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**Inspection and Maintenance cycles**  
**Industrial Water chillers and chilled water loop**

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	PROCEDURE		Réf : P16005		Ind : A		
	INSPECTION AND MAINTENANCE CYCLES	MAINTENANCE LEVEL					
			VISITS FREQUENCIES				
			IN	M	2M	Q	S

The following document defines the Inspection and maintenance cycles for industrial water chillers and chilled water loop built and sold by nano to industrial sites and to industrial end-users. nano remind that the installation must be conform to nano's preconisations.


**All tasks defined on inspection and maintenance cycles document must be ensure by end-user or maintenance teams approved by manufacturer during each period to ensure the good working** of the installation (industrial water chillers and water loop). In the case of end-user and/or owner of the installation can not ensure this maintenance program, the manufacturer can't ensure the good working of installation and can't be concerned by any troubles seen on the installation, even during warranty period.


**Glossary:** IN: If needed:

- M : Monthly
- 2M : Each 2 months
- Q : Quarterly
- S : Semester
- Y : Yearly


Maintenance level is defined on page 6 of this document and it refers to the accreditation people for each task and controls needed.

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<ul style="list-style-type: none"><li><b>Chilled Water Circuits:</b></li></ul>										
1	- Pipes :									
	. Seals controls .....	1							X	
	. Shelves controls .....	1							X	
	. Insulating controls .....	1							X	
	- Pipework :									
	. Check if drain/trap are functional.....	2				X				
	. Periodic handling on sluice gate .....	2				X				
	. Seals controls, cable glands and retightening if needed on pipework.....	2	X			X				
	. Painting if necessary .....	2							X	
	- Checking on all water temperatures on water loop.....	1		X						
	- General visual checking .....	1				X				
<ul style="list-style-type: none"><li><b>WaterPump :</b></li></ul>										
2	- permutation (if present / if possible) .....	1	X							
	- Seals controls, cable glands and retightening if needed on pipework.....	2	X			X				
	- Motors lubrication, if needed .....	3			X					
	- Oil level checks (if possible).....	3			X					
	- Electrical isolation measurement and absorbed intensities .....	3				X				
	- Electrical connections audit with retightening .....	2					X			
	- General visual checking.....	2				X				
	- Waterpump seal change (every 3 years).....	4							1/3	
<ul style="list-style-type: none"><li><b>Regulations (valves, servomotors, central and clockboard) :</b></li></ul>										
3	- Check the function of each control valve.....	2				X				
	- Check cable glands and valves .....	2				X				
	- Opening and closing tests on valves .....	2				X				
	- Lubirifcation of operating axles.....	3				X				
	- Set point control with regulation curves and adjustment if needed (reference described during comissionning).....	4	X							
	- Electrical connections audit with retightening .....	2					X			
	- General visual checking.....	3				X				
<ul style="list-style-type: none"><li><b>Heat exchangers :</b></li></ul>										
4	- Disassembly.....	4	X							
	- Cleaing and brushing of internal beam (if removable and if necessary).....	4	X							
	- Inside cleaning of heat exchanger (if removable and if necessary) .	4	X							
	- Beam rewinding .....	4	X							
	- General inspection (ΔT).....	3						X		

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• <u>Water tank:</u> 5 <ul style="list-style-type: none"><li>- Disassembly of inspection hatch (if possible) .....</li><li>- Internal water tank cleaning (if accessible).....</li><li>- Rewinding of inspection hatch (if accessible) .....</li><li>- General water tank check (mud and etancheity) / draining .....</li><li>- Accessories check on water tank (drains, valves, gauges, thermometer...).....</li></ul>		2 2 2 2 2	X X X						X X	
• <u>Expansion Pot/Vessel :</u> 6 <ul style="list-style-type: none"><li>- General pressure on water circuit with water addition if needed .....</li><li>- General visual checking of good working.....</li></ul>		3 3						X X		
• <u>Pressure loading equipments</u> (if present): 7 <ul style="list-style-type: none"><li>- Pressure monitoring on water circuit with water addition if needed bar) .....</li><li>- Periodic check of all pressure switchs and dump valves / safety valves).....</li><li>- General visual checking of good working.....</li></ul>		1 3 2		X				X X		
• <u>Measuring, controls and safety devices:</u> 8 <ul style="list-style-type: none"><li>- Good working checking of thermometers, thermostats, pressure switchs (lack of water).....</li><li>- Thermostat setting (set point) .....</li><li>- Security checks .....</li></ul>		2 3 3		X			X	X		
• <u>Cabinet and electrical panels :</u> 9 <ul style="list-style-type: none"><li>- Dust extraction to avoid any electrical troubles on cabinet and electrical panels.....</li><li>- Electrical connections audit with retightening .....</li><li>- Electrical controls of contactors.....</li><li>- Controls of indicators light.....</li><li>- Audit and check of all electrical executive bodies to shut off and protection.....</li><li>- Electrical isolation measurement.....</li><li>- Electrical absorbed intensities measurement.....</li><li>- Security checks .....</li></ul>		1 2 2 2 2 3 3 2				X X		X X X X X		
• <u>Filters :</u> 10 <ul style="list-style-type: none"><li>- Controls of ΔP Filters with cleaning.....</li><li>- Lack of leaks checks.....</li><li>- Pocket filter substitution (if present) .....</li><li>- Check magnetic field (if present).....</li></ul>		2 1 2 2			X X			X X		
• <u>Water treatments:</u> 11 <ul style="list-style-type: none"><li>- Water analysis : pH, th, TA, TAC, chlorures, sulfites, Iron.....</li></ul>		4						X		

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<ul style="list-style-type: none"> <li><b>Industrial Water chiller (With air condensing units) :</b></li> </ul>									
12									
- HP and LP checks (on each circuit) .....	3			X					
- Visual checks of oil tracks.....	1			X					
- Periodic check of good airflow around industrial water chiller .....	1			X					
- HP and LP safety checks .....	3							X	
- Check if refrigerant leaks .....	3							X	X
- Refrigerant charge, if needed .....	4								
- Electrical isolation measurement.....	3							X	
- Electrical absorbed intensities measurement.....	4								X
- Electrical connections audit with retightening .....	3								X
- Electrical circuits checks .....	3								X
- Contactors verification .....	3								X
- TXV or EEV adjustment, if necessary.....	4								
- Check if no humidity inside frigorific circuit to compressors (each circuit).....	2					X			
- Check of oil level on each compressor, with oil complement if needed.....	3					X			
- Oil quality controls on compressors.....	4								X
- Oil draining/maintenance compressors.....	4								
- Solenoid valve check with step of capacity on frigorific circuit (if present) .....	3					X			
- Superheater (Sh) controls and measures.....	3					X			
- Anti-freeze thermostat.....	4					X			
- Check of ΔT on Heat exchanger/evaporator .....	3					X			
- Check of good working use of water controler.....	3					X			
- MEG/MPG concentration check on the chilled water circuit (if present) .....	3					X			
- Check if good working use of crankcase heater on compressors (if present) .....	3					X			
- Cleaning of all air condensers .....	1					X			
- Check if good functioning of condensating regulation of fans systems.....	3					X			
- Fuse replacements (each 3 years).....	2								1/3
- Power contactors replacement (each 3 years) .....	2								1/3

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## Authorized/certified operators for specific actions

### Level 1 :

- Standard settings – No opening and part changing on installations
- Standard operators

### Level 2 :

- Minor changes/amendments on preventive maintenance
- Service technicians authorized

### Level 3 :

- Needs assessments : fault diagnosis – small mechanical reparation
- Specialized technicians

### Level 4 :

- Important works : Preventive maintenance and corrective maintenance with settings
- Approved technicians by manufacturer or manufacturers teams