A modern six-axle locomotive, specially designed for heavy freight transport.

E6ACT DRAGON is a traction vehicle from the six-axle locomotive platform specially designed for the heavy freight transport. Dragon locomotives are powerful, safe, attractively-priced, economical, fully-equipped locos utilizing reliable, latest technological solutions and offering high comfort of the driver’s work.

DRAGON’s main advantage is a very high tractive force of the value from 410 kN to 450 kN. In connection with a high locomotive weight, a performant antiskid system and an individual drive per each axle, this allows to pull heavy duty freight trains.

99.6 % reliability

4500 t Train weight at 7‰ profile
Our commitment:
Safety, reliability and ease of maintenance

Our utmost goal is to provide our Customers with safe and reliable locomotives. Dragon locomotives are manufactured using subassemblies designed and delivered by world-class suppliers offering the highest quality standards and the highest competence level. Therefore, Dragon locomotives are not only reliable but they also have an optimized maintenance schedule. This, in turn, allows us to guarantee a very high technical availability rate which each carrier will find satisfying.

The loco’s drive is made up of asynchronous traction motors driven by IGBT-based traction inverters. The locomotive has a modular construction which allows for tailoring technical parameters to individual clients’ needs e.g., increasing available tractive effort or implementing an additional Diesel engine to allow the loco to be run on non-electrified lines.

Our designers also ensured driver’s safety and enhanced working conditions by providing an ergonomically-designed cab and driver’s desk, a double function air-conditioning unit, as well as a system of cameras, a safety cage and anti-climbing structure protecting the operators in case of collision.

Dragon is equipped with microprocessor control systems adapting the operating mode to the changing conditions and to the customer’s requirements, an on-board diagnostics system with full visual information and a data registration module which facilitates locating or predicting possible damages.

Available options: Dual Power and Max Load

Our company’s high quality standards confirmed by such certificates as International Railway Industry Standard IRIS guarantee the highest level of quality.

According to customers’ needs, Dragon locomotives can be equipped with an additional combustion module called “Dual Power”. This additional Diesel engine greatly increases the locomotive flexibility, allowing it to drive a complete train on non-electrified track sections.

For customers who need a locomotive able to haul even higher loads, Dragon locomotive can be equipped with “Max Load” option, which allows to increase the maximum tractive effort up to 450 kN.
Dragon electric locomotives offer:

» Optimized use of available tractive effort
» Guaranteed high quality
» High availability rates
» Optimum maintenance costs
» Ergonomic, safe and comfortable working conditions
» Competitive price
» Additional amenities
FAMILY OF FOUR-AXLE LOCOMOTIVES

Cutting-edge, universal four-axle locomotive designed for pulling freight and passenger trains

Griffin is a universal family of four-axle locomotives designed for pulling freight and passenger trains. It is the first Polish multisystem locomotive adapted to be used both with the 3kV direct current power supply system and 15kV or 25kV alternating current power supply systems.

Thanks to its modular construction, the E4MSU Griffin locomotive can be tailored to suit specific needs of particular carriers and its interoperability (compliance with the TSI requirements) and the multi-system character facilitate obtaining...
homologation in most countries. NEWAG S.A.
cooperates with subcontractors who are European
leaders in their sectors. Owing to this, locomotives
from the Griffin family are characterised by high
reliability and extended servicing intervals, resulting
in a high availability rate. Locomotives from the Griffin
family stand out among other locomotives offered on
the European market due to their very competitive
purchase terms and their simple, fault-free design
guarantees low rolling stock maintenance costs.

Interoperational
and universal locomotive

Griffin locomotives may be used for pulling freight
trains of a maximum weight up to 3200t with the speed
of up to 160km/h, as well as passenger trains with the
speed of up to 200km/h. They are available in several
versions. Additionally, the "Dual Power" option available
in locomotives with the AC and the DC power supply
makes it possible for locomotives to be operated on
non-electrified lines.
LOCOMOTIVE BODY:

- integral welded design
- safety cage in driver’s cab
- modular structure
- ergonomic, two-persons loco cab
- modern fire detection and extinguishing system

WHEELSETS:

- monoblock wheels with a nominal diameter of 1250 mm
- braking discs fixed on both sides of the wheel
- asynchronous traction motors with power of 842 kW each
- axle bearing with conical roller bearings, temperature and speed sensors

SUSPENSION:

- primary level: two sets of coil springs mounted directly on both sides of the wheelset axle box
- secondary level: a set of large-scale, flexicoil spiral springs
- hydraulic shock absorbers for muffling vibrations

DRAGON SUMMARY
**HIGH VOLTAGE ELECTRICAL CIRCUITS:**

- two or four single-arm pantographs with independent ADD system
- two traction converters, each equipped with 3 traction inverters and auxiliary converter module
- individual water cooling system for each of the supply blocks

**LOW-VOLTAGE ELECTRICAL CIRCUITS:**

- 3x400V output voltage powering the auxiliary circuits
- 110V DC battery voltage
- top-class 100Ah FNC battery system

**LOCOMOTIVE DIAGNOSTIC AND CONTROL:**

- microprocessor-based control system
- two independent panels to display drive parameters and diagnostics in each cab
- event recorder synchronized with the electronic speedometer

**FUNCTIONS:**

- overall control of locomotive operation
- fully automatic drive control with speed set by loco driver
- verification of loco driver’s orders entered by man-machine interface panel
- full locomotive diagnostics with the event recording

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**TECHNICAL PARAMETERS**

<table>
<thead>
<tr>
<th></th>
<th>DC 3kV</th>
<th>AC 15kV 16 2/3 Hz</th>
<th>AC 25kV 50 Hz</th>
<th>DC 3kV</th>
<th>AC 15kV 16 2/3 Hz</th>
<th>AC 25kV 50 Hz</th>
<th>DIESEL</th>
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<tbody>
<tr>
<td><strong>Axle configuration</strong></td>
<td>CB’CB’</td>
<td></td>
<td></td>
<td>CB’CB’</td>
<td></td>
<td></td>
<td>CB’CB’</td>
</tr>
<tr>
<td><strong>Supply voltage</strong></td>
<td>DC 3kV</td>
<td>AC 15kV 16 2/3 Hz</td>
<td>AC 25kV 50 Hz</td>
<td>DC 3kV</td>
<td>AC 15kV 16 2/3 Hz</td>
<td>AC 25kV 50 Hz</td>
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</tr>
<tr>
<td><strong>Continuous power</strong></td>
<td>2.3 MW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.3 MW</td>
</tr>
<tr>
<td><strong>Maximum speed</strong></td>
<td>120 km/h</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Starting tractive effort</strong></td>
<td>400 kN or 450 kN (max Load)</td>
<td>450 kN or 500 kN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Track width</strong></td>
<td>1435 mm</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Service weight</strong></td>
<td>119 t</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum axle load</strong></td>
<td>20 t/axle</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Nominal wheel tread diameter</strong></td>
<td>1250 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Loco length with buffers</strong></td>
<td>20330 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clearance gauge</strong></td>
<td>UIC 505-1</td>
<td></td>
<td></td>
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</tbody>
</table>
GRiffin Summary

Reliability, Optimal Maintenance Programme, High Availability Rates

- Modern on-board diagnostic system with full visual information enabling both diagnosing and predicting potential problems
- Optimised maintenance system with extended servicing intervals
- Decreased failure rate owing to cooperation with strategic suppliers, selected from among leading European manufacturers
- High quality of manufacturing, the choice of the best suppliers and optimised servicing cycles guarantee high availability rates

Basic Features of E4MSU Griffin Locomotive:

- Multi-system – ready to operate in many power supply systems
- Universal – used for passenger and freight trains
- Interoperational – suitable for homologation in most European countries
- Comfortable – ensures enhanced driver’s working conditions
- Reliable – characterised by optimal maintenance costs and high availability rates
- Favourable and flexible terms of purchase
### TECHNICAL PARAMETERS

<table>
<thead>
<tr>
<th>Axle configuration</th>
<th>E4DOU</th>
<th>E4DOP</th>
<th>E4AOU</th>
<th>E4AOP</th>
<th>E4MSU</th>
<th>E4MSP</th>
<th>E4MSU</th>
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<tbody>
<tr>
<td>Supply voltage</td>
<td>DC 3kV</td>
<td>DC 3kV</td>
<td>AC 15kV 16.7Hz, AC 25kV 50Hz</td>
<td>AC 15kV 16.7Hz, AC 25kV 50Hz</td>
<td>DC 3kV</td>
<td>AC 15kV 16.7Hz, AC 25kV 50Hz</td>
<td>DC 3kV</td>
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<td>2.3 MW</td>
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<td>Maximum train weight</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>Maximum speed</td>
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<td>200 km/h</td>
<td>160 km/h</td>
<td>200 km/h</td>
<td>160 km/h</td>
<td>200 km/h</td>
<td>160 km/h</td>
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<td>Starting tractive effort</td>
<td>710 kN</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Track width</td>
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<td></td>
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<td></td>
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<tr>
<td>Service weight</td>
<td>791 kN</td>
<td>791 kN</td>
<td>841 kN</td>
<td>841 kN</td>
<td>881 kN</td>
<td>881 kN</td>
<td>791 kN</td>
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<tr>
<td>Loco length with buffers</td>
<td>1 990 mm</td>
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</tr>
<tr>
<td>Clearance gauge</td>
<td>UIC 150-1</td>
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</tr>
</tbody>
</table>

### GRIFFIN LOCOMOTIVES:

- Fitted with one, two or three power supply systems (3kV DC, 15kV AC and 25kV AC) depending on clients’ needs
- With high continuous power (5.6 MW) capable of pulling passenger trains with the speed of up to 200 km/h and freight trains of 3 200 t gross weight in all weather conditions
- Interoperational – comply with TSI requirements
- Enable to install safety systems required in particular countries
- Adapted for ERTMS and GSM-R installation

### ENHANCED DRIVER’S WORKING CONDITIONS:

- Well sound-insulated and spacious driver’s cab
- Clear, intuitive control panel
- Camera system facilitating driver’s work
- Cruise-control system enabling smooth and comfortable ride
- Driver’s cab amenities including a microwave oven, a fridge and a kettle

### THE HIGHEST SAFETY LEVEL:

- Integral welded structure with crumple zones and a safety cage with the anti-climbing system protecting drivers of both trains involved in a collision
- Modern fire detection and extinguishing system in the driver’s cab and in the machinery room
- Fire barrier with 15 minutes integrity
- Modern data-recording module
NEWAG S.A. is a modern company whose history dates back to 1876. As one of the oldest railway companies in Poland, it has many years of experience in the production of electric locomotives and rolling stock, trams and metro vehicles.

At its Nowy Sącz factory electric and diesel multiple units are manufactured, passenger trains and diesel locomotives are modernized whereas at the Rail Vehicles Competence Centre in Gliwice electric locomotives are produced and modernised. It is in Gliwice that the latest locomotives Dragon and Griffin are made.

NEWAG S.A. has a stable and strong market position within locomotive manufacturers in Poland. In recent years, the NEWAG S.A. Group has dominated the domestic market for the production and modernisation of diesel locomotives and production of electric multiple units.

NEWAG is the partner of choice for several multinational corporations such as GE, Siemens AG, Stadler AG, and Bombardier. Working in partnership with Siemens, NEWAG S.A. implemented a contract for supplying trains for the Warsaw Metro, a contract worth PLN 1.07 billion.

NEWAG is also supplying and maintaining 20 electric multiple units for PKP Intercity in a contract with Stadler valued at more than PLN 1.6 billion.

In December 2013, NEWAG S.A. begins its expansion into international markets by signing a contract for the supply of diesel multiple units to Italy.

NEWAG S.A. holds PN-EN ISO 9001:2009 certification which confirms that the company introduced and has implemented the modern quality control system and the IRIS Certification Rev. O21 that attests to the implementation of the international railway industry standards.