Electrical Systems for Thrusters and Auxiliary Drives
Optimum Solutions for Auxiliary Propulsion Drive Applications

**Auxiliary propulsion drive systems**

Auxiliary propulsion drive systems such as bow- and stern-thrusters, azimuth-thrusters or take-home and booster-drives have become an important aspect in the design of ship’s propulsion plants.

Electrical drive systems provide cost effective and highly reliable solutions for these applications.

SAM Electronics provides a wide range of different solutions with optimum performance for any auxiliary drive systems.

The adequate design of the electrical drive needs to be selected depending on the technical lay-out of the propulsion system.

For detailed information about the advantages and the technical aspects of the different drive system layouts please contact us. We will be glad to discuss the different technologies and lay-outs to find the optimum solution for your auxiliary drive application.

**Fixed-pitch propeller drives**

A speed controlled drive system is necessary for fixed-pitch propellers in order to control the thrust. Electrical drive systems with frequency converter units provide most efficient, reliable and precisely controllable power for fixed-pitch propeller drives.

Another well proven design principle for speed adjustable drives is the slip-ring motor with rotor resistor. This design provides different discrete speed values for both directions.

**Variable pitch propeller drives**

For variable pitch propeller systems an electrical drive with constant speed is sufficient. In this case the starting method of the drive motor is selected depending on the capacity of the power supply network as well as the technical demands of the propeller system itself.
Complete Systems for fixed-pitch Propeller Drives

AC motor with frequency converter unit

The AC motor is connected to a frequency converter allowing to run the drive system in both directions and at each speed with the following characteristic:
- Starting current is limited to 100% of the rated current
- Controllable smooth and soft acceleration and breaking
- Step-less speed adjustment over the full range from 0 rpm up to the rated speed (even over-speed applications are possible)
- System develops a starting torque of approx. 100% of the rated torque.

AC motor with slip-ring and rotor resistor

The special type AC motor with slip-ring is connected to a switch cabinet with integrated rotor resistor and contactors to choose the direction of rotation as well as the resistance levels for the rotor-circuit
- Starting current is limited to approx. 110% of the rated current
- Acceleration is carried out in several discrete steps without interruptions
- Speed adjustment is accomplished by changing the resistance in the rotor circuit, thus providing a number of fixed speed levels
- System develops a starting torque of approx. 25% of the rated torque.
Electrical Drive Systems for controllable-pitch Propeller Drives

**AC motor with direct on-line (DOL) starting**

The AC motor is connected directly to the main power supply
- Starting current is about 600% to 750% of the rated current
- Sudden acceleration
- Speed adjustment is only possible by using pole-changing type AC-motors
- System develops a starting torque of approx. 200% of the rated torque.

**AC motor with star-delta connection**

The AC motor is connected to the main power supply using changeover between star- and delta connection
- Starting current is about 300% to 350% of the rated current
- Sudden acceleration in two steps with short interruption in-between
- Speed adjustment is only possible by using pole-changing type AC-motors
- System develops a starting torque of approx. 30% of the rated torque.

**AC motor with starting transformer**

The AC motor is connected to the main power supply by using a starting transformer
- Starting current is about 150% to 200% of the rated current
- Sudden acceleration in two steps without interruption in-between
- Speed adjustment is only possible by using pole-changing type AC-motors
- System develops a starting torque of approx. 25% of the rated torque.

**AC motor with electronic softstart unit**

The AC motor is connected to the main power supply by using electronic softstart unit and a bypass contactor
- Starting current is about 300% to 350% of the rated current
- Controllable smooth and step-less acceleration
- Speed adjustment is only possible by using pole-changing type AC-motors
- System develops a starting torque of approx. 100% of the rated torque (or even more when using special pulse-start features)
Special Concepts for cost-efficient solutions

**AC motors with combined electronic softstart unit**

Identical AC motors can be started one after another by using an electronic soft-start unit. After completion of the starting procedure each motor is connected directly to the power supply. The same principle is possible with transformer starting units.

- Starting current is about 300% to 350% of the rated current
- Controllable smooth and step-less acceleration
- Speed adjustment is only possible by using pole-changing type AC-motors
- System develops a starting torque of approx. 100% of the rated torque (or even more when using special pulse-start features)

**Starting system with regulated excitation**

Large AC motors can be started when separately connected to a generator by regulated excitation control.

- Starting current is about 150% to 250% of the rated current
- Controllable smooth and step-less acceleration
- Speed adjustment is only possible by using pole-changing type AC-motors
- System develops a starting torque of approx. 25% of the rated torque.

**Drive system with electrical shaft and variable prime-mover speed**

AC motors can be started and speed controlled when separately connected to a generator by regulating the speed (and thus the frequency) of the prime-mover (variable frequency operation).

- Starting current is about 300% to 400% of the rated current
- Sudden acceleration
- Speed adjustment is possible by changing the speed of the prime-mover (generally in a range of 30% to 100% of the rated speed)
- System develops a starting torque of approx. 30% to 50% of the rated torque (depending on prime-mover speed).
Our Competence in Drive Systems ensures Outstanding Performance

Complete drive systems supplied by SAM Electronics

For several decades SAM Electronics (formerly AEG Schiffbau) has delivered complete units for electrically powered drive systems for seagoing ships and other offshore facilities. This one-hand supply ensures perfect function and outstanding performance of all relevant components such as the drive-motor and the motor control cabinet with its integrated control functions.

SAM Electronics provides a wide range of AC motors for marine applications in standard- and in explosion-proof (Ex/ATEX) design. This profound know-how combined with our long term experience in complex drive-systems ensures optimum solutions and high reliability from the first project sketches until many years of reliable service after commissioning.

Our systems are generally based on well proven design principles and all components are chosen and tested for perfect inter-action. For each installation we carry out detailed calculations regarding the dynamical performance (start-up) as well as the integration of the system into the ship’s power supply network. This is especially relevant when the drive system has to be integrated into a rather weak power supply network.

It is a matter of course that all drive systems provided by SAM Electronics are delivered with complete approval certificates by any major classification society.

For detailed information about the systems recently delivered by SAM Electronics please refer to our separate reference list.

Bow thruster motor (1400 kW, 440V, 60 c/s, 1200 rpm, IP23)

Motor starter and control cabinet for transformer start (1400 kW, 440 V, 60 c/s, IP23)

Starting transformer (for 1400 kW motor, 440 V, 60 c/s, IP23)