Power Assemblies
Products & Capabilities

Dynex Semiconductor Ltd
2020
Dynex Semiconductor Ltd has a rich history in the design, development and production of High Power Semiconductor modules and Power Assemblies. Throughout the years, Dynex products have been applied in projects that vary from transportation, power grid, renewables, industrial, equipment and specialist applications.

The Power Semiconductor and Power Assemblies operation is located in Lincoln, England, manufacturing a range of high power IGBT modules, Bipolar capsule devices and power assemblies.

**WHY CHOOSE DYNEK FOR YOUR PROJECT?**

- Over 60 years’ experience in the design and build of power assemblies
- Design and manufacture products with high quality materials, following internal and external processes and standards
- Engineering experts who encompass a wealth of power electronic experience and industry knowledge
- Bespoke assemblies designed and manufactured in-house to meet specific customer requirements
- Customer support from all business areas
- In-house design capability
- ISO14001, ISO9001 and ISO50001 certified
INTRODUCTION TO
POWER ASSEMBLIES

Dynex provide power assemblies products for those customers that require more than the basic semiconductor components.

OUR PRODUCTS

Specialising in the design and manufacture of assemblies such as rectifiers and converters, Dynex has an established supply chain for all components of power assemblies, resistors and capacitors for snubber networks and control circuits.

Our highly skilled power electronics, mechanical and electrical engineering experts have direct access to the company’s wider application, test and product design groups.

Key Features

The design and manufacture of power semiconductors and assemblies are supported by:

- In-house CNC machine shop
- In-house test facilities
- In-house power electronics laboratory

Assemblies by Application

TRANSPORT
Standard Assemblies, Modular Power Stack, Pulsed Power Assemblies & Delivery Equipment, Power Factor Correction, Traction Upgrade and Overhaul, Contract Assembly

RENEWABLES
Standard Assemblies, Modular Power Stack, Pulsed Power Assemblies & Delivery Equipment, Power Factor Correction, Contract Assembly

CUSTOM EQUIPMENT
Contract Assembly

INDUSTRIAL
Standard Assemblies, Modular Power Stack, Pulsed Power Assemblies & Delivery Equipment, Power Factor Correction, Traction Upgrade and Overhaul, Contract Assembly

POWER GRID
Standard Assemblies, Modular Power Stack, Pulsed Power Assemblies & Delivery Equipment, Power Factor Correction, Contract Assembly

SPECIALIST
Contract Assembly

STANDARD POWER ASSEMBLIES
Rectifiers, Stack Assemblies, Inverters/Converters

Dynex offer a varied range of industry standard power assemblies configured to suit your application and specific performance requirements.

In order to maximise the semiconductor performance in an assembly, the type of heatsink, transient conditions, overloads, ambient temperature, surface finish (e.g. black anodised) and the method of cooling (air, liquid or phase change) needs to be considered.

Our designers encompass a wealth of experience using 3D CAD and simulation software, with an increasing range of bipolar and IGBT power semiconductor devices and components available to ensure that standard power assemblies are optimised for customer applications.

RECTIFIERS

- Single phase controlled and uncontrolled rectifier assemblies
- 3-phase and dual 3-phase rectifier assemblies
- 3-phase (6 pulse) and dual 3-phase (12 pulse) controlled rectifier assemblies

STACK ASSEMBLIES

- Stick stacks for high voltage/high current applications
- MV soft starts
- Thyristor/GTO assemblies with anti-parallel diode combinations
- Air cooled and water cooled stack assemblies

INVERTERS/CONVERTERS

- 3-phase thyristor inverter power units
- IGBT chopper H-Bridge inverter modules
- IGBT full 3-phase inverters for motor control
- Frequency converters
STANDARD POWER ASSEMBLIES
Bipolar Assemblies, Pulse Power, IGCT, Soft Start, Locomotive Rectifier

Dynex are driven by the manufacturing of highly efficient power assemblies that deliver on performance and reliability for customer applications.

Dynex offer a variation of standard power assemblies in order to meet customer requirements.

**Air Cooled Bipolar Assemblies**
VDRM: ≤154V Imms: ≤1500A  
**Application:**  
✓ Locomotive  
✓ Industry  
✓ Converter  
**Features:** Thyristor/ diode available, extruded aluminium heat pipe heat sinks

**Water Cooled Bipolar Assemblies**
VDRM: ≤20kV Imms: ≤3000A  
**Application:**  
✓ Industrial  
✓ Converter  
✓ Heat pipe power supply  
**Features:** Thyristor/ diodes, IGCT available; gate drive and protection

**Pulse Power Bipolar Assemblies**
VDRM: ≤40kV Imms: ≤4000A@500μs  
**Application:**  
✓ Pulse power supply  
✓ High power microwave  
**Features:** Pulsed power device based for single switch application, gate drive and protection

**Locomotive Rectifier**
Vibration resistance  
**Application:**  
✓ Traction converter for locomotive  
**Features:** Alloyed diodes based air-cooling structure, vibration resistance and high reliability

**Soft Start Module**
Thyristor/ Diode based  
**Application:**  
✓ LV Soft-starter  
**Features:** Thyristor/ diode based, air-cooling structure, compact and light weight, stable and reliable performance

**IGCT Assemblies**
Up to 14MVA  
High surge current: single unit>35kA@10ms  
**Application:**  
✓ Rolling mill drive  
✓ Off-shore wind power  
**Features:** IGCT/ FRD based water cooling compact structure, up to 14MVA

**Modular Power Stack**
Suitable for Soft Starter and bypass switches

**Key Features**
✓ Standardised power semiconductor solution for soft-start application  
✓ Serialised parts with more than 10 power ratings to meet various application requirements  
✓ Standardised design dedicated to reducing the complexity and work-load of soft-starter design  
✓ Compass structure, power stack and bypass, enables the switch to be integrated into typical soft-starter cabinet  
✓ Easy to mount and maintain without auxiliary thermal grease  
✓ Centre distributed gate control  
✓ Sealed housing structure with inert gas protection enable improved PC capability and reliability  
✓ Thermal design to inforce thermal resistance performance  
✓ Automatic production platform, suitable for mass production.

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Dynex have developed a number of complete power supply converter equipments which enable customers to control the delivery of energy using Thyristor, GTO and IGBT technology to provide the best solutions.

The power supplies utilise the latest energy storage techniques with batteries, ultracapacitors or conventional capacitors. The output of our supplies deliver controlled DC or AC pulses using H bridge topology with IGBT modules.

The range of power supplies offer voltages up to 30kV and currents up to 40,000A DC suitable for applications in high power protection circuit testing, lightning simulation, magnet control, UPS and sag protection.

For many pulse power applications, semiconductor switches can offer advantages over alternative switch technologies. These advantages include: an increased number of operations and general reliability, improved waveform shaping and pulse control, increased repetition rate and higher current pulses.

The choice of the semiconductor device is critical for reliable operation.

Dynex offer a wide range of thyristor types, including those that have been specifically developed for high di/dt pulsed power applications. In addition to this, Dynex have many years experience in providing assemblies for custom pulsed power requirements.

Our pulsed power equipments are typically used for:
- Connection of energy storage to low inductance loads
- Crowbars for by-passing / protecting a load
- General thyatron and ignitron replacement.

Thyristor Controlled Reactors (TCRs) are primarily used in combination with Fixed or Mechanically Switched Capacitors (FC or MSC) to provide Static VAR Compensation (SVC). This enables improved quality of the mains voltage supply by compensating for large loads with poor power factors. Typical example applications include; flicker reductions and power factor compensation of electric arc furnaces in steel mills.

Dynex provide a complete range of water-cooled SVC valve assemblies, which utilise the latest thyristor technology for optimum efficiency and can be used in both single phase and three phase applications. These are primarily designed for operation at 35kV, with the range extending up to 300MVar. We have a growing number of reference projects currently in operation for the entire range.

The Dynex range of TCRs have been designed with optimum performance. All thyristor modules used in the TCR valves are matched to improve static and dynamic sharing whilst N+1 redundancy is included as standard to ensure consistent availability of supply, even in the harshest of operating conditions.

These switches are directly connected to the high voltage grid with Dynex designs completing tracking and flashing requirements. All valve assemblies are tested and verified at the Dynex facility.
Dynex & High Power Expertise

Disassembly and repairing of a GTO based assembly in an oil cooled converter system, these assemblies are also load tested at Lincoln.

Dynex offer the following capabilities to support this:

- Re-traction of propulsion systems (e.g. GTO to IGBT)
- Converter mid-life upgrade/overhaul
- Reliability improvements
- Replacement Semiconductor devices

Mid-life upgrades offer a number of benefits including:

- Improved reliability and maintainability resulting in reduced life cycle cost
- Availability through lower downtime and higher reliability
- Obsolescence management - full collaborative agreement with Dynex insures long-term UK support for spares and maintenance.

Dynex designed converter for Class 73 re-traction project

Concept converter design for GTO to IGBT conversion

Any questions? Email powersolutions@dynexsemi.com

For further information visit www.dynexsemi.com
The power technologies design team have vast experience of working alongside customers to create bespoke power assemblies to meet their exact requirements.

Dynex are able to provide a "fast prototype" service for most power conversion applications for the purpose of approving production by Dynex.

During the enquiry phase, the applications support team interact with customers to understand their specification and requirements.

Following a comprehensive simulation analysis to ensure feasibility of the project, a proposal is prepared to include estimated costings and semiconductor device selection.

In collaboration with the customer, the team produce a full engineering design with 3D modelling and if required, thermal, mechanical and electrical simulations to validate the design prior to manufacturing by Dynex.

During each stage of the design, customer feedback is encouraged to ensure the design and testing meets their requirements.

The design team use the following software to generate custom and standard power assemblies:
Dynex provide on-site power testing for the power assemblies it manufactures. Assembled products can be verified for standard end of line testing for example, isolation tests, partial discharge measurements and switching. The team provide specialised tests on custom assemblies, such as high energy crowbars and controlled 3 phase rectifiers, testing up to 100kV and 4kA.

As part of the test facility we are able to perform pressure testing up to 100kV and 4kA.

The experienced multi disciplinary team based in the power electronics laboratory provide lab validation and qualification capabilities for the semiconductor and power assembly business.

During the initial design stages, the power assemblies team validate the electrical circuits for expected behaviour. Component suitability investigation is undertaken to compare the life span of ultra capacitors from different manufacturers for use in Dynex power assemblies.

Our in-house laboratory is a high value asset for the engineering team and our customers, providing a unique environment to create specialised test conditions, in relation to power assemblies manufactured by Dynex.

The products and information in this publication are intended for use by appropriately trained technical personnel. Due to the diversity of product applications, the information contained herein is provided as a general guide only and does not constitute any guarantee of suitability for use in a specific application. The user must evaluate the suitability of the product and the completeness of the product data for the application. The user is responsible for product selection and ensuring all safety and any warning requirements are met. Although we have endeavoured to carefully compile the information in this publication it may contain inaccuracies or typographical errors. The information is provided without any warranty or guarantee of any kind.

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- Only purchase from Dynex directly or from one of Dynex’s authorised distributors. Our Customer Services team can advise you whether a distributor is authorised via the details below.

Dynex products should not be purchased if the outer appearance differs from Dynex products you normally receive unless Dynex or a Dynex authorised distributor has provided you with a product change notification or can be seen on datasheets from the Dynex Website.

We strongly advise against purchasing extraordinarily low priced Dynex products from unauthorised distributors. Dynex does not support the sale of Dynex products via online auction houses. We will be pleased to confirm the authenticity of the products. To do so please contact Dynex’s Customer Services (see reverse for contact information) with the following information:

- Part number, quantity purchased, unit cost
- Name and contact name of the supplier with address, phone, and web/ e-mail addresses
- Digital photos of inner & outer label, inner & outer packaging, and front & back of product
- Copy of purchase order and invoice

This is intended to provide you with additional information on counterfeiting and steps that can be taken to better recognize counterfeit products.