

ABB DRIVES

Selection and programming guide

ACQ580 or ACS880 for Grundfos MS6000P



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- This guide explains in detail how to setup the ABB ACQ580 and ACS880 to support Grundfos MS6000P permanent magnet motor.

Table of contents

04–05	Drive and motor selection
06–11	Programming ACQ580
12–18	Programming ACS880
20–21	Selection table Grundfos MS6000P series motor, ABB drive and sine wave filter for 380-415 V mains operation
22–23	Selection table Grundfos MS6000P series motor, ABB drive and sine wave filter for 440-480 V mains operation

This document only applies to the combination of ABB ACQ580 or ACS880 with Grundfos MS6000P motor. The information in this document is based on tests made in autumn 2021 by ABB in cooperation with Grundfos. Tests were performed with ABB ACQ580 and ACS880 both combined with sine filter using a Grundfos MS6000P in combination with different pumps. The document cannot be used for any other products than expressly specified above, and the selection of drive and filter is based on a correct match of pump and motor. ABB cannot be held responsible or liable for incorrect sizing or selection. ABB cannot be held responsible or liable if changes are made to the motor or pump.

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Front cover picture show Grundfos MS6000P and is property of Grundfos

Drive and motor selection

ACQ580 and ACS880 for Grundfos MS6000P

Introduction

The Grundfos MS6000P is a 6-inch permanent magnet borehole motor. The motor range is 4 different power sizes covering the range from 4 kW to 45 kW and from 5 hp to 50 hp. The 4 different motors will support a wide range of different pump combinations.

6-inch asynchronous borehole motors are commonly used in the water industry. The introduction of permanent magnet motors increases the motor efficiency to new levels, enabling energy savings, that cannot be reached with the asynchronous technology. The motor with internal magnets (IPM type) is designed for 3000 rpm (EU version) and 3600 rpm (US version). The motors are 4 pole motors running at 100 Hz (EU version) or 120 Hz (US version).

The typical application for these types of pumps are: Drinking water/fresh water and irrigation, but they are used in other applications as well.

This document explains how to program and use ABB ACQ580 or ACS880 drives to control the submersible pumps using the Grundfos MS6000P motor. There is no information about application control in this document.

System components:

- Drive: ABB ACQ580-01 or ACS880-01
(Ultra-low harmonic (ULH) ACQ580-31 is an option as well)
- Output filter: Sine wave filter
- Motor: Grundfos MS6000P

Drive selection

The ABB ACQ580-01 or the ACS880-01 can be used for this application. The ACQ580-31 will have the additional benefit with the DC boost function in installations with low input voltage. Low harmonic distortion is the perfect match for pumps running on generators or on a weak grid. The drives are rated for 400 V supply (EU) or 460 V/480 V supply (US).

The programming is easy, only standard parameters are needed without special tuning.

The correct sizing method is to select a pump that fulfills the requirements in the application to head (H) and flow (Q), combine it with a motor based on the max mechanical power the pump will load the motor.

With the pump and motor selected the drive and sine wave filter can be selected. The selection of drive and output filter is made simple, using this specific selection guide made for Grundfos MS6000P.

Output filter

The Grundfos MS6000P requires additional protection towards peak voltage (U_{peak}) and voltage change versus time (dU/dt). The ratings are:

- dU/dt : 2000 V/us
- U_{peak} : 850 V phase to phase

The rating for dU/dt for the motor requires an output filter, and with the limitation on U_{peak} combined with the typical long cables used in the application, a sine wave filter is required.

Submersible motors are NOT covered by the IEC60034 and will in most cases require a sine wave filter when used in combination with a drive.

The use of sine wave filter is mandatory to comply to the motor specifications of the Grundfos MS6000P.

Motor

There are 4 different motors in the power range, the same motor will be used for different loads (See: Motor specific data in tables 2 and 3).

The motors will have a max speed of 100 Hz (EU) or 120 Hz (US). They can be used for several different pumps, creating a wide range of different pump performance curves.

The motors will be selected to fit with the actual pump, and the maximum load of each specific pump type will be known and this will be used for the drive's selection.

The motors will have specific requirements for minimum speed and ramp times, see programming parameters section for more information.

Additional drive features

- **Quick ramps.** To protect the submersible pump bearings while starting the pumps, the pumps should be accelerated quickly up to speed, which creates some water flow and lifts the bearing. Pumps should also be stopped quickly once below minimum speed to protect the bearings. ACQ580 drive has a specific feature for this purpose called Quick ramps and similar feature can be programmed to ACS880 as well.
- **Filter temperature monitoring.** Some filter types have temperature switches included. These temperature switches are used to prevent the filters from overheating. Such switches can be wired to drives to make warning or fault to protect the filters.
- **IR compensation.** To have high enough breakaway torque while starting the pump, some IR compensation might be required. The higher the value, the higher voltage and torque is available for the motor at low speeds.
- **Voltage reserve.** Increasing the value improves motor's capability in highly dynamic situations and positive values prevent the drive to use so called overmodulation switching pattern. Overmodulation would create some extra harmonics to drive's output, which are unwanted in case sine filters are used.

General parameters

The parameters in table 1 apply independent of the power size of the motor. Parameters marked with *) will be needed for programming the drive.

Table 1: General parameters

Parameter	Unit	EU version	US version
Nominal motor voltage *)	V	350	410
Nominal motor frequency *)	Hz	100	120
Nominal motor speed *)	rpm	3000	3600
Motor minimum speed	rpm	1650	1650
Motor minimum frequency *)	Hz	55	55
Motor Maximum speed	rpm	3000	3600
Motor maximum frequency *)	Hz	100	120
Initial ramp time up to minimum speed *)	Sec	3	3
Operational ramp time from min to max speed *)	Sec	10	10
Operational ramp time from max to min speed *)	Sec	10	10
Final ramp time from min speed to zero speed *)	Sec	3	3

Note: Operational ramp times can be set according to the application.

It is common to need more parameters such as: d- and q-axis inductance and back EMF@1000 rpm when setting up a drive for a permanent magnet motor. These values however are NOT needed for setting up the ABB ACQ580 or ACS880 to support the Grundfos MS6000P motor.

Motor specific parameters

The motor specific parameters are Motor power and Nominal current. They can be found from the tables 2 and 3.

The nominal current given in tables includes the following service factors (S.F.):

Table 2. Service factor = 1 for nominal motor voltage 350 V, nominal motor frequency 100 Hz and mains voltage 380-415 V.

Table 3. Service factor = 1.15 for nominal motor voltage 410 V, nominal motor frequency 120 Hz and mains voltage 440-480 V.

Use the service factor current for the Grundfos MS6000P when programming the ABB drive Nominal current parameter. This ensures that the drive will supply the needed current for the load.

Table 2: Motor data for EU versions: nominal motor frequency 100 Hz, nominal motor voltage 350 V, mains voltage 380-415 V

Motor (Grundfos prod. no)	Motor nominal power [kW]	Nominal current EU (Motor S.F. current) [A]
76207712	4.0	9.6
	5.5	12.6
	7.5	16.6
76207717	9.2	21.4
	11	25
	13	29.2
	15	33.4
76207720	18.5	40.6
	22	46.2
	26	54
76207722	30	61.8
	37	85.6
	45	103

Table 3: Motor data for US versions: nominal motor frequency 120 Hz, nominal motor voltage 410 V, mains voltage 440-480 V

Motor (Grundfos prod. no)	Motor nominal power [hp]	Nominal current US (Motor S.F. current) [A]
76374612	5	8.8
	7.5	12.4
	10	16.2
76374617	12	20.6
	15	24.2
	17	28.2
	20	32.2
76374620	25	39.0
	30	44.8
	35	52.4
76374621	40	60.0
	50	82.6

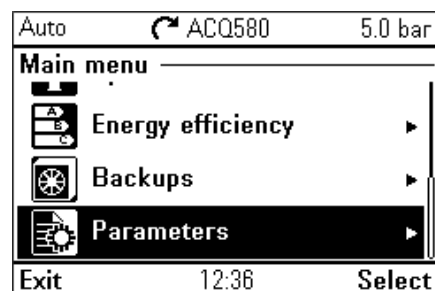
ACQ580-01



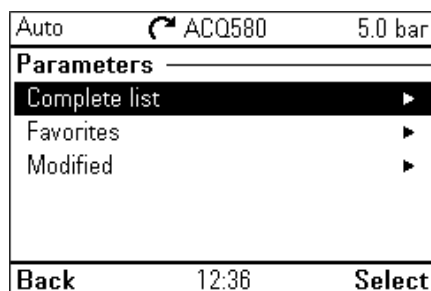
Programming parameters to ACQ580

Drive programming is done using several parameters. Some of the parameters are edited via direct access to parameters, but many values can be edited through easy to use Primary settings menu.

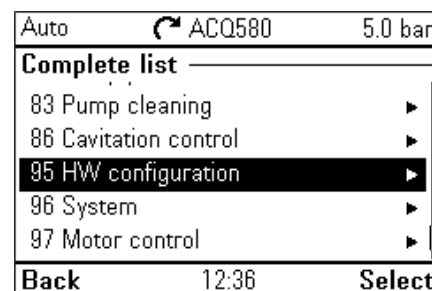
Hardware Configuration



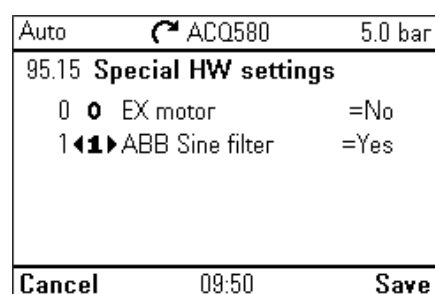
From the main menu go to:
Parameters



Select: Complete list



Navigate to parameter group 95 HW configuration



95.15 Special HW setting

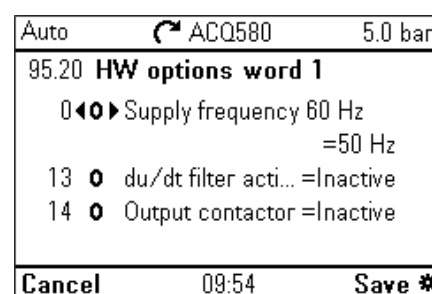
If using ABB recommended TDK sine filter (EU, max speed 100 Hz):

Select ABB sine filter, bit1:

Bit 01: 0 ABB Sine filter = No

Bit 01: 1 ABB Sine filter = Yes

Remember to save the selection



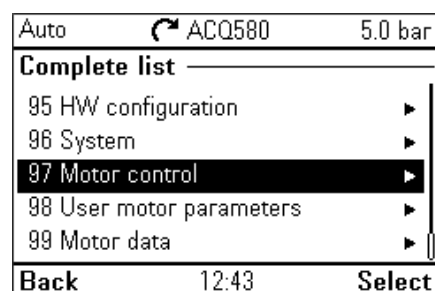
95.20 Select HW option word 1 to setup the mains supply frequency

Bit0:

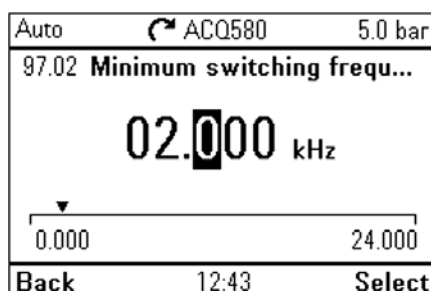
50 Hz: default for ACQ580 sold in EU

60 Hz: default for ACQ580 sold in the US

Switching frequency



Only if MTE (US) filters are in use:
Navigate to group 97 Motor control



97.02 Minimum switching frequency

If using ABB recommended MTE sine filter (US, max speed 120 Hz):
Set minimum switching frequency to 2 kHz.

Motor data

Auto	↻ ACQ580	5.0 bar
Complete list		
95 HW configuration	▶	
96 System	▶	
97 Motor control	▶	
98 User motor parameters	▶	
99 Motor data	▶	
Back	10:14	Select

Navigate to parameter group 99
Motor data

Auto	↻ ACQ580	5.0 bar
99.03 Motor type		
[0] Asynchronous motor		
[1] Permanent magnet motor		
[2] SynRM		
[3] PMaSynRM		
Cancel	12:38	Save

99.03 Set Motor type to:
[1] Permanent magnet motor

Auto	↻ ACQ580	5.0 bar
99 Motor data		
99.03 Motor type	Permanent magnet ...	
99.04 Motor control mode	Scalar	
99.06 Motor nominal current	1.2 A	
99.07 Motor nominal voltage	230.0 V	
99.08 Motor nominal freque...	50.00 Hz	
Back	12:38	Edit

99.04 Set Motor control mode to:
Scalar

Auto	↻ ACQ580	5.0 bar
99 Motor data		
99.03 Motor type	Permanent magnet ...	
99.04 Motor control mode	Scalar	
99.06 Motor nominal current	1.2 A	
99.07 Motor nominal voltage	230.0 V	
99.08 Motor nominal freque...	50.00 Hz	
Back	12:39	Edit

Set 99.06 Motor nominal current
= Motor S.F. current. See motor
nameplate or motor data from
page 5, table 2 or table 3.

Auto	↻ ACQ580	5.0 bar
99 Motor data		
99.03 Motor type	Permanent magnet ...	
99.04 Motor control mode	Scalar	
99.06 Motor nominal current	1.2 A	
99.07 Motor nominal voltage	375.0 V	
99.08 Motor nominal freque...	50.00 Hz	
Back	12:40	Edit

99.07 Set Motor nominal voltage
See the motor data from table 1:
General parameter for EU version or
US version.
There will be a voltage drop over the
sine filter. The following default values
can be used:
EU version: 375 V
US version: 440 V

Optional:
The maximum voltage drop over
the filter can be calculated as:
$$U = \omega * L * I = 2 * \pi * f * L * I$$

f is frequency 100 Hz for EU version,
120 Hz for US version
L is the inductance of the sine
wave filter
I is the S.F. current
Inductance and capacitance values
can be found in filter documentation
or filter nameplate.

Auto	↻ ACQ580	5.0 bar
99 Motor data		
99.04 Motor control mode	Scalar	
99.06 Motor nominal current	1.2 A	
99.07 Motor nominal voltage	375.0 V	
99.08 Motor nominal frequency	100.00 Hz	
Back	12:40	Edit

99.08 Set Motor nominal frequency
Options:
• 100 Hz (EU version)
• 120 Hz (US version)

Auto	↺ ACQ580	5.0 bar
99 Motor data		
99.04 Motor control mode	Scalar	
99.06 Motor nominal current	1.2 A	
99.07 Motor nominal voltage	375.0 V	
99.08 Motor nominal frequ...	100.00 Hz	
99.09 Motor nominal speed	3000 rpm	
Back	12:41	Edit

99.09 Set Motor nominal speed

Options:

- 3000 rpm (EU version)
- 3600 rpm (US version)

Auto	↺ ACQ580	5.0 bar
99 Motor data		
99.08 Motor nominal frequ...	100.00 Hz	
99.09 Motor nominal speed	3000 rpm	
99.10 Motor nominal power	0.75 kW	
99.11 Motor nominal cos φ	0.00	
99.12 Motor nominal torque	0.000 Nm	
Back	12:41	Edit

99.10 Set Motor nominal power according to Motor Specific Data

Auto	↺ ACQ580	5.0 bar
99 Motor data		
99.12 Motor nominal torque	0.000 Nm	
99.13 ID run requested	None	
99.14 Last ID run performed	None	
99.15 Motor polepairs calculated	2	
99.16 Motor phase order	U V W	
Back	12:41	Edit

99.16 Set Motor phase order to: U V W

Make sure to check direction of the pump rotation

Typically, the pump will produce less pressure if the motor is turning in the wrong direction. If direction of the rotation is wrong, it can be changed by changing the value of this parameter.

Limits

Auto	↺ ACQ580	5.0 bar
Complete list		
23 Speed reference ramp	▶	
24 Speed reference conditioning	▶	
25 Speed control	▶	
28 Frequency reference chain	▶	
30 Limits	▶	
Back	10:24	Select

Navigate to parameter group: 30 Limits

Auto	↺ ACQ580	5.0 bar
30 Limits		
30.02 Torque limit status ...0 0000 0000		
30.11 Minimum speed	0.00 rpm	
30.12 Maximum speed	1500.00 rpm	
30.13 Minimum frequency	55.00 Hz	
30.14 Maximum frequency	100.00 Hz	
Back	12:43	Edit

30.13 Set Minimum frequency to: 55 Hz

Auto	↺ ACQ580	5.0 bar
30 Limits		
30.02 Torque limit status ...0 0000 0000		
30.11 Minimum speed	0.00 rpm	
30.12 Maximum speed	1500.00 rpm	
30.13 Minimum frequency	55.00 Hz	
30.14 Maximum frequency	100.00 Hz	
Back	12:43	Edit

30.14 Set maximum frequency to:

- 100 Hz (EU version)
- 120 Hz (US version)

Tuning parameters

Auto	↺ ACQ580	5.0 bar
Complete list		
95 HW configuration	▶	
96 System	▶	
97 Motor control	▶	
98 User motor parameters	▶	
99 Motor data	▶	
Back	12:43	Select

Navigate to parameter group 97 Motor control

Auto	↺ ACQ580	5.0 bar
97.04 Voltage reserve		
01 %		
-5 50		
Cancel	10:14	Save

97.04 Voltage reserve

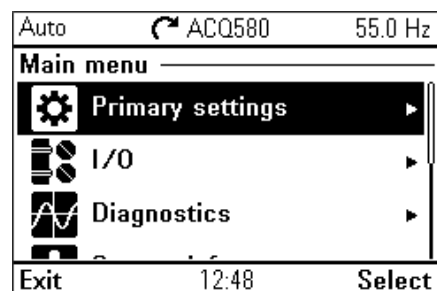
Parameter is used to select how much overmodulation can be used. The default is -2% (little bit of overmodulation is used). With sine filters overmodulation is not preferred. Select 0 to 3% (no overmodulation allowed). Recommended value: 1%.

Auto	↺ ACQ580	5.0 bar
97.13 IR compensation		
03.50 %		
0.00 50.00		
Cancel	12:44	Save

97.13 IR compensation

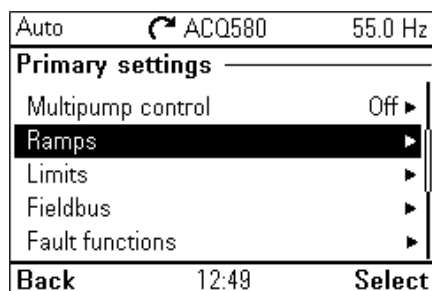
IR compensation helps with the start. Increase by one percent unit if the motor doesn't start and try again. Recommended value 3.5% can be increased up to 10%.

Quick ramps

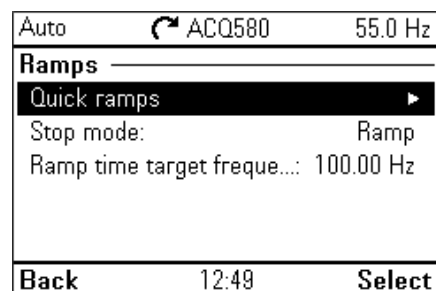


Exit the parameter setting and go to main menu

Navigate to Primary settings

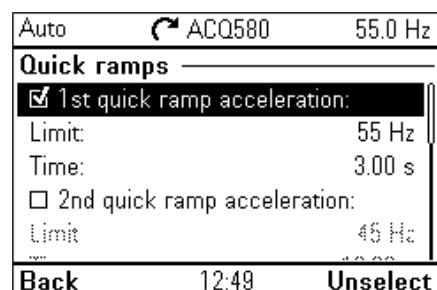


Select Ramps



Set stop mode to ramp

Select Quick ramps to go to the settings for the quick ramp

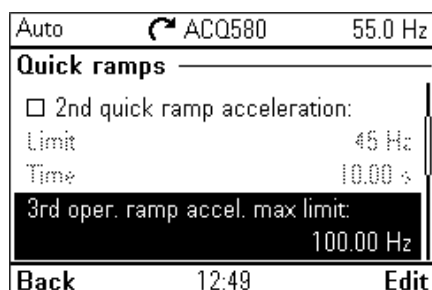


Activate 1st quick ramp acceleration by adding a check mark

Set Limit to: 55 Hz

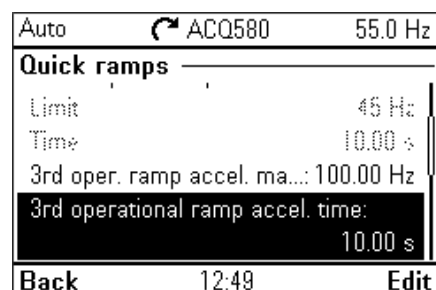
Set Time to: 3 sec

Info: 2nd quick ramp acceleration is not used

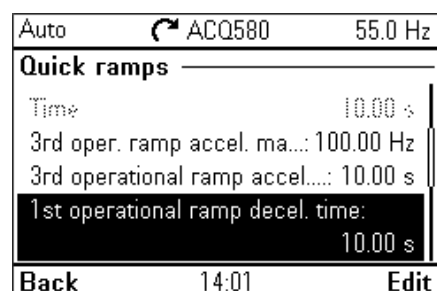


3rd operating ramp acceleration max limit

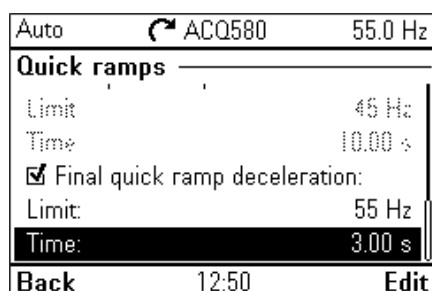
- 100 Hz (EU version)
- 120 Hz (US version)



Set 3rd operational ramp acceleration time to: 10 sec



Set 1st operational ramp deceleration time to: 10 sec



Activate Final quick ramp deceleration by adding a check mark

Set Limit to: 55 Hz

Set Time to: 3 sec

Info: 2nd quick ramp deceleration is not used

More information on quick ramps see ABB SmartGuides:

<https://drives-abb.swipeguide.com/guide/acq580-user-guide/pump-features/quick-ramps>



External filter temperature monitoring

Some biggest filter types have temperature switches installed, which can be connected to the drive to give warning or trip the drive in case of filter overheating.

Auto	↻ ACQ580	0.1 Hz
Primary settings		
Limits		▶
Fieldbus		Off ▶
Fault functions		▶
Security		▶
Advanced functions		▶
Back	17:25	Select

Navigate to Menu > Primary settings > Advanced functions

Auto	↻ ACQ580	0.1 Hz
Advanced functions		
External events		▶
Supervision		▶
Timed functions		Disabled ▶
User sets		▶
☐ Confirmation for HAND/OFF		
Back	17:25	Select

Navigate to External events

Auto	↻ ACQ580	0.1 Hz
External events		
External event 1		Off ▶
External event 2		Off ▶
External event 3		Off ▶
External event 4		Off ▶
External event 5		Off ▶
Back	17:34	Select

Choose any of the External events, e.g. External event 1

Auto	↻ ACQ580	0.1 Hz
External event 1		
☒ Enable		
Trigger from:		DI3 ⓘ
Action:		Warning
Label:		Sine filter temp warning
Instruction line 1:		Sine filter is runni...
Back	17:34	Edit

Select Enable

Select digital input where the temperature switch is connected to, e.g. DI6

Note!

Digital input HIGH (+24V DC) = normal temp

Digital input LOW = excessive temp

Choose action: Fault or Warning (Fault is the default)

Edit the label

Auto	↻ ACQ580	0.1 Hz
Label:		
		abc ABC 123 !?
Sine filter tem		
		Length: 15/35
Cancel	17:47	Save

Label can be edited with control panel or Drive Composer Pro PC tool.

Lower case and capital letters can be used in addition to numbers and symbols.

Auto	↻ ACQ580	0.1 Hz
External event 1		
Trigger from:		DI3 ⓘ
Action:		Warning
Label:		Sine filter temp warning
Instruction line 1:		Sine filter is running hot.
Back	17:35	Edit

Instruction line 1 and 2 can be edited as well.

Auto	↻ ACQ580	0.1 Hz
External event 1		
Action:		Warning
Label:		Sine filter temp warning
Instruction line 1:		Sine filter is runni...
Instruction line 2:		Check ambient conditions
Back	17:35	Edit

Auto	↻ ACQ580	0.1 Hz
 Warning A981 Aux code: 0000 0000 Sine filter temp warning 17:35:23 Sine filter is running hot. Check ambient conditions		
Back	17:35	

The resulting message can be checked with Preview.

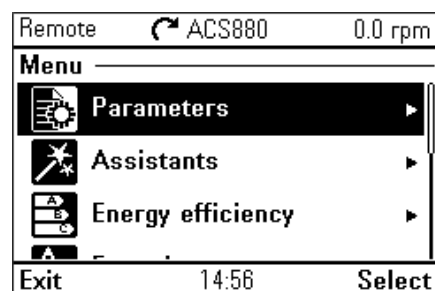
—
ACS880



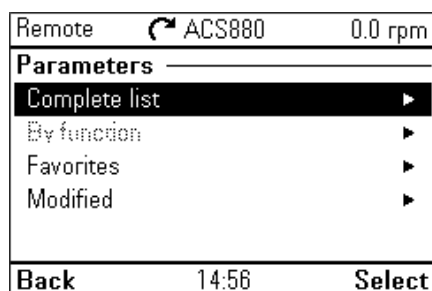
Programming parameters to ACS880

The programming is done using several parameter groups. It is recommended to modify parameters directly in different parameter groups.

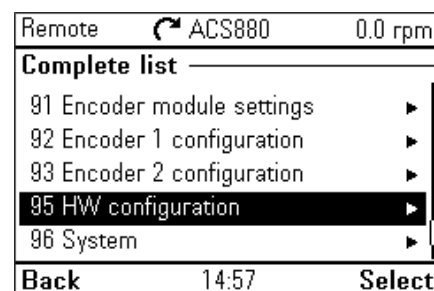
Hardware Configuration



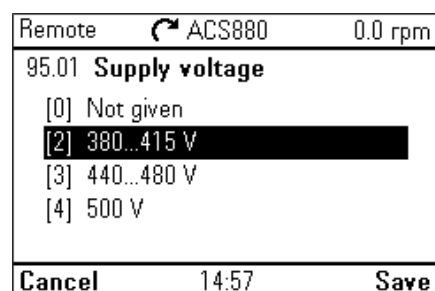
From the main menu go to:
Parameters



Select: Complete list



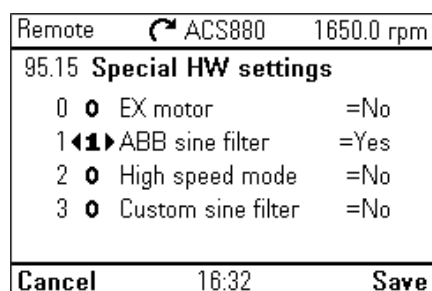
Navigate to parameter group 95
HW configuration



95.01 Supply voltage

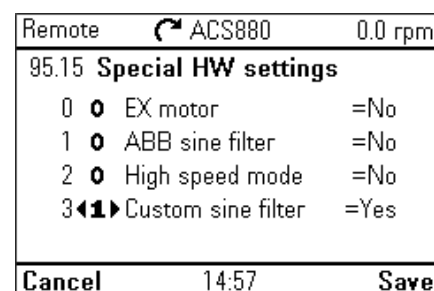
Select:
380-415 V (EU version)
440-480 V (US version)

Remember to Save the selection.



95.15 Special HW settings

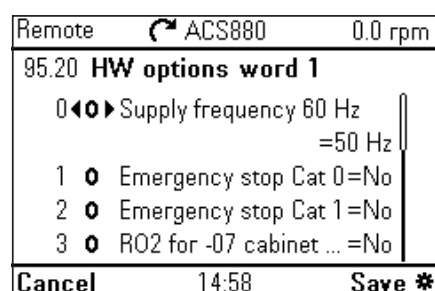
If using ABB recommended TDK sine
filter (EU, max speed 100 Hz):
Select ABB sine filter, bit1:
Bit 01: 0 ABB Sine filter = No
Bit 01: 1 ABB Sine filter = Yes



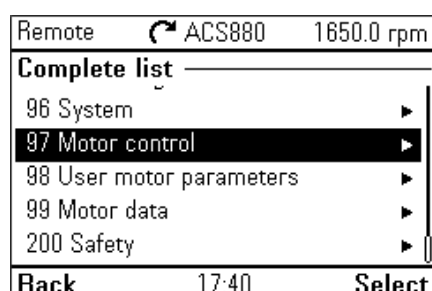
If using ABB recommended MTE sine
filter (US, max speed 120 Hz):
Select Custom sine filter, bit 3:
Bit 03: 0 Custom sine filter = No
Bit 03: 1 Custom sine filter = Yes

Remember to Save the selection.

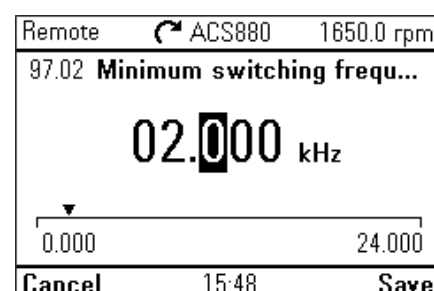
Switching frequency



95.20 Select HW option word 1 to setup
the mains supply frequency
0 = Supply frequency 50 Hz
1 = Supply frequency 60 Hz
Remember to Save the selection.



Only if MTE (US) filters are in use:
Navigate to group 97 Motor control



97.02 Minimum switching frequency

If using ABB recommended MTE sine
filter (US, max speed 120 Hz): Set
minimum switching frequency to 2 kHz.

Motor data

Remote	ACS880	1650.0 rpm
Complete list		
96 System		▶
97 Motor control		▶
98 User motor parameters		▶
99 Motor data		▶
200 Safety		▶
Back	17:40	Select

Navigate to parameter group 99
Motor data

Remote	ACS880	0.0 rpm
99.03 Motor type		
[0] Asynchronous motor		
[1] Permanent magnet motor		
[2] SynRM		
Cancel	14:59	Save

99.03 Motor type
Set Motor type to: [1] Permanent magnet motor

Remote	ACS880	0.0 rpm
99.04 Motor control mode		
[0] DTC		
[1] Scalar		
Cancel	14:59	Save

99.04 Motor control mode
Set Motor control mode to: Scalar

Remote	ACS880	0.0 rpm
99.06 Motor nominal current		
0040.6 A		
▼		
0.0		6400.0
Cancel	15:00	Save

99.06 Motor nominal current
Set motor nominal current.
See page 5 for Motor specific data: for EU version table 2 or US version table 3

Remote	ACS880	1650.0 rpm
99.07 Motor nominal voltage		
350.0 V		
▼		
0.0		800.0
Cancel	17:41	Save

99.07 Set Motor nominal voltage
• 350 V (EU version)
• 410 V (US version)

Remote	ACS880	0.0 rpm
99.08 Motor nominal frequency		
0100.00 Hz		
▼		
0.00		1000.00
Cancel	15:01	Save

99.08 Set Motor nominal frequency
• 100 Hz (EU version)
• 120 Hz (US version)

Remote	ACS880	0.0 rpm
99.09 Motor nominal speed		
03000 rpm		
▼		
0		30000
Cancel	15:01	Save

99.09 Set Motor nominal speed
• 3000 rpm (EU version)
• 3600 rpm (US version)

Remote	ACS880	0.0 rpm
99.10 Motor nominal power		
00000018.50 kW		
▼		
-21474836.48		21474836.47
Cancel	15:01	Save

99.10 Set Motor nominal power
See motor specific data for information

Remote	ACS880	0.0 rpm
99.16 Motor phase order		
[0] U V W		
[1] U W V		
Cancel	15:02	Save

99.16 Set Motor phase order (direction of rotation)
Make sure to check the direction of rotation. Typically, the pump will not deliver expected pressure/flow if the motor is turning in the wrong direction.
If direction of the rotation is wrong, it can be changed by changing the value of this parameter.

Custom filter

Remote	ACS880	0.0 rpm
99.18 Sine filter inductance		
000000.00 mH		
0.000 100000.000		
Cancel	15:07	Save

99.18 Sine filter inductance
(See sine filter nameplate or datasheet)

Remote	ACS880	0.0 rpm
99.19 Sine filter capacitance		
000000.00 uF		
0.00 100000.00		
Cancel	15:07	Save

99.19 Sine filter capacitance
(See sine filter nameplate or datasheet)

Limits

Remote	ACS880	1650.0 rpm
Complete list		
28 Frequency reference chain		
30 Limits		
31 Fault functions		
32 Supervision		
33 Generic timer & counter		
Back	17:45	Select

Navigate to parameter group
30 Limits

Remote	ACS880	0.0 rpm
30.11 Minimum speed		
01650.00 rpm		
-30000.00 30000.00		
Cancel	15:10	Save

30.11 Minimum speed
Set Minimum speed to 1650 rpm
(The minimum speed for the pump is 55 Hz, which corresponds to 1650 rpm when running 4-pole motor)

Remote	ACS880	1500.0 rpm
30.12 Maximum speed		
03100.00 rpm		
-30000.00 30000.00		
Cancel	15:16	Save

30.12 Maximum speed
Set maximum speed 100 rpm higher than the synchronous speed:
• 3100 rpm (EU version)
• 3700 rpm (US version)

Start/Stop mode

Remote	ACS880	1650.0 rpm
Complete list		
20 Start/stop/direction		
21 Start/stop mode		
22 Speed reference selection		
23 Speed reference ramp		
24 Speed reference conditioning		
Back	17:45	Select

Navigate to parameter group
21 Start/stop mode

Remote	ACS880	1500.0 rpm
21.03 Stop mode		
[0] Coast		
[1] Ramp		
[2] Torque limit		
Cancel	15:17	Save

21.03 Stop mode
Set stop mode to: Ramp
(ACS880 default setting is coast to stop)

Speed reference ramp. Configuring the acceleration and deceleration ramps

Remote	ACS880	1650.0 rpm
Complete list		
22 Speed reference selection	▶	
23 Speed reference ramp	▶	
24 Speed reference conditioning	▶	
25 Speed control	▶	
26 Torque reference chain	▶	
Back	17:45	Select

Navigate to parameter group
23 Speed reference ramp

Remote	ACS880	1650.0 rpm
23.11 Ramp set selection		
[6] DI5	▶	
[7] DI6	▶	
[10] DI01	▶	
[11] DI02	▶	
Other	▶	
Cancel	18:02	Edit

23.11 Ramp set selection
Select Other and select parameter P32.01.00 (Supervision status, bit 0) as input
This will set Supervision 1 as the source for Ramp set 1/Ramp set 2 change trigger.

Remote	ACS880	1650.0 rpm
23.11 Ramp set selection		
30 Limits	▶	
31 Fault functions	▶	
32 Supervision	▶	
33 Generic timer & counter	▶	
[32.00.00]		
Back	18:02	Select

Remote	ACS880	1650.0 rpm
23.11 Ramp set selection		
32.01 Supervision status	▶	
32.05 Supervision 1 function	▶	
32.06 Supervision 1 action	▶	
32.07 Supervision 1 signal	▶	
[32.01.00]		
Back	18:02	Select

Remote	ACS880	1650.0 rpm
23.11 Ramp set selection		
0 ☒ Supervision 1 a... Invert ▶		
1 ☐ Supervision 2 a...		
2 ☐ Supervision 3 a...		
[32.01.00]		
Back	15:38	Save

Remote	ACS880	1650.0 rpm
23 Speed reference ramp		
23.01 Speed ref ramp input	0.00 rpm	
23.02 Speed ref ramp output	0.00 rpm	
23.11 Ramp set selection		
32.01.00 Supervision 1 active		
23.12 Acceleration time 1	5.454 s	
Back	15:39	Edit

Supervision will be programmed in parameter group 32. See instructions on page 17

The aim is to accelerate pump from 0 Hz to 55 Hz in 3 sec (acceleration time 1) and from 55 Hz to 100/120 Hz (3000/3600 rpm) in 10 sec (acceleration time 2). Acceleration time 2 can be set according to the application.

Target maximum speed is defined in par 46.01 Speed scaling.

As the ramp acceleration rates are defined as time from zero to full speed, some calculation is needed to be able to enter correct parameter values.

Formula:

Ramp time = Actual time from speed A to speed B * Full speed/Speed change A to B

Example:

1st ramp for EU (100 Hz max):

0 Hz to 55 Hz in 3 sec

Ramp time = 3 sec * 100 Hz/

55 Hz = 5.454545 sec

2nd ramp for EU:

55 Hz to 100 Hz in 10 sec

Ramp time = 10 sec * 100 Hz/

(100-55) Hz = 22.2222 sec

Remote	ACS880	1650.0 rpm
23.12 Acceleration time 1		
0005.454 s		
0.000	1800.000	
Cancel	15:39	Save

23.12 Acceleration time 1
Ramp time used from 0 Hz to 55 Hz

Use 5.450 sec acceleration time 1 (EU version)

Use 6.540 sec acceleration time 1 (US version)

Remote	ACS880	1650.0 rpm
23.13 Deceleration time 1		
0005.454 s		
0.000	1800.000	
Cancel	15:39	Save

23.13 Deceleration time 1
Ramp time used from 55 Hz to 0 Hz

Use 5.450 sec for deceleration time (EU version)

Use 6.540 sec for deceleration time (US version)

Remote	ACS880	1650.0 rpm
23.14 Acceleration time 2		
0022.220 s		
0.000 1800.000		
Cancel	15:40	Save

23.14 Acceleration time 2
Ramp time used from 55 Hz to 100/120 Hz

Use 22.220 sec for the acceleration time 2 (EU version)
Use 18.460 sec for the acceleration time 2 (US version)

Remote	ACS880	1650.0 rpm
23.15 Deceleration time 2		
0022.220 s		
0.000 1800.000		
Cancel	15:40	Save

23.15 Deceleration time 2
Ramp time used from 100/120 Hz to 55 Hz

Use 22.220 sec for the acceleration time 2 (EU version)
Use 18.460 sec for the acceleration time 2 (US version)

Remote	ACS880	1650.0 rpm
23 Speed reference ramp		
23.11 Ramp set selecti... 32.01.00 Su...		
23.12 Acceleration time 1 5.454 s		
23.13 Deceleration time 1 5.454 s		
23.14 Acceleration time 2 22.220 s		
23.15 Deceleration time 2 22.220 s		
Back	15:44	Edit

All parameter group 23 settings done

Monitoring/scaling settings

Remote	ACS880	1650.0 rpm
Complete list		
45 Energy efficiency		
46 Monitoring/scaling settings		
47 Data storage		
49 Panel port communication		
50 Fieldbus adapter (FBA)		
Back	17:45	Select

Navigate to parameter group 46 Monitoring/scaling settings

Remote	ACS880	1650.0 rpm
46.01 Speed scaling		
03000.00 rpm		
0.10 30000.00		
Cancel	15:45	Save

46.01 Speed scaling
Select 3000 rpm (EU version)
Select 3600 rpm (US version)

Supervision

Remote	ACS880	1650.0 rpm
Complete list		
31 Fault functions		
32 Supervision		
33 Generic timer & counter		
35 Motor thermal protection		
36 Load analyzer		
Back	17:46	Select

Navigate to parameter group 32 Supervision

This is a part of setting up "Quick ramps" in ACS880

Remote	ACS880	1650.0 rpm
32.05 Supervision 1 function		
[0] Disabled		
[1] Low		
[2] High		
[3] Abs low		
[4] Abs high		
Cancel	15:45	Save

32.05 Supervision 1 function
Select: Abs. high

Remote	ACS880	1650.0 rpm
32.07 Supervision 1 signal		
[9] AI1		
[10] AI2		
[18] Speed ref ramp in		
[19] Speed ref ramp out		
[20] Speed ref used		
Cancel	15:46	Save

32.07 Supervision 1 signal
Select: Speed ref used
(Monitored signal = Speed ref used)

Remote	ACS880	1650.0 rpm
32.10 Supervision 1 high		
00001650.00		
-21474830.08 21474830.08		
Cancel	15:46	Save

32.10 Supervision 1 high
Select: 1650
Ramp 1 will be used below 1650 rpm
Ramp 2 will be used above 1650 rpm
This sets the change between ramps.

Tuning parameters

Remote	ACS880	1650.0 rpm
45.11 Energy optimizer		
☐ [0] Disable ☒ [1] Enable		
Cancel	15:47	Save

45.11 Energy optimizer

Select: Enable

Remote	ACS880	1650.0 rpm
97.04 Voltage reserve		
01 %		
-5 50		
Cancel	15:47	Save

97.04 Voltage reserve

Parameter is used to select how much overmodulation can be used. The default is -2% (little bit of overmodulation is used). With sine filters overmodulation is not preferred. Select 0 to 3% (no overmodulation allowed). Recommended value: 1%.

Remote	ACS880	1650.0 rpm
97.13 IR compensation		
03.50 %		
0.00 50.00		
Cancel	15:47	Save

97.13 IR compensation

IR compensation helps with the start. Increase by one percent unit if the motor doesn't start and try again. Recommended value 3.5% can be increased up to 10%.

External filter temperature monitoring

Some biggest filter types have temperature switches installed, which can be connected to the drive to give warning or trip the drive in case of filter overheating.

Remote	ACS880	1650.0 rpm
31.01 External event 1 source		
☐ [5] DI3 ☐ [6] DI4 ☐ [7] DI5 ☒ [8] DI6 ☐ [11] DI01 ☐ [12] DI02		
Cancel	17:39	Save

31.01 External event source

Select digital input where the temperature switch is connected to, e.g. DI6

Note!

Digital input HIGH (+24V DC) = normal temperature

Digital input LOW = excessive temperature

Remote	ACS880	1650.0 rpm
31.02 External event 1 type		
☒ [0] Fault ☐ [1] Warning ☐ [3] Warning/Fault		
Cancel	17:39	Save

31.02 External event type

Action in case External event source DI goes LOW. Default action is to Fault the drive.

Grundfos MS6000P series motor, ABB drive and TDK sine filter packages

EU, 50 Hz, 400 Vac

Grundfos MS6000P			ABB drive for water, ACQ580			
Part number	Motor power (kW)	Motor S.F. current (A)	Drive type, IP21	Drive type, IP55	Nominal power (kW)	Current w / sine filter (A)
76207712	4	9.6	ACQ580-01-12A7-4	ACQ580-01-12A7-4+B056	5.5	12.1
	5.5	12.6	ACQ580-01-018A-4	ACQ580-01-018A-4+B056	7.5	16
	7.5	16.6	ACQ580-01-026A-4	ACQ580-01-026A-4+B056	11	24
76207717	9.2	21.4	ACQ580-01-026A-4	ACQ580-01-026A-4+B056	11	24
	11	25	ACQ580-01-033A-4	ACQ580-01-033A-4+B056	15	31
	13	29.2	ACQ580-01-033A-4	ACQ580-01-033A-4+B056	15	31
	15	33.4	ACQ580-01-039A-4	ACQ580-01-039A-4+B056	18.5	37
	18.5	40.6	ACQ580-01-046A-4	ACQ580-01-046A-4+B056	22	43
76207720	22	46.2	ACQ580-01-062A-4	ACQ580-01-062A-4+B056	30	58
	26	54	ACQ580-01-062A-4	ACQ580-01-062A-4+B056	30	58
	30	61.8	ACQ580-01-073A-4	ACQ580-01-073A-4+B056	37	64
76207722	37	85.6	ACQ580-01-106A-4	ACQ580-01-106A-4+B056	55	91
	45	103	ACQ580-01-145A-4	ACQ580-01-145A-4+B056	75	126

Grundfos MS6000P			ABB ultra-low harmonic drive for water, ACQ580-31			
Part number	Motor power (kW)	Motor S.F. current (A)	Drive type, IP21	Drive type, IP55	Nominal power (kW)	Current w / sine filter (A)
76207712	4	9.6	ACQ580-31-12A7-4	ACQ580-31-12A7-4+B056	5.5	12.1
	5.5	12.6	ACQ580-31-018A-4	ACQ580-31-018A-4+B056	7.5	16
	7.5	16.6	ACQ580-31-026A-4	ACQ580-31-026A-4+B056	11	24
76207717	9.2	21.4	ACQ580-31-026A-4	ACQ580-31-026A-4+B056	11	24
	11	25	ACQ580-31-033A-4	ACQ580-31-033A-4+B056	15	31
	13	29.2	ACQ580-31-033A-4	ACQ580-31-033A-4+B056	15	31
	15	33.4	ACQ580-31-039A-4	ACQ580-31-039A-4+B056	18.5	37
	18.5	40.6	ACQ580-31-046A-4	ACQ580-31-046A-4+B056	22	43
76207720	22	46.2	ACQ580-31-062A-4	ACQ580-31-062A-4+B056	30	58
	26	54	ACQ580-31-062A-4	ACQ580-31-062A-4+B056	30	58
	30	61.8	ACQ580-31-073A-4	Available mid-2022	37	64
76207722	37	85.6	ACQ580-31-106A-4	ACQ580-31-106A-4+B056	55	91
	45	103	ACQ580-31-145A-4	ACQ580-31-145A-4+B056	75	126

Grundfos MS6000P			ABB industrial drive, ACS880			
Part number	Motor power (kW)	Motor S.F. current (A)	Drive type, IP21	Drive type, IP55	Nominal power (kW)	Current w / sine filter (A)
76207712	4	9.6	ACS880-01-12A6-3	ACS880-01-12A6-3+B056	5.5	12.1
	5.5	12.6	ACS880-01-017A-3	ACS880-01-017A-3+B056	7.5	16
	7.5	16.6	ACS880-01-025A-3	ACS880-01-025A-3+B056	11	24
76207717	9.2	21.4	ACS880-01-025A-3	ACS880-01-025A-3+B056	11	24
	11	25	ACS880-01-032A-3	ACS880-01-032A-3+B056	15	31
	13	29.2	ACS880-01-032A-3	ACS880-01-032A-3+B056	15	31
	15	33.4	ACS880-01-038A-3	ACS880-01-038A-3+B056	18.5	37
	18.5	40.6	ACS880-01-045A-3	ACS880-01-045A-3+B056	22	43
76207720	22	46.2	ACS880-01-061A-3	ACS880-01-061A-3+B056	30	58
	26	54	ACS880-01-061A-3	ACS880-01-061A-3+B056	30	58
	30	61.8	ACS880-01-072A-3	ACS880-01-072A-3+B056	37	64
76207722	37	85.6	ACS880-01-105A-3	ACS880-01-105A-3+B056	55	91
	45	103	ACS880-01-145A-3	ACS880-01-145A-3+B056	75	126

TDK sine filter			
Type IP00	Filter max current (A)	Type IP21	Filter max current @100 Hz (A)
B84143V0012R231	12	B84143V0011R229 + B84143Q0004R229	11
B84143V0016R229	16	B84143V0016R229 + B84143Q0006R229	16
B84143V0038R231	38	B84143V0025R229 + B84143Q0008R229	25
B84143V0038R231	38	B84143V0025R229 + B84143Q0008R229	25
B84143V0038R231	38	B84143V0025R229 + B84143Q0008R229	25
B84143V0038R231	38	B84143V0033R229 + B84143Q0008R229	33
B84143V0038R231	38	B84143V0050R229 + B84143Q0010R229	50
B84143V0043R231	43	B84143V0050R229 + B84143Q0010R229	50
B84143V0064R231	64	B84143V0050R229 + B84143Q0010R229	50
B84143V0064R231	64	B84143V0066R229 + B84143Q0010R229	66
B84143V0064R231	64	B84143V0066R229 + B84143Q0010R229	66
B84143V0091R231	91	B84143V0095R229 + B84143Q0012R229	95
B84143V0145R231	145	B84143V0162S229 + B84143Q0014R229	162

TDK sine filter			
Type IP00	Filter max current (A)	Type IP21	Filter max current @100 Hz (A)
B84143V0012R231	12	B84143V0011R229 + B84143Q0004R229	11
B84143V0016R229	16	B84143V0016R229 + B84143Q0006R229	16
B84143V0038R231	38	B84143V0025R229 + B84143Q0008R229	25
B84143V0038R231	38	B84143V0025R229 + B84143Q0008R229	25
B84143V0038R231	38	B84143V0025R229 + B84143Q0008R229	25
B84143V0038R231	38	B84143V0033R229 + B84143Q0008R229	33
B84143V0038R231	38	B84143V0050R229 + B84143Q0010R229	50
B84143V0043R231	43	B84143V0050R229 + B84143Q0010R229	50
B84143V0064R231	64	B84143V0050R229 + B84143Q0010R229	50
B84143V0064R231	64	B84143V0066R229 + B84143Q0010R229	66
B84143V0064R231	64	B84143V0066R229 + B84143Q0010R229	66
B84143V0091R231	91	B84143V0095R229 + B84143Q0012R229	95
B84143V0145R231	145	B84143V0162S229 + B84143Q0014R229	162

TDK sine filter			
Type IP00	Filter max current (A)	Type IP21	Filter max current @100 Hz (A)
B84143V0011R229	11	B84143V0011R229 + B84143Q0004R229	11
B84143V0016R229	16	B84143V0016R229 + B84143Q0006R229	16
B84143V0025R229	25	B84143V0025R229 + B84143Q0008R229	25
B84143V0025R229	25	B84143V0025R229 + B84143Q0008R229	25
B84143V0025R229	25	B84143V0025R229 + B84143Q0008R229	25
B84143V0033R229	33	B84143V0033R229 + B84143Q0008R229	33
B84143V0050R229	50	B84143V0050R229 + B84143Q0010R229	50
B84143V0050R229	50	B84143V0050R229 + B84143Q0010R229	50
B84143V0050R229	50	B84143V0050R229 + B84143Q0010R229	50
B84143V0066R229	66	B84143V0066R229 + B84143Q0010R229	66
B84143V0066R229	66	B84143V0066R229 + B84143Q0010R229	66
B84143V0095R229	95	B84143V0095R229 + B84143Q0012R229	95
B84143V0130S230	130	B84143V0130S230 + B84143Q0020R229	130

Grundfos MS6000P series motor, ABB drive and MTE sine filter packages

US, 60 Hz, 440-480 Vac

Grundfos MS6000P				ABB drive for water, ACQ580			
Part number	Motor power		Motor S.F. current (A)	Drive type (US) UL/Nema Type 1	Drive type (US) UL/Nema Type 12	Nominal power (kW)	Current @2 kHz swf (A)
	(kW)	(hp)					
76374612	4	5	8.8	ACQ580-01-012A-4	ACQ580-01-012A-4+B056	7.5	12
	5.5	7.5	12.4	ACQ580-01-014A-4	ACQ580-01-014A-4+B056	10	14
	7.5	10	16.2	ACQ580-01-023A-4	ACQ580-01-023A-4+B056	15	23
76374617	9.2	12	20.6	ACQ580-01-023A-4	ACQ580-01-023A-4+B056	15	23
	11	15	24.2	ACQ580-01-027A-4	ACQ580-01-027A-4+B056	20	27
	13	17	28.2	ACQ580-01-034A-4	ACQ580-01-034A-4+B056	25	34
	15	20	32.2	ACQ580-01-034A-4	ACQ580-01-034A-4+B056	25	34
	18.5	25	39	ACQ580-01-044A-4	ACQ580-01-044A-4+B056	30	44
76374620	22	30	44.8	ACQ580-01-052A-4	ACQ580-01-052A-4+B056	40	52
	26	35	52.4	ACQ580-01-065A-4	ACQ580-01-065A-4+B056	50	65
	30	40	60	ACQ580-01-065A-4	ACQ580-01-065A-4+B056	50	65
76374621	37	50	82.6	ACQ580-01-096A-4	ACQ580-01-096A-4+B056	75	96

Grundfos MS6000P				ABB ultra-low harmonic drive for water, ACQ580-31			
Part number	Motor power		Motor S.F. current (A)	Drive type (US) UL/Nema Type 1	Drive type (US) UL/Nema Type 12	Nominal power (kW)	Current @2 kHz swf (A)
	(kW)	(hp)					
76374612	4	5	8.8	ACQ580-31-012A-4	ACQ580-31-012A-4+B056	7.5	12
	5.5	7.5	12.4	ACQ580-31-014A-4	ACQ580-31-014A-4+B056	10	14
	7.5	10	16.2	ACQ580-31-023A-4	ACQ580-31-023A-4+B056	15	23
76374617	9.2	12	20.6	ACQ580-31-023A-4	ACQ580-31-023A-4+B056	15	23
	11	15	24.2	ACQ580-31-027A-4	ACQ580-31-027A-4+B056	20	27
	13	17	28.2	ACQ580-31-034A-4	ACQ580-31-034A-4+B056	25	34
	15	20	32.2	ACQ580-31-034A-4	ACQ580-31-034A-4+B056	25	34
	18.5	25	39	ACQ580-31-044A-4	ACQ580-31-044A-4+B056	30	44
76374620	22	30	44.8	ACQ580-31-052A-4	ACQ580-31-052A-4+B056	40	52
	26	35	52.4	ACQ580-31-065A-4	Available mid-2022	50	65
	30	40	60	ACQ580-31-065A-4	Available mid-2022	50	65
76374621	37	50	82.6	ACQ580-31-096A-4	ACQ580-31-096A-4+B056	75	96

Grundfos MS6000P				ABB industrial drive, ACS880			
Part number	Motor power		Motor S.F. current (A)	Drive type (US) UL/Nema Type 1	Drive type (US) UL/Nema Type 12	Nominal power (kW)	Current @2 kHz swf (A)
	(kW)	(hp)					
76374612	4	5	8.8	ACS880-01-11A0-5	ACS880-01-11A0-5+B056	7.5	11
	5.5	7.5	12.4	ACS880-01-014A-5	ACS880-01-014A-5+B056	10	14
	7.5	10	16.2	ACS880-01-021A-5	ACS880-01-021A-5+B056	15	21
76374617	9.2	12	20.6	ACS880-01-021A-5	ACS880-01-021A-5+B056	15	21
	11	15	24.2	ACS880-01-027A-5	ACS880-01-027A-5+B056	20	27
	13	17	28.2	ACS880-01-034A-5	ACS880-01-034A-5+B056	25	34
	15	20	32.2	ACS880-01-034A-5	ACS880-01-034A-5+B056	25	34
	18.5	25	39	ACS880-01-040A-5	ACS880-01-040A-5+B056	30	40
76374620	22	30	44.8	ACS880-01-052A-5	ACS880-01-052A-5+B056	40	52
	26	35	52.4	ACS880-01-065A-5	ACS880-01-065A-5+B056	50	65
	30	40	60	ACS880-01-065A-5	ACS880-01-065A-5+B056	50	65
76374621	37	50	82.6	ACS880-01-096A-5	ACS880-01-096A-5+B056	75	86

MTE sine filter			
Open type "Modular"	Type 1/2 "General"	Type 3R "Weather"	Filter max current @120 Hz
(A)			
SWGM0012D	SWGG0012D	SWGW0012D	11.2
SWGM0017D	SWGG0017D	SWGW0017D	15.8
SWGM0022D	SWGG0022D	SWGW0022D	20.6
SWGM0022D	SWGG0022D	SWGW0022D	20.6
SWGM0027D	SWGG0027D	SWGW0027D	25.1
SWGM0035D	SWGG0035D	SWGW0035D	32.6
SWGM0035D	SWGG0035D	SWGW0035D	32.6
SWGM0045D	SWGG0045D	SWGW0045D	41.9
SWGM0055D	SWGG0055D	SWGW0055D	51.2
SWGM0065D	SWGG0065D	SWGW0065D	60.5
SWGM0065D	SWGG0065D	SWGW0065D	60.5
SWGM0110D	SWGG0110D	SWGW0110D	102.3

MTE sine filter			
Open type "Modular"	Type 1/2 "General"	Type 3R "Weather"	Filter max current @120 Hz
(A)			
SWGM0012D	SWGG0012D	SWGW0012D	11.2
SWGM0017D	SWGG0017D	SWGW0017D	15.8
SWGM0022D	SWGG0022D	SWGW0022D	20.6
SWGM0022D	SWGG0022D	SWGW0022D	20.6
SWGM0027D	SWGG0027D	SWGW0027D	25.1
SWGM0035D	SWGG0035D	SWGW0035D	32.6
SWGM0035D	SWGG0035D	SWGW0035D	32.6
SWGM0045D	SWGG0045D	SWGW0045D	41.9
SWGM0055D	SWGG0055D	SWGW0055D	51.2
SWGM0065D	SWGG0065D	SWGW0065D	60.5
SWGM0065D	SWGG0065D	SWGW0065D	60.5
SWGM0110D	SWGG0110D	SWGW0110D	102.3

MTE sine filter			
Open type "Modular"	Type 1/2 "General"	Type 3R "Weather"	Filter max current @120 Hz
(A)			
SWGM0012D	SWGG0012D	SWGW0012D	11.2
SWGM0017D	SWGG0017D	SWGW0017D	15.8
SWGM0022D	SWGG0022D	SWGW0022D	20.6
SWGM0022D	SWGG0022D	SWGW0022D	20.6
SWGM0027D	SWGG0027D	SWGW0027D	25.1
SWGM0035D	SWGG0035D	SWGW0035D	32.6
SWGM0035D	SWGG0035D	SWGW0035D	32.6
SWGM0045D	SWGG0045D	SWGW0045D	41.9
SWGM0055D	SWGG0055D	SWGW0055D	51.2
SWGM0065D	SWGG0065D	SWGW0065D	60.5
SWGM0065D	SWGG0065D	SWGW0065D	60.5
SWGM0110D	SWGG0110D	SWGW0110D	102.3



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