Nuclear Power Plants Emergency power solutions





Engineering the Future – since 1758. **MAN Diesel & Turbo**



Nuclear Power Plants

Safety First

Over the past 40 years, MAN Diesel & Turbo has supplied more than 400 emergency diesel generators to over 80 nuclear power plants in 18 countries. This gives us unique engineering experience in this most critical of all application area.

Our expertise enables us to provide safe and highly reliable emergency power solutions that are specifically adapted to the needs of each installation. We also provide technical support throughout the project, from the earliest specification stages through to commissioning and servicing.

All MAN Diesel & Turbo emergency power solutions meet the strict international safety standards of the nuclear industry, such as IEEE, KTA, RCC-E, IEC.

Our projects are implemented and managed in line with specific nuclear quality standards, including GS-R-3 (former 50-C/SG-Q), 10 CFR 50 Appendix B, KTA 1401, ASME NQA-1 and the Chinese HAF standards.

OHSAS 18001 : 2007 Occupational health and safety management system

MAN Diesel & Turbo service includes occupational health and safety management system.

MAN Diesel & Turbo gains assurance to minimise risk to employees and other interested parties who may be exposed to OH&S risks associated with its activities.

ISO 14001 : 2004 Environmental management systems

The environmental management system as implemented applies to the operations and services carried out on MAN Diesel & Turbo site. This includes building high power diesel engines equipped with automation systems and training of the engine users.

Proven Technology Modern Concepts



PC2.6 B N



PA6 B N

Nuclear-certified PC2.6 B N & PA6 B N engines

The PC2.6 B N and PA6 B N engines have been granted nuclear qualification in accordance with several standards, such as IEEE 387, RCC-E and KTA 3702. These require high availability and reliability rates, which need to be confirmed by the relevant qualification tests as well as proven operational use.

The long track record of the PA6 and PC2 engines confirms their total suitability for the needs of the nuclear industry. They can be precisely adapted to individual customer requirements and also benefit from continuous technical improvements based on operational experience.

PA6 B N and PC2.6 B N combine the widest power range on the market – from 3MW up to 12MW – with a long working life and optimized on-site maintenance. All engines are designed for ease of access to the main components and can be serviced using very few special tools.

These two engine types have the versatility and power range to meet the needs of a diverse range of emergency power systems.











Tailored to your Needs

Your Requirements - Our Solutions

Our engineers tailor emergency diesel generator package to meet the specific requirements of your installation. In this way, you benefit from precisely the solution you need while also enjoying outstanding reliability and performance.

MAN Diesel & Turbo engines are designed to work reliably and efficiently in the most challenging conditions:

- Severe seismic conditions
- Extreme temperature ranges between -50°C to +50°C or wider
- Fast starting under any conditions
- Rapid response to changing load demand

Extended Expertise

A Comprehensive Emergency Power Unit

MAN Diesel & Turbo offers you expert support in all aspects of:

- Licensing
- Engineering
- Procurement
- Services

We can also provide all the electromechanical auxiliaries you need to create a comprehensive emergency power unit, ready for use.

Extensive experience with the main nuclear standards (IEEE, ASME, KTA, RCC-E, etc.) means that MAN Diesel & Turbo can tailor engine related equipment to meet your specific application needs. Our turnkey services include installation and commissioning in your EDG building, anywhere in the world.

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Electrical & Control cubicles

- 2 HT & LT water radiator coolers (air cooling option)
- 3 Emergency Diesel Generator
- 4 Compressed air EDG starting system
 - HT & LT water plates heat exchangers (service water cooling option)

Center of Competence

Work with the Specialists



MAN Diesel & Turbo France: Center of excellence

As part of the global MAN Group, MAN Diesel & Turbo France continuously develops PA6 and PC2 engines for use in emergency power generators in nuclear power plants. From supply chain to manufacture and testing, the components we use in our products are carefully selected and inspected by MAN Diesel & Turbo France via a dedicated quality control system. As specialists in mission-critical applications within the nuclear industry, safety is at the heart of our culture and is the primary concern of all our employees.

PrimeServ: a first-class service provider

MAN Diesel & Turbo provides you with a 24/7 worldwide technical support:

- Hotline / on-site technical assistance
- Genuine spare parts
- Long-term service agreements (LTSA)
- On-site maintenance
- Training in PrimeServ Academy





Global Reach Global Service



Meeting your localization requirements

Access to safe and secure nuclear power is a strategic issue for many countries. As a result, nuclear power plant designers and builders often need to comply with country-specific localization and local content requirements.

With our worldwide supply chain and the support of our global network of licensed diesel engines manufacturers which have continuously developed since the 1970s, we can ensure that your project fully complies with your local requirements.



Technical Details PA6 B N



PA6 B N high-speed engines 3 MW to 7 MW Compact plug-and-play concept

Bore 280 mm, Stroke 330 mm		12 V	16 V	18 V	20 V
60 Hz at 900 rpm	KWm/kWe	4,200/4,074	5,600/5,432	6,300/6,111	7,000/6,790
50 Hz at 1000 rpm (1)	KWm/kWe	4,440/4,310	5,920/5,740	6,630/6,460	7,400/7,180
(1) 110% overload available					
Dimensions		12 V	16 V	18 V	20 V
A	mm	4936	5856	6316	6786
В	mm	8920	9840	10300	10760
С	mm		369	95	
D	mm				
Genset dry mass	t	70	80	90	98

Nominal generator efficiencies: 97%. All dimensions and masses are approximate and subject to change without prior notice

Technical Details

PC2.6 B N



PC2.6 B N medium-speed engines 7 MW to 12 MW Highest power range in its class

Bore 400 mm, Stroke 500 mm		12 V	14 V	16 V
MRC	KWm	8,640	10,500	12,000
(maximum continuous rating)	KWe	8,380	10,155	11,640
Engine speed 50/60Hz	rpm			
Dimensions		12 V	14 V	16 V
A	mm	7,850	8,590	9,550
В	mm	11,890	12,630	13,590
C	mm	4,900	4,900	5,000
D	mm		4,100	
Genset dry mass	t	210	245	280

Nominal generator efficiences:97%. All dimensions and masses are approximate and subject to change without prior notice.

Trusted across the globe

Referent Supplier for all Reactor Types



40

years of expertise in emergency gensets for nuclear applications

45%

of the world's nuclear power plants under construction rely on MAN Diesel & Turbo EDGs



MAN Diesel & Turbo EDGs installed worldwide

18 nuclear powered countries (out of 32) have their nuclear power plants equipped with MAN Diesel & Turbo emergency diesel generators

ABWR 1300

Lungmen – Taiwan

In addition to the six EDGs equipped with 16 PC2.5 N type engines, MAN Diesel & Turbo has provided N PC2.5 N type engine, MAN Diesel & Turbo has provided one 12 PC2.6 B N for the SDG.

ACPR 1000

Yangjiang 1 & 2 – China

In cooperation with our local licensee, MAN Diesel & Turbo is delivering two EDGs equipped with the 18 PA6 B N engine, each with a power rating of 6 MWe.

AP 1000

Haiyang 1, 2, 3 & 4 – China

Together with our local licensee, MAN Diesel & Turbo has delivered four EDGs equipped with the 18 PA6 B N engine of 6.1 MWe each for Units 1 and 2. We are currently delivering four EDGs equipped with the 20 PA6 B N engine of 6.7 MWe each for Units 3 and 4.

Sanmen 1, 2, 3 & 4 – China

In cooperation with our local licensee, MAN Diesel & Turbo is delivering 8 EDGs equipped with the 18 PA6 B N engine, each with a power rating of 6.2 MWe.

APR 1400

Shin Kori 3 & 4 – South Korea

In addition to the previous EDG we delivered for the Shin Kori site, MAN Diesel & Turbo has delivered five 12 PC2.6 B N engines for EDG and AAC systems for two first-of-a-kind APR 1400 power plants.

Barakah AAC - United Arab Emirates

MAN Diesel & Turbo is delivering one 14 PC2.6 B N engine for an AAC diesel generator.

CAP 1400

Shi Dao Wan 1 & 2 – China

The first Chinese scaled-up version of the Westinghouse AP1000 power plant type integrates four EDGs equipped with four 12 PC2.6 B N engines.

CPR 1000

Hong Yan He 1, 2, 3, 4, 5 & 6 – China

In cooperation with our local licensee, MAN Diesel & Turbo is delivering 13 EDGs equipped with the 18 PA6 B N engine, each with a power rating of 6.3 MWe.

Ning De 1, 2, 3, 4 – China

In cooperation with our local licensee, MAN Diesel & Turbo is delivering nine EDGs equipped with the 18 PA6 B N engine, each with a power rating of 6.3 MWe.

Fang Cheng Gang 1, 2 – China

In cooperation with our local licensee, MAN Diesel & Turbo has delivered five EDGs equipped with the 18 PA6 B N engine, each with a power rating of 6.3 MWe.

EPR

Olkiluoto 3 – Finland

First-of-a-kind EPR type nuclear power plant: MAN Diesel & Turbo has been commissioned by AREVA to deliver four EDGs equipped with the 18 PA6 B N engine (6.1 MWe each).

Flamanville 3 – France

MAN Diesel & Turbo has delivered four 12 PC2.6 B N engines for the EDG of a nuclear plant, each with a unitary output of 7.2 MWe.

Taishan 1 & 2 – China

For the world's largest EDG nuclear power plant, MAN Diesel & Turbo is delivering eight 14 PC2.6 B N engines, each with a unitary output of 9.1 MWe. Taihan is the first EPR type plant in China.

Hualong One

Fuqing 5 & 6 – China

The emergency power system at the first Hualong One nuclear power plant type relies on five EDGs powered by 12 PC2.6 B N engines.

VVER 1000

Tianwan 3, 4 - China

MAN Diesel & Turbo delivered four AACs equipped with the 16 PA6 B N engine, each with a power rating of 5 MWe.

VVER 1200

Baltic - Russia

MAN Diesel & Turbo is delivering 18 PA6 B N EDG's of 6.3 MWe each, completed with a full package of mechanical engineering for genset-related equipment.

All data provided in this document is non-binding. This data serves informational purposes only and is especially not guaranteed in any way. Depending on the subsequent specific individual projects. The relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions. Copyright ©MAN Diesel & Turbo.

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