

MARINE

Drives for electrically driven deck machinery and spooling winches



Technical description of the ACS880 Winch Control Program +N5100 and the ACS880 Spooling Winch Control Program +N6000

ACS880 Winch Control Program +N5100

Designed for deck machinery winches

With the help of application expertise gained over many years, we've developed drives and motors that enable a precise, smooth, dependable and safe winch operation, while reducing wear on the ropes and winch. Our winch control program is an important part of our offering, ensuring this highly reliable winch operation both in new and retrofit installations.



The ACS880 drives' built-in control is designed for the following winch types

- Anchor (windlass) winches
- Mooring winches (handmooring and automooring)
- Standalone winch systems
- Master/follower winch systems
- Slipway winches
- Other harbor winch applications

ACS880 Spooling Winch Control Program +N6000

For trouble-free spooling

Our ACS880 drives also include a dedicated control program for winches that have a spooling device to guide the spooling of the rope. This prevents wire rope from getting snagged when spooled, especially when there's multiple layers of rope on a drum. The spooling control program is suitable for spooling and rope-guiding winches, and it includes both manual and automatic user modes.



The all-compatible ACS880 industrial drive series

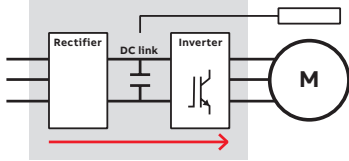
One platform for deck machinery and spooling winches

ELECTRICAL BRAKING OPTIONS

Dynamic braking

(ACS880 single drives)

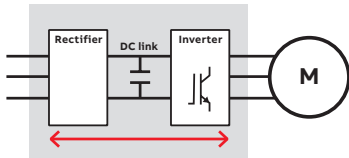
- Brake chopper on DC Bus where power is dumped into brake resistor



Regenerative braking

(ACS880 single drives)

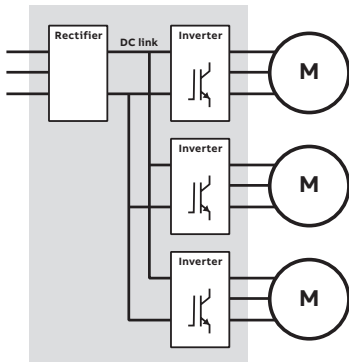
- Active Front End (AFE) where power is regenerated back to supply



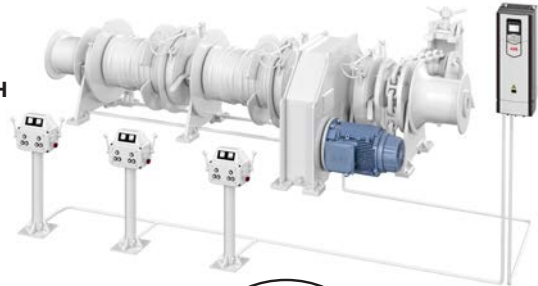
Regenerative braking

(ACS880 multidrives)

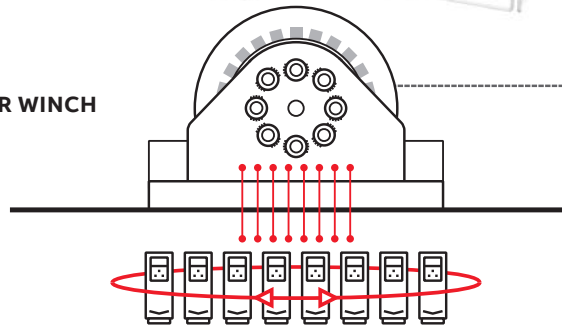
- Multidrive configuration with supply unit, DC bus and multiple inverters



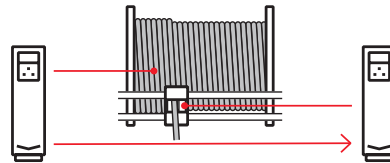
STANDALONE WINCH



MASTER/FOLLOWER WINCH



SPOOLING WINCH



COMMON HARDWARE

- The ACS880 all-compatible platform is used for all applications, resulting in a common platform for setup, troubleshooting, and maintenance.
- The ACS880 fulfills both marine and offshore requirements, and the design and operation comply with regulations from all major classification societies, including ABS, BV, CCS, ClassNK, DNV GL, KRS, Lloyd's Register, RINA, and RMRS. You can download the marine type approval certificates issued for ACS880 drives from our website: new.abb.com/drives/segments/marine/marine-type-approvals



ACS880 wall-mounted drives
IP21 (also available as IP55)
0.75 to 250 kW



ACS880 drive modules
IP00 or IP20 for cabinet design
55 to 710 kW



ACS880 cabinet-built drives
(air-cooled or liquid-cooled)
IP54 or IP55, 55 to 2800 kW



Removable memory unit
including all software

Dedicated built-in deck machinery functionalities to minimize your engineering time



Anchor – operation for heaving up and lowering anchor

Mooring – operation for heaving in and paying out mooring lines or ropes

Typically, anchoring and mooring are carried out as a standalone operation, meaning that each winch motor has its own variable speed drive (VSD) for control.

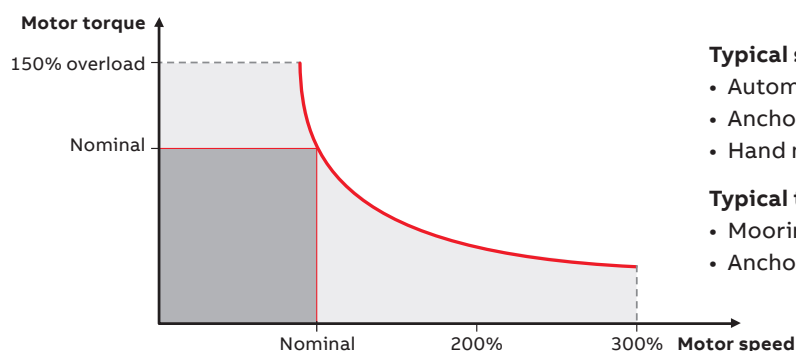
Advantages of the VSD controlled electrically driven winch

- Smooth operation and low noise level
- No risk of hydraulic oil leakages
- Less wear of mechanical components
- No current peaks to the vessel's electrical network
- Energy saving with stepless speed and time interval mooring operations
- Automoorings at low speed helps minimize energy consumption ($P = T \cdot \omega$)

Robust solution with minimized components

- No need for an external controller thanks to the built-in winch control program
- No need for a motor encoder thanks to the DTC motor control
- No need for a loadcell thanks to the application logic
- All features are adjustable with parameters
- Adaptive programming allows customization of the drive software

Typical electrically driven winch motor performance (with an induction motor)



Typical speed ranges

- Automoorings: up to 50%
- Anchoring: up to nominal speed
- Hand mooring: up to 200-300%

Typical torque ranges

- Mooring: up to nominal torque
- Anchoring: up to 150% overload for 2 min at start

Anchor mode

In the anchor mode, the winch is operated with a control joystick by a winch operator for lowering and heaving up the anchor, with a smooth speed control from zero to nominal speed. The drive's built-in adjustable temporary overloadability is 150% for two minutes, which is important in case the anchor gets stuck in the seabed.

Handmooring mode

The handmooring mode involves using a joystick to control the winch operation for rotating mooring drums in both directions. This is typically used for giving out ropes and taking in ropes, and creating pre-tension in the ropes before automooring is enabled. The handmooring mode includes a smooth speed control from zero up to three times the motor's nominal speed.

Automooring mode

The automooring mode operates the winch in an automatic mode, to ensure that the rope forces stay within predefined levels (tight) between the harbor pier and the winch drum. Automooring is available with different adjustable modes and it gets its setpoint typically from an IO selector switch or an AI potentiometer. The rope tension force is based on an internal rope tension calculation or on an external loadcell sensor measurement value.

Automooring modes:

- Time control mode – checks the rope tension in predefined time intervals: re-mooring 1 and 2
- Loadcell mode – checks the rope tension based on a sensor in the gearbox, including a correction
- Continuous mode – continuous operation with an open brake without the need for a loadcell sensor
- Continuous + time control mode – combined operation with adjustable switch-over timers

Clutch control mode

In clutch control mode, the clutch control push buttons are used for rotating the shaft at a low speed in both directions for the clutching operation. The push button IO inputs are used for heaving in and paying out with adjustable speeds, ramp and maximum torque.

Chain length calculation

The winch control program has a built-in functionality to calculate the actual length of an anchor chain.

The chain length can be calculated with different methods:

- With a proximity switch on the inner anchor drum, 4-8 pulses/revolution
- With an absolute encoder on the drum shaft
- With a HTL encoder on the motor shaft

Winch interface

The winch interface includes a ready-made control joystick interface for 3 control columns and an option for a wireless radio controller.

Operation without a motor encoder

The direct torque motor control (DTC) enables you to operate the deck machinery without a speed or position feedback sensor. In such cases, the commissioning of a winch motor (ID_run) is required for adapting a real motor characteristic to the software model.

Robust operation in harsh climate conditions

This is a special feature available for winch operations in arctic or hot climates. The DTC motor control is regularly adapted to match the ambient conditions.

Mechanical brake control

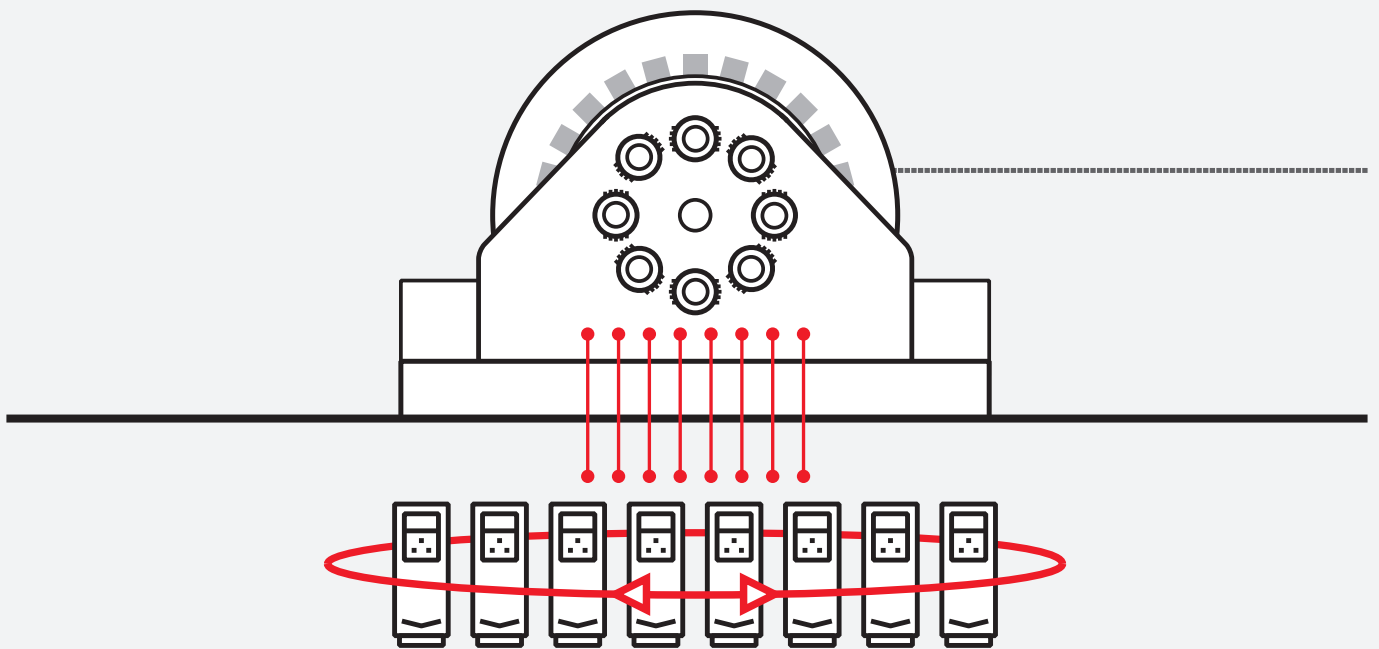
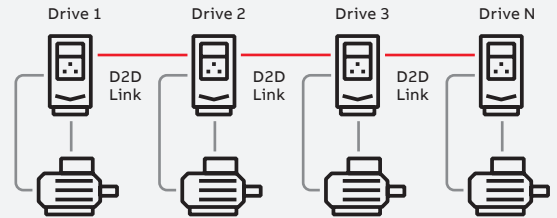
The disc, drum and band brakes can be controlled with the inbuilt mechanical brake control in the drives. The opening and closing sequences of the brake can be optimized separately with adjustable parameters.

Retrofit of old 3-speed motor winches

The operation of old DOL 3-speed motors can be upgraded to VSD control, where the contactor cabinet is replaced with a VSD. This way, the old motor and control columns can be re-used, improving their performance.

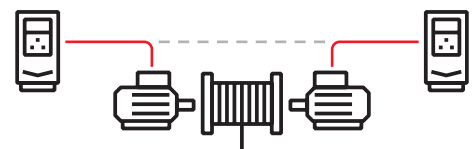
Master/follower

The multimotor functionality is supported for up to 12 drives. This includes 1 master drive and up to 11 follower drives that form a system together. The drives in the Master/follower system are linked together via the built-in D2D communication link.



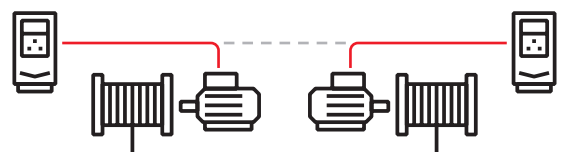
Torque and load sharing

Here, winch motors work together and share the load, which is typically connected mechanically via a gearbox to the drum.



Speed and position synchronization

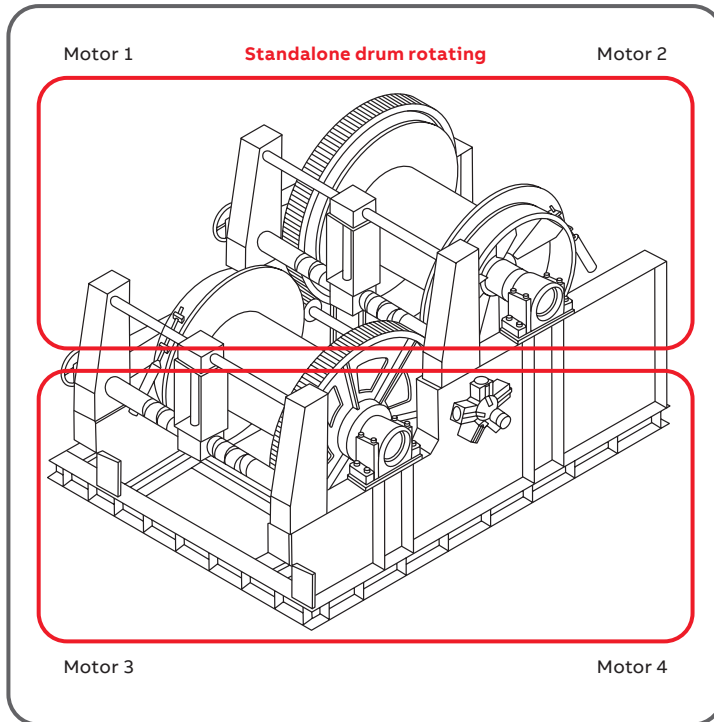
Working together, winch drums are synchronized with each other with the help of motor encoders. The motors are typically not mechanically connected to each other.



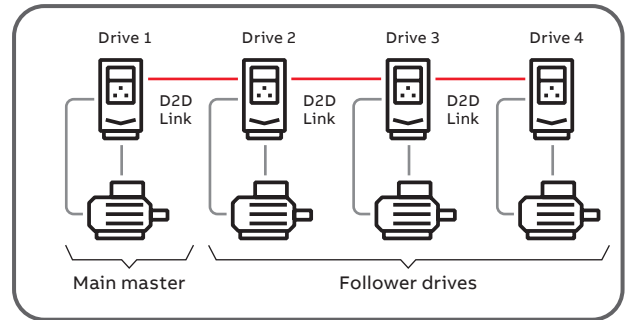
Split and structure operation

The master/follower operation can be used with a main master group and optionally be split to another sub-master group within one D2D link.

Common drum rotating, 1 master and 3 followers

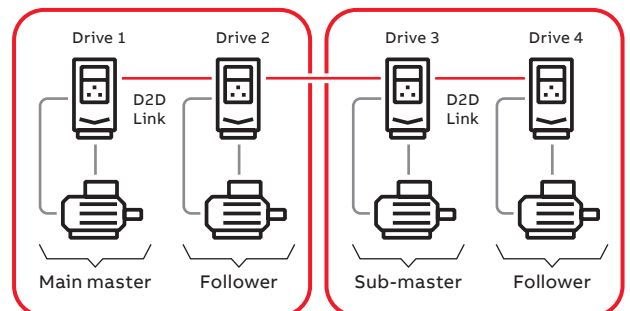


Structure 1



Main master group

Structure 2



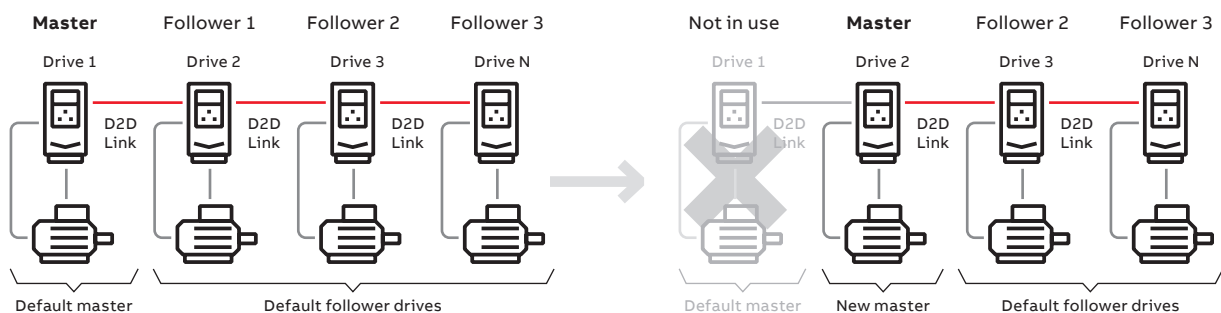
Main master group

Sub-master group

Redundant operation

The master/follower operation can work in redundant mode, which means that the winch operation continues without stopping and the follower and master drives change operation mode on the fly while running. In case the master drive trips out, one of the follower drives will replace it as a new master. If also one of the follower drives trips out, the operation continues as long as there are still enough drives in operation. The minimum number of required operational drives is set by the user in the drive settings. *)

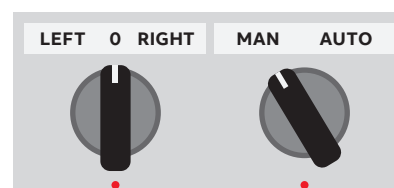
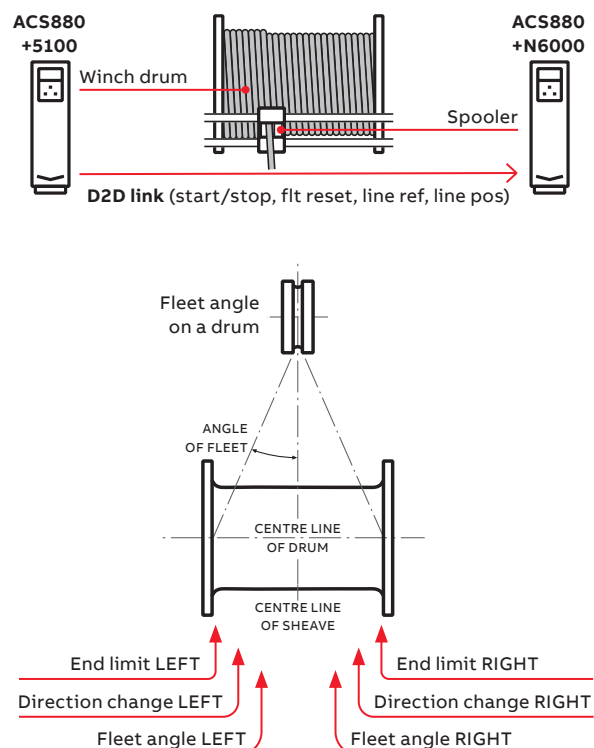
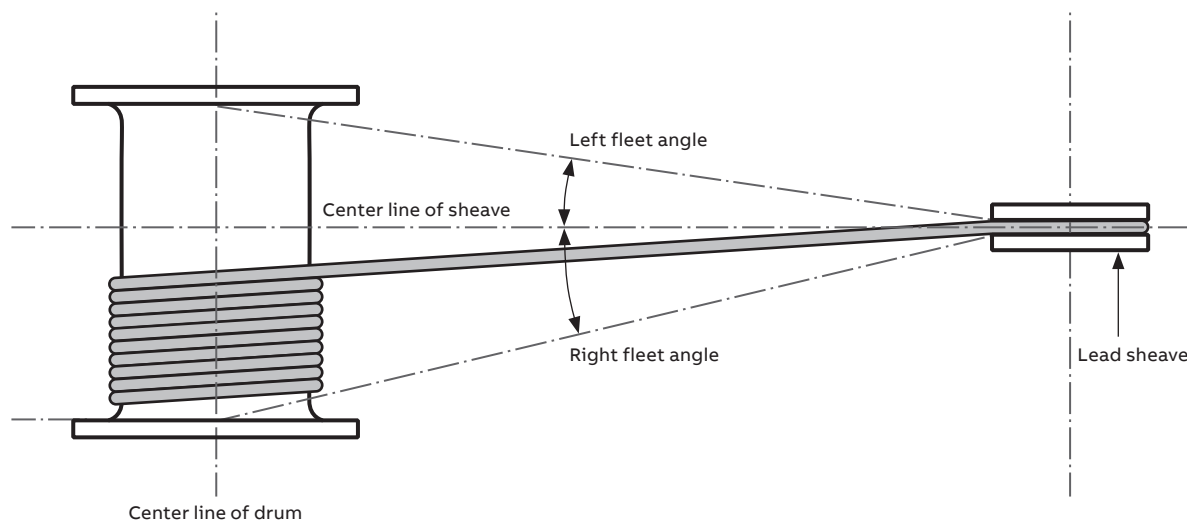
*) Redundant mode is available as limited release on special request.



ACS880 Spooling Winch Control Program +N6000

The dedicated ACS880 Spooling Winch Control Program, which works with marine winches, spooling winches, and rope guiding winches, enables multi-layer spooling and ensures that the rope layers are guided tightly side by side. *)

Overview of a typical spooling winch system



MANUAL START LEFT
MANUAL START RIGHT

AUTO/MANUAL SPOOLING ENABLE

AUTO – following winch line reference via D2D
MANUAL – following manual switches and fixed speed

EXTERNAL ENABLE (bandbrake acknowledge or other source)

*) Spooling Control Program is available as a limited release on special request.

Spooler function

The built-in spooler control software creates an electrical gearbox between the main winch drum and the spooling drum drive.

- The main winch is controlled with the ACS880 Winch Control Program +N5100
- The spooler winch is controlled with the ACS880 Spooling Winch Control Program +N6000

Communication between the main winch and a spooler winch

The actual speed and start/stop commands of the main winch can be sent to the spooler drive via:

- Serial communication (D2D link between drives from +N5100 control program)
- Fieldbus (PLC)
- Analogue and digital signals

The actual speed of the winch is scaled to the spooler drive in such a way that the rope moves according to the diameter of the rope when the winch drum rotates one cycle.

External scaling

External scaling factors are available in the spooling software for correcting the spooling speed reference.

Direction change

The spooler changes its direction when the rope reaches the side of the spooling drum. The correct timing for the change in direction is based on the proximity sensor signal or the motor encoder position.

Fleet angle and catch-up functions

The spooler has a fleet angle functionality for the spooling device to keep the rope tight in the rope guide.

Manual mode and automatic mode

The spooler has a manual mode for push button operation in left and right directions. This also includes an automatic mode selection switch for automatic-mode operation, including D2D communication from the main winch drum.

Speed reference based spooling

The spooling software functionality can be used in the speed reference spooling mode, which is based on the main drum speed and gearing factors.



PC tools

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Drive Composer pro
PC tool

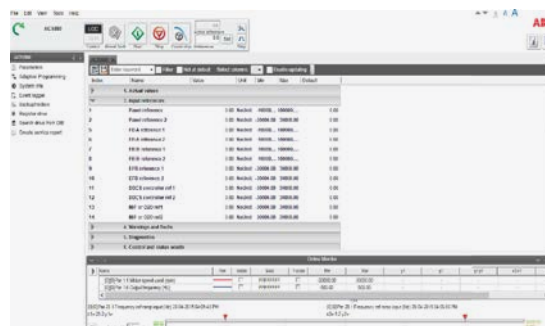
The **Drive Composer pro** PC tool offers a fast and harmonized setup, commissioning, and monitoring for ABB's all-compatible drives. The free version of the tool, **Drive Composer Entry**, provides startup and maintenance capabilities, and includes support for adaptive programming. It also gathers all drive information, such as parameter loggers, faults, backups and event lists, into a support diagnostics file.



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The **Drive Composer pro** provides additional features, such as:

- Graphical reference and control chain diagrams
- The possibility to connect to several drives simultaneously over Ethernet or a panel bus
- Graphical user interface for configuring functional safety features







For more information, please contact
your local ABB representative or visit

new.abb.com/drives/segments/winches

new.abb.com/motors-generators/segments/marine