

TM350

Traffic Monitor



AMENDMENT TO MANUAL

Document No. 03.314.010.12e

Guideline for Installation and Approval Procedures ACC TO EASA STANDARD CHANGE (CS-STAN)

Change History

Revision	Date	Description of Change
1.00	17.05.2025	Initial Version

List of Service Bulletins (SB)

Service-Bulletins affecting TM350 are to be recorded in this table:				
SB Number	Rev. No.	Date of Issue	Entry Date	Name

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1 GENERAL TM350

The Traffic Monitor **TM350** is a device to improve the situational awareness of the pilot by providing position and position change of compatible near-by air traffic. Aircraft in the vicinity are identified by receiving signals from transponders operating in Mode-C or Mode-S (incl. Extended Squitter with ADS-B information) as well as transmissions from Flarm® in the SRD860 Band and other compatible electronic conspicuity devices.

The received signals are processed in near real-time for display on various mobile devices, electronic flight bags and multi-function displays.

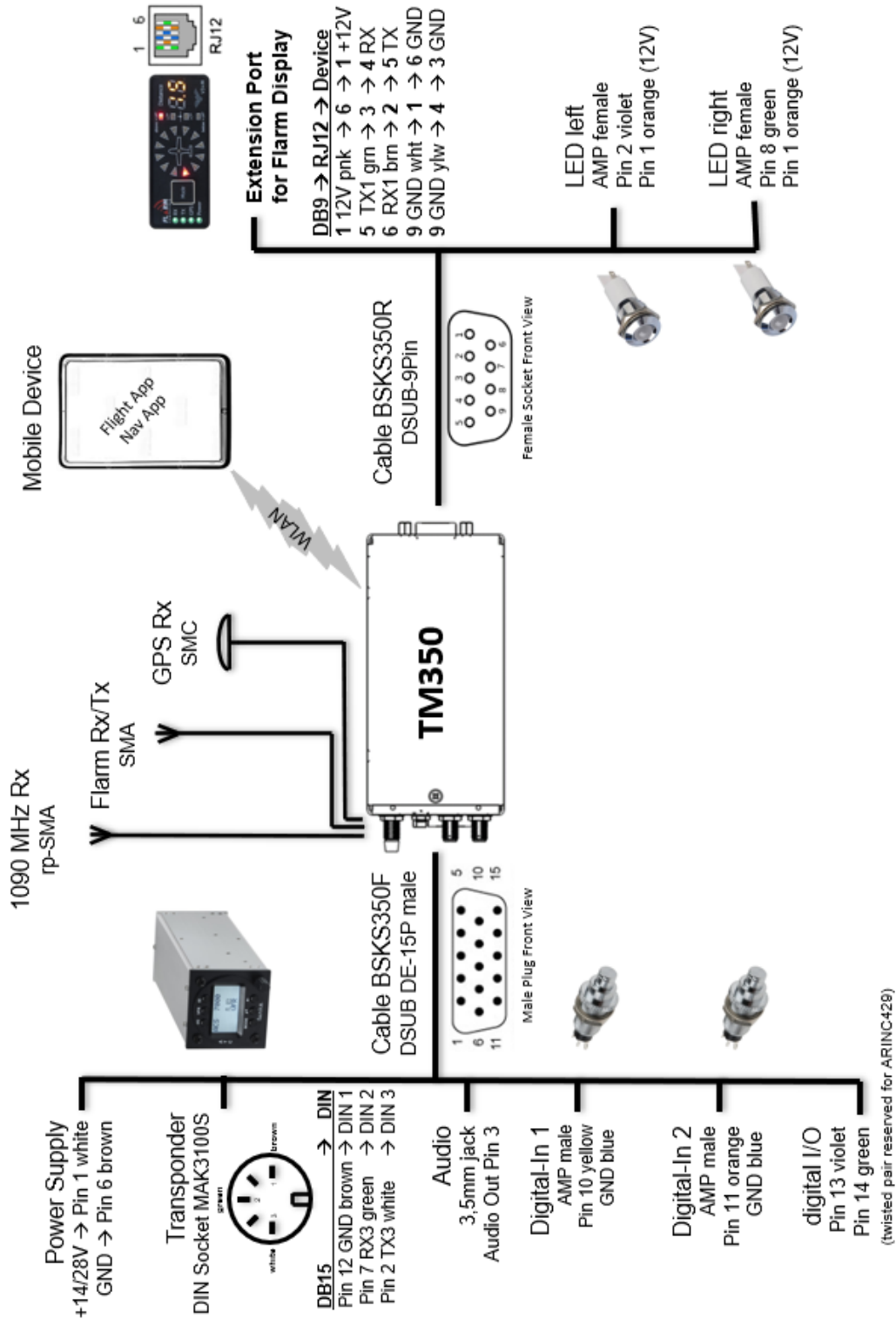
Detected targets within a defined range are evaluated concerning the risk of a dangerous approach and related warnings are issued in the data stream and as audio signal.

The **TM350** provides four serial ports which can be configured individually to support a variety of navigations apps and cockpit displays. The WLAN connectivity allows the connection of two mobile devices simultaneously.

1.1 TM350 Connection Scheme

The following scheme shows a complete installation setup using the standard cable harnesses BSKS350F and BSKS350R. It includes (optional) connections to:

- a FLARM compatible traffic display
- a TRT800 transponder for ADS-B Out
- 2 x Warning LEDS for improved situational awareness
- audio output to intercom system
- pushbuttons for warning acknowledgement and control



1 - Connection Scheme

2 APPROVAL PROCEDURES

A retrofit installation in EASA certified aircraft can be performed under “Certification Specifications for Standard Changes and Standard Repairs (CS-STAN) which defines the acceptable means of compliance for the release to service of the modified aircraft.

The installation of a TM350 device can be performed under two different Standard Changes according to CS-STAN Issue 4.

- 1) Installation according to CS-SC057a, which is applicable for installations that integrate Flarm in a manner different from SC051 (FLARM), e.g. on a different frequency.
- 2) Installation according to CS-SC062a, which describes the installation of an awareness function or an awareness device.

ADS-B Out functionality in combination with the transponder TRT800H/A can be performed under CS-SC005b.

The installation of additional annunciators can be performed under CS-SC110a.

The installation according to CS-STAN must be approved by an EASA Part M or Part 145 approved organization and documented on the EASA Form 123.

This document describes the specific procedures for a TM350 installation.

2.1 CS-SC057a – Electronic Conspicuity (EC) Device

The SC057a can be used for the installation of an electronic conspicuity (EC) function. It is applicable for installations that integrate FLARM in a manner different from SC051 (FLARM).

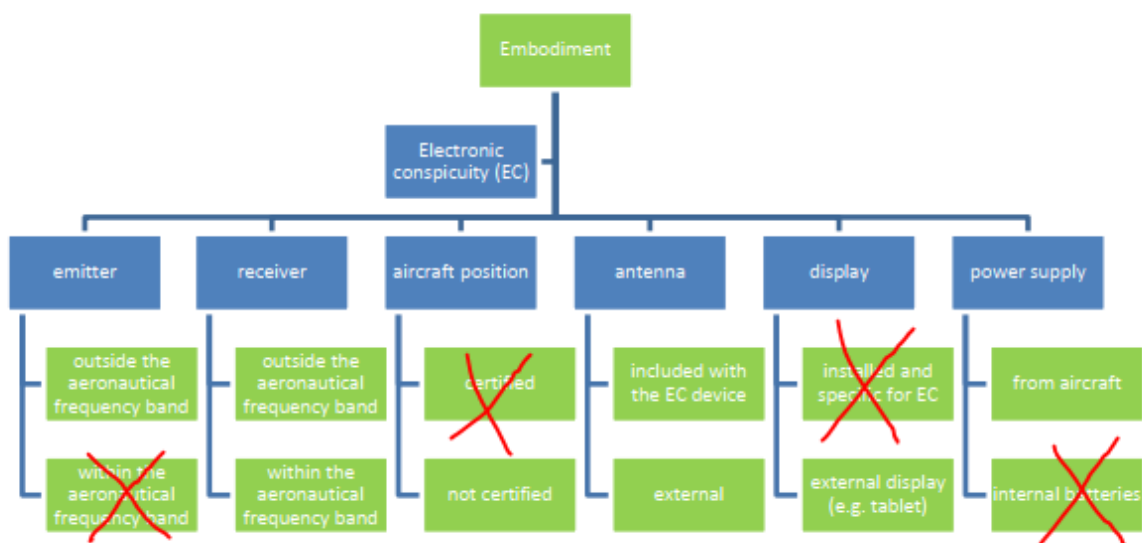
2.1.1 Applicability / Eligibility

The SC057a can be applied for:

- aeroplanes that are not complex motor-powered aircraft;
- rotorcraft that meet all the following conditions:
 - MTOM of 3.175 kg or less;
 - certified for a maximum passenger seating configuration of nine (9) passengers or less;
 - not approved for Category A or equivalent operations;
- ELA2 aircraft.

The functionality of the TM350 allows to define it as an “electronic conspicuity device” because it

- incorporates a receiver and transmitter
- has embedded and external antennas
- has an embedded GNSS receiver
- broadcasts its own position
- receives positions from other aircraft
- can be combined with other systems



2 - TM350 elements for an Electronic Conspicuity Device

Checklist for embodiment of an electronic conspicuity device:

Emitter	
Emitter outside the aeronautical frequency band	The TM350 incorporates a licensed Flarm transceiver operating in the SRD band. Non-interference was demonstrated by the corresponding CE tests. (Manual Appendix D, p.60f)
Emitter within the aeronautical frequency band	not applicable
Receiver	
Receiver	MODE C/S and ADS-B reception is within the aeronautical frequency band (1090 MHz). Flarm reception is outside the aeronautical frequency band (868,2 MHz). The 1090 MHz receiver has no ETSO authorization or equivalent and requires no EASA Form 1.
Aircraft Position	
Aircraft position	The TM350 incorporates its own position source and has no ETSO authorization. It can be installed without an EASA Form 1.
Antenna	
Internal antenna	Internal 1090 MHz – PNETAN35 Internal Flarm antenna – PNETAN80 Check that the antennas are installed without obstructing any installed equipment or are blocking any exit.
External antenna	External antennas may also be used but must be installed according to installation rules for external antennas in aircraft. The 1090 MHz antenna is for reception only. Flarm transmission is outside the aeronautical frequency band. Certified antennas are not required.

Display	
Display	TM350 does not come with its own display but is compatible to a variety of Flarm displays and mobile devices. Instructions of the display manufacturer and the operation of such displays in the aircraft cockpit shall apply.
Embodiment	
Embodiment	The TM350 is tested according to environmental conditions acc. to DO-160F (pls refer to the Operating Manual, Appendix C). Data connection to other ETSO equipment is not allowed unless explicitly listed by its manufacturer.
Power supply	
Internal batteries	not applicable
Avionics bus	The TM350 shall be protected by a fuse or CB switch 2A/14V (1A/28V).

2.1.2 Required Procedures for Acceptance / Approval

The installation shall meet the electrical requirements set out in the FAA Advisory Circular AC 43.13-2B or equivalent standard:

Chapter 2 Communication, navigation, and emergency Locator transmitter system installations

And, if applicable:

Chapter 3 Antenna installation

Chapter 11 Adding or relocating instruments

The installation requires an amendment of the Aircraft Flight Manual.

2.1.3 Limitations

The Standard Change SC0057a cannot be used to extend the operational capability of the specific aircraft (e.g. conversions to VFR at night or to IFR operations).

CS- SC0057a is not applicable for aircraft approved for NVISs/NVGs

According to CS-SC057a §4 no connection is allowed to any system required by airworthiness or operational rules.

According to CS-SC057a §4 no alerts may be generated that override other alerts that need more immediate crew action.

2.1.4 Required Checks

Check that internal antennas are installed without obstructing any installed equipment or blocking any exit.

Check that connected displays are installed in such a manner that is independent from other displays and does not obstruct primary field of view

Check that the TM350 is installed at a location with suitable environment conditions for normal operations

Check that the TM350 is installed at a location with minimum risk of interference, i.e. away from instruments required for flight.

Check, that the power supply of the TM350 is attached to a non-essential supply (bus bar, if available) and verify that power consumption is compatible with a/c installation.

Check that the power supply wire (PWR – Pin 1) is protected by a fuse or circuit breaker with 2A/14V slow or 1A/28V slow.

Check that TM350 outputs are not used as input to an AFCS (e.g. autopilot) or to similar equipment to maintain their airworthiness

Check that TM350 outputs overwrite alerts from other equipment.

2.1.5 Ground Tests / Flight Tests

A ground test shall be performed acc. to CS STAN.48 Subpart A including test for lack of interference (EMI/EMC) with other systems acc. to AC43.13-1B Chapter 11 or ASTM F2639-18 for AMC for EMC test.

Conduct an installation check flight to assess the proper functioning of the Traffic Monitor TM350, unless a ground test can adequately assess all the features from such an awareness function or awareness device.

The proper FLARM functionality can be tested with various FLARM Range Analyzer tools, e.g. FLARM, LXNav, Ktrax, OGN,....

2.1.6 Declarations of the manufacturer:

The TM350 includes a GNSS receiver as a/c position: sensor which can be installed without ETSO authorization, i.e. w/o EASA Form 1.

The TM350 does not issue any advice on how to avoid traffic. (see manual document no. 03.314.010.71 §1.2.4 p.7)

f.u.n.k.e. AVIONICS declares that the TM350 exclusively relies on its own systems/units in order to provide its intended function.

f.u.n.k.e. AVIONICS declares that the TRT800H/A is listed as compatible equipment and can be connected to the TM350 for ADS-B out.

The weight of the TM350 is appr. 250g (0,55lbs) and is below the limit of 300g.

2.2 CS-SC062a – Awareness Device

The TM350 can be installed according to Standard Change SC062a as an awareness device or awareness function.

2.2.1 Purpose

The TM350 meets the purpose of an awareness device as defined in CS-SC0062a §1, because the TM350

- makes aware what is going on outside the aircraft
- supports successful decision making
- provides useful cues on the status of the aircraft and on the surrounding environment
- includes a 1090 MHz and Flarm receiver
- does not emit outside the aeronautical frequency band
- the emitter within the aeronautical frequency band, i.e. ADS-B out on 1090 MHz can be performed with SC005b.

2.2.2 Applicability / Eligibility

Standard Change SC062a is applicable to

- aeroplanes that are not complex
- motor-powered aircraft
- any ELA2 aircraft.

It may be used in the following cases:

- to install or exchange an awareness function or awareness device on a VFR aircraft (including VFR at night)
- to exchange an existing awareness function or awareness device on an IFR aircraft

2.2.3 Limitations:

The Standard Change SC062a cannot be used to extend the operational capability of the specific aircraft (e.g. conversions to VFR at night or to IFR operations).

SC062a excludes any equipment that is required for airworthiness purposes or to comply with any related regulation.

SC062a cannot be used to install any type of transmitter within the aeronautical frequency band.

2.2.4 Required Procedures for Acceptance / Approval

The installation shall meet the electrical requirements set out in the FAA Advisory Circular AC 43.13-2B:

Chapter 2 Communication, navigation, and emergency Locator transmitter system installations

and if applicable:

Chapter 3 Antenna installation

Chapter 11 Adding or relocating instruments

If external antennas are used with the TM350, the installation shall be done according to CS-SC004b.

If an Electronic Flight Bag display is used in combination with the TM350, installation of a mounting system to hold the equipment shall follow CS-SC105b.

The installation requires an amendment of the Aircraft Flight Manual.

2.2.5 Required Checks

Check that the equipment is suitable for the environmental conditions to be expected during normal operations (CS-STAN.42). (see Declarations)

Check that TM350 location is away from aircraft instruments required for flight in order to minimise the risk of interference.

Check that the TM350 installation does not obstruct the primary field of view of equipment that is essential for the safe operation of the aircraft.

If warning LEDs are installed (see manual §8.7) check that the colors differ sufficiently from the colors used for warnings, cautions, and advisories, to avoid possible confusion.

Check, that the power supply of the TM350 is attached to a non-essential supply (bus bar, if available) and verify that power consumption is compatible with a/c installation.

Check that a power consumption of min. 6 Watt (500mA @ 12V) is compatible with the aircraft installation. The results of the electrical-load analysis shall be recorded, or referred to, in EASA Form 123.

Check that the power supply wire (PWR – Pin 1) is protected by a fuse or circuit breaker 2A@14V slow (1A@28V).

Check that TM350 data is not fed into systems or displays required for flight.

2.2.6 Ground Tests / Flight Tests

A ground test shall be performed acc. to CS STAN.48 Subpart A including test for lack of interference (EMI/EMC) with other systems acc. to AC43.13-1B Chpt. 11 or ASTM F2639-18 for AMC for EMC test.

Conduct an installation check flight is to assess the proper functioning of the Traffic Monitor TM350, unless a ground test can adequately assess all the features from such an awareness function or awareness device.

The proper FLARM functionality can be tested with various FLARM Range Analyzer tools, e.g. from FLARM, LXNav, Ktrax, OGN...

2.2.7 Declarations of the manufacturer

f.u.n.k.e. AVIONICS declares that the TM350 is suitable for installation on an any non-complex ELA 1 and 2 aircraft and for the operations defined in the standard change (SC). A statement of f.u.n.k.e. AVIONICS on a specific aircraft is issued on request.

An optionally integrated antenna must be assessed together with the installation of the awareness function or awareness device for crash worthiness, weight and balance, interference, and structural integrity. Such an integrated antenna is eligible for installation without an EASA Form 1."

The weight of the TM350 is 250g (0.55lbs) and below the limit of 300g.

2.3 CS-SC110a – Annunciators

The installation of a dedicated display and TM350 Warning LEDs according to manual §8.7 can be performed according to CS-SC110a Installation of annunciators.

2.3.1 Applicability / Eligibility

Standard Change SC110a can be used to install or replace a single annunciator or an integrated annunciator in not complex motor-powered aircraft and any other ELA2 aircraft for:

- VFR installations (including VFR at night) or
- IFR aeroplanes

under the conditions defined for each configuration.

2.3.2 Limitations

The installation of the equipment cannot be used to extend the operational capability of the specific aircraft (e.g. from VFR to IFR).

The installation can only be used to replace an existing annunciator or install an annunciator that aggregates aircraft warnings for awareness only in Configurations 1 and 2.

2.3.3 Required Procedures for Acceptance / Approval

The annunciator installation shall meet the electrical requirements set out in the FAA Advisory Circular AC 43.13-2B:

Chapter 1 Structural data

Chapter 2 Communication, navigation, and emergency Locator transmitter system installations

Chapter 11 Adding or relocating instruments
or ASTM F2639-18 or subsequent revisions.

The installation requires an amendment of the Aircraft Flight Manual.

2.3.4 Required Checks

Check that the new annunciator(s) are powered from the same supply (bus bar) as the system which is being monitored.

Check that the locations recommended by f.u.n.k.e. AVIONICS are used.

Check that amber annunciator LEDs are used for caution indications as TM350 warnings require immediate flight crew awareness and subsequent flight crew response.

Check that the AFM contains or is amended with appropriate instructions for operation and related limitations.

2.3.5 Declarations of the manufacturer

The annunciator LEDs are powered over the device and thus from the same supply (bus bar) as the system

2.4 CS-SC005b – ADS-B Out

This Standard Change covers the installation of an ADS-B OUT system combined with a transponder system as “Configuration 3” of CS-SC005b.

2.4.1 Purpose

The TM350 may be coupled with a TR800H/A transponder or any other suitable transponder to enable ADS-B Out transmissions. The TM350 feeds position data from its integrated GNSS receiver to the TRT800 and the TRT800 sends the height from the barometric altitude encoder. The transponder altitude data are adopted from the TM350 to avoid ambiguity with the TM350 internal barometric altitude sensor. See also the manual of the TRT800 for connecting these kinds of devices or follow the instructions of the manual of your transponder manufacturer. The following sections will refer to a combination of TM350 with TRT800 only.

2.4.2 Applicability / Eligibility

Standard Change SC005b is applicable to

- aeroplanes that are not complex
- motor-powered aircraft
- non-ADS-B required A/C
- any ELA2 aircraft.

2.4.3 Required Procedures for Acceptance / Approval

CS-SC052() for the GNSS source is applied concurrently with CS-SC005() and/or CS-SC057().

The quality indicators Static Source Integrity Level (SIL), Navigation Accuracy Category (NAC) and System Design Assurance Level (SDA) shall be set to “unknown” = 0 (zero). This is ensured if the “NMEA” protocol is chosen in the TRT800 for the data connection to the TM350.

The ADS-B Out installation shall be recorded in the EASA/LBA Form sheet 123 (see Appendix D).

The installation requires an amendment of the Aircraft Flight Manual.

2.4.4 Required Checks

Check the proper operation of the transponder by testing it in accordance with Appendix F of “14 CFR Part 43 – ATC Transponder Tests and Inspections”.

Check that the setting of quality indicators (SIL, SDA, NAC) in the TRT800 are set to zero (in case that the NMEA protocol is chosen, the TRT800 will ensure that these indicators are all set to 0).

Check that the aircraft flight manual includes the amendment "ADS-B Out installation for traffic awareness only".

2.4.5 Ground Tests

The ADS-B Out function should be tested on ground with an IFR Tester or suitable equipment to verify the correct settings of the ADS-B quality indicators.

2.4.6 Declarations of the manufacturer

The ADS-B function of the TRT800H/A has not been evaluated during the FAA TSO certification process other than to ensure non-interference. Due to the SW assurance of DAL "D", the ADS-B function cannot be used in the US National Airspace. Connecting the TM350 GPS source will not comply with FAA certification requirements with regard to ADS-B.

3 INSTALLATION CHECK FLIGHT

Guidance on installation check flights acc. to CS STAN.48 in Subpart A.

Within the scope of CS-STAN, every time an installation check flight is listed among the activities to be performed in order to embody a SC or a SR in the aircraft, the pilot conducting the installation check flight must:

- make sure that their ratings and flight experience are suitable for the technical content of the flight;
- receive an appropriate briefing; this briefing shall include:
 - a description of the SC to be implemented and the related system or equipment identified as potentially unreliable; and
 - the scope and the objective of the installation check flight;
- conduct a risk assessment and establish any necessary mitigating measures;
- identify the need for any additional crew member or task specialist(s), or both, if appropriate;
- establish the procedures, including relevant checklists, appropriate to the flight and any operating constraints.

Depending on the complexity of the installation test flight tasks and the complexity of the SC, the pilot may choose not to require a documented risk assessment, risk mitigation procedures, test procedures and checklists. This should be recorded in Block 6 of the EASA Form 123.

An installation check flight is considered part of the SC installation activity, and it can be conducted without an individual permit to fly or any other certificate of release to service for the SC installation, as long as there is no other ongoing maintenance activity on the aircraft (i.e. other maintenance, which has not yet been released to service).

[Issue: STAN/4]

4 INSTRUCTIONS FOR CONTINUING AIRWORTHINESS (ICAS)

The following text can be used as a template for a supplement to the ICAS:

“ICAS shall include required maintenance actions, inspections and intervals to be observed.

Flarm reception with proper decoding of aircraft positions is a licensed function from FLARM Technology Ltd, Cham, Switzerland.

FLARM devices need to be updated with the latest firmware version at least once per year. This has to be part of the Aircraft Maintenance Program (AMP). The entry in the AMP is to be made during installation. If you have a FLARM installation that is not previously monitored by the AMP, an entry should be made as soon as possible.

Beyond this, the TM350 does not require scheduled maintenance for continuous airworthiness from the manufacturer's point of view.”

5 INSTRUCTIONS FOR FORMSHEET 123

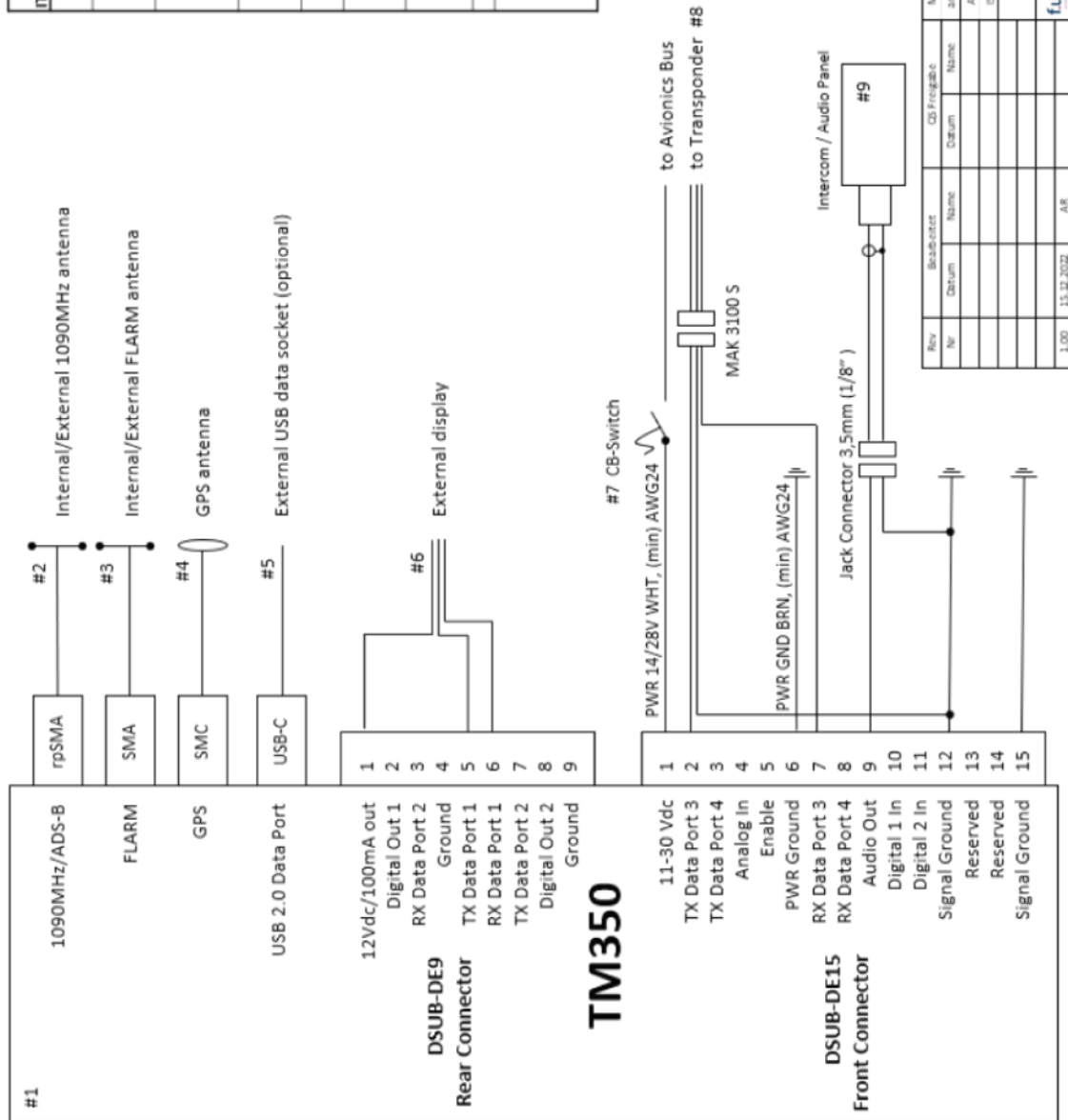
Completion instructions for EASA/LBA Formsheets 123 (see Appendix D):

Please use English or German to fill in the form.

1. Identify the SC/SR with a unique number and reference this number in the aircraft logbook.
2. Specify the applicable CS-STAN chapter including revision (e.g. CS-SCxxx or CS-SRxxx) & title. Provide also a short description.
3. Identify the aircraft (a/c) registration, serial number and type.
4. List the parts' numbers and description for the parts installed. Refer to an auxiliary document if necessary.
5. Identify affected aircraft manuals.
6. Refer to the documentation developed to support the SC/SR and its embodiment, including design data required by the CS-STAN: design definition, documents recording the showing of compliance with the Certification Specifications or any test result, etc. The documents' references should quote their revision/issue.
7. Identify instructions for continuing airworthiness that need to be considered for the aircraft maintenance programme review.
8. To be used as deemed necessary by the installer.
- 9a., 9b., 10. and 12. Self-explanatory.
11. Give full name details and certificate reference (of the natural or legal person) used for issuing the aircraft release to service.

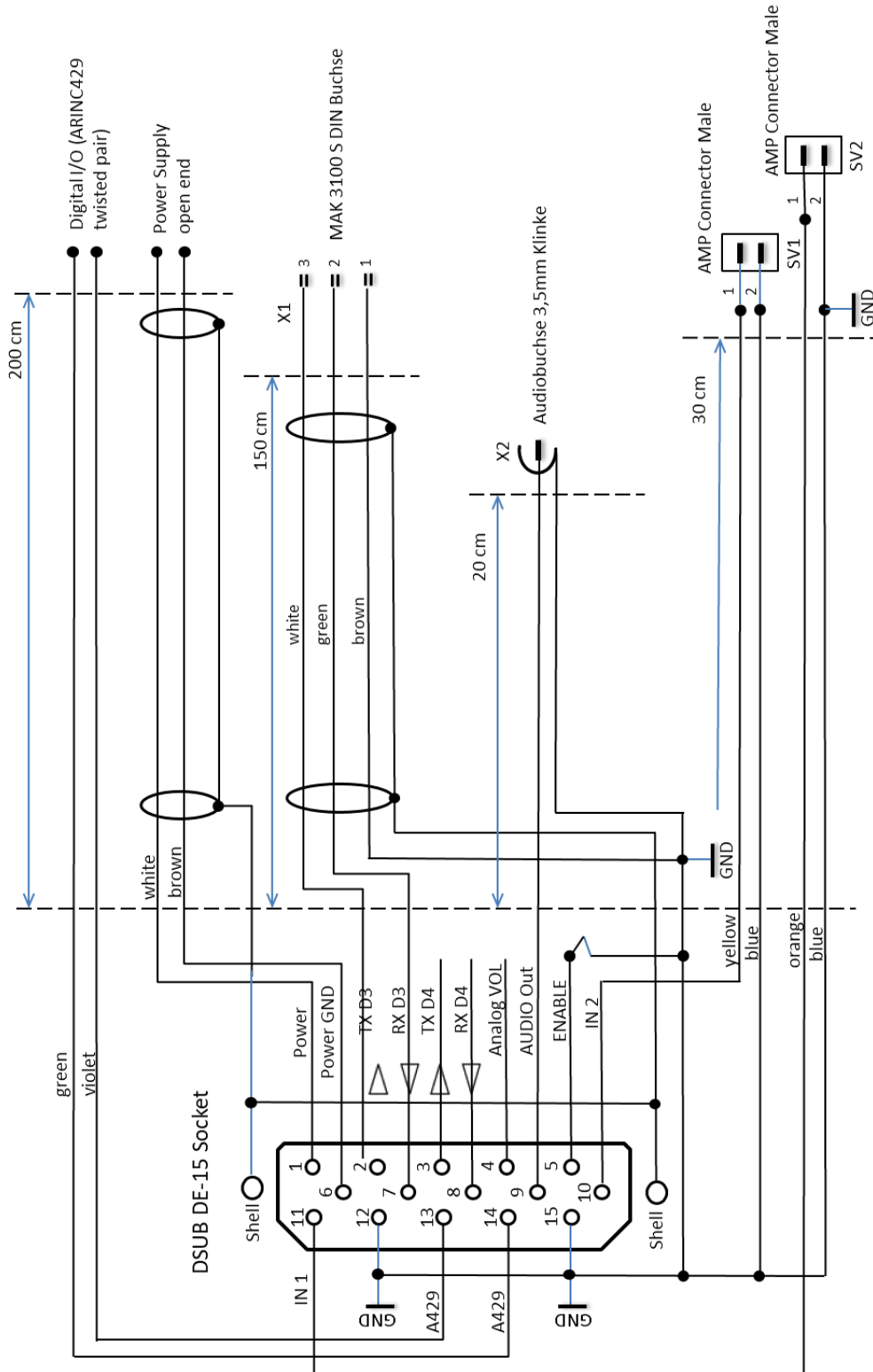
APPENDIX A – WIRING DIAGRAM

ITEM #	DESCRIPTION	PART #
1	Traffic Monitor TM350	ZTM350
2	1090MHz Antenna	PNETAN35 AV22 / AV74 and various
3	Flarm Antenna	PNETAN80 PNETAA80 GAV-868 and various
4	GPS antenna	DA1A03-SMC 23-110147 and various
5	USB-C Socket	various e.g. LLC 4261
6	External Display	various e.g. AA, ATD57
7	CB-Switch 2A@14V 1A@28V	W58XC4C12A2 and various
8	Transponder	TRTS00H/A
9	Intercom / Audiopanel	various e.g. ATR833S/-II/A-II integr. Intercom

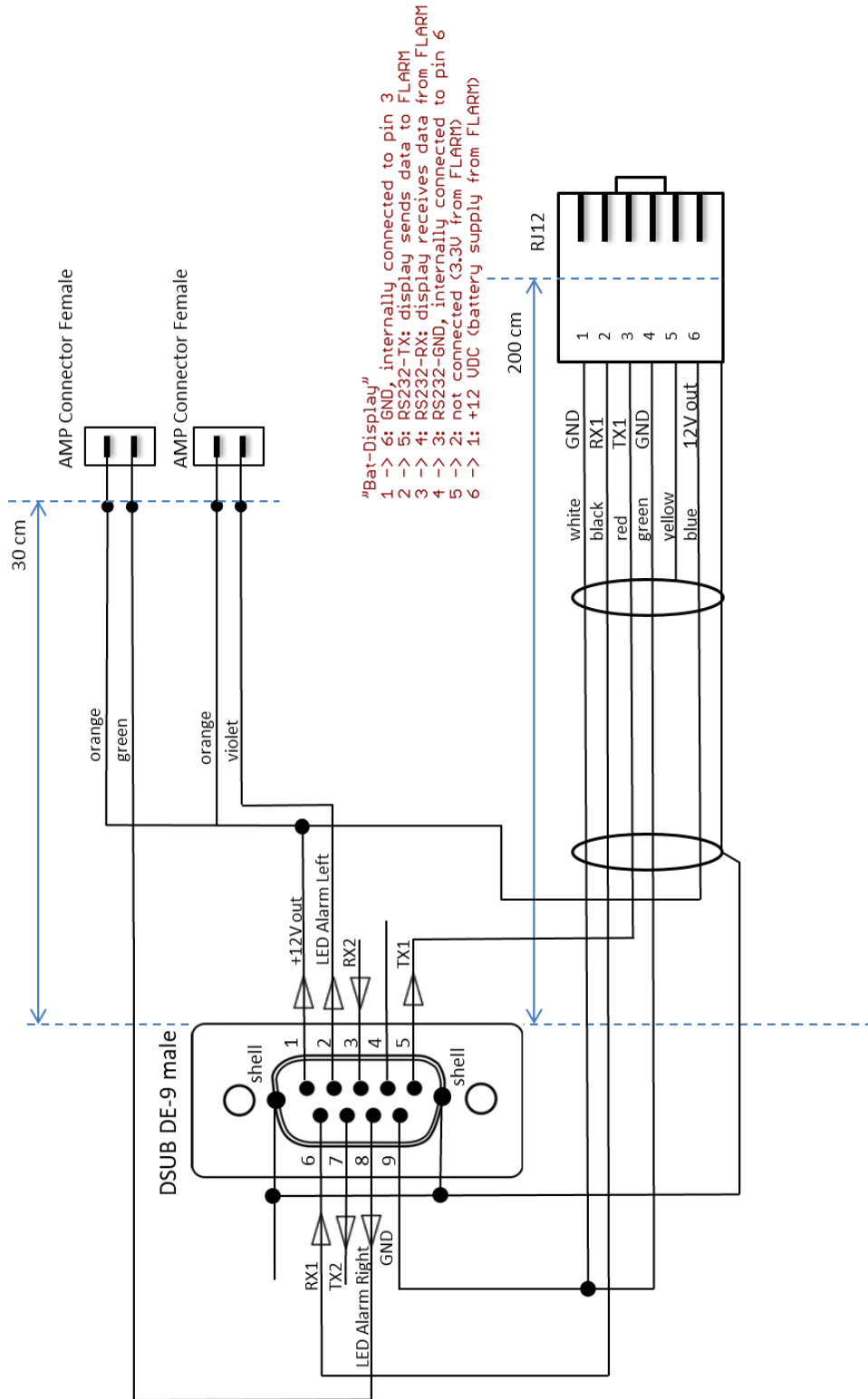


Rev	Revisions	Name	Datum	CB Programm	Name	Datum	Maßstab	angegeben	Blatt Nr./Anzahl
1.00	15.12.2022	AR						Alt 701 ISO 2798	Wiring Diagram
								funk.e.	
								Part No.	TM350
								Blatt	1/1

APPENDIX B – CABLE HARNESS BSKS350F^



APPENDIX C – CABLE HARNESS BSKS350R



APPENDIX D - EASA FORM 123

EASA Form 123 — Standard Change/Standard Repair (SC/SR) embodiment record		1. SC/SR number(s): DEABC-SC-062a
2. SC/SR title & description: Installation of an awareness-function or awareness device Installation of an ADS-B Out system combined with a transponder system		
3. Applicability: Cessna 172; S/N 17299999; D-EABC		
4. List of parts (description/Part-No/Qty): Traffic Monitor TM350/TM350-(HW101)/1 Cable Harness / BSKS350F / 1 (BSKS350R / 1) if required		
5. Operational limitations/affected aircraft manuals. Copies of these manuals are provided to the aircraft owner: AFMS-DEABC-SC-062a		
6. Documents used for the development and embodiment of this SC/SR: f.u.n.k.e. AVIONICS GmbH 03.314.010.71d / Revision 1.51, dated 25.06.2024 f.u.n.k.e. AVIONICS GmbH 03.314.010.71e / Revision 1.51, dated 25.06.2024* EASA CS STAN Issue 4 , dated 27.04.2022 * -Copies of the documents marked with an asterisk are handed to the aircraft owner.		
7. Instructions for continuing airworthiness. Copies of these manuals are provided to the aircraft owner: f.u.n.k.e. AVIONICS GmbH 03.314.010.71e / Revision 1.51 Chapter 5		
8. Other information: none		
9a. <input checked="" type="checkbox"/> This SC complies with the criteria established in 21A.90B(a) and with chapter SC062a (awareness device) and SC005b (ADS-B Out) of Certification Specifications CS-STAN Issue 4.		
9b. <input type="checkbox"/> This SR complies with the criteria established in 21A.431B(a) and with chapter(s)..... of Certification Specifications CS-STAN.		
10. Date of SC/SR embodiment: dd.mm.yyyy	11. Identification data and signature for the person responsible for the embodiment of the SC/SR:	
12. Signature of the aircraft owner. This signature attests that all relevant documentation is handed over from the organisation to the aircraft owner, and, therefore, the latter becomes aware of any impact or limitations on operations or additional continuing airworthiness requirements which may apply to the aircraft due to the embodiment of the change/repair.		

APPENDIX E –POST-INSTALLATION CHECK SC057A

	Criteria to comply with CS-SC057a	Yes	No
1	Internal antennas do not obstruct any installed equipment, block any exit or obstruct primary field of view.		
2	Connected display is independent from other displays and does not obstruct primary field of view.		
3	TM350 body is installed at a location with suitable environment conditions for normal operations.		
4	TM350 is installed at a location away from instruments required for flight.		
5	Power supply is attached to a non-essential supply		
6	Power consumption is compatible with a/c installation.		
7	Power supply wire is protected by fuse or CB (2A@14V slow or 1A@28V slow).		
8	TM350 outputs are not connected to AFCS or similar		
9	Ground test successful		
10	Check flight successful		
11	Aircraft Flight Manual supplemented		

All criteria must be met to achieve approval acc. to CS-SC057a.

APPENDIX F –POST-INSTALLATION TEST SC062A

	Criteria to comply with CS-SC062a	Yes	No
1	TM350 body is installed at a location with suitable environment conditions for normal operations.		
2	TM350 installation does not obstruct the primary field of view of essential equipment.		
3	If installed, warning LEDS color is amber		
4	Power supply is attached to a non-essential supply		
	Power consumption is compatible with a/c installation.		
5	Power supply wire is protected by fuse or CB (2A@14V slow or 1A@28V slow).		
7	Data are not fed into flight essential systems/displays.		
8	Ground test successful		
9	Check flight successful		
10	Aircraft Flight Manual supplemented		

All criteria must be met to achieve approval acc. to CS-SC062a.

APPENDIX G –POST-INSTALLATION TEST SC005B

	Criteria to comply with CS-SC005b	Yes	No
1	Transponder functional test successful		
2	Quality indicators (SIL, SDA, NAC) are set to zero		
4	Check flight successful		
5	AFM includes amendment "ADS-B Out installation for traffic awareness only"		

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