

MODULARITY AND SCALABILITY

**The key to generator
performance in the dynamic
data centers of the future**

KOHLER[®]
IN POWER. SINCE 1920.



INTRODUCTION: THE IMPORTANCE OF MODULARITY IN DATA CENTER NEW-BUILD

Time is money in the data center sector. From edge and regional through to hyperscale, new-build infrastructure projects must run like clockwork, with systems and components delivered in strict sequential order to minimize the chance of any delays. Failure to comply with these timelines can cause significant problems, running the risk of program overrun and an associated cost increase.

These factors drive a trend towards modularization and off-site manufacturing and testing in the data center industry, whereby purpose-engineered systems and components are built and tested at supplier factories and delivered to site for 'plug and play' installation. This modular approach can act as a powerful means of streamlining new build processes, reducing carbon footprints, and lowering costs. It also provides an effective means of adding customized capability to data centers, encouraging scalability when the need arises.

“Taking a modular approach can act as a powerful means of streamlining new data center build processes, reducing carbon footprints, and lowering costs.”

MODULARITY IS BUILT UPON ENGINEERING INNOVATION

But modularity requires innovative design and engineering to make it work. For generators, specifically, it means own-brand engines, cooling systems and other ancillary equipment must be seamlessly integrated with robust canopies and containers with the latest soundproofing. This requires significant in-house expertise, with teams of engineers using computer-aided design and 3D modelling packages to make the most of the available space within every module. It also needs one-stop-shop manufacturing capabilities, with generators and their external housings produced in the same location, resulting in consistent levels of repeatable build quality, and technical performance.

In short, modularity is the sum of many parts. This e-Book will describe Kohler's unique approach to supplying modular generators to the data center sector, focusing on the benefits it can bring to new-build projects in terms of site layout, noise, emissions, fast-track manufacturing programme, and other factors. It also looks at how modularity has been successfully applied in real-world applications across multiple sites.

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SELECTING THE RIGHT TYPE OF GENERATOR FOR THE TASK AT HAND

When specifying generators for new build projects, total power output is perhaps the most critical consideration. But there is a lot more to it than that. Configuration arrangements also need to be carefully assessed, with many data centers preferring to phase the installation of generators to ensure the highest return on capital investment through granular deployment. Meanwhile, server rooms must have the correct power available plus power redundancy to ensure end-user SLAs are met through so-called swing or redundant generators that can come online to provide backup power if one fails, offering a flexible option to other paralleling equipment.

Other important factors also come into play. For instance, genset design and installation must consider the impact of noise on local populated areas and comply with all local environmental regulations. Emissions levels are crucial, too – with advanced engine design, as with the KOHLER® KD range, and exhaust treatment equipment deployed to further reduce emissions into the atmosphere. The footprint of a generator is also a critical part of the selection process. In urban areas, particularly, space is at a premium, with generators needing to pack a big power performance into a small size.

TAKING A ONE-STOP-SHOP APPROACH TO MODULARITY

This is where Kohler’s expertise and innovative approach is important. An experienced team of in-house specialists can help data center designers, builders, and operators identify precisely the right modular solution during the early stages of conceptual design. Then, our mechanical and electrical design engineers work together using the latest 3D modelling to provide more detailed proposals. This is where customization is fully exploited, with specific configurations and layouts optimized to fit selected canopies or containers with the correct levels of all generator systems optimized, depending on customer requirements.

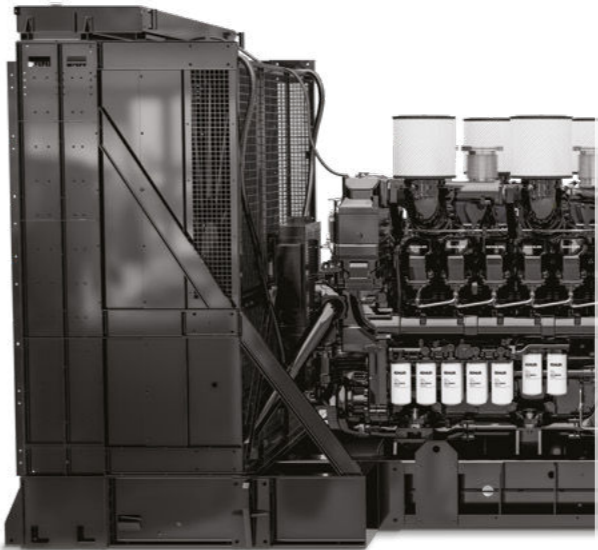
The data center customer deals with a single project lead, every step of the way, ensuring efficiency and accountability throughout the design, assembly, test, shipment, installation, and commissioning. Crucially, each of these processes is carried out within a single manufacturing plant – most commonly the Kohler headquarters in Brest, northwest France - eliminating the need for third-party fabricators and packagers. That is an essential factor when considering the trend towards modularity, as by keeping all this work in-house, consistency and repeatability of build quality can therefore be guaranteed.

The outcome is a range of power solutions fully optimized for data center applications, fitted out off-site and delivered as installation-ready packages, offering flexible configurations that can meet every eventuality.

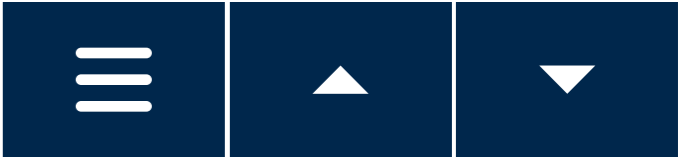


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HOW KOHLER COVERS ALL THE BASES OF MODULAR GENERATOR DESIGN

Achieving modularity for the data centers requires a baseline range of generators covering a broad spectrum of power outputs, which can then be customized and fitted out to suit. Edge, regional and hyperscale new-build facilities have very different requirements, and these needs must be considered carefully in the early stages of the selection process.

For edge data centers up to 5 MW, modularity is achieved by using smaller generators housed within 20-foot, skin-tight canopies, which can be custom modified to suit site conditions. These custom-made metal canopies – produced in high-grade, corrosion-resistant steel – are effectively wrapped around the engine, alternator, and other associated equipment, providing excellent acoustic and weather protection. These compact modules, measuring 6.5 meters in length, two meters in width, and 2.4 meters in height, can be used indoors or outdoors, and are often paralleled side-by-side in data centers to produce exactly the right amount of power. This configuration can be easily achieved with slight modifications to the switchgear.

ISO-STYLE CONTAINERS OFFER SIGNIFICANT INSTALLATION ADVANTAGES

Meanwhile, in the middle range are modular generators more suited to regional data centers up to 25 MW. These pieces of equipment come in 40-foot containers rather than canopies, which means they can be stacked alongside standard-sized shipping containers for ease of transportation around the world. The container provides a greater level of flexibility than skin-tight housings, allowing for more configuration options for the positioning of the fuel tank, transformer, switchgear and other equipment. These modules are highly customizable, providing a broader range of options for cable entries, air inlets and exhaust outlets, matched to the bespoke requirements of the data center site.

The modular nature of regional data center designs also provides many benefits on site. By sharing a standard ISO shipping container footprint, they can be quickly and easily racked in gantries with other containerized equipment such as air conditioning and switchgear, making optimum use of the space. This is a critical consideration in urban data centers, which are often hemmed in from all sides and built with the smallest possible footprint. The container also allows maintenance access to the generator from the back and the side of the module through large access doors.

“The bigger modules also maximize airflow for cooling, which makes them ideally suited for rackable layouts where ventilation is a factor.”

Finally, generator modules also represent an excellent solution for hyperscale new-builds up to 500 MW. This equipment is typically housed in walk-in Containers (WIC), with thicker walls offering the highest levels of sound attenuation. The bigger modules also maximize airflow for cooling, which makes them ideal for rackable layouts where ventilation is a factor. These larger containers also provide complete walk-in access for maintenance teams. This provides additional comfort for employees working at data centers installed in locations that encounter extreme variations in temperatures. These walk-in containers are relatively new to the market and are detailed in greater detail in the next section.

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INTRODUCING WALK-IN CONTAINERISED GENERATOR DESIGN

As hyperscale data centers continue to grow in size, their power requirements become more complex and demanding. To meet this market need, Kohler has introduced a new range of Power Optimized Design Solutions (PODS) for both low and medium high-voltage gensets, offering the highest standards in performance, reliability, robustness and safety.

Crucially, the size of the walk-in PODS allows for enough internal cooling to accommodate the KOHLER® KD range of engines, providing the data center market with the ability to use the highest power generators without compromising on installation and maintenance. The innovative, modular design enables set mounted radiators on the generator base-frame for all models. Units fix onto an external slab with all the options already connected and tested, making for a quick and adaptable installation.

The walk-in PODS are proportioned to provide up to 4 m width and height for the base module. The enclosures offer optimal access to different elements of the electrical genset allowing technical teams to perform all operations and maintenance tasks with ease. Single swing doors with locks and anti-panic bars facilitate access to the central console, while a push-button located near the access doors controls the interior lighting system.

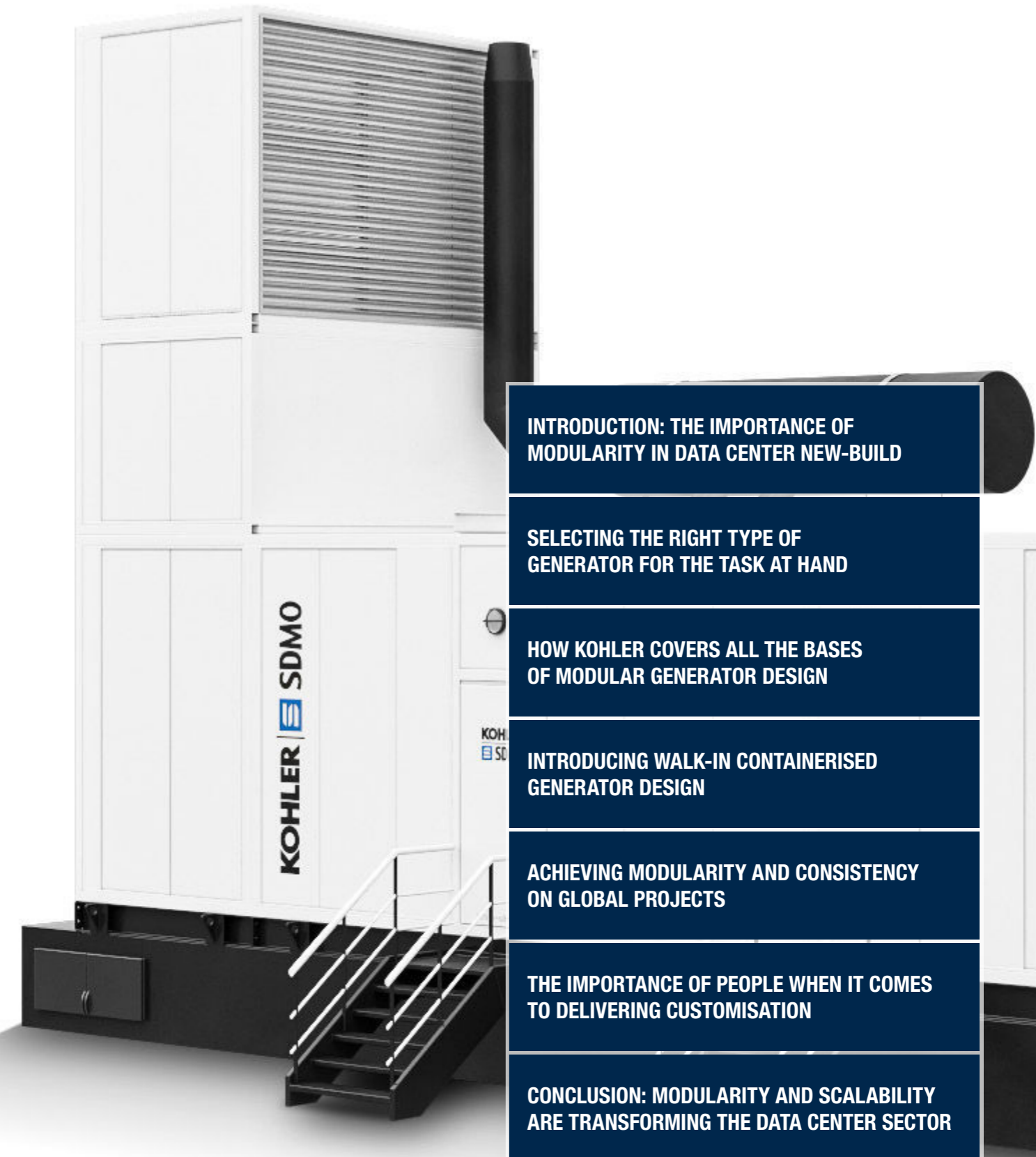
SOUNDPROOFING PROTECTS THE LOCAL ENVIRONMENT

Adherence to strict noise standards was a critical design consideration, with 85 dB(A) sound reduction at 1 m, with 75 and 65 dB(A) options also available. Soundproofing panels are made of mineral wool with an M1-class fire rating covered by glass fibre.

Rain barrier grilles fitted with an anti-volatile barrier protect air inlets and outlets from harsh weather conditions. Furthermore, a specialized primer coat and polyurethane finish enhances the durability of the enclosures.

Kohler can now supply the walk-in PODS from its Brest facility in France, which recently committed to over \$6 M of investment to enhance manufacturing capacity and optimize the logistics and transport for these new enclosures. This includes significant investment on the shop floor to enable the rapid expansion of capacity and upgraded dock infrastructure to take account of the PODS' larger size.

“Walk-in PODS allows for enough internal cooling to accommodate KOHLER® KD4500 generators, providing the data center market with the ability to use the highest-power generators without compromising on installation and maintenance.”



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ACHIEVING MODULARITY AND CONSISTENCY ON GLOBAL PROJECTS

Many data center operators want to replicate new-build designs at multiple sites worldwide. This approach encourages the commonality of systems and equipment, reducing build-times and enhancing operational efficiency through standardized maintenance techniques.

One recent customer is adopting this set-up across Europe, with new data centers built to repeatable standards in Germany, Poland and the UK. Each facility will have the same 'look and feel' with operational teams working with the same types of equipment, every time. Kohler is a preferred supplier for this program and has started to manufacture generators in modularized containers in large volumes to meet project demand.

One primary consideration here has been the consistency of build quality. The data center operator wanted the peace of mind offered by strict process repeatability found in the Brest facility, combined with the highest standards of engineering excellence. Kohler's designers and engineers have worked with the customer's team from the outset – managing the planning and execution, to testing and commissioning, and after-sales support worldwide using Kohler's extensive dealer network.

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SIMPLIFYING THE SUPPLY CHAIN AND REDUCING LEAD-TIMES

Modularity was deployed from the start. Notably, the design and construction of the containers were all managed in-house, without the need for third-party fabrication. This approach has simplified the supply chain and reduced lead-time times. It has also resulted in the same high-quality metalworking and finishing, ensuring that each generator is housed and protected in the same way. Consistency of layout inside the containers has also been delivered, making life much easier for maintenance and operational teams.

The ability to provide a one-stop-shop approach to modular generators is becoming ever-more crucial in the data center sector. To illustrate this, Kohler has invested in the plant, processes and people to ensure that it can be achieved on all projects, no matter the size or location.

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THE IMPORTANCE OF PEOPLE WHEN IT COMES TO DELIVERING CUSTOMISATION

To drive the maximum benefit from modularity in the data center sector, it is essential to take a flexible and adaptable approach throughout the generator design and manufacture process. The introduction of larger ‘plug and play’ containers provide a significant opportunity to create highly customized internal layouts, allowing the end-user to glean the maximum operational benefit from having things ‘built their way’.

But such levels of customization and customer focus are only possible with the full support of in-house mechanical and electrical engineers who produce and amend the drawings required to account for bespoke configurations. Kohler invests heavily in these resources and can work in close collaboration with customers to achieve the best results.

ESTABLISHING CLEAR LINES OF COMMUNICATION

A people-driven, outcome-focused approach lies at the heart of Kohler’s ethos. Clear lines of communication are always established, with a dedicated lead driving the project forward. Senior Kohler management – right up to directorship level in the boardroom – is readily available to clients and are often involved in many aspects of data center programs.

It is only by taking this top-down, people-led approach to the data center sector that truly meaningful relationships can be established over the long term. This is the only way to operate in an increasingly globalized industry where consistent standards must be achieved.



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It is clear, then, that modularity is providing some significant advantages in the data center sector. Generators built and packaged offsite with standard and reliable components in a variety of configurations can shorten lead-time availability, streamline new build processes, reduce carbon footprints, and ultimately lower project costs.

Whether you need to secure the power supply of your data center or simply replace your current backup generators, it is possible to design and build the perfect power options for your business needs. Our qualified technical teams will guide you towards the right technical solution for your project, based on your individual requirements and regulations.

So why Kohler?

- Kohler is an adaptable and flexible company that can bring new options and added value to the supply of modular generators to the data center market.
- Kohler takes a one-stop-shop approach to generator design and manufacture, eliminating the need for third-party fabricators, thus improving quality, consistency, and reliability.
- Kohler can provide a generator solution for all requirements - no matter the size of the project and the constraints in terms of noise, emissions, space or access.

IN SHORT, KOHLER HAS THE POWER TO MEET ALL YOUR MODULAR DATA CENTER REQUIREMENTS. VISIT OUR SITE TO FIND OUT MORE.



[CLICK HERE](#) to contact us, or visit KOHLER-SDMO.COM.



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