

## Diesel Locomotive Retrofitting System – product description

Despite the general advances made in railway electrification, there are still many locations that are only accessible by Diesel locomotives. Furthermore, this type of engine unit remains the most popular for shunter locomotives. Most Diesel locomotives in Poland are already beyond their prime and do not meet the latest stringent exhaust emissions standards.

The response to market needs is to modernise these ageing locomotives, which consists primarily in replacing the old types of engine with new Diesel engines that meet the latest exhaust emissions standards. This process also requires the replacement of the related components – especially the main and auxiliary generators, which together with the combustion engine form the power generator. Replacement also applies to smaller items of equipment, including the main controller for the locomotive, followed by the rectifiers and inverters that supply the auxiliary equipment, and finally even the cabin panels. Of course, the modernising also includes refreshing the locomotive appearance, with a fresh livery and sometimes modifications to the body.

Such retrofitting has been undertaken by Tabor Dębica and Orion Kolej, for example, and they invited ENIKA to participate as a supplier of electrical equipment. The main electrical components are located in the lateral spaces, under the driver's cabin. However, the main controller of the locomotive is located in the switchgear cabinet at the front of the locomotive. The driver's cabin also has two ergonomically designed control panels, which enable driving in each direction. Each panel is fitted with a diagnostics panel, drive and brake controller, manometers for the pneumatic brake system and other buttons and equipment necessary for locomotive operation. The layout of the cabin and the ergonomics of the panels contribute to optimum working conditions for the driver.



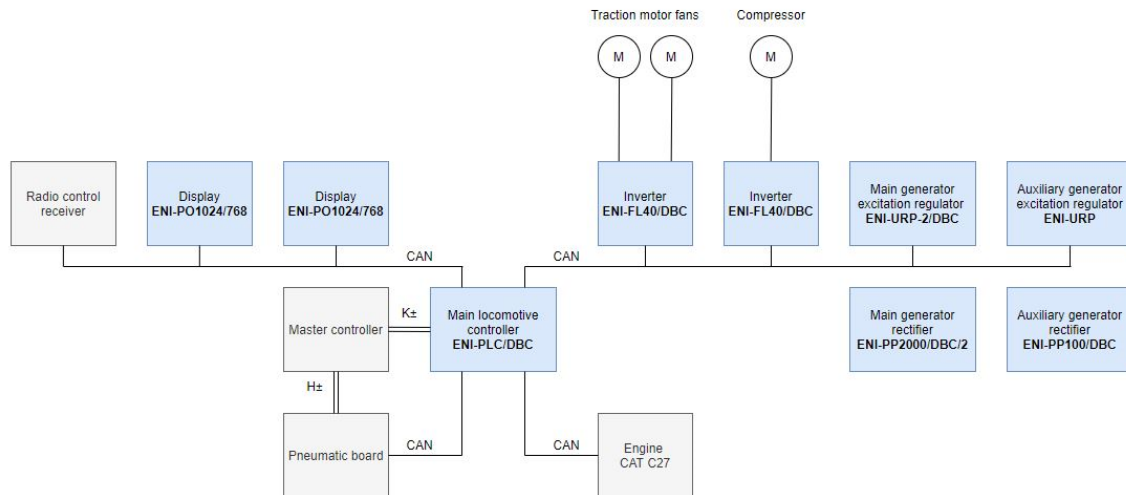
*6Dm-01 locomotive modernised by Orion Kolej*



*Lokomotywa 6Dh-1 001 zmodernizowana przez Tabor Dębica (Source: [www.hery.com.pl](http://www.hery.com.pl))*

To modernise the type SM42 locomotives to type 6Dm (Orion Kolej) and type 6Dh (Tabor Dębica), ENIKA designed and implemented a control system based on the following equipment:

- main locomotive controller ENI-PLC/DBC;
- main generator rectifier ENI-PP2000/DBC/2;
- auxiliary generator rectifier ENI-PP100/DBC;
- main generator activation regulator ENI-URP-2/DBC;
- auxiliary generator activation regulator ENI-URP;
- auxiliary inverters for supplying the compressor, fans etc. ENI-FL40/DBC;
- driver's panel touch panels ENI-PO1024/768.



*Schematic diagram of the control system*

The system designed with this equipment ensures optimum utilisation of the Diesel engine and generator unit parameters. It also ensures communication with the engine controller and continuous setting of the traction force by the drive controller, which is achieved by monitoring the main generator and selecting the required Diesel engine speed in accordance with the optimum traction characteristic. The main controller of the locomotive also communicates with the pneumatic panel, responsible for braking the locomotive and the entire train.

The system also enables the supply and control of the auxiliary systems required for locomotive operation – pneumatic system and compressor, traction engine fans etc. Another function is slip detection and prevention, which is responsible for automatic sander activation.

Every subsystem is controlled from the main controller of the locomotive, each connected via a CAN bus. In addition, the controller also enables monitoring of the operating parameters of every piece of equipment and diagnostics for the entire system. Reviewing of the system visualisation and diagnostics takes place on driver's control panels.



*Main screen on the driver's control panel*

An additional advantage of the modernised locomotives is the radio control function. This is based on the main controller for the locomotive, with the participation of Akerstroms and Hetricon radio control units.

Furthermore, the introduction of these new types of control also allows implementation of a cruise control function. The controller maintains the selected speed through automatic setting of the traction force. If the selected speed is exceeded, e.g. during descents, light braking is applied under the control of the pneumatic panel.

The advantages of the modernised locomotives are appreciated by the customers as well as the operators, resulting in orders for further rail items.



*One of four 6Dh-1 003 locomotives retrofitted by Tabor Dębica for PGE Opole (Source: [www.hery.com.pl](http://www.hery.com.pl))*

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