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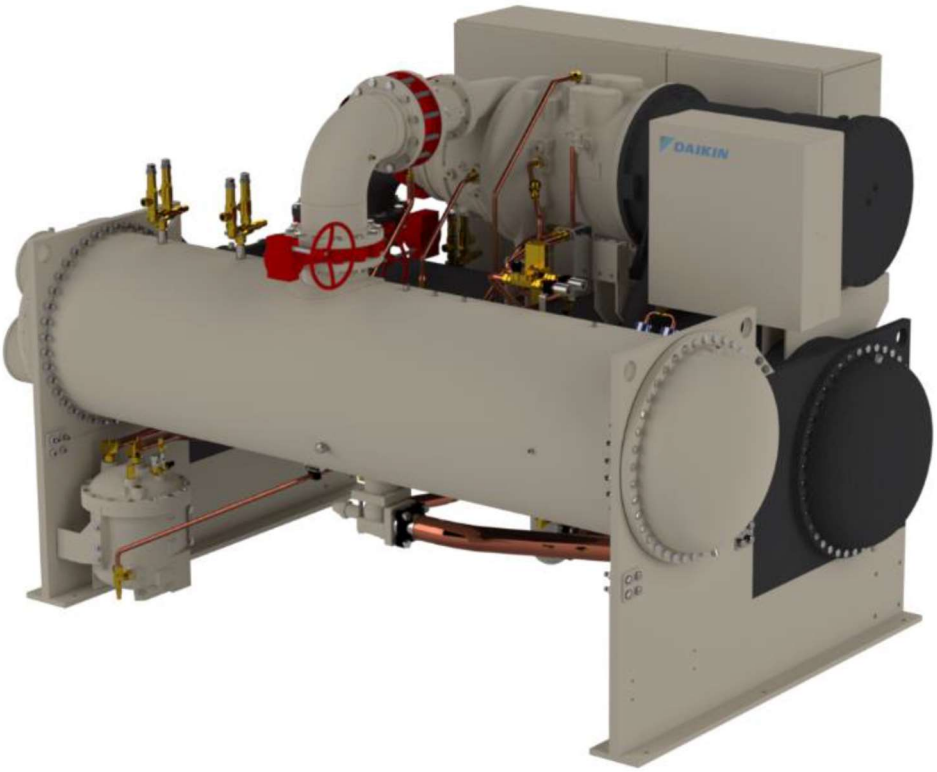
Service Manual

Startup Guide – DWSC VINTAGE C



Original instructions

CE

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1 Technician Qualifications

Initial startup on Daikin chillers must be performed only by Daikin Service Technicians or Authorized Service Providers. The contents of this manual are not intended as a substitute for professional skills training, or knowledge and practice of industry standards. Additional literature will be required that is product and component specific, including: product Installation Manuals, Service Bulletins, selection data, system control and piping specifications, etc. (see List of References on *Paragraph 2* for a list of some supplemental items).

The following information is intended only as a guide for authorized personnel with a sound basic knowledge of HVAC equipment, mechanical systems, electrical wiring, controls, & microprocessors. Attempts by untrained or unauthorized persons to start, operate and service this equipment can result in equipment failure, personal injury, or death, as well as invalidation of product warranty. It is the responsibility of the technician to ensure that proper safety equipment safe practices are used.

Be sure that before beginning any work, the Startup Service Technician has reviewed and is thoroughly familiar with all Daikin Factory Service Safety Policies and Procedures and has reviewed any Service Bulletins or Rapid News regarding this product.

2 Required Tools and Supplies

In addition to standard tools needed on most service jobs, be sure to bring the following items to the jobsite for Startup:

- ☑ Personal Protective Equipment (Safety)
- ☑ Commissioning Sheet
- ☑ Chiller Technical Data, Selection Sheet, and Certified Submittal Drawings
- ☑ Manuals:

  Note: Be sure that all manuals are the current revision appropriate for this unit.
  - This Manual: Startup Guide –DWSC VINTAGE C.
  - Installation, Operation and Maintenance WATER COOLED CENTRIFUGAL CHILLERS (D–EIMWC00803-21_02EN)
  - Control Manual: WATER COOLED CENTRIFUGAL CHILLERS (D-EOMWC00803-21_00EN)
  - DWSC VINTAGE C P&ID (last revision)
  - Wiring Diagram

- ☑ Other technical reference material as necessary
- ☑ Current operating software version downloaded and ready to install if needed:
  - Last NEPTUNE version available on official repository

- ☑ Miscellaneous gauges and hand tools, including:
  - Electronic Leak Detector
  - Differential Pressure Gauge (*adequate for system pressures)*
  - Phase Rotation Meter
  - Refrigeration Gauge Manifold (*Range: 50bar, Accuracy: ±0.5% of Final Value, Resolution: 0.01bar/0.1psi/1kPa*)
  - Digital thermometer (*Range: -50°C/+150°C, Accuracy: ±0.1°C, Resolution: 0.1°C*)
  - Amp probe
  - Voltmeters
  - Recover refrigerant cylinder (*for eventual charge adjustments*)
  - Full refrigerant cylinder *(for eventual charge adjustments)*
  - Recovery pump (*for eventual charge adjustments*)

3 Collaboration and Responsibilities

Throughout the installation and startup process, members of the Daikin Service Department (Supervisor / Coordinator / Technician) must establish contact and meet regularly with the following persons and/or their designated representatives:

- Mechanical, Electrical, and Controls Contractors
- Installing Contractor
- Daikin Sales Department
- Customer/Owner
- Personnel to be trained in unit operation

It is the responsibility of the Daikin Service Representative to ensure that all items on the *Pre-Power On Checklist* are complete and the system is ready for start-up. Upon arrival at the jobsite, the DAIKIN Service technician will verify that all items on the *Pre-Power On Checklist* are complete.
The Chiller Start-up Technician must confirm that the unit installation conforms to Daikin specifications and requirements. This includes mounting and support, piping, electrical and control installations related to the unit. These items must, as a minimum, meet acceptable industry standards and Daikin published requirements. All factory supplied controls and valves must be set and, where required, calibrated. Electrical power and control wiring must be selected and sized as specified by Daikin and the applicable electrical code.
The various contractors associated with the installation have the responsibility to provide the following items (as noted on the Pre-Start Checklist), in accordance with the product IOM, applicable codes and acceptable practices for the trade involved. Note any discrepancies on Commissioning Sheet and notify Supervisor as appropriate. Ensure that access to appropriate systems is available for startup operations.

4 Before Arriving at Jobsite

- Review and Verify Pre-Commissioning Sheet received from the Installer/Customer (*Table D*) Company/Contractor.
- Review Required Materials List on (refer to paragraph 2) and gather necessary items.
- Review Unit Design Specifications.
- Review Unit Selection Sheet.
- Review Startup Guide and Commissioning Form.
- Review IOM.
- Review Control Manual.
- Establish estimated timeline and milestones for Startup.

5 Upon Arrival at Jobsite

Meet with Mechanical, Electrical, and Control Contractors to discuss Startup Process and identify any potential issues that may interfere with a successful startup.

Be sure to meet with the Controls Contractor to discuss and clarify the chiller control sequence and settings for the chiller, towers, pumps, BAS integration, etc…

6 Pre-Power on Checks

Initial Chiller Inspection has to be performed according to the ***Pre-Power On Checklist*** of the Commissioning Sheet by following the instruction below shown.

Verify that all the items are correct. If the system is not ready and/or items on the Pre-Power On Checklist are incomplete, the technician should immediately notify his supervisor and request direction on how to proceed. A separate work order authorization may be required.

6.1 Visual Inspection

- Inspect the chiller for shipping/installation damage including fans and internal parts of condenser.
- Verify that chiller is adequately located, and level mounted as per the IOM according to the minimum space requirements (***Paragraph 2.4***)
- Verify that appropriate anti-vibration pads are installed.
- Visually inspect for oil and refrigerant leaks.
- Record component model and serial numbers as appropriate on Commissioning Form.
- Clean the chiller from any foreign debris and surrounding area.

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

6.2 Leak Test

Before to start with Leak Test, verify that during stock period (from Delivery Date), leak tests have been performed periodically as per local FGas Regulation. Collect all leak test reports for recording purpose.

Connect service gauges. Confirm pressure in the condenser and evaporator, to verify that charge was not leaked during storage/shipping. Using Electronic Leak Detector, leak check entire unit. Be sure to note any leaks found and repairs performed on the Commissioning Sheet. Follow all applicable industry and regulatory authority standards. If refrigerant loss is catastrophic, startup may need to be postponed until appropriate warranty leak repairs are completed.

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

6.3 Water Piping System Check

- Verify water piping as per IOM (***Paragraph 4.6***). The water filter must be installed as close as possible to the chiller, as in Figs. 8 and 9. If the water filter is installed in another part of the water system, the Installer has to guarantee the cleaning of the water pipes between the water filter and the evaporator. Missing filter results withdraw of heat-exchangers warranty.
- Verify if proper glycol percentage for the application in accordance with Daikin specifications.
- Walk length of piping system (in equipment area). Ensure that connections are correctly installed, and piping is properly supported (i.e., not supported by the chiller). Flanges must not be stressed.
- Check evaporator piping for proper flow direction through vessels by consulting Dimensional Drawing. If flow is incorrect, notify Mechanical Contractor, Service Supervisor, and Sales Rep.
- Verify that water pressure gauges are installed at proper locations
- Confirm that all piping specialties (expansion tank, make-up, relief, vents, etc), water pumps are properly installed.

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

6.4 Water Flow

Use Differential Pressure Gauge at the inlet/outlet nozzles of the unit connections to measure the pressure drop across the exchanger/exchangers.

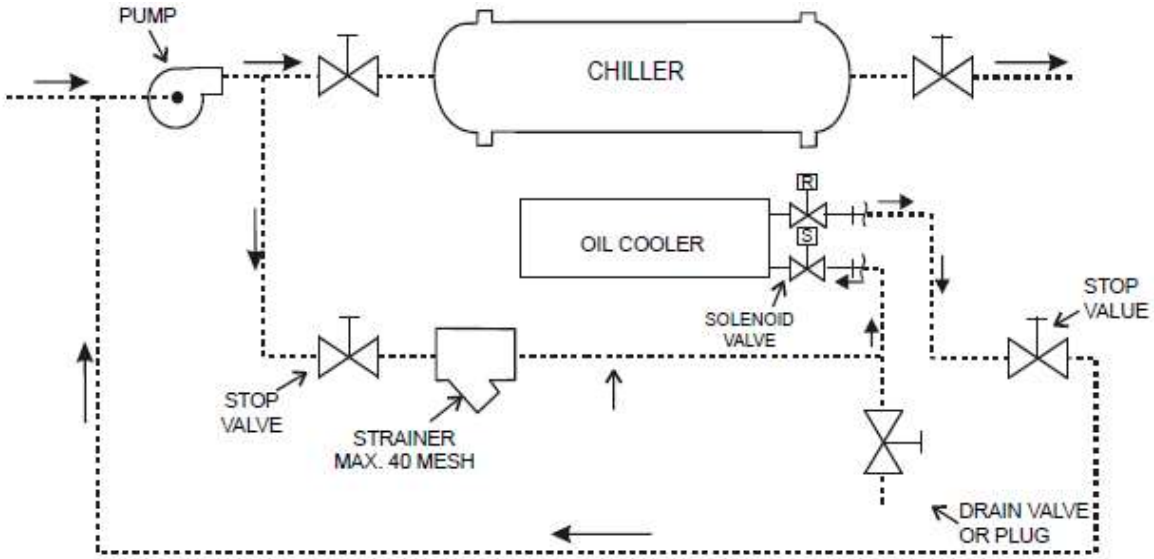
Compare actual flow with Pressure Drop specified on the Unit Selection Sheet. Verify that actual flow is in line with the selection data.

If the measured flow isn't in line with the selection data, then refer to the CSS (Chiller Selection Software) for the verification of allowability of the measured water flow.

If flow is outside of acceptable margins, corrective action is required. If flow is too high, valves may be adjusted to trim flow. If flow is too low, notify Installing Contractor, and note on the Commissioning Form. If flow is different from the selection data, notify Service Supervisor and Sales Rep. Correction may be required prior to startup.
Note any issues in the Commissioning Form (***Pre-Startup Comments***)

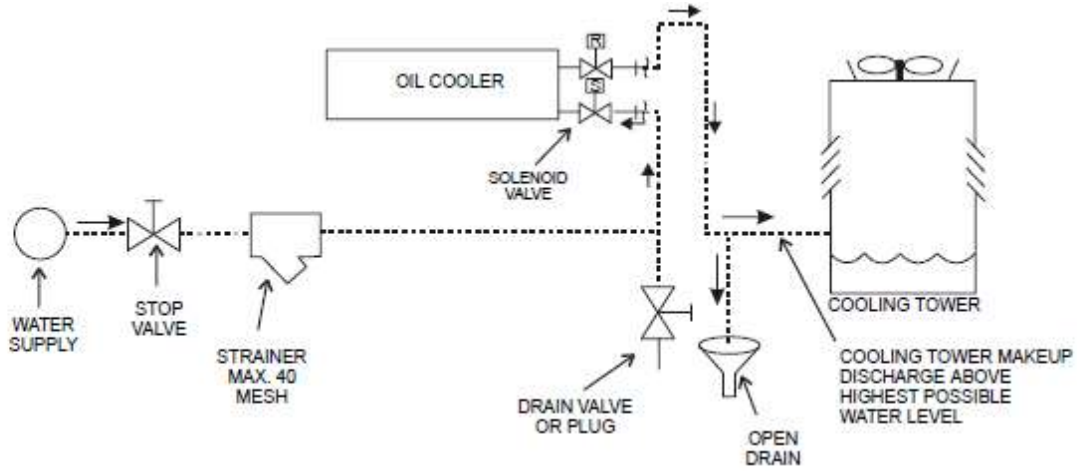
6.5 Oil Cooler Piping

- Check oil cooler piping to assure it is installed as per IOM (paragraph 4.10).
- The oil cooler piping must include a water cleanable strainer (40 mesh maximum) before the solenoid valve and drain valve or plug must also be field installed.
- When using chilled water, it is important that the water pressure drop across the evaporator is greater than the pressure drop across the oil cooler. If the pressure drop across the evaporator is less than the oil cooler, the oil cooler must be piped across the chilled water pump, provided that its pressure drop is sufficient.



The water pressure drop across the evaporator must be greater than the pressure drop across the oil cooler

- When supplied with city water, the oil piping must discharge through a trap into an open drain to prevent draining the cooler by siphoning. The city water can also be used for cooling tower makeup by discharging it into the tower sump from a point above the highest possible water level.



Note any issues in the Commissioning Form (***Pre-Startup Comments***)

6.6 Electric Connections Check

- Check Fuse and/or Circuit Breaker Sizing at the source. Circuit breaker maximum settings will vary with the type of breaker and the type of starter being used.
- Verify that motor connections are not made. Motor leads must be disconnected prior to startup and may only be connected under the supervision of an authorized Daikin Service Startup Technician. On factory-mounted models, motor leads may come from the factory connected, but they MUST be disconnected (For free standing VFD only).
- Clean all construction dirt, debris, and metal filings out of the starter cabinet.
- Tighten all electrical connections, which may have loosened during shipment/installation. Check continuity of power leads for proper termination and mark for proper phasing/connection, if necessary.
- For free standing VFD only, verify proper control wiring between compressor terminal strip and Starter/Drive.
- Check Unit Control Box connections. Ensure all external wiring is properly terminated.
- Check power conductors size, number, and type to the starter disconnect switch. Check conduit size and number).
- Check Conductors size and type between the starter and compressor motor (on Remote Mounted Starters).
- Be sure the wire size is the correct current and temperature rating for the application. The conduit size should be checked to be sure it is adequate for the number and size conductors being used. All wiring conductors connected to McQuay equipment must be copper.
- Check wire size, conduit size and number (all 3 phases in each conduit) and proper termination of wiring to motor terminals (i.e. L1 to T1, L2 to T2, etc.). Do not connect until after starter verifications. Confirm that that the heaters in the oil sump and gear housing are energized and functioning. These heaters must be energized for a minimum of 12 hours before attempting to start the compressor.

Field Wiring Connection

DAE_F03_001

Type Signal description	Function	Page / column		Symbol
Analog input	4 to 20mA	14	7	
Analog input	COMMON CONDENSER LEAVING WATER TEMPERATURE NTC10K probe	17	1	
Analog input	LEAVING WATER TEMPERATURE RESET 4 to 20mA	14	8	
Analog input	ANALOGIC OUTPUT CONDENSER THREE WAY VALVE 0...10Vdc	21	2	
Analog input	ANALOGIC OUTPUT EVAPORATOR THREE WAY VALVE 0...10Vdc	21	4	
Analog output	COOLING TOWER VFD 0 to 10V	15	1	
Digital input	Obligatory	15	7	
Digital input	DOUBLE SET POINT	11	3	
Digital input	UNIT START/STOP REMOTE	11	6	
Digital input	REMOVE JUMPER	11	8	
Digital input	RAPID RESTART ENABLE Remove wire jumper	18	2	
Digital input	REFRIGERANT LEAK DETECTION	15	4	

Type Signal description	Function	Page / column		Symbol
Digital input	EVAPORATOR FLOW SWITCH or DIFFERENTIAL PRESSURE SWITCH Obligatory	14	1	
Digital output	CONTROL EVAPORATOR WATER PUMP 1 Max Load 2A-230Vac External power supply	12	2	
Digital output	UNIT ALARM Max Load 2A-230Vac External power supply	12	4	
Digital output	CONTROL CONDENSER WATER PUMP 1 Max Load 2A-230Vac External power supply	12	5	
Digital output	READY TO START Max Load 2A-230Vac External power supply	20	3	
Digital output	CONTROL COOLING TOWER 1 Max Load 2A-230Vac External power supply	13	1	
Digital output	Max Load 2A-230Vac External power supply	13	2	
Digital output	CONTROL COOLING TOWER 3 Max Load 2A-230Vac External power supply	13	4	
Digital output	CONTROL COOLING TOWER 4 Max Load 2A-230Vac External power supply	13	5	
Digital output	EVAPORATOR WATER PUMP 2 Max Load 2A-230Vac External power supply	13	7	
Digital output	CONDENSER WATER PUMP 2 Max Load 2A-230Vac External power supply	13	8	
Digital output	COMPRESSOR 1 ALARM Max Load 2A-230Vac External power supply	27	1	

Type Signal description	Function	Page / column		Symbol
Digital output	Max Load 2A-230Vac External power supply	27	2	
Digital output	RUN SIGNAL Max Load 2A-230Vac External power supply	20	8	
Digital output	GAS LEAK DETECTOR ALARM OUTPUT Max Load 2A-230Vac External power supply	12	7	
Process bus	REMOTE DISPLAY MASTER/SLAVE BUS Master/Slave bus connection	9	3	

External power supply needed for Digital output terminals
Analog Inputs must be generated through external auxiliary voltage

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

6.6.1 Phase rotation Check

- Disconnect the conductors at the motor (remote starters only) and check continuity on each conductor for proper motor terminations before checking the phase rotation.
- Make sure the starter disconnect is open. Close the disconnect switch at the source supplying power to starter.
- Using proper PPE, check the power at the conductors from the main power source in the motor starter at the incoming terminals of the starter/drive disconnect.

7 Pre-Startup Checks

Once the "*Pre-Power On Checks"* are completed, the technician can proceed with the Pre-Startup Checks by turning on the unit main switch.
Pre-Startup checks must be performed according to the ***Pre-Startup Checklist*** of the Commissioning Sheet by following the instruction below shown.

Make sure that unit switch (Q0) is set in OFF state before turning on the unit main switch

Verify that all the items are correct. If the system is not ready and/or items on the Pre-Startup Checklist are incomplete, the technician should immediately notify his supervisor and request direction on how to proceed. A separate work order authorization may be required.

7.1 Voltage Check

- Verify the electric Main voltage and frequency.
- Verify all on-board auxiliary transformer voltages.
- Verify that the emergency stop contact is closed.

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

If the emergency stop contact is open all the low voltage contact are not energized.

7.2 Heaters check

Oil heaters and compressor crankcase heaters must be energized. Check the heaters amperage with a current clamp.

NEVER attempt to apply an external heat source to the compressor or oil sump, as equipment damage including bearing failures may result. Never touch oil sump or gear hosing heaters, as severe burns are possible. If necessary, cautiously check casting near heaters to verify heaters are operational. This operation is extremely important to ensure a safe commissioning of the unit.

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

7.3 Flow Switches

- Check the water flow safety switches: verify that field-installed flow switches are installed as per the manufacturer's instructions and IOM.
- Any differential pressure switch connections must be made across the vessel they protect.
- Field-installed Flow switches should not be located close to any source of turbulence and should be located in inlet or outlet piping of the vessel away from any shutoff valves or isolation devices.
- Verify flow switches operation, by throttling the flow and verify that switch opens when flow rate falls below 50% of nominal operating flow rate.

Note any issues in the Commissioning Form (***Pre-Startup Comments***)

7.4 Control Settings

- Check all MicroTech 4 controller settings to verify they are optimized for application conditions.
- Download and/or install updated software as needed.
- Verify settings of all safety and operating controls.

7.4.1 Unit Configuration

On the unit controller, enter the “Technician Password” and go into

Main Menu → Commission Unit → Configuration → Unit

Setpoint	Default	Range	Description
Apply Changes=	No	No Yes	Use this command to reset the controller to confirm the configuration made
Apply / Save	No	No Yes	Use this command to save the configuration made
Unit Model	Not Selected	Not Selected	Use this command to select the unit type by copying the 5 digits chiller code from the label. 
Mfg Place	Not Selected	Not Selected Europe USA	Define the chiller location.
Refrigerant	R134A	R134A R1234ZE R513A R515B	This parameter is auto selected after inserted the Unit Model string
Gear Ratio	Blank space	Blank space	This parameter is auto selected after inserted the Unit Model string
Comp VFD	NoVFD	NoVFD VFD	NoVFD= No VFD are mounted. VFD= The compressors run by a VFD.
Inverter Type=	DAE	DAE DANFOSS EXTERNAL	Select the inverter model. DAE for the Daikin Applied on board VFD. Danfoss for Danfoss VFD application. External for any other VFD type application.
Motor Freq	60 HZ	50 HZ 60HZ	Chose the maximum compressor frequency.
Unit RLA Design	Blank	0 - 3000 A	Insert the Unit rated load amps (RLA) that in the selection sheet as Rated Load Amps .
Inv Output Amps	Blank	-	Insert the INV output amps only if DAE VFD are installed present in the selection sheet as Output Amps.

Main Menu → Commission Unit → Configuration → Options

HGBP Enable	Disable	Disable Enable	Select Enable to Enable the Hot gas bypass. In DWSC chiller the HGBP is present only if opt 175 has been purchased.
Power Supply	400 V	380 V 400 V 460 V	Select the actual power supply for the unit after checking it with a mustimeter
Limit Type	None	None Current Demand Flexible	Select Curent, Demand or Flexible depending on the option available. If no option is available leave default value None.
Energy Mtr =	None	None Nemo	Select Nemo in case energy meter is present
Leak Detektor	Disable	Disable Enable	Select enable in case this option is available on the unit
Rapid Restart	Disable	Disable Enable	Select enable in case this option is available on the unit
Alm Out Type	Solid	Solid Blinking	Status of the General Alarm relay Solid= the alarm output will be continuous Blinking= the alarm output will blink
Ext Fault Cfg	None	None Event Alarm	Definition of the unit behaviour after switching of external alarm contact Event= the ext alarm will trigger an event on the unit Alarm= the ext alarm will trigger an alarm on the unit
Water Dp Inpt	None	Evap Cond	Used to regulate the unit in variable flow condition.

		Both	
Water Dp Signal	4 - 20 mA	4 - 20 mA 0 - 10V DI	Select the right value based on the application
Comm Module 1=	None	None IP LON MSTP Modbus AWM	Select whether a connected communication module is present on the left side of the controller. IP → POL908 LON → POL906 MSTP → POL904 Modbus → POL902 AWM → POL909
Comm Module 2=	None	None IP LON MSTP Modbus AWM	Select whether a second communication module is present on the left side of the controller. IP → POL908 LON → POL906 MSTP → POL904 Modbus → POL902 AWM → POL909
Comm Module 3=	None	None IP LON MSTP Modbus AWM	Select whether a third communication module is present on the left side of the controller. IP → POL908 LON → POL906 MSTP → POL904 Modbus → POL902 AWM → POL909
M/S Adress =	None	None Master Slave 1 Slave 2 Slave 3	Defines if the unit is Master or Slave in the M/S system or leave to none in case of standalone unit.
M/S Num Of Units =	2	2 3 4	Defines the number of units in the M/S system
M/S Sns Type	NTC10K	None NTC10K PT1000	Select the type of common LWT temperature sensor used in the M/S system
Display Units	Metric	Metric English	Select the display unit system (metric or imperial)
Liquid Injection	On	On Off	Select On to enable the Liquid Injection logic.
Marine	Disable	Disable Enable	Select Enable for marine application only.
Low THD Filter	Off	Off On	Select on to enable the low harmonic filter.
Pr Sens Type	Std	Std US	Select the Pressure sensor type according to the chiller options.
Mhp	On	On Off	Select Off if there are no Mech high pressure switch on the unit.

After termination of the Unit configuration, it's necessary to restart the controller to activate the settings made through the "Apply changes" command.

The control part of Micro-channel DWSC Vintage C is composed of the controller POL688 + 1 module POL965 and POL94U (depending on whether the machine option, if the HGBP is present).Once the **unit** has been **configured,** after the controller has been restarted, a part of the program will automatically be transferred on the POL965U module. Be careful not to remove the power supply if the BSP and BUS LEDs of both POL94U modules have become green.

7.5 Software Options

Software Options (Only for Microtech 4). The possibility to employ a set of software options has been added to the functionality of the chiller, in according with the new Microtech 4 installed on the Unit. The Software Options do not require any additional hardware and regard communication channels and the new energy functionalities.
During the commissioning the machine is delivered with the Option Set chosen by the customer; the Password inserted is permanent and depends on the Serial Machine Number and the Option Set selected.
The available options are:

1. Modbus Slave MSTP for settings refer to BAS integration guide Doc. Name: D-EIGOC00201-22EN_DWSC
2. BACNet MSTP for settings refer to BAS integration guide Doc. Name: D-EIGOC00101-22EN_DWSC
3. BACNet IP for settings refer to BAS integration guide Doc. Name: D-EIGOC00101-22EN_DWSC

4. Performance Monitoring. The Energy Monitoring is a software option not requiring any additional hardware. It can be activated to achieve an estimation (5% accuracy) of the instantaneous performances of the chiller in terms of:

   • Cooling Capacity
   • Power Input
   • Efficiency-COP

   An integrated estimation of these quantities is provided:

1. iCM Standard for settings and configuration contact servicesupport@daikinapplied.eu
2. iCM Advanced for settings and configuration contact servicesupport@daikinapplied.eu

After termination of the Software Options configuration, it's necessary to restart the controller to activate the settings made through the "Apply changes" command.

7.6 Twin evaporator pump setting

In the case of twin evaporator pumps, set the automatic start-up management pumps.

1. Enter technician password in the controller
2. Open the menu:

Main Menu → View / Set Unit → Pumps → Evp Pmp Ctrl → Auto

7.7 Alarm Limits

On the unit controller, enter the “Technician password” and set the alarm limits in the following menu:

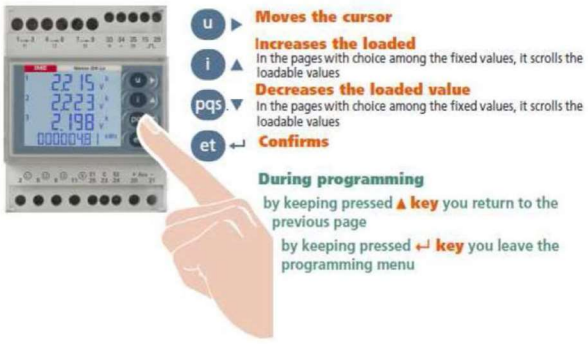
Main Menu → Commission Unit → Alarm Limits

At the end of the Alarm Limits setting a restart of the controller (“Apply Changes”) is required BEFORE to proceed with the startup of the unit.

7.8 Energy Meter

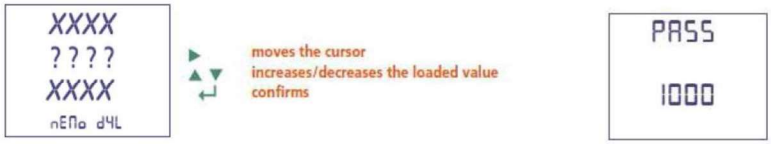
If the unit is provided with Opt.16/16a, proceed with the energy meter settings check.

Function of the buttons:



Acces the setup menu

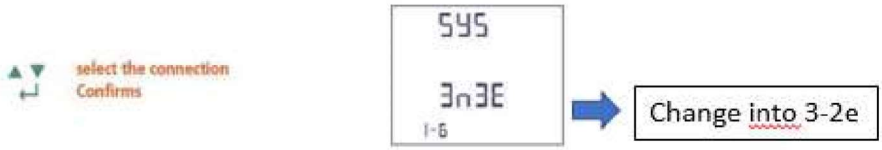
1) press "et " repeatedly until the page is displayed: "nEMo D4L "
2) Press and hold the "et " button until you see the page: "PASS "
3) Enter the password “1000” and confirm with the "et " key.



The “arrow” ▸ is used to move between the various digits, while ▲ ▼ is used to increment or decrement the numerical value of each digit. The ENTER key is used to confirm the password.

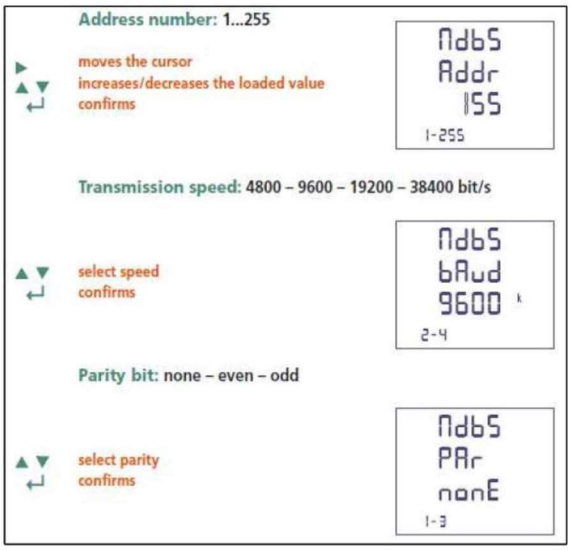
Depending on the wiring configuration, the respective programming scheme must be selected

1) log in with the password "1000 "
2) press the "et " button repeatedly until the page is displayed: "SYS "
3) Select the desired configuration: **3-2e** if the number of current transformers is 2, which is the standard configuration.



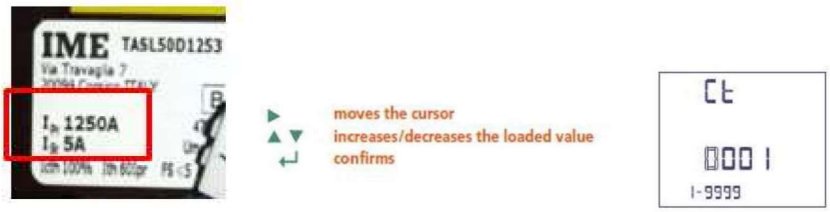
In case the energy meter is integrated in the modbus communication network of the POL687 controller of the chiller unit , the modbus parameters of the Nemo energy meter needs to be updated. It will be necessary to configure the address, transmission speed and parity bit on the energy meter corresponding to those on the chiller controller (POL 687).

1) log in with the password "**1000** "
2) press "et " repeatedly until the page is displayed: "MDB Addr "
3) Select Address **20**
4) press "et " repeatedly until the page is displayed: "MDB BAud "
5) Select the baud rate **19200**
6) press "et " repeatedly until the page is displayed: "MDB par "
7) Select **None** Parity bit



Set the transformation ratio of the current transformers (CT ratio)

On the label of the CT it's indicated what the maximum primary and secondary currents are. For example max primary current 1250A / max secondary current 5A gives an CT ratio of 250 (1250/5)



Warning: the nominal current value at the Ime Nemo Energy meter input terminals should be between 1A~5A. Do not use CT's exceed this range in order to avoid damage to the energy meter!

7.9 Pre-Running Adjustments

It is highly recommended to use a double sample sensor for the calibration of temperature sensors

7.9.1 Check and calibration of unit water side temperature sensors

Calibration of unit temperature sensors is a fundamental step for the correct operation of the unit.
There are three temperature sensors to be calibrated:

- Evaporator LWT
- Evaporator EWT
- Condenser LWT
- Condenser EWT

7.9.1.1 Evaporator Leaving Water Temperature

- Place the sample and Evap LWT sensors in a container with ice
- Enter in *Commission Unit* → *Sensors Calibration* → *Unit* menu and then compare the Evap *LWT* value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Offset* parameter.

Make sure to have a good water/ice mix and wait for the water/ice system temperature to stabilize before to proceed with the calibration.
Place both sensors (sample and unit) in the middle of the container in order to not affect the readings.

7.9.1.2 Evaporator Entering Water Temperature

- Place the sample and Evap EWT sensors in a container with ice
- Enter in *Commission Unit* → *Calibrate Sensors* → *Unit* menu and then compare the Evap *EWT* value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Offset* parameter.

Make sure to have a good water/ice mix and wait for the water/ice system temperature to stabilize before to proceed with the calibration.
Place both sensors (sample and unit) in the middle of the container in order to not affect the readings.

7.9.1.3 Condenser Leaving Water Temperature

- Place the sample and Cond LWT sensors in a container with ice
- Enter in *Commission Unit* → *Sensors Calibration* → *Unit* menu and then compare the Cond LWT value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Offset* parameter.

Make sure to have a good water/ice mix and wait for the water/ice system temperature to stabilize before to proceed with the calibration.
Place both sensors (sample and unit) in the middle of the container in order to not affect the readings.

7.9.1.4 Condenser Entering Water Temperature

- Place the sample and Cond EWT sensors in a container with ice
- Enter in *Commission Unit* → *Sensors Calibration* → *Unit* menu and then compare the Cond EWT value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Offset* parameter.

Make sure to have a good water/ice mix and wait for the water/ice system temperature to stabilize before to proceed with the calibration.
Place both sensors (sample and unit) in the middle of the container in order to not affect the readings.

7.9.2 Check and calibration of unit refrigerant side sensors

Calibration of circuit temperature sensors is a fundamental step for the correct operation of the unit.
There are three temperature sensors to be calibrated (for each circuit):

- The Suction temperature sensor (ST-1 & ST-2)
- The Discharge temperature sensor (DT-1 & DT-2)
- The Liquid temperature sensor.

7.9.2.1 Suction Temperature sensor

- Place the sample and suction temperature sensors in a container with ice
- Enter in *Commission Unit → Sensors Calibration → Compressor 1* menu and then compare the *Suction Tmp* value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Suction Offset* parameter.

Make sure to have a good water/ice mix and wait for the water/ice system temperature to stabilize before to proceed with the calibration.
Place both sensors (sample and unit) in the middle of the container in order to not affect the readings.

Suction temperature sensor is the most crucial of chiller's sensors as will guarantee the correct working of the EXV and consequent safe compressor running

7.9.2.2 Discharge temperature sensor

- Place the sample and discharge temperature sensors in ambient temperature
- Enter in *Commission Unit → Sensors Calibration → Compressor 1*menu and then compare the *Discharge Tmp* value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Disch Offset* parameter.

Make sure to have a stable air conditions and wait until read unit and sample temperatures are stabilized respect to air ambient temperature before to proceed with the calibration.

7.9.2.3 Liquid temperature

- Place the sample and Subcooling temperature sensors in ambient temperature
- Enter in *Commission Unit → Calibrate Sensors → Compressor 1* menu and then compare the *Liquid Temp* value with that detected by the sample sensor
- If the temperature value measured by the unit sensor is different from the sample one, set the difference in the *Liquid Offset* parameter.

Refer to Table A for the complete overview of the components positioning.

7.9.2.4 Evaporator Pressure

- Connect the sample transducer to the "T shape" pressure port on which the suction pressure transducer is installed.
- If the pressure value measured by the unit transducer is different from the sample one, set the difference in the *Evp Pr Offset* parameter.

7.9.2.5 Condenser Pressure

- Connect the transducer to the “T shape” pressure port on which the discharge pressure transducer is installed.

With the unit on, enter in *Commission Unit → Calibrate Sensors → Compressor* 1 menu and then compare the *Cond Pressure* value with the one detected by the sample transducer. If the value of the pressure measured by the unit transducer is different from the sample one, set the difference in the *Cond Pr Offset* parameter

7.9.2.6 Oil sump pressure

- Place the pressure gauge on the vent line pressure transducer port.
- Enter in the Commission Unit → Calibrate Sensors → Compressor #1/2 menu and then compare the Oil sump pressure value with that detected by the guage.
- If the pressure value measured by the unit transducer is different from the gauge one, set the difference in the Oil sump pressure Offset parameter.

7.9.2.7 Oil Feed pressure

- Place the pressure gauge on the sump pressure transducer port.
- Enter in the Commission Unit → Calibrate Sensors → Compressor #1/2 menu and then compare the Oil Feed pressure value with that detected by the gauge.
- If the pressure value measured by the unit transducer is different from the gauge one, set the difference in the Oil Feed pressure Offset parameter.

7.10 Dry Tests

Perform the Dry Tests by setting the unit in “test mode”:

1. Enter the “Technician Password” on the controller
2. Go in *Main Menu → Unit Mode → Mode*
3. Set *Test*

All the dry tests are performable through the following menu:

Main Menu → Commission Unit → Manual Control

7.10.1 Unit Alarm

Check the correct activation of the software general alarm:

Main Menu → Commission Unit → Manual Control → Unit → Unit Alarm

7.10.2 Compressor Alarm

Check the correct activation of the software general alarm:

Main Menu → Commission Unit → Manual Control → Unit → Compressor Alarm

7.10.3 Evap Pump #1/#2

Check the correct activation of the water pump (if it is controlled by the unit):

Main Menu → Commission Unit → Manual Control → Unit → Pump #1/#2→ set Pump Speed in %.

7.10.4 Cond Pump #1/#2

Check the correct activation of the water pump (if it is controlled by the unit):

Main Menu → Commission Unit → Manual Control → Unit → Pump #1/#2→ set Pump Speed in %.

7.10.5 Tower Fan Step

Check the correct activation of the cooling tower fan steps (if it is controlled by the unit):

Main Menu → Commission Unit → Manual Control → Unit → Tower Step X

7.10.6 Tower VFD

Check the correct modulation of the cooling tower fan VFD (if it is controlled by the unit):

Main Menu → Commission Unit → Manual Control → Unit → Tower VFD → set Fan Speed in %.

7.10.7 3 Way Valve

Check the correct modulation of the 3 Way Valve (if it is controlled by the unit):

Main Menu → Commission Unit → Manual Control → Unit → 3 Way Valve → set % opening.

7.10.8 Expansion Valve

Verify the correct operation of the EXV valves:

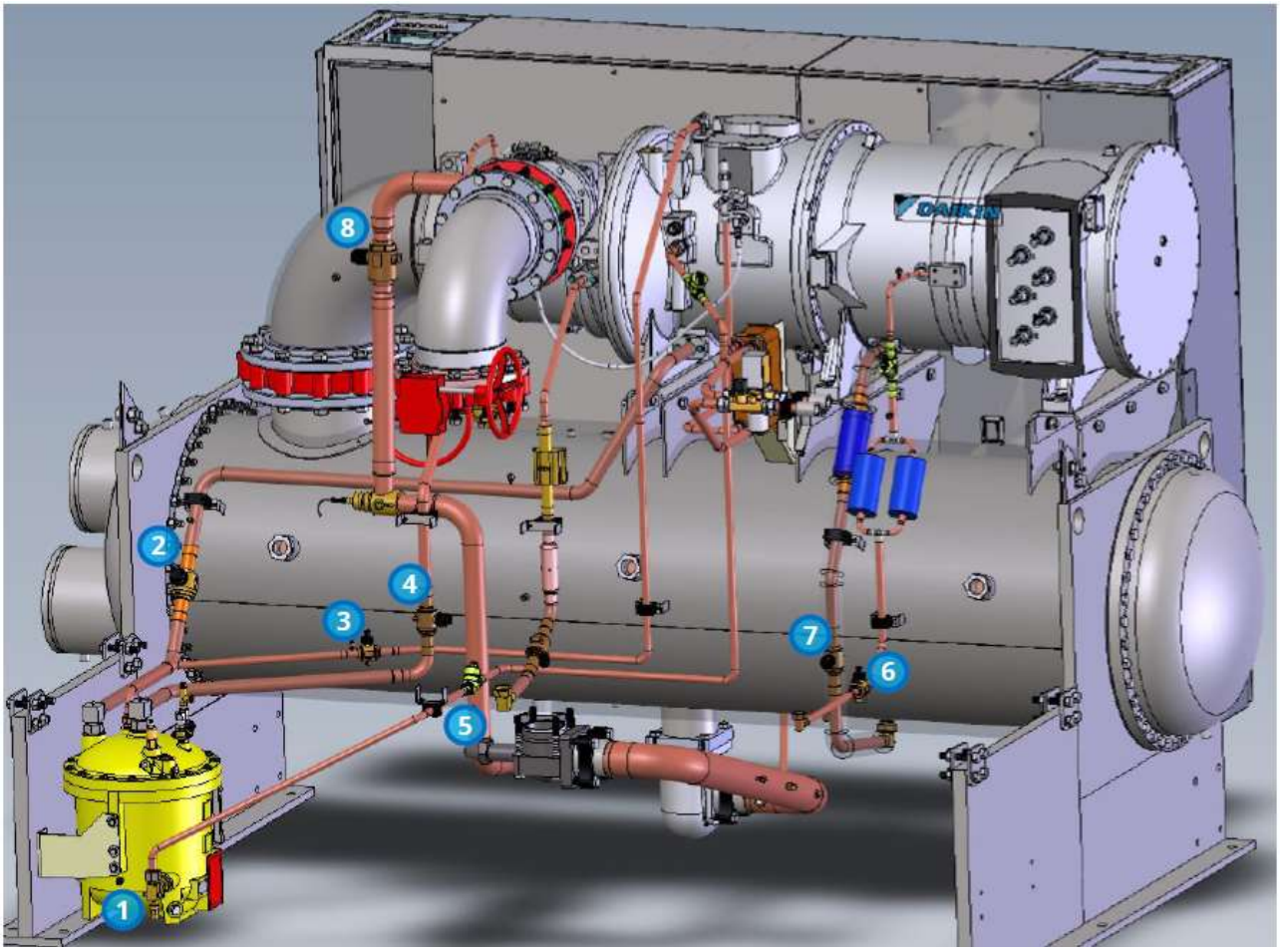
Main Menu → Commission Unit → Manual Control → Compressor → EXV Position

And set the opening percentage, it is possible to verify the movement of the piston inside the expansion valve through the glass port on it.

7.11 Service Valves check

As follows a list of all the service valves that need to be opened:

1. Oil feed line
2. Oil drain line
3. Oil equalizer line
4. Vent line
5. Liquid line
6. Motor cooling line
7. Vapor return line
8. Hot Gas Bypass line
9. VFD cooling in line
10. VFD Cooling out line
11. LHF cooling in line
12. LHF cooling out line



	***Before activating the oil pump, it is necessary to open all the services valve. The service valve can be opened only if the oil sump temperature is bigger than the evaporator saturated temperature.***

7.12 IGV calibration

The oil net pressure value must be within **670÷730 kPa**. The net pressure can be adjusted through the feed bypass valve.

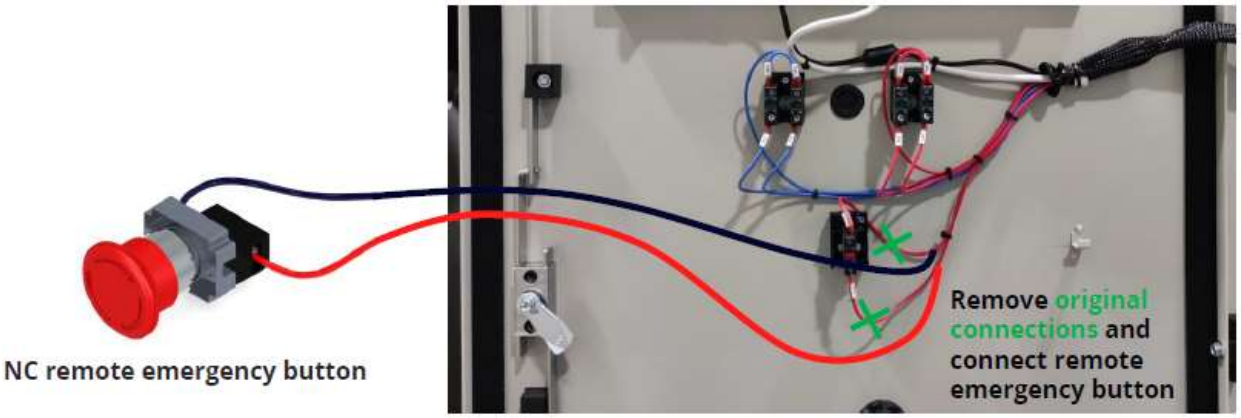
With the unit:

- Put the unit in test mode (see paragraph 7.9).
- In *Commission Unit → Manual control → Compressor → Test Oil Pump → on.*
- Once the oil pump is running, move the Bypass valve since the oil net pressure is in the acceptability range.
- To check the net pressure: *View/Set Circuit → View/Set Comp → Compressor 1 → Data → Oil Net Pres.*
- In *Commission Unit → Calibrate Sensors → Compressor 1 → IGV calibration → Start → On.*

7.13 Bump Test

A bump test must be performed to make sure that the direction of rotation is correct:

1. Wire a remote NC emergency button.



2. Bump the compressor using a normal starting sequence.
3. **IMMEDIATELY STOP THE COMPRESSOR,** through the remote emergency button
4. Check for the rotation direction through the sight glasses placed on the back of the motor housing.

8 Start-Up

The first data acquisition must be performed in “Cooling mode”, in order to also check the correctness of the refrigerant charge by measuring the subcooling.

To do that, follow these steps:

1. Enter the “Technician Password” on the controller
2. Go in Main Menu→Unit Mode → Mode and set Cool
3. Go in *Main Menu → Unit Enable*
4. Set *Compressor 1 → Enable*
5. Set *Unit→ Enable*
6. *Set on Local the switch Q0*

8.1 Running Adjustments

Running Adjustments must be performed while the unit is running near the rating conditions.

Make sure that the Unit is working in cooling mode in stable conditions in order to don’t affect the following operations result

Make sure that the unit status is "Run: Normal" before to proceed with the Running Adjustments

8.1.1 Check and calibration of pressure transducers

Calibration of pressure transducers is a fundamental step for the correct operation of the unit.
There are three pressure sensors to be calibrated:

- The suction pressure transducers
- The discharge pressure transducers
- The oil pressure transducers

8.1.2 Evaporator Pressure check

Double check the evaporator pressure transducer:

- Connect the sample transducer to the "T shape" pressure port on which the suction pressure transducer is installed.
- With the unit on, with the *Suction Temperature* of 7°C ± 1°C and before making gas charge adjustments, enter the *Commission Unit → Calibrate Sensors → Compressor 1* menu and then compare the *Evap Pressure* value with that detected by sample transducer
- If the pressure value measured by the unit transducer is different from the sample one, set the difference in the *Evp Pr Offset* parameter.

Sample transducer is the measuring device has been calibrated and it must be very accurate.

If this difference is greater than ± 100 kPa replace the transducer and repeat the operation.

Evaporator pressure transducer is the most crucial of chiller's transducer as will guarantee the correct working of the EXV with consequent safe compressor running and since all low-pressure safeties are based on its readings.

8.1.3 Condenser Pressure check

Double check the condensor pressure transducer:

- Connect the transducer to the "T shape" pressure port on which the discharge pressure transducer is installed.
- With the unit on, enter in *Commission Unit → Calibrate Sensors → Compressor* 1 menu and then compare the *Cond Pressure* value with the one detected by the sample transducer. If the value of the pressure measured by the unit transducer is different from the sample one, set the difference in the *Cond Pr Offset* parameter.

If this difference is greater than ± 100 kPa replace the transducer and repeat the operation.

8.1.4 Oil net pressure adjusting

After the IGV calibration the oil net pressure must be adjusted whit the running unit.

- Enable the unit and the Compressor.
- Once the oil pump is running, move the Bypass valve since the oil net pressure is in the acceptability range.

- To check the net pressure: *View/Set Circuit → View/Set Comp → Compressor 1 → Data → Oil Net Pres.*

9 Running Safeties Test

9.1.1 Flow Switches

With the running unit, disable the water pumps and check if “Water Flow Loss” alarm appears after 30sec.
If not, check proceed with the check of correct flow switch installation and calibration.

9.2 Data acquisition

Make sure that the unit is working in stable conditions to don’t affect the Data Acquisition

- Data acquisition must be performed according to the ***Data Acquisition*** section of the Commissioning Sheet.
- Data acquisition must perform in Chiller and Heat Pump mode.
  To select the circuit working mode refer to the following setting:

  Start in Cool Mode:

  Main Menu → Unit Mode → Cool

  Enable this setpoint for testing the unit in Mechanical mode:
- It is recommended to let the compressor reach the 100% of capacity before to proceed with the data acquisition (according to the plant load conditions).
  To evaluate the stable operation of the unit check, following conditions must be satisfied:
  - Compressor Status equal to “Run=Normal”
  - ELWT and/or CLWT is as near as possible to the relative setpoint
  - EXV is working in Superheat mode:
    - Main Menu → View/Set Circuit → EXV Cool/Heat → State = SSH
  - SSH is equal to the SSH target for 5 minutes continuously:
    - Main Menu → View/Set Circuit → EXV Cool/Heat → SSH Target

CLIMATIX Scope Light data recording during commissioning is strongly suggested.
For all material required for the recording get in contact with servicesupport@daikinapplied.eu

10 TABLES

Impostazioni Parametri Inverter Danfoss per Pompe				
Start-up Wizard for Open Loop Applications				
Parametro	**Descrizione**	**Settings**	**Default**	**NOTE**
0-03	Regional Settings	default	*[0] International*	
0-06	Grid Type	[12] 380-440V/50Hz	*[12] 380-440V/50Hz*	*Verificare Tensione di alimentazione su R.M.*
1-10	Motor Construction	default	*[0] Asynchron*	
1-20	Motor Power	default	*Size related*	*Verificare Targa Motore*
1-22	Motor Voltage	400 V	*Size related*	*Verificare Targa Motore*
1-23	Motor Frequency	50 Hz	*Size related*	*Verificare Targa Motore*
1-24	Motor Nominal Current	default	*Size related*	*Verificare Targa Motore*
1-25	Motor Nominal Speed	See Pump Motor Label	*Size related*	*Verificare Targa Motore*
1-73	Flying Start	default	*[0] Disabled*	
3-02	Minimum Reference	-	*0*	*Con velocità comandata dal cliente, impostare a 40Hz.*
3-03	Maximum Reference	50	*50*	*Come 1-23 a meno che non sia riportata su R.M. una velocità inferiore*
3-41	Ramp-Up Time	10 s	*Size related*	*Tempo per arrivare a 1-23 frequency*
3-42	Ramp-Down Time	10 s	*Size related*	*Tempo per fermarsi da 1-23 frequency*
4-12	Motor Speed Low Limit [Hz]	default	*0*	
4-14	Motor Speed High Limit [Hz]	default	*65*	
4-19	Max Output Frequency	default	*Size related*	
5-40	Function Relay [0]	default	*Alarm*	
5-40	Function Relay [1]	default	*Drive running*	
6-10	Terminal 53 Low Voltage	default	*0.07 V*	
6-11	Terminal 53 High Voltage	default	*10 V*	
6-12	Terminal 53 Low Current	default	*4 mA*	
6-13	Terminal 53 Low Voltage	default	*20 mA*	
6-19	Terminal 53 mode	default	*1*	*Voltage input - [0] commuta all'ingresso in corrente*

Table A - Pump inverter settings

Pre-Start Checklist – Centrifugal Chillers

Must be completed, signed and provided to Daikin Applied Europe Service Dept. at least 2 weeks prior to requested start date.

Job Name	
Installation Location	
Customer Order Number	
Model Number(s)	
E.O./G.O. Number(s)	

Chilled Water	Yes	No	N/A	Initials
Piping Complete				
Water Quality in compliance with Daikin Specifications				
Water System- flushed, filled, and vented; Water treatment in place				
Strainer installed on the water pipe connected to the heat exchanger inlet				
Pumps installed and operational (rotation checked, strainers installed and cleaned)				
Controls operational (3-way valves, face/bypass dampers, bypass valves, etc.)				
Water system operated and tested; flow meets unit design requirements				

Condenser Water	Yes	No	N/A	Initials
Piping Complete				
Water Quality in compliance with Daikin Specifications				
Cooling tower flushed, filled, and vented; Water treatment in place				
Strainer installed on the water pipe connected to the heat exchanger inlet				
Pumps installed and operational (rotation checked, strainers installed and cleaned)				
Controls (3-way valves, bypass valves, etc.) operable per IM or IOM				
Water system operated and flow balance to meet unit design requirements				

Electrical	Yes	No	N/A	Initials
115 volt service completed, but not connected to control panel (when applicable)				
Unit correctly power supplied as per Daikin Specification (phase sequence checked)				
Line Power leads(a) cable length correct (same length) and connected to starter *				
Load leads(b) cable length correct (same length) and connected to compressor *				
All interlock wiring complete and compliant with Daikin specifications				
Starter complies with Daikin specifications (if not supplied by Daikin)				
Oil cooler solenoid wired to control panel as shown on wiring diagram				
Pump starters and interlocks wired				
Cooling tower fans and controls wired				
Wiring complies with International Electrical Code and local codes				
Unit's control side powered on (Note 1)				

Miscellaneous	Yes	No	N/A	Initials
Oil cooled water piping complete and strainer installed on plate's inlet				
Relief valve piping complete				
Thermometers, wells, gauges, control, etc., installed				
Minimum system load of 80% capacity available for continuous 4 hours for testing/adjusting				
Document Attached: Selection Sheet from Daikin Tools				

Notes:

1. Unit's control side must be powered on for at least for 48 hours before commissioning visit to enable the oil heaters and guarantee the required oil temperature for the starting of the unit.

* Does not apply to on-board VFD units

Contractor Representative

Signed: _____
Name: _____
Company: _____
Date: _____
Phone/Email: _____

Daikin Representative

Signed: _____
Name: _____
Company: _____
Date: _____
Phone/Email: _____

Table B - Pre-Commissioning Sheet

DAIKIN APPLIED EUROPE S.p.A.

Commissioning Sheet (Fourth form)

Client:		Address :		Date :	
Responsible:		Telephone no.		Chiller ID :	
Chiller Model :		Serial no. :		Cooling power :	
Refrigerant:		Oil :			
Commissioned :		Location :			
Service Technician:					

A PRE START UP CHECK LIST (INSTALLATION)

Any shipping damage	☐ YES	☑ NO
Is chiller Adequately Grounded	☐ YES	☑ NO
Anti vibration pads installed	☐ YES	☑ NO
Check electrical connections	☐ YES	☑ NO
Oil Heaters were on before start up	☐ YES	☑ NO
Fully leak tested system	☐ YES	☑ NO
Compressor model C1 / Serial No.		
Compressor model C2 / Serial No.		
Compressor model C3 / Serial No.		
Compressor model C4 / Serial No.		
Compressor model C5 / Serial No.		
Compressor model C6 / Serial No.		
Compressor model C7 / Serial No.		
Compressor model C8 / Serial No.		

EVAPORATOR	Evap1	Evap2
Evaporator water type	☐ Water	☑ Glycol
Glycol in system [TYPE]		
Glycol in system [%]		
Pressure drop evaporator [kPa]		
Design pressure drop [kPa]		
Evaporator water flow rate [m³/h]		
Design flow rate [m³/h]		
Check flow swich	☐	☐
Freeze stat set point common	☐	☐

CONDENSER (WATER COOLED)	Cond1	Cond2
Pressure drop evaporator [kPa]		
Design pressure drop [kPa]		
Evaporator water flow rate [m³/h]		
Design flow rate [m³/h]		
Check flow swich	☐	☐
Condenser water source:	☑ Waterwaorks	☐ Other

B PRE START UP CHECK LIST (ELECTRICAL)

Software version				
Unit water temp set point				
Mains voltage L1-L2 [V]				
Mains voltage L2-L3 [V]				
Mains voltage L3-L1 [V]				
Control voltage 400VAC				
Control voltage 110VAC				
Control voltage 24VDC				
Main power supply frequency [Hz]				
	C1	C2	C3	C4
Check oil heaters (measure current) [A]				
Check default parameter	☐	☐	☐	☐
Optimize parameters for site conditions	☐	☐	☐	☐
Comp overload setting	☐	☐	☐	☐
Soft start fitted	☐	☐	☐	☐

C START UP CHECK LIST FOR CENTRIFUGALS

REFRIGERANT CIRCUIT	C1	C2
Water pressure drop on the oil cooler		
Oil pressure before filter		
Oil pressure after filter		
Entering oil temperature in oil cooler		
Leaving oil temperature in oil cooler		
Entering water temperature in oil cooler		

D RUNING DATA

REFRIGERANT CIRCUIT	C1	C2	C3	C4
Percentage load for measurements [%]				
Comp running amps L1 [A]				
Comp running amps L2 [A]				
Comp running amps L3 [A]				
Phases Unbalance [%]				
Full liquid sight glass	☐	☐	☐	☐
Suction pressure [kPa]				
Suction temperature [°C]				
Suction superheat [°C]				
Discharge pressure [kPa]				
Discharge temperature [°C]				
Discharge superheat [°C]				
Liquid line temperature [°C]				
Subcooling [°C]				
EXV Position steps [%]				
Oil pressure [kPa]				
Oil filter pressure drop [Max = 250kPa]				
Oil level checked on the compressor	☐	☐	☐	☐

EVAPORATOR	Evap1	Evap2
Inlet water temperature [°C]		
Outlet water temperature [°C]		
Evaporator approach [°C]		
Check operation of LWT sensor	☑	☐

CONDENSER (WATER COOLED)	Cond1	Cond2
Inlet water temperature [°C]		
Outlet water temperature [°C]		
Condenser approach		

CONDENSER (AIR COOLED)	C1	C2	C3	C4
Air temperature [°C]				
Fan inverter	☐ Yes		☑ No	
Fan steps				
Fans running	☐	☐	☐	☐
Fans 1 Current [A]				
Fans 2 Current [A]				
Fans 3 Current [A]				
Fans 4 Current [A]				
Fans 5 Current [A]				
Fans 6 Current [A]				
Fans 7 Current [A]				
Fans 8 Current [A]				
Fans 9 Current [A]				
Fans 10 Current [A]				

Comments

A) Chiller can be put into operation ?	☑ Yes	☐ No

If NO please motivate:

B) Warranty on the Daikin equipment ?	
1 Is applicable without further conditions ?	☑
2 Is applicable under below conditions :	☐

Please mention under which conditions Warranty will apply

Table C - Commissioning Sheet

Leak test result Sheet (Fifth form)

Client:		Address :		Date :	
Responsible:		Telephone no.		Chiller ID :	
Chiller Model :		Serial no. :		Cooling power :	
Refrigerant:		Oil :			
Commissioned :		Location :			

Service Technician:				Refrigerant Certificate:	
Detection System used	Brand	Type	Serial no:	Date of Calibration	Sensitivity (ppm)
Manual leak detector					

Reason for Test:		
☐ Repair	☐ Periodic leak control	☒ Commissioning

Minimum frequency of controls:	Tons CO2 Equivalent →	☐ SsT< 50	☒ 50 ≤ T < 500	☐ Tx 500
☐ With installed leakage detection systems	Frequency of test →	☐ 24 Months	☐ 12 Months	☐ 6 Months
☒ Without install leakage detection systems	Frequency of test →	☐ 12 Months	☒ 6 Months	☐ 3 Months

Leaks found:	☐ Repair	Location of the leaks	Findings / Observations
No: 1	☒ Today ☐ To do		
No: 2	☒ Today ☐ To do		
No: 3	☒ Today ☐ To do		
No: 4	☒ Today ☐ To do		

Refrigerant quantity:					
Declared kg:		Recuperated refrigerant kg:		Refrigerant returned to distributor kg:	
		Reintroduced refrigerant kg:		For destruction kg:	
		New introduced refrigerant kg:		For treatment kg:	
		Total quantity kg:	0		

Remarks:	

Date of operation:	Service Technician signature	

Table D - Leak test result sheet