

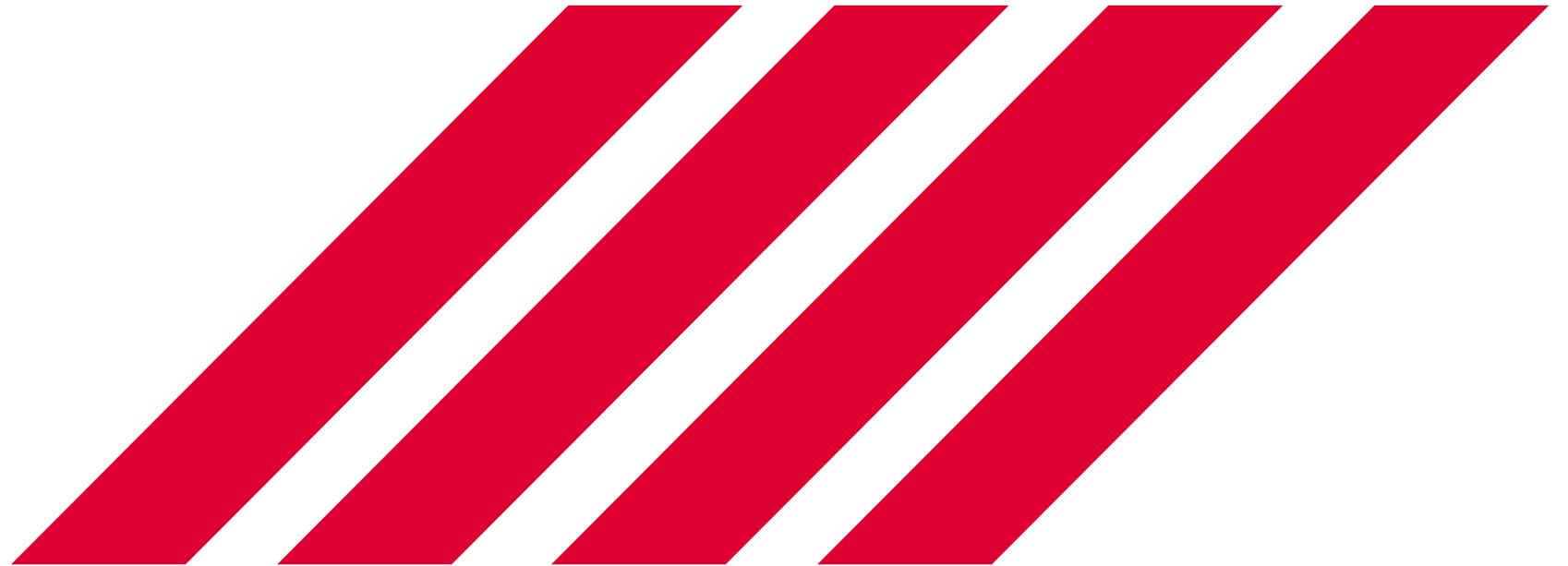
ELECTRIC

LOCOMOTIVES

E4MSU-001

newac
GROUP

DRAGON



PLATFORM
OF SIX-AXLE
LOCOMOTIVES

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

99.6 %

reliability

4500 t

Train weight at 7‰ profile

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.



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.

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

Available options: Dual Power and Max Load

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

DRAGON





 **LOTOS**

DRAGON
E6ACT-006

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PL - LOTOS

E6ACT-006 kabina 1

$v_{max} = 120 \text{ km/h}$

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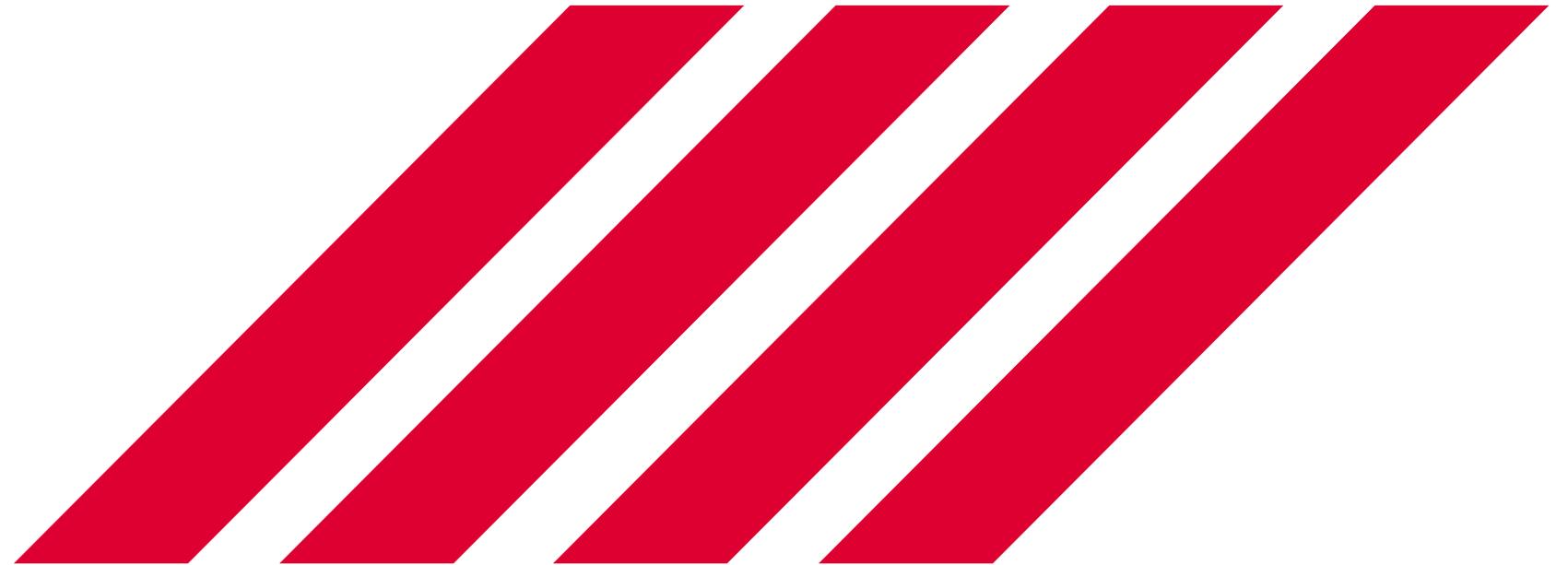
E6ACT-008

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LOTOS

132
7

GRIFFIN



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.

GRIFFIN





E4MSU-001

newag
GLIWICE

newag
GLIWICE

E4MSU-001

E4MSU

850kN

E4MSU-001

A

V max 160 km/h

newac

PIERWSZA POMOC





newag



newag
GLIWICE





DRAGON SUMMARY

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

LOCOMOTIVE BODY:



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

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

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

LOW-VOLTAGE ELECTRICAL CIRCUITS:



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

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

TECHNICAL PARAMETERS



	DC	AC	MS	DIESEL
Axle configuration	Co' Co'			
Supply voltage	DC 3 kV	AC 15 kV 16 2/3 Hz AC 25 kV 50 Hz	DC 3 kV AC 15 kV 16 2/3 Hz AC 25 kV 50 Hz	
Continuous power	72 MW AC and MS version			2.3 MW
Maximum speed	120 km/h			
Starting tractive effort	410 kN or 450 kN (max Load)			410 kN or 450 kN
Track width	1435 mm			
Service weight	119 t			
Maximum axle load	20 t/os			
Nominal wheel tread diameter	1250 mm			
Loco length with buffers	20330 mm			
Clearance gauge	UIC 505-1			



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

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



GRIFFIN LOCOMOTIVES:



- » Fitted with one, two or three power supply systems (3kV DC, 15kV AC and 25kVAC) depending on clients' needs
- » With high continuous power (5.6MW) capable of pulling passenger trains with the speed of up to 200km/h and freight trains of 3200t 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

TECHNICAL PARAMETERS



	E4DCU	E4DCP	E4ACU	E4ACP	E4MSU	E4MSP	D4MSU
Axle configuration	Bo' Bo'						
Supply voltage	DC 3kV	DC 3kV	AC 15 kV 16,7Hz; AC 25 kV 50 Hz	AC 15 kV 16,7Hz; AC 25 kV 50 Hz	DC 3 kV; AC 15 kV 16,7Hz; AC 25 kV 50Hz	DC 3 kV; AC 15 kV 16,7Hz; AC 25 kV 50Hz	DIESEL
Continuous power	5.6 MW						2.3 MW
Maximum train weight	3200 t						
Maximum speed	160 km/h	200 km/h	160 km/h	200 km/h	160 km/h	200 km/h	160 km/h
Starting tractive effort	310 kN						248 kN
Train speed at gross weight:							
-500t train at 0‰ profile	160 km/h	200 km/h	160 km/h	200 km/h	160 km/h	200 km/h	160 km/h
-2400t train at 0‰ profile	135 km/h						80 km/h
-2400t train at 7‰ elevation	80 km/h						35 km/h
-3200t train at 0‰ profile	120 km/h						70 km/h
Track width	1435 mm						
Service weight	79 t	79 t	84 t	84 t	88 t	88 t	79 t
Maximum axle load	196 kN	196 kN	208 kN	208 kN	220 kN	220 kN	196 kN
Nominal wheel tread diameter	1250 mm						
Loco length with buffers	19900 mm						
Clearance gauge	UIC 505-1						

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. 021 that attests to the implementation of the international railway industry standards.



ISO 9001:2008

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Paid-up share capital of PLN 11 250 000,25