



KLIC-DI SKY

KNX Interface for Commercial A/C Units

ZN1CL-KLIC-DI

Application programme version: [2.0]
User manual edition: [2.0]_a

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DOCUMENT UPDATES

Version	Changes	Page(s)
[2.0]_a	Changes in the application programme: <ul style="list-style-type: none"> Improvement of the error handling. 	-
[1.14]_b	Clarifications for a correct configuration.	-
[1.14]_a	Changes in the application programme: <ul style="list-style-type: none"> Compatibility with the new remote control of Daikin BRC1E53A7. Changes in the fan speed percentages. Minor revision of certain object / parameter names. 	-
[1.13]_a	Changes in the application programme: <ul style="list-style-type: none"> Swing control added. Improvement of the "Auto-Off" function. Custom initialisation after download implemented. Simplified Mode Reception object added. 	-
[1.12]_a	Changes in the application programme: <ul style="list-style-type: none"> Compatibility with new air-conditioning system models. Name changed in parameter "Internal Temp. Sending Time". Name changed in object "Internal Temperature (Status)". 	-
[1.11]_a	Changes in the application programme: <ul style="list-style-type: none"> Compatibility with new air-conditioning system models (and their respective functionality). 	-
[1.10]_a	Changes in the application programme: <ul style="list-style-type: none"> Improvement of the compatibility with certain models to prevent communication interruption at the start-up. 	-

1 INTRODUCTION

1.1 KLIC-DI

KLIC-DI is an interface that allows full-duplex communication between a KNX domotic system and **commercial and industrial** air-conditioning units, through two possible application programmes.

- **KLIC-DI VRV**, for industrial A/C systems with a variable refrigerant volume.
- **KLIC-DI SKY**, for other commercial A/C systems.

Because of this **bidirectional** communication, the air conditioning unit can be controlled in the same manner as through its own controls, while the real status of the air-conditioning unit is monitored and periodically sent to the KNX bus to inform other devices.

KLIC-DI includes the following features, among others:

- **Bidirectional control** of industrial and commercial A/C units.
- Control of the **main features of the A/C units**: On/Off, temperature, mode of operation, fan speed, swing, etc.
- **Error identification and management** to handle specific A/C unit error codes as well as any communication errors that may arise.
- **LED indicator** that allows monitoring the bidirectional traffic flow.

1.2 INSTALLATION

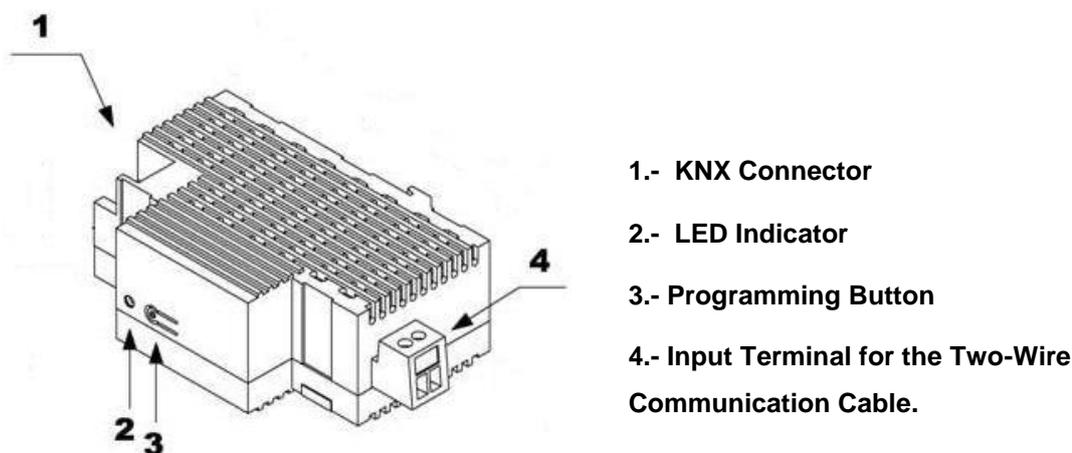


Figure 1. Element scheme

KLIC-DI connects to the KNX bus via the corresponding built-in terminals (1). On the other hand, this device is connected to the internal PCB board of the A/C unit (P1/P2 connectors), using a 2-wire cable. See Figure 2.

Important: *in case of aiming to control the air conditioning both through KLIC-DI and through the incorporated wired remote control of the actual unit, please refer to the “Control types” subsection, under section 2.2 in order to ensure that both of them have been properly configured.*

Once the device is provided with power supply from the KNX bus, both the physical address and the KLIC-DI application programme for commercial A/C systems can be downloaded.

This device does not need any additional external power as it is entirely powered through the KNX bus.

The functionality of the main elements is explained below:

- **Programming Button (3):** a short press on this button will set the device into the programming mode, making the red component of the LED (2) indicator light up. If the button is held while plugging the device into the KNX bus, KLIC-DI will go into secure mode, making the red colour of the LED blink intermittently.
- **LED Indicator (2):** three-colour (red, blue and green) light indicator that reflects the current state of the device. Apart from showing whether the

device is under the programming or secure modes, this LED will also show react to the communication between KLIC-DI and the A/C unit, which may be particularly useful during the installation process. The meaning of the different colour components is explained next:

- **Red Component (still):** KLIC-DI is under the programming mode.
- **Red Component (blinking):** KLIC-DI is under the secure mode.
- **Green Component (still):** KLIC-DI is not connected to the A/C unit, or the A/C unit is disconnected from the power supply.
- **Green Component (blinking):** transmission or data flow from the A/C machine towards KLIC-DI.
- **Blue Component (blinking):** transmission or data flow from KLIC-DI towards the A/C machine.

Note: *each colour component works with independence of the others. Therefore, for example, if KLIC-DI is set into the programming mode being the A/C unit disconnected, the perceived colour will be typically a still orange, as the red and green components are lighting (still).*

- **Input Terminal for the Two-Wire Communication Cable (4):** slot for the connection of the two-wire communication cable that will connect KLIC-DI to the A/C unit. The other end of the cable, therefore, is intended to be connected to the P1/P2 ports from the PCB board of the internal unit, or from the wired remote control of the A/C unit.

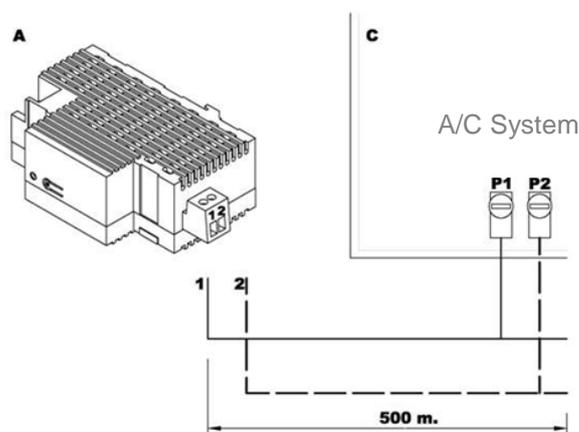


Figure 2. Connecting KLIC-DI to the P1/P2 Bus (Master Mode).

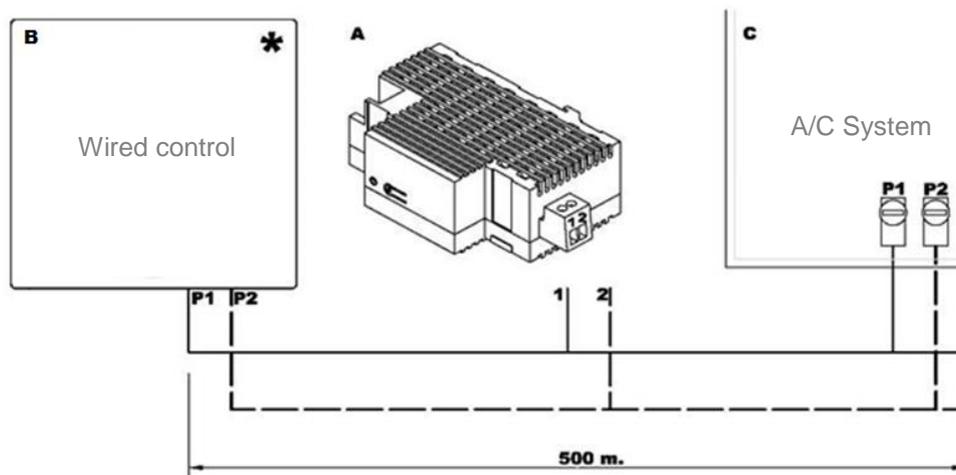


Figure 3. Connecting KLIC-DI to the P1/P2 Bus with a Wired Remote Control (Slave Mode)

Connection Diagram Legend	
A	KLIC-DI
B	Wired control
C	A/C unit
P1-P2	Connection base for the A/C unit
1-2	Zennio input terminal
*	The wired remote control needs to work contrary to the mode (slave/master) set for KLIC-DI (see section 2.2).

For detailed information about the technical features of KLIC DI, as well as on security and installation procedures, please refer to the device **Datasheet**, included within the device packaging and also available at <http://www.zennio.com>. Reading the KLIC-DI **installation note**, available at the same website, is also encouraged.

Note: sections following this point will focus on the KLIC-DI SKY application programme for commercial A/C machines, and its specific configuration. Please refer to the KLIC-DI VRV user manual in case of running that particular application programme.

2 CONFIGURATION

2.1 BASIC CONTROL

KLIC-DI allows controlling and monitoring an air-conditioning unit the same way it would be through the wired remote control provided with it.

Through the KNX bus, the following basic functionalities of the air conditioning unit can be controlled:

- **ON/OFF** switch of the air-conditioning unit.
- **Temperature Setpoint** between 16 and 32 °C.
- **Operation Mode**: Auto, Heat, Cool, Fan and Dry.
- **Fan Speed**: configuration of 2 or 3 speed levels.

Important: *check which levels are provided by the A/C unit.*

These functionalities imply changes in the state of the machine, which are periodically sent to KLIC-DI. When KLIC-DI receives from the machine a state different to the previous one, it updates the status objects and sends them to the KNX bus.

2.2 ADVANCED FUNCTIONALITY

Apart from basic control functions over the air-conditioning system, KLIC-DI offers other advanced functionalities that provide added value to the wired remote control:

- **Scene Configuration**: allows establishing a specific parameter combination to be sent to the machine in order to generate a determined climate ambient. KLIC-DI allows configuring up to 4 different scenes.
- **Temporary Switch-Off**: allows an automatic and temporary switch-off of the machine (after a pre-established delay, if set up) when the communication object associated to this function changes its value. A typical application of this functionality is linking a window sensor to the automatic switch-off object, which will make KLIC-DI switch the machine off while the window is open.

- **Setpoint Restriction:** temperature setpoints of commercial air conditioning systems are typically limited to the range 16-32°C (please refer to the user manual of the actual unit). This function of the KLIC-DI device allows configuring custom setpoint ranges in ETS for the Heat and Cool modes, provided that the custom values stay within the original range. In case of receiving a temperature command from the KNX bus with a value exceeding the configured range, the temperature value sent by KLIC-DI to the machine will be the corresponding limit value.
- **Internal Temperature and Reference Temperature:** commercial A/C units include several sensors for measuring the temperature at different internal points. KLIC-DI monitors the value of one of these internal measures, called **Internal Temperature**, which, together with the **Reference Temperature**, is used for switching between the Auto-Cool and Auto-Heat modes of the A/C machine. The **Reference Temperature** is the actual ambient temperature of the room under climate control. It is necessary that KLIC-DI provides the machine with this value, which implies that it should be sent first to KLIC-DI through the corresponding communication object (generally from an external sensor).

The A/C unit can control the Auto-Heat and Auto-Cool modes by three different ways:

1. The machine receives the Reference Temperature and, basing on a hysteresis value pre-configured by the installer of the machine, it determines the corresponding auto mode.
2. The machine receives the Internal Temperature and, basing on a hysteresis value pre-configured by the installer of the machine, it determines the corresponding auto mode.
3. The machine establishes the auto mode according to the average value between the Reference Temperature and the Internal Temperature.

The concrete temperature value that triggers the commutation between the Auto-Cool and Auto-Heat modes depends on the configuration established in the A/C unit itself. In all of the above cases, this value is compared to the temperature setpoint so that if the temperature setpoint is higher, the Auto-

Heat mode is established; and if the temperature setpoint is lower than this value, the Auto-Cool mode is established.

Note: *it is highly recommended to link the Reference Temperature to a temperature sensor that periodically monitors the real temperature of the room, as it may happen that the pre-configuration of the unit is unknown, causing a wrong behaviour of the Auto mode. The Reference Temperature communication object has a default value of 25°C and is only available when the control type of KLIC-DI is master.*

- **Error Management:** allows sending messages to the KNX bus informing about errors. Error management handles both external errors from the A/C unit itself and those that may arise in the KLIC-DI – A/C unit communication process.

Apart from reporting external errors, a numerical code associated with them is also provided and must be consulted in the specific user manual of the installed air-conditioning system, according to ANNEX II: Correspondence with A/C Unit Error Codes.

- **Initial Configuration:** allows establishing the desired initial parameters for the state of the A/C unit after downloading or restarting the device from ETS, or after recovering from a bus failure. The following may be configured: ON/OFF state, temperature, mode, fan and swing of the machine. It is also possible to send the initial values to the KNX bus after the start-up.
- **Control Type:** permits defining the control type, *master* or *slave*, that KLIC-DI will work according to (**important when KLIC-DI will be used together with the wired remote control of the A/C unit**).

The master control type will correspond to the device directly communicating with the machine. It will also be in charge of retransmitting the instructions to the slave control, if any. This configuration will still permit controlling the machine from the slave control.

This feature allows connecting to the same installation both the KLIC-DI interface and the wired remote control of the A/C unit, provided that they are not both configured as masters or as slaves.

Important: *in case of having KLIC-DI and the wired remote control operating together, please, make sure that the control type of both devices is not the same (necessarily one of them must be master and the other slave).*

Notes:

- *Switching the wired control between the slave and master modes requires interrupting the power supply in order to make the wired control re-initialise under the new mode.*

- *If the power supply of the wired control fails, it may be necessary to disconnect and reconnect the bus voltage of the device after the power supply has been restored in order for the configuration between the wired control unit and the KLIC DI to be successful (especially if the KLIC DI has been configured as master and the wired control as slave).*

2.3 TESTING KLIC-DI FROM AN IR REMOTE

KLIC-DI incorporates –next to the LED indicator– an infrared receiver that may be used together with any of the Zennio IR remotes (such as models ZN1IRZ38 and ZN1IRZAS) to check the proper control of the A/C machine from KLIC-DI.

Note: *KLIC-DI will only respond to infrared orders under the programming mode (i.e., with the red component of the LED on).*

The action performed by each button of the IR control is shown in Figure 4.

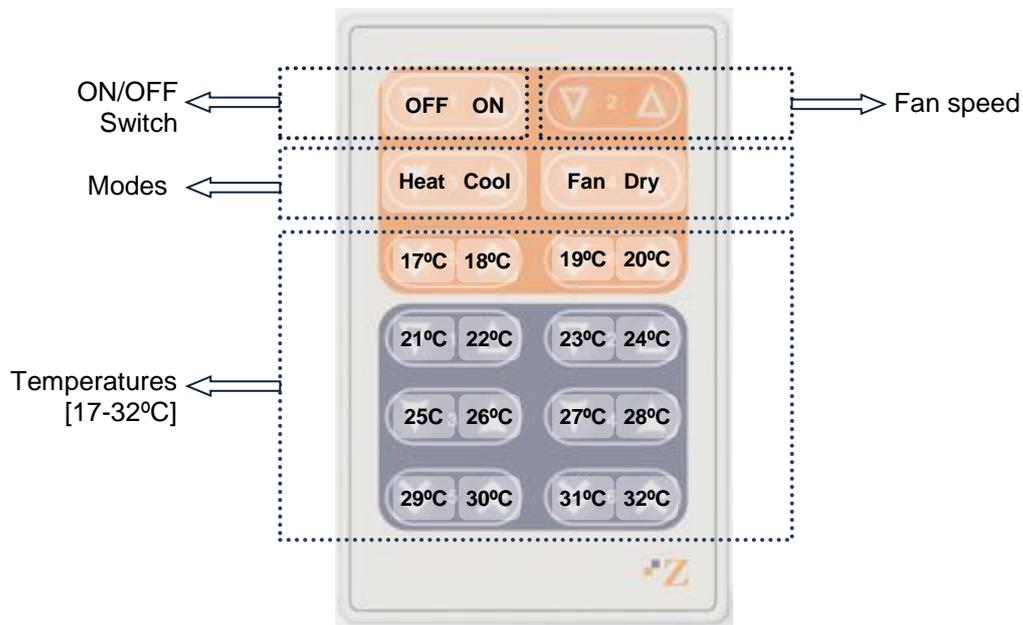


Figure 4. Testing KLIC-DI from the IR Remote

3 ETS PARAMETERISATION

To begin with the parameterisation process of the KLIC-DI interface it is necessary, once the ETS programme has been opened, to import the database of the product (**KLIC-DI SKY** application programme).

Next, the device should be added to the project. And then, one right-click on the device will permit selecting "Edit parameters", in order to start the configuration.

In the following sections a detailed explanation is provided about how to parameterise the different functionalities of the device in ETS.

3.1 DEFAULT CONFIGURATION

This section shows the default configuration the device configuration starts from.

Number	Name	Object Function	De Gr	Length
0	On/Off	Turn On/Off the Machine		1 bit
1	Setpoint	Setpoint sent to the machine		2 bytes
2	Mode	0=Aut;1=Ht;3=Cool;9=Fan;14=Dry		1 byte
3	Fan [1byte]	0-50%=Low;51-100%=High		1 byte
6	On/Off (Status)	Machine State (On/Off)		1 bit
7	Setpoint (Status)	Setpoint received from machine		2 bytes
8	Mode (Status)	Current Mode:0=Auto;1=Heat...		1 byte
9	Fan (Status)	50%=Low;100%=High		1 byte
31	Internal Temperature (Status)	Value Received from Machine		2 bytes
32	Reference Temperature	Externally Received Value		2 bytes

Figure 5. Default Topology

The default topology window (Figure 5) contains the communication objects associated to the reception of the control orders for the basic operation of the A/C unit: on/off, setpoint, mode and fan. In addition, the corresponding status objects (which will report the updated state values of the A/C system to the KNX bus) are also shown.

When entering the parameter edition for the first time, the following window will be shown.

Parameter	Value
Scenes	<input checked="" type="radio"/> No <input type="radio"/> Yes
Setpoint Restriction	<input checked="" type="radio"/> No <input type="radio"/> Yes
Auto OFF	<input checked="" type="radio"/> No <input type="radio"/> Yes
Error handling	<input checked="" type="radio"/> No <input type="radio"/> Yes
Type of Control	<input checked="" type="radio"/> Master Control <input type="radio"/> Slave Control
Swing	<input checked="" type="radio"/> No <input type="radio"/> Yes
WARNING: Configure according to the machine characteristics.	
Internal Temp. Sending Time [x1 sec]	30
Initial Configuration	<input checked="" type="radio"/> Default <input type="radio"/> Custom
Logical Functions	<input checked="" type="radio"/> No <input type="radio"/> Yes

Figure 6. Default General Configuration

As shown in Figure 6, the configuration window is initially divided into three main tabs:

- **General:** allows individually enabling the control over the advanced functionalities of the A/C unit.
- **Mode:** allows selecting the communication objects to be used to control the mode of operation of the A/C unit.
- **Fan:** allows configuring features related to the fan speed of the A/C unit.

The next sections cover all of the above in detail.

3.2 GENERAL

From the General parameter window it is possible to select the advanced functionalities of the A/C system (scenes, setpoint restriction, auto OFF, error handling and initial configuration) to be controlled. All of them, which will be explained in the next section, are disabled by default.

From the General window it is also possible to configure the desired **control type** for KLIC-DI (master control or slave control) and the **Internal temperature sending time** (30-255, in seconds), which allows carrying out a periodical sending to the KNX bus of the internal temperature measured by the machine, even if the value does not change.

3.2.1 SCENES

After enabling this function, the left menu will show a new tab named Scenes, from where it will be possible to set up different scenes (up to 4), consisting each of them in a set of orders to be sent to the A/C unit upon the reception, through the KNX bus and by means of the **Scenes** object, of the corresponding scene value (decreased by 1, according to the KNX standard).

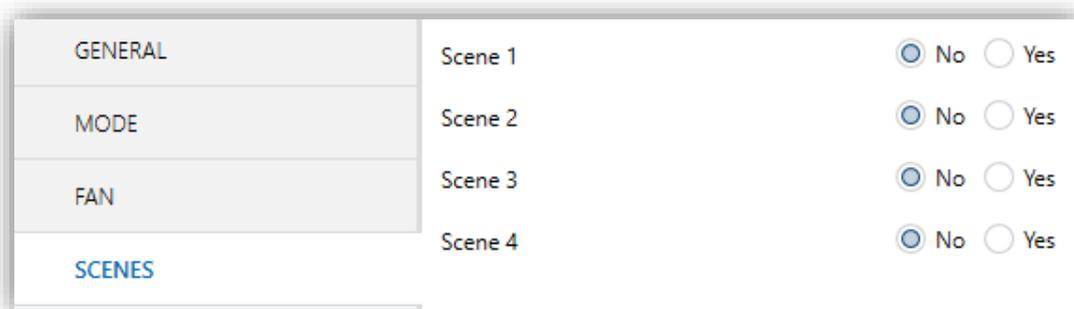


Figure 7. Scene Configuration

For every enabled scene, the particular parameters that may be configured are the following:

- **Scene number.** Sets the scene number (1-64) on whose reception (through the Scenes object, decreased by one) the corresponding configured orders will be sent to the A/C machine. The available orders are:
 - **On/Off.** Brings the possibility of setting the A/C machine state: No change, on or off.
 - **Temperature.** No change, or a New temperature setpoint (from 16°C to 32°C).
 - **Mode.** No change, Auto, Heat, Dry, Fan or Cool.
 - **Fan.** No change, minimum or maximum.
 - **Swing.** No change, Swing (in motion) or in any of the five Fixed positions available.

An example of scene configuration is shown in Figure 8.

GENERAL	Scene 1	<input type="radio"/> No <input checked="" type="radio"/> Yes
MODE	Scene Number	1
FAN	On/Off	ON
SCENES	Temperature	<input type="radio"/> No change <input checked="" type="radio"/> New Temperature
	New Temperature	25
	Mode	Heat
	Fan	Minimum
	Swing	Swing
	Scene 2	<input checked="" type="radio"/> No <input type="radio"/> Yes
	Scene 3	<input checked="" type="radio"/> No <input type="radio"/> Yes
	Scene 4	<input checked="" type="radio"/> No <input type="radio"/> Yes

Figure 8. Scene configuration example (Scene 1)

3.2.2 SETPOINT RESTRICTION

The A/C unit imposes restrictions to the temperature setpoint (typically, only values in the range 16°C - 32°C are available). Nevertheless, KLIC-DI offers the possibility of establishing new setpoint temperature limits provided that they are still within the A/C unit predefined limits (please refer to the A/C unit user manual for details).

Setpoint restrictions can be customised independently for the two modes of operation that require a temperature setpoint: Cool and Heat).

GENERAL	COOL MODE	
MODE	Minimum	23
FAN	Maximum	28
SETPOINT RESTRICTION	HEAT MODE	
	Minimum	19
	Maximum	26

Figure 9. Setting setpoint restriction.

Important: to make KLIC-DI aware of these customised limits, the specific **Setpoint Restriction** communication object must be set to "1" (its value is "0" after the device

starts up). To control the machine back with the predefined temperature limitations, the mentioned object needs to be sent the value "0".

Once established the new setpoint restriction for every mode and enabled the functionality, when an out-of-range value is received from the KNX bus, the A/C machine will actually be sent a value equal to the corresponding setpoint restriction (thus, truncating the out-of-range value).

3.2.3 AUTO OFF

This option allows an automatic and temporary switch-off of the A/C machine if a value change (from value "0" to value "1") in the associated communication object (**Auto-OFF**, typically intended to be linked to an open/closed window sensor). If the A/C machine was already off, the Auto-OFF will still apply, so the machine will remain off (not being possible to switch it on) until this situation is over.

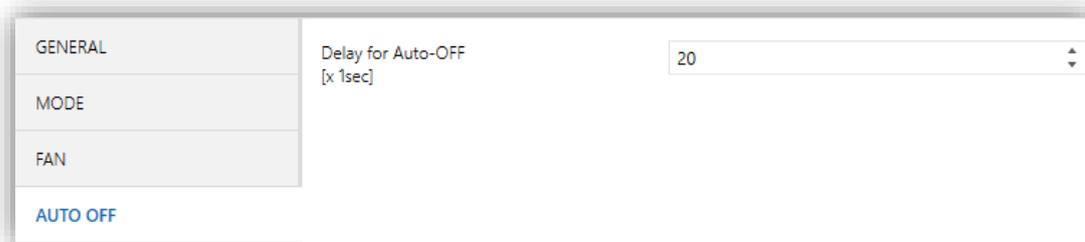


Figure 10. Auto OFF

The only configurable parameter is:

- **Delay for Auto-OFF:** sets the time, in seconds, KLIC-DI waits before automatically switching the A/C machine off. Any OFF order received during the delay will abort the delay and the Auto-OFF will be applied immediately.

Once the Auto-OFF object adopts the value "1", any ON order will not be sent to the machine until the object "Auto-OFF" acquires the value "0". However, any other control orders (setpoint, fan speed, etc.) received during the open window state will in fact be taken into account by KLIC-DI and applied afterwards, once the Auto-Off object is back set to "0" (which will set the machine back to the state it had prior to the Auto-OFF).

Note: switch-on orders sent to the A/C unit from a wired remote control configured as a master will not be ignored during the open window state (Auto-OFF=1), as KLIC-DI has

no authority over the wired remote control. In such case, the Auto-OFF will be aborted (Auto-OFF=0).

3.2.4 ERROR HANDLING

From this parameter window it is possible to enable the sending of messages to the KNX bus to report the occurrence of errors, including both internal errors regarding the communication between KLIC-DI and the A/C unit, and external errors affecting the A/C unit itself.

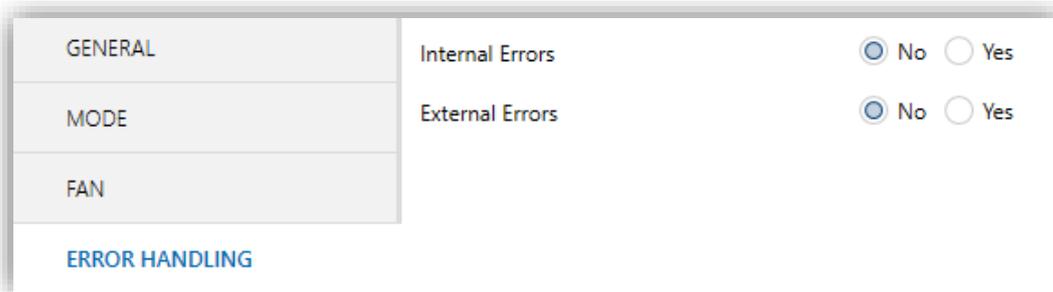


Figure 11. Configuring the error handling.

It is possible to select whether to report none, internal, external or both types of error:

- **Internal errors:** when enabled, a new communication object shows up: "**Internal Error: Communication**" (1-Bit), which indicates if there is a problem in the communication between the KLIC-DI and the A/C unit or there that there is no unit connected. Thus, if its value is "1", there is an error; and if it is "0", there is no error.

Note: *If an internal error communication is active, the next actions are recommended:*

1. *If there is a remote wired control in the installation, check whether it reports any error.*
2. *Verify that KLIC-DI is properly connected to the A/C unit.*
3. *Verify that control configuration is correct. Check that the device and the remote wired control are not both configured as slaves.*
4. *If internal error is still active, please, contact with Zennio support.*

- **External errors:** when enabled, two new communication objects show up: "**External Error (Status)**" and "**Type of external error (Status)**". The first one indicates if an external error is active (value "1") or not (value "0"). The second object indicates the specific code that identifies the error (please refer to the specific user manual of the A/C unit and to ANNEX II: Correspondence with A/C Unit Error Codes).

Important: in case of configuring KLIC-DI as master to operate together with the wired remote control, error handling functionality must be enabled in order not to cause an abnormal control or behaviour of the air machine.

3.2.5 TYPE OF CONTROL

The control type of the KLIC-DI interface is also parameterised from the General window. This can be **Master Remote Control** or **Slave Remote Control**, depending on whether or not there is an additional wired remote control in the bus. Please refer to the "Control type" subsection under section 2.2.

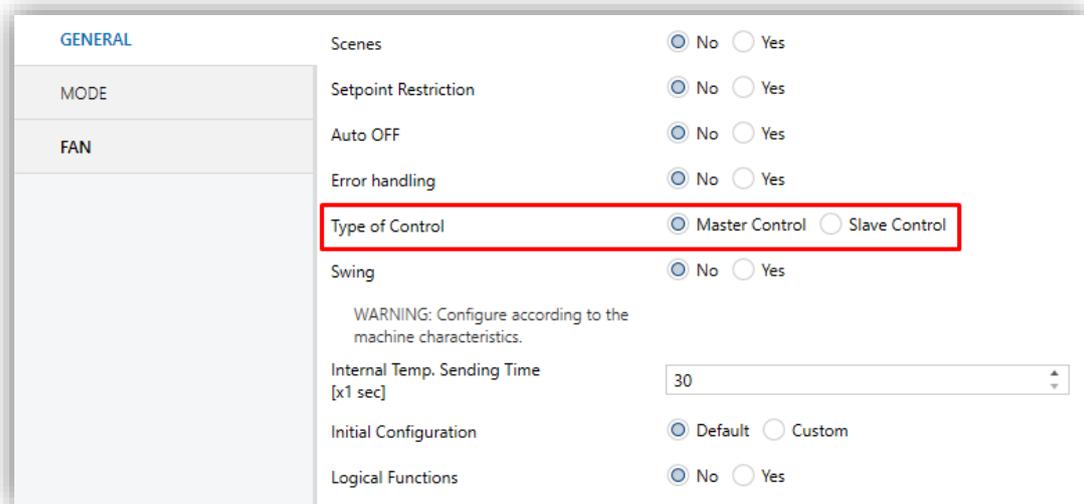


Figure 12. Configuring the type of control.

3.2.6 SWING

Through this parameter, it is possible to select whether to permit controlling the swing function (i.e., the slats that address the air flow) of the A/C machine. The availability of such function in the particular A/C unit being controlled needs to be confirmed in advance.

Important: in case of not being available swing control in the machine, enabling this parameter may cause an abnormal behaviour of the air machine.

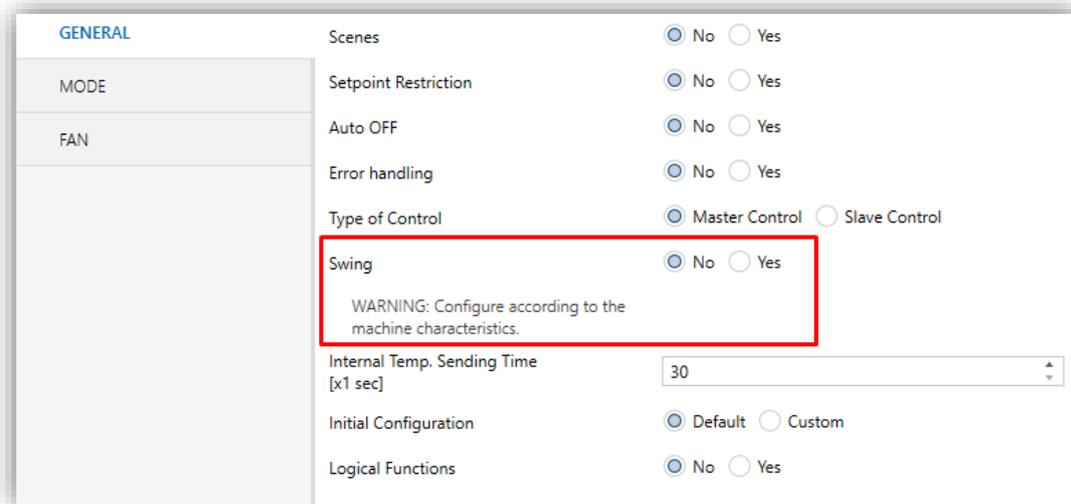


Figure 13. Swing.

The control of the swing function is performed by assuming up to **five fixed positions**, and an option to make the slats stay permanently in motion or still.

After enabling this parameter ("Yes"), two 1-byte communication objects come up: "**Swing [1byte]**" and "**Swing [1byte] (Status)**", as well as the following two 1-bit objects: "**Swing [1bit]**" and "**Swing [1bit] (Status)**". By means of this set of objects it is possible to implement the reception of control orders from the bus, and afterwards report the updated state of the machine.

- The "**Swing [1bit]**" 1-bit object permits controlling the slat position as follows:
 - **Sending the value "0"**: if the slats are at a still position, they switch to the following one, according to the following cyclical sequence: Fixed Position 1 – Fixed Position 2 – ... – Fixed Position 5 – Fixed Position 1... In case of being in motion (swinging), the slats will switch back to the last still position they had before entering the swing mode.
 - **Sending the value "1"**: the slats begin to move continuously.

The "**Swing [1bit] (Status)**" object indicates the current slats state: swing (value "1") or still (value "0").

- The "**Swing [1byte]**" 1-byte object allows setting a particular slat position in terms of percentage, according to Table .

The status object ("**Swing [1byte] (Status)**") indicates the current slats state, as a percentage.

Value of the "Swing [1byte]" object	Position number	Value of the "Swing [1byte] (Status)" object
0%	Position 1	0%
1-20%	Position 2	20%
21-40%	Position 3	40%
41-60%	Position 4	60%
61-80%	Position 5	80%
81-100%	Swing	100%

Table 1. Swing function

Note: on certain A/C unit models, positions 3-5 may not be available under the Cool mode, as a measure to prevent that a cold air flow is outputted directly to particular points of the room where people are supposed to stand. Analogously, positions 1 and 2 may not be permitted by the A/C unit under the Heat mode, to prevent hot air accumulation on the top of the room.

3.2.7 INTERNAL TEMPERATURE SENDING TIME

The "**Internal Temp. Sending Time [x1 sec]**" parameter permits defining a period, between 30 and 255 seconds, to cyclically send the internal temperature measured by the A/C machine itself and sent to KLIC-DI during the internal communication process. This value will be sent to the KNX bus through the "**Internal temperature (status)**" object. Note that it will be sent even if the value is equal to the last one sent, and that in the event of non having a built-in sensor in the machine for performing this measure, abnormal values may be sent to the bus.

3.2.8 INITIAL CONFIGURATION

This functionality allows setting the desired initial state that KLIC-DI will send the A/C unit after downloading or restarting the device from ETS, or when recovering from a KNX bus failure. This state can be the one by default or a custom state. If the latter is selected, the window in Figure 14 will be shown.

GENERAL	On/Off	Last
MODE	Temperature	<input checked="" type="radio"/> Last <input type="radio"/> Custom
FAN	Mode	Last
INITIAL CONFIGURATION	Fan	Last
	Swing	Last
	Send Initial Configuration to the bus?	<input type="radio"/> No <input checked="" type="radio"/> Yes
	Delay [x 1sec]	10

Figure 14. Initial configuration

The variables whose initial state can be set are:

- **On/Off:** last (the state the machine had before the power failure), ON or OFF.
- **Temperature:** last or custom (a new field appears to set the custom initial temperature setpoint, between 16°C and 32°C).
- **Mode:** Last, Auto, Heat, Dry, Fan or Cool.
- **Fan:** Last, Minimum or Maximum.
- **Swing:** Last, In motion or in any of the 5 Fixed positions available.

Moreover, the status objects can be sent to the bus when applying the initial settings:

- **Send initial configuration to the bus?:** If enabled ("Yes"), a new field will appear next, "**Delay**", where to configure the time, in seconds, KLIC-DI will delay the sending of the status objects to the KNX bus.

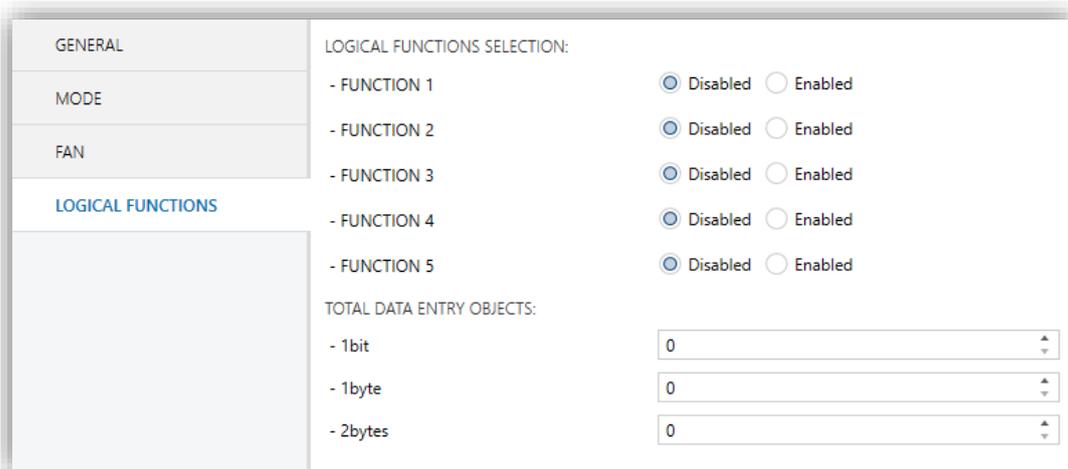
Note: *if the parameterised delay is too short, the status objects sent to the bus may not show the selected custom configuration. In such case, an*

additional transmission of the objects will take place once the custom configuration becomes effective and has been confirmed by the machine.

3.2.9 LOGIC FUNCTIONS

This section of the application programme is capable of performing arithmetic and binary logic operations with incoming data from the KNX bus, and of sending the result through other communication objects specifically enabled in the actuator for this operation.

Up to 5 different logic functions, independent of each other, can be enabled, each capable of performing **between 1 and 4 operations**. To make use of them, they need to be enabled from the following ETS window, which appears after selecting "Yes" under "Logical Functions" in the General parameter window.



The screenshot shows a configuration window with a sidebar on the left containing menu items: GENERAL, MODE, FAN, and LOGICAL FUNCTIONS (highlighted in blue). The main area is titled 'LOGICAL FUNCTIONS SELECTION:' and contains five rows, each with a function label and two radio buttons: 'Disabled' (selected) and 'Enabled'. Below this is a section titled 'TOTAL DATA ENTRY OBJECTS:' with three rows: '- 1bit', '- 1byte', and '- 2bytes', each followed by a text input field containing the value '0' and a small up/down arrow icon.

Figure 15. Configuring the Logical Function Module

To obtain detailed information about the use and the ETS parameterisation of the logical functions, please refer to the "**Logical Functions X5**" specific document, available at: <http://www.zennio.com>.

3.3 MODE

As explained in section 3.1, the Mode specific window allows configuring what type of communication objects will be required for controlling the mode of operation of the A/C machine.

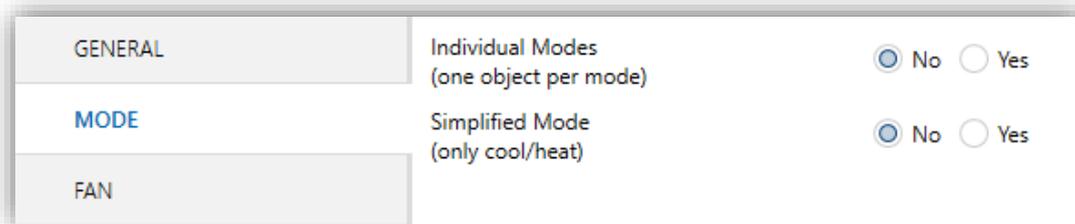


Figure 16. Mode window

- Individual modes:** selecting this option brings 10 new 1-bit communication objects, five of which will be associated to the reception, from the KNX bus, of mode switch orders (Auto, Cool, Heat, Fan and Dry, respectively) while the other five will be used by KLIC-DI to inform the KNX bus about the updated state of each function, as it is sent by the A/C machine.

Equivalently, the 1-byte objects "**Mode**" and "**Mode (status)**" are available by default and permit switching between the different modes of operation as well as checking the currently active mode, respectively.

In case of having activated the **Individual modes** option, it will be possible to switch from one mode to another by simply sending the value "1" to the control object corresponding to the new mode. After that, KLIC-DI will acknowledge the new mode by sending a "1" through the status object (unless the machine has, for whatever reason, not changed the mode).

- Simplified mode:** enabling this option activates the "**Simplified Mode**" 1-bit object. This object allows switching from the Cool and the Heat modes by respectively sending the values "0" or "1" to the object. Associated to this control object, a status object is also enabled. It will acquire the value "0" for modes **Cold** and **Dry**, and the value "1" for mode **Heat**. Switching to the **Fan** mode does not change the value of this object.

3.4 FAN

This window configures several features related to the fan speed (or the volume of the air flow) of the A/C machine.

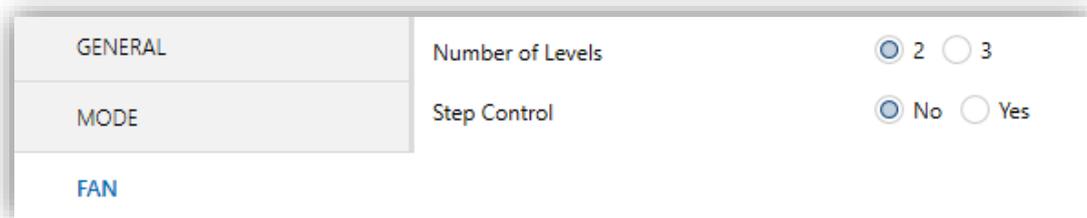


Figure 17. Fan

- **Number of levels:** allows specifying the number of the fan levels distinguished by the A/C unit, which may be **2 or 3 levels**. The fan speed is related to two 1-byte objects: "**Fan [1 Byte]**" and "**Fan (Status)**", for controlling and reporting the fan speed, respectively. The control orders are to be received from the KNX bus as percentage values, which will be then interpolated according to the specification explained below. The same interpolation will be applied over the values sent by KLIC-DI through the status object.
- **Two levels:** the fan speed percentages will be interpolated according to Table 3.

Initial Speed Percentage	Interpolated Speed Percentage	Level
0-50%	50%	Minimum
51-100%	100%	Maximum

Table 2. Fan speed percentage for two Levels

- **Three levels:** the fan speed percentages will be interpolated according to Table 4.

Initial Speed Percentage	Interpolated Speed Percentage	Level
0-33%	33%	Minimum
34-67%	67%	Middle
68-100%	100%	Maximum

Table 3. Fan speed percentage for three Levels.

Important: *the number of levels must match with the number of levels of the A/C machine.*

- **Step control:** enabling this feature ("Yes") brings up the "**Fan [1 bit]**" 1-bit object, which allows increasing (by sending the value "1") or decreasing (value "0") the fan speed by one level (for example, under a three-level parameterisation and under the minimum fan speed level, the value "1" sent via the "Fan [1 bit]" object will make the fan speed level change to "medium").

The step control is **non-cyclical**. This means that, being at the minimum level (33% or 50%), any decrease order will be ignored by the unit, which will maintain the same fan level unless an order to increase it is received. Analogously, when the fan speed is at its maximum (100%), it will remain unchanged until a decrease order is received.

ANNEX I. COMMUNICATION OBJECTS

- “**Functional range**” shows the values that, with independence of any other values permitted by the bus according to the object size, may be of any use or have a particular meaning because of the specifications or restrictions from both the KNX standard or the application programme itself.

Number	Size	I/O	Flags	Data type (DPT)	Functional range	Name	Function
0	1 Bit	I	C--WU	DPT_Switch	0/1	On/Off	Turn On/Off the Machine
1	2 Bytes	I	C--WU	DPT_Value_Temp	16°C - 32°C or ac. to param.	Setpoint	Setpoint sent to the machine
2	1 Byte	I	C--WU	DPT_HVACContrMode	0=Auto 1=Heat 3=Cool 9=Fan 14=Dry	Mode	0=Aut;1=Ht;3=Cool;9=Fan;14=Dry
3	1 Byte	I	C--WU	DPT_Scaling	0%-50% Low 51%-100% High	Fan [1byte]	0-50%=Low;51-100%=High
	1 Byte	I	C--WU	DPT_Scaling	0%-33% Min. 34%-67% Med. 68%-100% Max.	Fan [1byte]	0-33%Min;34-67%Mid;>68%Max
4	1 Bit	I	C--WU	DPT_Switch	0/1	Swing [1bit]	0=Fixed pos.;1=Motion
5	1 Byte	I	C--WU	DPT_Scaling	0% Posit. 1 1-20% Posit. 2 21-40% Posit. 3 41-60% Posit. 4 61-80% Posit. 5 81-100% In mot.	Swing [1byte]	0-80%=Fixed Pos.;100%=Mot.
6	1 Bit	O	CTR--	DPT_Switch	0/1	On/Off (Status)	Machine State (On/Off)
7	2 Bytes	O	CTR--	DPT_Value_Temp	16°C - 32°C or accord. to param.	Setpoint (Status)	Setpoint received from machine
8	1 Byte	O	CTR--	DPT_HVACContrMode	0=Auto 1=Heat 3=Cool 9=Fan 14=Dry	Mode (Status)	Current Mode:0=Auto;1=Heat...
9	1 Byte	O	CTR--	DPT_Scaling	33%/67%/100%	Fan (Status)	33%Min;67%Mid;100%Max
	1 Byte	O	CTR--	DPT_Scaling	50%/100%	Fan (Status)	50%=Low;100%=High
10	1 Bit	O	CTR--	DPT_Switch	0/1	Swing [1bit] (Status)	0=Fixed Position; 1=Motion
11	1 Byte	O	CTR--	DPT_Scaling	0% Posit. 1	Swing [1byte] (Status)	0-80%=Fixed pos.;100%=Motion

Number	Size	I/O	Flags	Data type (DPT)	Functional range	Name	Function
					20% Posit. 2 40% Posit. 3 60% Posit. 4 80% Posit. 5 100% In mot.		
12	1 Bit	I	CT-WU	DPT_Switch	0/1	Auto Mode	1=Set Auto Mode;0=Nothing
13	1 Bit	I	CT-WU	DPT_Switch	0/1	Cool Mode	1=Set Cool Mode;0=Nothing
14	1 Bit	I	CT-WU	DPT_Switch	0/1	Heat Mode	1=Set Heat Mode;0=Nothing
15	1 Bit	I	CT-WU	DPT_Switch	0/1	Fan Mode	1=Set Fan Mode;0=Nothing
16	1 Bit	I	CT-WU	DPT_Switch	0/1	Dry Mode	1=Set Dry Mode;0=Nothing
17	1 Bit	I	C--WU	DPT_Heat_Cool	0=Cool 1=Heat	Simplified Mode	0=Cool; 1=Heat
18	1 Bit	O	CTR--	DPT_Switch	0/1	Auto Mode (Status)	1=Auto Mode Enabled;0=Disabled
19	1 Bit	O	CTR--	DPT_Switch	0/1	Cool Mode (Status)	1=Cool Mode Enabled;0=Disabled
20	1 Bit	O	CTR--	DPT_Switch	0/1	Heat Mode (Status)	1=Heat Mode Enabled;0=Disabled
21	1 Bit	O	CTR--	DPT_Switch	0/1	Fan Mode (Status)	1=Fan Mode Enabled;0=Disabled
22	1 Bit	O	CTR--	DPT_Switch	0/1	Dry Mode (Status)	1=Dry Mode Enabled;0=Disabled
23	1 Bit	O	CTR--	DPT_Switch	0/1	Simplified Mode (Status)	0=Cool; 1=Heat
24	1 Bit	I	C--WU	DPT_Step	0=Decrease 1=Increase	Fan [1 bit]	0=Down;1=Up
25	1 Byte	I	C--WU	DPT_SceneControl	0-63	Scenes: Receive	Selected Scene Value
26	1 Bit	I/O	CTRWU	DPT_Switch	0/1	Setpoint Restriction	0=Disable;1=Enable
27	1 Bit	I	C--WU	DPT_Switch	0/1	Auto-Off	0=Disable;1=Enable
28	1 Bit	O	CTR--	DPT_Bool	0/1	Internal Error: Communication	Unable to Set AC Communication
29	1 Bit	O	CTR--	DPT_Bool	0/1	External Error (Status)	0=No Error; 1=Error
30	1 Byte	O	CTR--	-	1-239	Type of External Error (Status)	Check Error's Table
31	2 Bytes	O	CTR--	DPT_Value_Temp	0°C – 99°C	Internal Temperature (Status)	Value Received from Machine
32	2 Bytes	I	C--WU	DPT_Value_Temp	0°C – 99°C	Reference Temperature	Externally Received Value
33-48	1 Bit	I	C--W-	DPT_Bool	0/1	[LF] (1 bit) Data Entry X	Binary Data Entry (0/1)
49-56	1 Byte	I	C--W-	DPT_Value_1_Ucount	0-255	[LF] (1 byte) Data Entry X	1 byte Data Entry (0-255)
57-64	2 Bytes	I	C--W-	DPST-7-1 DPST-8-1 DPST-9-1	Acc. to param.	[LF] (2 bytes) Data Entry X	2 bytes Data Entry
65-69	1 Bit	O	CTR--	DPT_Bool	0/1	[LF] Function X RESULT (1 bit)	FUNCTION X Result
70-74	1 Byte	O	CTR--	DPT_Value_1_Ucount	0-255	[LF] Function X RESULT (1 byte)	FUNCTION X Result
75-79	2 Bytes	O	CTR--	DPST-7-1 DPST-8-1 DPST-9-1	Acc. to param.	[LF] Function X RESULT (2 bytes)	FUNCTION X Result

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