

Marine Systems Guide

Integrated Automation Solutions



// Marine automation since 1959



Integrated Alarm Monitoring Control (IAMCS)



Local Operation & Engine Vision



Switchboards



Safety Systems (AMS - FDS)



Signal Processing



Software



Monitoring & Display



Data Gateways



Ballast Water & Feed Water



Custom products



Sensors



Wiring Harnesses



Front cover & p3-4 pictures ©G.Martin-Raget

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// Your trusted global marine partner

- New build and refit projects from design to commissioning
- Supplying leading marine operators, shipyards, yacht builders and ship brokers
- Integrated Automation Systems balancing technology with cost
- Extensive Research and Development delivering cutting-edge products
- Full type approvals by the leading marine classification societies



//Complete Marine Solutions

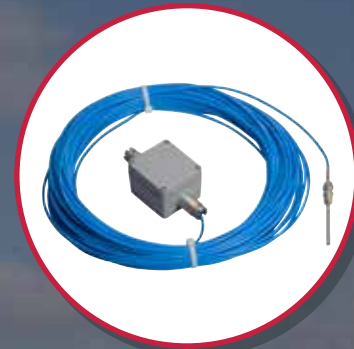
Your trusted global marine partner since 1959



Integrated Alarm Monitoring Control Systems (IAMCS)



Wiring Harnesses



Sensors



Workstations



Alarm Monitoring & Fire Detection Systems (AMS - FDS)



Display Units



Switchboards & Power Management



Local Operating Panels (LOP)



Engine Safety Systems



Data Gateways



Signal Processing



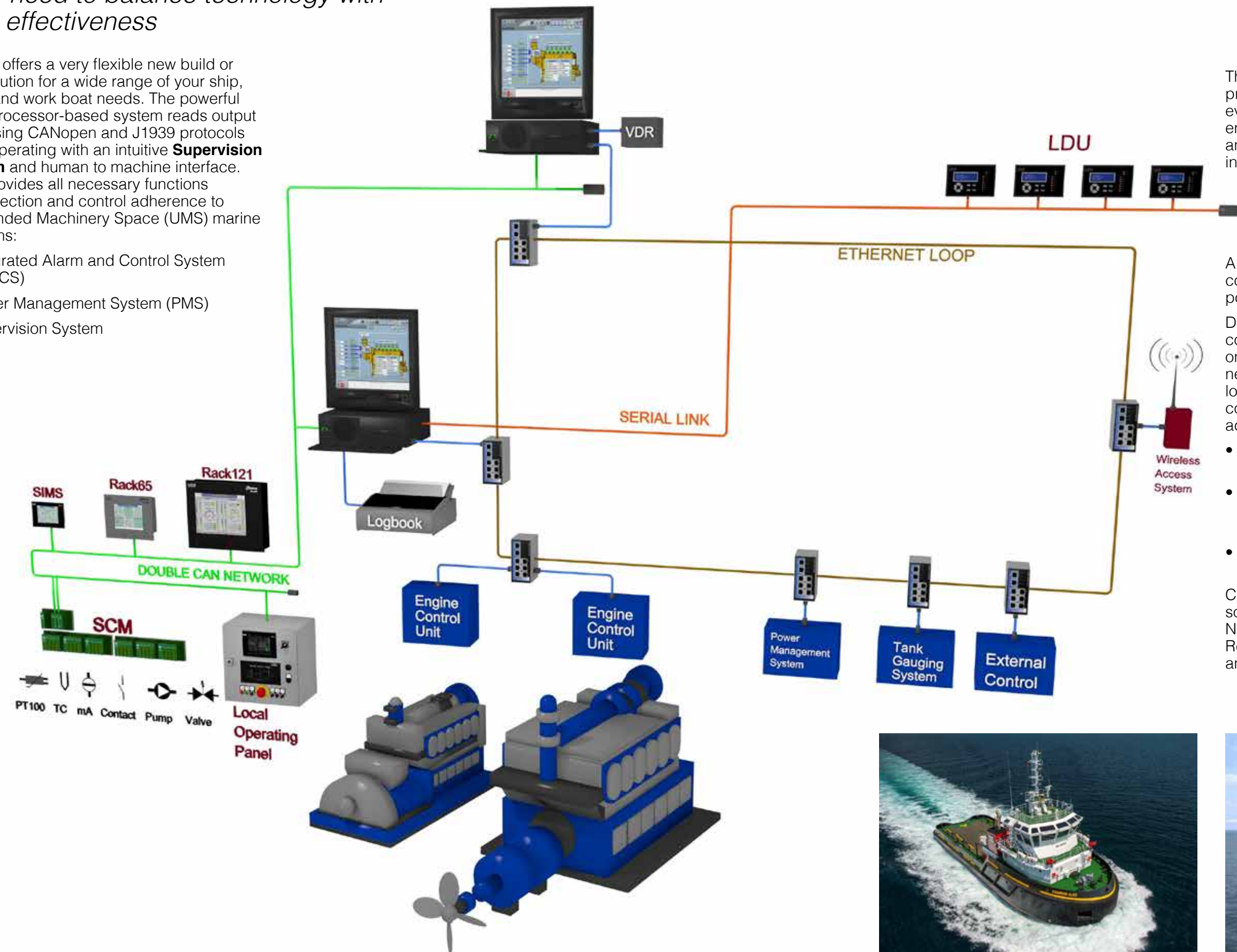
Marine Software

// Integrated Alarm Monitoring Control Systems (IAMCS)

Your need to balance technology with cost effectiveness

IAMCS offers a very flexible new build or refit solution for a wide range of your ship, yacht and work boat needs. The powerful microprocessor-based system reads output data using CANopen and J1939 protocols while operating with an intuitive **Supervision System** and human to machine interface. This provides all necessary functions for protection and control adherence to Unattended Machinery Space (UMS) marine notations:

- Integrated Alarm and Control System (IAMCS)
- Power Management System (PMS)
- Supervision System



The **Integrated Alarm and Control System** provides visual and audible signals in the event of abnormal running conditions. This ensures fully automatic, semi-automatic and manual remote control of the whole installation including machinery and cargo.

A in-built **Power Management System** controls all generator sets, providing enough power to allow normal operations of the ship.

Data transmission between the alarm/control and supervision systems is based on a double CANopen network and, when necessary, on a Modbus Ethernet TCP/IP loop, ensuring the redundancy of systems communication. This assists in supporting additional marine class notations including:

- Alarm and control systems using fail-to-safety and self-checking principles
- Control system design ensuring that individual faults do not affect the overall system
- Common hardware, reducing the number of spare parts

CMR systems are marine classified by societies including Lloyd's Register, Det Norske Veritas, Nippon Kaiji, Bureau Veritas, Regino Italiano Navale, Russian Register and American Bureau of Shipping.



//Local Operation & Engine Vision

Your need for marine engine compliance



The benefits provided by this technology are illustrated through two distinct applications:

- A vessel featuring a single propulsion engine where the redundancy of the controller is compulsory. In this instance, one of the most important performance capabilities of the LOP is to manage dual controllers in parallel and in real time. The CMR device is therefore equipped with two CAN networks, enabling the system to continuously manage the parameters of both electronic control modules (ECM), monitor communications and display the main controller parameters of the engine.

- The numerous requests for simultaneously managing several communication protocols available on engines or ships, CANopen / SAEJ1939 / Modbus TCP/IP / Ethernet which are all embedded in the CLARINUX software, allows the LOP to manage the communication with engine parameters (T°/Pressure/Speed) through I/O modules, ECM and the propulsion system by reading and writing messages both ways.

LOP systems have been supplied by CMR to customers using the world's leading controller hardware from Bosch™, Woodward™, Heinzmann™, Caterpillar™ and MTU™.



The International Maritime Organization (IMO) regulation for MARPOL Annex VI Tier III aimed at reducing pollution emissions has led to upheavals for marine diesel engine manufacturers, particularly for those with Electronic Fuel Injection Control (EFIC).

Using advanced proprietary technology to simultaneously manage the functions of engine safety, shut down and condition monitoring, CMR Local Operating Panels (**LOP**) provide marine and navy crews with a single integrated control system that is easy to use.

CMR's LOPs incorporate the Smart Innovative Monitoring System (**SIMS™**) which is driven by our proprietary **CLARINUX™** software and can be integrated, configured and installed for quick and easy use.

Our Smart Connecting Modules (**SCM™**) convert and digitize analog and binary inputs into CAN, Double CANBus and CANopen protocols. SCMs manage all the normal channel monitoring functions such as sensor break, fault and scale overlaps. Other data gateways may also be employed, depending on application.

CMR systems process and display all user defined engine parameters, trigger local alarm outputs, update the alarm list and store events in the log book. Built upon modular architecture, LOP operates with one acquisition unit and one Human to Machine Interface (HMI) module.

Implementations are supported by CMR with design expertise, prototyping, on-site validation, commissioning and service.



// Software

Your systems need seamless integration



Our powerful open-source based **CLARINUX™** software using the LINUX Operating System, is an extremely cost-effective, license-free solution.

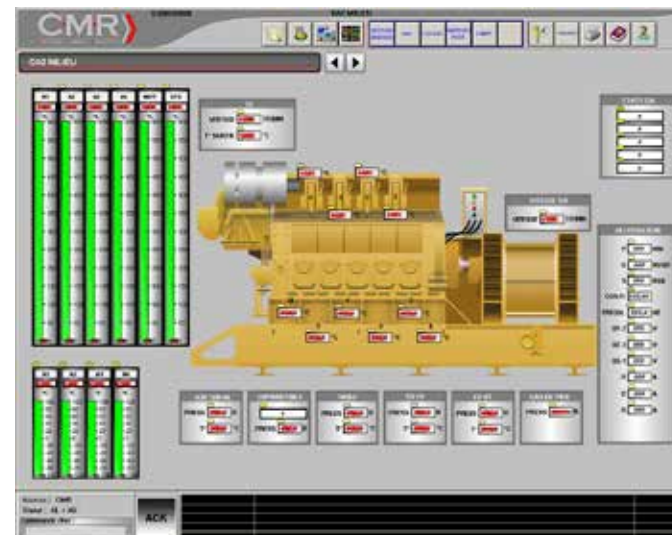
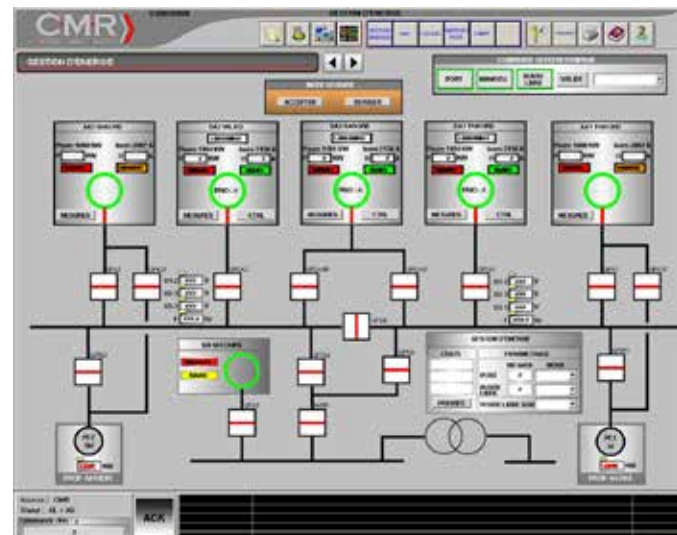
CMR's software has the capability to handle key functions related to Alarm, Monitoring and Control, manipulating data from CAN Bus (CANopen and J1939) and Modbus (RTU and over Ethernet TCP/IP) protocols.

Our systems engineering team introduces regular

base-line upgrades, most recently including engine control functions such as pre-lubrication, pre-heating, engine starting sequencing, pumps/compressor compliance and additional sensor inputs.

An added advantage of the CLARINUX software is its extendibility, particularly in a marine context. Fully approved by marine classification societies, the system receives AUT-UMS Class notation acceptance for 'Engine on

Duty' Management, dead man systems, cabins and mess rooms.



// Switchboards

Your need for reliable power - switchboards, power management and turnkey solutions



Certified by Siemens

As an authorized system integrator for the use of Siemens S7 series PLCs, we have developed a range of world-class systems using this technology, including:

- power management
- generator control
- vessel monitoring
- jacking monitoring
- skid control

CMR supplies these switchgear and power management systems to international vessel owners rig owners and FPSO operators.

CMR Group is a global industry leader in the design and manufacturing of electrical systems for marine and offshore applications.

The product range includes low voltage switchboards; medium and high voltage switchgear; motors; transformers; AC variable speed drive panels; DC switchboards; and alarm, monitoring, and control automation systems.

Low voltage experts

We design, manufacture and commission type-tested low voltage switchboards (less than 1 kV), motor control centers (MCC's) and distribution boards under license from Siemens™.

Using high quality and durable components, CMR satisfies all marine and offshore requirements for harsh and demanding environments, minimizing maintenance costs and down time.



// Ballast Water & Feed Water

You require specialist global engineering support



CMR develops Ballast Water and Feed Water control panels and systems, working to your design requirements and parameters.

We manufacture high quality and best-cost solutions, meeting the needs of ship builders, owners and operators.



Typically, these panels employ:

- PLC-based control systems
- HMI user interface
- Mild or stainless steel construction
- Ingress Protection: IP54
- Voltage Range: 380 – 690V, 3-Phase, 50/60Hz



// Vessel Equipment

// Monitoring

Your need for flexible and cost-effective monitoring

Our **SIMS™** Smart Innovative Monitoring System, can either stand alone or be integrated within an Integrated Alarm Monitoring Control System (IAMCS) or Local Operating Panel framework.

SIMS offers a highly modular, flexible and cost-effective approach that meets all marine classification standards, particularly useful for mechanical to electronic

engine conversion. Operating with CLARINUX software and interfaced to Smart Connecting Modules (SCM), it offers powerful alarm monitoring and safety functionality.

CMR's **MS™** module range, designed as plug type terminal blocks for use on local DIN Rails, provides signal processing, monitoring, insulation and power supply functions.

MS modules convert Pt100 thermocouple voltage inputs



into 4-20mA signals, providing local power whilst insulating signals and applying current and voltage threshold limits.

CMR's tried and tested **S-series™** units offer stand-alone multi-channel monitoring in a small form factor.



// Display

Your engineering end users demand visual monitoring of critical functions



Our LCD displays and analog indicators for temperature, pressure and rev counting provide you with that clarity.

CMR's Local Display Units (**LDU's™**) have been developed to perform two main functions - alarm reporting and responsibility transfer. These features are mandatory for operating in Unattended Machinery Space (UMS) environments.

The LDU communicates with the supervision software in an RS485/RS422-type network architecture using the MODBUS RTU communication protocol.

The communication interface can be configured in RS232 to perform a point-to-point connection. CMR's LDU's are mechanically designed to have a minimal form factor, with full approval for marine environments and optimization for use with CLARINUX software.

CMR can quickly develop custom digital indicators according to your specification, working either independently or to your design and build schedule. Prototypes can be developed in a local application center and transferred for production to a best-cost CMR manufacturing location.



// Temperature & Pressure Sensors

Your desire to work with a sensor expert

Our range of specialized sensors is the most tried and tested in the global high horsepower engine and rotating machine market.

Our knowledge of sensors spans 50 years, all tested and referenced by the world's largest engine and equipment manufacturers on every developed continent. CMR's deep understanding of engine platform requirements include elegant solutions deployed inside the crank case using wireless technology.

CMR offers specialized thermocouple / temperature sensors and pressure sensors to meet your exact requirements:

- Ambient (AMB™)
- Charge Air (MBT™)
- Combustion Chamber (MTC™)
- Cylinder Liner (MTCH™)
- Exhaust Gas & Turbo Compressor (ETS™, MD™, MC™, EGT™)
- Exhaust Valve (MTS™)
- Fuel Quality (NIRIS™)
- Fluids (LTS™, MBT™)
- Hazardous Area (AD3)
- Knock (CNV™)
- Large End Bearing (BTS™, TB3™)
- Main Bearing (MP™)
- Pressure (P™)
- Rotating Machine Bearings (BC™, BS™)
- Smart J1939 Sensors (J-SENSE™)

Approved by LCIE (Electrical Industries Central Laboratory) our AD3 hazardous areas (ATEX) sensor, is designed for direct measurement of gas and fluid temperatures "in situ". Its feature set includes:-

- Easy maintenance with interchangeable mountings.
- Possibility of 360°C orientation of head for access to the cable glands.
- Capable of integrating a head transmitter.
- Choice of sensing element - thermocouple (all types) or resistance probe.
- Simplex or duplex.

From standard thermocouples to advanced sensors with embedded CAN Bus and J1939 technology, CMR has it covered.



// LNG

Your need for safer control of natural gas

CMR supplies and develops specialist LNG temperature sensors to help mitigate the risk of explosion and damage to expensive equipment due to low temperature gas leaks.

Our TCM2 sensor monitors for gas leakages in the secondary double hull barrier space of industrial LNG tanks.

With the probe element and cable rated between -200°C to +200°C and measuring to class 1 IEC 60751 accuracy standards, the sensor is engineered for performance.

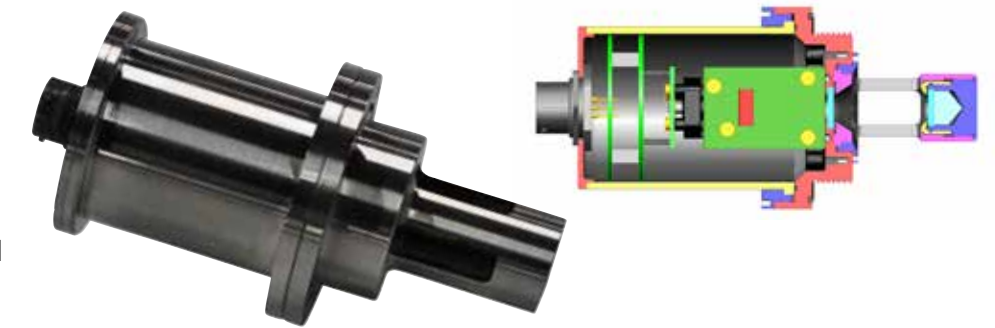


// Fuel Quality

Your systems may be subject to variable fuel quality at remote locations

Our world leading and patented, **NIRIS™** Near Infra-Red Intelligent Sensors provide spectral analysis on critical fuel information, offering compact sensing technology, powerful embedded software and typical operation with no moving parts.

CMR's **NIRIS Diesel™** sensor can continuously measure the cetane index, density, percentage of biodiesel and HCP content. Combined with an ECU, NIRIS technology



is designed to reduce fuel consumption and pollutant emissions.

The **NIRIS HFO™** sensor has

been field tested to work with heavy fuel oil and application engineered to overcome the difficulties posed by 'sticky' residues.



//Wiring Systems & Pipe Harnesses



Your ability to perform is based on a need for absolute reliability.

Our class-leading range of pre-cabled rigid and flexible harnesses can meet your every requirement.

CMR's PIPEHarness™ systems, first patented in 1972, set the global industry standard for robustness.

Enclosed within aluminium profiles, the CMR PIPEHarness encapsulates and protects your critical wiring like no other harness on the market.

CMR uses a wide variety of production technologies in order to manufacture and test any type of system or ancillary components.

The range includes:

- Braided harnesses
- Cables & Inter-Connects
- Conduit harnesses
- Flexible harnesses
- Wire & Taped harnesses

Our pre-cabling systems are used both externally on the engine and equipment platforms and internally within the crank case.

CMR's PIPEHarness approach improves aesthetics, reduces cost of installation (TAKT time) and negates the chance of sensor inversion upon connection.

Our PIPEHarness range includes:

- Thermometric & Pyrometric pipes (CT™, CPT™ & CTT™, PYR™)
- Inside Crankcase Thermometric pipes (CTC™)
- Complex & Multi-Service (CAW™, CPW™, MSP™)
- Non-Rigid, flexible plug and play pipes (NR™)
- Patented Ignition Pipes for gas engines, including Coils and Pulse transmission (CAL™, CAC™, CMB™)

- Smart Connecting pipes using CANopen, J1939 protocol (SCP™)

As you would expect, many systems are also UL, CSA and ATEX classified, while adhering to marine approval standards.

We bring 50 years of experience to your projects and have thousands of reference part numbers with engine and genset manufacturers throughout the world.



//Our Heritage

1959-1960s



1959 Business started
Marseille, France
servicing marine engines.

1960s Electronic control & Instrumentation
Developing instrumentation for industrial engines.

1970s



Growth & technology development
First patents for marine 'pipe harnesses' granted. One of the first organizations involved in marine vessel automation.

1980s



Market Penetration into Global Power markets
Asian growth enabling set-up of CMR Far East, CMR Korea & SFAIF in Shanghai. First Technology Transfer in China. Growth of medium speed engine market, with CMR UK established.

1990s



Diversification into Offshore, Nuclear & US markets
Acquisition of Electrical Link in Singapore, dedicated to LV Switchboards. Nuclear sensors and monitoring development, particularly for China. CMR US established.

2000-2005



Global collaboration & best cost manufacturing
CMR Tunisia, center of manufacturing excellence, started. CMR Germany founded.

2006-Present



2006-10 Accelerated Growth
CMR Products established in Singapore.
CMR China in Suzhou started.
CMR India established.
CMR - CPC – Supply Chain founded.
2010+ USA Focus
CMR Group focus on oil & gas sector.
CMR US relocated as business expands.

About CMR

YOUR global engineering partner.

Our proud heritage has navigated us from the shipping channels of Marseille, France towards all the major global industrial hubs.

With some of the first patents for marine electronics and ground-breaking technology transfers, to the latest in green innovation

for industrial fuel systems, CMR Group has consistently delivered you quality and reliable products for decades.

Our systems are found far and wide. From the oil and gas fields of Texas to the mine trucks of South America and the bustling ports of Asia, our supremely

engineered solutions perform 24/7, 365 days a year in your harshest environments.

CMR's quality accreditations include ISO 9001, TS16949 ISO 14001 & OHSAS 18,001.

We offer true quality, true reliability as your global engineering partner.



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