

CONFIDENTIAL

**TITLE: CM20 DIGITAL CHRONOMETER -
DECLARATION OF DESIGN AND PERFORMANCE**

DOCUMENT NO.: CM20-DDP

VERSION: 2.0

PROJECT: Aircraft Clocks and Chronographs

**MANUFACTURER: THOMMEN AIRCRAFT EQUIPMENT AG
Hofackerstrasse 48
CH-4132 Muttenz
Switzerland**

ISSUING OFFICE: R&D DEPARTMENT



CHANGE HISTORY				
Revision	Modification Description	Date	Author	Checked
0.1	Initial release	9-Mar-2012	T. Balazs	T. Balazs
0.2	Content update	28-Mar-2012	T. Balazs	T. Balazs
0.3	Minor corrections after review	3-Apr-2012	T. Balazs	T. Balazs
0.4	Update after review	4-Apr-2012	T. Balazs	T. Balazs
1.0	Finalization	4-Apr-2012	T. Balazs	T. Balazs
1.1	Env. Qual. Update (sect. 19.0, cat. ZN added)	31-May-2012	T. Balazs	T. Balazs
1.2	Env. Qual. Update (sect. 14.0, Salt Fog)	15-Aug-2012	T. Balazs	T. Balazs
1.3	Reference to document CM-LIG-100 replaced by CM-LIG_UNI-100 in table 4	21-Mar-2013	T. Balazs	T. Balazs
1.4	Deviation of CM20.XN software added	18-Apr-2013	T. Balazs	T. Balazs
1.5	Update to HW 1.02	16-May-2014	T. Balazs	T. Balazs
1.6	Reference to QTR update	4-May-2015	T. Balazs	T. Balazs
1.7	Include change of address and contact information for Thommen Aircraft Equipment. Correction formatting, as necessary.	DEC 02/2016	C. Bradbury	A. Anwar
1.8	MID number (1760) and '-100' deleted from document number. New configuration CM20.EL added. ECID reference and master drawings reference updated (Section 2). Figure 1 updated. Referenced document removed from Section 10. General corrections and improvements.	MAY 10/2022	J. Garrett	A. Savin
1.9	Table 1 corrected. Note added before Table 1.	SEPT 16/2022	J. Garrett	A. Savin
2.0	Revision of ECID updated in Section 2. Grey variant added to master drawings in Section 2.	SEPT 28/2022	 J. Garrett	 A. Savin

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1. Name and Address of Manufacturer

THOMMEN AIRCRAFT EQUIPMENT AG
Hofackerstrasse 48
CH-4132 Muttenz
Switzerland

2. Description and Identification

Type No	CM20.XX
Modification	None
Equipment Configuration Index	CM20-ECID_Rev 1.05
Master drawing No.	CM902-01-A (black) CM902-05-A (grey)
Mass	Max. 210 gram
Form Factor	2" semi ARINC housing
Weight	0.5 kg (1.1 lb)
Dimensions	L 62.0 mm (2.441 in) x W 60.3 mm (2.375 in) x H 60.3 mm (2.375 in), see also Figure 1
Brief description	The CM20 is a precision, multifunctional digital chronometer intended for installation in the cockpit instrument panel.

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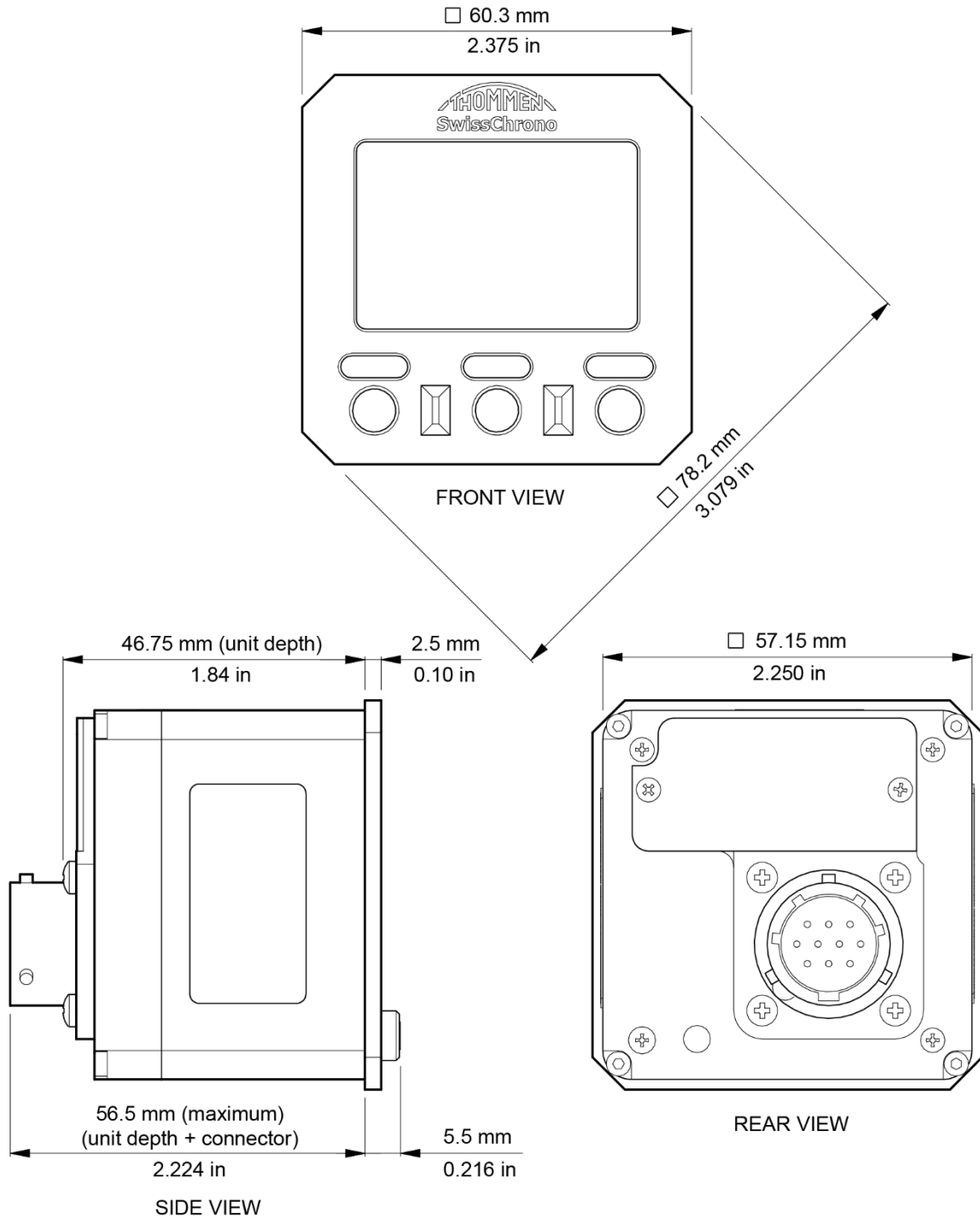


Figure 1 – CM20 Digital Chronometer – Physical Dimensions

3. Specification Reference

- | | |
|---|---|
| <ul style="list-style-type: none"> • EASA/PART 21, Subpart K | Certification of aircraft and related products, parts and appliances and of design and production organizations |
| <ul style="list-style-type: none"> • EUROCAE ED-14D/RTCA/DO-160F | Environmental Conditions and Test Procedures for Airborne Equipment. |
| <ul style="list-style-type: none"> • EUROCAE ED-12B/RTCA/DO-178B | Software Considerations in Airborne Systems and Equipment Certification. |
| <ul style="list-style-type: none"> • EUROCAE ED 80/RTCA/DO-254 | Digital Clock Installation in Aircraft |
| <ul style="list-style-type: none"> • AG/CM-SIC-100 | CM20 System Interface Control Data |
| <ul style="list-style-type: none"> • AG/CM20-SYR | CM20 System Requirements Data |
| <ul style="list-style-type: none"> • AG/CM-FME-100 | CM20 Safety Analysis / FMEA Report |

4. Rated Performance

Performance Specification:

- | | |
|---|--|
| <ul style="list-style-type: none"> • Meantime Between Failures | > 20.000 hours of operation not in Storage Mode of Operation |
| <ul style="list-style-type: none"> • Lighting Options for NVIS equipment compatibility | MIL-STD-3009 Type I Class B or RTCA/DO-275 or OST 1 00415-81 |

Qualifications:

- | | |
|--|---|
| <ul style="list-style-type: none"> • RTCA/DO-160F | As defined in Table 1: Environmental Qualification, DO-160F |
| <ul style="list-style-type: none"> • MIL-STD-810F | Method 514.5
Method 505.4 Procedure I |

Electrical Characteristics:

- | | |
|---|---|
| <ul style="list-style-type: none"> • Supply Power | Nominal 14 or 28 VDC
< 300 mA @ 28 VDC |
| <ul style="list-style-type: none"> • Lighting Control Input Signal | 0-5 / 0-14 / 0-28 VDC < 5 mA
0-5 / 0-14 / 0-28 VAC @ 400 Hz < 5 mA
0-5 / 0-14 / 0-28 VDC PWM < 5 mA |
| <ul style="list-style-type: none"> • Lighting Mode Input Signal | 0 to Supply Power Voltage sinks < 5 mA against power return |

Interfaces:

- **User interface** The CM20 provides 3 push buttons for selecting operational mode, start/stop counters and increase field values. Output is displayed on a 3-line negative image liquid crystal display (LCD)
- **System connector** The system connector provides connection to aircraft power and ground, inputs to accomplish Day/Night dimmable lighting, input for weight-on-wheels signal and output for alarm signal.
- **RS-232 interface** The CM20 provides a serial RS-232 interface for synchronization, remote control and maintenance purposes.

5. Reference to Qualification Test Report

The CM20 was tested in accordance with procedures and specifications in the Aerospace Standard RTCA/DO-160F to the categories as listed in Table 1. The reports and results of these qualification tests are given in the CM20 Qualification Test Report, document number CM20-QTR.

6. Service and Instruction Manual Reference

The CM20 is described in terms of installation, maintenance and functionality in the following THOMMEN AIRCRAFT EQUIPMENT AG documents:

- Component Maintenance Manual with Illustrated Parts List, CM20-CMM
- Installation and Operation Manual, CM20-INSOP
- User Operational Manual, CM20-USOM

7. Conformance

At the time of writing this DDP, neither EASA nor FAA have issued a Technical Standard Order (TSO) for chronometers or clocks. The CM20 is airworthy because EASA Part 21 Subpart K – Parts and Appliances is applicable. Furthermore, the CM20 is designed and constructed to meet the requirements of FAA/AC20-94.

8. Compliance with the Ability to withstand Various Ambient Conditions

NOTE:

Definitions for abbreviations/terms used in Tables 1 and 2:

N/A - Not applicable

NIL - Zero deviation

Table 1 - Environmental Qualification, DO-160F

Environmental Criteria	Requirement RTCA/ DO-160F / EN2282 / MIL-STD	Declarations, Design, Test	Test Results / Deviations
Temperature & Altitude	Section 4.0 Cat. [B2Z]	See test report CM20-QTR	NIL
Temperature:			
Continuous operation	-45 to +70 °C		NIL
Ground Survival Temperature	-55 to +85 °C		NIL
Operating Low Temperature	Section 4.5.1 -45°C		NIL
Operating High Temperature	Section 4.5.3 +70°C		NIL
Short Time Operating High Temperature	Section 4.5.2 +70°C		NIL
Decompression	Section 4.6.2	N/A	N/A
Overpressure	Section 4.6.3		N/A
Altitude:	Section 4.6.1 25,000 ft	See test report CM20-QTR	Tested to 55,000 ft
Temperature Variation	Section 5.0 Cat. B	See test report CM20-QTR	NIL
Humidity	Section 6.0 Cat. B	See test report CM20-QTR	NIL
Shock and Crash Safety: Operational shock	Section 7.0 Cat. B 6g, 11ms	See test report CM20-QTR	NIL
Vibration	Section 8.0 Cat. [U2] Curves F and F1 without shock mounts	See test report CM20-QTR	NIL
Explosive Atmosphere	Section 9.0 Cat. E	See test report CM20-QTR	NIL

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Environmental Criteria	Requirement RTCA/ DO-160F / EN2282 / MIL-STD	Declarations, Design, Test	Test Results / Deviations
Waterproofness	Section 10.0 Cat. W	See test report CM20-QTR	NIL
Fluids Susceptibility	Section 11.0 Cat. F	See test report CM20-QTR	NIL
Sand and Dust	Section 12.0 Cat. S	See test report CM20-QTR	NIL
Fungus Resistance	Section 13.0 Cat. F	See test report CM20-QTR	NIL
Salt Fog	Section 14.0 Cat. S	See test report CM20-QTR	NIL
Magnetic Effect	Section 15.0 Cat. Y	See test report CM20-QTR	NIL
Power Input	Section 16.0 Cat. [ZI]		
Normal operating conditions (DC):			
Max. voltage	30.3 VDC		
Nominal voltage	28.0 VDC		
Min. voltage	22.0 VDC		
Emergency operation voltage level	18.0 VDC		
Ripple voltage			
Momentary power interruptions	up to 1000 ms		
Normal surge voltage	up to 50 V for 50 ms		
Engine starting undervoltage operation	10.0 to 20.5 VDC		
Abnormal operating conditions (DC):			
Voltage steady state: Maximum			
Minimum	32.2 VDC 20.5 VDC		
Low voltage conditions	0 to 20.5 VDC		
Momentary undervoltage operation	12.0 VDC up to 7 s		
Abnormal surge voltage	up to 80 V for 100 ms up to 48 V for 1 s	See test report CM20-QTR	NIL

Continued

Environmental Criteria	Requirement RTCA/DO-160F / EN2282 / MIL-STD	Declarations, Design, Test	Test Results / Deviations
Voltage Spike	Section 17.0 Cat. A	See test report CM20-QTR	NIL
Audio Frequency Conducted Susceptibility – Power Inputs	Section 18.0 Cat. Z	See test report CM20-QTR	NIL
Induced Signal Susceptibility	Section 19.0 Cat. [ZC] and [ZN]	See test report CM20-QTR	NIL
Radio Frequency Susceptibility	Section 20.0 Cat. [RR]	See test report CM20-QTR	NIL
Radio Frequency Emission	Section 21.0 Cat. M	See test report CM20-QTR	NIL
Lightning Induced Transient Susceptibility	Section 22.0 Cat. [A3H33]	See test report CM20-QTR	NIL
Lightning Direct Effects	Section 23.0 Cat. X	No test required	N/A
Icing	Section 24.0 Cat. X	No test required	N/A
Electrostatic Discharge (ESD)	Section 25.0 Cat. A	See test report CM20-QTR	NIL
Fire, Flammability	Section 26.0 Cat. C	See test report CM20-QTR	NIL

Table 2 – Environmental Qualification, MIL and Thommen Aircraft Equipment AG

Environmental Criteria	Requirement RTCA/DO-160F / EN2282 / MIL-STD	Declarations, Design, Test	Test Results / Deviations
Vibration During Transport	MIL-STD-810F Method 514.5	See test report CM20-QTR	NIL
Solar Radiation	MIL-STD-810F Method 505.4 Procedure I	See test report CM20-QTR	NIL
Bonding	CM-SYR-100 Section 5.1.11	See test report CM20-QTR	NIL
Lighting	CM-SYR-100 Section 5.3.1	See test report CM-LIG_UNI- 100	Luminance not uniform
The CM20 Has no limitation when used continuously			

9. Statement of Criticality of Software

The CM20 software was developed to EUROCAE ED-12B/RTCA/DO-178B rigor for:

- **Software Level D**

Software, whose anomalous behaviour (as shown by the system safety assessment process), would cause or contribute to a failure of system function resulting in a minor failure condition for the aircraft.

10. Statement of Hardware Design Assurance

The CM20 hardware was developed to EUROCAE ED-80/RTCA/DO-254 rigor for:

- **DAL D**

Hardware functions, whose failure or anomalous behaviour would cause a failure of system function resulting in a minor failure condition for the aircraft.

11. Declaration

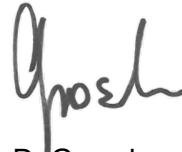
The declaration in this document is made under the authority of THOMMEN AIRCRAFT EQUIPMENT AG.

THOMMEN AIRCRAFT EQUIPMENT AG cannot accept responsibility for equipment used outside the limiting conditions stated in section 8 without written acceptance and agreement.

The user is responsible for checking with THOMMEN AIRCRAFT EQUIPMENT AG to make sure that this declaration is to the latest issue.

Date: 25.10.2022

Accountable Manager



D. Grosch