XAP TECHNOLOGY
SOLUTIONS FOR YOUR FUTURE

ENGINE MANAGEMENT SYSTEMS: KAIROS

KAIROS-E12

PROGRAMMABLE ENGINE MANAGEMENT SYSTEM





UP TO 12 CYLINDERS, FULLY SEQUENTIAL

The KAIROS-E12 is a programmable spark-ignition engine management system driving up to twelve cylinders in full sequential mode: twelve injector outputs, twelve smart coil drives, four variable valve timing channels and four H-bridges on a single unit.

Two wideband lambda controllers, a 4 bar absolute MAP sensor, a dedicated barometric sensor and a three-axis accelerometer sit on the board. Four measurements with no external sensor, no extra harness and no additional box.

Engine builders, tuners, test benches, small-series manufacturers, and industrial, marine and agricultural applications. Calibration runs under TunerStudio, the tool your team already uses, with no learning curve and no usage fee.

The complete standard perimeter ships unlocked: every input, every output, the measurement chain, the logging capacity and the usual engine strategies. No activation key, no recurring fee.

SENSE - CONTROL - SHARE

TYPICAL APPLICATIONS

Engine conversion and retrofit programmes
Competition and track powertrain control
Engine test benches and dynamometer cells
Small-series and prototype vehicle manufacturing
Industrial, marine and agricultural engines
Multi-cylinder engines up to twelve cylinders
Direct injection development with the GDI module
Research, teaching and powertrain laboratories

INSTRUMENTED, CONNECTED, OPEN

A COMPLETE MEASUREMENT CHAIN ON BOARD:
Two wideband lambda controllers, a 4 bar absolute MAP sensor, a dedicated barometric sensor and a three-axis accelerometer. Four measurements, no external sensor, no additional box.

UP TO 12 CYLINDERS, FULLY SEQUENTIAL:
Twelve injector outputs, twelve smart coil drive outputs, four independent variable valve timing channels and four full H-bridges, including electronic throttle.

NO LICENCE ON THE STANDARD PERIMETER:
Every input, every output, the measurement chain, the logging capacity and the usual engine strategies are unlocked at purchase. No activation key, no recurring fee.

THE CALIBRATION SOFTWARE YOU ALREADY KNOW:
TunerStudio, with tens of thousands of users worldwide. Live tuning with the engine running, base project supplied, and no proprietary tool to learn.

LOGGING YOU OWN:
Publicly specified log format, MegaLogViewer supplied, export to CSV and to the text formats read by Bosch WinDarab and Cosworth Pi Toolbox, with no conversion licence.

SPARK IGNITION, EVERY FUEL:
Petrol, gas and ethanol, with a dedicated flex fuel input. Port injection is native on twelve channels; direct injection is available through the XAP GDI module.

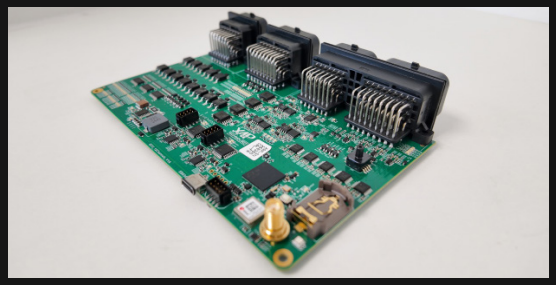
A MATURE POWER STAGE:
Built on the 75 V step-down stage shared by the whole XAP range, in series production at XAP since 2021. Wide input range, proven in the field.

PROTECTED BY DESIGN:
Self-protected output stages with over-temperature, over-current and active clamping. Freewheeling diodes on every inductive output, resettable fuses on sensor supplies.

DESIGNED AND BUILT IN FRANCE:
Boards designed, assembled and supported in Calvisson, by the team that designed them. No component from a Chinese manufacturer; traceability on request.

MORE INFORMATION ON WWW.XAP.FR






ENGINE CAPABILITY

Cylinders, fully sequential	Up to 12
Combustion	Spark ignition - petrol, gas, ethanol
Compression ignition	Not supported
Port injection	Native, 12 channels
Direct injection	Through the XAP GDI module
Ignition outputs	12, smart coil drive
Variable valve timing	4 independent channels
Electronic throttle	1 full H-bridge, 6 A, SPI diagnostics
Auxiliary H-bridges	3, 6 A, SPI diagnostics
Boost control	Dedicated output, closed loop
Knock detection	2 channels
VR synchronisation inputs	4, differential
Hall and digital inputs	6, one SENT- capable
Throttle and pedal position	4 channels, redundant pairs
Trigger wheel patterns	Extended library - [TO BE CONFIRMED]

ENGINE STRATEGIES

Sequential, semi-sequential, grouped injection	Yes
Injector dead time compensation	Yes
Closed-loop lambda control	Yes, on both channels
Long and short term fuel trims	Yes
Closed-loop boost control	Yes
Electronic thorttle, dual redundant	Yes
Closed-loop variable valve timing	4 channels
Traction control	Yes
Launch control	Yes
Anti-Lag	Yes
Gearshift torque reduction	3 three- dimensional tables indexed by gear, 8 gears x 9 points, axis selectable from 35 channels
Nitrous	Yes
Engine protections	Speed, pressure, temperature, knock
Output bench test	Yes
Flex fuel operation	Dedicated input
Sequential shift supervision	Not offered

CALIBRATION SOFTWARE

Software	TunerStudio
Installed user base	Tens of thousands of users worldwide
Learning curve	None for existing users
Base project	Supplied, ready to adapt
Connection	USB-C, Bluetooth Low Energy
Live tuning	Yes, with the engine running
Usage fee	None

COMMUNICATION

CAN buses available	2
Transceivers	Specified 5 Mbit/s
120 Ω termination	On-board provision, selectable
USB	Type-C
bluetooth Low Energy	u-blox module, SMA antenna

INPUTS

General analogue 0-5 V	9
Throttle and pedal position	4, redundant pairs
Temperature	4
Flex fuel	1
Hall and digital speed	6, one SENT- capable
Variable reluctance, differential	4
Knock	2
Configurable switches	4
Vehicle speed	1

LOGGING & ANALYSIS

Media	Removable memory card, presence detection
Capacity	Not capped, not charged- set by the card
Logging rate	1 to 250 Hz, adjustable
Time stamping	Battery-backed real-time clock
Log format	Publicly specified by the publisher
Analysis software supplied	MegaLogViewer
Export	CSV, and text formats read by Bosch WinDarab and Cosworth Pi Toolbox
Conversion fee	None

OUTPUTS

Injectors	12, low side, self-protected, 40 V / 18 A/ 35 m Ω
Ignition	12, smart coil drive
Low side, general purpose	7
Low side, dedicated	6- pump, fan, main relay,nitrous, boost, tacho
High side	3
H-bridges	4, including electronic throttle
5 V sensor supplies	2, individually protected

POWER SUPPLY

Vehicle network	12 V
Input range	7 to 75 V DC
Architecture	75 V step-down, common to the XAP range
Maturity	Same converter in series production at XAP since 2021

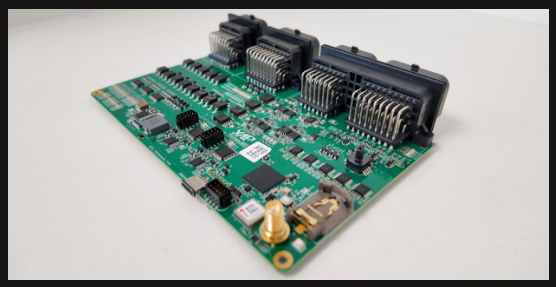
ON-BOARD SENSING

Manifold pressure	20-400 kPa absolute (4 bar)
Barometric pressure	260-1260 hPa, dedicated sensor
Accelerometer	3 axes, up to 16 G
Wideband lambda	2 channels, full 5-wire interface
Lambda architecture	Dedicated microcontroller and heater driver per channel

PROTECTION

Output stages	Self-protected OMNIFET: over-temperature, over-current, active clamping
Freewheeling diodes	On every inductive output
Sensor supplies	Resettable fuses
Power input	High-voltage suppressor, reserve polarity protection
Bus and connector lines	Protection networks on CAN, USB and analogue inputs
Status indication	Tri-colour status LED






ENGINE MANAGEMENT SYSTEMS: *KAIROS-E12*

MECHANICAL

Connector	120 ways, TE Connectivity, 4 functional zones
Housing	Splash-proof
Bare board version	Available under supply agreement
Dimensions	205 x 120 x 43 mm
Weight	1.5 kg
Operating temperature	-20 °C to +75°C

OPTIONS & ECOSYSTEM

GDI module	Direct injection
XAP universal harness	Yes
Connector kit	Yes
Wideband lambda sensor kit	Yes
MPC power distribution box	Same input stage, coherent architecture
XAP CAN display	Yes
E-Shift2 gear actuator	Built by XAP
Bare board version	Under supply agreement

REFERENCES

PF1038	**KAIROS-E12, enclosed**
PS0606	KAIROS-E12, bare board — under supply agreement
PF1039	KAIROS-E12 connector kit
PF1040	KAIROS-E12 universal harness
PF1041	GDI module
PF1042	Wideband lambda sensor kit

WHAT SETS IT APART

A COMPLETE MEASUREMENT CHAIN ON BOARD:
Two wideband lambda controllers, a 4 bar absolute MAP sensor, a dedicated barometric sensor and a three-axis accelerometer on the same board. Four measurements with no external sensor, no extra harness and no additional box: four fewer points of failure and a lower installation cost.

NO LICENCE ON THE STANDARD PERIMETER:
Established manufactures sell deliberately restricted hardware and then charge for unlocking it. The kaIROS-E12 ships with its entire standard functional perimeter unlocked, at purchase, with no activation key and no recurring fee.

A MATURE POWER STAGE:
The unit is built on the 75 V step-down stage that forms the standard input stage of the whole XAP range and has been qualified in series production since 2021. It is not a promise: it is an architecture with five years of field return.

INTENDED USE OF THE PRODUCT

The KAIROS-E12 is intended for use off public roads, including motorsport competition, test benches, laboratories, research and development, industrial, marine and agricultural applications, closed circuits, and vehicles subject to an individual approval procedure, in accordance with the regulations of the country of registration.

It is not intended for installation in vehicles operated on public roads and has not been granted any type approval or certification for this purpose. The purchaser is hereby informed that such use would, in most jurisdictions, violate applicable emissions control regulations.

Incorrect wiring or calibration may damage the engine, wiring harness, or ECU. Installation must be carried out by a qualified professional or an experienced user, including sensor validation, synchronization checks, and bench testing of the outputs before the engine is started for the first time.

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