



VIBOX 6430

4-channel HD analog recorder with embedded processing capabilities

Part Number: **3S643-00000**

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Abbreviations and symbols

AC	Alternating Current
ADC	Analog-to-Digital Converter
CAN	Controller Area Network
CMRR	Common-Mode Rejection ratio
DC	Direct Current
DDR	Double Data Rate [memory]
eMMC	Embedded Multi-Media Card
EEPROM	Electrically Erasable Read-Only Memory
EIA	Electronic Industries Alliance
ESD	Electrostatic Discharge
GND	Ground
IEPE	Integrated Electronics Piezo-Electric [sensor]
LAN	Local Area Network
OS	Operating System
PLC	Programmable Logic Controller
RGB	Red Green Blue [LED]
RMS	Root Mean Square
RTC	Real-Time Clock
SD	Secure Digital [memory card]
SNR	Signal-to-noise ratio
THD	Total Harmonic Distortion
V_{pp}	Peak-to-Peak Voltage

Glossary

SNR: SNR is the ratio of the RMS value of the actual input signal to the RMS sum of all other spectral components below the Nyquist frequency, excluding harmonics and DC.

THD: THD is the ratio of the RMS sum of the first six harmonic components to the RMS value of a full-scale input signal.

1 OVERVIEW

VIBOX 6430 is a smart stand-alone system to perform continuous diagnostics of engines and rotating machines.

4 input channels are dedicated to industrial measurements from external sensors, which can be efficiently processed by the embedded controller to compute detailed diagnostic results.



Acquisition channels

- 4 AC/DC and IEPE AC analog inputs
- ± 40 V range
- 24-Bit acquisition resolution
- 256 ksps sampling rate

Embedded controller

- Dual Arm Cortex-A9 @ 766 MHz
- 1 GB DDR3L RAM
- 64 MB QSPI Flash memory
- 8 GB eMMC
- SD memory cards up to 128 GB
- Real-Time Clock with internal super-capacitor
- Powered by Linux OS

Communication ports

- 1 Gigabit Ethernet port (10/100/1000 Mbps)
- 1 CAN 2.0B port up to 1 Mbps
- 1 RS232 (EIA-232) serial port up to 230 kbps
- 1 RS485 (EIA-485) serial port up to 1 Mbps

Additional interfaces

- Acquisition channels status LED
- 4 user status tri-color (RGB) LED
- 2 opto-isolated outputs
- Temperature sensors

Power supply

- 24 V DC isolated power supply

Target Application

- Rotating machines monitoring
- Engines monitoring
- Sensors acquisition

Electrostatic discharge sensitivity



The VIBOX 6430 uses semiconductors that can be damaged by electrostatic discharge (ESD). Observe precautions for handling. Damage due to inappropriate handling is not covered by the warranty.

2 BLOCK DIAGRAM

Hereafter is a simplified block diagram of the VIBOX 6430.

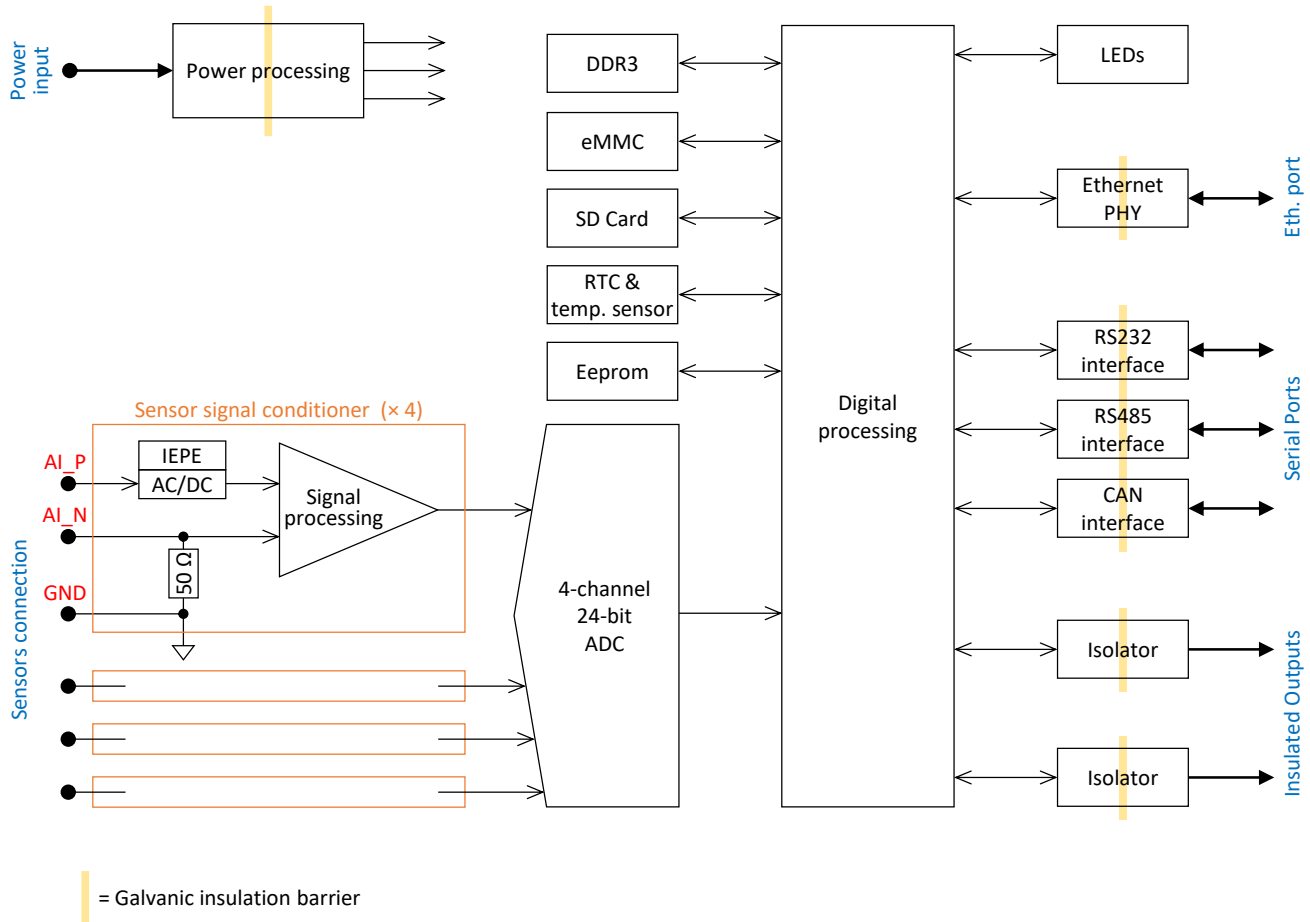


Fig 1: Block diagram.

3 FUNCTIONAL DESCRIPTION

3.1 SENSOR CONNECTION

The VIBOX 6430 measures the voltage between AI_P and AI_N terminals. AI_P shall be the signal input, whereas AI_N shall be the signal return wire.

A third terminal, labelled GND, is provided to connect additional shielding (common to all sensor inputs).

The connection scheme will depend on the sensor wiring.

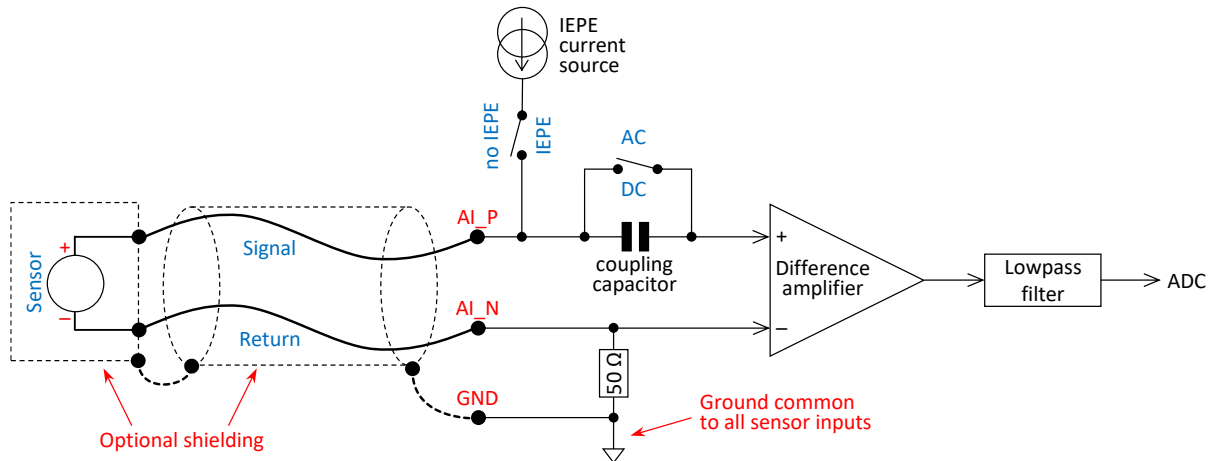


Fig 2: Floating sensor connection.

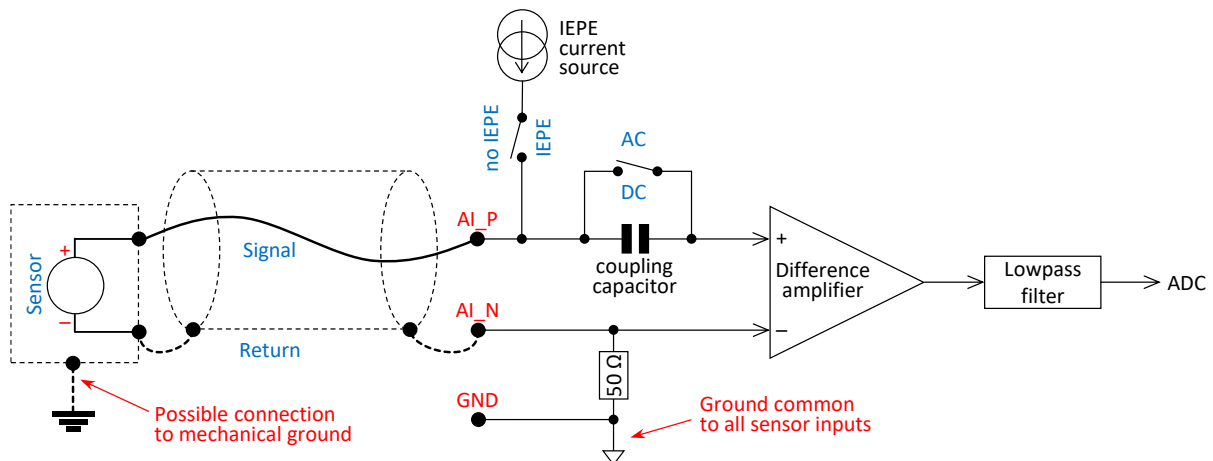


Fig 3: Grounded sensor connection.



When using the grounded scheme with two or more sensors, ensure that the voltage across the 50 Ω resistors remains negligible (1 V_{RMS} may be tolerated), as difference of potential may exist between chassis or equipments.

A software-activated current source is available to power IEPE compatible sensors, especially accelerometers: a polarization current of 4.25 mA current is driven to the sensor from AI_P to AI_N.

With IEPE sensors, AC mode shall logically be used.

3.2 OPTO-ISOLATED OUTPUTS

The VIBOX 6430 has two opto-isolated outputs that can be used to control relays, warning lights, buzzers, or to report logic signals to PLC inputs.

Each output is an unpolarized switch (consisting of an Opto-MOS):

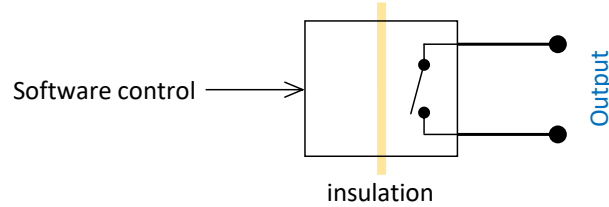


Fig 4: Isolated output.

The wiring depends on what it is used for. An external power source is required.

Here are some basic wiring examples:

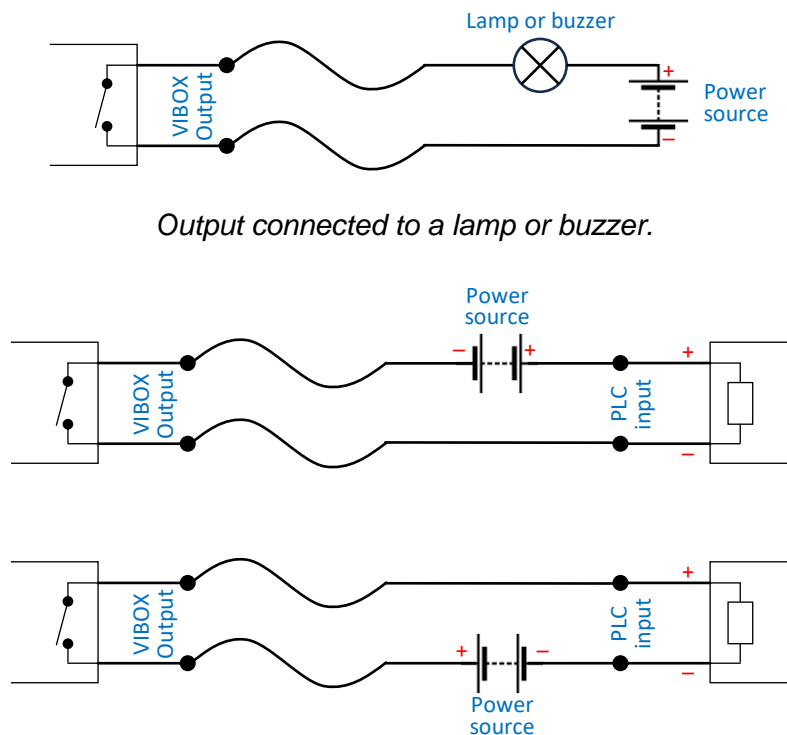


Fig 5: Output connected to a PLC input.

4 TECHNICAL CHARACTERISTICS

4.1 MECHANICAL LAYOUT

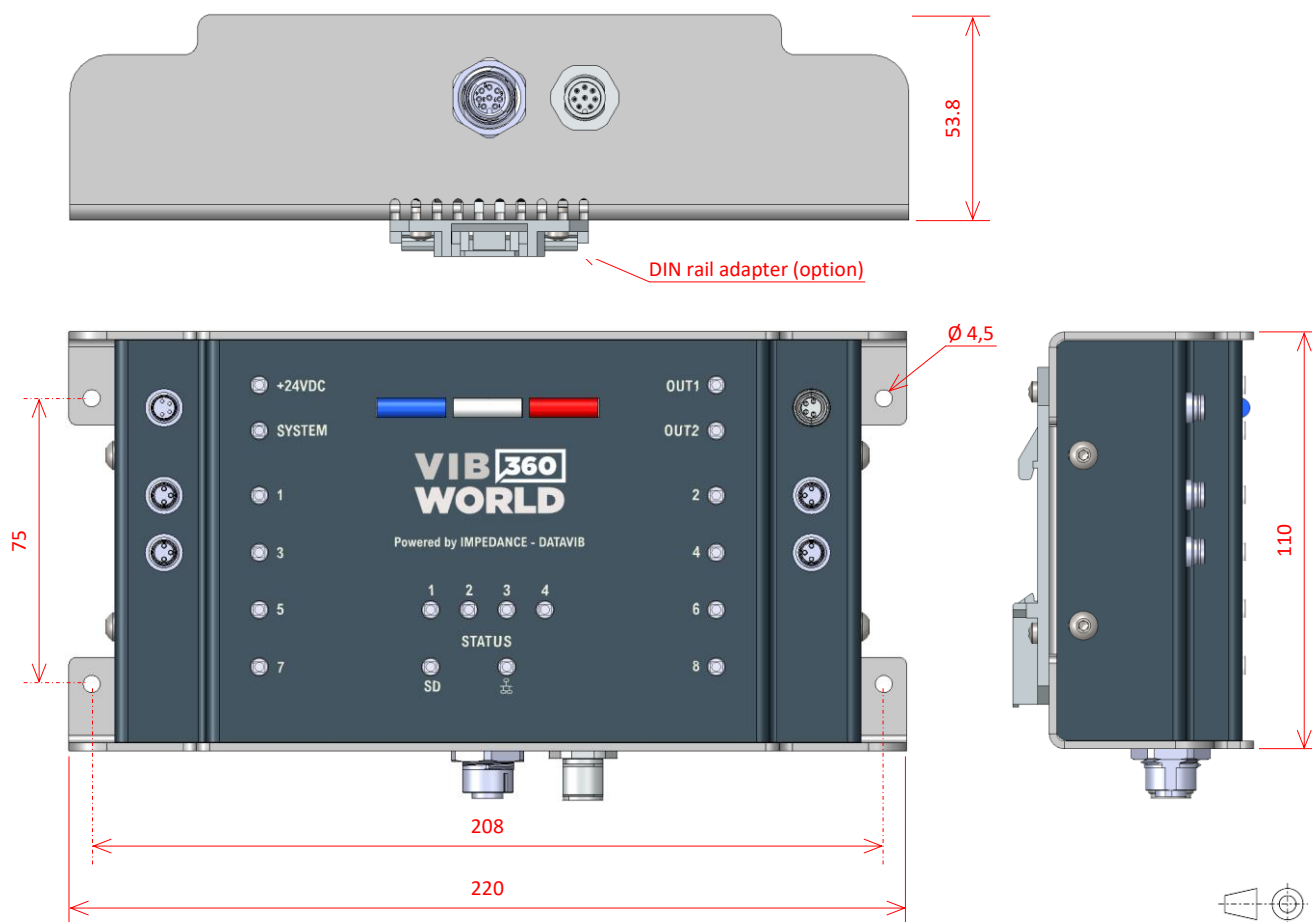


Fig 6: Dimensions drawing.

GENERAL	
Height	110 mm
Length	220 mm
Thickness	53.8 mm
Weight	0.9 kg
Enclosure Material	Bottom: stainless steel Cover: aluminum

Table 1: Dimensions table.

4.2 LEDs


LABEL	COLOR	DESCRIPTION
+24VDC	Off	No power supply
	Red	Wrong polarity (negative voltage)
	Yellow	Abnormal (positive) voltage
	Green	Power ok
SYSTEM	Red	CPU power is starting
	Yellow	FPGA not loaded
	Off Green (blink) Blue	Refer to software documentation
	Off	No Ethernet link
	Yellow	10 Mbit/s Ethernet link (blink: activity)
	Green	100 Mbit/s Ethernet link
	Blue	1000 Mbit/s (Gigabit) Ethernet link
SD	Off	No SD card
	Red	SD card fault
	Blue	SD card present, write-protected
	Green	SD card present, not write-protected
STATUS 1 to 4		Refer to software documentation
1 to 4 (Sensor inputs)		Refer to software documentation
OUT1 OUT2	Off	Output inactive (open)
	Orange	Output active (closed)

Table 2: LEDs.

4.3 CONNECTORS

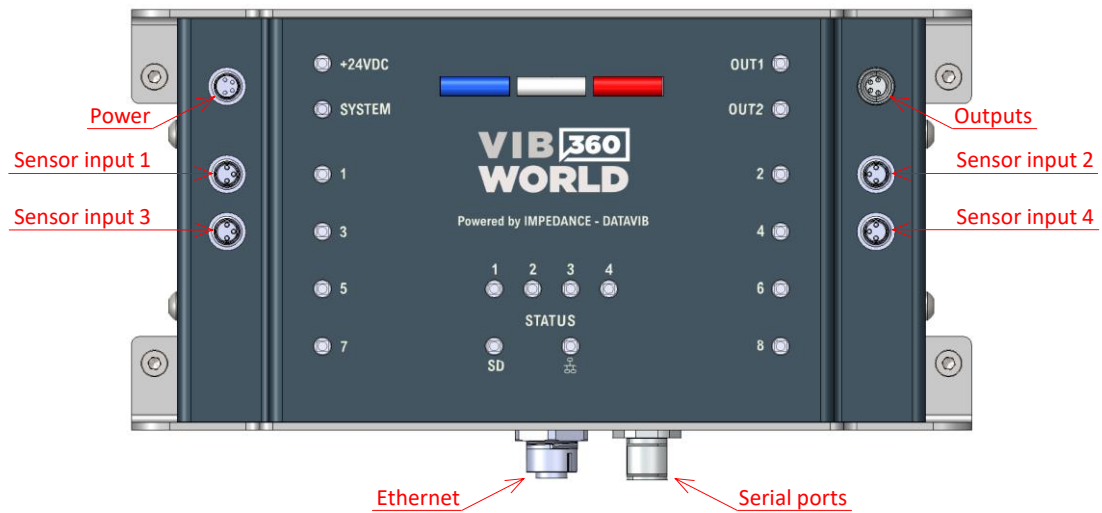


Fig 7: Connectors position.

Notes:

- All connector shields are electrically connected to the metal casing.
- Connectors must be tightened moderately, preferably by hand.

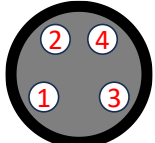


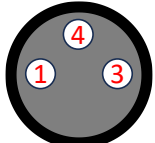
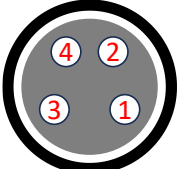
NAME	TYPE	GENDER	PINS	KEYING	DESCRIPTION	PINOUT
Power	M8	M	4	A	Power supply	
Serial ports	M12	M	8	A	RS232 RS485 CAN	
Ethernet	M12	F	8	A	Ethernet port	
Sensor input (1 to 4)	M8	M	3	A	Analog input channels	
Outputs	M8	F	4	A	Isolated outputs	

Table 3: Connectors table.

4.3.1 Power supply connector

PIN	NAME	DESCRIPTION
1	0 V	Power return (negative)
2	+24 V	Power supply (positive)
3	+24 V	Power supply (positive)
4	0 V	Power return (negative)

Table 4: Power connector pinout.

4.3.2 Serial Ports connector description

PIN	FOR RS232	FOR RS485	FOR CAN
1		B, Z or D+	
2		A, Y or D-	
3	TX		
4	RX		
5	Ground	C or ground	
6			H
7			L
8			Ground

Table 5: Serial ports connector pinout.

Notes:

- The three serial ports have a common ground connected to pins 5 and 8.
- The RS485 port has a 120 Ω termination resistor.
- The CAN port has no termination resistor.

4.3.3 Ethernet connector description

PIN	FOR 10BASE-T, 100BASE-TX	FOR 1000BASE-T (GIGABIT ETHERNET)	RJ45 WIRING (MDI)
1		C-	5
2		D+	7
3		D-	8
4	TX-	A-	2
5	RX+	B+	3
6	TX+	A+	1
7		C+	4
8	RX-	B-	6

Table 6: Ethernet connector pinout.

Note: the Ethernet PHY supports Auto MDI-X.

4.3.4 Isolated Outputs connector

Refer to § 3.2 (page 8) for more details.

PIN	DESCRIPTION
1	OUT2 output
2	
3	OUT1 output
4	

Table 7: Isolated outputs connector pinout.

4.3.5 Sensor connector description

Refer to § 3.1 (page 7) for more details.

PIN	NAME	DESCRIPTION
1	AI_P	Sensor signal
3	AI_N	Sensor reference/return signal
4	GND	Common ground

Table 8: Sensor connectors pinout.

Notes:

- Pins 3 and 4 are internally connected via a 50 Ω resistor.
- Pin 4 of all sensor input are connected.

4.4 ELECTRICAL CHARACTERISTICS

4.4.1 Power supply

POWER SUPPLY	MINIMUM	TYPICAL	MAXIMUM	UNIT
Supply voltage, normal (guaranteed operating range)	+20	+24	+28	V
Supply voltage, abnormal (no damage, unlimited time)	−36		+36	V
Supply current (@ 24 V)		150	220	mA
Inrush current		500	600	mA
Power reserve (@ 24 V) (after startup)	15	20		ms
Insulation (to casing and other signals)			250	V

Table 9: Power supply input specifications.

Notes:

- Power input is insulated from enclosure and from other signals. This is not a safety isolation.
- Supply voltage must stay within the guaranteed operating range for 1.5 s to allow startup.
- Power reserve: supply voltage transient exceeding the guaranteed operating range.

4.4.2 (Sensor) signal acquisition

PARAMETER	MIN	TYP	MAX	UNITS
Sample rate	8		256	ks/s
Amplitude range (AC + DC)	−40		+40	V
DC offset		0		V
Input impedance Differential (DC mode) AI_N to common Ground		350 50		kΩ Ω
AC mode cutoff frequency −3 dB −0.1 dB		0.23 1.5		Hz Hz
Channel voltage, to casing and other signals			250	V
IEPE excitation current		4.25		mA
IEPE compliance voltage	28			V
IEPE fault detection	2		26	V
Overvoltage protection		± 48		V
Gain Flatness (0 Hz to 102.4 kHz), DC coupling		0.5		dB
Gain Flatness (10 Hz to 102.4 kHz), AC coupling		0.5		dB
Passband −3 dB −0.1 dB		110 102.4		kHz kHz
SNR 256 ksps 128 ksps 64 ksps 32 ksps 16 ksps 8 ksps		90 91 93 98 100 101		dBFS dBFS dBFS dBFS dBFS dBFS
THD 1 kHz (@ 256 ksps)		−83		dBc
CMRR (@ 1 kHz)		> 80		dB
Crosstalk Floating connection Grounded connection		60 80		dB dB

Table 10: Signal acquisition specifications.

4.4.3 Isolated outputs

PARAMETER	MIN	TYP	MAX	UNITS
Voltage (inactive, open state) open voltage	0		60	V
Current (active, closed state) continuous current peak current (100 ms, non-repetitive) resistance		17	120 300 25	mA mA Ω
Insulation voltage to other output, casing, and other signals	250			V

Table 11: Isolated outputs specifications.

5 SD CARD ACCESS

While the VIBOX 6430 is powered off, the SD Card may be accessed by opening the trap door located on the backside.

Use a T10 Torx screwdriver to unscrew the middle screw until trap release.

A small pliers or tweezers can prove handy to handle the SD Card.

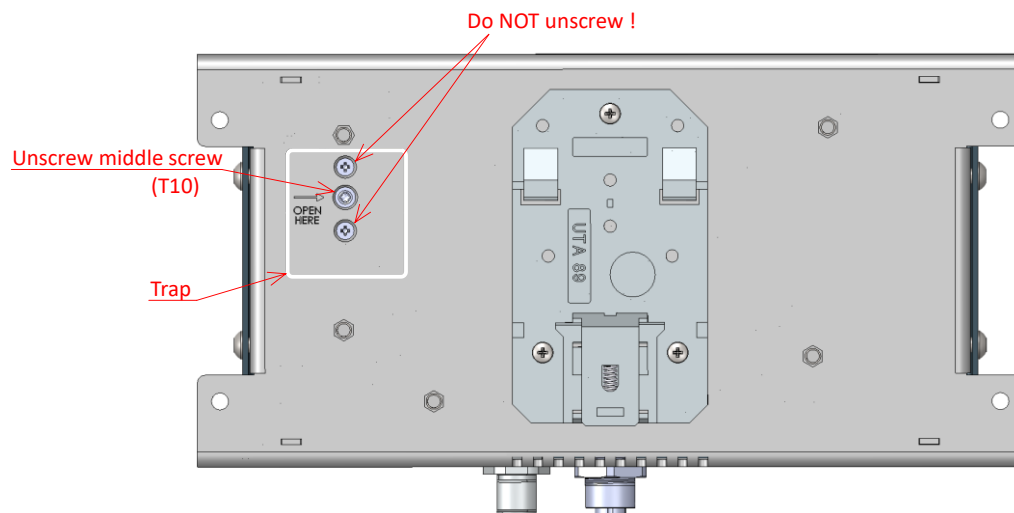


Fig 8: Backside trap door.

6 OPERATING CONDITIONS

OPERATING CONDITIONS	MIN	TYP	MAX	UNIT
ESD immunity		4		kV
Operating temperature range	0	25	55	°C
Storage temperature range	−40		85	°C
Ingress protection		IP31		

Table 12: Operating conditions.

7 APPENDIX

7.1 EARTH CONNECTION

Care must be taken for integration.

It is recommended to connect the metal casing to earth before connecting cables.


7.2 THERMAL MANAGEMENT

Precautions should be taken during installation to obtain a good thermal dissipation.

Product misuse may result in malfunction or hazard.

To obtain more detailed information about integration recommendations, please contact support@smartware.fr

8 REGULATORY

The VIBOX 6430 is  compliant.

9 CONTACT INFORMATION

For more information, please send an email to: support@smartware.fr

For ordering information, please send an email to: sales@smartware.fr

10 SOFTWARE

Complete SDK is available for development of user embedded applications.

11 REVISION HISTORY

VERSION	DATE	AUTHOR	DESCRIPTION OF CHANGES
V2R01a	July/Aug. 2023	MZ	Update to V2R01 (VIBOX 6430 models)
V1R02b	January 2018	DM	Update to VIBOX 54X0 models Editorial corrections
V1R02a	June 2017	FA	Update according to VIBOX V1R02
V1R01b	December 2016	FA	Original Version