusted so that the propeller can't hit the engine door during retraction. If the switch is moved (distance reduced) the range will be enlarged.

If the distance is too large, the RPM measurement won't work correctly. For a new adjustment start with a distance of 1.8mm (.071 in.).

It is absolutely essential to secure the switch with the 4 counter nuts, as damage to the switch will stop the RPM measurement and the retraction-extension control unit. With a defective proximity switch (short circuit) or with the generator circuit breaker popped out **000** will be displayed on the DEI.



**1.15 Canopy operating handles**

The canopy opening handles and the canopy emergency release handles must have a certain amount of friction to prevent the canopies from opening by themselves e.g. due to engine vibrations.

The opening force must be checked once a year.

Measurement as follows:

Remove the canopies from the fuselage. Wrap a thin strong tape or a string around the opening handle at 80mm (3.15 in.) from hinge point and hang a spring scale in.

Open the handle from its closed position by pulling at the spring scale.

The force necessary shall be 25 up to 35N (5.5 up to 7.7 lbs.).

Execute the same measurement at the emergency release handle at the fuselage.

If a force is below 25N then retorque the nut at the hinge point of the respective handle and adjust to a force of 35N (spanner 8mm and Allen key wrench 4mm).

Reinstall the canopies.

**2. Inspections****2.1 Daily inspection**

see flight manual DG-500MB

**2.2 Regular inspections****A) After 200 flight hours and during the annual inspection**

Check the rudder cables for wear especially around the S tubes on the rudder pedals. Worn rudder cables should be replaced (see sect.4.2).

Check the sealing of the rudder (see sect.1.3.5).

**B) Annual inspection (and 100hr inspection – only for USA)**

Execute all items of the daily inspection see flight manual sect. 4.3.

Inspect all bolted connections and locking devices ie. locknuts, split pins etc.

Check all metal parts for adequate greasing and rust prevention. (see sect. 3.3).

Check the control surface deflections (see sect. 1.2 - 1.4).

Check the free play in all control circuits (see sect. 1.2 - 1.6) and the fore and aft play of the wings (see sect. 1.10).

Check the canopy emergency releases according to sect. 7.15 of the flight manual.

Check the rubber cords in the control system (see sect. 1.2.6, 1.4.6 and 1.7.5).

Check the thickness of the wheel brake linings (see sect. 1.6.4).

Check if the brake fluid has to be exchanged (see sect. 1.6.4).

Check the airbrakes according to "Instructions for inspection 500/20" (at the end of this manual).

Check the friction brake of the throttle control (see sect. 1.11.8).

Check the complete powerplant (see sect. 3.5.1 only with the 100 hr inspection)

Check the torque of the propeller bolts see sect. 3.5.1 item 25 of this manual.

Check the friction of the canopy operating handles see section 1.15.

**Tow hook**

The operating and maintenance instructions for the release mechanisms, see sect. 0.4 of this maintenance manual have to be followed.

**All-up weight and centre of gravity**

These should be checked at least every 4 years during the yearly inspection.

**C) Every 3 months**

Check the tension of the lines of the waterbag attachment (see sect. 4.1.).

With sticking piston rings the cylinders must be removed.

Take out the piston rings and clean the grooves and the rings or replace the rings. Remove also any combustion deposits inside the pistons.

**Caution:** Necessary repair work including removal of combustion deposits must be accomplished at a certified repair station rated for such engine work.

13. Check the muffler for cracks and ensure mounting is secure. Check especially the cable which lifts the muffler during engine extension. Check the retaining cable for the muffler lifting cable incl. the rubber cord. Check the moving part at the front end of the muffler for any cracks. Check the exhaust manifold (already removed) for cracks. Reinstall the exhaust manifold, therefore remove any remains of the gaskets, install new gaskets. Check the function of the gas-spring at the muffler frame. Therefore retract the engine until the muffler pops downwards. The gas-spring must press the muffler frame securely to its lower stop. Check the length of the cable which lifts the muffler. To accomplish this extend the engine and press the muffler body in downward direction at its front end with a force of approx. 5 daN (11 lbs.). If the cable is too long or if the spring in the cable has been permanently stretched, the muffler will interfere with the exhaust manifold.  
Check the spring pressure at the coupling of exhaust manifold to muffler. To accomplish this, measure the distance between the brackets for the spring couplings at the muffler pipe and at the movable part of the muffler in disengaged and in operating position. Extend the powerplant to operating position via the ignition switch. As soon as the extension stops, lift the red cover of the manual extension switch and switch off the ignition. In operating position the distance should be approx. 1 mm (0.04 in.) smaller than when disengaged. If the difference should be less than 0.5 mm (0.02 in.) you have to adjust to 1mm using the nut on the eyebolt. By this procedure you will pull the muffler forwards in its frame.  
Note: With new manifold and/or new movable part the difference should be adjusted to 2 – 3 mm (0.04 – 0.12 in.) to allow breaking in of the parts.
14. Check all engine nuts and bolts with a torque wrench (see sect. 1.11.10).

15. Check the rubber engine mounts, especially for cracks. Therefore apply strong pressure to the propeller mount in forward, backward and sideways direction.
16. Check and grease the starter motor gear shaft (don't grease the starter motor gear) Check starter motor for tight mounting. There should be no excessive radial free play of the starter motor gear axle. With too much free play the starter must be exchanged.
17. Clean the starter ring gear and check for damage. Check if the starter ring gear was bent forwards by the starter motor. There should be approx. 1mm (.04 in.) clearance between starter ring gear and drive belt.
18. Remove the fairings which protect the drive belt. Check the drive belt for wear and tension (see sect. 1.11.5). If the drive belt shows signs of wear or if there are cracks/tears at the base of the belt teeth, the drive belt must be replaced. Check the 6 rollers which guide the drive belt for tight fit to their mounting brackets and for easy turning. If there is any significant friction in their bearings, the rollers have to be replaced. Check the roller mounts for proper attachment to the propeller mount.
19. Clean the spindle drive. Operation test. The bare surface of the spindle drive piston must be greased slightly. If necessary apply some grease. Check the rubbermounts at the front and rear attachment of the spindle drive for wear. The fork at the rear attachment must rotate without twisting the rubbermount.
20. Check all the hinges on the engine compartment doors for proper fit and any cracks, tears etc. Check if hinge pins are secured properly. Check the engine door rubber cord and its retaining cord for wear and function.
21. Oil all hinge points of the powerplant.
22. Check the time taken to extend the power plant. Batteries must be fully charged. If it takes longer than described under sect. 1.12.3 first check the wiring of the spindle drive for any damage. If no other reason for the slow extension can be detected the spindle drive has to be replaced.
23. Check the engine retaining cable for wear and kinks. Check the engine position with the retaining cable fully tensioned according to sect. 1.12.4. If the cable is too long it has to be adjusted at the adjustment screw in the rear end of the engine bay.
24. Check the main bearings of the upper pulley for any free play.
25. Check the tension of the propeller bolts: remove the lockwire, loosen the propeller bolts and retorque them with a torque wrench, torque value see sect. 1.11.10. Secure again with lockwire.

- 26. Check the propeller blades for any damage.
- 27. Check all electric cables and connectors. Check the terminals especially of the starter positive and earth wire for cracks.  
**Note:** The critical spots may be covered by heat shrink tubing.
- 28. Check the whole electrical system wiring, ensure all equipment is secure and all connections are OK. Check proper functioning of all systems and fuses/circuit breakers.

**Ground test run:**

**Warning:** Never run the engine without the wings assembled,

- 29. If needed adjust the idle RPM (see sect. 1.13.7).
- 30. Check the magnetos - at 3000 RPM, drop should not be more than 300 RPM.
- 31. Check max. engine RPM - 6300 RPM minimum.
- 32. Check EGT's (only with optional EGT probes) EGT should be adjusted according to the instructions see sect. 1.13.7, item 5.
- 33. With engine running at full power press the test button on the front instrument panel for 10 seconds to switch off the first fuel pump. The engine must run with the same speed with the fuel supplied by the second pump.

**4.2 Replacement of control circuit cables**

The following cable connections are approved:

3.2 mm dia. control cable construction 7×19 zinc plated with Nicopress-sleeves 28-3-M Copper and tool No. 51-M-850 or 63-V-XPM or 64-CGMP where the M groove is to be used. The above applies to the rudder cables, the tow release cable and the engine retaining cable.

The cable for the rudder pedal adjustment is 1.6 mm dia. construction 7×7 zinc plated with Nicopress-sleeves 28-1C Copper and the C groove for tool 64-CGMP should be used.

Attachment of the Nicopress sleeves should only be done using the respective tool. All the procedures and checks noted by the tool manufacturers should be followed.

Please refer to aircraft inspection and repair FAA AC 43.13-1 A.

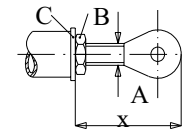
**Note:** For the manual propeller brakes and the throttle cable Ø 1.6mm construction 7×7 zinc plated is used. Only for the electrical propeller brake Bowden cable Ø 1.5 mm 19 x 0.31 is used.

All Bowden outers (2.6 mm inside dia.) are without liner; only the Bowden outer for the electrical propeller brake has a teflon liner.

**Note:** Control cables according to MIL-W-83420 I/A (former MIL-W-1511A) or ISO 2020 (former LN 9374) should be used.

**4.3 Adjustment and servicing of the control circuit**

- a) In all cases, new self locking nuts DIN 985.8 or LN 9348 must be used.
- b) Bolts which are not secured with locking nuts have to be secured with Loctite 243. Before installing the bolt clean the thread and the inside thread see section 4.8. Apply only 1 drop of Loctite on the bolt thread. Too much Loctite may cause damage when you try to loosen the bolt again.
- c) With all adjustment work, it should be ensured that the rod ends are not screwed out too far from the pushrod - see sketch below for allowable max. distances for the two sizes used.



A	max. of x	
	mm	inch
M 6	36	1.4
M 8	60	2.36

**Note:** All lock nuts (B) are secured by a spring washer (C) DIN 6798 I. Be careful not to loose that washer!

4.16 cont.

**II) Retract powerplant almost completely**

10. Disconnect the electrical connections at the firewall:

- a) Disconnect the multiple plug of the wiring set.
- b) Only with EGT-option: Screw off the two screw-in-plugs for the EGT probes .
- e) Now arrange all wires in a way to enable easy removal of the powerplant from the engine bay. For this purpose it might be necessary to remove some further Ty-raps.

11. Separation of the extension/retraction unit from the propeller mount:

Spindle drive: Retract powerplant until the propeller mount is approx. in horizontal position. Unscrew the bolt which fixes the fork to the spindle drive. Then lift the powerplant a little by hand to pull out the bolt and let down the powerplant into the engine bay.

12. Bend up the securing washers at the two bolts at the hinge axis of the propeller mount. Unscrew the bolts with a 19mm socket wrench. Mark the position of the now accessible eccentric brass bushes to be able to reinstall them in the same position. Then lift the powerplant to minimize the load on the bolts and remove them including the brass bushes. Finally lift the powerplant out of the fuselage with two persons.

4.16 cont.

**4.16.2 Removal of the engine from the propeller mount**

General notes:

Before removing the engine from the propeller mount screw four long bolts M 10 resp. M12 into the 4 threads at the lower end of the engine block. This facilitates handling on the workbench because the powerplant can be placed on the screws.

**Necessary tools**

Socket wrenches: 6, 7, 17, 19 mm

Open end spanner 30 mm

Wrench for spark plugs 21 mm (13/16 in.)

Allen key wrenches: 3, 4, 5, 6 mm

1 wire cutter

1 hot-air gun

1 small screwdriver

1 flange bolt (incl. in SOLO tool kit)

1 puller assembly W40 (drawing encl. to this manual) with

1 bolt M 12 x 90 DIN 933-8.8 and

4 bolts M5 x 20 DIN 912-8.8

1 sharp knife

1 roll insulating tape

1 bucket

1. Remove the drive belt fairings from the propeller mount by unscrewing the 20 bolts with a 3 mm Allen key wrench.
2. Remove the drive belt according to section 4.11 a) and c).
3. Pull off the lower drive belt pulley including starter ring gear from the crankshaft:
  - a) Remove the front retaining ring from the pulley.
  - b) First heat the screw at the crankshaft with the hot-air gun, then remove it with a 19mm socket wrench.
  - c) Put the factory supplied flange bolt in the crankshaft thread.
  - d) Install the puller assy. W40 with 4 bolts M5x14 DIN 912-8.8 to the drive belt pulley. Then screw the bolt M12x90 DIN 933-8.8 into the puller to pull off the pulley from the crankshaft. Secure the puller with a 30 mm open end spanner against rotation. If the pulley resists coming off you should hit the head of the bolt M12x90 with a hammer to loosen the pulley.

4.19 Checking the ignition unit and the generator

**Ducati-magneto generator Type P12W150 part no. 43171402 12V/150W with electronic boxes Ducati part no. 432372500**

The engine has 2 independent ignition circuits. It is equipped with a DUCATI electronic C.D. ignition unit with magneto generator for supplying the electrical system of the aircraft. The ignition unit is adjusted by the engine manufacturer and requires no servicing. In case of trouble execute the following procedures:

- 1) The engine does not start or suddenly stops without running out of fuel. This means, that both ignition circuits are defective.
  1. if the starter turns at less than 500 rpm, there are no sparks at the spark plugs. Therefore the battery must be charged enough to reach this rpm (normal starting rpm with well charged battery is approx. 600 rpm).
  2. Shorting cables must not be in contact with ground or with each other when the ignition switch is in on position. For checking gain access to the connector plugs at the ignition electronic boxes by removing Ty-raps and heat-shrink tubing. Check the resistance between wire 301 (right) and ground (engine block) wire 302 and ground (plugs disconnected). The resistance must be infinite (ignition on) and zero (ignition off)
  
- 2) During ignition circuit check before take off the rpm goes down significantly or the engine stops. For checking gain access to the connector plugs at the ignition electronic boxes by removing Ty-raps and heat-shrink tubing.
  1. Swap the connector plugs at the ignition boxes from one box to the other. Therefore you need extension wires see drawing 8E210 (enclosed to this manual). If the malfunction now changes to the other circuit, one of the boxes is defective. Detect the faulty one by mutual disconnection of the plugs. Stop the engine before disconnecting a plug from a box.

**Warning:** Don't mix up the wires!

2. If the malfunction remains on the same circuit, then carry on according to the following instructions:

- 2.1 Check the shorting cables see above.
- 2.2 Checking the ignition, trigger and charging coils  
Disconnect the connector plugs from the electronic boxes see 1. and measure the resistance:

item	pin nos.	resistance (Ohm)
primary ignition coil 1	76 and 77 (right)	approx. 300
primary ignition coil 2	79 and 80 (left)	approx. 300
trigger coil 1	75 and ground (right)	approx. 170
trigger coil 2	78 and ground (left)	approx. 170

With other values identify the defective part by the wire numbering see wiring plan 5E102.

- 2.3 Checking the air gap between trigger coils and actuators (metal plates on the magneto housing) with a gauge. The gap must be 0.45 – 0.55 mm (0.018in. –0.022in.) wide
3. Checking the generator coil: Disconnect the engine main plug and measure the resistance between wires 491 and 501. It should be approx. 0.5 Ohm.

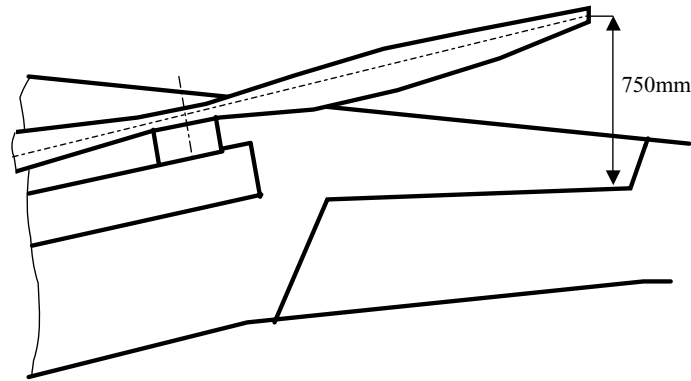
**Warning:** Starting and operating the engine with spark plug connectors taken off can damage the ignition electronic boxes. Check for spark only with spark plugs fitted to the connectors and spark plug bodies having ground connection.

3) **Generator**

1. If the red generator control light shines although the engine is running:
  - 1.1 Check the 10 A circuit breaker Gen.. If it has popped out this may be caused by: Short circuit in the battery or defective regulator (in the control unit) or bad contacts in the circuit breaker. Switch the circuit breaker on and off several times to eliminate the contact problems.  
**Caution:** The circuit breaker shouldn't be operated with the engine running.
  - 1.2 Check the generator. Disconnect the plug (37 poles) from the control unit 8E103. Measure the resistance between pins 34 and 37 with the engine stopped. It should be approx. 0.5 Ohm. Measure the resistance between pin 34 or 37 and ground. It should be infinite.

## 4.22 Installation and removal of the extension/retraction unit

When installing the extension/retraction spindle drive proceed as follows: First, don't tighten the bolt which connects the spindle drive to its front mounting block. Extend the powerplant to the position (see sketch). Then tighten the bolt. The reason for this procedure is to make sure that the rubber bush in the mounting block will be twisted approx. by the same amount in upward and downward direction. False adjustment may result in cracks in the rubber.



## 8. Partlist

In this list you will find only parts of the powerplant and the electrical system.

Please find the part no's of the control-system parts and of the metal fittings of the powerplant in the following diagrams.

## 8.1 Parts for the powerplant

a) necessary for the 25 hours inspection

40050360 Spark plugs S36 (Bosch W5AC electrode gap 0.5 mm) with screw cap fastened to the thread by crimping (4 pieces necessary)

**Caution:** Bosch delivers the W5AC spark plugs with removable caps. It is not allowed to use these spark plugs. Spark plugs S36 can be identified by a dot of red paint on the insulator.

60507570 Fuel filter Entrata IN straight CH27

60507569 Fuel filter Entrata IN 90° elbow CH28

60500150 Gaskets for exhaust manifold (2 pieces needed)

60500142 Airfilter

70002200 Oil for airfilters with cottonfabric K&N 99-05046

b) Spare parts

60510821 Spark plug connector Bosch 0356351032 1kΩ

60500127 Nut for spring coupling M 8 for exhaust muffler (Rotax 842330)

60500128 Spring for spring coupling M 8 (Rotax 239628)

60502500 Starter motor: DENSO 128 000-1671 12 V  
or DENSO 12 000-1679 12 V

60500155 Gasket for coolant outlet

60504013 Drive belt Poly Chain GT 8 M 2520-45

59332050 Front bearing for upper pulley 32205B

59320320 Rear " " " " 320/32X

52200054 Securing washer 20 DIN 462 for upper pulley front bearing

30002028 Special grease for upper pulley bearings SKF LGMT3

39001026 Exchange kit nuts and bolts for 400 h overhaul

60000182 Gas strut for muffler frame E1 E1-76-040-130/150N

60507561 Electric fuel pump Facet 40106

60001200 Electric water pump Webasto U4810 modified

60504049 Radiator KTM VW 00425

60504033 Extension-retraction spindledrive type

Warner LA 10 model D 12.20B5.08 special version for DG

40872873 Brake pad for propellerbrake (glued to mounting bracket)

40050350 Screw nipple S35 (Attachment of the throttle cable to the carburetors, omitted from ser.no 5E213 on)

8.2 Parts for the electrical system

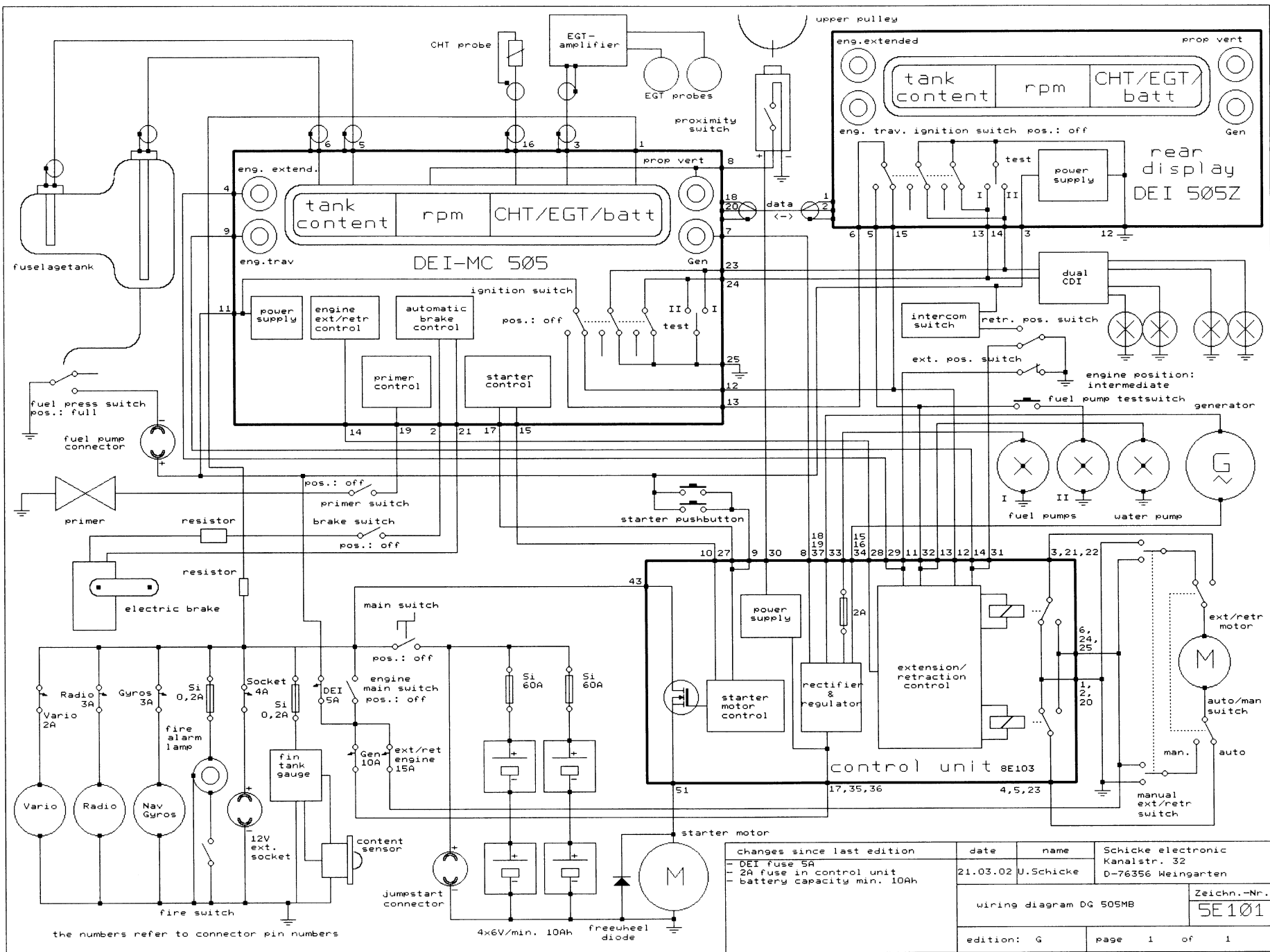
- 60510891 Battery 6V, 10 or 12Ah equipped with screw - terminals
- 40876070 DEI MC 500 B
- 40876090 rear panel DEI MC 500 ZB
- 40876030 Control unit 8E103 (including relays and regulator)
  
- 60510464 Limit-switch engine retracted and engine extended 164-574

**Ser.no B1 –B15 with instruction 5 from TN 843/17 not executed:**

- 60510476 Manual extension-retraction switch APR 20-647H
- 60510475 Switch to switch over from normal to emergency extension-retraction APR 20-646H

**Ser.no B1 –B15 with instruction 5 from TN 843/17 executed, ser.no. B16 and on:**

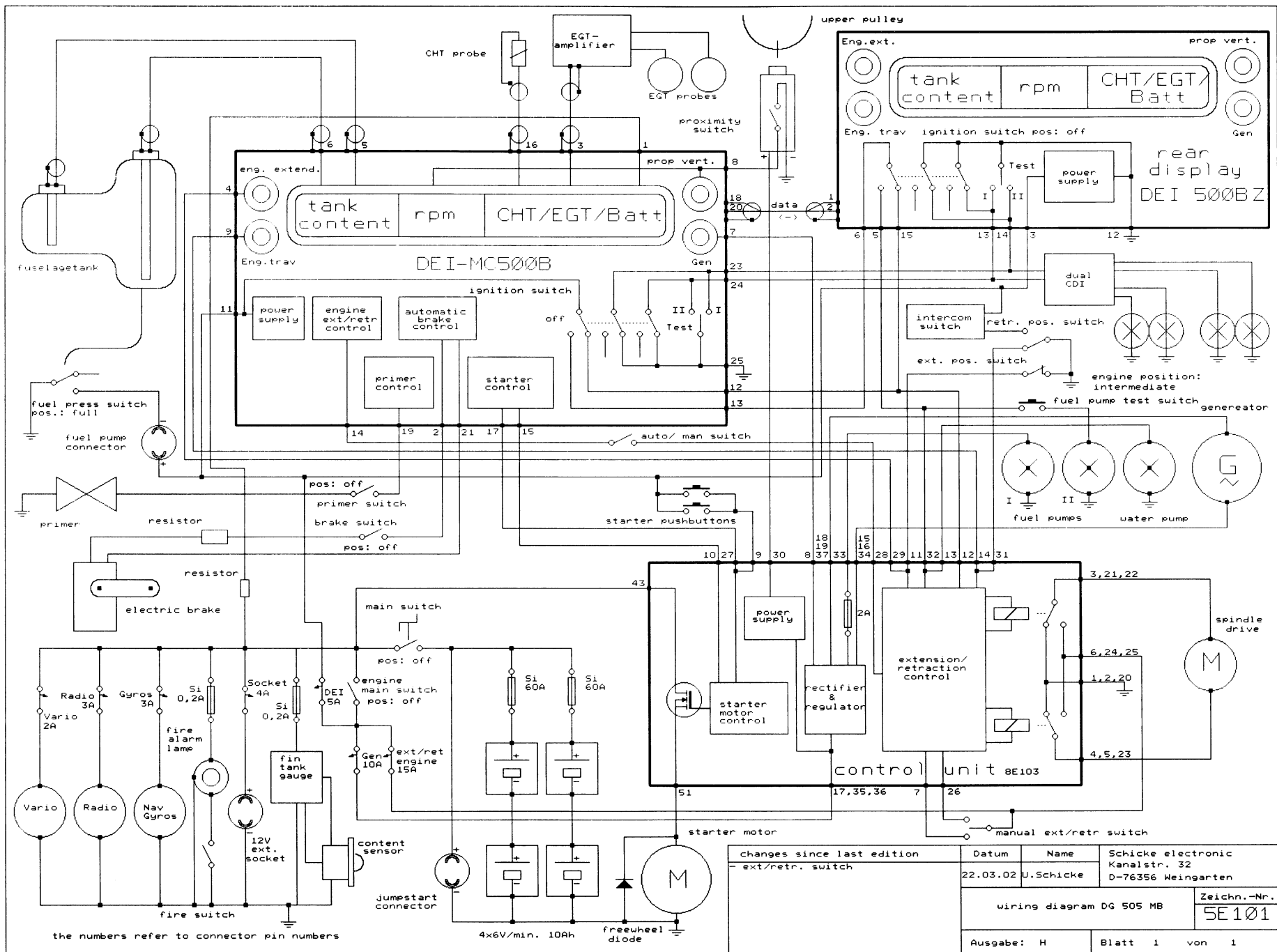
- 60510482 Manual extension-retraction switch APEM 637 H/2
- 60510483 Switch to switch over from normal to emergency extension-retraction APEM 5636 MA
  
- 60510476 Manual extension-retraction switch APR 20-647H
- 60510475 Switch to switch over from normal to emergency extension-retraction APR 20-646H
- 60510813 Master switch Bosch 0341001001
- 60510812 Key for master switch Bosch 0341001001
- 60510478 Engine master switch 631 H-215A
- 60510370 Press-button SECME 07 17801 21 for starter and for test of second fuel pump
  
- 60510391 Circuit breaker Klixon 7277-2-15A for spindledrive
- 60510394 Circuit breaker Klixon 7277-2-5A for DEI
- 60510385 Circuit breaker ETA 2A
- 60510386 Circuit breaker ETA 3A
- 60510388 Circuit breaker ETA 10A
  
- 60510436 Fuse 535257 60 A for batteries
- 60510440 Fuse 250V 0.2A 5x20 m for fire warning light
- 60510419 Fuse 250V 2A 5x20 m for second fuel pump
  
- 60510550 Proximity switch Insor INCT 1212
- 40576150 Proximity switch ready assembled with wiring and plug
  
- 60510796 Socket BSB 12 (in main bulkhead)
- 60510797 plug BSK12 for socket BSB 12



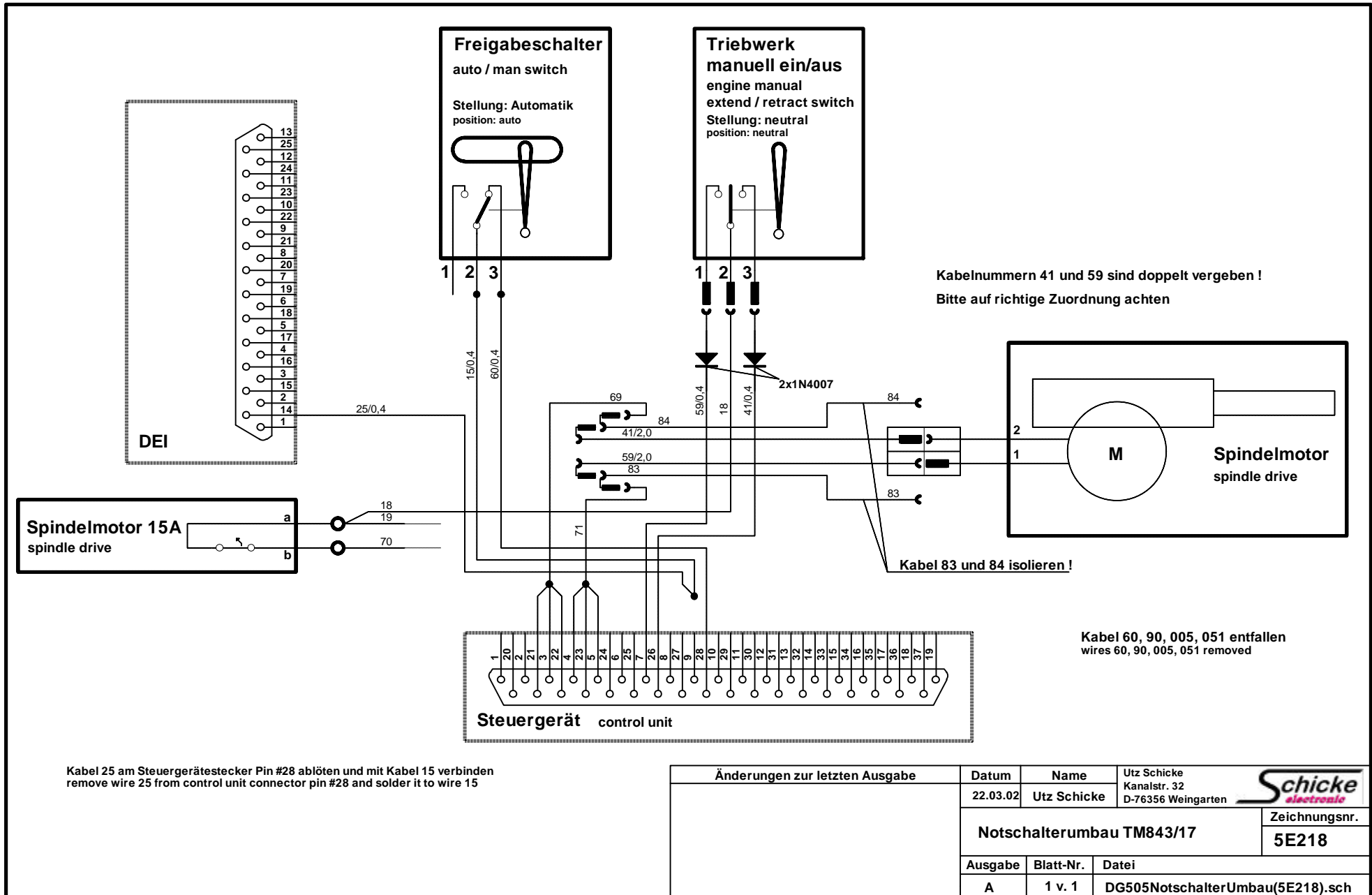
- changes since last edition
- DEI fuse 5A
- 2A fuse in control unit
- battery capacity min. 10Ah

date	name	Schicke electronic
21.03.02	U.Schicke	Kanalstr. 32 D-76356 Weingarten
wiring diagram DG 505MB		Zeichn.-Nr. <b>5E101</b>
edition: G	page 1	of 1






changes since last edition - ext/retr. switch	Datum	Name	Schicke electronic Kanalstr. 32 D-76356 Weingarten
	22.03.02	U.Schicke	
wiring diagram DG 505 MB			Zeichn.-Nr. 5E101
Ausgabe: H	Blatt 1 von 1		



Kabel 25 am Steuergerätestecker Pin #28 ablöten und mit Kabel 15 verbinden  
remove wire 25 from control unit connector pin #28 and solder it to wire 15

Änderungen zur letzten Ausgabe		Datum	Name	Utz Schicke Kanalstr. 32 D-76356 Weingarten	 Zeichnungsnr. <b>5E218</b>
		22.03.02	Utz Schicke		
<b>Notschalterumbau TM843/17</b>					
Ausgabe	Blatt-Nr.	Datei			
A	1 v. 1	DG505NotschalterUmbau(5E218).sch			