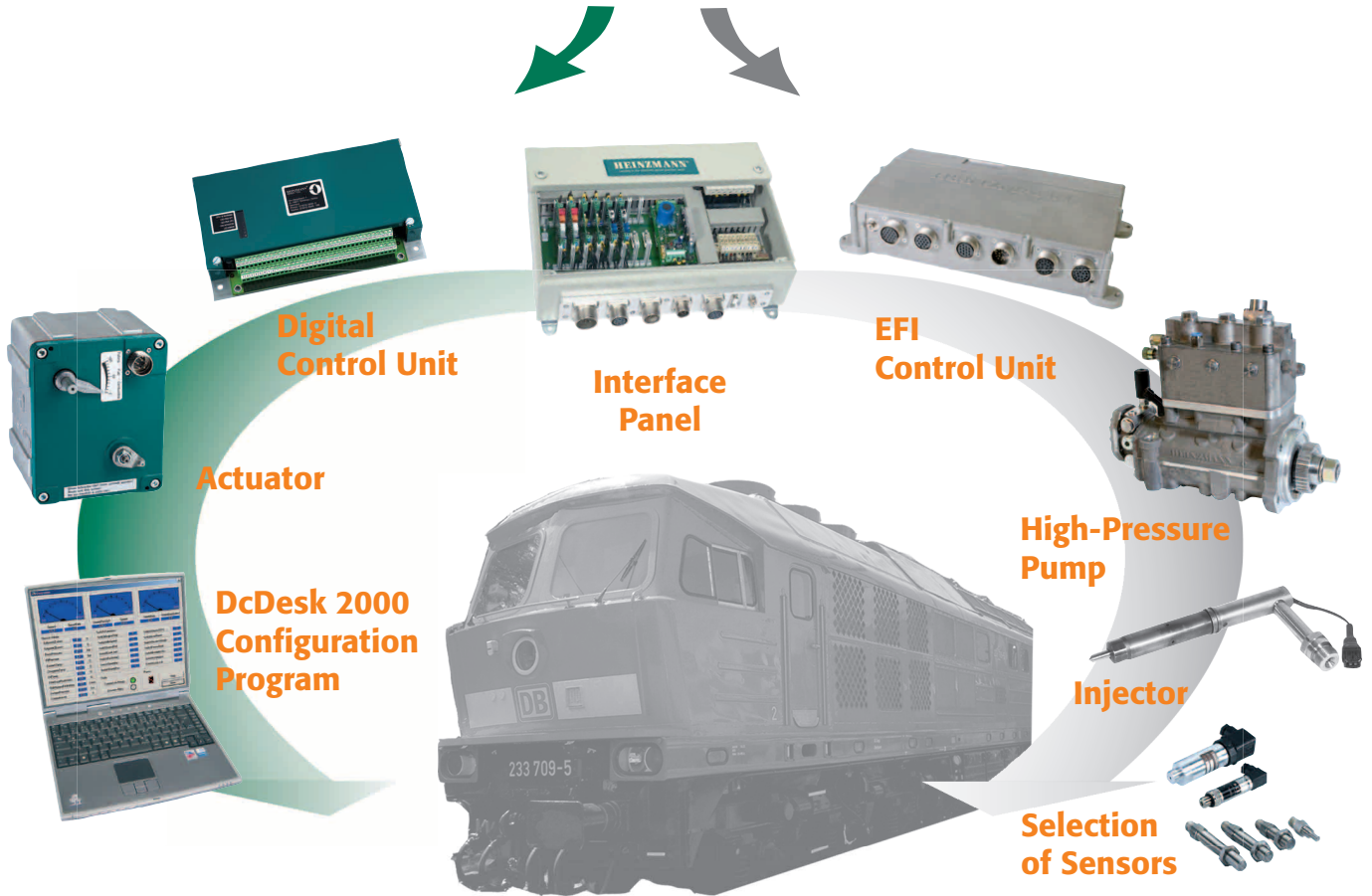


# PEGASOS

## HEINZMANN Locomotive Control Solutions

*Conventional control systems*

*Electronic fuel injection solutions*



*For diesel-electric and diesel-hydraulic drives*

- ✓ Fuel savings
- ✓ Lower emissions
- ✓ Proven reliability
- ✓ Cost-effective OEM solution
- ✓ Universal retrofit system



*Engine & Turbine Management*

## PEGASOS

HEINZMANN's PEGASOS locomotive control meets the specific requirements of the railway market for both diesel-hydraulic and diesel-electric drives.

This speed and load control has galvanically isolated in- and outputs and power supply to protect the internal control electronics from the adverse locomotive electrical environment. The combined speed/load control ensures maximum traction efficiency with its variable excitation control.

The HEINZMANN PEGASOS solution is available for conventional fuel injection as well as electronic fuel injection (EFI) systems in connection with a complete common rail solution, PPN or PNU.

A range of selectable speed setting modes makes the PEGASOS eligible for many different engine control systems. PEGASOS offers an universal retrofit system for locomotives with hydraulic governors as well as for OEMs. It is suitable for almost every locomotive type.



## PEGASOS Benefits

- ✓ **Reduced fuel consumption**
- ✓ **Reduced wear of diesel engine traction motors**
- ✓ **Suitable for almost every locomotive and engine type**
- ✓ **Available for new or retrofit installations**
- ✓ **Complete control system in compact design**
- ✓ **Proven in multiple installations worldwide**
- ✓ **Optimum engine power achieved by fully programmable load control**
- ✓ **Prevention of traction wheel slip**
- ✓ **Extended monitoring functions**

PEGASOS is a compact device to retrofit locomotive engines, replacing existing hydraulic governors by a modern digital speed and load control system.

Inputs for up to 16 notches, speed demand via CAN bus or current/voltage signals allow a variable speed setting. The setpoint may be adapted individually by internal speed ramps.

A fully programmable load control provides optimum engine power for each speed level and prevents traction wheel slip.

A wide range of load control amplifier versions is available to suit all customers' AVR requirements.

All actuators are fully electric and require no mechanical drive.

Sensors for engine pressure and temperature monitoring may be incorporated into the system.

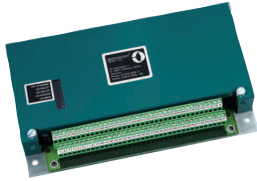
PEGASOS may be equipped with an extended error memory on request (recordings related to engine running hours, including environmental data).

HEINZMANN locomotive control systems are in operation all over the world, for example in Australia, Austria, Finland, France, Germany, Hungary, Sweden, Switzerland, China, Thailand, Vietnam, India, USA, Russia and Ukraine.

# SELECTION OF PEGASOS COMPONENTS

## Conventional Injection

*Digital control system version consisting of*



**Digital control unit**  
Digital control unit DC 40.2-01  
(integrated in interface panel)

**Actuator**  
StG 40-10

**Sensors**  
Speed pickup IA 20-76



## Electronic Fuel Injection

*Common rail version consisting of*

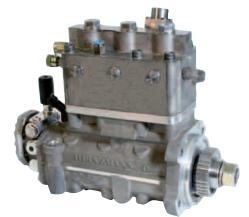


**Digital control unit**  
EFI control unit MVC 01-20

**Injectors**

**High-pressure Pump HDP K3**

**Sensors**  
Hall sensors HIA Series



## Required for both systems

### Interface panel

DC/DC converter, 28-140 V/24 V

Locomotive interface LCI-02:

- Amplifier for excitation control (output signal: project dependent)
- Digital inputs, opto-isolated digital and analogue outputs



### Temperature and pressure sensors

### Complete cable harness

### Junction box

Configuration dependent on application

### Configuration software

Dialogue software DcDesk 2000, including dongle and communication cable



## Optional for both systems

### Input/output extension units

I/O extension units for analogue and digital signals, communicating via CAN bus with the main controller

### CAN bus interface

Isolated, including extended error memory

# PEGASOS CONVENTIONAL INJECTION CONTROL SYSTEM

The PEGASUS conventional fuel injection solution is proven in a high quantity of railway applications. The HELENOS digital control unit can be combined with a range of actuators for different engine sizes. Further system components are an interface panel containing an DC/DC converter and a locomotive interface. The system is completed by various sensors for temperature and pressure, the complete cable harness, a junction box and the HEINZMANN configuration software DcDesk 2000. Optional are input/output extension units and a CAN bus interface.

## Digital control unit

### HELENOS DC 2-02

HEINZMANN's digital control for medium-speed engines and turbines. The HELENOS unit forms the core control of application-dedicated systems for marine, locomotive and turbine applications. External communication via variable CAN protocols and Modbus.



DC 2-02

## Actuators

### StG 2080

The most powerful version of the 2000 actuator series is installed in diesel and gas engines as well as in dual fuel engines and can be driven by HEINZMANN analogue or digital control units and HEINZMANN positioner units.

It has a torque output of 11 Nm at 36° rotation or 8.4 Nm at 68° rotation.



StG 2080

### StG 6 / StG 10

The main application of StG 6 and StG 10 actuators is on industrial diesel and gas engines, which require less than 6 and 10 Nm torque respectively to move the fuel rack or the fuel metering valves. Rotation is 36°.

They are driven by HEINZMANN analogue or digital controls.



StG 6 / 10

### StG 16 / StG 30 / StG 40

These actuators are utilised on industrial diesel and gas engines and on turbines to move the fuel rack or fuel metering valves. Application examples are locomotive, marine and power generations. They work with HEINZMANN analogue and digital controls.

They have a torque output of respectively 15, 28 or 44 Nm and either 42° or 90° rotation.



StG 16 / 30 / 40

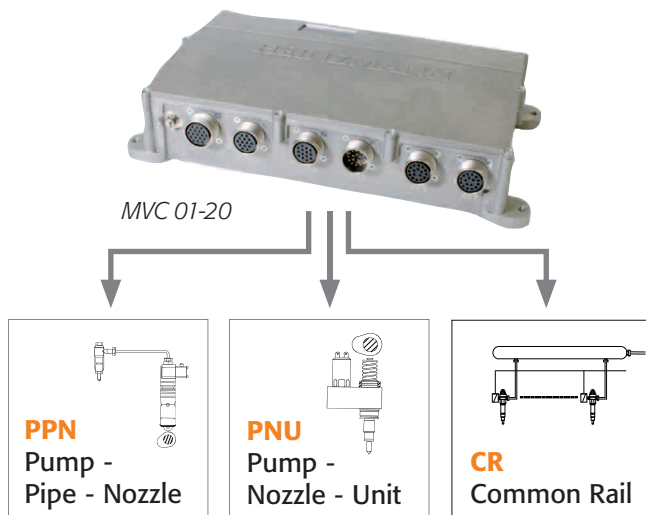
# PEGASOS EFI LOCOMOTIVE CONTROL SYSTEM

HEINZMANN has long-term experience in EFI technology and in EFI engine commissioning.

DARDANOS EFI versions have been running under different conditions in several countries and on various engines/locomotives for several years. HEINZMANN electronic fuel injection controls can be used with PPN, PNU and common rail diesel engines up to 20 cylinders.

## DARDANOS EFI control units

The DARDANOS series are designed as universal speed controllers for engines with electronically-controlled injection systems. In addition to their primary purpose of controlling speed, these controllers provide further features that offer other benefits for your diesel engines. HEINZMANN EFI control units are available for engines up to 20 cylinders.

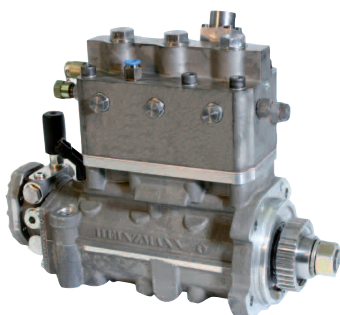


## Common rail components

HEINZMANN provides a complete package of common rail fuel injection components such as various sizes of injectors and high-pressure pumps, sensors, application software and spare parts.

HEINZMANN high-pressure pumps have a uniquely robust design and are able to generate rail pressures of up to 2000 bar.

## High-pressure pumps



High-pressure pump

## Injectors

HEINZMANN injectors are available in many sizes and provide the flexibility to be adapted as required for engines with cylinder powers between 15 and 500 kW.



Electronic fuel injectors

## ADVANTAGES OF PEGASOS SYSTEM

- ➔ Exhaust reduction and/or fuel saving (depending on injection pressure and settings – EFI version only)
- ➔ Improved cold start performance (variable start fuel)
- ➔ Lower min. idle speed (e.g.: 190 rpm instead of 280 rpm)
- ➔ Excellent engine speed stability and dynamics
- ➔ Soft loading leads to extended maintenance intervals for traction motors and diesel engines (example GT26 locomotive: 4 times longer running period without major overhaul)
- ➔ Adaption to injector tolerances and cylinder characteristics (to minimise exhaust temperature differences – EFI version only)
- ➔ Pressure and temperature depending power deratings to protect the engine from overload (electric load reduction instead of fuel quantity reduction)
- ➔ Dynamic brake function and slip control may be incorporated
- ➔ All analogue or binary speed setting signals are accepted, CAN bus as well (Modbus: for conventional systems, not for EFI)
- ➔ Minimised number of moving mechanical parts, compared to conventional hydraulic speed governors (“wear and tear problem”)
- ➔ Troubleshooting assistance by actual and stored error memories for HEINZMANN PC based DcDesk 2000 communication program
- ➔ A major advantage is the flexible HEINZMANN software functionality, which may be adapted to all operating conditions and particular applications

# PEGASOS COMPONENTS

## Actuators

Technical data	StG 2080	StG 6	StG 10	StG 16	StG 30	StG 40
Output shaft travel	36° / 68°	36°	36°	42°	42°	42°
Maximum torque at output shaft, approx.	11 Nm / 8.4 Nm	4 Nm	10 Nm	15 Nm	28 Nm	44 Nm
Torque in steady state condition, approx.	3.7 Nm / 4.2 Nm	1.4 Nm	3.5 Nm	5 Nm	9 Nm	15 Nm
Response time 0-100 % without load, approx.	60 ms / 85 ms	70 ms	80 ms	120 ms	170 ms	190 ms
Current consumption of whole governor:						
• max. current, approx.	5 A	5 A	5 A	5 A	5 A	7 A
• safe current in steady state condition, approx.	1.7 A	1.7 A	1.7 A	1.7 A	1.7 A	2.3 A
Storage temperature	-55 °C up to +110 °C	-55 °C up to +110 °C	-55 °C up to +110 °C	-55 °C up to +110 °C	-55 °C up to +110 °C	-55 °C up to +110 °C
Ambient temperature in operation	-25 °C up to +90 °C	-25 °C up to +90 °C	-25 °C up to +90 °C	-25 °C up to +90 °C	-25 °C up to +90 °C	-25 °C up to +90 °C
Ambient temperature special version	-40 °C up to +90 °C	-40 °C up to +90 °C	-40 °C up to +90 °C	-40 °C up to +90 °C	-40 °C up to +90 °C	-40 °C up to +90 °C
Humidity	98 %	98 %	98 %	98 %	98 %	98 %
Protection grade	IP 55	IP 55	IP 55	IP 55	IP 55	IP 55
Weight, approx.	8.6 kg	3.5 kg	4.3 kg	12.3 kg	12.3 kg	12.3 kg

For further information please request the manual DG 96001-e "PEGASOS for Locomotive Operation"

## DARDANOS

### Electronic fuel injection control

Supply voltage	24 VDC
Min. voltage	18 VDC
Max. voltage	32 VDC
Max. ripple voltage	max. 10 % with 100 Hz
Output voltage for solenoids (MVC 01-20)	24 VDC / 48 VDC / 90 VDC
Current consumption	approx. 0.4 A + 0.5 A / injector
Storage temperature	-55 °C up to +105 °C
Ambient temperature	-40 °C up to +80 °C -40 °C up to +120 °C with fuel coolant

## HELENOS

### Digital control unit

Supply voltage	24 VDC
Min. voltage	18 VDC
Max. voltage	36 VDC
Max. ripple voltage	max. 10 % with 100 Hz
Current consumption	approx. 200 mA + current of actuator
Storage temperature	-55 °C up to +85 °C
Ambient temperature	-40 °C up to +80 °C -40 °C up to +70 °C

For further information please refer to the HEINZMANN Product Guide, the product leaflets ODYSSEUS Complete Common Rails Systems, DARDANOS Electronic Fuel Injection Control Systems and the manuals DG 07 001-e Control devices for conventional injection with actuators, MV 09 001-e DARDANOS Basic Information.

# PEGASOS

## LIST OF RAILWAY INSTALLATIONS

### Conventional systems

#### Digital governor systems

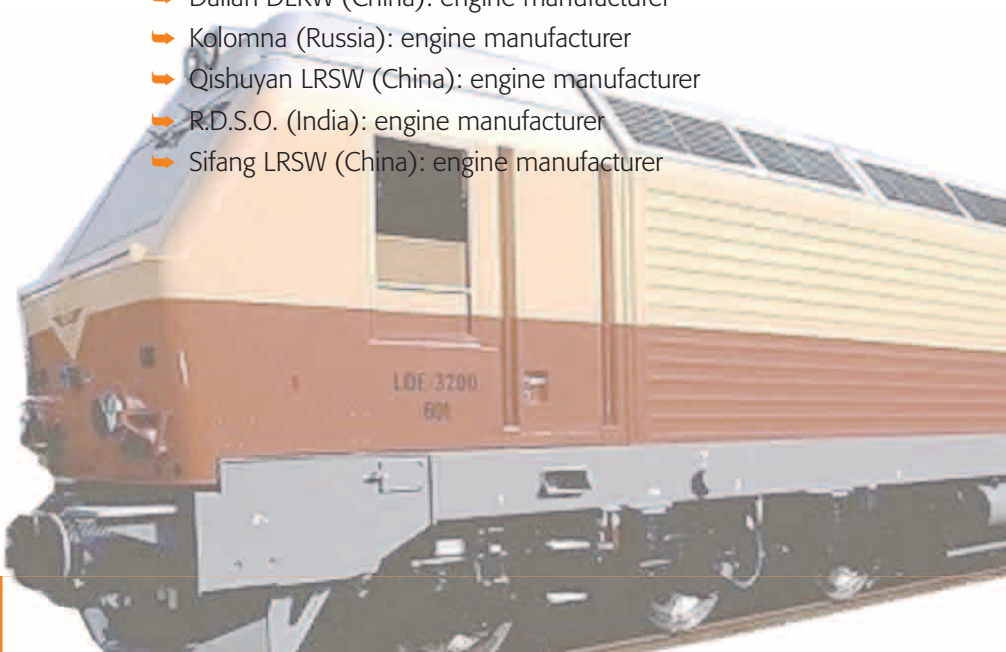
- ADTRANZ (Germany): MTU engines
- Belgium Railways (Belgium): ABC engines
- BVG (Germany): MTU engines
- Deutsche Bahn (Germany): Kolomna engines
- FERSA (Switzerland): MTU engines
- GKE (Austria): MAN engines
- Kongo Railway (Kongo): ABC engines
- KTM (Malaysia): Pielstick engines
- Malishev (Ukraine): Malishev engines
- MÁV (Hungary): GANZ-Pielstick engines
- PLASSER & THEURER (Austria): MTU engines
- Rhätische Bahn (Switzerland): DEUTZ engines
- SRT (Thailand): Pielstick engines
- STADLER (Switzerland): MTU engines
- Swedish Railway (Sweden): Cummins engines
- Ukrainian Railways (Ukraine): Kolomna engines
- Vestbanen (Denmark): Daimler engines
- Vietnam Railways (Vietnam): CKD engines
- Windhoff AG (Germany): SCANIA engines
- Zillertaler VB (Austria): MAN engines

#### Analogue governor systems

- British Railway: MIRRLEES engines
- Hungarian Railway: MWM engines
- KBE (Germany): MWM engines
- South Africa: CAT engines
- State Railway of Austria: JENBACHER engines
- State Railway of Finland: SEMT-VALMET engines

#### Electronic fuel injection systems

- Beijing, 7th February (China): engine manufacturer
- Dalian DLRW (China): engine manufacturer
- Kolomna (Russia): engine manufacturer
- Qishuyan LRSW (China): engine manufacturer
- R.D.S.O. (India): engine manufacturer
- Sifang LRSW (China): engine manufacturer





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**ELECTRONIC FUEL INJECTION**



**DIGITAL AND ANALOGUE CONTROL SYSTEMS**



**HYBRID TECHNOLOGY**



**GENERATOR MANAGEMENT**



**ELECTRIC AND HYDRAULIC ACTUATORS**



**SAFETY SYSTEMS**



**ENGINE EMISSION MANAGEMENT**



**TURBINE MANAGEMENT**



**GAS ENGINE MANAGEMENT**



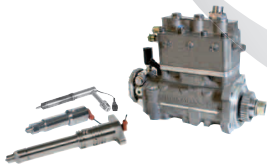
**DUAL FUEL CONTROLS**



**SENSORS AND SOLENOIDS**



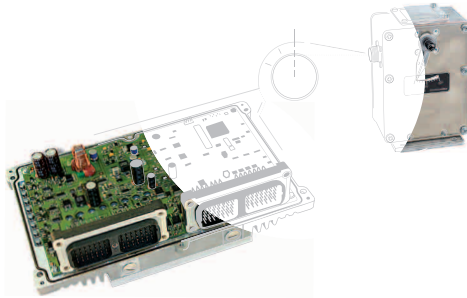
**COMMON RAIL**



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