# Addendum 1 to Cavalon Gyroplane Maintenance Manual

## For the Rotorhead III modification (MC-382) and the Garmin G3X installation (MC-389)

### Document number RSUK0412

**This document must be read in conjunction with the current issue of Cavalon Maintenance Manual RSUK0288**

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**CAA Approval No: DAI/9917/06**

# Applicability

| | |
|---|---|
| **Aircraft Registration:** | **G-** |
| **Aircraft serial no.** | **RSUK/CVLN/** |
| **Engine type:** | **Rotax 912ULS & 914UL** |
| **Engine serial No:** | |
| **Rotor blade type & diameter:** | **Autogyro 8.4m RotorSystemII TOPP (blue cap, silver clamp profile)** |
| **Propeller type:** | **HTC 1,73m (with or without spinner), or, IVO-prop DL3-68 in-flight variable pitch (with or without spinner)** |

## CONTENTS AND CHECK LIST OF PAGES

## SECTION 1

### AMENDMENTS TO THE SCHEDULE

1. Where & when necessary RotorSport UK Ltd (hereafter referred to as RSUK) will issue updates to this maintenance standard, and will notify known owners to review the changes via the RSUK website with changes appropriately identified by a strike in the margin.
2. Aircraft operators are responsible for ensuring that amendments to their publication are carried out immediately and in accordance with instructions contained in amendment transmittal letters (where issued).

| ISSUE NUMBER | DATE | INSERTED BY | ISSUE NUMBER | DATE | INSERTED BY |
|---|---|---|---|---|---|
| **Initial** | | | 4 | | |
| 1 | 24.07.18 | | 5 | | |
| 2 | | | 6 | | |
| 3 | | | 7 | | |

| Issue | Change summary |
|---|---|
| 1 | First issue |
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| 4 | Intentionally blank |

| Statement of initial certification:<br>This manual complies with British Civil Airworthiness Requirements | | |
|---|---|---|
| RotorSport UK Ltd approval signatures for the above manual issue. | | |
| Signature:<br>G. Shaw Oct 1 2018 2:54 PM<br>DocuSign<br>Position: Engineering Manager | Signature:<br>G. Speich Oct 1 2018 9:38 AM<br>DocuSign<br>Position: Head of Engineering | Signature:<br>3 Oct 2018<br>Position: Head of Airworthiness |

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## SECTION 2 Introduction

2.1. This Addendum is issued to provide interim information to owners and maintenance personnel pending a major revision of Cavalon Maintenance Manual RSUK0288.

2.2 It relates to two particular topics:

(i) Introduction of Rotorhead III under modification MC-382
(ii) Introduction of the Garmin G3X EFIS-system under modification MC-389

## SECTION 3 Periodic and Functional checks.

3.1. The checks defined later in the text are carried-out prior to flight and should be repeated each time the aircraft is inspected by an engineer every 100 flight-hours or Annually (whichever is sooner)

## SECTION 4 Maintenance requirements

4.1. Rotorhead III is subject to certain maintenance requirements, as defined later in the text.

4.2. The Garmin G3X EFIS system is essentially maintenance-free, other than periodic checks as to calibration.

## SECTION 5 Rotorhead III

Introduction

Rotorhead III was introduced to the Cavalon gyroplane under modification MC-382 in mid-2018. It is constructed of aluminium and stainless steel parts and its configuration enables optimisation of flight characteristics.

It also enables higher pre-rotation speeds, this achieved by a different ratio ring-gear, different shaft bearings, and an improved pre-rotator gearbox. Rotation up to 320rpm is now possible, leading to much reduced take-off run.

To aid the Pilot in use of the faster pre-rotation capability an amber “clutch” warning light is fitted to the top of the instrument panel. By means of a simple electronics module in the wiring harness the “clutch” warning light indicates to show:

- a continuous light - clutch slipping excessively during pre-rotation
- a blinking light – intended take-off run with low rotor RPM, with danger of blade-flapping occurring

Rotorhead III is also fitted with two separate braking systems:

- the original arrangement engaged by the flight/brake selector switch
- a secondary brake pad on the gimbal block engaged by full forward movement of the control stick. This front brake pad also acts as the primary pitch control stop, effective before the secondary pitch control stop fitted at the stick. The rear pitch limit stop is between the gimbal block and the bridge, and is not adjustable,

It should be noted that although Rotorhead III accommodates the standard Rotorsystem II rotor variants its teeter tower is different to previous designs so only complete Rotorhead systems should be fitted. The correct teeter tower and teeter block combination MUST be used! Short tower plus short block, tall tower plus tall block.

Because the rotorhead is more compact than the original version, a longer mast is also used.

The pre rotator gearbox is also changed to version III. This version includes an improved bearing arrangement and clutch plate material to withstand the increased loadings at 320 rotor rpm.

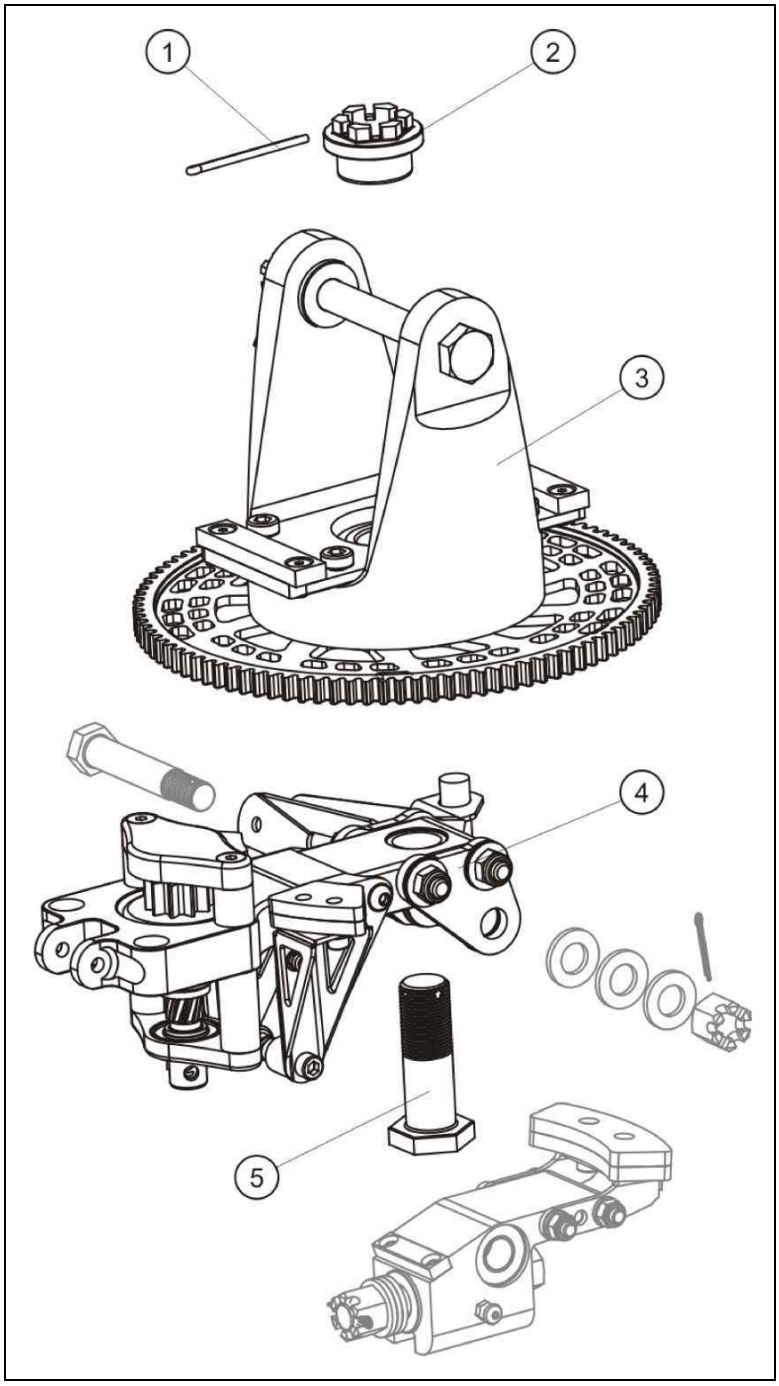
**Note that at this time only the TOPP rotors are approved for use with the Rotorhead III configuration.**

Critical Parts

The critical parts list is revised as below when Rotorhead III is fitted:

| Item & pt No. | Reason/comment |
|---|---|
| Rotor Head Upper Assembly, 22.5mm sideplates 46048 | Correct assembly of pitch, roll, main bearing and teeter bolts/nuts and splits pins is essential for safe operation |
| Upper Mast assembly 45983 with bushes 45980 welded assy | Must be inspected carefully for cracks or other weld problems |
| Teeter tower III assy 45567 | No cracks or damage permitted for safe operation |
| Main bearing nut 23796 | Critical part, must be properly tightened and correctly fitted with a split pin. |
| Main bearing bolt 45132 | Critical part, must be properly tightened and correctly fitted with a split pin. |
| Rotorhead bridge 43575 | Must be inspected carefully for cracks or other fractures |

| | |
|---|---|
| Rotorhead sideplates 22.5mm<br>45121<br>45966 | Must be inspected carefully for cracks or other fractures |
| Gimbal block assy<br>36128 | Must be free of cracks or fractures for safe operation |
| Pitch and roll bolts<br>20675<br>43673 | Must be correctly fitted, with no cracks or damage |




Exploded view of Rotorhead III

Procedure for inspection of Rotorhead bridge, bearing and teeter tower

1 Inspect rotor head bridge (4) function and condition, i.e. no misalignment, dents, nicks, corrosion, or cracks. In case of any of the aforementioned is evident or suspected contact RSUK customer support.

2 Inspect, whether the upper bearing holder for the Bendix shaft is properly secured to the bridge, rectify as required..

3 Inspect teeter stops for correct attachment and condition.

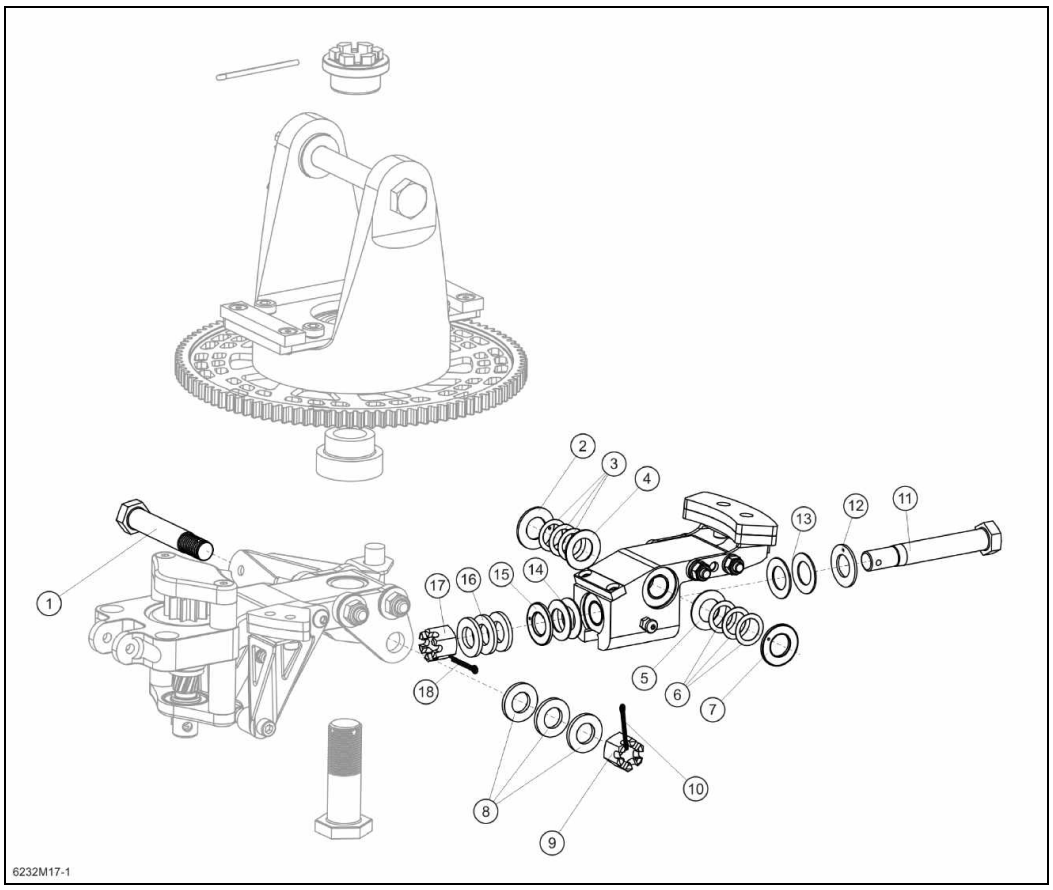
4 Inspect teeter tower (3) for correct attachment and condition, i.e. no cracks. In case of cracks or unusual condition or appearance contact RSUK customer support.

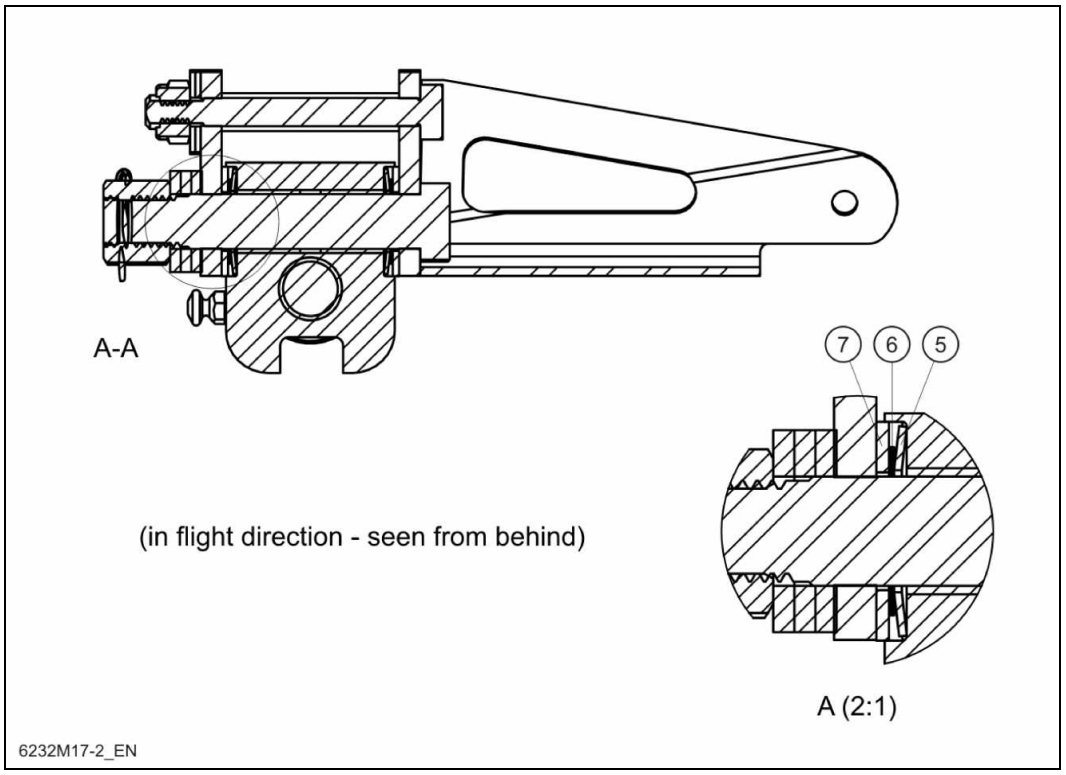
5 Perform torque-check on main bolt nut (2). In order to do so, remove and discard split pin (1) and torque-check castle nut with 120 Nm.

6 If torque-check fails, check carefully for any damage of the teeter tower or bearing or system. Only if there is no damage, retorque. If in doubt, contact RotorSport.UK Ltd

7 Insert new split pin (1) and secure. Make sure that ends do not contact rotating parts.

***WARNING: Do not fly gyroplane in case torque-check failed unless properly corrected. Clearly mark as unserviceable and prevent from use until resolved.***




Gimbal head assembly showing spring and shim washers

Procedure for inspection of Rotorhead III gimbal head

1 Inspect gimbal head for correct function and condition, i.e. check split pins (10) and (18) are installed and no play at the hinge points is evident.

2 Verify angles of gimbal head mechanical end stops. In order to do so perform the following work steps:

3 Place gyroplane on level ground with zero roll attitude and lower mast section vertical.

4 Rotate rotor head so that rotor blades (removed!) would point exactly fore-aft. Place inclinometer on top of teeter tower and measure RH and LH end stop angle. Make sure that mechanical stops are reached. Record values.

5 Rotate rotor head so that rotor blades (removed!) would point exactly left-right. Place inclinometer on top of teeter tower and measure FORE and AFT end stop angle. Make sure that mechanical stops are reached. Record values.

6 Verify measured angles comply with the values specified in the corresponding type certificate data sheet. If any of the values differs by more than 1° from the specified value mark component unserviceable and contact RSUK customer support

NOTE! Wear of the rotor brake will allow increased forward travel in the pitch plane. This is permissible. Always ensure that the head reaches the brake before the stick limit stop.

Procedure for inspection of Pre-rotator upper engagement

Gyroplane must be placed on level ground and restrained (blocks, chocks)

1 Inspect wear pattern and gear mesh of pre-rotator upper engagement. If in doubt, contact RSUK customer support.

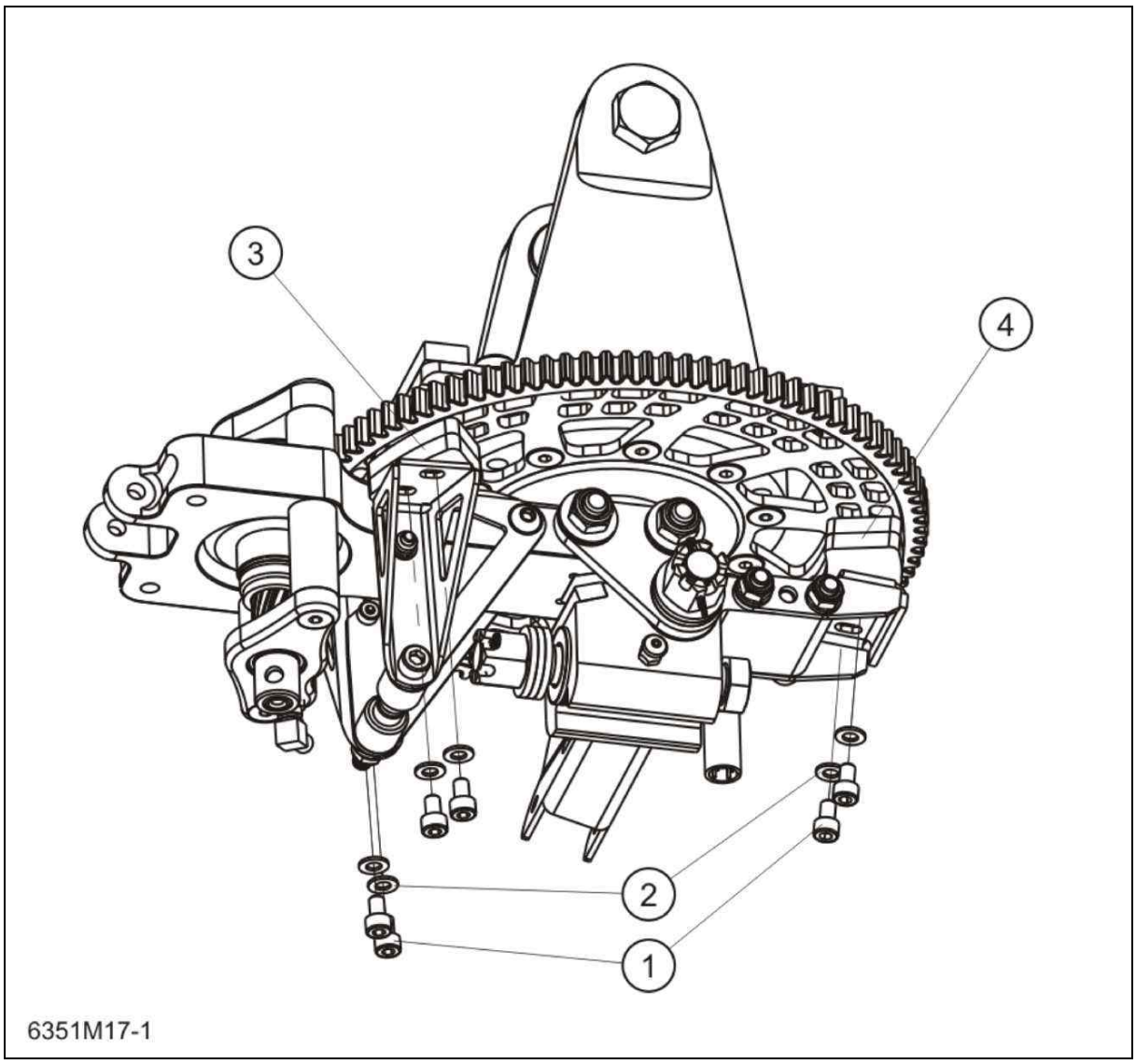
2 If the wear pattern is uneven (see photo below), e.g. due to dynamic skew, the pre-rotator upper engagement /Bendix shaft must be repaired according to 63-11-30 8-2.

3 Inspect backlash of pre-rotator upper engagement. Backlash should be as tight as possible, but also wide enough to allow easy engagement of the pinion into the sprocket in any position.

4 If necessary, have backlash adjusted according to 62-31-00 5-1.

5 Grease with AG-GRS-01 or equivalent.

Wear Pattern (uneven)




Rotorhead III brake pads

Procedure for replacement of rotor brake pads

Gyroplane must be placed on level ground and restrained (blocks, chocks)
Rotor system must be removed, see 62-11-00 4-1

1 Unscrew and remove hexagon socket screws (1) with washers (2) of affected brake pad.

2 Replace integrated rotor brake pad assembly (3/4) with new component.

3 Apply Loctite 243 (blue) on screws, re-install hexagon socket screws (1) with washers (2) and torque-tighten.

4 After replacing the front pad, check that the head stops onto the pad before the stick reaches the forward limit stop. Adjust limit stop as required,

## SECTION 6 Garmin G3X EFIS system

An EFIS system supplied by Garmin Aviation Products, the G3X Touch, has been approved for fitment to Cavalon under modification MC-389. To meet BCAR Section T requirements certain conventional instruments must be fitted as primary reference devices. The other instruments are displayed on the Garmin flat-screen display.

The following conventional instruments (as approved under AAN29345) are fitted:

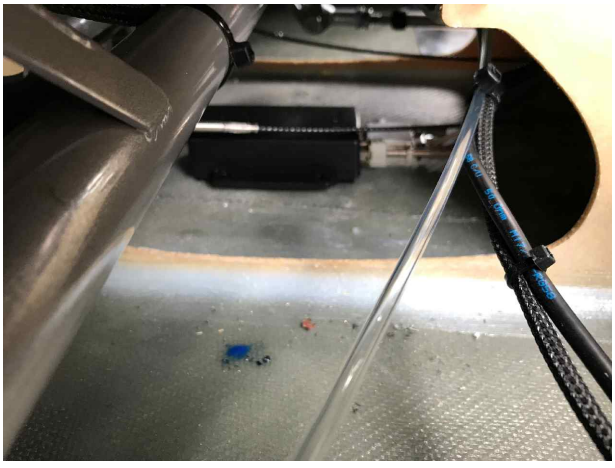
- Airspeed indicator (0-120mph)
- Altimeter (0-20,000ft)
- Magnetic compass (card-compass mounted on the glareshield)
- Slip indicator (in the form of a slip-string attached to the windscreen)
- Rotor rpm gauge (with limitation markings in accordance with T33)
  (NB: This is optional and may be incorporated into the Garmin display)
- Radio (ATR833 MkII)

The conventional instruments deleted and appearing on the Garmin display are:

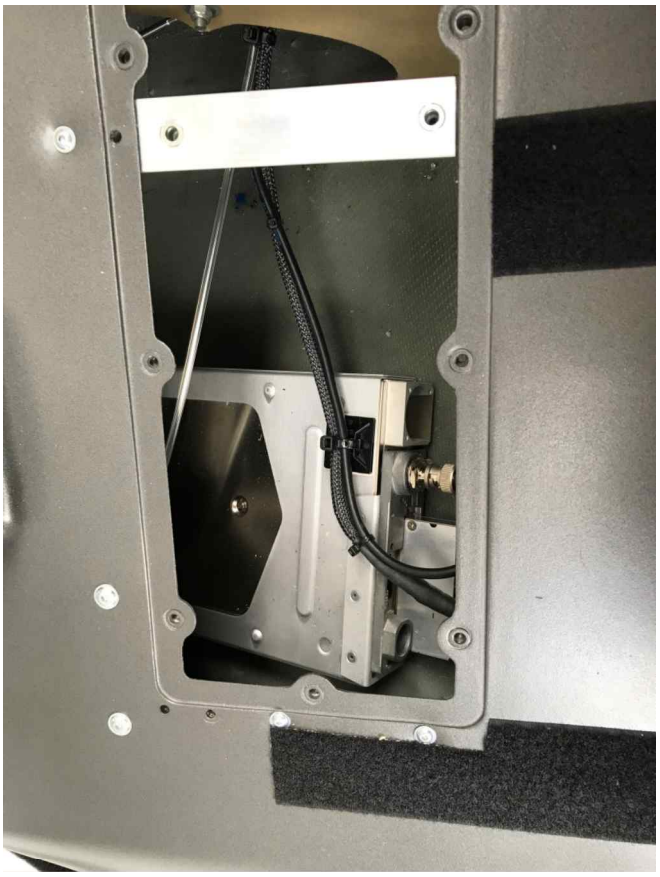
- Transponder (TRT800H) (weight 0.6kg)
- CHT or CT gauge (Note Rotax mandatory SB's relating to CT gauge are satisfied by MC-321 and modification MC-389)
- Oil pressure gauge
- Oil temperature gauge
- Engine rpm gauge
- Manifold pressure gauge
- Attitude indicator (optional)
- VSI (2-1/4") or VSI (full size) (optional)
- OAT gauge
- iPad and bracket (optional)
- Audio control

Although not previously fitted exhaust gas temperature (EGT) and fuel pressure are optional items for the Garmin display. Also optional is an ADS-B receiver (GDL 50), this being mounted on top of the glareshield.

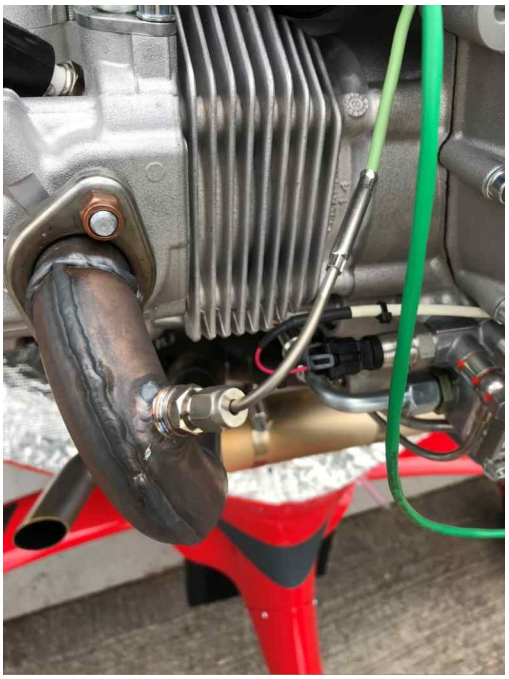
The various sensors and modules of the Garmin G3X system are fitted in different locations around the gyroplane, as shown below:

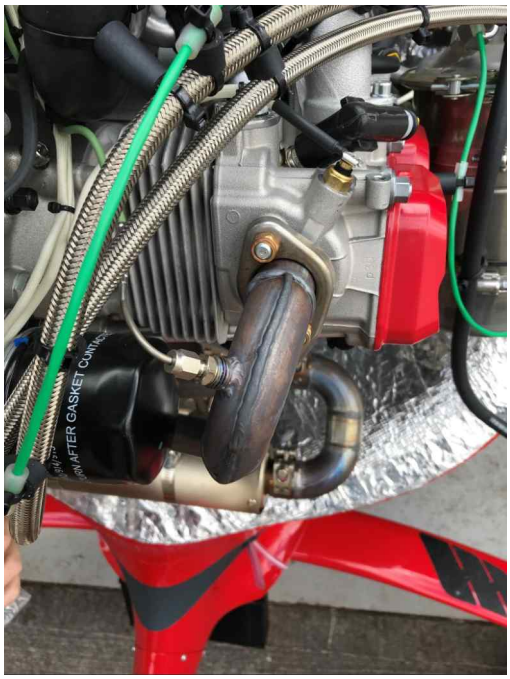


AHRS unit installed in the mid channel, weight ~1.0kg. Bonded to the body floor with structural mastic

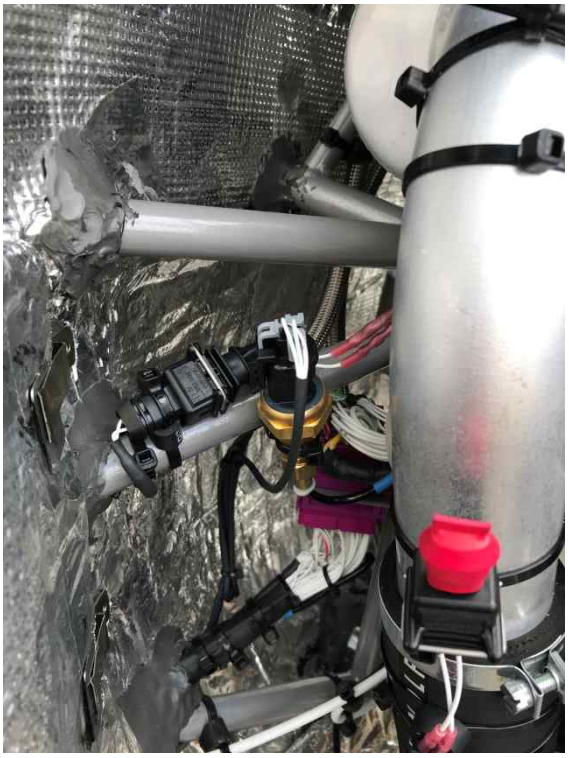


Transponder unit located on floor under passenger seat. Weight 1.18kg. Attached by self-adhesive Velcro





EGT sensors mounted into the standard Rotax sensor receptacles

.. 

Manifold pressure sensor located in engine bay (attached to engine frame)

Fuel pressure sender integrated into fuel-pipes


Equipment bay mounted Garmin engine information unit. Total weight 0.57kg attached to CFRP bulkhead by M4 cap-screws into threaded inserts

Wiring diagrams pertaining to the G3X installation are shown below.

Special setup instructions

Comprehensive User and Installation instructions are provided by Garmin and are supplied by RSUK with the gyroplane equipment.

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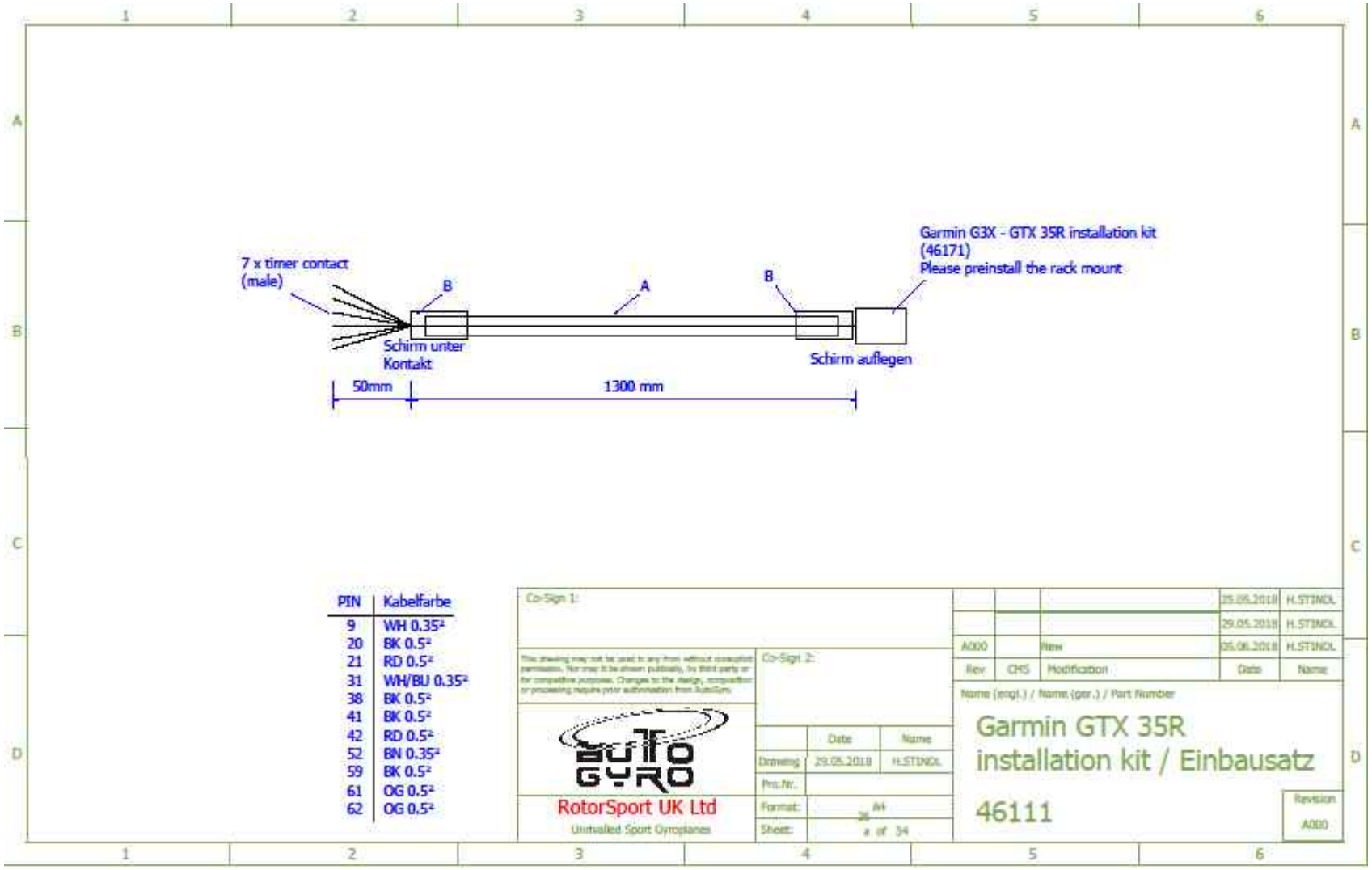

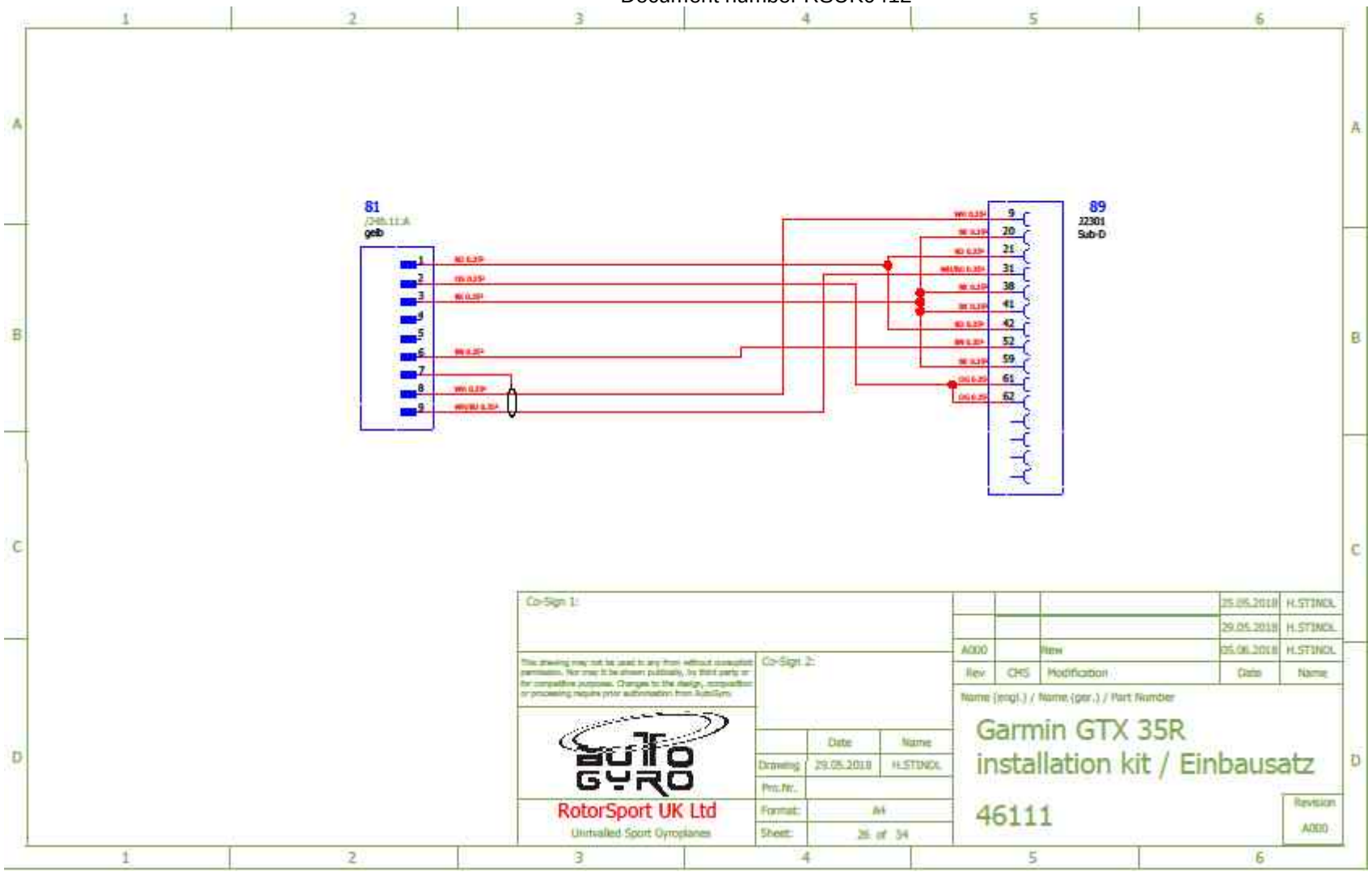

Model:
Cavalon

## GTX 35R installation kit

Artikel:46111
Version: A000

| Connection: | Case: | Position on gyro: |
|---|---|---|
| Transponder wiring harness to cockpit |  | behind the cockpit |
| Plug no. (wiring diagram): 81 | | |

| Pin | Color | Lable | Cross section mm² | Cross section AWG | Function | Note |
|---|---|---|---|---|---|---|
| 1 | RD | | 0.35 | #22 | Power | |
| 2 | OG | | 0.35 | #22 | Backup power | |
| 3 | BK | | 0.35 | #22 | Ground | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | BN | | 0.35 | #22 | RS-232 Ground | |
| 7 | shield | | 0.35 | #22 | RS-232 shield | |
| 8 | WH | | 0.35 | #22 | RS-232 RX | |
| 9 | WH/BU | | 0.35 | #22 | RS-232 TX | |

| Connection: | Case: | Position on gyro: |
|---|---|---|
| Wiring to transponder | | under the copilot seat |
| Plug no. (wiring diagram): 89 | | |

| Pin | Color | Lable | Cross section mm² | Cross section AWG | Function | Note |
|---|---|---|---|---|---|---|
| 9 | WH | | 0.35 | #22 | RS-232 RX | |
| 20 | BK | | 0.35 | #22 | Ground | |
| 21 | RD | | 0.35 | #22 | Power | |
| 31 | WH/BU | | 0.35 | #22 | RS-232 TX | |
| 38 | BK | | 0.35 | #22 | Ground | |
| 41 | BK | | 0.35 | #22 | Ground | |
| 42 | RD | | 0.35 | #22 | Power | |
| 52 | BN | | 0.35 | #22 | RS-232 Ground | |
| 59 | BK | | 0.35 | #22 | Ground | |
| 61 | OG | | 0.35 | #22 | Backup power | |
| 62 | OG | | 0.35 | #22 | Backup power | |

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Harald Stindl

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Model:
Cavalon

## G3X installation kit

Artikel:46160
Version: A001

| Connection: | Case: | Position on gyro: |
|---|---|---|
| Fuel level to G3X | 22183  | between the tanks |
| Plug no. (wiring diagram): 6 | | |

| Pin | Color | BT | Cross section mm² | Cross section AWG | Function | Note |
|---|---|---|---|---|---|---|
| 1 | S_GND | | 0,35 | #22 | Sensor GND | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | OG/BN | | 0,35 | #22 | Fuel level signal | |
| 5 | | | | | | |
| 6 | | | | | | |

| Connection: | Case: | Position on gyro: |
|---|---|---|
| wiring harness to engine bay | 22404  | in front of the engine at the left side |
| Plug no. (wiring diagram): 14 | | |

| Pin | Color | BT | Cross section mm² | Cross section AWG | Function | Note |
|---|---|---|---|---|---|---|
| 1 | YE/WH | | 0,35 | #22 | CHT1 right rear | |
| 2 | OG/YE | | 0,35 | #22 | CHT2 left front | |
| 3 | YE | | 0,35 | #22 | Oil temperature | |
| 4 | YE/BU | | 0,35 | #22 | Oil pressure 12V | |
| 5 | YE/GN | | 0,35 | #22 | Oil pressure | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | BK | | 0,5 | #20 | Sensor GND | Add this wire |
| 10 | GN | | 0,35 | #22 | Engine RPM | Add this wire |
| 11 | GN1 | | 0,35 | #22 | EGT 1 + (option) | |
| 12 | WH1 | | 0,35 | #22 | EGT 1 - (option) | |
| 13 | WH | | 0,35 | #22 | Engine RPM GND | |
| 14 | GN2 | | 0,35 | #22 | EGT 2 + (option) | |
| 15 | WH2 | | 0,35 | #22 | EGT 2 - (option) | |
| 16 | | | | | | |
| 17 | | | | | | |
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Harald Stindl

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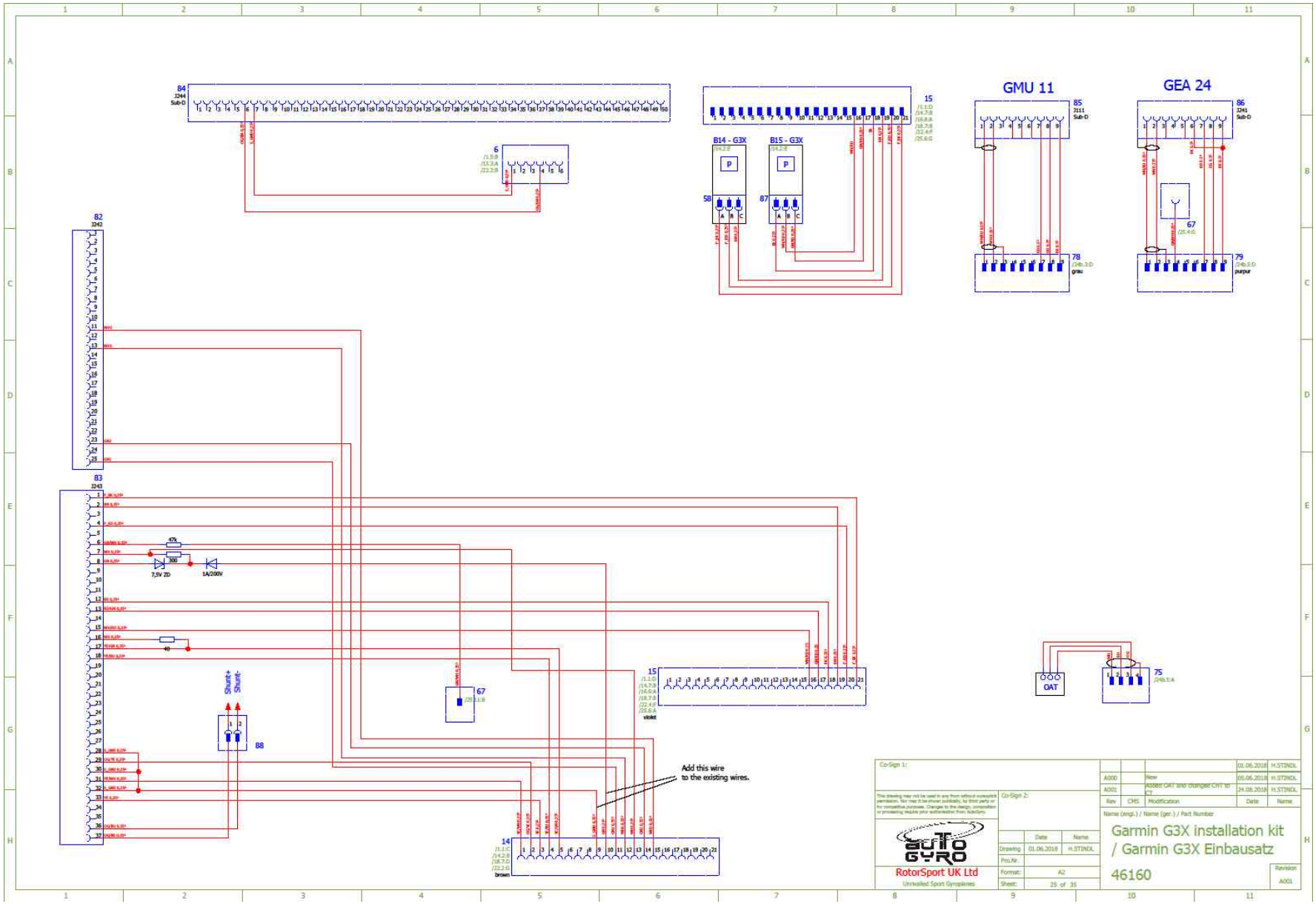
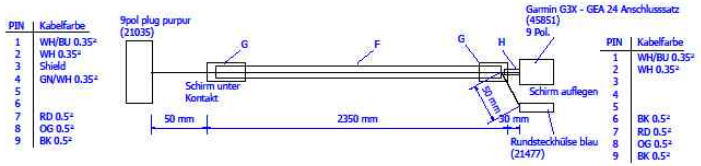


## Sensoranalyser wiring harness (GEA 24 - J241)



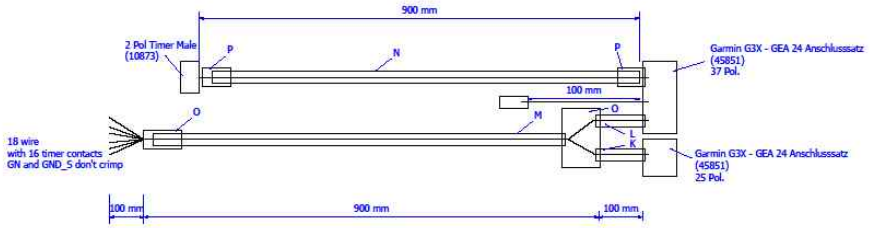

| PIN | Kabelfarbe |
|---|---|
| 1 | WH/BU 0.35² |
| 2 | WH 0.35² |
| 3 | Shield |
| 4 | GN/WH 0.35² |
| 5 | |
| 6 | |
| 7 | RD 0.5² |
| 8 | OG 0.5² |
| 9 | BK 0.5² |

| PIN | Kabelfarbe |
|---|---|
| 1 | WH/BU 0.35² |
| 2 | WH 0.35² |
| 3 | |
| 4 | |
| 5 | |
| 6 | BK 0.5² |
| 7 | RD 0.5² |
| 8 | OG 0.5² |
| 9 | BK 0.5² |

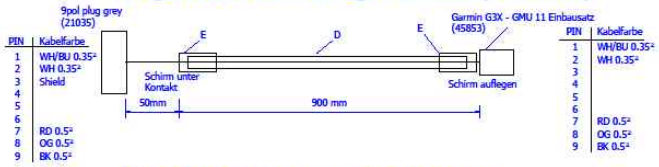
## GEA 24 - J244


| PIN | Kabelfarbe |
|---|---|
| 6 | OG/BN 0.35² |
| 7 | S_GND 0.35² |

## GEA 24 - J242/J243




## Magnetometer wiring harness (GMU 11)




| PIN | Kabelfarbe |
|---|---|
| 1 | WH/BU 0.35² |
| 2 | WH 0.35² |
| 3 | Shield |
| 4 | |
| 5 | |
| 6 | |
| 7 | RD 0.5² |
| 8 | OG 0.5² |
| 9 | BK 0.5² |

| PIN | Kabelfarbe |
|---|---|
| 1 | WH/BU 0.35² |
| 2 | WH 0.35² |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | RD 0.5² |
| 8 | OG 0.5² |
| 9 | BK 0.5² |

## Manifold pressue wiring harness


| PIN | Kabelfarbe |
|---|---|
| A | BK 0.35² |
| B | WH/RD 0.35² |
| C | GN/RD 0.35² |

## Fuel pressue wiring harness


| PIN | Kabelfarbe |
|---|---|
| A | F_BK 0.35² |
| B | F_RD 0.35² |
| C | BN 0.35² |

## OAT


| PIN | Kabelfarbe |
|---|---|
| 1 | WH |
| 2 | BU |
| 3 | OG |
| 4 | Shield |

| Rev | CHG | Modification | Date | Name |
|---|---|---|---|---|
| A001 | | Added OAT | 24.06.2018 | H.STINDL |
| A002 | | Change connect at J244 from timer to MCP | 31.06.2018 | H.STINDL |
| A003 | | Overlines cable length at markers crossure | 01.06.2018 | H.STINDL |

RotorSport UK Ltd
Uncivalled Sport Gyroplanes

Name (engl.) / Name (ger.) / Part Number
Garmin G3X installation kit
/ Garmin G3X Einbausatz
46160

Drawing 01.06.2018 H.STINDL
Format: A2
Sheet: 5 of 35
Revision A003

Model:
Cavalon

# G3X cockpit installation

Artikel:46216
Version: A001

| Connection: | Case: | Position on gyro: |
|---|---|---|
| G3X to GMA 245 |  | behind the cockpit |
| Plug no. (wiring diagram): 68 | | |

| Pin | Color | Lable | Cross section mm² | Cross section AWG | Function | Note |
|---|---|---|---|---|---|---|
| 1 | WH/BU | | 0.35 | #22 | CAN-Bus high | |
| 2 | WH | | 0.35 | #22 | CAN-Bus low | |
| 3 | shield | | | | CAN-Bus shield | |
| 4 | | | | | | |
| 5 | RD7 | | 0.5 | #18 | Power | |
| 6 | WH | | 0.5 | #18 | Ground | |

| Connection: | Case: | Position on gyro: |
|---|---|---|
| GDU XXX - J4x02 | | behind the cockpit |
| Plug no. (wiring diagram): 71 | | |

| Pin | Color | Lable | Cross section mm² | Cross section AWG | Function | Note |
|---|---|---|---|---|---|---|
| 1 | WH/BU | AUDIO | 0.35 | #22 | AUX IN Signal | drilled with wire at p18 |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | WH | | 0.5 | #20 | Coding bridge | bridged with pin 27 |
| 11 | | | | | | |
| 12 | | | | | | |
| 13 | | | | | | |
| 14 | | | | | | |
| 15 | BK | | 0.5 | #20 | Ground | |
| 16 | BK | | 0.5 | #20 | Ground | |
| 17 | RD | | 0.2 | #24 | Configmodul 3.3V | |
| 18 | WH | AUDIO | 0.35 | #22 | AUX IN Ground | drilled with wire at p1 |
| 19 | | | | | | |
| 20 | | | | | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | WH | | 0,50 | #20 | Coding bridge | bridged with pin 10 |

29.06.2018 10:07
Harald Stindl

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