

ETH-VHS-A2N

Vibration Monitoring Gateway • 6 isolated RS-485 ports • Dual Ethernet • Built-in four-language interface



ETH-VHS-A2N Vibration Monitoring Gateway

Overview

ETH-VHS-A2N is a dedicated monitoring gateway for HY-VT series triaxial vibration sensors. Six isolated RS-485 ports poll multiple sensors in parallel; the gateway applies the built-in HOYAN-CBM criteria set to produce the ISO 10816-3 zone verdict, health score and trend statistics. Results are served simultaneously over **Modbus TCP** to an existing SCADA, published northbound by **MQTT (TLS)** to a cloud platform, and offered to a local PLC as a **Modbus RTU slave**.

The unit also inherits the ETH-A2N serial device server platform and keeps serial ↔ Ethernet transparent bridging, so **adopting vibration monitoring needs no extra communication box and no change to the existing serial architecture**. A complete monitoring and management interface is built in — a browser is all that is needed for live monitoring, trend enquiry, alarm handling and configuration, with no software to install and no licence to buy. Traditional Chinese, Simplified Chinese, English and Japanese are supported.

Key Features

- **6 × isolated RS-485** plus 1 × RS-232; role, baud rate and format set independently per port
- **Dual 10/100BASE-TX ports with separate MACs** — device and monitoring networks kept apart
- Verdict at the edge: built-in **HOYAN-CBM criteria set** outputs ISO zones and a health score
- **Built-in monitoring interface**: dashboard, trends and alarms in four languages, no install
- IEC 62443-4-2 style security baseline: three-tier RBAC, salted SHA-256, login lock-out
- Session idle and absolute timeouts, live session list with forced logout, audit event log
- **OTA update** with automatic rollback; **dual-slot configuration storage** survives power loss
- Trend buffer and TF-card logging keep measurement data unbroken while the network is down
- Redundant dual power input (9 – 36 V DC); DIN-rail or wall mounting

Applications

Motor & pump sets	Fans & blowers	Gearboxes	Cooling towers & chillers	Compressor rooms
Marine auxiliaries	Machine-tool spindles	Facility plant rooms	Existing PLC / SCADA integration	
6 + 1 Six isolated RS-485 + one RS-232	2 × LAN 10/100BASE-TX, separate MACs	4 languages TC / SC / English / Japanese web UI	ISO 10816 Built-in criteria, verdict at the edge	

Ordering Information

Model	Part number	Description
ETH-VHS-A2N	HOYAN-VHS-A2N-D	6 × RS-485, 1 × RS-232, 2 × 10/100BASE-TX, TF card, USB-C
Companion sensors		
HY-VT2000	HOYAN-VT2000-M	Triaxial overall vibration + dual-channel temperature, IP68 — trend-based PdM
HY-VT3K	HOYAN-VT3K-S	Triaxial 3 kHz, low noise 20 µg/√Hz — low-speed machines
HY-VT5K	HOYAN-VT5K-S	Triaxial 5 kHz, ±60 g clipping-free — CBM spectral diagnostics

CE Product marked CE / FCC / RoHS. Datasheet version V1.0. Specifications stated here are design values; the shipping production version governs.

Parameter	Specification
Serial Interfaces	
RS-485	6 ports, half-duplex, isolated transceivers with fail-safe biasing
RS-232	1 port (TX / RX / GND), factory default role: bridge (transparent)
Baud rate / format	1200 – 921600 bps; 8 data bits, parity none / odd / even, 1 or 2 stop bits
Port role (independent per port)	Sensor acquisition / context acquisition / host slave / bridge (transparent) / disabled
Terminals	3-pin pluggable screw terminal block (GND / TX- / RX+), 24 – 14 AWG
Bus termination	120 Ω termination fitted at both ends of the bus by the installer
Network	
Interfaces	2 $\times$ 10/100BASE-TX, RJ-45, auto-negotiation / auto MDI-MDIX
Addressing	LAN-A and LAN-B each have their own MAC and independent IP / subnet mask / gateway; static or DHCP
Protocols	Modbus TCP (server), Modbus RTU (master / slave), MQTT (TLS supported), HTTP, DHCP, DNS, SNTP, ICMP
Transparent transmission	TCP server / TCP client / UDP, bidirectional serial $\leftrightarrow$ Ethernet
Concurrent sessions	Web interface supports 4 simultaneous connections
Acquisition & Data Processing	
Supported sensors	HY-VT2000 / HY-VT3K / HY-VT5K triaxial vibration and temperature sensors (Modbus RTU)
Acquired parameters	Velocity RMS / peak, acceleration RMS / true peak / p-p, displacement, machine surface temperature, crest factor, kurtosis, skewness, dominant frequency and 1 $\times$ / 2 $\times$ / 3 $\times$ shaft-order components, ISO zone and overload flags
Condition verdict	ISO 10816-3 Group 1–4 selectable; outputs zone A / B / C / D and a health score
Alarming	Multi-level thresholds (warning / alarm) with configurable hysteresis and delay; event log with acknowledgement
Trending	Built-in trend buffer; long-term CSV logging to TF card, accumulated while the network is down
Time	Built-in RTC with SNTP synchronisation (time zone configurable)
Web Interface	
Form	No installation, no licence; direct browser access, HTML5 responsive layout
Languages	Traditional Chinese / Simplified Chinese / English / Japanese, switched live
Display	Live dashboard (card or list view), trend curves and sparklines, alarm log, dark / light theme
Configuration pages	Network, serial ports, data routing, alarms, TF card, security, maintenance, firmware update
Cyber Security	
Account roles	Three-tier RBAC: administrator / operator / viewer
Password storage	SHA-256 with a per-account random salt; the default password must be changed at first login
Login protection	Account lock-out after consecutive failures, with the remaining lock time reported; configurable login banner
Session	Idle timeout plus absolute timeout; live session list with forced termination
Audit	Login, logout, lock-out, configuration change and firmware update events are all recorded
Configuration protection	Dual-slot configuration storage with automatic rollback to the last complete set; CONFIG button restores factory defaults

Parameter	Specification
System & Storage	
Configuration & trend storage	Internal non-volatile memory; configuration held in two slots
External storage	TF card (microSD, ≤ 32 GB, FAT32)
Local interface	USB-C (maintenance / console)
Firmware update	Uploaded through the web interface; a backup image allows automatic rollback after a failed update or power loss
Power	
Input voltage	9 – 36 V DC
Input current	0.45 A max.
Power consumption	5.4 W max.
Power terminals	5-pin pluggable terminal block (V+ / V+ / G / V- / V-), redundant dual supply supported
Wiring	Use 75 °C copper conductors only
Indicators & buttons	LEDs: POWER (green) / COM (green) / ALARM (red); buttons: RESET, CONFIG
Environmental & Mechanical	
Operating temperature	–25 to +70 °C
Storage temperature	–40 to +85 °C
Relative humidity	5 – 95 % RH, non-condensing
Housing / protection	Metal enclosure / IP30, indoor use only
Mounting	35 mm DIN rail (EN 60715) / wall mount
Dimensions / weight	105 × 118 × 60 mm (excl. terminals and DIN clip) / approx. 650 g
Compliance	CE, FCC, RoHS

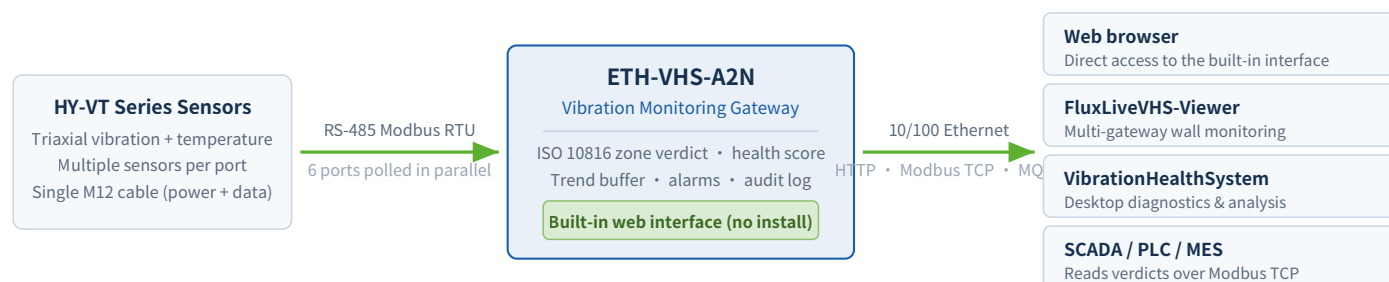
Power Wiring

Pin	Signal	Notes
1, 2	V+ (9 – 36 V DC)	The two V+ / V- pairs may be fed from different power supplies to form a redundant input. G is the chassis earth terminal and should be bonded to the cabinet earth bar by the shortest route.
3	G (chassis earth)	
4, 5	V- (0 V)	

RS-485 Wiring (gateway ↔ HY-VT sensor)

Gateway RS-485 terminal	HY-VT sensor M12 4-pin	Notes
RX+	Pin 2 RS-485 A (+)	Sensor power (pin 1, +V 12 – 32 V DC) is supplied externally. Bond the cable shield to the connector body and earth it at one point only; fit 120 Ω termination at both ends of the bus.
TX-	Pin 4 RS-485 B (-)	
GND	Pin 3 GND	

System Architecture



Built-in Monitoring Interface

A complete monitoring web application is built into the gateway and needs no software installation or licence. One screen shows the ISO zone, health state, RMS velocity, crest factor, temperature and trend of every sensor; dark and light themes switch instantly, and cards and zone bars change colour as the condition degrades.



Dark theme — all four machines in zone A, health score 84–85

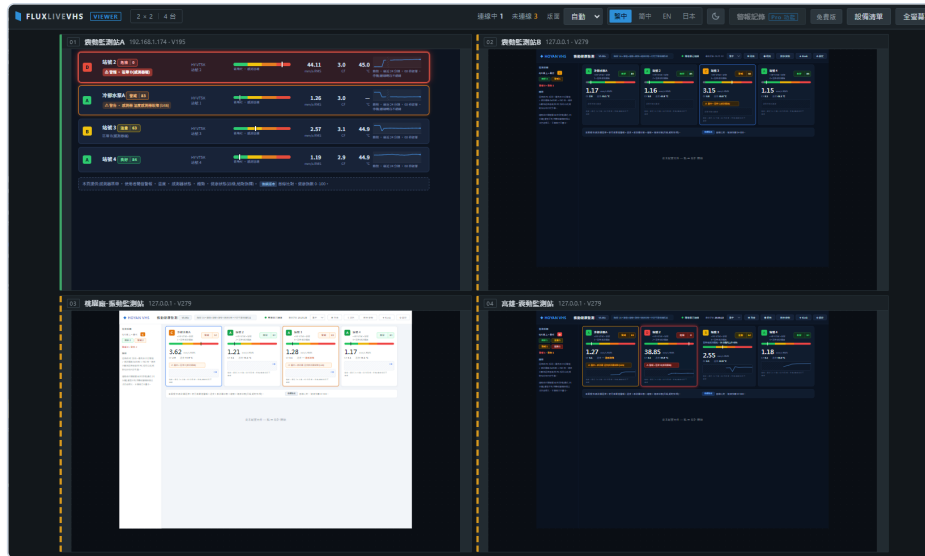


Light theme — two machines have fallen into zone C; the cards turn to the warning colour and show the alarm source. Screenshots are from a development build.

Function	Description
Live dashboard	Each sensor shows ISO zone, health state and score, RMS velocity, crest factor and machine surface temperature; the zone bar marks the position between A and D
Trending	Built-in trend sparklines; stopped or offline periods are shaded and left unconnected so they cannot be read as a drop in level
Layout & display	Card / list view, light / dark theme, selectable sort order, kiosk full-screen mode
Language & status	TC / SC / English / Japanese switched live; the header shows gateway link state and last update time

FluxLiveVHS-Viewer Multi-station Monitoring

A single gateway is monitored with a browser. When a site runs several gateways, or gateways spread across plants, FluxLiveVHS-Viewer places them side by side on one screen. Built on the FluxLiveCenter-Viewer architecture, **each tile is the live screen of that gateway itself, not a second copy of the data** — the control room sees exactly what the technician sees in the browser, so there are never two sets of numbers to reconcile.



Tiled monitoring — four gateways on one screen; offline stations are outlined with a dashed border, and each station keeps its own card/list view and theme

Function	Description
Tiled monitoring	Layout arranged automatically (for example 2 × 2); each tile shows station name, IP and firmware version, colour-coded by link state
Device list	Add by URL or discover automatically by subnet scan ; entries can be sorted, located, edited and removed
Single-station zoom	Scroll-wheel zoom and drag to pan; previous / next station, reload, open in browser and full screen
Device detail	Triaxial velocity and zone, true peak / peak-to-peak / displacement / skewness, dominant frequency, 1× amplitude, feature values and status flags, plus communication success / failure counts and polling period
Trend views	24 minutes / 24 h / 30 d; stopped periods are shown as a break in the line rather than interpolated
Language & theme	TC / SC / English / Japanese; dark / light theme

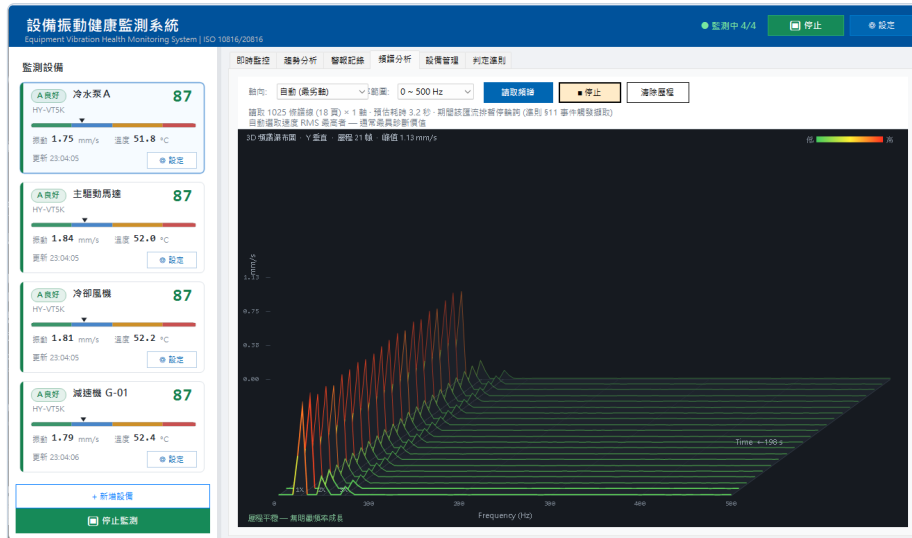


Device detail — triaxial vibration breakdown, feature values, trend and communication statistics, with the zone source and criteria version behind each verdict

A free edition of FluxLiveVHS-Viewer is available; the alarm log and automatic zoom on critical alarms are Pro features. Screenshots are from a development build; the shipping version governs. Please contact HOYAN Technologies for availability and licensing.

VibrationHealthSystem Desktop Monitoring & Analysis

VibrationHealthSystem is the PC-side equipment vibration health monitoring application. It connects to ETH-VHS-A2N over Ethernet, brings many machines onto one screen and adds the deeper analysis the gateway does not run continuously: on-demand spectrum capture, spectral history on a 3D waterfall, long-term trending and baseline analysis. The roles are complementary — **the gateway interface handles routine monitoring and alarming on site, the desktop application handles diagnosis.**



VibrationHealthSystem spectrum analysis view (3D spectral waterfall) — development build

Tab	Description
Live monitoring	Machine cards show ISO zone, health score, velocity (mm/s) and surface temperature; the zone bar shows the distance to the threshold
Trend analysis	Long-term trend curves compared against the baseline, showing the rate of degradation rather than a single reading
Alarm log	Alarm event list with time sequence and acknowledgement record
Spectrum analysis	Spectrum captured on demand; axis selectable or set to the worst axis by highest RMS velocity; band configurable (e.g. 0 – 500 Hz), history shown as a 3D waterfall to reveal a growing component
Device management	Adding and maintaining machines, sensor model and installation details
Evaluation criteria	Review of the criteria set in use, identical to the one on the gateway

Spectrum Capture Behaviour

Spectral data is far larger than feature values, so it is captured **on demand rather than by continuous polling**: reading 1025 spectral lines (paged transfer) takes about 3.2 s, during which polling on that RS-485 bus is suspended and then resumes automatically. Routine monitoring therefore keeps a stable update period, and the interface states the expected duration and scope of the interruption before it starts.

Monitoring & Analysis Software

Software	Description
Built-in interface	Shipped inside every gateway; live monitoring, trend enquiry, alarm handling and configuration for one gateway, no installation, no licence
FluxLiveVHS-Viewer	Dedicated viewer built on the FluxLiveCenter-Viewer architecture for tiled monitoring of many ETH-VHS-A2N units (see page 5)
VibrationHealthSystem	Desktop monitoring and analysis application providing spectrum capture, 3D waterfall history and long-term trending (this page)
Third-party systems	Existing SCADA / PLC / MES read the gateway verdicts directly over Modbus TCP

Screenshots are from a development build; the shipping version governs. Please contact HOYAN Technologies for availability, licensing and system requirements.

Evaluation Criteria Set HOYAN-CBM v1.1

The ISO 10816 / 20816 series answers one question: **is the overall vibration of this machine too high?** It is a screening tool — it shows that a problem exists but not what it is. HOYAN-CBM adds a diagnostic layer on top of ISO and, just as importantly, **states which layer is standard and which is engineering practice**. The criteria set is held in internal flash and ships with the firmware — no TF card, no PC software, no extra licence.

Three-layer Evaluation Architecture

L0 Zone verdict (A / B / C / D)

Answers "how large is the vibration?" • boundary values taken directly from ISO 10816-3 / ISO 10816-1

Basis: international standard

L1 Feature-based indication (crest factor / kurtosis / skewness / orders)

Answers "what might be wrong?" • defined by HOYAN engineering practice; ISO sets no limits for these quantities

Basis: engineering practice

L2 Baseline comparison (against its own history)

Answers "how much has it changed relative to itself?" • 168 h learning period, released in a later firmware

Planned

HOYAN-CBM v1.1 • 12 ISO zone tables, 24 boundary values • 12 feature rules • zone hysteresis 5 % • run threshold 0.30 mm/s

Why L1 Is Needed

An early fault does not raise the overall level. Small bearing spalls produce impacts that are high in peak but low in energy, so RMS velocity barely moves — this is exactly why crest factor and kurtosis exist, and it is the blind spot of any overall-level method.

Same overall level, different cause. 3.0 mm/s may be unbalance, misalignment or looseness, and the remedy differs completely. Shaft-order rules ($1\times / 2\times / 0.5\times$) are the cheapest way to tell them apart.

Fault Indications Available

Unbalance

Misalignment

Mechanical looseness

Early bearing fault

Pronounced impacting

Gear fault

Rub

Rolling-element bearing anomaly

Journal bearing oil whirl

Zone Verdict Coverage

Basis	Tables	Applicable machines
ISO 10816-3 Group 1 – 4 (rigid / flexible support)	8	Large machines > 300 kW, medium machines 15 – 300 kW, pumps (separate or integrated driver)
ISO 10816-1 Class I – IV	4	Machines with no dedicated ISO part. The classification originates from ISO 2372:1974 and is superseded by ISO 20816-1:2016, which no longer classifies machines; setting a Group table is preferred
Custom thresholds	Unlimited	Set from site experience; highest priority
Evaluation priority	Custom threshold > zone reported by the sensor > the 12 internal tables. The sensor value always wins; the internal tables are a fallback when the network is down or no zone is reported	

Health Score 0 – 100

The score is mapped from **the machine's own ISO zone boundaries** rather than an absolute mm/s figure, so machines of different groups and sizes can be compared and ranked directly. It is a HOYAN management indicator; the ISO series defines no such score, and the zone verdict with expert interpretation remains decisive.

Statement of basis The zone verdict (A / B / C / D) uses the ISO 10816-3 boundary values exactly as published: 12 tables, 24 boundary values, every one verifiable. The feature rules (crest factor, kurtosis, orders) are indications defined by HOYAN from engineering practice — ISO sets no limits for these quantities. They give an early hint before the overall level changes; the final verdict remains with a qualified person interpreting trends and spectra. Full boundary values, rule definitions and weights are in the HOYAN-CBM Evaluation Criteria Specification.

Companion Sensors HY-VT2000 / HY-VT3K / HY-VT5K

All three sensors connect over RS-485 Modbus RTU and can be mixed on one gateway; choose by the depth of diagnosis required. **HY-VT2000** offers dual temperature channels and IP68 and suits high-count deployment where overall-level trending is enough, but it does not provide an ISO zone verdict. **HY-VT3K / HY-VT5K** compute FFT spectra inside the sensor and output the ISO zone verdict directly, for critical machines needing spectral diagnosis.

Sensor Comparison

Parameter	HY-VT2000	HY-VT3K	HY-VT5K
Positioning	Overall-level trending + temperature; no ISO verdict	Low-speed machines, low noise	CBM spectral diagnostics, high range
Measurement axes	Triaxial (X / Y / Z), synchronous sampling		
Acceleration range	±3 g (single range)	±4 / ±8 / ±16 g	±15 / ±30 / ±60 g
Frequency capability	X/Y 0.5 – 1600 Hz; Z 0.5 – 550 Hz (dominant freq. 0.1 Hz res.)	Amplitude-accurate bandwidth 0.5 Hz – 3 kHz (±0.5 dB)	Amplitude-accurate bandwidth 0.5 Hz – 5 kHz (±0.5 dB)
FFT spectrum	—	0 – 3 kHz, 6144 lines, Δf 0.488 Hz	0 – 5 kHz, 10240 lines, Δf 0.488 Hz
Time waveform	—	16384 samples @ 8 kHz	32768 samples @ 16 kHz
Velocity / overall level	Overall level 0 – 50 mm/s (0.01 mm/s)	Velocity RMS / peak, 10 – 1000 Hz (ISO 10816-3 band)	
Displacement	0 – 2 mm (2 – 200 Hz band)	RMS / peak, 2 – 1000 Hz by integration	
Peak & statistical features	≤ 6 g p-p (0.022 g/LSB); crest factor 0 – 10, tilt 0 – 50 g	True peak / p-p (configurable band); crest factor / kurtosis / skewness / standard deviation	
Temperature	2 channels (equipment + ambient) –40 to +125 °C, ±0.5 °C	Contact NTC on the mounting face, –20 to +70 °C, ±1 °C	
ISO evaluation	Not supported (550 Hz Z-axis bandwidth does not cover the 10 – 1000 Hz band)	Zone A / B / C / D on board (Group 1–4 selectable)	
Data integrity	—	Overload detection (sticky flag); clipped data marked invalid, excluded from trending	
Communication	RS-485 / Modbus RTU		
Supply	12 – 24 V DC	12 – 32 V DC, reverse-polarity protected; 20 mA typ. @ 24 V DC	
Housing / protection / temp.	All-316 stainless steel / IP68 / –40 to +85 °C	316 stainless steel + aluminium alloy / IP67 / –20 to +70 °C	
Connection	4 × 0.25 mm² PUR shielded cable	M12 4-pin (A-coded), power + RS-485 on one cable	
Dimensions	60 × 25 × 7 mm	ø35 × 27 mm, 80 g body	
Mounting / usable bandwidth	Magnetic base / screw bracket	M8 stud 3 kHz / adhesive 3 kHz / magnet approx. 1.5 kHz	M8 stud 5 kHz / adhesive approx. 3 kHz / magnet approx. 1.5 kHz

Sensor and Accessory Ordering

Model	Part number	Description
HY-VT2000-M / -B	HOYAN-VT2000-M / -B	Triaxial overall vibration + dual-channel temperature, IP68 (M = magnet, B = bracket)
HY-VT3K-S / -H	HOYAN-VT3K-S / -H	Triaxial 3 kHz, low noise 20 µg/√Hz — low-speed machines
HY-VT5K-S / -H	HOYAN-VT5K-S / -H	Triaxial 5 kHz, ±60 g clipping-free — CBM spectral diagnostics
VT-MAG	HOYAN-VT-MAG	Magnetic base (M8 thread), usable bandwidth approx. 1.5 kHz
VT-CBL-05 / -10	HOYAN-VT-CBL-05 / -10	M12 4-pin A-coded shielded cable, 5 m / 10 m

Part numbering: HOYAN-**product code-variant code**; **S** = M8 stud, **H** = hex base, **M** = magnetic base, **B** = screw bracket. HY-VT3K / HY-VT5K data comes from their Rev. 0.92 preliminary datasheet; see IF-2026-004 for the register map.

Northbound Delivery and System Integration

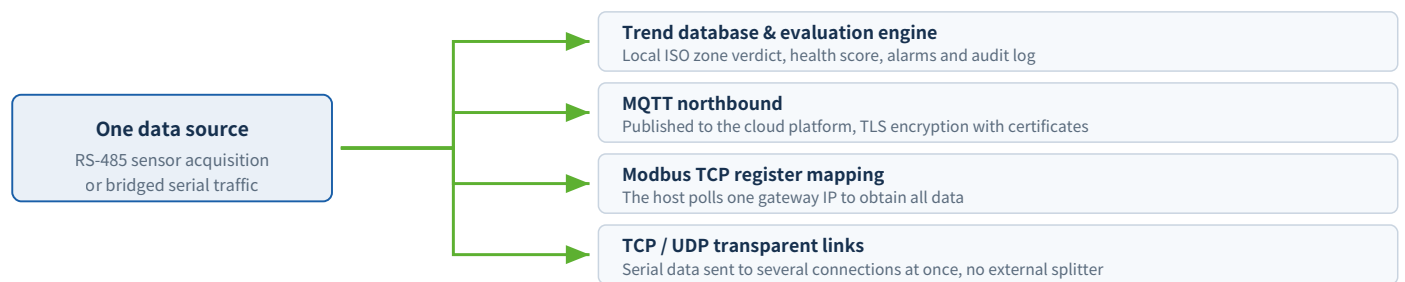
ETH-VHS-A2N inherits the ETH-A2N serial device server platform, so alongside vibration monitoring it keeps the full set of data delivery and serial integration capabilities. **One gateway can send verdicts to the cloud, serve an existing SCADA by polling and keep the original serial devices transparently connected at the same time** — adopting vibration monitoring needs no extra communication box and no rework of the existing serial architecture.

Data Delivery Methods

Method	Description	Typical use
MQTT northbound	Publishes measured values, ISO zones, health scores and alarm events; TLS encrypted connection with certificate management	Cloud platforms, IoT data lakes, cross-plant monitoring
Modbus TCP mapping	Sensor registers are mapped into the gateway's Modbus TCP address space, so the host polls a single IP	Existing SCADA / HMI reads directly, no change to field devices
Modbus RTU slave	Serves the processed condition data to an existing PLC / HMI over a serial port	Older plants with no network, or closed network segments
Transparent bridge	Bidirectional serial ↔ Ethernet tunnelling over TCP server / TCP client / UDP	Bringing existing serial devices online while keeping their protocol

Data Routing

One data stream can be delivered to several destinations at once, with no external splitter and without giving up the existing polling architecture in order to reach the cloud.



Network & Maintenance

Item	Description
Dual ports & redundancy	LAN-A and LAN-B can be set as separate segments (device network and monitoring network) or as a redundant pair
Black-box recording	Communication history is recorded for after-the-fact investigation, so a field anomaly need not be reproduced to be diagnosed
Diagnostics	Per-port traffic, link state and error counters, viewed live in the interface
TF-card logging	Long-term CSV log of measured values and events, accumulated while the network is down

The northbound and serial integration functions are inherited from the ETH-A2N serial device server platform and run in parallel with vibration monitoring without interfering with it; port roles and routing paths are configured independently in the web interface. See the product user manual for the MQTT topic structure and the Modbus mapping address table.

Serial Port Roles

The unit has seven serial ports (6 × RS-485, 1 × RS-232). Each port is assigned one of the roles below independently, so a single gateway can act as an acquisition master and as a slave to a host at the same time.

Role	Description	Available on
Sensor acquisition	Actively polls HY-VT series sensors for feature values, ISO zones and validity flags	RS-485 1 – 6
Context acquisition	Reads third-party Modbus slaves such as speed, current or temperature controllers as context for the verdict and the trend	RS-485 1 – 6
Host slave	Serves the processed condition data to an existing PLC / HMI as a Modbus RTU slave	RS-485 1 – 6, RS-232
Bridge (transparent)	Bidirectional serial ↔ Ethernet tunnelling, preserving the original serial device server function	All ports (RS-232 default)
Disabled	Port switched off and excluded from the polling schedule	All ports

Design Highlights

Six ports polled in parallel. Every RS-485 port has its own schedule and buffer, so one sensor timing out or dropping off does not affect the update period of the others, and a long bus can be split across ports with different baud rates.

No extra software to monitor. The monitoring web application ships inside the unit and a browser is enough for monitoring and configuration on site; multi-station viewing and analysis are added later only if needed.

The verdict is made at the edge. ISO zones and health scores are computed in the gateway, so the host system only subscribes to results and an existing SCADA needs no spectral processing logic to adopt condition monitoring.

Updates and settings survive power loss. A failed firmware update rolls back to the previous image automatically, and configuration is written to two slots so the last complete set is always retained.

Status Indicators

LED	Colour	State
POWER	Green	Steady: power present and the system has started
COM	Green	Blinking: serial or network traffic; off: no traffic
ALARM	Red	Steady: an unacknowledged alarm exists; blinking: sensor offline or self-diagnostic fault

External Interface Layout



Location	Interfaces
Top	LAN-A, LAN-B (RJ-45); power input terminal block (5-pin, V+ / V+ / G / V- / V-)
Left side	TF card slot; RS-485-1 to -3 terminals; USB-C; ALARM / COM / POWER LEDs; RESET and CONFIG buttons
Bottom	RS-485-4 to -6 terminals; RS-232 terminals (GND / TX / RX)
Body	Product label with P/N, S/N, LAN-A and LAN-B MAC addresses, firmware version and product QR code