

## Services note

# Preventive Maintenance and Reconditioning for wind turbine converters ACS800



**ABB recommends its Preventive Maintenance and Reconditioning services to help control and cut operating costs associated with its wind turbine converters. On-site preventive maintenance is designed around converter maintenance schedules and significantly reduces the risk of failure while increasing the lifetime of a converter. Reconditioning in an authorized ABB service workshop should be considered when major components need replacing according to the maintenance schedule. Both services contribute to higher reliability of the installed plant which in turn helps maintain high productivity.**

### **The importance of maintenance**

The failure probability of industrial products equipped with electronic components, such as wind turbine converters, increases over time. The main reason for failure is aging of components, but it is also greatly affected by the operational conditions. A demanding environment, such as high ambient temperature, humidity, dirt, dust and cyclic heavy loads, can shorten component lifetime as well as maintenance and component replacement intervals.

A component failure may cause consequential damage to other parts of the converter, including power semiconductors.

A maintenance schedule provides a systematic and functional means of maintaining a specific converter type and is based on ABB's extensive experience and know-how of manufacturing and maintaining frequency converters.

### **Preventive maintenance – the lifeblood of a converter**

Converter preventive maintenance consists of annual converter inspections and component replacements according to the product specific maintenance schedule. Specifications of component suppliers are carefully observed, while the environmental and operational conditions of the converter are also considered.

Preventive maintenance is carried out during planned production shutdowns. It should be planned well in advance and the required resources and service parts reserved.

The success of preventive maintenance depends on the information recorded in the service reports provided by the end user. The more thorough the information provided, the greater the benefit.

### All labor and service parts included

The Preventive Maintenance service includes labor, if not agreed otherwise, and the service parts to perform the work according to the maintenance schedule.

Included are inspections of the:

- wind turbine converter and its environmental conditions
- connections
- ribbon and fiber optic cables
- fan and cooling system
- fault logger
- parameters

Tests include:

- functional testing of the converter under normal conditions
- basic measurements with supply voltage

In addition, the following can be purchased as options:

- ESD protected cleaning of the converter
- reforming of the spare module capacitors
- converter spare part inventory

A detailed service report, including recommendations for future actions, is provided once the maintenance work is completed and the inspection data fully analyzed.

Maintenance schedule		Years from startup																					
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<b>Startup</b>	A L	P																					
<b>Cooling</b>																							
<b>Air-cooled unit</b>																							
Cooling fans	A		I	I	I	I	R	I	I	I	I	I	R	I	I	I	I	I	R	I	I	I	I
<b>Liquid-cooled unit</b>																							
Cooling fans	L	I	I	I	I	R	I	I	I	I	R	I	I	I	I	R	I	I	I	I	R	I	I
Add coolant inhibitor	L	I	P	I	P	I	P	I	P	I	P	I	P	I	P	I	P	I	P	I	P	I	P
Water-glycol coolant	L	I	I	I	I	R	I	I	I	I	R	I	I	I	I	I	I	I	R	I	I	I	I
Expansion tank air pressure	L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Cooling water pump	L	I	I	I	I	R	I	I	I	I	I	R	I	I	I	I	I	I	R	I	I	I	I
Cooling water pipe connections	L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<b>Heating</b>																							
Heating fan	A		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<b>Aging</b>																							
Electrolytic capacitors (DC circuit)	L								R										R				
Memory backup battery replacement in the APBU-xx unit	A L	I	I	I	I	R	I	I	I	I	R	I	I	I	I	I	I	R	I	I	I	I	I
<b>Connections and environment</b>																							
AINT, AITF+ flat cables	A L								R										R				
Tightness of terminals	A L					I					I								I				
Quick connector of the converter module	A L			I		I					I								I				
Cabinet air filters	A		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Module air filters	A		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Condition of contactors	A L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Output contactors (maintenance according to manufacturer instructions)	A L	I	I	I	I	I	I	I	I	P	I	I	I	I	I	I	I	I	I	I	I	P	I
Air circuit breaker (maintenance according to manufacturer instructions)	A L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Fiber optic cables (connections)	A L			I		I							I						I				I
Dustiness, corrosion and temperature	A L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Quality of supply voltage	A L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<b>Improvements</b>																							
Based on product notes	A L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<b>Measurements</b>																							
Basic measurements with supply voltage	A L	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
<b>Spare parts</b>																							
Spare parts	A L	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
DC circuit capacitors reforming	L	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Note! Recommended maintenance intervals and component replacements are based on specified operational and environmental conditions. ABB recommends annual converter inspections to ensure the highest reliability and optimum performance. More detailed maintenance information can be found in maintenance instructions, product manuals and on the Internet.

Legend:

- A = Air-cooled wind turbine converter, ACS800
- L = Liquid-cooled wind turbine converter, ACS800
- I = Inspection (visual inspection and maintenance action if needed)
- P = Performance of on/off-site work (commissioning, tests, measurements or other work)
- R = Replacement of component



### Preventive Maintenance kits

Preventive Maintenance kits contain all the necessary replacement parts for a scheduled maintenance. The content of each kit is carefully selected to match the maintenance schedule and the size and other characteristics of a specific drive.

Preventive Maintenance kits can be selected and ordered according to the number of drives in use and their age, ensuring that all the required parts are available for maintenance.

The parts contained within a Preventive Maintenance kit cost less than parts sourced individually. Therefore, engaging in a proactive preventive maintenance plan will prove more cost effective than sourcing spares as a result of an emergency or general repair job. Preventive Maintenance kits are available from [www.abb.com/partsonline](http://www.abb.com/partsonline) for component replacements marked “R” in the maintenance schedule. The local ABB representative can define, select and deliver the correct parts and help plan preventive maintenance. Visit [www.abb.com/drives](http://www.abb.com/drives) to find your nearest ABB representative.

Preventive Maintenance kits for	Every year	Every 5 <sup>th</sup> year	Every 6 <sup>th</sup> year	Every 9 <sup>th</sup> year
<b>Air cooled</b>				
Door filter	X			
Cooling fan (module, lcl-filter)			X	
AINT, AITF+flat cables				X
<b>Liquid cooled</b>				
Cooling fan (module, lcl-filter)		X		
Electrolytic capacitors (DC)				X
AINT, AITF+flat cables				X

## Reconditioning – giving wind turbine converter a new life

While, within preventive maintenance, component replacements can be carried out on-site, ABB recommends that, at least once in the converter's lifetime, it is reconditioned to its original factory condition.

Reconditioning should be considered when major components, such as electrolytic capacitors, need replacing according to the maintenance schedule.

The ABB wind turbine converter Reconditioning service is carried out at an authorized ABB service workshop within a clean environment and with suitable testing facilities. The service includes a full inspection, thorough cleaning and the analysis of individual components, as well as part replacements according to a product specific maintenance schedule. The reconditioned converter is then fully tested.

With on-site preventive maintenance, only the replaced parts come with a warranty whereas with reconditioning the entire module or converter carries a warranty.

### Complete reconditioning

When the converter arrives at the ABB workshop, the following is carried out:

- visual inspection
- electronic boards are dismantled and cleaned ultrasonically
- mechanical parts are washed
- after drying, individual components are analyzed and replaced according to a product specific maintenance schedule
- software is updated

Tests include:

- functional testing
- a load test, using a minimum 50 percent of nominal load

Once all stages are complete, a service report is compiled and a 12 months warranty issued for the complete module or converter.

Exchange units may be available during the reconditioning period. The ABB service engineer or local sales office will be able to advise.

## Non-repairable converters

Following reconditioning, ABB returns the converter with its functionality fully restored. However, if at the workshop the converter is examined and fails to meet ABB's quality standards, ABB can declare the converter non-repairable. Common reasons for a converter to be declared non-repairable include heavy mechanical damage and corrosion.

If an item is declared non-repairable, ABB informs the customer without delay and offers alternative solutions.

### Summary

The advantages and benefits of preventive maintenance include:

Advantage	Benefit
Use of genuine service parts	Increased reliability leading to longer component lifetime
Timely part replacements in accordance with maintenance schedule	Increased reliability leading to reduced converter and plant operational lifetime costs
Economical kit pricing compared to individual part price	Lower operational lifetime costs
Maintenance schedules help long term maintenance budget planning	Schedules help define whether to continue maintenance or to upgrade, retrofit or replace a converter
Updating to the latest software version	Ensures optimum converter performance

In addition to the above, reconditioning includes the following advantages and benefits:

Advantage	Benefit
Work performed in clean service workshop environment. Washing facilities, ESD protected working conditions and comprehensive testing arrangements to maximize the reconditioning quality.	Converter returned to its original condition and entire converter delivered with one year warranty

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

[www.abb.com/windpower](http://www.abb.com/windpower)

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