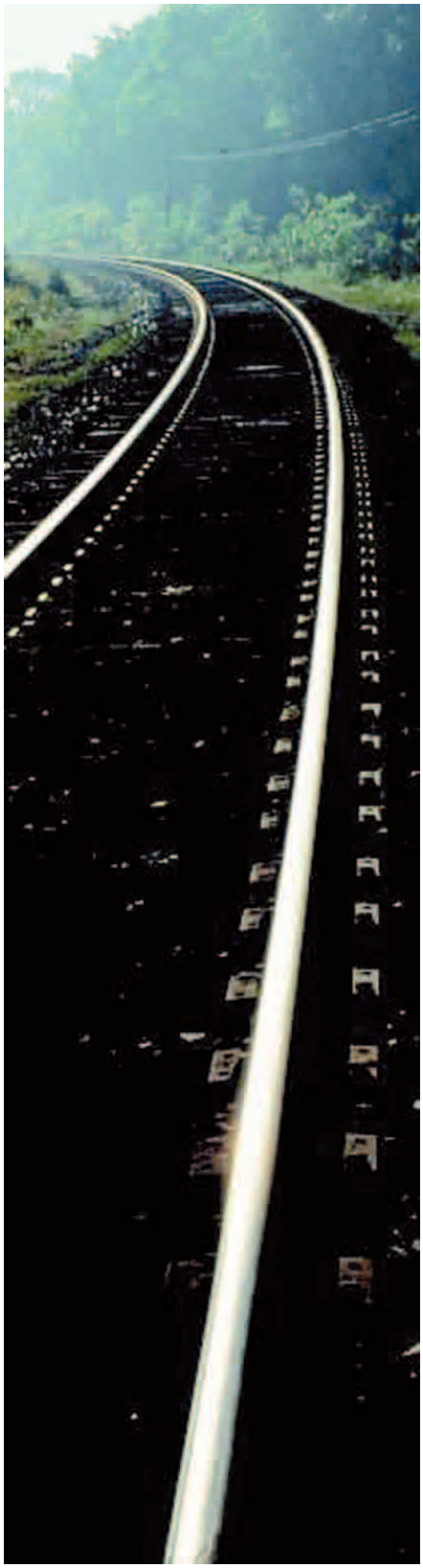
An Overview



REGULATEURS EUROPA have been producing traction governors for over 40 years. The governors are operational in many types and manufacture of locomotive worldwide; including Australia, China, Iran, Kenya, Nigeria, Syria, Sri Lanka, Tanzania and the United Kingdom.

REGULATEURS EUROPA offers a range of both Mechanical Hydraulic Governors and Microprocessor based governing systems to suit the locomotive and application.

REGULATEURS EUROPA (RE) have had particular success in recent years in supplying Viking Governing Systems to replace mechanical-hydraulic governors of any manufacture. The reduction in maintenance has been proven to finance the procurement of the new equipment. The electronic controls have also meant that speed and load control settings have proven to be more repeatable than its mechanical-hydraulic predecessors. Mechanical-hydraulic governors by their nature suffer from heating effects and internal wear.

Viking Traction Governors can be tailored to interface with any locomotive speed setting and load control arrangement.

The REGULATEURS EUROPA Viking Traction Equipment provides the platform for a complete solution to traction diesel engine control, protection and monitoring with interface to microprocessor based locomotive controllers. The system is configurable to suit the engine type, locomotive type and application requirements.

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Viking Traction System Overview

The REGULATEURS EUROPA Viking Traction System consists of a set of standard hardware providing a large capacity of configurable I/O on a platform of core diesel electric power car functionality.

The platform provides control, protection and monitoring functionality applicable to medium and high speed traction diesel engines.

The configurable analogue, digital and serial I/O is driven by project specific software. This enables the standard arrangement to be configured into a system that interfaces with specific diesel engines, loco controllers and/or power car equipment to provide the right solution for a particular diesel electric power car arrangement.

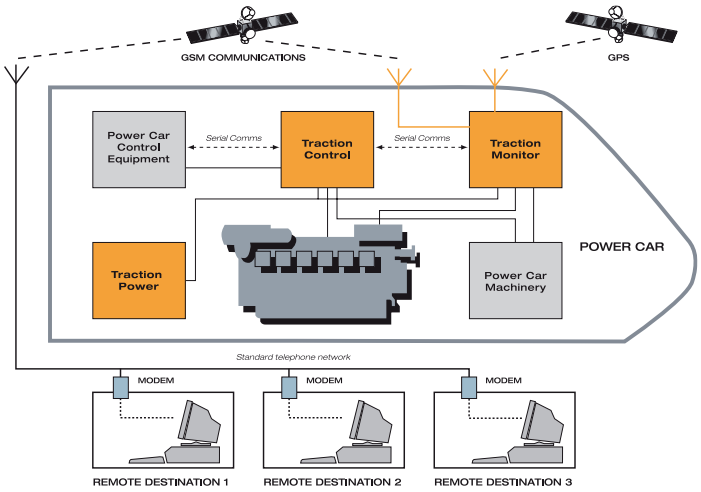
The Viking Traction System consists of the following power car mounted units:

- 1x Traction Power Unit
- 1x Traction Control Unit
- 1x Fuel Actuator
- 1x Traction Monitor Unit

All units have been designed to be compact and lightweight, whilst maintaining the robustness required for reliable operation within the harsh physical and electrical environment of the power car.

Enclosure design, circuit design, equipment layout, and internal wiring routes have all been designed with best Electro-Magnetic Compatibility (EMC) practices adopted. RE provide technical support for the design of high quality power car cabling installations that are required to maintain maximum system immunity to Electro-Magnetic Interference (EMI).

All units receive external cabling through plug and socket connectors. This arrangement supports the repair by replacement philosophy achieving minimum power car 'out of service' periods should problems occur.



Traction Control and Traction Monitor Software can be written to support the functionality required for a specific traction diesel engine and power car arrangement. Both units have considerable configurable digital, analogue and serial I/O capacity available to support the required solution.

REGULATEURS EUROPA exhibit the capability to design additional system components for project specific solutions.

Traction Power Unit

Hardware

Traction Power is presented as a wall/bulkhead mounted, folded and welded stainless steel enclosure of dimensions 400(W) x 410(H) x 110(D) (dimensions in mm), material thickness 1.5 mm. The unit weighs approx. 15 kg.

Functionality

Traction Power provides a regulated 28 Vdc, 300 W power supply output for Traction Control and Traction Monitor units, derived from a power car power supply input. Isolation between the power car power supply +ve and -ve lines to ground is maintained. Traction Power protects the system control and monitoring components from power car supply voltage surges and transients in accordance with RIA12 requirements.

The unit houses a 24 V NiCAD battery pack that maintains a power supply output to Traction Control and Traction Monitor Units during short time period losses of the power car power supply.

Traction Control Unit

Hardware

Traction Control is presented as a wall/bulkhead mounted, folded and welded stainless steel enclosure of dimensions 500(W) x 700(H) x 110(D) (dimensions in mm), material thickness 1.5 mm. The unit weighs approx. 30 kg.

Traction Control houses the following main components:

- Viking Controller
- Speedswitch pcb
- Protections module
- Interface circuitry

Functionality

Engine protection

Engine Protection Functions are performed by both the Viking controller (processing project specific software) and hardwired circuitry within Traction Control.

The software provides the following engine protections:

- 1st stage protection through reduction of applied load based on defined sequences and measured engine parameter values, designed to avoid engine shutdown under fault conditions for as long as possible, whilst maintaining the engine within its safe operating envelope.
- 2nd stage protection through reduction of fueling rate to zero on detection of control system fault through diagnostic routines or on detection of measured parameters outside of the engines safe operating window.

The hardwired circuitry provides the following engine protections:

- Overspeed detection performed by Speedswitch pcb providing speed sensing independent of normal mode of speed control.
- 10 channels performing engine shutdown independent of the normal mode of engine stopping provided by the Protections Module. Commissioning and fault delay functions are configurable. Each channel is latched through local Reset push button.

Engine Control

Engine Control Functions are performed by the Viking Controller within Traction Control, processing project specific software.

The software includes the following core functionality:

- Start interlocks based on input status and memory of previous events.
- Engine auxiliaries control during engine starting, running and stopping conditions.
- Engine speed governing.

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- Engine load modifier control output or available load status output as required by the power car arrangement. This load control is very important to achieving successful power car operation. By linking the control of traction load to the available power of the engine the system can ensure limitation to engine performance (e.g. charge air pressure fuel limitation) and does not cause the engine to stall down.
- The system can be programmed to provide optimised performance of the overall traction power system. Additional control functionality can be designed and implemented into the Viking controller software to meet the power car requirements.

Traction Monitor Unit

Hardware

Traction Monitor is presented as a wall/bulkhead mounted, folded and welded stainless steel enclosure of dimensions 256(W) x 406(H) x 106(D) (dimensions in mm). The unit weighs approx. 8 kg.

Traction Monitor houses the following main components:

- Controller processing project specific software
- Global positioning system
- GSM cellular phone
- Interface circuitry

The unit is supported by a navigation antenna and a communications antenna, both of which are required to be mounted externally, on the roof of the power car.

Functionality

Traction Monitor collects Viking Traction System status data from the Traction Control Unit via serial communications and hardwired inputs. Traction Monitor also collects engine and power car status data via hardwired analogue and digital inputs.

Traction Monitor processes the collected data in accordance with project specific software to produce statistical data and alarm 'black box' data. Traction Monitor will automatically initiate communications with remote PC's at traction HQ on a regular time period basis to download statistical data and an exception basis to download alarm 'black box' data.

Fuel Actuator

REGULATEURS EUROPA type 2221 engine mounted actuator.

The engine driven actuator is designed for reliable operation and long periods between overhaul. Proportional operation, without position feedback, drive shaft face seals and the submersion of all moving parts under oil, are some of the measures that help to achieve this aim.

Nominal Stalled Work Capacity	8 ft lbf 11 Nm	15 ft lbf 20 Nm	25 ft lbf 34 Nm	34 ft lbf 48 Nm	40 ft lbf 55 Nm
Work Capacity Increase Fuel	10 ft lbf 13.5 Nm	17.8 ft lbf 24.1 Nm	29.7 ft lbf 40.2 Nm	34.5 ft lbf 46.7 Nm	35.25 ft lbf 47.8 Nm
Work Capacity Decrease Fuel	6.1 ft lbf 8.3 Nm	12.0 ft lbf 16.2 Nm	19.9 ft lbf 27.0 Nm	35.4 ft lbf 48.0 Nm	42.5 ft lbf 57.6 Nm
Output Shaft torque Increase Fuel	11.4 ft lbf 15.4 Nm	21.3 ft lbf 28.8 Nm	35.6 ft lbf 48.2 Nm	39.8 ft lbf 53.9 Nm	40.75 ft lbf 55.0 Nm
Output Shaft torque Decrease Fuel	6.9 ft lbf 9.3 Nm	12.9 ft lbf 17.5 Nm	21.5 ft lbf 29.2 Nm	40.94 ft lbf 55.3 Nm	49.13 ft lbf 66.4 Nm
Servo Oil Pressure	150 lbf/in^2 10.3 bar	150 lbf/in^2 10.3 bar	250 lbf/in^2 17.2 bar	250 lbf/in^2 17.2 bar	300 lbf/in^2 20.7 bar

Operator Interfaces

Traction Power exhibits panel mounted LEDs that indicate the status of the power car power supply input and the Traction Control and Traction Monitor power supply outputs.

Traction Control exhibits a 4 digit LED display and legend viewable at all times through a window in the front door of the unit. The display is driven by the Viking25 controller software. The display provides system alarm and status code information.

Traction Control exhibits panel mounted LEDs that indicate the Protections Module individual protections channel status. The associated reset pushbutton is located close to the LED display.

Viking Vision

Traction Control presents a port for temporary connection of a laptop running REGULATEURS EUROPA Viking Vision Software. Viking Vision provides a window into the Viking controller and supports comprehensive monitoring of system status and alarms and enables system parameter editing. Viking Vision implements a multi-level security arrangement that inhibits modification of critical parameters.

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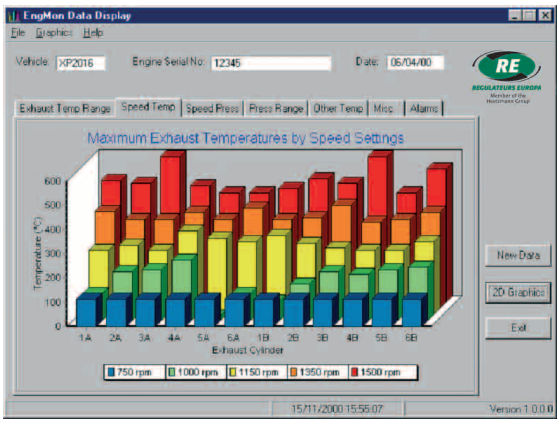
Remote Monitoring

Traction Monitor supports a remote operator interface through traction headquarters PC's running Engmon Display software communicating with the power car mounted unit via GSM cellular communications. The operator can view alarm and statistical data previously downloaded by communications automatically initiated by Traction Monitor.

The operator can manually initiate communications with the power car mounted unit and view real time data through Engmon Display software graphical displays.



Direct Drive Controls

REGULATEURS EUROPA can also provide control and monitoring solutions for shunting engines with hydraulic drives.

REGULATEURS EUROPA Ltd.
Port Lane, Colchester, Essex CO1 2NX
United Kingdom
Phone: +44 (0)1206 799 556
Fax: +44 (0)1206 792 685
Email: sales@regulateurseuropa.com

REGULATEURS EUROPA
Member of the
Heinzmann Group

REGULATEURS EUROPA BV
Ekkelkamp 3, 9301 ZZ Roden
The Netherlands
Phone: +31 (0)5050 19888
Fax: +31 (0)5050 13618
Email: sales@regulateurs-europa.com

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