

ABB BU Motors and Generators training

K293e

Product overview

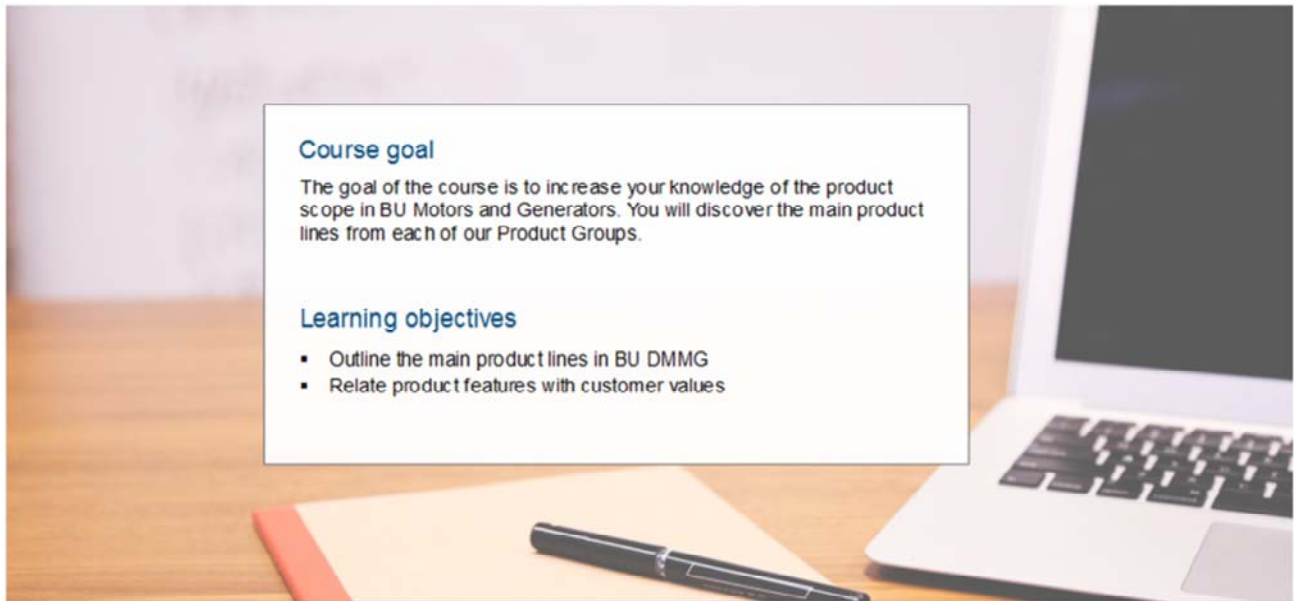
© ABB
October 27, 2016

Slide 1

Power and productivity
for a better world™ **ABB**

Welcome to BU Motors and Generators product overview e-learning.

Course goal and learning objectives



© ABB
October 27, 2016

Slide 2

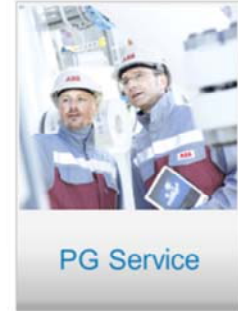


This course is part of the AVP introduction training program, and it is now time to introduce our products. The goal of the course is to increase your knowledge of the product scope in BU Motors and Generators. You will discover the main product lines from each of our Product Groups.

Upon completion of this course, you will be able to Outline the main product lines in BU motors and generators, and Relate product features with customer values.

BU DMMG Product offering

BU Motors and Generators product offering



Here is the main menu of the course. Start your studies by choosing one of the product groups to learn more about our product offering. Once you have studied all the material, click next to continue.

PG IEC LV Motors offering

PG IEC Low voltage motors

Product portfolio for any industry, any application



ABB's IEC low voltage motors are suitable for all industries, and all applications.

ABB has always been a forerunner when it comes to efficiency and today's motors are no different with standard series reaching as high as IE4, and concept motors of IE6.

IEC low voltage motors come with outputs up to 1,000 kW in frame sizes from 56 to 450.

<http://new.abb.com/motors-generators>

PG IEC Low voltage motors offer a wide range of motors for any industry and practically any application. And as the name of the product group applies all motors made are according to the IEC standards where applicable.

ABB has always been a forerunner when it comes to efficiency and today's motors are no different with standard series reaching as high as IE4 and beyond while the latest concept motors reach an efficiency of IE6.

IEC low voltage motors come with outputs up to 1,000 kW in frame sizes from 56 to 450.

PG IEV LV Motors offering General performance motors



- A simple and robust design for your general needs.
 - Aluminum 0,06 – 55kW
 - Cast Iron 0,18 – 355kW
- OEM motor for pumps, fans etc.
- Global off-the-shelf availability
- Designed to meet general requirements, and provide reliability and performance

© ABB
October 27, 2016

Slide 7

ABB

The general performance motors have a robust and simple design to meet the general requirements for a electrical motor. The motors are offered in both cast iron and aluminum housing based on the application requirements. The motors are available in IE1, IE2 and IE3 execution. The biggest users of these motors are OEMs dealing with pumps, fans and compressors they are also used in other applications and segments like for instance utilities.

The general performance motors are designed for the less demanding applications but still offers a wide variety of modifications.

Global of the shelf availability is one the other values this product line offers.

PG IEV LV Motors offering Process performance motors



- Designed to last in the most demanding environments and applications.
 - Aluminum 0,055 – 90kW
 - Cast Iron 0,09 – 1000kW
- Process industries like pulp and paper, metals, mining etc.
- Versatile executions available to fit any purpose.
- Full monitoring availability

© ABB
October 27, 2016

Slide 8

ABB

The process performance motor is the real work horse of PG IEC LV Motors. It is designed to last in the most demanding environments and applications you could imagine.

This product line is also offered in both aluminum and cast iron housing, with slightly different target groups. Both come in a variety of executions, and are tailored for the segment or application for which it's intended.

One of the benefits in the flexibility of this product line is that it enables continuous monitoring of windings, bearings, speed etc. to spot any irregularities in the process.

This product line is offered as IE2, IE3 and IE4 and meets all MEPS requirement as of today, also has it been registered for most local MEPS schemes.

The standard execution of this product line is an asynchronous induction motor but a part of the range can also be offered as a synchronous reluctance motor suitable for direct on line duty with an efficiency class of IE4 or IE5.

PG IEV LV Motors offering Motors for explosive atmospheres



- Suitable for any application in explosive atmospheres without giving an inch to safety and reliability
 - Flame proof: 0,55 – 950 kW
 - Increased safety: 0,25 – 390 kW
 - Non-sparking: 0,25 – 1000kW
 - Dust ignition protection: 0,25 – 1000kW
- OGP industry, F&B industry, underground mining etc.
- Meeting requirements in both global and local standards and directives
- Full support through the whole lifecycle

When it comes to explosive atmospheres safety is number one. PG IEC LV Motors offer flame proof, increase safety, non sparking and dust ignition proof motors according to the IEC standards.

It is based on the same design philosophy as the process performance motor so it's designed to last in the most demanding environments and applications you could imagine, with outstanding finish on painting etc.

Most of these motors are to be used in the Oil, Gas or petrochemical industry but also a lot of other industries are using these motors where flammable gases or dusts are present, like in food and beverage, the wood processing industry, mining and so on.

Globally there are a lot of local certification requirements in addition to IEC, like ATEX, INMETRO, Kosha etc. ABB can offer our products to most of these local certificate requirements.

In addition to the sales organization ABB also has a global network of certified repair shops that is able to service our products after the warranty period has expired.

PG IEV LV Motors offering Frequency controlled motors



- SynRM – Synchronous reluctance motors
 - IE4 5,5 – 315 kW, High output 1,1 – 350kW
 - First choice for all industrial variable speed applications
- HDP – High dynamic performance motors
 - Compact motor matching DC motor dimensions
 - Commonly used in extruders, wire drawing, tests benches etc.
- Low speed permanent magnet motors – low speed direct drive
 - Applications with 100-600rpm nominal speed and 1 – 44 kNm
 - Commonly used in paper machines, slurry pumps etc.

ABB

© ABB
October 27, 2016

Slide 10

Standard induction motors can be used also in variable speed applications. However motors optimized for VSD applications offer even better performance characteristics.

Synchronous reluctance motors are suitable for all industrial applications. The advantage is that this motor doesn't have rotor losses at all, which is why it can reach higher efficiency or more compact construction compared to induction motor. Other benefits are cooler running – higher reliability, better partial load efficiency and quiet operation. A drive with dedicated control software is needed to run this motor type.

HDP motor is an induction motor, which is substantially more compact compared to traditional IP55 induction motor with corresponding output. This gives the motor a low inertia, which in turn enables good dynamic characteristics. The most compact version of this motor type is IP23, so typically intended for indoor use. Typical applications are extruders, wire drawing machines and test benches.

Low speed/High torque permanent magnet motors are suitable for applications with nominal speeds 100-600rpm. Torque range is from 1000 Nm to 44 000Nm. The idea with these motors is to simplify the drive system by eliminating the need of a gear box. This motor type has been very successful in paper machine drives but can be used for any low speed direct drive applications. A drive with dedicated control software is needed to run these motors.

PG IEV LV Motors offering Special application motors



- Designed with the application in focus.
- 0,18 – 1 000kW
- Smoke extraction, roller table, break motors, water cooled, air cooler motors etc.
- Built for purpose
- Each product line in this family brings unique values to it's application.

© ABB
October 27, 2016 Slide 11

ABB

The special application motors are all designed with the application in focus. There are smoke extraction motors built to withstand temperatures up to 400 degrees, roller table motors built to accelerate, run and reverse, open deck motors to withstand the waves of the Atlantic, break motors, water cooled motors, air cooler motors and many more.

As these are all built for purpose they all bring unique values to the application and do not compromise the reliability of the application.

PG Large Motors and Generators

PG Large Motors and Generators

Comprehensive range of reliable and high efficiency motors and generators for all applications



- Various industries served: mining, oil and gas and petrochemicals, power, water, and food and beverage industry.
- Power range offered by from PG Large Motors and generators is varying from 14 kW to 75 MW
- Key Values:
 - Advanced, reliable solutions for demanding operational conditions.
 - High efficiency, energy saving
- <http://new.abb.com/motors-generators>

© ABB
October 27, 2016

SHRM 1.0

ABB

ABB has what it takes to help every industry and application reach new levels of efficiency and energy savings even under the most demanding conditions. Combining the best available materials with superior technology, the electric motors and generators are designed to operate reliably no matter how challenging the process or application is. With ABB's wide product portfolio in Large Motors and Generators ABB is supporting various industries such as mining, oil and gas and petrochemicals, power, water, and food and beverage industry to reach higher efficiency and energy saving requirements. ABB's goal is to become the preferred partner providing the best value proposition.

ABB provides different types of motors and generators for different applications and industries: Rib cooled motors, Modular induction motors, Flameproof motors, Slip-ring motors, Synchronous motors, Permanent magnet motors and low voltage induction motors using form wound coils. From generator side ABB can provide induction and synchronous wind power generators, diesel and gas engines, and steam and gas turbines belong to ABB's product portfolio.

With manufacturing locations in all parts of the world: Asia, Europe as well as Americas, ABB is a truly global supplier of motors and generators.

PG Large Motors and Generators

HV induction motors



- Used in pumps, fans and compressors. in mining, cement, power, water, oil, gas and petrochemical industries, mills
- Power range in HV induction motors is from 14 kW to 23 MW
 - Rib cooled motors NXR and HXR
 - Process performance rib cooled motor M3
 - Flame proof motors Exd – AMD, AMD-T
 - Modular induction motor AMI, AMA, NMI
 - Modular Slip-ring motors AMK / AML
- Key Values:
 - Customization according to customer needs
 - reliability of ABB's insulation and bearing system

ABB's induction motors wide product offering includes cast iron motors, modular induction motors, flame proof motors and slip-ring motors.

Power range in HV induction motors is from 14 kW to 23 MW.

High voltage rib cooled motors NXR and HXR are engineered individually according to requirements, case-by-case and to withstand in demanding environment. NXR motors are lightweight compact designs with rigid cast iron frame construction and high efficiency. ABB NXR motor is ideal motor for pumps, fans and compressors used in mining, cement, power, water, oil, gas and petrochemical industries.

ABB flame proof Exd motors fulfill the requirements of demanding process applications: onshore or offshore, oil and gas pipelines, refineries and petrochemical plants, floating production storage and offloading oil platforms.

AMI High voltage modular induction motors are engineered according to customer requirements and are used in most industries and applications including compressors, pumps, fans, blowers, conveyors, mills, crushers, refiners and ship thrusters.

The NMI motor, rated from 315 to 8,000 kW, in frame sizes 400 to 630, packs more power per kilogram which means the power required is achieved in a smaller frame size. The NMI modular induction motor's pre-engineered platform ensures ABB can meet customer requirements for short delivery times and on-time delivery.

PG Large Motors and Generators

Synchronous motors



- ABB synchronous motor modular product platforms cover products for compressors and pumps in oil and gas, chemical and mining industry.
- Power range: 1 – 75 MW
Speed range: 20 – 2,000 rpm
- shaft height range 710 – 2,500 mm
- From medium to very high voltages: 1 – 60 kV
- Key values:
 - Design allows flexibility
 - reliable design based on long term experience
 - high powers and torque

Synchronous motors from ABB are based on a modular design and offer easy configurability for different applications and customer requirements. They are built to the strictest manufacturing standards for the highest efficiency, performance and reliability. As a global player, ABB can design its products to meet local and regional regulations in all parts of the world. Synchronous motors are widely used to drive compressors and pumps in the oil and gas industry, as well as extruders in the chemical industry and in mining industry solutions. Synchronous motors are typically preferred when higher power and torque are required. Synchronous motors also offer adjustable power factor.

PG Large Motors and Generators LV and HV wind power generators



ABB offers all solutions for main concepts from fixed speed and doubly-fed to permanent magnet generators

- Power range from 1 to 8 MW with ratings up to 20 MW and 15 kV available
- Key Values:
 - Leader in off-shore
 - Tailormade designs for customers
 - Knowledge on standards and grid requirements and certifications

ABB has supplied more than 30 000 generators over the last 35 years to leading wind turbine customers all over the world.

ABB has solutions for all the main drivetrain concepts from direct drive to medium and high speed.

The main concepts are doubly-fed (DF) and full converter (FC), using gearless low speed or geared medium or high speed generator solutions. There is no single optimum solution and the ideal choice will always be a perfect compromise chosen according to market factors and wind conditions.

In offshore wind power, proven ABB generators offer the highest efficiency and reliability. In fact, the majority of the offshore turbines now operating rely on ABB generators. Reliability means availability, and it is realized by using proven components. ABB has supplied generators to majority of the leading wind turbine manufacturers around the world.

PG Large Motors and Generators

LV synchronous generators 14 kVA – 5 MVA



- ABB's LV generators used to supply continuous or standby power for facilities like schools, hospitals, offices and factories, and for demanding applications like mines, telecommunications, and transportation.
- ABB low voltage (LV) standard marine generators are specifically designed for marine diesel gen-sets in main, auxiliary or emergency power generation.
- Output range: 14 kVA – 5 MVA
- Key Values:
 - Robust ABB design
 - Reliable in hard conditions such as vibrating environment

© ABB
October 27, 2016

Slide 17

ABB

ABB's LV generators are typically used to supply continuous or standby power for facilities like schools, hospitals, offices and factories, and for demanding applications like mines, telecommunications, cogeneration, and transportation. ABB can also provide generators to Generators for special requirement areas, like for plants that use renewable sources of energy such as solar thermal power, geothermal energy, energy recovery expanders, generators for explosive atmospheres, ocean energy and small hydro, and generators for railway application.

ABB standard 4-pole generators have proven themselves in demanding marine applications. Other advantages of ABB's LV marine generators are robust design for harsh marine environment. It is compatible to all marine classifications. Also wide range of application specific accessories, both standard and optional are available. The AMG LV Marine generators are designed to operate reliably on vibrating environment caused by the piston engine.

PG Large Motors and Generators

HV and LV synchronous generators for diesel and gas engines 1-60 MVA



- Diesel and gas engine-driven AMG ABB generators are operating in power plants, district heating plants, oil and gas platforms, refineries, mines, textile mills, paper mills, ships and in many other industries.
- High voltage generators
 - Output: 1 – 60 MVA, Voltage: 1 – 15 kV
 - Speeds: 200 – 1800 rpm
- Low voltage generators
 - Output: 14 – 3750 kVA, Voltage: 400 – 480 V
 - Speeds: 600 – 1800 rpm
- Key Values:
 - ABB is an independent supplier
 - Compliance with standards

Our range of synchronous generators is one of the widest in the market, covering all land-based and marine applications.

ABB supplies low voltage (LV) marine generators for use in main, auxiliary or emergency power generation. These products can be incorporated into diesel generating sets, or operated as shaft generators. They are found in many different vessel types, including cruisers, ferries, ice-breakers, multi-purpose tankers, LNG tankers, ice-going vessels, supply vessels and drilling rigs.

ABB high voltage (HV) generators are in use all over the world, producing power in electric utilities and district heating plants, industrial plants, the marine and offshore sectors, and similar applications.

ABB is an independent manufacturer. Many competitors are bound to some engine maker or genset manufacturer. ABB is interested in any business where generators are required. ABB has a long track-record of building reliable high performance generators to the most demanding standards for even the biggest gensets with common base frames.

PG Large Motors and Generators

HV and LV synchronous generators for steam and gas turbines 2 -85 MVA



- AMG and AMS generators are delivered to power utilities, paper mills, sugar plants, oil and gas installations, and many other sectors
- High voltage generators
 - Output: 2 – 85 MVA
 - Voltage: 1 – 15 kV
 - Speeds: 1000 – 1800 rpm
- Low voltage generators
 - Output: 14 – 5000 kVA
 - Voltage: 400 – 690 V
 - Speeds: 600 – 1800 rpm
- Key Values:
 - Leading wide range supplier
 - Optimized cooling

ABB is a leading supplier of synchronous turbine-driven generators to power utilities, paper mills, sugar plants, oil and gas installations, and many other sectors. Our broad selection of turbine-driven 4-pole generators enables us to supply the right products for many different customer needs.

The world's gas and steam turbine markets are dominated by few players.

ABB generators have optimal cooling designs. One of the factors that determine the lifetime of a generator is temperature. ABB's pre-engineered generators use a symmetrical cooling principle that allows uniform cooling within the generator. ABB designs and manufactures generators that are engineered to meet the highest demands for efficiency, performance and reliability.

PG Large Motors and Generators

Synchronous condensers 1- 60 MVA



- A synchronous condenser is a machine that provides reactive power support to the network
- It is commonly used as a complement to other means of providing network stability
- Output: 1 – 60 MVA
- Voltage: 1 - 15 kV
- Key Values:
 - Tailored modules to match system performance requirements
 - Long service intervals
 - Low noise levels and vibrations

A synchronous condenser is a device that supports network voltage by providing reactive power compensation and additional short circuit power capacity. Fundamentally, a synchronous condenser is a synchronous generator operating without a prime mover. Generation/consumption of reactive power is achieved by regulating the excitation current.

Synchronous condensers from ABB ensure efficient and reliable operation of power grids through reactive power compensation and additional short circuit power capacity. ABB can tailor synchronous condenser modules to match system performance requirements and site conditions, and deliver optimum cost-efficiency. To ensure enduring and reliable operation, ABB synchronous condensers are designed for high reliability, durability and the capability to operate for a long time between service intervals. ABB synchronous condensers are carefully designed for minimum losses, noise levels, vibrations and weights.

PG MPT offering

PG MPT



- PG MPT Dodge mechanical power transmission product family offers the widest range of bearing, gearing, coupling, and conveyor components available. All Dodge products are designed to improve output, decrease downtime and enhance system value.

<http://new.abb.com/mechanical-power-transmission>

© ABB
October 27, 2016
Slide 22

ABB

The PG MPT Dodge mechanical power transmission product family offers the widest range of mounted bearings, enclosed gearing, conveyor components, and mechanical drive components available.

All Dodge products are designed to improve output, decrease downtime and enhance system value.

PG MPT offering Mounted Ball Bearings



- Broad line of mounted ball bearings for all applications
- Bore sizes 17 mm to 85 mm (1/2" to 3-1/2")
- Bulk Material Handling; HVAC; Unit & Baggage Handling; Food & Beverage
- Proven locking devices; Shaft Attachments; Superior Sealing Systems
- Dodge mounted ball bearings use superior sealing for longer bearing life and proven shaft attachment methods for fast removal without damage to the shaft.

© ABB
October 27, 2016

5109 23

ABB

Mounted ball bearings offers a broad product line suitable for all applications.

Bore sizes range from 17 mm to 85 mm or 1/2" to 3-1/2" inches.

Mounted ball bearings are found in bulk material handling; HVAC; unit & baggage handling and food & beverage industries.

Dodge mounted ball bearings use superior sealing systems for longer bearing life and proven shaft attachment methods for fast removal without damage to the shaft.

PG MPT offering Mounted Roller Bearings



- Mounted Bearing for Heavy Duty Applications
- Bore sizes 30 – 360 mm dependent upon style selection
- Bulk Material Handling; Paper; Water/Wastewater;
- Variety of Shaft Attachment methods and housing options; Superior Sealing Systems;
- Dodge mounted roller bearings use superior sealing for longer bearing life and proven shaft attachment methods for fast removal without damage to the shaft.

Mounted Roller Bearings are appropriate for Heavy Duty Applications. Bore sizes 30 – 360 mm dependent upon style selection.

Mounted roller bearings are used in a variety of industries such as bulk material handling, paper and water/wastewater industries.

Dodge mounted roller bearings use superior sealing for longer bearing life and proven shaft attachment methods for fast removal without damage to the shaft.

PG MPT offering Mounted Plain Bearings



- Plain bearing line of products engineered for harsh environments
- 20 mm to 70 mm (3/4" – 3") bore sizes with pillow block and flange housing types
- High Temp applications; Air Handling;
- Shaft Attachments; Sealing Systems; Reduced maintenance
- Dodge mounted plain bearings feature patented technologies that reduce maintenance and ensure long service life in harsh conditions.

Mounted plain bearings are engineered for harsh environments. Mounted plain bearings are available in 20 mm to 70 mm (3/4" – 3") bore sizes with pillow block and flange housing types.

Mounted plain bearings are appropriate in high temperature applications and in the air handling industry.

Benefits include different shaft attachments, secure sealing systems and reduced maintenance.

Dodge mounted plain bearings feature patented technologies that reduce maintenance and ensure long service life in harsh conditions.

PG MPT offering Small Gearing – Torque Arm II (TAII) and Motorized Torque Arm (MTA)



- Shaft Mounted Speed Reducers
- TAII through 300 kW (400 Hp); MTA 1.5 -75 kW (3-100 Hp)
- Bulk Material Handling; Food & Beverage; Wastewater
- Premium harsh duty oil seals; Twin tapered bushing system of easy install/removal; Industry leading backstop design; Meet AGMA standards; ATEX certified;
- This powerful line of ATEX certified, highly efficient shaft mounted speed reducers offers unparalleled torque ratings in industry proven designs.

In the selection of shaft mounted speed reducers Torque Arm II (TAII) for horsepower through 300 kilowatt or 400 horse and the Motorized Torque Arm (MTA) 1.5 -75 kilowatt or 3 – 100 Horsepower

TAII and MTA are best suited for use in Bulk material handling.

Shaft Mounted speed reducers offer premium harsh duty oil seals, twin tapered bushing system of easy installation and removal, and an industry leading backstop design.

TAII and MTA meet AGMA standards, are ATEX certified, and offers unparalleled torque rating in industry proven designs.

PG MPT offering Small Gearing – Quantis



- Shaft Mounted Speed Reducers
- Quantis in-line, right-angle or motorized shaft mount ranging from 0.18 – 55 kW or 1/4-75 HP
- Food & Beverage; Unit & Baggage Handling; Packaging
- Twin tapered bushing system for easy install/removal; Superior sealing systems
- Shaft mounted speed reducers designed for greater torque, efficiency and flexibility in compact housings.

© ABB
October 27, 2016

Slide 27

ABB

PG MPT offers a variety of small gearing options. Quantis in-line, right-angle or motorized shaft mount ranging from 0.18 – 55 kW or 1/4-75 HP.

These gear reducers service the food & beverage, unit & baggage handling and packaging industries.

Features include a twin tapered bushing system for easy installation and removal; and superior sealing systems.

Quantis speed reducers are designed for greater torque, efficiency and flexibility in compact housings.

PG MPT offering Large Gearing

Magnagear^{XTR}; Vertical GearMotor; Controlled Start Transmission; Maxum^{XTR}



- Heavy duty line of large gearing products that provide reliability in tough applications
- Wide range of power ratings depending on product choice
- Bulk Material Handling; Power generation; Paper
- Power dense designs; Superior harsh duty sealing
- Dodge large gearing products offer power dense designs for optimum power and performance under strenuous loads

© ABB
October 27, 2016 Slide 28

ABB

In the large gearing portfolio, Dodge offers a heavy duty line of large gearing products that provide reliability in tough applications. These offerings include the Maxum XTR, Magnagear XTR, Vertical Gearmotor, and Controlled Start Transmission (CST). Large gearing offerings are appropriate in bulk material handling, power generation and paper industries.

The Magnagear, Vertical Gearmotor, CST and Maxum offer power dense designs and superior harsh duty sealing.

Dodge large gearing products offer power dense designs for optimum power and performance under strenuous loads.

PG MPT offering Couplings



- Elastomeric, and metallic coupling line to meet all industry needs
- Bore size and Torque capabilities vary by product
- Pumping applications; Water/Wastewater; Chemical, Oil & Gas; Food & Beverage; Unit & Baggage Handling; Paper;
- Fast installation, even on misaligned shafts; Industry leading misalignment capabilities;
- Dodge couplings are designed to dampen vibration, accommodate shaft misalignment, extend life, and put an end to unexpected downtime.

© ABB
October 27, 2016 Slide 29

ABB

Dodge offers both an elastomeric and metallic coupling line to meet all industry needs. The bore size and torque capabilities vary by the coupling product selected.

Dodge elastomeric couplings are designed to dampen vibration, accommodate shaft misalignment, extend life, and put an end to unexpected downtime.

PG MPT offering Conveyor Components



- High performing conveyor pulleys for any application
- Hub diameter depends on product
- Bulk Material Handling;
- Integral hub, profiled, turbine and T-section end disc designs; vulcanized lagging; Mine and Heavy duty meet CEMA dimensions
- Dodge conveyor components are engineered to exceed the demands of the industry on conveyor pulleys.

© ABB
October 27, 2016
Slide 30

ABB

Dodge Conveyor Component product line offers high performing conveyor pulleys for any application.

Mine duty extra pulleys offer an integral hub, profiled, turbine and T-section end disc designs, vulcanized lagging.

Dodge conveyor components are engineered to exceed the demands of the industry on conveyor pulleys

PG MPT offering Mechanical Drive Components



- Mechanical drive components connect one driven shaft to another
- Not applicable
- All industries
- Rugged Materials; Energy efficient designs
- Synchronous drives offer high torque and are energy efficient

Mechanical drive components connect one driven shaft to another and are utilized in all industries in variety of applications. Synchronous drives offer high torque and are energy efficient.

PG MPT offering Washdown Products – Bearings and Gearing



- Products designed for superior protection in harsh washdown environments
- Depends on product
- Food & Beverage; Pharmaceutical
- Factory-filled H1 food grade lubricant; superior sealing for ingress protection; maintenance free;
- Dodge Ultra Klean and E-Z Klean bearings and gearing are engineered for long life in washdown environments using harsh chemicals and high temperature sprays.

Dodge offers both bearings and gearing products that are designed for superior protection in harsh washdown environments.

Washdown products are filled with H1 good grade lubricant and have superior sealing for ingress protection.

PG NEMA Motors



ABB offers the broadest line of energy-efficient Baldor-Reliance NEMA motors to meet any application need.

Designed and built with reliability and lowest total cost of ownership at the forefront, motors meet or exceed NEMA energy-efficiency levels.

<http://new.abb.com/motors-generators/nema-low-voltage-ac-motors>

© ABB
October 27, 2016
Slide 34

ABB

ABB offers the broadest line of energy-efficient Baldor-Reliance NEMA motors to meet any application need.

These NEMA motor are designed and built with reliability and the lowest total cost of ownership for the customer.

These motors meet or exceed NEMA energy-efficiency levels.

PG NEMA Motors General Purpose



- General purpose motors are designed for safe and moderately dry environments
- Three phase 0.09 – 1,100 kW (1/6 – 1500 Horsepower)
- All Industries
- Energy Efficiency, high starting torque, overload capability
- Designed to meet or exceed energy efficiency requirements while providing performance and reliability

© ABB
October 27, 2016
Slide 35

ABB

General Purpose motors are designed for use in safe and moderately dry environments.

The General purpose line includes Three phase motors rated from 0.09 to 1,100 kilowatts or 1/6 to 1500 Horsepower.

General purpose motors are suitable for use in all industry applications that need an energy efficient motor with high starting torque and overload capability.

The General purpose motor is designed to meet or exceed energy efficiency requirements while providing performance and reliability.

PG NEMA Motors Severe Duty



- Severe duty motors are designed for applications requiring extra protection against severe environmental operating conditions
- 0.4 - 2200 kW or ½ - 3,000 Hp (LV), up to 11,000 kW or 15,000 Hp (MV)
- Chemical, Oil & Gas; Bulk Material Handling; Paper
- High starting and peak torques, overload capabilities, ingress protection
- Designed to protect against contamination, moisture, vibration, severe duty motors meet IP55 while IEEE 841 motors meet IP56 protection

© ABB
October 27, 2016

Slide 36



Severe Duty motors are designed for applications requiring extra protection against severe environmental operating conditions.

These motors are rated from 0.4 - 2200 kilowatt or ½ - 3,000 horsepower for Low Voltage up to 11000 kilowatt or 15,000 horsepower for Medium Voltage

Severe Duty motors are suitable for use in the Chemical, Oil & Gas, Bulk Material Handling and Paper Industries.

These motors offer high starting and peak torques, overload capabilities and ingress protection

Severe Duty motors are designed to protect against contamination, moisture and vibration.

Severe duty motors meet IP55 while IEEE 841 motors meet IP56 protection

PG NEMA Motors Washdown



- When high-pressure cleaning and sanitation is critical, washdown motors are the right choice!
- 0.18 – 15 kW ($\frac{1}{4}$ - 20 Hp) rated
- Food & beverage; Pharmaceutical
- Multiple seals on the drive end, encapsulation on stainless steel motors, fully welded conduit box and feet to prevent contaminate build-up
- Painted and stainless steel motors meet the demands of washdown conditions with proper sealing to protect the motor

Washdown duty motors are used when high-pressure cleaning and sanitation is critical for the application.

They are rated from 0.18 – 15 kilowatt or $\frac{1}{4}$ - 20 Horsepower.

Washdown motors are suitable for Food & Beverage and Pharmaceutical applications

These motors offer multiple seals on the drive end, encapsulation on stainless steel motors, a fully welded conduit box and feet to prevent contaminate build up.

Washdown motors are offered in painted or stainless steel to meet the demands of washdown conditions with proper sealing to protect the motor

PG NEMA Motors Explosion Proof



- When environmental conditions are considered hazardous, explosion proof motors are the best fit for safety and protection
- 0.18 - 600 kW ($\frac{1}{4}$ - 800 Hp)
- Chemical, oil & gas
- Meet UL and CSA standards for Division based hazardous locations. ATEX and IEC Ex are available.
- Certified for hazardous locations or potentially hazardous locations where combustible gases, vapors, dust and fibers may be present

© ABB
October 27, 2016

Slide 38

ABB

Explosion proof motors are used when environmental conditions are considered hazardous and there is a need for safety and protection in hazardous situations.

Explosion proof motors are available with ratings from 0.18 - 600 kilowatt or $\frac{1}{4}$ - 800 Horsepower.

Explosion proof motors are found in the Chemical Oil and Gas industry.

These motors meet UL and CSA standards for Division based hazardous locations. ATEX and IEC Ex are available. They are also certified for hazardous locations or potentially hazardous locations where combustible gases, vapors, dust and fibers may be present.

PG NEMA Motors Pump



- Pump motors are designed for specific mounting configurations and motors capable of running while submerged in water
- 0.75 – 335 kW or 1/3 – 450 Hp
- Chemical, oil & gas, food & beverage, water & wastewater,
- Meet NEMA Premium® efficiency, inverter ready, with a wide torque speed range

Pump motors are designed for specific mounting configurations, both horizontal and vertical, and are capable of running while submerged in water.

Pump motors are rated for 0.75 – 335 Kw or 1/3 – 450 Hp. These motors are applicable for the chemical oil & gas, food and beverage and water & wastewater industries.

Pump motors meet NEMA Premium® efficiency rating, are inverter ready and offer a wide torque speed range.

PG NEMA Motors HVAC



- HVAC motors are designed to offer efficiency and performance in the air handling industry
- 0.75 - 298 kW or ¼ - 400 Hp rating
- Air Handling
- Low noise vibration dampening bases, dynamically balanced rotor for extended bearing life, vertical solid shaft with low, medium and high thrust
- Specifically designed for the air handling industry for smooth, quiet operation for total system reliability and performance

HVAC motors are specifically designed to offer efficiency and performance in the air handling industry.

HVAC motors are available with 0.75 – 298 kilowatt or ¼ - 400 Horsepower rating.

The low noise vibration dampening bases and dynamically balanced rotor are effective for extended bearing life. They also have a vertical solid shaft and can offer low, medium and high thrust.

HVAC motors offer a smooth, quiet operation for total system reliability and performance for the air handling industry

PG NEMA Motors Farm Duty



- Farm duty motors are designed for reliability and performance in all types of environmental conditions
- 0.25 – 75 kW or 1/3 – 100 Hp
- Food & beverage, farm industry
- Corrosion resistant epoxy finish, optimized windings to protect against voltage drop and phase shift

© ABB
October 27, 2016
Slide 41



Farm duty motors are designed for reliability and performance in all types of environmental conditions.

These motors range from 0.25 – 75 kW or 1/3 – 100 Hp.

Farm duty motors are most often used in the food & beverage and farm industries.

They are coated with an corrosion resistant epoxy finish, and have optimized windings to protect against voltage drop and phase shift.

PG NEMA Motors Definite Purpose



- Offer a solution to unique application and industries that don't fall into other product lines
- 0.35 – 187 kW or ½ - 250 Hp
- All industries
- Unique selling points, differentiators
- The Definite Purpose family of motors covers the challenges presented by specific industries. Each motor line in this family has unique characteristics to meet the definite purpose of the industry it was designed for.

Definite purpose motors offer a solution to unique application and industries that do not fall in other product lines. These motors are used in all industries but offer unique selling points and differentiators for very specific applications.

These motors range from 0.35 – 187 kW or ½ - 250 Hp.

The Definite purpose family of motors covers the challenges presented by specific industries. Each motor line in this family has unique characteristics to meet the definite purpose of the industry it was designed for.

PG NEMA Motors Variable Speed AC



- Variable speed AC motors are designed to run on inverter power, offering optimized performance and efficiency
- 0.2 to 11000 kW or 1/3 – 15000 Hp
- Chemical, oil & gas, unit handling, mining, paper & forest,
- Constant torque across entire operating speed range in traditional NEMA and IEC designs

© ABB
October 27, 2016
Slide 43

ABB

Variable speed AC motors are designed to run on inverter power, offering optimized performance and efficiency.

These motors are available in 0.2 to 11000 Kilowatt or 1/3 to 15000 Horsepower and are suitable for the chemical, oil & gas, unit handling, mining, paper & forest industries.

The Variable speed AC motors offer constant torque across the entire operating speed range in traditional NEMA and IEC designs.

PG NEMA Motors Large AC



- When the application calls for large amounts of power, large ac motors are available in general purpose designs to the most critical, highly specified designs
- Up to 22000 kW or 30,000 Hp
- Chemical, oil & gas, water & wastewater, aggregate & mining, paper & forest
- Low vibration cast iron construction, 1.15 SF as standard, V-Ring slinger for increased bearing protection

© ABB
October 27, 2016

Slide 44

ABB

Large AC motors are used when the application calls for large amounts of power and are available in general purpose designs to the most critical highly specified designs.

Large AC motors are offered in sizes up to 22000 kW or 30,000 Hp.

These motors are utilized in the chemical, oil & gas, water & wastewater, aggregate & mining, and paper & forest industries.

Large AC motors offer low vibration, cast iron construction with a 1.15 Service Factor as standard and a V-Ring slinger for increased bearing protection.

PG NEMA Motors Direct Current (DC)



- Direct Current motors are still being used today as drop-in replacement motors, offering a competitive solution to expensive rewinds and AC conversions.
- Fractional – 0.18-0.75 kW (0.25 -1 Hp); Integral – 0.75 kW -2200 kW (1-3000 HP)
- Processing, paper & forest, plastics, machine tool
- Power Dense package; Extended speed range capabilities; Reduced maintenance
- DC motors offer a power dense design that offers a flexible, cost effective, drop-in replacement with improved reliability and reduced maintenance.

Direct current, or DC, motors are still being used today as drop-in replacement motors, offering a competitive solution to expensive rewinds and AC conversions in applications.

DC motors are available ratings from 0.18-0.75 kW or 0.25 – 1 Hp for fractional motors and 0.75 Kw -2200 Kw or 1 – 3000 Hp for integral motors.

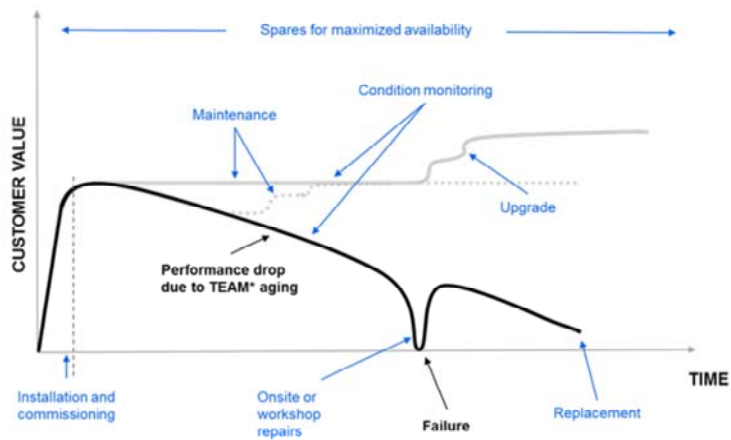
They are most commonly found in the processing, paper & forest, plastics and machine tool industries.

DC motors offer a power dense package; extended speed range capabilities and reduced maintenance.

DC motors offer a power dense design that offers a flexible, cost effective, drop-in replacement with improved reliability and reduced maintenance.

PG Service

PG Service offering Overview



- We offer service solutions that supports our customers to improve productivity, usability, reliability, safety, cost and energy efficiency throughout the life cycle of the products.
- <http://new.abb.com/motors-generators>

Most customers are interested in minimizing total cost of ownership for their equipment. Our service solutions supports our customers to do just that. We offer installation and commissioning service to get the motor or generator safely up and running, we offer different maintenance solutions and spareparts to minimize costly production stops and we support our customers with upgrades to reduce running costs and increase product lifetime.

PG Service offering Installation and commissioning



Installation and commissioning service is a solid basis for high efficiency and reliability over the entire lifetime.

The key benefits for the customers when ABB performs the installation and commissioning are:

- Reduction of installation and commissioning time.
- Electrical work carried out by skilled personnel only.
- Safe and controlled start-up methodology.
- Warranty protection.
- Record of parameters.
- Increase of reliability, availability and safety

The very first services that a new motor or generator requires are the installation and commissioning. Every motor and generator requires these services and this is a good opportunity to build a long lasting new customer relationship between ABB and the customer. It is extremely important that installation and commissioning are done in a proper way to avoid future problems. It is highly recommended that ABB offers installation and commissioning services along with the new motor or generator every time.

PG Service offering Maintenance



- Our offering for the maintenance services are:
- Preventive maintenance (Service programs L1-L4)
- Life cycle assessments (ABB LEAP)
- On-site condition monitoring (ABB MACHsense-P)
- Remote condition monitoring (ABB MACHsense-R)

Customers have different approach for doing maintenance and sometimes it is a mix of different strategies. It is important to understand the reasons for their selected maintenance strategy and how we can support with a solution that will minimize costly productions stops and increase product lifetime.

ABB's offering for the maintenance services are preventive maintenance, life cycle assessments, on-site condition monitoring and remote condition monitoring.

PG Service offering Extensions, upgrades and retrofits



- Updating older motors and generators with the latest technology provides higher performance and availability
- Control panel upgrades for synchronous motors deliver also reliability and functionality
- New Automatic Voltage Regulators for synchronous generators prevent unexpected downtime
- Upgrade your synchronous motor or generator with a state-of-the-art UNICITER® brushless exciter

ABB provides Extensions, upgrades and retrofits for motors and generators. Updating older motors and generators with the latest technology provides higher performance and availability.

The benefits apart from an extended product lifetime, is improved reliability and reduced operating and maintenance costs.

PG Service offering Spare parts



- We supply both individual parts and spare part packages
- Customers get easy access to our global spares operations through local Service unit or our online portal, My ABB. Sign up for My ABB on www.abb.com
- Our experts help to rationalize on-site spare part stocks
- Design improvements mean new parts can be even better than originals

© ABB
October 27, 2016
Slide 51

ABB

Customers buy motors because they need to run the process. Standstills are normally not acceptable and typically incurs high stand still costs. Having spare parts at the customer site may reduce the downtime significantly when something breaks.

We can provide expert support in part and capital spares identification based on motors and generators condition and criticality and help customers to rationalize on-site spare part stocks.

PG Service offering Repairs



WORKSHOP REPAIRS

- Workshops are staffed with professional engineers, supported by our design experts and global service network

ON-SITE REPAIRS

- Fast on-site response times to minimize the disruption to your production

TECHNICAL SUPPORT

- Talk directly to engineers experienced in your equipment and applications

For critical applications the consequences of an equipment failure and an unplanned production stop can be extremely costly. To support our customers ABB has a wide network of service centers with fast response and competence. ABB offers a range of repair services, warranty or non-warranty, to provide customers with a choice depending of the situation and exact financial and operation needs. The services include on-site repair by ABB or its certified partners. If an immediate on-site repair is not required or not possible a repair can be carried out at ABB's or its service partners workshop facilities.

PG Service offering Replacements



- Replacements for both ABB and non-ABB motors and generators
- Choose the optimal solution from standard products, tailor made units and replicas
- Replacements are usually fully interchangeable with the original
- Replicas can be simply 'slotted in' to your plant – no changes are needed in surrounding equipment

At some point the end user have to replace an existing motor or generator with a new product. We have three main alternatives for the customer. Depending on the customer situation and needs, the options are to offer a new standard motor or generator, a new standard motor or generator type, but with special electrical or mechanical design, or make an exact replica of the existing product.

PG Service offering

Service agreements, Advanced services and Training



- Service agreements (ABB MotorCare)
 - Risk analysis at customers site. The outcome is a maintenance plan that will optimize uptime of customers line.
- Advanced services
 - ABB Replacement Savings Analysis evaluates opportunities at site for energy savings and reliability improvements.
 - ABB Performance Evaluation Program analyzes your motors' actual operating characteristics
- Training
 - Develop competence in defining the correct maintenance strategy and first-line troubleshooting



A service contract is an efficient way to manage the total life cycle of motors and generators and minimize the risk of customer production. One or more services can be combined to achieve best possible solution for each customer.

Advanced services includes ABB Replacement Savings Analysis which is a tool that evaluates energy savings and reliability improvements for direct online induction motors replacement. ABB Performance evaluation program analyzes the motors actual operating characteristics.

In addition ABB offers customer trainings to maximize the value they get from their assets, develop competence in defining the correct maintenance strategy and first-line troubleshooting.

Power and productivity
for a better world™

