Smartive Mini Server

CE technical file

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This technical documentation is the manufacturer technical file for the fixed Smartive Mini Server SM-MS Rev. 1.2.1 release configuration. The EU Declaration of Conformity is issued on the basis of this technical file, the supplier evidence and the verification records.

Document field	Value
Product	Smartive Mini Server
Model and revision	SM-MS / 1.2.1
Manufacturer	Apptive Kft
Registered address	9932 Viszák, Fő út 56, Hungary
Product type	DIN-rail, Raspberry Pi based, Wi-Fi/BLE capable mini server and I/O controller.
Intended use	Building automation and control tasks: 33 x 3.3 V digital inputs, a 1-Wire sensor interface, an extender port and 6 dry-contact relay outputs. Part of a system installed by qualified personnel.
Radio product	Because of the Raspberry Pi 4/5 Wi-Fi 5 and BLE 5.0 function, the lead CE directive is RED 2014/53/EU. EMC and safety are handled under RED Article 3.1(b) and 3.1(a) respectively.
Power supply	No USB-C adapter is included. Only a CE-marked SELV/LPS or PS2-type 5 VDC supply of adequate power may be used.
Relay outputs	The relay outputs are dry-contact type; no internally supplied mains bus is declared. At product level the switched circuit is max. 40 V SELV/PELV, and each branch must be protected by external overcurrent protection rated max. 5 A.

1. Product description and intended use

The Smartive Mini Server is a DIN-rail building-automation mini server with 5 VDC supply. The compute and radio base system is prövided by a Raspberry Pi 4 Model B or a Raspberry Pi 5 according to the final production variant. The 33 digital inputs are Raspberry Pi GPIO-level, 0-3.3 V logic inputs; the 24 V industrial input class is outside the product specification.

Characteristic	Product-level data
Product name	Smartive Mini Server
Model and revision	SM-MS / 1.2.1
Enclosure	137.6 x 93 x 32 mm; specified as UL94 V-0 PLA material; bottom ventilation; DIN-rail mounting.
Wiring connection	Spring-clamp terminals.
Base system	Raspberry Pi 4 Model B or Raspberry Pi 5 variant.
Radio	Wi-Fi 5 and BLE 5.0 through the Raspberry Pi module.
Network and ports	Ethernet, 2 x USB 2.0, 2 x USB 3.0, 2 x Micro-HDMI
Inputs	33 digital inputs, 0.0-3.3 V signal level. The low-voltage IO inputs have no overvoltage protection: anything from 0.0 to 3.3 V may be connected; above that the device is destroyed.
Outputs	6 dry-contact relay outputs with SRD-05VDC-SL-C relays; product-level rating max. 5 A/channel, switched circuit max. 40 V SELV/PELV.
1-Wire	For DS18B20-type sensors, with a 4.7 kOhm pull-up resistor.
Extender port	Only for Smartive-compatible modules in a SELV environment.
Built-in sensor	Temperature and humidity sensor (AHT30).
Firmware	Smartive firmware, OTA update with digital signature; the conformity configuration is valid with the manufacturer software fixed at release level.

2. Rated data and operating limits

Parameter	permitted value	Conformity note
Power supply	5 VDC	Only with an external CE-marked SELV/LPS or PS2-type supply. No USB-C adapter included.
Raspberry Pi 4 variant	5 V / 3 A, min. 15 W	Based on the official Raspberry Pi 4 power requirement.
Raspberry Pi 5 variant	5 V / 3 A, min. 15 W standard; 5 V / 5 A, 25 W full USB/peripheral budget	The 25 W release configuration is validated with the AO3401A reverse-polarity path and a thermal and voltage-drop profile.
Reverse polarity protection	AO3401A P-channel MOSFET + gate-source zener clamp	Calculated MOSFET loss approx. 0.54 W at 3 A and approx. 1.5 W at 5 A; the thermal behaviour is verified in the final PCB/enclosure design.
Relay outputs	6 x dry-contact, max. 5 A/channel	External overcurrent protection rated max. 5 A is mandatory for each output. The relay outputs prövide no internal current limiting.

Parameter	permitted value	Conformity note
Switched voltage	Max. 40 V SELV/PELV at product level	The relay component itself is of a higher voltage category, but the product is restricted in the release configuration to non-mains max. 40 V SELV/PELV circuits; mains voltage shall not be connected.
IO inputs	0,0-3,3 V logic, max. 3,3 V	0.0-3.3 V low-voltage logic input class, without overvoltage protection: anything between 0.0 V and 3.3 V may be connected to the input, above 3.3 V the device is destroyed. For long external cables the documented cable-length, ESD and EMC configuration applies.
1-Wire port	SELV sensor interface, for DS18B20-type sensors	A sensor interface, not a power or industrial bus. The documented cable-length limit is part of the release configuration.
Operating environment	10-50 C per the enclosure marking	The temperature rise is verified within limits in the final DIN enclosure under the declared load profile.
Pollution degree	PD2 target environment	Closed building-automation or distribution-cabinet environment.

Reverse-polarity MOSFET thermal calculation: the AO3401A datasheet RDS(on) is at most 60 mOhm at VGS = -4.5 V. At 3 A supply current the conduction loss is P = I^2R = 3^2 x 0.060 = 0.54 W with a voltage drop of approx. 0.18 V; at 5 A, P = 5^2 x 0.060 = 1.50 W. With the final PCB copper area, soldering design and DIN enclosure, the MOSFET temperature and the Raspberry supply voltage are verified within limits in the declared 15 W and 25 W release load profiles.

3. Applicable EU legislation and standards

The product is radio equipment because the final product contains the Raspberry Pi 4/5 Wi-Fi and BLE radio function. Accordingly, safety and EMC conformity is handled not as separate LVD/EMC directives but under the essential requirements of RED 2014/53/EU.

Legislation	Applicability	Product-level treatment
2014/53/EU - Radio Equipment Directive (RED)	Applicable	Safety: Article 3.1(a); EMC: Article 3.1(b); radio spectrum: Article 3.2; internet-connected/cyber: Article 3.3(d), and 3.3(e) where applicable.
2011/65/EU - RoHS, (EU) 2015/863	Applicable	Electrical/electronic equipment; the material-conformity documentation per EN IEC 63000:2018 is part of the technical file.
2014/30/EU - EMC Directive	Not declared separately	The EMC requirement of the radio final product is covered under RED Article 3.1(b).
2014/35/EU - Low Voltage Directive	Not declared separately	The safety requirement of the radio final product is covered under RED Article 3.1(a), without a voltage limit.
(EU) 2024/2847 - Cyber Resilience Act	Handled across the product lifecycle	The main requirements apply from 2027-12-11; the product lifecycle includes vulnerability- and incident-handling processes.

Test standards package

Area	document	Application note
Safety	EN IEC 62368-1:2020 + A11:2020; EN 61010-1, EN IEC 61010-2-201	The Pi supplier evidence is EN 62368-1 based; due to the dry-contact relay outputs and DIN-rail use the technical file also addresses the control-equipment viewpoint.
EMF	EN 62311:2008	Human exposure to radio equipment; also referenced by the Raspberry Pi supplier DoC.
RED EMC	ETSI EN 301 489-1 V2.2.3; ETSI EN 301 489-17 V3.3.1	Broadband data transmission systems; applicable per the harmonised RED list.
2.4 GHz radio	ETSI EN 300 328 V2.2.2	Wi-Fi/BLE 2.4 GHz radio spectrum.
5 GHz radio	ETSI EN 301 893 V2.2.1	Wi-Fi 5 GHz WAS/RLAN; the release assessment is handled per V2.2.1.
RED cyber	EN 18031-1:2024	Internet-connected radio equipment. The factory Smartive firmware has a signed OTA.
RED data/privacy	EN 18031-2:2024	Applicable if the device processes personal data, user access or usage data.
RED fraud	EN 18031-3:2024	Not applicable, because the product does not process money, virtual money or monetary value.
RoHS	EN IEC 63000:2018	Supplier material declarations, PCB finish, enclosure material and critical-component documentation.

4. Critical components and supplier evidence

Component	calculation	Product-level consequence
Raspberry Pi 4 Model B	Raspberry Pi EU DoC: RED 2014/53/EU and RoHS; radio standards EN 300 328, EN 301 893, EN 301 489-1/-17, EN 62368-1, EN 62311, EN 18031-1, EN IEC 63000.	Integrated as an unchanged radio base system; enclosure, wiring, supply and firmware are addressed by product-level RED assessment.
Raspberry Pi 5	Raspberry Pi EU DoC with the same RED/RoHS structure; CB safety certificate stored in the technical file.	The Pi 5 variant 15 W standard and 25 W full USB/peripheral release power is handled with the documented reverse-polarity path.
SRD-05VDC-SL-C relé	5 V coil; UL/CUL/TUV recognized per the Songle SRD family datasheet; component-level switching capability is higher, but product-level rating is max. 5 A/channel.	The product 5 A/channel rating applies with external max. 5 A branch OCPD and to max. 40 V SELV/PELV circuits.
AO3401A P-MOSFET	30 V P-channel MOSFET; RDS(on) max. 60 mOhm at VGS=-4.5 V; max. VGS +/-12 V; Ptot 1.4 W at 25 C.	Reverse-polarity protection with thermal and voltage-drop behaviour validated in the 15 W and 25 W release load profiles.
MCP23017	Microchip 16-bit I2C I/O expander; 1.8-5.5 V supply; I/O port function for low-voltage logic.	Input/output logic in a SELV/GPIO environment. The product-level input specification is 0-3.3 V.
DS18B20-kompatibilis 1-Wire szenzor	1-Wire digital thermometer reference; -55..+125 C range; 4.7 kOhm pull-up on the port.	A connectable external sensor interface. The cable-length, ESD and EMC configuration is part of the release conditions.

Component	calculation	Product-level consequence
Enclosure material	Specified as UL94 V-0 PLA material.	The material declaration of the final production batch and a UL94 or equivalent supplier confirmation are part of the technical file.

BOM and component functions

Component	Qty	Function	RoHS evidence
SS8050(RANGE:200-350)	6	Relay coil NPN driver	Included in supplier evidence set
0402WGF3300TCE	13	Relay LED/base resistor	Included in supplier evidence set
SM4007PL	6	Relay coil flyback diode	Included in supplier evidence set
AHT30	1	Temperature and humidity sensor	Included in supplier evidence set
KFM736H-5.0-2*6P	1	5.0 mm spring clamp terminal / 5.0 mm spring clamp terminal	Included in supplier evidence set
KT-0603R	7	piros állapotjelző LED	Included in supplier evidence set
SRD-05VDC-SL-C	6	Dry-contact relay, product derated	Included in supplier evidence set
2.54-2*20P	1	Raspberry Pi 40-pin header	Included in supplier evidence set
KFM736H-3.5-2*4P	1	3.5 mm spring clamp terminal / 3.5 mm spring clamp terminal	Included in supplier evidence set
KFM736H-3.5-2*8P	2	3.5 mm spring clamp terminal / 3.5 mm spring clamp terminal	Included in supplier evidence set
CL10A106KP8NNNC	1	Input decoupling capacitor	Included in supplier evidence set
MCP23017-E/SS	1	I/O bővito	Included in supplier evidence set
0805W8F4701T5E	1	1-Wire pull-up resistor	Included in supplier evidence set
CL05B104KB54PNC	1	I/O decoupling capacitor	Included in supplier evidence set
R-RJ45R08P-A004	1	RJ45 connector	Included in supplier evidence set

The referenced supplier datasheets, certificates and DoC documents are included as full PDF pages in the evidence folders of the package.

5. Safety and EMC design position

Relay outputs and overcurrent protection

The relay outputs are dry-contact outputs. The device declares no internal common mains phase bus, so the overcurrent protection of the relay branches must be prövided on the installation side. The product 5 A/channel rating is only valid if each output branch has external overcurrent protection rated max. 5 A and a max. 40 V SELV/PELV circuit. The PCB trace is sized for a 5 A nominal-current environment and shall not be treated as a rated fuse; misuse without max. 5 A branch overcurrent protection is treated and validated as an abnormal-operation fault state.

Insulation and accessibility

In the release configuration the relay outputs are non-mains, max. 40 V SELV/PELV circuits. The distances, insulation, PCB spacing and enclosure openings between the SELV/Raspberry side and the relay-contact circuits match the limits of the selected safety standard; after normal use and installation the enclosure prevents accidental contact with live parts.

EMC and radio position

The Raspberry Pi supplier RED conformity is the starting evidence. The final product's own enclosure, cables, relay wiring, supply, extender and 1-Wire ports are addressed by product-level EMC/RED assessment. The release configuration is defined with the final enclosure, power source, typical cable bundles and representative relay loads.

Cyber and firmware

The Smartive firmware OTA update uses a digital signature, and the product conformity configuration is valid with manufacturer-released firmware. The user guide states that with a third-party modified operating system or software configuration the Smartive CE/RED conformity claim does not extend to the modified software state.

6. Risk analysis

fault state	Possible consequence	Mitigation	Verification
Hazardous voltage connected to the relay terminals	Electric shock, exceeding the 40 V rating	Label and guide: max. 40 V SELV/PELV, mains voltage prohibited; closed enclosure; installation by qualified personnel.	Accessibility and insulation check
Relay output overloaded above 5 A	Overheating of PCB trace, relay, terminal; smoke/fire hazard	Max. 5 A external OCPD per output; documented derating for inductive/inrush loads.	Temperature-rise and abnormal-overload verification
Wired to a 16 A circuit without branch protection	The trace becomes an unrated weak point	Label and installation guide: max. 5 A external OCPD per output; installation drawing; validated fault state.	Document review and fault-state verification

fault state	Possible consequence	Mitigation	Verification
Relay contact welding or sticking	The load can no longer be switched off	The relay output is a functional switching element; for critical loads the installation includes an external isolation point.	FMEA and functional verification
Reverse polarity of the Raspberry 5 V supply	Damage to electronics, thermal fault	AO3401A P-MOS reverse-polarity protection + zener clamp.	Reverse-polarity verification at rated supply current
AO3401A thermal load at 3-5 A supply current	Voltage drop, unstable Raspberry operation	Pi 4 and Pi 5 release power modes with validated AO3401A path and documented thermal margin.	Steady-state thermal verification in the final enclosure
Input overvoltage above 3.3 V	The input and the device are destroyed (no input overvoltage protection)	The low-voltage IO inputs have no overvoltage protection; only 0.0-3.3 V may be connected; max. 3.3 V input specification and marking; SELV/GPIO input class.	Input overvoltage misuse assessment
Long 1-Wire/extender cable	Degraded EMC emission/immunity, ESD damage	Documented cable-length limit, SELV modules, ESD protection.	EMC and ESD verification with representative cable length
Unsuitable external 5 V supply	Brownout, overheating, EMC issue	Only CE-marked SELV/LPS/PS2 5 V supply; power per Pi variant.	Power-input functional and thermal test
Blocked ventilation	Internal temperature rise	Bottom ventilation, installation clearance, max. 50 C ambient.	Temperature-rise test in worst-case orientation
unsigned software	Cyber, EMC, radio or functional deviation	Signed OTA, release firmware identifier, user guide on third-party software.	EN 18031 review and firmware verification
Processing of personal or usage data	Privacy/cyber conformity risk	Data minimisation, access protection, password requirement, update policy.	EN 18031-2 assessment if data processing is active
RoHS unverified component or enclosure	Legal non-conformity	Supplier RoHS/material declarations, EN IEC 63000 technical file.	RoHS document review

7. Laboratory and release verification matrix

Test	method	Configuration	Acceptance criterion
Safety construction review	EN IEC 62368-1; EN 61010-1 + EN IEC 61010-2-201	Final enclosure, terminals, Pi variant, relay PCB	No accessible hazardous voltage; adequate insulation, creepage/clearance, marking.
insulation resistance	Per the selected safety standard	Insulation between max. 40 V SELV/PELV relay-contact circuits and the SELV/Raspberry side	No breakdown; IR limit per the standard.
Temperature rise	EN 62368-1/EN 61010 temperature rise	Max. 50 C ambient; Pi 4 3 A or Pi 5 release supply; relays at 5 A load; closed enclosure	Component, enclosure and trace temperatures within limits.
Relay output abnormal overload	single fault	Output with branch OCPD; above-5 A misuse as engineering control	No flame, accessible hazard or hazardous tracking.
Reverse polarity	Product functional safety test	5 V input with reverse polarity; rated-current environment	No hazardous heat, smoke or harmful output state.
voltage drop	Functional test	Pi 4/5 variant, declared USB/peripheral load profile	Stable boot and operation under the declared supply conditions.
ESD immunity	EN 61000-4-2	Enclosure, terminals, USB/Ethernet/1-Wire/extender access points	No hazardous state; function recovers per the performance criterion.
Radiated RF immunity	EN 61000-4-3 / EN 301 489-17	Final product with representative cabling	Performance criterion per the verification matrix.
Burst	EN 61000-4-4	Power and relay wiring, documented long input/1-Wire cable	No hazardous state, acceptable functional behaviour.
Surge	EN 61000-4-5	External supply and relay circuits, with installation OCP/SPD conditions	No hazardous state; product and installation limit documented.
Conducted RF immunity	EN 61000-4-6	Cabled ports	No hazardous state; per the performance criterion.
Radiated/conducted emission	Per EN 301 489-17 / EN 55032 methodology	Final product, Pi radio active/inactive, typical cables	Below the limit.
Radio 2.4 GHz	ETSI EN 300 328 V2.2.2	Wi-Fi/BLE active; supplier evidence + final product assessment	Spectrum-access requirements are met.
Radio 5 GHz	ETSI EN 301 893 V2.2.1	Wi-Fi 5 GHz active; country/region domain fixed	Spectrum-access requirements are met.
EMF	EN 62311:2008	Final product radio configuration	Exposure limits are met.
Cybersecurity	EN 18031-1:2024; EN 18031-2:2024 if data processing is active	Smartive firmware, OTA, password/auth, network services	No default weak access; signed OTA and update.
RoHS documentation review	EN IEC 63000:2018	PCB, Pi, relay, MOSFET, enclosure, terminals, solder	Material-conformity evidence complete and consistent.
Production final test	Manufacturer test instruction	Every produced unit	Power draw, relays, inputs, 1-Wire, extender, Ethernet/Wi-Fi/BLE, OTA and label verified.

8. Marking, conditions of use and DoC content

Marking field	Final content
Product	Smartive Mini Server
rev.	SM-MS, Rev. 1.2.1
Manufacturer	Apptive Kft, 9932 Viszák, Fő út 56, Hungary

Marking field	Final content
Power	5 VDC; min. 15 W Pi 4 / Pi 5 standard; Pi 5 full USB/peripheral: 25 W
Relay	Dry-contact relay outputs, max. 40 V, max. 5 A / CH
Overcurrent protection	External OCPD max. 5 A required per output
Input	Digital inputs max. 3.3 V
Environment	Operating temp. 10-50 C
Warning	Installation by qualified personnel only. Disconnect the supply and the external feed of the relay circuits before servicing. Mains voltage shall not be connected to the relay outputs.
CE/RoHS/WEEE	CE marking; separate WEEE marking where placing on the market requires it.
EU Declaration of Conformity	The DoC applies to the fixed release configuration and lists 2014/53/EU RED and 2011/65/EU RoHS. The list of harmonised standards includes EN 300 328, EN 301 893, EN 301 489-17, EN IEC 62368-1, EN 62311, EN 18031-1/2 and EN IEC 63000.