

DAIKIN



REV	05
Date	01-2022
Supersedes	D-EOMOC00610-21_04EN

**Installation & Operating Manual
D-EOMOC00610-21_05EN**

Intelligent Chiller Manager (Opt.184)

iCM Option Versioning

Revision	Software Version	Changelog
0 – 07/2020	iCM_1.00	Introduction of iCM Option
1 – 11/2020	iCM_2.00	Heat Recovery Management iPM (Intelligent Pump Manager) iCT (Intelligent Cooling Tower Manager)
2 – 05/2021	iCM_2.10	Free-cooling Management
3 – 10/2021	iCM_3.00	System Mode Management Defrost Management Variable Primary Flow in dedicated pump piping
4 – 12/2021	iCM_3.0	IOM Revision
5 – 01/2022	iCM_3.20	Centrifugal Unit Management

Table of contents

iCM Option Versioning	2
1 WHAT IS iCM®	6
1.1 Before starting	6
1.2 Available Control functions	6
1.3 Possible configurations	7
1.4 Limitations	7
1.5 Integration in a Building Management System	8
1.6 Daikin on Site	8
2 LICENSING	10
2.1 When license is needed	10
2.2 Temporary License	10
2.3 Permanent License	11
3 FIELD WIRINGS	12
3.1 Daikin Communication Network connection	12
3.2 Common water temperature sensors	12
3.3 System Variable primary flow with dedicated pump: equipment installation (Only with iCM)	13
3.4 System Pump Management in manifolded piping: Shut-off valve installation	14
3.5 System Variable primary flow with manifolded pump: equipment installation (Only with iCM)	15
4 HMI DESCRIPTION	16
4.1 Introduction	16
4.2 Preliminary configuration	16
4.3 Main Menu	17
4.4 System Data	17
4.4.1 Units: States	19
4.4.2 Units: ActMode	19
4.4.3 Unit: Defrost	20
4.4.4 Units: Load	20
4.4.5 Evap Water Temps	21
4.4.6 Cond Water Temps	21
4.4.7 Units: Heat Recovery	21
4.4.8 Units: Free Cooling	21
4.5 Evap / Cond PM (Evaporator or Condenser Pump Manager Menu)	22
4.6 Maintenance	24
4.6.1 Units Starts	25
4.6.2 Units Run Hours	25
4.7 System Settings	25
4.7.1 Priority	27
4.7.2 Staging thresholds	27
4.8 Standby Chiller	28
4.9 Configuration	28
4.9.1 Pump Manager Configuration (PM Config)	29
5 SYSTEM OPERATING	31
5.1 System Enable setpoint	31
5.1.1 Master Disable	31
5.1.2 Slave Disable	31
5.2 System water temperature setpoints	31
5.2.1 System Cool Setpoint	31
5.2.2 System Heat Setpoint	31
5.2.3 System Heat Recovery EWT Setpoint	31
5.2.4 System Setpoints by Network communication	32
5.2.5 System Active Setpoint	32
5.3 System mode and System mode setpoint	32
5.4 System controlled temperature	32
5.5 System Heat Recovery Enable (iCM option only)	33
5.5.1 Heat Recovery Disable on Master	33
5.5.2 Heat Recovery Disable on Slave	33

5.6	System Free Cooling Enable (iCM option only)	33
5.6.1	Free-cooling Disable on Master	34
5.6.2	Free-cooling Disable on Slave	34
5.7	Standalone Mode	34
5.7.1	Setting Slave in Standalone	34
5.7.2	Setting Master in Standalone	34
5.8	System Overview	35
6	TROUBLESHOOTING	36
6.1	iCM Master Alarms	36
6.1.1	iCMConfigAlm:MultistateFault - Configuration Error	36
6.1.2	System Lwt Sensor Fault	36
6.1.3	System Heat Lwt Sensor Fault	37
6.1.4	Slave Communication Error	37
6.1.5	Slave Missing	38
6.2	Slave Alarms	38
6.2.1	Master Communication Error	38
6.2.2	Master Missing	38
6.2.3	Master Disconnect	38
6.3	Pump Manager Alarms	39
6.3.1	Pump Manager Communication Error	39
6.3.2	Pump Manager Missing	39
6.3.3	Pump Manager Configuration Error	39
6.3.4	Pump Manager Sensor Fault	40
6.3.5	Pump Manager – Not Available Pump Alarm	40
6.4	Events	41
6.4.1	Heat Recovery Configuration Error	41
6.4.2	Free-cooling Configuration Error	41
6.4.3	Energy Monitoring Configuration Error	41

List of figures

Figure 1	iCM plant visualization on Daikin on Site	9
Figure 2	iCM System configuration page on Daikin on Site	9
Figure 3:	Temporary Activation	10
Figure 4:	Temporary password activation	10
Figure 5:	Software Options page	11
Figure 6:	Enter the license code	11
Figure 7:	Activate the iCM Standard	11
Figure 8:	Connecting the network	12
Figure 9	Common Leaving water temperature installation position	13
Figure 10	Variable Flow based on DP in primary system with dedicated pumps	13
Figure 11	Shut-off valve electrical installation	14
Figure 12	Variable Primary Flow with iCM and iPM	15
Figure 13:	Basic system configuration	16
Figure 14:	Extended configuration menu	17
Figure 15:	System Overview on Main menu of Master unit HMI	35

List of tables

Table 1:	Comparison between iCM and Master/Slave	8
Table 2:	Common Leaving water temperature in plant room	12
Table 3:	Example of parameter and setting representation	16
Table 4:	Access levels	16
Table 5:	Basic configuration	16
Table 6:	Main Menu	17
Table 7:	Additional settings in the Main Menu	17
Table 8:	System Data parameters	19
Table 9:	Unit States overview	19
Table 10:	Units and circuits actual operating modes	20
Table 11:	Units and circuits actual capacities	20
Table 12:	Individual evaporator water temperatures (leaving and entering)	21

Table 13: Individual condenser water temperatures (leaving and entering)	21
Table 14: Individual heat recovery statuses	21
Table 15 Evaporator or Condenser Pump Manager Menu	23
Table 16: Maintenance page.....	24
Table 17: Individual number of starts for Units and circuits	25
Table 18: Individual running hours for Units and circuits	25
Table 19: System settings	26
Table 20: Priority settings for cooling and heating modes	27
Table 21: Stage up and stage down capacity thresholds for cooling and heating modes	28
Table 22: Standby chiller configuration	28
Table 23: System configuration	29
Table 24 Evaporator or Condenser Pump Manager Configuration menu	30
Table 25: System controlled temperature based on system layout	33

1 WHAT IS iCM®

1.1 Before starting

Each unit controller provides a set of embedded control functions that can be used to manage more than one Daikin unit in a plant-room.

Daikin unit will be connected to each other through the Daikin Communication Network. In this network, one unit will be elected as Master and the others will be elected as Slave.

Master unit is the single point of management of Daikin units, whereas the Slave units will follow the Master management.

Daikin unit manager can be distinguished in two categories:

- Master/Slave
- iCM® (intelligent Chiller Manager)

Each category provides a set of system control functionalities (resumed in the following paragraph).

Master/Slave control is available as a standard option and it can be activated at any time on Daikin units with Microtech III and Microtech IV controller.

iCM® control is available only on Daikin unit with Microtech IV controller and it must be bought as “Option 184” in the material request of each Daikin unit composing the plant-room. Purchase of Option 184 provides a License key to activate iCM control on unit controller. The activation can be performed by Factory or during the commissioning of the units on site by a Daikin technician.

The main difference between iCM® and Master/Slave is that iCM® offers advanced optimization features and a comprehensive plant control management, whereas Master/Slave is limited by offering a very basic unit sequencing and staging without any energy efficiency optimization logics.

1.2 Available Control functions

In this section are resumed all the control function provided by iCM or Master/Slave. As aforementioned, not all the control functions are applicable with Master/Slave.

- **Unit Sequencing:** allows to equalize the operation hours of the units through rotation of units.
- **Unit Staging:** allows to provide a stable system-controlled water, minimizing the number of running units and consequently reducing the power consumption.
- **Controlled temperature configuration** allows to select the controlled temperature which Unit Staging is based on. Possible configurations are:
 - Control on Leaving water temperature: the installation of a temperature sensor on supply header is mandatory
 - Control on Entering water temperature: system control function manages the units to achieve a stable Return water temperature. In this case a sensor-less configuration is possible and the installation of the temperature sensor is not necessary.
- **Circuit Staging Control:** (applicable only to system with Multipurpose unit) allows to provide a stable chilled water and hot water in a four-pies distribution system, minimizing the number of running units and controlling the mode of unit circuits.



Control on Entering water temperature and consequently sensor-less installation is not always possible. Please refer to table Table 2: Common Leaving water temperature in plant room

Further system functions are available only with iCM. Those functions are related to advanced unit management or management of unit options at system level:

- **Unit Capacity control:** (not available for Multipurpose unit; available with M/S and EWT control) allows to manage the capacity generation of each unit, in order to increase or decrease the overall system capacity according to building load demand. Thus, this function provides energy efficiency optimization.
- **System Changeover:** (not available for Multipurpose unit) allows to set the operating mode of the system and consequently on all the units able to perform the changeover.
- **System Defrost:** (available only in system with Air-cooled Heat Pumps) allows to manage the defrost process of the units assuring that available heating capacity will be higher than cooling capacity generated during defrost
- **System Automatic Changeover (System collective housing):** (available only in system with Heat Pumps) allows to change automatically operating mode of the system and consequently on the units able to perform the changeover.
- **System Heat Recovery:** (available only for units with Heat Recovery option installed) allows to manage the activation of heat recovery function on the units in order to provide a stable system entering water temperature on Heat recovery circuit. Moreover, iCM will prioritize the start of units with heat recovery option among all the managed units to maximize the heat recovery production.
- **System Free Cooling** (available only for units with Free Cooling option installed) allows to manage the activation of free-cooling function on units in order to maximize the system cooling capacity generated through free-cooling

despite of mechanical cooling. For this reason, iCM will prioritize the start of units with free-cooling option among all the managed units.

- **System Variable primary flow management with dedicated pumps:** (available only for units with VPF option installed) allows to manage the speed of primary pumps dedicated to each unit in order to afford the building flow demand and assuring minimum flow to running units exchanger.
- **Evaporator Pump Manager:** (available only with additional “accessory” “iPMxx”: external panel) allows to monitor manifolded piping on evaporator side.
- **Condenser Pump Manager:** (available only with additional “accessory” “iPMxx”: external panel) allows to monitor manifolded piping on condenser side.
- **Cooling tower Manager** (available only with additional “accessory” “iPMxx”: external panel, configured as Condenser Pump Manager) allows to monitor manifolded cooling tower on cooling water distribution system.

1.3 Possible configurations

According to type (Air-cooled or water-cooled; chiller, heat pump or multipurpose) and combination of the Daikin units in the plant-room, only one category of Daikin unit manager (Master/Slave or iCM) is available:


Master/Slave can manage only plants with up to 4 Units and composed by:

- all chillers (mix of air-cooled and water cooled is not allowed; mix of unit with different compressor is not allowed)
- all heat pumps (mix of air-cooled and water cooled is not allowed; mix of unit with different compressor is not allowed; only in two-pipes water distribution)
- all multipurpose all the Units must have the same capacity control (all scroll or all screw compressors).

iCM can manage only plants with up to 8 Units and composed by:

- all chillers (mix of air-cooled and water cooled is not allowed)
- all heat pumps (mix of air-cooled and water cooled is not allowed)
- all multipurpose
- mix of Air cooled Screw chillers and Multipurpose (units with three circuits are currently not managed)
- mix of Air cooled Heat pumps and Chillers (operating in two-pipes water distribution: chiller units are stopped during Heating mode)
- mix of Screw and Scroll compressor Air-cooled unit
- mix of Screw and Centrifugal compressor Water-cooled unit
- mix of VFD and Slide compressor unit
- air cooled chillers with optional Heat Recovery (not all chillers must have heat recovery)
- air cooled chillers with optional Free-cooling (not all chillers must have free-cooling)

Master controller is able to detect the type of units and the type of Daikin system management activated on each controller connected in the network. If the combination between Daikin unit type and Daikin System manager type were wrong, Master controller disables the Daikin System Manager and provide a notification.

 In case of doubts about what Master/Slave can and cannot do, please refer to the following sections or contact your Sales Support reference.

1.4 Limitations

As mentioned in the previous Section 1.3, there are limitations in using Master/Slave and iCM in some plant layout. Nevertheless, limitations of Master/Slave can be overcome by using iCM® control. If any of those limitations are found during system commissioning, it is given the possibility to activate a trial of the iCM® for a limited period of time. When the trial expires and the permanent license has not been activated, iCM® will be automatically disabled by the controller. To clarify this specific aspect, please refer to Section 2.

The following Table 1 resumes the possible configurations and limitations of the two management:


Option	Master/Slave	iCM®
Up to 8 Units	x	✓
All Chillers	✓	✓
All Heat Pumps	✓	✓
All Multipurpose	✓	✓
Mix of Water-cooled Units + Air-cooled Units	x	x
Mix of Water-cooled Units + Multipurpose Units	x	x
All Screw Units	✓	✓
All Scroll Units	✓	✓
All Centrifugal Units	✓	✓
Mix of Screw + Scroll Units	x	✓

Mix of Centrifugal + Screw/Scroll Units	x	✓
Mix of Screw Units with slide compressor + Units with VFD compressor	✓	✓
Mix of Scroll Unit + Multipurpose	x	x
Mix of Chillers + Heat Pumps (only in two pipes system)	x	✓
Heat Pumps + System Changeover	x	✓
Heat Pumps with Collective housing	x	✓
Air-cooled Heat Pumps + System Defrost	x	✓
Mix of Multipurpose + Air-cooled Screw Chillers (max 2 circuits)	x	✓
Mix of Chillers + Heat Pumps + Multipurpose	x	x
Air-cooled Chillers with Heat Recovery (HR)	x	✓
Mix Air-cooled Chiller with HR + Air-cooled Chiller with no HR	x	✓
Mix of Chillers with HR + Multipurpose	x	x
Air-cooled Chillers with Free-cooling (FC)	x	✓
Mix Air-cooled Chiller with FC + Air-cooled Chiller with no FC	x	✓
Mix of Chillers with FC + Multipurpose	x	x

Table 1: Comparison between iCM and Master/Slave

Even if iCM[®] can manage Units with different operating mode (Chiller/Heat Pump), it can be applied only in plant room with 2-pipes system. In these plants, there are only one supply and return headers that provide chilled water or hot water according to Daikin Units operating mode. In fact, neither iCM nor Daikin Units can manage the changeover of the diverting valve needed for the connection to a 4-pipes system.

Only in case of combination of multipurpose with air-cooled chiller Units, iCM[®] is able to manage a 4-pipes system, where multipurpose is connected to heated water circuit, while multipurpose and chiller are connected to chilled water circuit.

	In case of doubts about what Master/Slave or iCM [®] can and cannot do, please refer to the following sections or contact your Sales Support referent in Daikin Applied Europe S.p.A.
---	--

1.5 Integration in a Building Management System


Daikin unit is elected as the “Master” of the plant, it is able to retrieve the most important information of all the other “Slave” units and of the equipment managed by additional Panels (Evaporator or Condenser Pump Manage) connected to Daikin Communication Network.

Thus, Master controller works as single point of integration with the BMS that will be able to gather all that information through protocol communication:

- BACnet over IP
- BACnet MSTP
- Modbus over RS485

Moreover, BMS will be able even to set the most important setpoints related to Daikin Unit Manager.

Please refer to document “BAS Integration – iCM Modbus protocol” or “iCM BACnet protocol” where all the datapoints are listed.

	Not all the variables regarding the single unit are accessible through Master controller. In case all the information about single unit is requested, even Slave controller must be integrated by BMS
---	---

1.6 Daikin on Site

iCM[®] is integrated within Daikin on Site (DoS). When a Unit is connected to DoS and it is elected as the Master of the plant, all the status info, settings and web graphics of the plant are displayed. Specific sections will support an easy commissioning of the system and trending to monitor capacities and temperatures, starts and stops can help the remote Operator to fine tune and optimize the plant control.

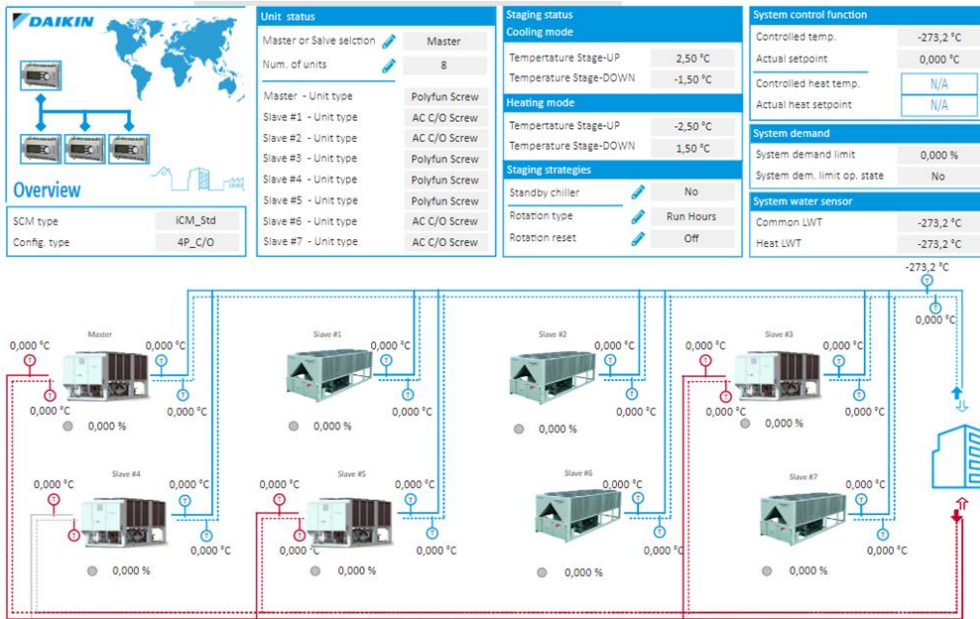


Figure 1 iCM plant visualization on Daikin on Site

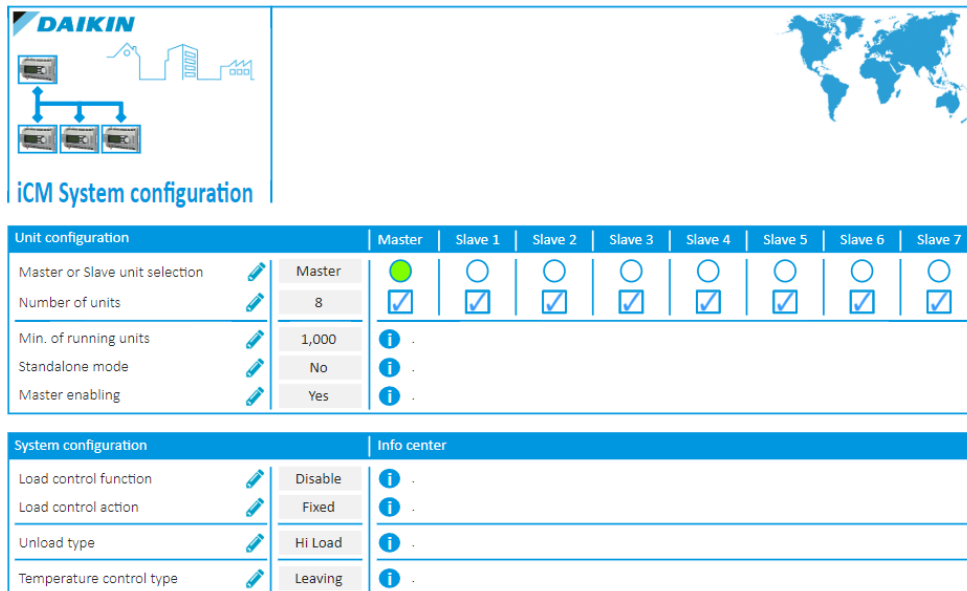


Figure 2 iCM System configuration page on Daikin on Site


2 LICENSING

2.1 When license is needed

When the plant configuration requires iCM®(please refer to Table 1 for more details), then a License key is needed. In case iCM® is added to the Units' order, the control function is automatically activated from the Factory by allowing a Plug&Play control solution during the commissioning phase.

If iCM® is requested in a later stage, the License can be ordered from the Factory. Simple information like the order number of Units and the corresponding serial numbers of the Unit controllers are needed to for the License activation.

The License key is a unique code specifying the special options associated to that Unit and applicable to that Unit only. In case of multiple Units in the same plant an individual License key must be set on every Unit to let iCM® being unlocked.

	iCM® is a Unit option and must be purchased as any other option. Don't forget to add it to your order for Factory activation.
---	---

2.2 Temporary License

A temporary License can be used if iCM® has not been ordered and the system layout requires its functionalities. To activate the time-limited License for iCM® please, let's proceed through menu Commissioning – Software Options page and the Temporary Passwords menu:

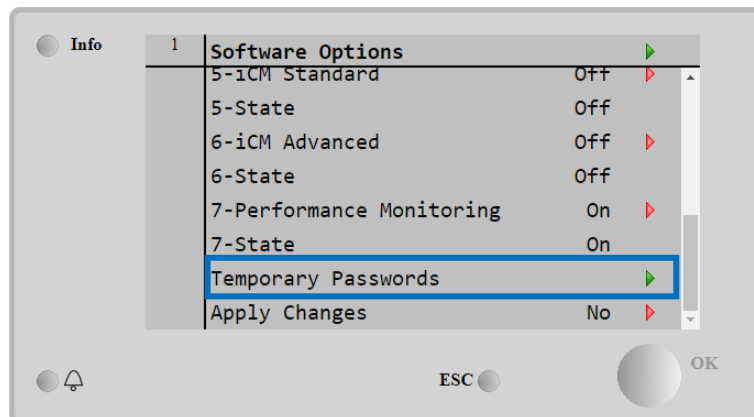


Figure 3: Temporary Activation

Then, by entering the page, three temporary passwords are displayed:

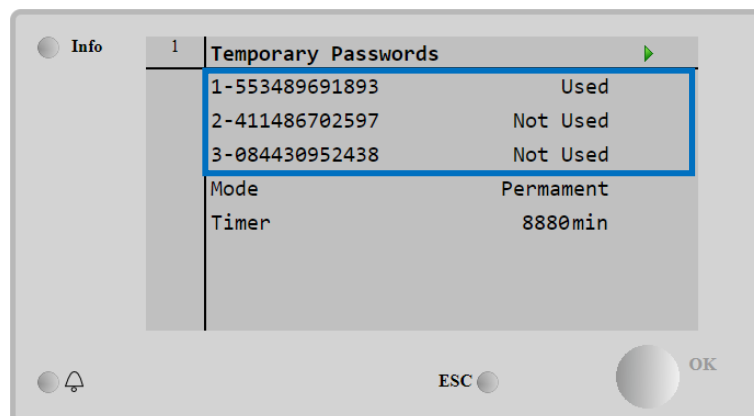



Figure 4: Temporary password activation

In the same page the usage of the activation code is also visible and a Timer indicating the remaining time before expiration can be checked.

When timer expires, iCM® will be disabled. All the settings will be retained, and a re-activation will restart the normal sequencing as per previous configuration.

	If the iCM® get disabled because the temporary licenses expire, Daikin Applied Europe cannot be considered responsible for any consequence or claims from the customer.
---	---

2.3 Permanent License

To enter a permanent License and activation key of the iCM®, go into the Commissioning – Software Options page:

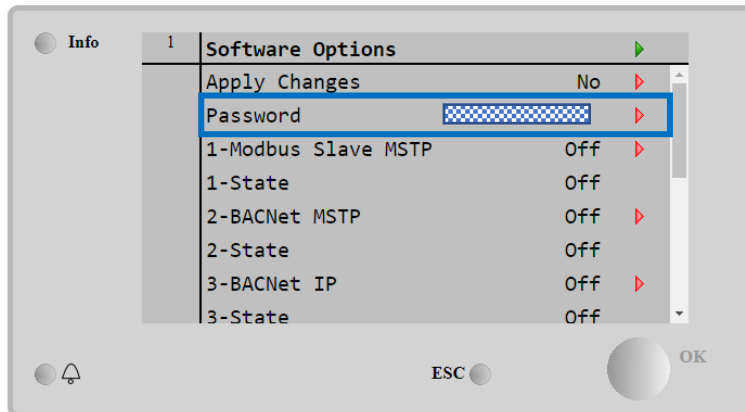


Figure 5: Software Options page

Click on the red arrow next to the item Password and enter the numeric License key.

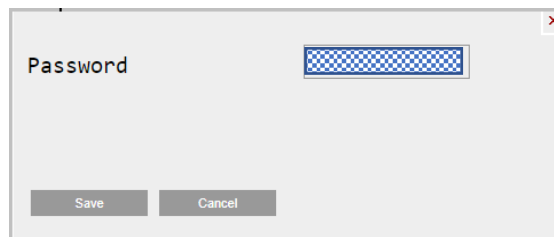


Figure 6: Enter the license code

With the License key correctly installed, let's proceed and activate all the options including the iCM® by changing the corresponding value to *On*, then apply all the changes.

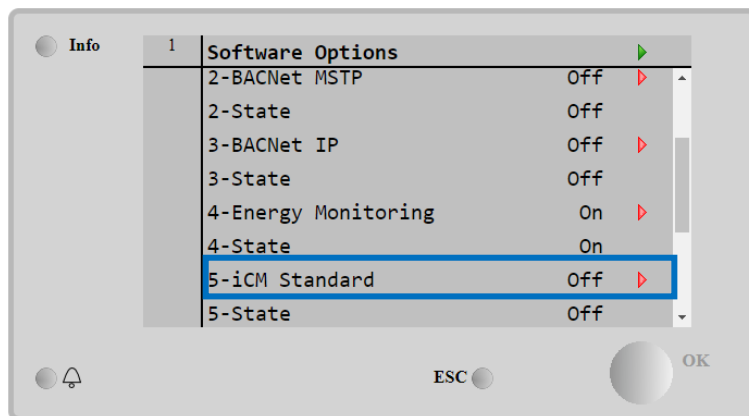


Figure 7: Activate the iCM Standard

After the controller reboot, go back again to the Software Options page and check if the activation states (5-State) are *On* to confirm the correct activation of the iCM® function.

3 FIELD WIRINGS

3.1 Daikin Communication Network connection

The following diagram shows how to connect the Daikin Units to each other and establish the Daikin communication Network. Starting from first Daikin Unit, connect in parallel the PB terminals [CE+ / CE-] of every controller. Refer to the Unit wiring diagram for the enumeration of the terminals.

A shielded twisted pair cable must be used to make the connection.

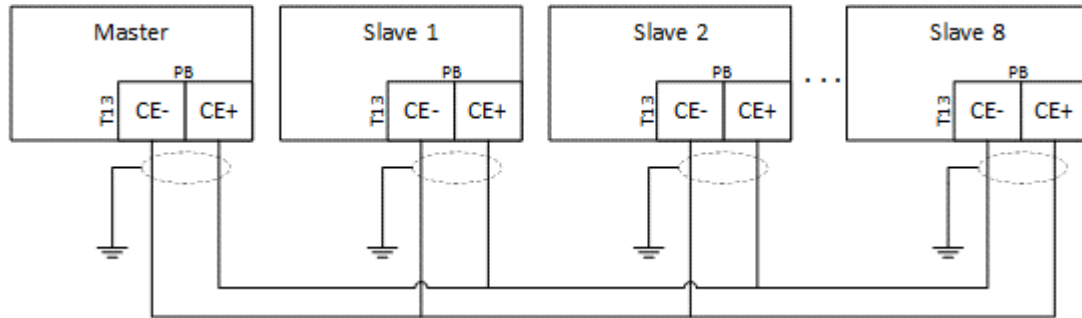


Figure 8: Connecting the network

It is important to respect the below limitation to avoid instability in the communication network:

- Twisted and Shielded 2-wire cable
- Bus cable length between 2 Units Max. 700 m
- Total bus cable length Max. 1,000 m

3.2 Common water temperature sensors

As explained in paragraph 1.2, Daikin unit managers can work in a sensor-less configuration, providing a stable Entering water temperature (calculated as average of entering water temperature of running units) and simplifying the installation but not assuring a stable system leaving water temperature.

It must be highlighted that “entering water temperature control” and sensor-less configuration is not always possible. For this reason, Master controller can be equipped with common water temperature sensors depending on the specific Control temperature configuration, set of Daikin units to be managed and set of Special option of the Daikin units. The following table resume when one or two common leaving water temperature sensors are needed or mandatory:

Option	1 sensor	2 sensors
All Chillers	✓	✗
All Heat Pumps	✓	✗
All Multipurpose	✗	M
Mix of Chillers + Multipurpose	✗	M
Mix of Chillers + Heat Pumps	✓	✗
Water cooled cooling only	✓	✗
Water cooled cooling/heating	✓	✓
Water cooled heating only	✓	✓
Air cooled Heat Pump + Defrost	M	✗
Air cooled Chiller + Heat recovery	M	✗
Air cooled Chiller + Free-cooling	M	✗

Table 2: Common Leaving water temperature in plant room

Configurations with the “M” highlights that installation of one or two sensors are mandatory. For example, any time a multipurpose is managed in the system, 2 temperature sensors are always needed.

Type of sensors that can be used are:

- Daikin NTC10K (with a beta of 3977), that can be bought as an “accessory” of the Daikin unit in the material request
- Generic PT1000 sensors.

Please refer to the specific Unit wiring diagrams for a correct hardwired connection of the sensors to the “Master” controller terminals.

These sensors must be installed in a proper position to measure the Supply water temperatures of the system. The temperature sensor must be installed upstream an eventual bypass pipe or tank or common header that decouple primary circuit from secondary circuit.

Below picture shows the recommended position on supply header:

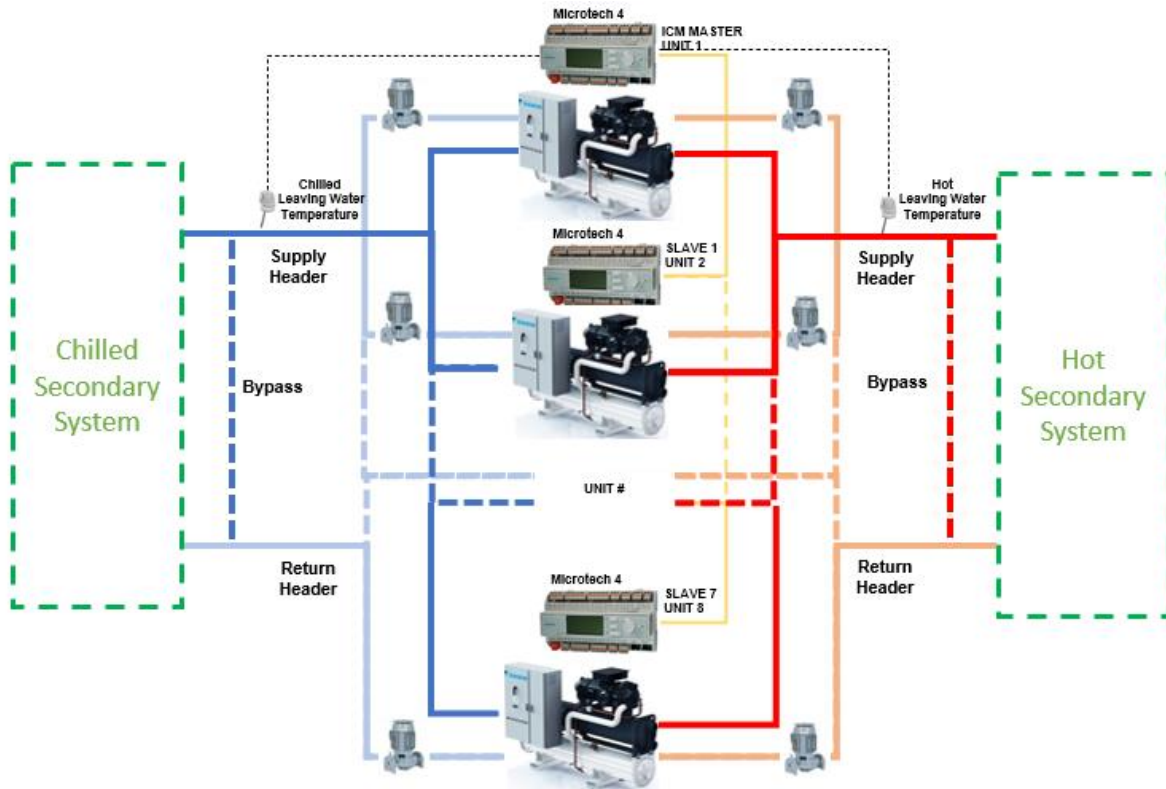


Figure 9 - Common Leaving water temperature installation position

3.3 System Variable primary flow with dedicated pump: equipment installation (Only with iCM)

When Daikin unit controller is equipped with "VPF Option", unit is provided with a Differential pressure sensor installed between Leaving and Entering water pipe on the exchanger, that notifies the possible minimum flow. If multiple Daikin units with VPF option are connected to Daikin Network, unit (elected as Master controller) will be able to manage the speed of the primary pumps according to a Differential Pressure sensor, to assure the correct flow to the building, and to manage the opening of the by-pass valve to assure minimum flow to running units. The equipment installation and connection to Daikin units is shown in the following picture:

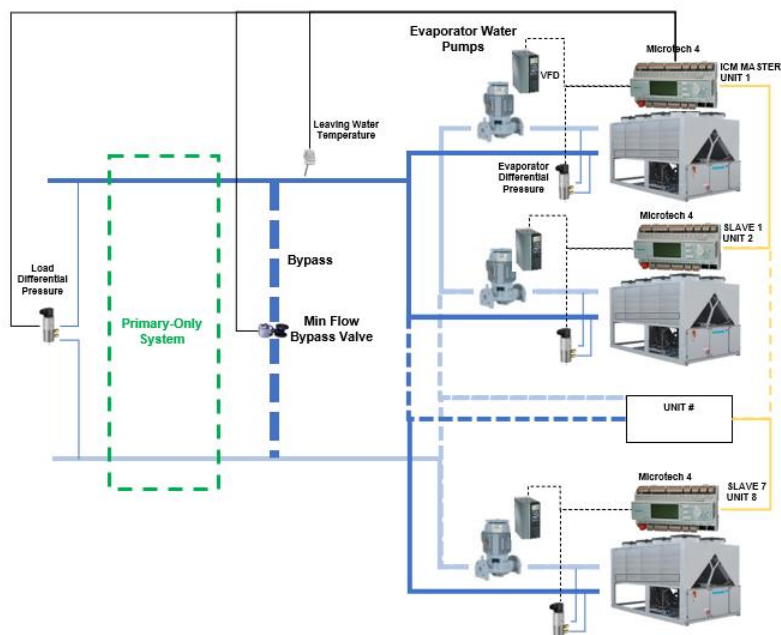


Figure 10 - Variable Flow based on DP in primary system with dedicated pumps

Daikin Units with VPF option are equipped with an Evaporator differential pressure and they are able to manage the dedicated primary pump with the following signals:

- Pump #1 Request: Digital Output (Normally Open contact) to command the start of variable speed driver (VFD) of the pump.

i Pump Request Contact need an External Power Supply at 24 or 230 Vac (not provided by unit controller)

- Pump Speed Signal: 0...10Vdc Output Signal to command the speed of VFD of the pump.

Only on Master controller, by-pass valve actuator and Differential pressure sensor on the building must be connected to the following controller terminals:

- Load Differential pressure: 0...10Vdc Input Signal to gather the measurement of the sensor (unit controller provides 24Vdc for power supply)
- By-pass Valve Request: Digital Output (Normally Close and Normally Open) of internal relay to command the closing/opening of the valve actuator.

i By-pass Valve Request needs an External Power Supply at 24 or 230 Vac (not provided by unit controller)

i Load Differential Pressure sensor and By-pass Valve actuator and body are not part of Factory provision

Please refer to the specific Unit wiring diagrams for a correct hardwired connection of the equipment to the controller terminals.

3.4 System Pump Management in manifolded piping: Shut-off valve installation

In plant-room where primary water distribution is projected as manifolded piping, primary pumps are installed in parallel and provide water flow to all the units. In order to avoid water flow when the unit is shut-down, shut-off valve must be installed on the inlet pipe of each unit.

Each unit can manage the closure or opening of the shut-off valve through the following output:

- Pump #1 Request: Digital Output (Normally Open contact) to be connected to an External Relay that can provide separated Normally Close and Normally Open contact to send open/close command to valve.

The following scheme shows the electrical device that must be installed in unit panel and connections with valve actuator:

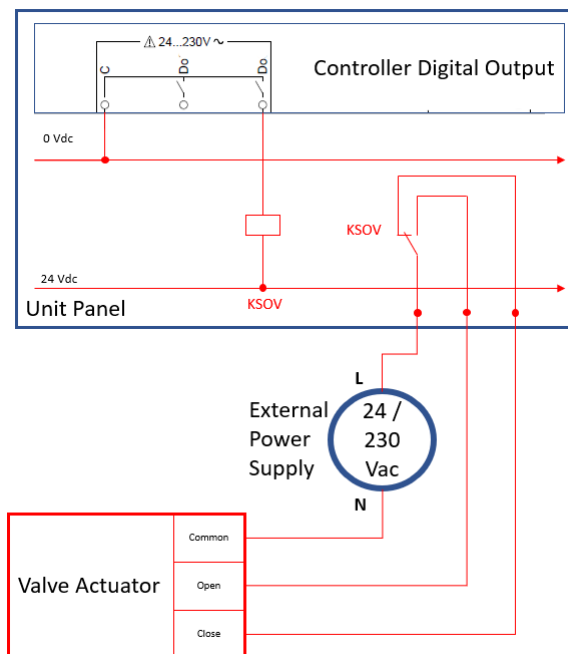


Figure 11 - Shut-off valve electrical installation

i Installation of KSOV Relay, External Power supply, Valve actuator and body are not part of Factory provision

3.5 System Variable primary flow with manifolded pump: equipment installation (Only with iCM)

In plant-rooms with manifolded piping, intelligent Pump Manager can manage the primary pumps and variable primary flow, in conjunction with iCM that will manage the Daikin units.

In those plant-rooms:

- iPM will manage all the equipment related to water distribution:
 - o VFD pump
 - o Bypass Valve
 - o Load Differential pressure
- Each unit must be equipped with “VPF option” to measure the Evaporator Differential Pressure
- Each unit can manage the dedicated inlet shut-off valve (connections are explained in the previous paragraph).

The following picture shows the hardwired connections to iPM and Daikin units:

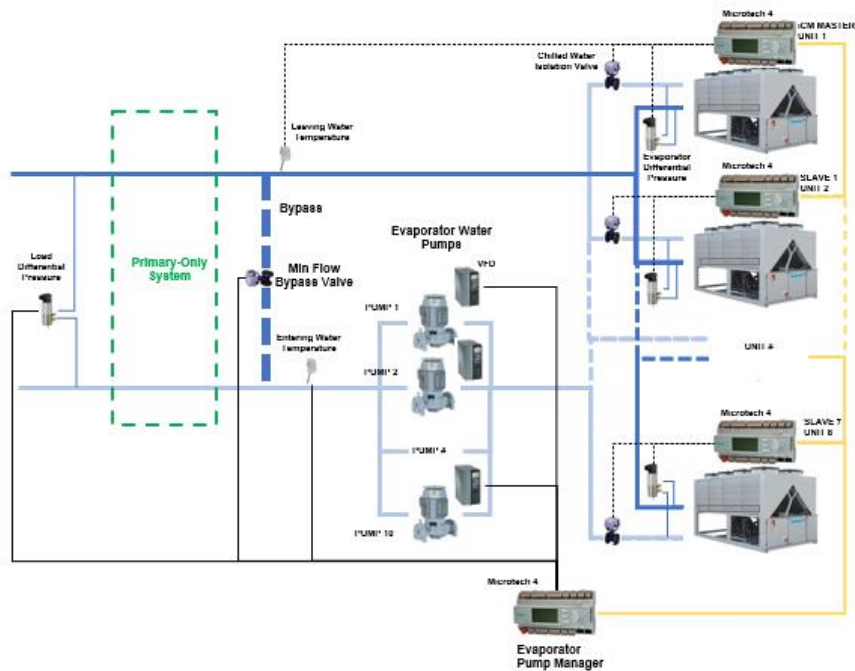


Figure 12 - Variable Primary Flow with iCM and iPM

4 HMI DESCRIPTION

4.1 Introduction

The following sections will go into the configuration and navigation of both iCM and Master/Slave. All the menus and submenus will be described in terms of purpose and contents. All the pages will be described in terms of parameters and settings. The two classes can be easily identified referring to the below table.

Description	Default	Range and function	AL	MS
This is a parameter	7.6°C	-15.0°C...30.0°C This is a parameter	4	Y
This is a setting	2	iCM: 2...8 M/S: 2...4	2	N
This is a link to a subpage	u		4	Y

Table 3: Example of parameter and setting representation

The description of any setting or parameter will also include the required Access Level (AL). Access level is defined by the password entered to access the different menus of the Microtech® 4. Please refer to the Unit's Operating Manual for more details.

The column MS will show if a setting or parameter is available

Access levels are the following:

AL	Profile	Access rights
6	Basic user	Limited access to settings and parameters
4	Maintenance	extended access to settings and parameters
2	Service	full access to configuration, settings and parameters

Table 4: Access levels

Some of the settings for the lower profile users can be limited to read only but can be changeable with a higher access level.

4.2 Preliminary configuration

Before being able to configure all the function of the iCM® or Master/Slave, it is needed to activate this additional control on the Units. To do this, it is needed to enter the Commission Unit - Configuration menu:

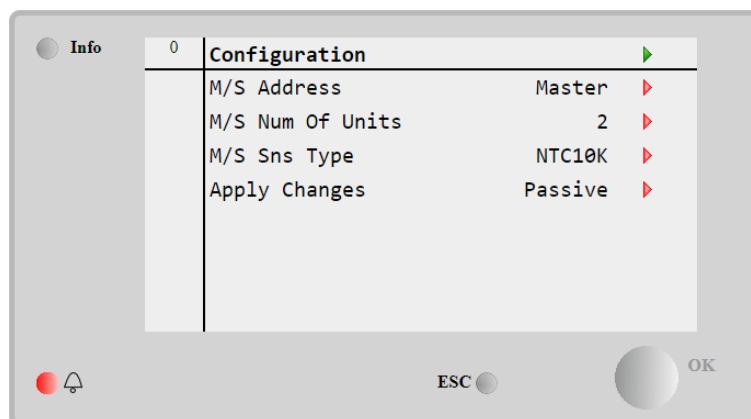



Figure 13: Basic system configuration

Description	Default	Range and function	AL	MS
M/S Address	None	iCM: Master, Slave1,..., Slave8 M/S: Master, Slave1,..., Slave4	4	Y
Defines the ID of each Unit inside the network.				
M/S Num Of Units	2	iCM: 2...8 M/S: 2...4	4	Y
Relevant on the Master Unit only to define the number of Units. This value is also used to set communication alarms on disconnected Units.				
M/S Sns Type	NTC10K	NTC10K, PT1000	4	Y
Defines the type of sensor connected to the Master Unit to monitor the supply water temperature to the System. In case of Return water temperature control this setting will not affect the regulation. In case of Supply water temperature control the sensor must be connected or an alarm will be generated				

Table 5: Basic configuration

	The above settings if not properly adjusted may generate alarms on the Master controller. In this case check the settings on this page and on the corresponding page of each Slave controller. Refer to the Troubleshooting section for further details.
---	--

After a reboot of the controller the needed additional menus will be shown on the Master controller.

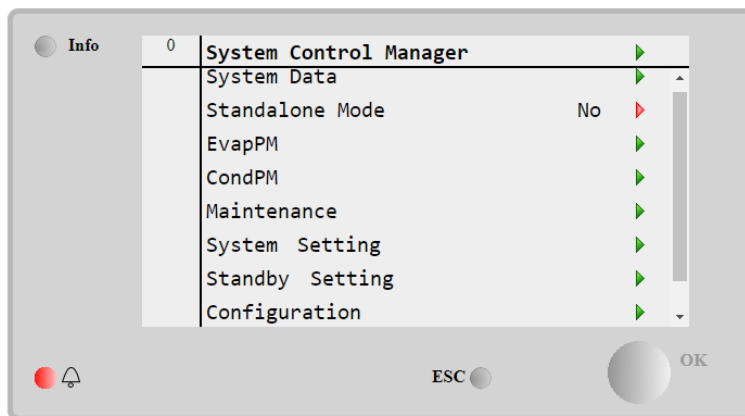


Figure 14: Extended configuration menu


A detailed description of all the sub-pages is in the following sections.

4.3 Main Menu

The Main Menu contains the links to all the configuration and visualization pages. The following table will list all the sections and the related contents.

Section	Content	AL
System Data	Operational data of the System	6
Evap PM	Evaporator Pump Manager menu contains data and setpoint exchanged between Master Controller and Pump Manager controller	
Cond PM	Condenser Pump Manager menu contains data and setpoint exchanged between Master Controller and Pump Manager controller	
iCT	Cooling Tower Manager menu contains data and setpoint exchanged between Master Controller and Cooling Tower manager	
Maintenance	Information about running hours and number of starts for each Unit. It also allows to disable the sequencing functions or disable the heat recovery management.	
System Settings	Allows to define the relevant settings for the temperature control of the plant.	6
Standby Settings	Allows to define the Standby chiller management.	4
Configuration	Options configuration, allows to review the type of system, define the main control strategies and activate additional controls	6


Table 6: Main Menu

	EvapPM, CondPM, iCT menu will display only if Evaporator or Condenser Pump Manager or Cooling Tower manager are enabled in the Configuration menu
---	---

From the Main Menu is possible to access one setting, described in the following table.

Description	Default	Range and function	AL	MS
Standalone Mode	NO	NO, YES	4	Y
Unit set in Standalone mode will work independently from iCM sequencing even if connected on Daikin Chiller network. Those Unit can be managed by Unit controller itself.				

Table 7: Additional settings in the Main Menu

	If Master Unit is set Standalone, all the Units (Master and Slaves) will work independently from iCM sequencing.
---	--

4.4 System Data

This section will describe the parameters accessible in the Data page. It will also describe the links to other sub-sections.

Description	Default	Range and function	AL	MS
Sys State	Stop	Stop, Run	6	Y
This is the general System status.				

<ul style="list-style-type: none"> - Stop will mean that Logic is not doing any sequencing. This may be due to the Enable switch on the Master controller. - Run means that all the sequencing functions are running. 				
Sys Mode	Cool	Cool, Ice, Heat, Multi	6	Y
This is the actual System operating mode. It's defined by operating mode of the Master Unit unless a Multipurpose Unit is controlled. In that case the System Mode will be fixed to "Multi".				
Sys Defrost	Stop	Stop, Run	6	N
This status will display only in case Master controller is an Air-cooled Heat Pump.				
<ul style="list-style-type: none"> - Stop means that there are no unit with circuits in defrost mode. - Run means that Defrost managed by iCM is running 				
Sys HeatRec State	Stop	Stop, Run	6	N
This is the general System Heat Recovery state. Stop will mean that Logic is not doing any sequencing. This may be due to the Heat Recovery is not enabled on the Master controller. Run means that Heat Recovery function is running at system level				
Sys FreeCig Status	Off:Swi	Off:Swi, waitOaT, Run, Off:Alm	6	N
This variable will display only if Master controller is equipped with Free-cooling option. This is the general System Free-cooling status. Possible statuses are:				
<ul style="list-style-type: none"> - Off:swi: System free-cooling management is disabled by FC enable Switch on Master controller - waitOaT: System free-cooling management is not running because condition on Outside air temperature is not achieved - Run: System Free-cooling management is enabled, condition on OaT is achieved and it is running - Off:Alm: System Free-cooling management is stopped because OaT sensor is in alarm. 				
System Temperatures				
Sys Evap LWT	-- °C		6	Y
This is the actual value of the system supply chilled water temperature. Its value may not be relevant in case of return water temperature control				
Sys Cond LWT	-- °C		6	Y
This is the actual value of the system supply heated water temperature. Its value may not be relevant in case of return water temperature control in heating mode. It is available only for water cooled and multipurpose Units.				
Sys Evap EWT	-- °C		6	Y
This is the average entering water temperatures of all the running Units. In normal condition is equivalent to the return water temperature from the System and can be used to control the staging if the additional water temperature sensor is not needed.				
Sys Cond EWT	-- °C		6	Y
This is the average condenser entering water temperatures of all the running Units. In normal condition is equivalent to the return water temperature from the System and can be used to control the staging if the additional water temperature sensor is not needed. It is available only for water cooled and multipurpose Units.				
Sys Heat Rec EWT	-- °C		6	N
This is the average of the heat recovery entering water temperatures of the Units equipped with this option. This data is available only on the iCM.				
Sys Outside Air	-- °C		6	N
This is the outside air temperature of the Master controller when Units is equipped with Free-cooling option. This data is available only on the iCM.				
System Load	0%	0...100%	6	Y
This is the average of Capacity of running unit on the total number of Units.				
Cooling Load	0%	0...100%	6	Y
This is the average of Capacity of unit running in Cool/Ice mode on the total number of Units.				
Heating Load	0%	0...100%	6	Y
This is the average of Capacity of unit running in Heat mode on the total number of Units.				
Sys Demand Lim	100%	0...100%	6	Y
This is the value of Capacity limit set on Master controller that will be used to limit the System Capacity				
System Sequencing				
Next On	-	iCM: Master, Slave1,..., Slave7 M/S: Master, Slave1,..., Slave3	6	Y
This is the elected next on Unit.				
Next off	-	iCM: Master, Slave1,..., Slave7 M/S: Master, Slave1,..., Slave3	6	Y
This is the elected next off Unit.				
Standby	-	iCM: Master, Slave1,..., Slave7 M/S: Master, Slave1,..., Slave3	6	Y
This is the elected standby Unit.				
System Staging				
Sys Ctrld Tmp	-- °C		6	Y

This is the actual value of the controlled temperature. It may change according to the Unit type (Air Cooled or Water Cooled) and Unit mode (Cool or Heat). For an air cooled chiller or air cooled heat pump this will be always measured on the evaporator loop; while for a water cooled heat pump unit it may change if operating in Cool mode (evaporator side) or Heat mode (condenser side).				
Sys Act Setpt	-.- °C		6	Y
This is the actual value of setpoint for the system. It may change according to System mode (Cool or Heat). For air cooled or water cooled heat pump, this could be Hot Setpoint or Cool Setpoint according to System operating mode.				
Sys Ctrl'd Heat	-.- °C		6	Y
This is the actual value of the controlled Heat temperature. This value is available only in case of multipurpose Units.				
Sys Heat Setpt	-.- °C		6	Y
This is the actual value of the Heat setpoint for system. This value is available only in case of multipurpose Units.				
StageUp Left	0s		6	
This is the time left before the next stage up of the Next On Unit.				
StageDn Left	0s		6	
This is the time left before the next stage down of the Next Off Unit.				
Clear Timers	off	Off, Reset		
Reset the Stage down and Stage Up inhibition timers.				

Table 8: System Data parameters

4.4.1 Units: States

This section will list the current status of each individual Unit connected in the Units network.

Item	Standalone	State	M/S
Mst	NO	Off	Y
S_1	NO	Off	Y
S_2	NO	Off	Y
S_3	NO	Off	Y
S_4	NO	Off	N
S_5	NO	Off	N
S_6	NO	Off	N
S_7	NO	Off	N
Possible values	NO, Yes	Off, Run, Alarm, ComErr, N/Avail	

Table 9: Unit States overview

Standalone unit must be considered not available for the sequencing and thermostatic control. User can set the unit in Standalone mode through setting in menu: System → Standalone.

The Unit State can assume the following values:

- Off: the Unit is currently Off
- Run: the Unit is currently running
- Alarm: the Unit has an active alarm
- ComErr: the Unit is not communicating with the Master controller and requires actions to re-establish a proper communication. When a Unit is in communication error, it will run autonomously and in local mode. Please refer to the Troubleshooting section for further details.
- N/Av: the Unit is "Not Available" and stopped by iCM, i.e out of sequencing and staging control, for one of the following conditions:
 - Unit Switch and all the Circuit Switch on unit electrical panel are turned OFF.
 - Unit has available capacity less than 5%, i.e. a shut-down alarm prevents unit from starting.
 - Unit is set with "Operation Mode" (Cool/Heat), different from Master Operation Mode. (This is applicable only in case system composed by Heat-pump units or in mixed system with Heat-pump and Chiller units).
 - Unit is elected in "Stand-by" on Master unit controller.

4.4.2 Units: ActMode

This section will list the current operating mode of each individual Unit connected in Daikin Communication Network (column ActMode) and of the circuits composing the unit

Description	Default			M/S
ModeChangerover	Disable	Disable, Enable		Y
In case of Master/Slave, this value is always disable In case of iCM, this value can be enabled in configuration menu, and iCM will be able to change Operating mode of all the connected unit				
	ActMode	C1	C2	
Mst	Cool	off	off	Y
S_1	Cool	off	off	Y

S_2	Cool	Off	Off	Y
S_3	Cool	Off	Off	Y
S_4	Cool	Off	Off	N
S_5	Cool	Off	Off	N
S_6	Cool	Off	Off	N
S_7	Cool	Off	Off	N
Possible values	Cool, Ice, Heat, Multi	Off, water, Cool, Heat, N/Avail	Off, water, Cool, Heat, N/Avail, N/Cfg	

Table 10: Units and circuits actual operating modes

ActMode shown the actual operating mode of each Unit as follow:

- Cool: actual mode is cooling
- Ice: actual mode is ice (this operating mode has an impact on the capacity control)
- Heat: actual mode is heat
- Multi: actual mode for multipurpose Units

The additional two columns show the possible circuit operating modes as follow:

- Off: Circuit is currently off
- Water: Circuit is currently running in water to water mode (only in case unit is a multipurpose)
- Cool: Circuit is currently running in cool mode
- Heat: Circuit is currently running in heat mode
- N/Av: Circuit is "Not Available" for:
 - turned off by Circuit Switch
 - circuit in alarm
- N/Cfg: only for circuit C2: unit has only one circuit.

4.4.3 Unit: Defrost

Description	Default			M/S
Defrost Mngt	Disable	Disable, Enable		N
In case of Master/Slave, this value is always disable In case of iCM, this value can be enabled in configuration menu, and iCM will be able to manage the Defrost demand by each unit controller				
	DfrstDmd	C1	C2	
Mst	No	Off	Off	Y
S_1	No	Off	Off	Y
S_2	No	Off	Off	Y
S_3	No	Off	Off	Y
S_4	No	Off	Off	N
S_5	No	Off	Off	N
S_6	No	Off	Off	N
S_7	No	Off	Off	N
Possible values	No, Yes	Off, On	Off, On	

Defrost Demand shows the request for circuit defrost by each unit to iCM.

The additional two columns show if the circuit is in Defrost mode.

4.4.4 Units: Load

This section will list the current Unit capacities and circuit capacities.

Item	Load	C1	C2	M/S
Mst	0%	0%	0%	Y
S_1	0%	0%	0%	Y
S_2	0%	0%	0%	Y
S_3	0%	0%	0%	Y
S_4	0%	0%	0%	N
S_5	0%	0%	0%	N
S_6	0%	0%	0%	N
S_7	0%	0%	0%	N
Possible values	0...100%	0...100%	0...100%	

Table 11: Units and circuits actual capacities

The column Load refers to the Unit capacity and the two columns to individual circuit capacities.

4.4.5 Evap Water Temps

This section will list the evaporator water temperatures (entering and leaving) of each Unit.

Item	ELWT	EEWT	M/S
Mst	-.-°C	-.-°C	Y
S_1	-.-°C	-.-°C	Y
S_2	-.-°C	-.-°C	Y
S_3	-.-°C	-.-°C	Y
S_4	-.-°C	-.-°C	N
S_5	-.-°C	-.-°C	N
S_6	-.-°C	-.-°C	N
S_7	-.-°C	-.-°C	N
Possible values	-40°C...+70°C	-40°C...+70°C	

Table 12: Individual evaporator water temperatures (leaving and entering)

4.4.6 Cond Water Temps

This section will list the condenser water temperatures (entering and leaving) of the Unit. These temperatures are displayed only in case of water cooled or multipurpose Units.

Item	CLWT	CEWT	M/S
Mst	-.-°C	-.-°C	Y
S_1	-.-°C	-.-°C	Y
S_2	-.-°C	-.-°C	Y
S_3	-.-°C	-.-°C	Y
S_4	-.-°C	-.-°C	N
S_5	-.-°C	-.-°C	N
S_6	-.-°C	-.-°C	N
S_7	-.-°C	-.-°C	N
Possible values	-40°C...+70°C	-40°C...+70°C	


Table 13: Individual condenser water temperatures (leaving and entering)

4.4.7 Units: Heat Recovery

This section will list the heat recovery operating states of the Units equipped with this option. These states are displayed only if at least iCM Master Unit is equipped with the heat recovery option.

Item	Cnfgd	Avail	State	M/S
Mst	No	No	Stop	N
S_1	No	No	Stop	N
S_2	No	No	Stop	N
S_3	No	No	Stop	N
S_4	No	No	Stop	N
S_5	No	No	Stop	N
S_6	No	No	Stop	N
S_7	No	No	Stop	N
Possible values	No, Yes	No, Yes	Stop, Run	

Table 14: Individual heat recovery statuses

	Master/Slave cannot manage systems which include chillers equipped with Heat Recovery option. This functionality is only managed by the iCM.
---	--


The three columns describe the possible operating states of heat recovery option of all the units manage by iCM

1. Cnfgd: shows if connected unit has heat recovery option configured. iCM will manage heat recovery at system level only for unit with heat recovery configured.
2. Avail: shows if a unit with configured heat recovery option is available for iCM management. Unit is considered "Not Available" for heat recovery if Heat recovery function is disabled by HR switch on unit cabinet or through BMS HR enabling.
3. State: show if heat recovery has been enabled by iCM and running.

4.4.8 Units: Free Cooling

This section will list the Free-cooling operating states of the Units equipped with this option. These states are displayed only if at least iCM Master Unit is equipped with the free-cooling option.

Item	Cnfgd	Avail	Mode	M/S
Mst	No	No	Off	N
S_1	No	No	Off	N
S_2	No	No	Off	N
S_3	No	No	Off	N
S_4	No	No	Off	N
S_5	No	No	Off	N
S_6	No	No	Off	N
S_7	No	No	Off	N
Possible values	No, Yes	No, Yes	Off, Mechanical, FC Start, Mixed, FC Full	

	Master/Slave cannot manage systems which include chillers equipped with Free-cooling option. This functionality is only managed by the iCM.
---	---

The three columns describe the possible operating states of heat recovery option of all the units manage by iCM

1. Cnfgd: shows if connected unit has free-cooling option configured.
2. Avail: shows if a unit with configured free-cooling option is available for iCM management. Unit is considered "Not Available" for free-cooling if this function is disabled by HR switch on unit cabinet or by HMI Free-cooling Enable setpoint or by BMS through Free-cooling Network Enable setpoint.
3. Mode: shows the actual mode of the circuits and consequently of the whole unit.
 - a. Off: unit is shut down
 - b. Mechanical: unit is generating cooling capacity using circuit compressors (free-cooling is stopped)
 - c. FC_Start: Unit is starting one or both circuits in free-cooling (Free-cooling Valves are changing their position to activate the freecooling)
 - d. Mixed: unit is generating cooling capacity with both Compressors and Free-cooling equipment
 - e. FC Full: unit is generating cooling capacity only with Free-cooling equipment.


4.5 Evap / Cond PM (Evaporator or Condenser Pump Manager Menu)


This menu contains all the values communicated by the Pump Manager to iCM. Moreover, it contains the setpoint for Pump Speed control and Header Bypass Valve opening that iCM can set on the Pump Manager controller through Daikin Communication Network.


Description	Default	Range and function	AL	MS
Status	Off:Auto	Off:Auto, On:Auto, Off:Local, Off:SensAlarm, On:SensAlarm, Off:CommErr, On:CommErr, Configuration, Off:ConfigAlarm		N
This value indicated the Status of Pump Manager to iCM				
State	Off	Off, On		N
This value indicates the operating state of Pump Manager				
Alarm Active	None	None*Alarm		N
This value indicates that an alarm occurred on Pump Manager.				
Clear Alarm	Off	Off, On		N
This setting allows to send a reset of the active alarms on Pump Manager from iCM.				
Nr Pump Running	0	0...10		N
This value indicates the number of running pump				
Pump Speed	0%	0%...100%		N
This value indicates the speed percentage of the pump				
Speed Control	Constant	Constant, DTemp, DifPres, AbsPres		N
This indicates controlled sensor used by Pump Manager for Pump Speed Control				
The following sensor measurement and related setpoints display according to Speed Control value and they are exclusive.				
_Delta Temp	-.- °Dc			N
This value indicates the controlled sensor measurement on Pump Manager				
_Actual Setpoint	-.- °Dc			N
This value indicates the actual setpoint on Pump Manager for pump speed control				
_Setpt iCM	5.0 °Dc	0.5 °Dc...20.0 °Dc		N
This setting allows to send setpoint for speed control to Pump Manager from Local HMI on iCM				


_Setpt Ntwk	5.0 °Dc	0.5 °Dc...20.0 °Dc		N
This value indicates the setpoint for speed control to Pump Manager sent by BMS when iCM is in Control Source = Network				
Alternatively. (Speed Control Value = Differential Pressure)				
_Diff Press	-.-kPa			N
This value indicates the controlled sensor measurement on Pump Manager				
_Actual Setpoint	50.0 kPa			N
This value indicates the actual setpoint on Pump Manager for pump speed control				
_Setpt iCM	50.0 kPa	0.0kPa...300.0kPa		N
This setting allows to send setpoint for speed control to Pump Manager from Local HMI on iCM				
_Setpt Ntwk	50.0 kPa	0.0kPa...300.0kPa		N
This value indicates the setpoint for speed control to Pump Manager sent by BMS when iCM is in Control Source = Network				
Alternatively. (Speed Control Value = Absolute Pressure)				
_Abs Press	-.-kPa			N
This value indicates the controlled sensor measurement on Pump Manager				
_Actual Setpoint	-.-kPa			N
This value indicates the actual setpoint on Pump Manager for pump speed control				
_Setpt iCM	50.0 kPa	0.0kPa...300.0kPa		N
This setting allows to send setpoint for speed control to Pump Manager from Local HMI on iCM				
_Setpt Ntwk	50.0 kPa	0.0kPa...300.0kPa		N
This value indicates the setpoint for speed control to Pump Manager sent by BMS when iCM is in Control Source = Network				
BypValve Opening	0%	0%...100%		N
This value indicates the opening percentage of header bypass valve				
BypValve Control	None	None, MinDP, Flow, Ewt		N
This value indicates controlled sensor used by Pum Manager for control of Header bypass valve				
The following sensor measurement and related setpoints display according to Header Bypass Valve Control value and they are exclusive.				
_MinDPonUnits	None	None, Active		N
This value indicates that Minimum pressure drop has been reached by one of the Units and force opening of the header bypass Valve				
Alternatively. (Bypass Valve Control = Flow)				
_Flow	-.- 1/s			N
This value indicates the controlled sensor measurement on Pump Manager				
_Actual Setpoint	-.- 1/s			N
This value indicates the actual setpoint on Pump Manager for Header bypass valve control				
_Setpt iCM	4.5 1/s	0.01/s...200.01/s		N
This setting allows to send setpoint for speed control to Pump Manager from Local HMI on iCM				
_Setpt Ntwk	4.5 1/s	0.01/s...200.01/s		N
This value indicates the setpoint for speed control to Pump Manager sent by BMS when iCM is in Control Source = Network				
Alternatively. (Bypass Valve Control = EvapEwt)				
_EvapEwt	-.- °C			N
This value indicates the controlled sensor measurement on Pump Manager				
_Actual Setpoint	-.- °C			N
This value indicates the actual setpoint on Pump Manager for Header bypass valve control				
_Setpt iCM	7.0 °C	4.0 °C...30.0 °C		N
This setting allows to send setpoint for header bypass valve control to Pump Manager from Local HMI on iCM				
_Setpt Ntwk	7.0 °C	4.0 °C...30.0 °C		N
This value indicates the setpoint for Header bypass valve control to Pump Manager sent by BMS when iCM is in Control Source = Network				
Alternatively. (Bypass Valve Control = CondEwt)				
_CondEwt	-.- °C			N
This value indicates the controlled sensor measurement on Pump Manager				
_Actual Setpoint	-.- °C			N
This value indicates the actual setpoint on Pump Manager for pump speed control				
_Setpt iCM	25.0 °C	15.0 °C...40.0 °C		N
This setting allows to send setpoint for header bypass valve control to Pump Manager from Local HMI on iCM				
_Setpt Ntwk	25.0 °C	15.0 °C...40.0 °C		N
This value indicates the setpoint for Header bypass valve control to Pump Manager sent by BMS when iCM is in Control Source = Network				
_Active Power	-.- kW			N
This value indicates the Active Electrical Power consumption				

Table 15 Evaporator or Condenser Pump Manager Menu

 Pump Speed Controlled sensor and related setpoint will display only if Speed Control is different from "Constant"

 Header by-pass Valve controlled sensor and setpoint will display only if Bypass Valve Control is different from "None"

 Active Power value will display only if Energy Mtr is configured on Pump Manager

 iCM can set the values of control functions of the Pump Manager. The values chosen depend on Control Source setting of Master Unit controller.

- If Control Source is Local:
_Setpt iCM: Local setpoint on HMI of Master controller will be communicated to Pump Manager
- If Control Source is Network
_Setpt Ntwk: Writeable setpoint by BMS through Modbus or BACnet communication with Master Unit controller, that will be communicated by iCM to the Pump Manager

4.6 Maintenance

This section will describe the parameters accessible in the Maintenance page. It will also describe the links to other sub-sections. This section contains two settings and two sub-menus. The settings are the following:






Mst Enable	Yes	No, Yes	4	Y
It is used to stop the Master Unit and take it out from sequencing, but iCM function keeps on working and managing the other slave Units. This setting shall be used to stop the Master for maintenance or other purpose.				
Mst HeatRec Enable	No	No, Yes	4	N
It is used to stop heat recovery function on Master Unit and take it out from sequencing, but iCM function keeps on working and managing the other slaves Units. This setting shall be used to stop the Master for maintenance or other purpose.				
Mst FreeClg Enable	No	No, Yes	4	N
It is used to stop Free-cooling function on Master Unit and take it out from sequencing, but iCM function keeps on working and managing the other slaves Units. This setting shall be used to stop the Master for maintenance or other purpose.				
Units Starts			4	Y
Sub-page with the individual Units and circuits starts				
Units Run Hours			4	Y
Sub-page with the individual Units and circuits run hours				
Evap LWT Sensor	-.-°C		4	Y
This value represents the actual reading of the common sensor on the evaporator loop.				
Evap LWT Offset	0.0°C	-5.0°C...5.0°C	4	Y
This setting represents the offset applied to the evaporator common sensor reading .				
Cond LWT Sensor	-.-°C		4	Y
This value represents the actual reading of the common sensor on the condenser loop. This sensor reading will be visible only in case of water cooled Units and multipurpose.				
Cond LWT Offset	0.0°C	-5.0°C...5.0°C	4	Y
This setting represents the offset applied to the condenser common sensor reading.				

Table 16: Maintenance page

 iCM staging and sequencing is enabled through Unit switch and other enable settings on Master Unit controller.
To stop the Master without stopping iCM functions, "Mst Enable" must be used

 iCM staging and sequencing of heat recovery function is enabled through Unit switch and other enable settings on Master Unit controller.
To stop the HR function on Master without stopping iCM functions, "Mst HeatRec Enable" must be used

 iCM staging and sequencing of free-cooling function is enabled through Unit switch and other enable settings on Master Unit controller.
To stop the FC function on Master without stopping iCM functions, "Mst FreeClg Enable" must be used

The sub-menus will be explained in the following sub-sections.

4.6.1 Units Starts

This section will list the number of starts of each Unit and each circuit.

Item	Starts	C1	C2	MS
Mst	0	0	0	Y
S_1	0	0	0	Y
S_2	0	0	0	Y
S_3	0	0	0	Y
S_4	0	0	0	N
S_5	0	0	0	N
S_6	0	0	0	N
S_7	0	0	0	N
Possible values	0...4294967295	0...4294967295	0...4294967295	

Table 17: Individual number of starts for Units and circuits

The column Starts refers to the number of starts of each Unit and the two remaining columns refers to individual circuit starts.

4.6.2 Units Run Hours

This section will list the count of the running hours of each Unit and each circuit.

Unit Run Hours	0	0...4294967295	Set the Unit run hours	2
Item	RunHours	C1	C2	MS
Mst	0	0	0	Y
S_1	0	0	0	Y
S_2	0	0	0	Y
S_3	0	0	0	Y
S_4	0	0	0	N
S_5	0	0	0	N
S_6	0	0	0	N
S_7	0	0	0	N
Possible values	0...4294967295	0...4294967295	0...4294967295	

Table 18: Individual running hours for Units and circuits

The first column refers to the number of running hours of each Unit and the two others refer to individual circuit running hours.

4.7 System Settings

This section will describe the parameters accessible in the System Settings menu.

Description	Default	Range and function	AL	MS
Priority			4	Y
This is a sub-page where it's possible to set individual Unit priorities.				
Max Run Units	1	iCM: 1...8 M/S: 1...4	4	Y
This setting allows to define the maximum number of Units that can be started by the M/S or iCM.				
Min Run Units	0	iCM: 0...1 M/S: 0...1	4	Y
This setting allows to define the minimum number of Units that will always run in the system.				
Staging thresholds			4	Y
This is a sub-page where it's possible to set individual staging thresholds.				
Stage for Temperature				
StageUp DT Cool	2.5 °C	0.0 °C...5.0 °C	4	Y
This setting defines what is the delta temperature with setpoint to force a Unit stage up in Cool mode.				
StageDn DT Cool	1.5 °C	0.0 °C...5.0 °C	4	Y
This setting defines what is the delta temperature with setpoint to force a Unit stage down in Cool mode.				
StageUp DT Heat	2.7 °C	0.0 °C...5.0 °C	4	Y
This setting defines what is the delta temperature with setpoint to force a Unit stage up in Heat mode.				
StageDn DT Heat	1.5 °C	0.0 °C...5.0 °C	4	Y
This setting defines what is the delta temperature with setpoint to force a Unit stage down in Heat mode.				
Dead Band	0.5 °C	0.1 °C...1.5 °C	2	Y

This setting defines what is the temperature range around the actual setpoint in which the system manager will not do staging actions or capacity control.				
Stage Up Time	600s	60s...3600s	6	Y
This value indicates what is the actual stage up time to start the Next On Unit. This is a calculated value.				
Max Stage Up Time	600s	60s...3600s	2	Y
This setting defines what is the maximum delay between to Unit starts.				
Min Stage Up Time	300s	60s...3600s	2	Y
This setting defines what is the minimum delay between to Unit starts.				
Max StageUp Error	5.0°C	0.0°C...10.0°C	2	Y
This setting defines what is the error which corresponds to the minimum delay in a linear interpolation. The maximum delay is calculated at 0.0°C of error.				
Stage Dn Time	600s	60s...3600s	6	Y
This value indicates what is the actual stage up time to start the Next Off Unit. This is a calculated value.				
Max Stage Dn Time	600s	60s...3600s	2	Y
This setting defines what is the maximum delay between Unit stops.				
Min Stage Dn Time	300s	60s...3600s	2	Y
This setting defines what is the minimum delay between Unit stops.				
Max StageDn Error	5.0°C	0.0°C...10.0°C	2	N
This setting defines what is the error which corresponds to the minimum delay in a linear interpolation. The maximum delay is calculated at 0.0°C of error.				
Load Control Settings				
Delta Load	15%	0%...100%	2	N
This setting defines the capacity step that the unit needs to perform during load or unload of compressors, after iCM swaps to another unit to load or unload.				
Load Time	30 sec	5sec...600sec	2	N
This setting defines the wait time after each unit load before iCM swaps to another unit.				
UnLoad Time	30 sec	5sec...600sec	2	N
This setting defines the wait time after each unit unload before iCM swaps to another unit.				
Min Cool Tmp	4.0°C	-30.0°C...30.0°C	2	N
This setting defines what is the minimum acceptable cool setpoint for the Units in general.				
Max Heat Tmp	50.0°C	20.0°C...70.0°C	2	N
This setting defines what is the maximum acceptable heat setpoint for the Units in general.				
Defrost Setting				
Defrost Mngt	Disable	Disable, Enable	6	N
This value show if Defrost management of iCM is enabled				
Defr Inhibit Time	5min	0...15min	2	N
This setting defines the time that should expire since unit defrost demand before iCM allow the defrost on Unit				
Heat Recovery Settings				
Ht Rec StageTimer	15min		2	N
This setting defines the stage delay between any heat recovery activation commanded by the iCM.				
Ht Rec Max Run	0	iCM: 1...8 M/S: Not Available	2	N
This setting specified the maximum number of Units with activated Heat Recovery. After reaching up this number, iCM will stop activating heat recovery function on other units.				
FreeCooling Settings				
FC Max Run	0	iCM: 1...8 M/S: Not Available	2	N
This setting specified the maximum number of Units with activated Free-cooling. After reaching up this number, iCM will stop activating free-cooling function on other units.				
FC Approach	4.0°C	2.0°C...10.0°C	2	N
This Free-cooling setting on Master unit is used at system level. This setting represents the minimum delta temperature between System Actual setpoint and Outside air temperature to activate the Free-cooling at system level. This setting will update if it is changed in View/Set Unit → Freecooling → Setting menu of Master Units				
FC High Thresh	87%	60%...90%	2	N
This Free-cooling setting on Master unit is used at system level. This setting represents the capacity threshold of the running units with activated free-cooling to be exceeded to allow the changeover from Free-cooling to Mix Mode or from Mix Mode to Mechanical. This setting will update if it is changed in View/Set Unit → Freecooling → Setting menu of Master Units				
FC ChangeMode DT	1.5°C	0.5°C...2.5°C	2	N
This setting represents the DT from System actual setpoint to be exceeded to allow the changeover from Free-cooling to Mix mode or from Mix Mode to Mechanical				
FC ChangeMode Delay	15min	1min...60min	2	N
This setting represents the delay after each Free-cooling mode changeover that must expire before allowing the changeover of another unit.				


Table 19: System settings

4.7.1 Priority

This sub-page will allow to set the individual Units priorities for stage sequencing.

Description	Default	Range and function	AL	MS
Cooling Mode				
Master	1	1...4		N
Slave1	1	1...4		N
Slave2	1	1...4		N
Slave3	1	1...4		N
Slave4	1	1...4		N
Slave5	1	1...4		N
Slave6	1	1...4		N
Slave7	1	1...4		N
These settings are used to define the individual Unit priority when operating in cooling mode. If properly set, they will allow Units grouping.				
Heating Mode				
Master	1	1...4		N
Slave1	1	1...4		N
Slave2	1	1...4		N
Slave3	1	1...4		N
Slave4	1	1...4		N
Slave5	1	1...4		N
Slave6	1	1...4		N
Slave7	1	1...4		N
These settings are used to define the individual Unit priority when operating in heating mode. If properly set, they will allow Units grouping.				

Table 20: Priority settings for cooling and heating modes

	In case the system includes multipurpose Units, those will always have the maximum priority and will be started first.
---	--


4.7.2 Staging thresholds

This sub-page will allow to set the individual staging thresholds for each individual Unit.

Description	Default	Range and function	AL	MS
Cooling Mode				
Stage Up Thresholds				
Master	100%	0%...100%		Y
Slave1	100%	0%...100%		N
Slave2	100%	0%...100%		N
Slave3	100%	0%...100%		N
Slave4	100%	0%...100%		N
Slave5	100%	0%...100%		N
Slave6	100%	0%...100%		N
Slave7	100%	0%...100%		N
Stage Down Thresholds				
Master	30%	0%...100%		Y
Slave1	30%	0%...100%		N
Slave2	30%	0%...100%		N
Slave3	30%	0%...100%		N
Slave4	30%	0%...100%		N
Slave5	30%	0%...100%		N
Slave6	30%	0%...100%		N
Slave7	30%	0%...100%		N
These settings are used to set the individual stage up and down thresholds on each Unit in cool mode. These thresholds are used for staging up and down the Units and, if properly set, can let the iCM achieve an improved system efficiency.				
Heating Mode				
Stage Up Thresholds				
Master	100%	0%...100%		Y
Slave1	100%	0%...100%		N
Slave2	100%	0%...100%		N
Slave3	100%	0%...100%		N
Slave4	100%	0%...100%		N
Slave5	100%	0%...100%		N

Slave6	100%	0%...100%		N
Slave7	100%	0%...100%		N
Stage Down Thresholds				
Master	30%	0%...100%		Y
Slave1	30%	0%...100%		N
Slave2	30%	0%...100%		N
Slave3	30%	0%...100%		N
Slave4	30%	0%...100%		N
Slave5	30%	0%...100%		N
Slave6	30%	0%...100%		N
Slave7	30%	0%...100%		N

Table 21: Stage up and stage down capacity thresholds for cooling and heating modes


	In case of systems with multipurpose Units, the staging thresholds will not be managed as the iCM will control the individual circuits activation and operating modes.
---	--

4.8 Standby Chiller

This section will describe the settings needed to configure the standby function.

Description	Default	Range and function	AL	MS
Standby Chiller	No	No, Yes		Y
This setting is used to activate the Standby chiller management.				
Cycling Type	RunHour	RunHours, Sequence		Y
This setting is used to define how to select the standby Unit				
<ul style="list-style-type: none"> Run Hours: the Unit with the higher number of run hours will be selected. Sequence: the Unit with the next numeral id is selected. If the Unit in standby is the Slave 3 the next standby Unit will be Slave 4 and so on. 				
Interval Time	7Day	1...365 days		Y
This setting is used to define after what number of days the standby Unit is rotated.				
Switch Time	00:00:00	00:00:00...23:59:59		Y
This setting is used to define at what time of the day the standby Unit is rotated. This might be useful to command the rotation of the standby Unit when the system is off.				
Tmp Comp	No	No, Yes		Y
This setting is used to activate the standby Unit for temperature compensation. If the active setpoint cannot be reached for multiple reasons different from a Unit alarm, the standby Unit can become operational and compensate the lack of capacity.				
Tmp Comp Time	120min	0min...600min		Y
This setting is used to define the how long the system manager should wait before activating the standby Unit to compensate the lack of capacity.				
Standby Reset	No	No, Yes		Y
This setting is used to reset the Standby Unit calculation. The elected Standby Unit will be re-defined if the reset is activated.				

Table 22: Standby chiller configuration

	If the switch time is improperly set, the Standby Unit changeover may have an impact on the water temperature stability. Please, check with the plant Manager if there are specific limitations on the changeover time (i.e. process applications).
---	---

4.9 Configuration

This section will describe the parameters accessible in the Configuration page.

Description	Default	Range and function	AL	MS
SCM Type	Mst/Slv	Mst/Slv, iCM Std, iCM Adv*	4	Y
This value indicates which type of system control is active on your Unit.				
Config Type	Undef	Undef, Only C/O, Only H/P, C/O_H/P, Only 4P, 4P_C/O	4	Y
This value indicates the type of system is being controlled. It includes the following:				
<ul style="list-style-type: none"> Undef: Undefined mix of Units Only C/O: system composed with cooling only Units Only H/P: system composed with reversible (water side or refrigerant side) heat pumps only C/O_H/P*: system composed with a mix of cooling only and heat pumps (all reversible refrigerant side or all reversible water side) Only 4P: system composed with only multipurpose Units 				

<ul style="list-style-type: none"> 4P_C/O*: system composed with a mix of multipurpose and air-cooled cooling only Units 				
*iCM only.				
Config Alarm	None	None, ModeErr, ComprErr, CooledErr, UnitNotDef, iCMtypeErr	4	Y
This value indicates if configuration alarm of iCM has occurred (please refer to Troubleshooting)				
Control Tmp	Leaving	Leaving, Entering	4	Y
This value indicates what temperature is used to stage up and down the Units: <ul style="list-style-type: none"> Leaving: in this case the additional common water temperature sensor(s) is required Entering: in this case the controlled temperature will be the average of the entering water temperature to the Units 				
Load Control	Enable	Disable, Enable	2	Y
This setting specifies if the Unit capacity control shall be done by the iCM (Enable) or if a staging only control is needed (Disable).				
_ Load Ctrl Mode	Fixed	Fixed, Regime	2	
This setting specifies the type of load control: <ul style="list-style-type: none"> Fixed: iCM will control the load/unload of the Unit since start-up of the system Regime: iCM will control the load/unload of the Units until the system temperature is inside Stage for Load/Unload temperature range. 				
_ Unload Type	Hi Load	Hi Load, Lo Load, Next Off	2	
This setting specifies the type of unload control: <ul style="list-style-type: none"> Hi Load: the Unit with the higher capacity will be unloaded first Lo Load: the Unit with the lower capacity will be unloaded first Next Off: the elected Next Off Unit will be downloaded first 				
ModeChangeover	Disable	Disable, Enable	4	N
This setting will display only if Master controller is a Heat pump unit In case of Master/Slave, this value is fixed to "Disable" In case of iCM, this value can be enabled and iCM will be able to change Operating mode of the connected unit				
Defrost Mngt	Disable	Disable, Enable	4	N
This setting will display only if Master Controller is an Air-Cooled Heat Pump In case of Master/Slave, this value is fixed to "Disable" In case of iCM, this value can be enabled and iCM will be able to manage start of defrost of the connected units				
HeatRec Configured	No	No, Yes		N
This value shows if Heat Recovery is managed at system level. If at least Master Unit is equipped with Heat Recovery option, then this value become automatically Yes.				
FreeClg Configured	No	No, Yes		N
This value shows if Free Cooling is managed at system level. If at least Master Unit is equipped with Free Cooling option, then this value become automatically Yes.				
Evap PM Enable	No	No, Yes		N
This setting is used to activate communication and display values of the Evaporator Pump Manager				
Evap PM config	▶			N
This menu contains the configuration settings communicated by Evap. Pump Manager to iCM				
Cond PM Enable	No	No, Yes		N
This setting is used to activate communication and display values of the Condenser Pump Manager				
Cond PM config	▶			N
This menu contains the configuration settings communicated by Cond Pump Manager to iCM				
Apply changes	No	No, Yes		N
This setting forces a reboot of the Unit controller to configure the HMI layout and parameters accordingly with the system configuration.				

Table 23: System configuration


4.9.1 Pump Manager Configuration (PM Config)

This menu reports the configuration values of Pump manager communicated to iCM.

Description	Default	Range and function	AL	MS
Type	Config	Config*Evap*Cond		Y
This value indicates what kind of Pump Manager is connected to iCM				
Version	##.##			Y
Application version of Pump Manager				

Pump Number	0	0...10		Y
Number of pumps configured and managed by Pump Manager				
Speed Ctrl Type	Constant	Constant, DeltaTemp, DiffPress, AbsPress,		Y
This value indicates which kind of sensor is used by Pump Manager to control speed of the pumps				
BypValve Ctrl Type	None	None, MinDiffPress, Flow, Ewt		Y
This parameter specifies which kind of sensor is used by Pump Manager to control opening of Headers Bypass Valve				
Energy Mtr	No	No, Yes		Y
This value indicates if Energy Meter is enabled on Pump Manager				

Table 24 Evaporator or Condenser Pump Manager Configuration menu

	This menu is available only if "Evap or Cond PM" is enabled and after reboot of controller
---	--

5 SYSTEM OPERATING

This chapter explains how to interact with controllers where iCM is configured.

Firstly, it must be highlighted that iCM logic is embedded in the unit controller. When a unit is elected as “Master” in plant-room, main setpoints on Master unit controller will be used as “System Setpoints”. On the other hand, the “Slave” units are under iCM control that will communicate the operating setpoints. If “Slave” unit is not communicating anymore with “Master” or it is set in “Standalone” mode through HMI setting, “Slave” will work using its own setpoints.

5.1 System Enable setpoint

The enabling conditions on Master unit controller, generally checked to enable a unit, must be satisfied to enable iCM logic and consequently the system sequencing and staging. Those conditions are the following:

1. “Unit Enable” = ON on unit controller HMI
2. “Unit Switch” turned ON on the unit cabinet
3. “Netwrk En Sp” on unit controller HMI (only if “Control Source” = Network, i.e. Master is commanded by third party BMS though protocol communication with object “Chiller Enable Setpoint – Network”)

If all the above conditions are true on Master Unit controller, in menu

- “System → Data → Sys State” = “Run”

and iCM sequencing and staging logic will be performed.

If one of the above conditions is false on Master Unit, iCM sequencing and staging logic is stopped and all the units will be stopped by Master controller.

5.1.1 Master Disable

If user would like to stop the Master unit and take it out of sequence, keeping iCM logic running, he should operate on the setpoint in menu

- “System → Maintenance → Mst Enable” = No

In this way, state of Master unit will become “Not Available”, iCM stops the Master unit and it keeps on sequencing the other available units.

5.1.2 Slave Disable

If user would like to stop a Slave unit and take it out of sequence, he should set one of the enabling conditions to false, mentioned in paragraph 5.1.

When Slave unit is disabled, iCM will consider it as “Not available” and consequently, out of sequencing logic. iCM will send stop command to unit and it will show in menu

- “System → Data → Units: State → Slv# State” = N/Av (not available)

5.2 System water temperature setpoints

To set temperature setpoints, used by iCM for sequencing and staging logic, user should operate on Cool or Hot setpoint on Master controller HMI.

5.2.1 System Cool Setpoint

It must be highlighted that iCM can sequence the units according to System Leaving water temperature or according to System Entering water temperature, depending on setting in menu “System→Configuration→ Control Tmp”. In both cases of controlled temperature, user must change the setpoint of the Master unit controller HMI:

- “Cool LWT 1”

5.2.2 System Heat Setpoint

If the Master is a Heat-pump or a Multipurpose unit, user should operate on the setpoint of the Master controller HMI:

- “Heat LWT 1”

The Heat setpoint on Master becomes “System Heat Setpoint” in both cases of temperature control based on System Leaving water temperature or System Entering water temperature.

5.2.3 System Heat Recovery EWT Setpoint

In system with more than two units equipped with Heat recovery option, to set Heat Recovery setpoint, used by iCM for heat recovery management at system level, user needs to operate on the setpoint of Master controller HMI:

- “HR EWT”

The Heat Recovery on Master will become the “System Heat Recovery Setpoint”.

5.2.4 System Setpoints by Network communication

It worth noting that if Master controller is connected to a third party BMS and “Control Source = Network” on Master controller HMI, BMS can write the temperature setpoints on Master; those setpoints will become the “Active setpoints” on Master unit controller and consequently for iCM logic.

BMS should operate on

- Cool Setpoint – Network
- Heat Setpoint – Network

on Master Unit protocol communication (Please refer to specific Unit Protocol Communication Mapping).

Those setpoints can be used to set System Temperature Setpoints Cool or Heat for both controlled temperatures (System LWT or System EWT) by iCM logic.

If Master unit is equipped with Heat recovery option, BMS should operates on

- Heat Recovery EWT setpoint – Network

on Master Unit protocol communication.

The above setpoints set by BMS on Master unit controller can be checked on HMI:

- → Netwk Cool LWT
- → Netwk Heat LWT
- → Netwk HR EWT

5.2.5 System Active Setpoint

Once Temperature setpoints and Operation Mode (Cool/Heat) are set on Master controller, “Active setpoint” of Master will become “System Active Setpoint”.

Master unit controller sends the “System Active Setpoint” to all the Slaves units. This setpoint overwrites the “Local” setpoints of the Slave units and it can be visualized in each unit in main page

- “Main Menu → Setpoints”.

5.3 System mode and System mode setpoint

In system with only Heat-pump units or a mix of Heat-pump and Chiller units, iCM can sequence the unit in order to achieve System Cool temperature setpoint or System Heat temperature setpoint. To allow changeover of the operation mode in the sequencing and staging logic of iCM, user should operate on setpoints on Master unit controller. The following conditions trigger the mode-changeover from Cool mode to Heat Mode:

1. “Unit Available Mode = Cool/Heat” on controller HMI (showing that unit is a heat-pump and changeover is possible)
2. “Mode Switch” is turned on “Heat” on Unit cabinet
3. “Network Mode” = Heat” on controller HMI (only if “Control Source” = Network, i.e. Master is commanded by third party BMS through protocol communication with object “Unit Mode Setpoint – Network”).

If one of the aforementioned conditions should become “Cool”, Master change System operation mode in “Cool”.

System Operation Mode can be checked in menu

- “System → Data → Sys Mode”



In case of Master/Slave option, Master does not set the System Operation Mode on the Slave units. Mode changeover on all the units in the system must be performed satisfying the aforementioned conditions (through switch and/or Network mode setpoint)

In case of iCM Option and configured “System Mode Changeover”, iCM Master will set the System mode on all the connected heat pump slaves.

System Mode Setpoint by iCM takes over the aforementioned conditions on the slave units (Mode Switch and Network mode setpoint are ignored by Slave unit controller).



If a Slave unit should not be set with same operation mode of the Master, iCM will consider it “Not Available” and stop it.

5.4 System controlled temperature

This variable represents the temperature at system level that iCM tries to affect with sequencing and staging of the units to achieve the system temperature setpoint. The variable is shown in menu:

- “System → Data → Sys Ctrlld Temp”

The table below shows the values that “System Controlled temperature” can assume according to configuration of Common LWT sensor, type of unit (Air-cooled/Water Cooled/Multipurpose) and System Operation Mode:

Common LWT Config	Unit Type	Sys Op. Mode	Sys Ctrl Temp
NTC10K (sensor is installed)	A/C	Cool	Common Leaving WT sensor
NTC10K	A/C	Heat	Common Leaving WT sensor
NTC10K	W/C	Cool	Common Evaporator Leaving WT sensor
NTC10K	W/C	Heat	Common Condenser Leaving WT sensor
NTC10K	Multipurpose	Multi	1) Common Cool Leaving WT sensor 2) Common Heat Leaving WT sensor
No Sensor	A/C	Cool	Average Entering WT sensors of running units
No Sensor	A/C	Heat	Average Entering WT sensors of running units
No Sensor	W/C	Cool	Average Evaporator Entering WT sensors of running units
No Sensor	W/C	Heat	Average Condenser Entering WT sensors of running units

Table 25: System controlled temperature based on system layout

5.5 System Heat Recovery Enable (iCM option only)

In system with more than two units equipped with Heat recovery option, Master unit controller can manage sequencing and staging of the units in order to maximize Heat Recovery at system level.

The enabling conditions on Master unit controller, generally checked to start heat recovery management on a unit, must be satisfied to enable heat recovery management on iCM logic. Those conditions are the following:

1. “Heat Recovery Switch” is turned ON on unit cabinet
2. “Network HR Enable” on Unit controller HMI (only if “Control Source” = Network, i.e. Master is commanded by third party BMS through protocol communication with object “Heat Recovery Enable Setpoint – Network”)

If all the above conditions are true on Master Unit controller, in menu

- “System → Data → Sys HeatRec State” = Run

and iCM sequencing and staging logic to satisfied Heat recovery load will be performed.

If one of the above conditions is false on Master Unit Controller, Heat Recovery function is disabled on Master and all the Slave units.

5.5.1 Heat Recovery Disable on Master

If user would like to stop heat recovery on the Master unit, keeping Heat Recovery management by iCM, he should operate on the setpoint in menu

- “System → Maintenance → Mst HeatRec Enable” = No


In this way, Heat Recovery state of Master unit will become “Not Available”, iCM stops Heat Recovery function on Master unit and it keeps on sequencing other units with available Heat Recovery to satisfied Heat load demand.

5.5.2 Heat Recovery Disable on Slave

If user would like to stop Heat Recovery function on Slave unit and take it out of sequence, he should set one of the enabling conditions to false, mentioned in paragraph 5.5.

When Slave unit is disabled, iCM will consider it as “Not available” and consequently, out of sequencing logic. iCM will send stop command to unit and it will show in menu

- “System → Data → Units: HeatRecovery → Slv# Avail” = No (not available)

	When Heat Recovery function is disabled on a unit, iCM keeps on taking in consideration the unit to satisfy load on cooling side.
---	---

5.6 System Free Cooling Enable (iCM option only)

In system with more than two units equipped with Free Cooling option, Master unit controller can manage sequencing and staging of the units in order to maximize cooling capacity generated by free-cooling at system level.

The enabling conditions on Master unit controller, generally checked to start free cooling management on a unit, must be satisfied to enable free cooling management on iCM logic. Those conditions are the following:

1. “Free Cooling Switch” is turned ON on unit cabinet
2. “Netwrk HR Enable” on Unit controller HMI (only if “Control Source” = Network, i.e. Master is commanded by third party BMS through protocol communication with object “Heat Recovery Enable Setpoint – Network”)
3. “Free Cooling Enable” is Yes on Master Unit HMI
4. Outside air temperature (OAT) is less than Sys Actual setpoint minus FC Approach (configurable setting)

If all the above conditions are verified on Master Unit controller, in menu

- "System → Data → Sys FreeClg Status" = Run

and iCM start to perform the sequencing and staging logic to satisfied cooling load request through free-cooling. Moreover "Sys FreeClg Status" can assume different values as explained below:

- Off:Switch*: Free-cooling is stopped because one of the enabling setpoints on Master Unit controller is not satisfied
- Wait for OAT*: Free-cooling is stopped because even if the option is enabled, condition on OAT is not satisfied.
- Run*: Free-cooling is running because all the conditions are satisfied.
- Off:Alm*: Free-cooling is stopped because the outside air temperature sensor on Master unit controller (use by iCM at system level) is broken or it is not working properly.

5.6.1 Free-cooling Disable on Master

If user would like to stop free-cooling on the Master unit, keeping Free-cooling management by iCM, he should operate on the setpoint in menu

- "System → Maintenance → Mst FreeClg Enable" = No

In this way, Free-cooling availability of Master unit will become "No", iCM stops free-cooling function on Master unit and it keeps on sequencing other units with available Free-cooling to satisfied cooling demand.

5.6.2 Free-cooling Disable on Slave

If user would like to stop Free-cooling function on Slave unit and take it out of sequence, he should set one of the enabling conditions to false, mentioned in paragraph 5.6.

When Slave unit is disabled, iCM will consider it as "Not available" for free-cooling and, consequently, out of free-cooling sequencing logic. iCM will send stop command for free-cooling function and it will show in menu

- "System → Data → Units: HeatRecovery → Slv# Avail" = No (not available)



When Free-cooling function is disabled on a unit, unit will change its mode in Full mechanical and it can keep on generating cooling capacity through circuit compressor. Beside that, iCM can stop the unit if staging conditions on unit capacity or system controlled temperature will be satisfied.

5.7 Standalone Mode

In any moment, setting a unit in "Standalone" mode allows to operate the unit independently from iCM control. User needs to set the related setpoint in menu:

- "System → Standalone" = Yes

When a unit is set in "Standalone" mode, iCM cannot manage the unit that is considered out of sequencing logic. Moreover, unit starts to work with local settings: Enable setpoint, Temperature setpoints, Operation Mode setpoint.

User can check the unit set "Standalone" on master unit controller in menu:

- "System → Data → Units: Status"

5.7.1 Setting Slave in Standalone

If a Slave unit is set "Standalone", it cannot become Next On or Next Off unit and user has to operate locally.

Once a unit is set again under iCM control (setting "Standalone" = No), iCM starts to operate the unit in the last found status. In other words, if the unit previously in "Standalone", was running, iCM lets the unit running and stops it only if Stage Down conditions are satisfied. Likewise, if the unit previously in "Standalone", was stopped, iCM leaves the unit stopped and available for sequencing and staging.

5.7.2 Setting Master in Standalone

If Master unit is set "Standalone", all the units in the system start to work in "Standalone" mode and iCM cannot manage them.

Moreover, Slaves units notify that Master is "Standalone" raising an alarm of "Master Disconnect".

Only when Master is set back to "Not standalone", iCM start to manage the units, keeping them in the last operating status and start the sequencing and staging logic.

5.8 System Overview

On Master unit controller HMI, Main menu shows an overview of the status of the units through icons:

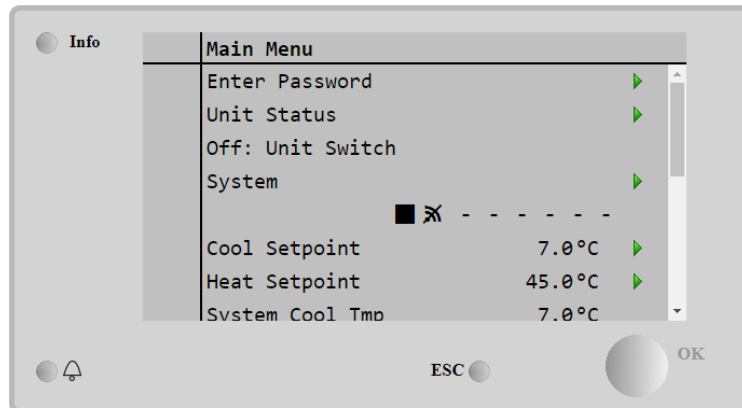







Figure 15: System Overview on Main menu of Master unit HMI

The icons represent the different status of the units:

-  *Off*: the Unit is currently Off
-  *Run*: the Unit is currently running
-  *Alarm*: the Unit has an active alarm
-  *ComErr*: the Unit is not communicating with the Master controller and requires actions to re-establish a proper communication. When a Unit is in communication error, it will run autonomously and in local mode.
-  *N/Av*: the Unit is "Not Available" and stopped by iCM, i.e out of sequencing and staging control, for one of the following conditions:
 - "Unit Switch" or all the "Circuit Switch" on unit electrical panel are turned OFF.
 - Unit is set with "Operation Mode" (Cool/Heat), different from Master Operation Mode. (This is applicable only in case system composed by Heat-pump units or in mixed system with Heat-pump and Chiller units).
 - Unit is elected in "Stand-by" on Master unit controller.
- - *N/Cfg*: unit does not exist.

At any moment, user can check all the information about system management and unit statuses on Master unit HMI in menu:

- "Main Menu → System → Data"

6 TROUBLESHOOTING

This chapter will try to explain the alarms and events generated by the iCM and Master/Slave and guide to resolution. In the following sections all the alarms will be described. Alarms will disable the iCM and Master/Slave or will reduce their ability to control the system properly.

6.1 iCM Master Alarms

6.1.1 iCMConfigAlm:MultistateFault - Configuration Error

This alarm on **Master** controller can occur during configuration of System Control and it indicates that kinds of Unit (Unit Type) or kind of System Control Type (M/S or iCM Std) from Units on process network is not correct.

The reason of configuration alarm can be checked in menu: *System --> Configuration --> ConfigAlarm*.

Available configurations and possible configuration alarms are explained on Paragraph 1.3

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>iCMConfigAlm:MultistateFault</i> System does not start even if enabled by Master Unit Switch	<i>ConfigAlarm = Undef</i> Connected slaves did not send the "Unit Type".	Check if Communication Error with slaves occurred. Reboot Master controller when all the communication errors with slaves are fixed.
	<i>ConfigAlarm = iCMTypeError</i> System Control Type (Software Option: Master/Slave or iCM Standard) is different among connected Units.	Check if iCM Standard (software option) is not unlocked on all the connected Units. Contact Factory for Unlock Key
	<i>ConfigAlarm = CooledError</i> WaterCooled + AirCooled Chiller or WaterCooled + <u>Multipurpose</u> Unit are connected to Master	Configuration NOT supported. Contact Factory
	<i>ConfigAlarm = ModeError</i> Multipurpose + HeatPump Units are connected to Master	Configuration NOT supported Contact Factory
	<i>ConfigAlarm = ModeError</i> Unit with Master/Slave option Chiller + HeatPump or Chiller + Multipurpose Unit are connected to Master	iCM standard option must be unlocked on all the Units Contact Factory for Unlock Key.
	<i>ConfigAlarm = ComprError</i> Scroll + Centrifugal compressor Units are connected to Master	Configuration NOT supported Contact Factory
	<i>ConfigAlarm = ComprError</i> Unit with Master/Slave Option Scroll + Screw compressor Units are connected to Master	iCM standard option must be unlocked on all the Units Contact Factory for Unlock Key.
Reset	.	Notes
Local HMI	<input type="checkbox"/>	
Network	<input type="checkbox"/>	

6.1.2 System Lwt Sensor Fault

This alarm indicates that the sensor for the Cool/Heat water header on Evaporator side is not working properly. This alarm can occur if CommonLWT sensor is configured on all the Unit

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>Common EvapLWT</i> Forced Start of all Units,	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (kΩ) range. Check correct sensors operation
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.

Load control disabled, All Units in Local.	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network	<input type="checkbox"/> <input type="checkbox"/>	

6.1.3 System Heat Lwt Sensor Fault

This alarm indicates that the sensor for the hot water header on condenser side is not working properly. This alarm can occur if CommonLWT sensor is configured only on WaterCooled heat-pump and Multipurpose Units.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>Common HeatLWT</i> Forced Start of all Units, Load control disabled, All Units in Local.	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (kΩ) range. Check correct sensors operation
	Sensor is shorted	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors. Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network	<input type="checkbox"/> <input type="checkbox"/>	

6.1.4 Slave Communication Error

This alarm on the **Master** controller, indicates that the communication with one Slave is not working properly. There is the possibility that this alarm can be related to several Units in case of wrong wiring.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>Slave# CommErr.</i> <i># identifies the Slave number</i> Unit Not available for sequencing and staging.	Process bus network is not properly cabled.	Check the continuity of the RS485 network with the Unit which is not communicating.
	Process bus communication is not running properly.	Check Units' addresses in the Process bus network. All the addresses must be different.
	EM noise over the process bus	Check the cabling. It's required to use shielded twisted pairs to connect the different Units with the shield properly connected to the system ground. See section related to field wiring for further details.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.1.5 Slave Missing

This alarm on the **Master** controller, indicates that some of the Slaves are not visible in the network. This can happen during the system configuration if the Master is configured first.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>Slave# Missing</i> <i># identifies the Slave number</i> Unit Not available for sequencing and staging.	Wrong configuration of the system.	Check the number of configured Units and the corresponding individual Units' configurations. All the Units must be configured with a different address and the number of Units configured on the Master matches the number of Units in the system.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.2 Slave Alarms

6.2.1 Master Communication Error

This alarm on the **Slave** controller, indicates that the communication with the Master is not working properly. There is the possibility that this alarm can be related to several Units in case of wrong wiring.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>CommError</i> Each Unit starts working in Local according to Unit logic, Enable setpoints and Temperature setpoints.	Process bus network is not properly cabled.	Check the continuity of the RS485 network with the Unit which is not communicating.
	Process bus communication is not running properly.	Check Units' addresses in the Process bus network. All the addresses must be different.
	EM noise over the process bus	Check the cabling. It's required to use shielded twisted pairs to connect the different Units with the shield properly connected to the system ground. See section related to field wiring for further details.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.2.2 Master Missing

This alarm on the **Slave** controller, indicates that the Master is not visible in the network. This can happen during the system configuration if the Slaves are configured first.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>Master Missing</i> Each Unit starts working in Local according to Unit logic, Enable Setpoints and Temperature setpoints	Wrong configuration of the system.	Configure the Master address and the number of Units on the Master.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.2.3 Master Disconnect

This alarm on the **Slave** controller, indicates Unit is not managed by Master anymore.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>Master Disconnect</i> Each Unit starts working in Local according to Unit logic, Enable Setpoints and Temperature setpoints	1) Parameter "Disconnect" on Master Unit controller is set "Yes" 2) An Alarm of System controlled sensor has occurred.	1) Set "Disconnect" = "No" on Master. 2) Fix the alarm of LWT sensor on Master
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.3 Pump Manager Alarms

6.3.1 Pump Manager Communication Error

This alarm can occur only on **iCM Master** if Evaporator pump Manager or Condenser pump manager has been configured but communication is not working properly.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>EvapPM CommErr.</i> Or <i>CondPM CommErr</i> Staging Up of the Units is inhibited.	Process bus network is not properly cabled.	Check the continuity of the RS485 network with the Unit which is not communicating.
	Process bus communication is not running properly.	Check Units' addresses in the Process bus network. All the addresses must be different.
	EM noise over the process bus	Check the cabling. It's required to use shielded twisted pairs to connect the different Units with the shield properly connected to the system ground. See section related to field wiring for further details.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.3.2 Pump Manager Missing

This alarm on the **iCM Master** controller indicates that Pump managers are not visible in the network. This can happen during the system configuration if the Master is configured first.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>EvapPM Missing</i> Or <i>CondPM Missing</i> System does not start even if enabled by Master Unit Switch	Wrong configuration of the system.	Check that iPM has been configured (on iPM controller). Check that same iPM has been configured on iCM.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established.

6.3.3 Pump Manager Configuration Error

This alarm on the **iCM Master** controller occurs when Pump Manager is configured and in communication, but configuration of pump system as not been received. This can happen during the system configuration if the Master is configured first.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>EvapPM Config Error</i> Or <i>CondPM Config Error</i> System does not start even if enabled by Master Unit Switch	Configuration from Pump Manager has not been received through Daikin Network and applied on iCM.	Check that no communication error is active and that iPM have been send its own configuration parameters to iCM. Then reboot iCM controller
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when the communication is re-established, and controller is reboot.

6.3.4 Pump Manager Sensor Fault

This alarm on the **iCM Master** controller occurs when Pump Manager communicates the alarm of connected sensor used for pump speed control.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>EvapPM Sensor Fault</i> Or <i>CondPM Sensor Fault</i> Staging Up of the Units is inhibited.	On iPM sensor is broken.	Check for sensor integrity. according table and allowed kOhm (kΩ) range. Check correct sensors operation
	On iPM sensor is shorted	Check if sensor is shorted with a resistance measurement.
	On iPM sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts. Check for correct plug-in of the electrical connectors. Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The alarm clears automatically when sensor issue is fixed.

6.3.5 Pump Manager – Not Available Pump Alarm

This alarm on the **iCM Master** controller occurs when Pump Manager communicates a cumulative alarm of the pumps.

Symptom	Cause	Solution
Bell icon is moving on controller's display. String in the alarm list: <i>EvapPM NotAvail Pumps</i> Or <i>CondPM NotAvail Pumps</i> Staging Up of the Units is inhibited.	On iPM number of alarmed pumps exceed the number of Daikin Units.	Check pumps connected to iPM controller and solve the cause of alarm.
Reset		Notes
Local HMI Network Auto	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	This alarm clears automatically when pump issue is fixed.

6.4 Events

In this section all the events will be described. Events are situation where some functionality cannot be started or managed by the iCM for a wrong configuration of the system.

6.4.1 Heat Recovery Configuration Error

This alarm on the Master controller, indicates that the system configuration would require the use of the iCM option, but the Master/Slave option has been configured

Symptom	Cause	Solution
No alarm bell is shown on controller display The event will be shown in the event log. String in the event log: <i>HeatRec Config Error</i> Heat Recovery managed by iCM is inhibited. NOTE: Heat Recovery can be managed by HR unit according to unit logic	Wrong configuration of the system to be managed by iCM.	Check if the selected Master controller has the heat recovery installed. If not, a different Master controller shall be chosen, and this must have the heat recovery installed.
		Check if Master unit and Slave units have iCM Option configured

6.4.2 Free-cooling Configuration Error

This event on the Master controller, indicates that the system configuration would require the use of the iCM option, but the Master/Slave option has been configured.

Symptom	Cause	Solution
No alarm bell is shown on controller display The event will be shown in the event log. String in the event log: <i>FreeClg Config Error</i> Free cooling managed by iCM is inhibited. NOTE: Free-cooling can be managed by FC unit according to unit logic	Wrong configuration of the system to be managed by iCM.	Check if the selected Master controller has the free-cooling installed. If not, a different Master controller shall be chosen and this must have the free-cooling installed.
		Check if Master unit and Slave units have iCM Option configured
		Check that "Common LWT sensor" is configured, installed on supply header and connected to Master controller

6.4.3 Energy Monitoring Configuration Error

This event on the Master controller, indicates that the system configuration would require the use of the iCM option, but the Master/Slave option has been configured.

Symptom	Cause	Solution
No alarm bell is shown on controller display The event will be shown in the event log. String in the event log: <i>EnergyMon Config Error</i> Energy monitoring at system level is not available	Wrong configuration of the system to be managed by iCM.	Check if the selected Master controller has the heat recovery installed. If not, a different Master controller shall be chosen and this must have the heat recovery installed.

The present publication is drawn up by of information only and does not constitute an offer binding upon Daikin Applied Europe S.p.A.. Daikin Applied Europe S.p.A. has compiled the content of this publication to the best of its knowledge. No express or implied warranty is given for the completeness, accuracy, reliability or fitness for particular purpose of its content, and the products and services presented therein. Specification are subject to change without prior notice. Refer to the data communicated at the time of the order. Daikin Applied Europe S.p.A. explicitly rejects any liability for any direct or indirect damage, in the broadest sense, arising from or related to the use and/or interpretation of this publication. All content is copyrighted by Daikin Applied Europe S.p.A..

DAIKIN APPLIED EUROPE S.p.A.

Via Piani di Santa Maria, 72 - 00072 Ariccia (Roma) - Italia

Tel: (+39) 06 93 73 11 - Fax: (+39) 06 93 74 014

<http://www.daikinapplied.eu>