DCC-XP V3.3 and ADC

Compact compound control
with integrated condensation pressure control

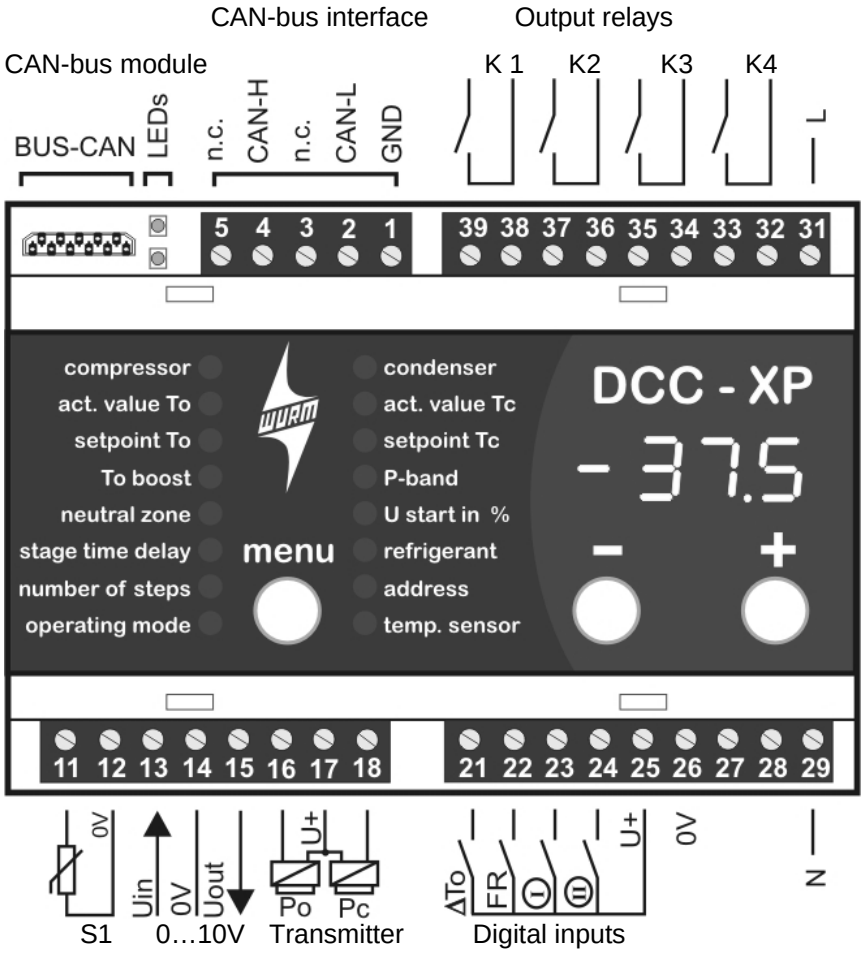
Front view

Characteristics

- Compressor capacity optimally adjusted to the necessary refrigeration capacity
- Operating mode for controlling compressor capacity via voltage input
- Up to 4 capacity steps for the most varied compressor designs:
  evenly or unevenly graduated compressors
  1-, 2- or 3-step compressors
  with or without cylinder lift
- Cascadable for up to to 8 capacity steps
- Optimised base load change according to operating time and switching frequency
- Integrated operating hours counter for each compressor step
- Simple setting of parameters via clear text menu and direct operation
- Current refrigerating plant operating status display
- Peak load shedding and fast rewind possible
- Suction pressure increase possible by means of switching contact
- Multifunctional input can be customised as independent alarm input
- Integrated continuous condensation pressure control
  Speed regulator or ADC multiple contact switch connection
- Cyclic forced start up for condenser ventilators
- Optional connection of TRK277 temperature probe for documentation
- Optional interface for remote data transmission
- Optimised peak load limit
- Compressor and compound dwell monitoring

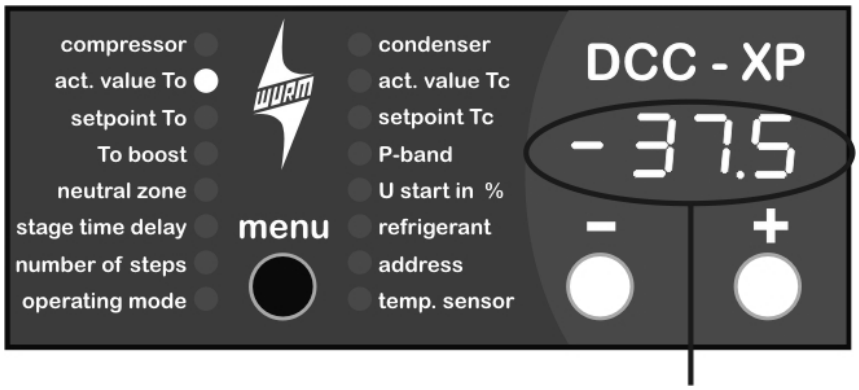
Table of Contents

1 DCC-XP connection diagram



2 Operation

Display



Value/parameter number

The device parameters are divided into two ranges.
The basic actual values and set values are displayed directly above the menu selection on the front plate. All other values are assigned to the advanced level.

Standard level

The "Act. value To" temperature is always displayed as standard.

M oder M⊕ oder M⊖	Select next or previous parameter

After the menu option or parameter is selected, the related value appears in the display.
If no key is pressed within 2 minutes, the display automatically returns to the temperature display "Act. value To".

Standard level – setting parameters

M⊖⊕ 5 sec. menu LED flashes	Enable set value adjustment
M or M⊕ or M⊖	Select next or previous parameter
⊖ or ⊕	Set parameter
M⊖⊕ 5 sec.	Block set value adjustment

If no key is pressed within 2 minutes, the setpoint adjustment is automatically blocked.

Advanced level

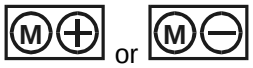
Besides the standard parameters, which can be queried directly via the front operating panel, the device has additional parameters. These are assigned to the advanced level.

Switch to the advanced level and back to the standard level
When the advanced level is selected, all menu LEDs are lit.

If no key is pressed within 2 minutes, the display automatically switches to the standard level.

Advanced level - selecting parameters

Displays the currently selected parameter

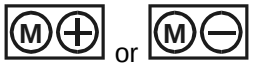


Select next or previous parameter

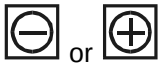
When the key is released, the value corresponding to the parameter appears.

Advanced level - setting parameters

Enable set value adjustment



Select next or previous parameter



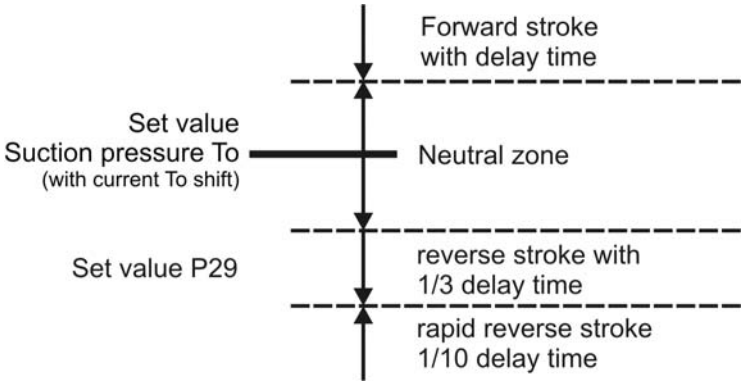
Set parameter

Block set value adjustment

If no key is pressed within 2 minutes, the setpoint adjustment is automatically blocked.

3 Suction pressure control

The suction pressure p_0 is measured with a pressure transmitter and fed to the controller in the form of a proportional current signal. In the processor, the suction pressure p_0 is converted into the evaporation temperature T_0, which can be shown in the display (actual value T_0).
The controller's task is to keep the evaporation temperature within the neutral zone. If the actual value of the evaporation temperature goes outside the neutral zone, the number of steps switched on is increased or reduced gradually until the actual value returns to within the neutral zone.



The neutral zone is arranged symmetrically to the setpoint

Setting is carried out in the "Neutral Zone" menu

The temperature difference between the lower limit of the neutral zone and the fast return flow is set with parameter P29 "Range limit for fast return flow".

Cascading

Two DCC-XP controllers can be cascaded if more than 4 relays are needed to control the compressor of a refrigerating system. Both devices must be equipped with the "BUS-CAN" module and be connected to each other via the bus.
The slave controller is switched into the controlled slave mode with Parameter P37 "Cascading". There are no other control parameters to set on the slave. Instead of the actual values for evaporation and condensation temperature, the text „SLA“ is shown in the display.

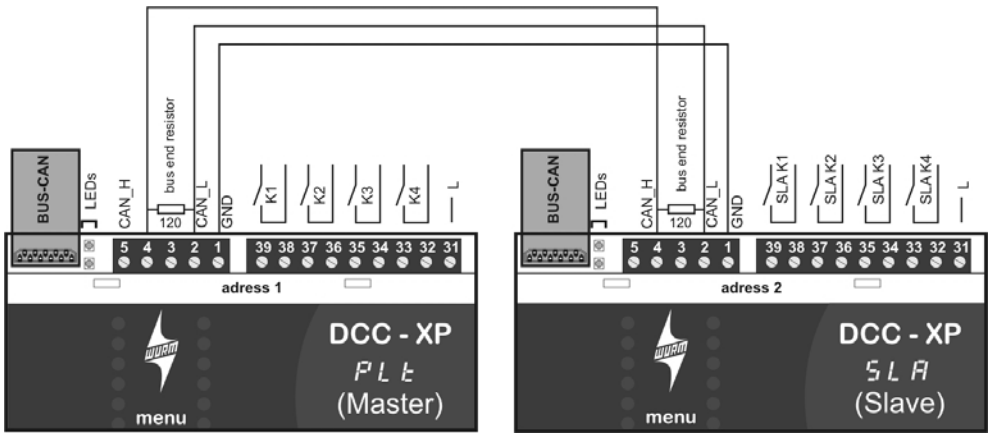
The transmitters for suction and condensation pressure are not monitored in the slave for interruption and short circuit. As a result, connection of the transmitter is optional. The readings of the connected transmitter are recorded in internal data storage and can be evaluated with Frigodata XP. The temperatures of the temperature probe are also recorded. The alarm is made as described in Chapter 11.

The master control takes over control of the compressor relay at the slave module if a number of steps greater than 4 is set. The slave's address is entered with parameter P38 "Slave address". Cascading is not possible in the mode of operation for unevenly graduated compressors (2).

Since parameter P38 is not needed in the slave, the address of the controlling master can be entered in order to make an assignment. In Frigodata XP, the parameter is designated "Pilot address" in the slave.

If no complete bus system, such as for remote data transmission, is available, at least the interfaces of the two DCC-XPs must be connected to each other according to the following connection diagram. The two DCC-XPs should be installed immediately adjacent to each other if at all possible. A resistance of 120 ohms each must be connected to both devices as the bus end.

A different address must be set for each device, and the parameters P37 "Cascading" and P38 "Slave address" set as described above.



Bus connection for cascading of 2 DCC-XPs

Delay times dependent on controlled conditions

To adjust the control conditions to the equipment, a base delay time of 1 to 6 minutes can be set under "Delay". The base delay corresponds to the delay time between the switch points of the steps when compressors are switched on.

The delay time between the switch points at the reverse stroke is 1/3 of the set base delay if the difference between the set and actual value is small. As the difference becomes larger, the delay time is reduced to 1/10 of the base delay. These conditions can be influenced with the parameter P29 "Range limit for fast return flow".

Optimised base load change

Besides the operating hours, the number of mechanical changes and, in particular, their duration has a decisive impact on the service life of compressors. For that reason, a rating value is calculated for each compressor containing the total running time, the number of mechanical changes and the elapsed time since the last switching procedure. If the capacity of the compound has to be changed by switching a compressor on or off, the program will always select the compressor with the smallest rating value. This creates optimum conditions for the compressors with regard to running times and mechanical stress.

In the case of multistep compressors, the base load change is always carried out after the load steps “Full load” and “All steps off” have been reached. Following a power interruption, all steps are at first switched off. Following this, Step 1 always begins.

Evaporating temperature setpoint increase

The set value for the evaporation temperature T_0 can be increased via the digital input $\Delta T_0\uparrow$ (terminal 21). The increase helps, for example, to save energy when the refrigerating plant is operating at night. The value of the desired setpoint increase can be changed within the range 0...20K under "T_0 Increase".

The status of the digital input can be displayed at parameter P18 "Setpoint increase" in the 2nd operating level.

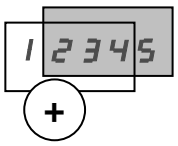
Rapid reverse stroke (Fast return)

To switch off the suction pressure controller compressors quickly, the controller has a “Fast return” (FR) digital input. If this input is actuated, all compressor steps are switched off in rapid succession (delay approx. 2 seconds) regardless of the set delay time. This does not affect the condensation pressure control.
If continuous compressor operation has been selected via digital input II "To Pump Down" (see chapter 5: Multifunctional Input), then the last compressor step will also be switched off with the fast return function.

The status of the digital input can be displayed at parameter P19 "Fast return" in the 2nd operating level.

Displaying operating hours

The total running times of the compressor steps can be read at the DCC-XP compound controller. The related values are to be found on the parameters P21 to P24 "Total operating hours". The operating hours are shown in the display with a resolution of 1 hour. A maximum of 65535 hours can be recorded per step. That equals a constant run time of more than 7 years. For a larger number of operating hours the counter reverts to 0 and begins again.



As only 4 figures of the operating hours value can be shown in the display, it is possible to shift the display by one place for values greater than 9999 by pressing the plus button. The highest 4 places of the operating hours are then shown.

The sequence numbers registered and stored in the controller (total and previous day) and the operating hours for the previous day can only be read with Frigodata XP.

After a compressor has been replaced it may be necessary to delete the integrated counter for sequences and operating hours. To do this, first select the menu for the operating hours for the required step (P21 to P24). With access enabled (see: Operation) press the menu and minus buttons simultaneously for 5 seconds. The display then shows "0".

Warning! The deletion procedure cannot be reversed.

The hours of operation are determined by output. In cascaded operation, the run times of the slave steps can therefore only be found in the slave.

Manual compressor control

In order to switch on additional compressor power independently of the controller, for example during commissioning, steps can be demanded manually. To do this, with access enabled, the plus button must be actuated in the "Compressor" menu in which the status of the output relay is displayed.

Beginning at K1 the output relays for the controller are switched on step-by-step. By pressing the minus button the relays are switched off again in the reverse order.

So long as the relays are being controlled manually, the controller’s control mechanisms are suppressed. Once the last manually controlled relay has been reset, the compound will be switched on again by the controller in the usual manner, in each case after the delay time has expired.

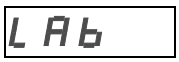
Manual switching has a time limit. Manual demand is at the latest no longer active when access is blocked.

Warning! This function is not suitable for compressors with cylinder lift off (operation modes 3 and 6), as the special switch-on sequence for this type of machine cannot be met.

Manual triggering of the slave steps must take place at the slave.

Load shedding

By wiring inputs I and II (terminals 23 and 24) for peak load shedding, the maximum number of steps to be controlled can be reduced by up to two steps. Only one voltage-free contact per step is needed for this on site. Compressor shedding then only takes place if the suction pressure controller has previously controlled all steps. If the load shedding demand disappears again (contact opened), then the lead time delay conditioned by the controller will continue to expire until a compressor is switched on.



Input II is a multifunctional input. It is used as the 2nd load shedding input if load shedding has been selected in the "Meaning, input 2" menu on parameter P26 Load shedding (see Chapter 5, Multifunctional Input).

Optimised peak load limit

The optimised peak load limit serves to limit the advance running of the compound control up to a previously determined number of steps if the set-actual difference does not exceed a determinable threshold. The result is that not all steps are requested for small differences. The remaining compressors are requested only when the temperature-difference threshold is exceeded. The parameters for setting the number of compressor steps that may be requested in normal operation is P40 "Number of steps in regular operation". The temperature-difference threshold for switching on the remaining compressor steps is set with the parameter P39 "Set-actual-difference reserve".

Operation modes and number of steps

The number of steps is the number of activated steps, which can be set in the range 2...10. It depends on the operation mode and the number of compressors. The output relays are controlled differently, depending on the operation mode. In cascaded operation, the relays marked in the following table with "SLA" are controlled in the slave. The mode of operation and number of steps are set exclusively at the master.

Note: Adjusting the operation mode leads to changes in the compressor controls. It is not possible to change the operation mode if compressors or steps are already being controlled or the number of steps is set greater than 6.

Operation mode 1: even compressors with base load change			
Relay	Compressor	Compressor	Steps
K1	Compressor 1		
K2	Compressor 2	2	2
K3	Compressor 3	3	3
K4	Compressor 4	4	4
SLA K1	Compressor 5	5	5
SLA K2	Compressor 6	6	6
SLA K3	Compressor 7	7	7
SLA K4	Compressor 8	8	8
Operation mode 2: unevenly graduated compressors			
Relay	Compressor	Compressor	Steps
K1	Compressor with 10% system capacity		
K2	Compressor with 20 % system capacity	2	3
K3	Compressor with 30 % system capacity	3	6
K4	Compressor with 40 % system capacity	4	10
SLA	Cascading is not intended!		

Operation mode 3: 2-step compressors, two windings			
Relay	Compressor	Compressor	Steps
K1	Compressor 1 low speed	1	2
K2	Compressor 1 high speed switching		
K3	Compressor 2 low speed	2	4
K4	Compressor 2 high speed switching		
SLA K1	Compressor 3 low speed	3	6
SLA K2	Compressor 3 high speed switching		
SLA K3	Compressor 4 low speed	4	8
SLA K4	Compressor 4 high speed switching		
Operation mode 4: 2-step compressors with cylinder lift off			
Relay	Compressor	Compressor	Steps
K1	Compressor 1	1	2
K2	Solenoid valve 1, contact opening in case of power requirement		
K3	Compressor 2	2	4
K4	Solenoid valve 2, contact opening in case of power requirement		
SLA K1	Compressor 3	3	6
SLA K2	Solenoid valve 3, contact opening in case of power requirement		
SLA K3	Compressor 4	4	8
SLA K4	Solenoid valve 4, contact opening in case of power requirement		
Operation mode 5: Compressors without base load switchover			
Relay	Compressor	Compressor	Steps
K1	Compressor 1		
K2	Compressor 2	2	2
K3	Compressor 3	3	3
K4	Compressor 4	4	4
SLA K1	Compressor 5	5	5
SLA K2	Compressor 6	6	6
SLA K3	Compressor 7	7	7
SLA K4	Compressor 8	8	8
Operation mode 6: 3-step compressors, three windings			
Relay	Compressor	Compressor	Steps
K1	Compressor 1 low speed	1	3
K2	Compressor 1 medium speed switching		
K3	Compressor 1 high speed switching		
K4	Not used		
SLA K1	Compressor 2 low speed	2	6
SLA K2	Compressor 2 medium speed switching		
SLA K3	Compressor 2 high speed switching		
SLA K4	Not used		
Operation mode 7: 3-step compressors with cylinder lift off			
Relay	Compressor	Compressor	Steps
K1	Compressor 1	1	3
K2	Solenoid valve 1.1, contact opening in case of power requirement		
K3	Solenoid valve 1.2, contact opening in case of power requirement		
K4	Not used		
SLA K1	Compressor 2	2	6
SLA K2	Solenoid valve 2.1, contact opening in case of power requirement		
SLA K3	Solenoid valve 2.2, contact opening in case of power requirement		
SLA K4	Not used		

Compressor dwell monitoring / forced base load change

The DCC-XP controller has a compressor dwell monitoring to avoid cooling off of undemanded compressors. This function can only be used with single-stage compressors with base load change (mode of operation 1).

The maximum permitted dwell time is defined with Parameter P44 "Monitoring time for compressor dwell". If a compressor is standing longer than the time set here, the compressor with the greatest run time is switched off completely. This control then ensures that compressor steps are added according to the power requirements. Analysis of the evaluation variables relevant for the base load change ensures that the compressor with the longest dwell is switched on next.

Compressor dwell monitoring can be switched off by setting the monitoring time to 0 min (factory setting: no monitoring).

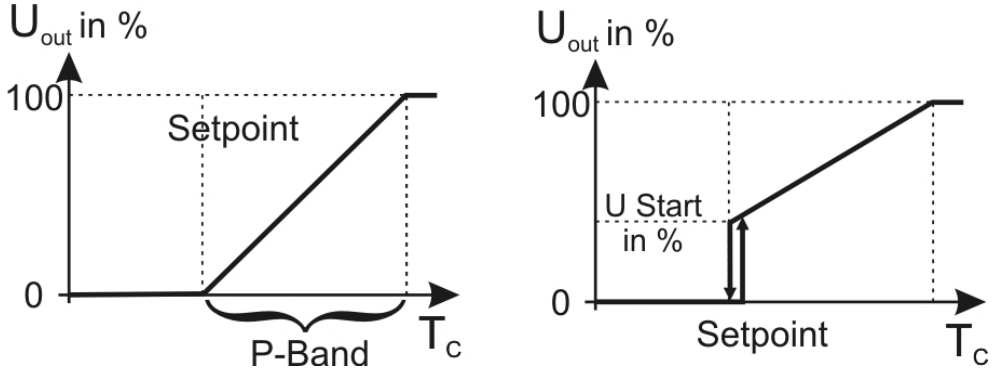
4 Condensation pressure control

The condensation pressure is detected by means of a pressure transmitter and carried to the controller by means of a proportional current signal. The condensation temperature is determined from the condensation pressure and is made available to the controller as an actual value. The value is shown in the display as "Act. value T_C".

By default, the condensation pressure transmitter is not monitored for break, since connection of the transmitter is only necessary if condensation pressure control is desired. Monitoring can be activated with parameter P42 "Monitoring condensation pressure transmitter". If the transmitter fails and active alarm is set, an emergency function is also activated in which about 50% of the ventilator capacity is switched on.

The controller's output signal is available on terminal 15 as an analogue signal. The voltage of 10 volt corresponds to a demand of 100% ventilator capacity.

Using the "P-band" parameter, it is possible to determine at what set-actual difference full modulation occurs. If the actual value equals the control setpoint (menu option "Setpoint T_C"), then the controller modulation is 0%. If the actual value is greater than the set value by the amount of the „P-band" parameter, the output signal of the controller is 100%.
Using the parameter "U Start in %", the condensation pressure controller's output signal can be adapted for frequency converters or speed regulators that require a minimum correcting signal. When there is low capacity demand the controller output signal jumps to the start value in order to achieve the full modulation of 10 volt at 100%.



The correcting variable changes by a maximum of 2% per second, i.e., the entire correcting range from 0% to 100% is passed through in the quickest case in 50 seconds. This limitation does not relate to U-start.

When an analogue input actuator is connected (e.g. phase actuator), the number of ventilators must always be set to 4 with Parameter P31 "Number of ventilators" to achieve maximum modulation.

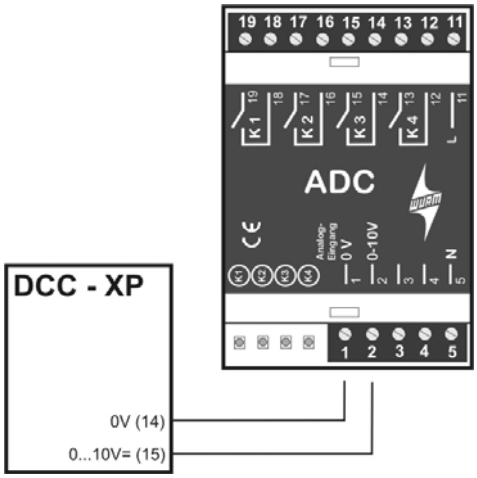
A second analogue actuator can be connected to the analogue output of a slave controller. In this case, the number of ventilators is to be set to 8 with parameter P31 "Number of ventilators" at the master. Additional prerequisites for cascade operation are described in section "3 Cascading".

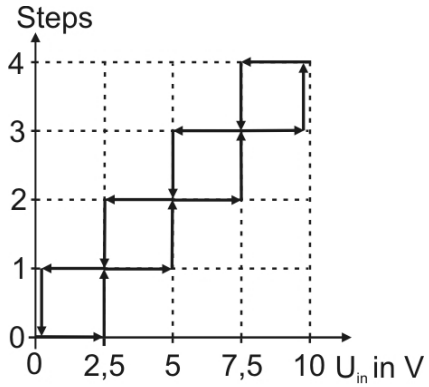
ADC multiple contact switch

In place of an analogue speed regulator or frequency converter, the ADC unit can be connected to the analogue output of the controller (terminal 15) to control switched condenser ventilators. The 0-10 volt signal is converted into 4 ventilator steps in the ADC. To prevent frequent switching of a ventilator at the switching threshold, a sufficiently large hysteresis is set permanently. Changing the switching sequence by determining the switching frequency (base load change) is not possible with the ADC unit.

The ADC multiple contact switch is always designed for controlling 4 ventilator steps. With the parameter P31 "Number of ventilators", the P-band is set to the number of ventilators actually connected. If, for example, only 3 ventilators are connected, the 3 steps are triggered if the actual-set difference equals the set P-band. In this case, a voltage of 7.5 volts is output at the analogue output.

Up to 8 ventilator steps can be selected with cascaded controls. The expanded number of steps is then output at the analogue output of the slave. The P-band of the master defines here, too, the actual-set difference at which full modulation takes place at master and slave.





Cyclic forced start up

As a result of humidity and corrosion, prolonged down times for condenser ventilators can lead to ventilator motors no longer starting correctly. To guarantee that all steps can be requested at low condensation capacities even without a base load change to the condenser ventilator, the controller has a special function which checks the last operating time cyclically. If the maximum modulation was more than 24 hours earlier, the condensation pressure controller is driven at 100% output for 2 minutes. To prevent refrigerant displacement during this phase, all ventilators are first forced off. The compressor steps are switched on again in the usual manner, in each case after the set delay time. The function of the cyclic forced start up can also be switched off with parameter P32 "Cyclic forced start up".

5 Multifunctional input

The DCC-XP compound controller has a multifunctional input. The function is assigned with parameter P26 "Meaning, input 2". In pre-setting, input II (terminal 24) is used as the second load shedding input (see "Load shedding“).

If input II is used as a universal alarm input, the mode must be customised accordingly. Two different modes are available for alarms. The modes “Alarm / zero signal current” and “Alarm / load current” are indicated in the display as given in the table below. The respective alarm delay time can be set within the range 0 min to 240 min with parameter P27 "Alarm delay".

The function of the compound control in reverse stroke can be influenced in another mode of digital input II. If the "To Pump Down" mode is activated, setting the input causes the last compressor step in reverse stroke to be switched on only when a suction pressure set in parameter P30 "Low pressure threshold E2 / Ureg" menu is not achieved.

The input can also be used for selective signalling of the gas level alarm (see the following table). In this case, the input is always evaluated in the failsafe principle. The alarm is shown here in the display with the blinking text "GAS" (see chapter 11).

LAb	Load shedding
ALnc	Alarm failsafe principle (normally closed)
ALno	Alarm load current principle (normally open)
toPd	Pump down function
AGAS	Gas level alarm

6 Refrigerant

To convert the values for suction pressure and condensation pressure detected by means of the pressure transmitter into the respective temperature values, it is necessary to specify a refrigerant. There are 16 types to select from under the "Refrigerant" menu: R22, R502, R134A, R717, R404A, R402A, R507, R407A, R407B, R407C, R32, R290, R410A, R508, R600A and R744.

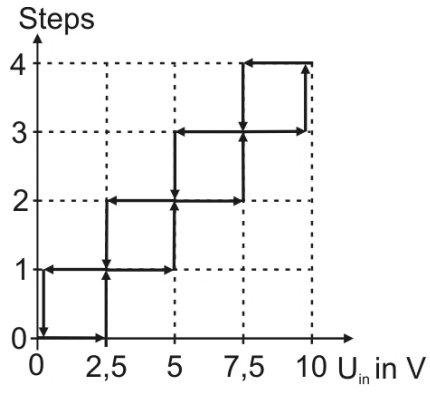
7 Control mode, compressor voltage control

If the DCC-XP controller is used for climatic applications, there is often no suction pressure control undertaken. The compressors switch on more often on the basis of a control signal from the central climatic technology when cooling capacity is required, and switch off again when there is less demand.

In the case of the DCC-XP compound controller, the compound is controlled with a standard 0-10 VDC signal, fed to the unit at terminals 13 (0-10V=) and 14 (0V).

The Voltage control mode is activated via the parameter P25 "Controller type".

PrEG	Suction pressure control
UrEG	Voltage control



In the Voltage control mode, the analogue input signal is converted into step switching. This takes into consideration the compressor operating types set in the "Operation mode" menu as well as the set number of steps ("Number of steps" menu).
The base delay for the switching the compressor on an off is 1/12 of the set value for the small compressor contact. The controller works in this operating mode as an actuator for a higher-level control and communication system. The delay times that appear as dead time are not desirable for high-quality control. The switching times are crucial to the design of the processing controller.
Input voltage of 10V always represents 100% capacity demand. To prevent frequent switching at one of the switching thresholds, a sufficiently large hysteresis is permanently set.

Cascading of up to 2 controllers is possible to increase the number of steps up to 8.

Both the fast return and load shedding functions are available in the Voltage control mode.

With voltage control, the connected suction pressure transmitter can be used for documentation of the pressure and for emergency shut-off if the temperature falls below an evaporation temperature threshold, which can be set (frost protection function). The threshold is set with parameter P30 "Low pressure threshold E2 / Ureg".

The alarm, emergency program and frost protection function can be switched off here so that a T0 pressure transmitter is not required in the "Voltage control" mode. To do this, the parameter P41 "Monitoring, suction pressure control (Ureg)" must be switched off. Switching this off has no effect in all other operating modes.

8 FRIGOTAKT control process

The DCC-XP device is prepared for equipment concepts with the FRIGOTAKT control process. Compressors are controlled with optimised mass current management of all refrigeration equipment. Communication between the compound controller and cooler controller takes place over the bus system with CAN-bus (absolutely required).

When the suction pressure controller DCC-XP is used in a FRIGOTAKT system, the FRIGOTAKT control process must be selected for the desired refrigeration circuit with parameter P25 "Controller type" and, in addition, the total cooling output with parameter P34 "Total power" according to the specification. In addition, the Frigolink cold location main module must be addressed with parameter P33 "HKS address", which demands the required refrigerating capacity. To further optimise switching, the starting power can be specified with parameter P35 "Power 1st step". Parameter P36 "Power factor" additionally causes the demanded refrigerating capacity of the Frigolink cold location main module to be dynamically evaluated depending on the condensation pressure and thus the workpoint of the refrigerating equipment.

The standard parameters of the compound equipment are set as with a typical suction pressure controller. But in the FRIGOTAKT control process, the parameters are automatically adjusted dynamically. The parameters necessary for the FRIGOTAKT control process are adjusted according to the instructions of Wurm GmbH & Co. KG or the responsible sales organisation.

Ft: n	**F**rigo**t**akt control **N**K cooler compound equipment
Ft: t	**F**rigo**t**akt control **T**K freezer compound equipment

9 Temperature probe

The temperature probe of type TRK277, which can be connected to terminal 11 and 12 (F1), has no influence on the suction or condensation pressure control of the DCC-XP device. This probe can be used to measure the cooling zone temperature, machine room temperature or outside temperature. The temperature values are recorded and are available via the Frigodata XP software as transient values or mean hours values. The current measured value is shown in the "Temp. probe" menu display.
Connecting the probe is optional. Parameter P43 "Monitoring temperature probe" activates monitoring for break or short circuit (Alarm, see chapter 11).

10 CAN-bus interface for remote data transmission

The DCC-XP controller is not equipped with an interface for data communication as standard.

The DCC-XP compound controller is designed to be operated on a CAN-bus system. The BUS-CAN bus module is required for this.

The "Address" parameter for the 1st operating level must then be set to a unique number so that the unit can be clearly identified in the bus system.

Communicating and recording values with a master system then requires a Frigodata XP-compatible gateway with CAN-BUS connection. This application records in the DCC-XP the actual value and setpoint of the suction pressure, the actual value of the condensation pressure, the currently demanded number of steps of the compressor and the modulation of the condenser. The temperature value of the additional probe is also registered.

As soon as the interface module is plugged into the DCC-XP control unit, the two green-flashing light-emitting diodes signal data communication in the bus system.
Parameter P46 "Interface" controls whether a CAN interface module is plugged in.

`no IF` No interface module plugged in

`CAn` BUS-CAN module plugged in for CAN-bus connection

The CAN interface is essential for cascading and for the FRIGOTAKT control process, since data exchange takes place over this interface.

11 Monitoring and emergency programs

If there is a fault the display flashes, showing the code given in the following table. As soon as the fault is corrected, the last error code is permanently displayed until a button on the device is actuated. And so it is possible to diagnose faults that have already occurred even without analysis of the event list, which can be seen with Frigodata XP.

Display	Cause of malfunction	Monitoring function and emergency program
`HP`	High pressure	Short circuit in transmitter connection for measuring condensation pressure, ventilator off With active break monitoring (P42), also interruption of the transmitter connection, ventilator at approx. 50%
`LP`	Low pressure	Short circuit or break in transmitter connection for suction pressure; emergency operation through stepwise switching on of approx. 50% of the compressor steps, taking into account the compressor operating modes
`AL`	Alarm	Alarm at Multifunctional Input II, if it has been customised as an alarm input (zero signal current or load current), following expiration of alarm delay time
`GAS`	Gas level alarm	Alarm at multifunctional input II if it has been customised as a gas level alarm (always failsafe principle), following expiry of alarm delay time
`EE`	Data error in the non-volatile memory	A power surge may destroy the set values. The factory setting overwrites the destroyed parameter. Check all memory locations and re-enter if necessary! Cut off power to controller!
`F 1`	Temperature probe	Alarm for interruption or short circuit of the temperature probe if it was activated with P43. No effects on the control processes!

EFt	Error FRIGOTAKT	The FRIGOTAKT control process has been deactivated by the controller. The compound control switches over to suction pressure control. Possible causes: - FRIGOTAKT operation mode was set by mistake. - The address of the assigned cooler controller (P33) was selected incorrectly. - The bus system has stopped working.
COLL	Address collision on the bus	The set address is already assigned. Set a different address for the device ! The alarm does not expire until approx. 20 seconds after the end of the fault.
buS	Bus error No bus communication	Check bus connection and BUS-CAN module or set address to 0!
ECAS	Cascading	Pilot: no slave present with address on P38 Slave: no data communication from the master Poss. cause: - number of steps not greater than 4 or mode of operation for uneven compressors - Number of ventilators not greater than 4 - incorrect slave address in the master

If the DCC-XP controller is not integrated into a bus system for data transfer, the bus interface can be used for alarms via an ALC-XP central alarm module. The alarm module must be connected for this purpose over the bus lines, and the interface module BUS-CAN must be plugged in. The simultaneous connection of several controllers for central alarm generation is permitted. The rules for CAN-BUS wiring must be followed (line topology, end resistors, etc.).

The alarm function on the bus interface is only active when the controller address is set to 0, FRIGOTAKT is not used, no other controllers are connected via cascading and, of course, the bus alarm is switched on with parameter P47 "Bus alarm". If one of these conditions is not fulfilled, parameter P47 is ineffective.

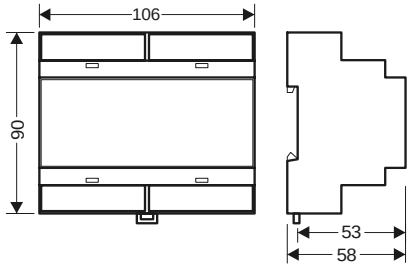
12 Installation

The DCC-XP and ADC devices are designed for profile rail mounting. The housings are standard size and are also suitable for installation in cutout boxes. They can be positioned immediately next to one another and without gaps

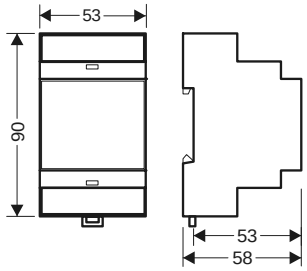
Standard 2x2x0.8ø telephone cable is recommended for wiring data lines up to 100 m in length. The protective shield must be grounded in the control cabinet. For cable runs between 100m and 400m, sheathed cable with braided sheathing should be used.

For probe extensions, it is recommended that sheathed cable be laid.

Cable run	Diameter
up to 100m	0.75 mm²
up to 400 m	1.5 mm²



DCC-XP dimensions



ADC dimensions

13 Commissioning

The entire wiring must be checked before initial start-up.
When the supply voltage has been switched on observe display: If there is no suction pressure transmitter connected, the display flashes *LP* and approx. 50% of the steps entered in the "Number of steps" menu are switched on.
To check the functioning of the control cabinet, a resistance of approx. 2.2 kOhm should be used instead of the transmitter (actual value T_0 approx. –27.5°C with refrigerant R404A).

First set the set value T_0 to -42°C, the T_0 increase to 0K and the delay to 1.0 min.

After the supply voltage is briefly switched off and then on again, all compressors must next switch off. The steps then switch back on in intervals of approx. 1 min. Then set the setpoint T_0 to +10°C. The compressor (steps) switch back off in time intervals of 2s each.

Finally carry out the operational setting.

14 Menu format

The basic operation and menu control were already described in depth in chapter 2 (Operation). The parameters with their settings as well as the factory settings are listed in this section.

1. Operating level (standard)

Parameter	Fac-tory	Min.	Max.	Description
Left column				
Compressor		Compressor currently switched on *1100* = 2 on, 2 off *1110* =3 on, 1 off Compressor status and manual start up		
Actual value T_0				Suction pressure temperature actual value
Set value T_0	-37°C	-42°C	10°C	Suction pressure temperature set value
T_0 increase	2K	0K	20K	Increase (at set input $\Delta T_0\uparrow$)
Neutral zone	3K	2K	8K	Symmetrical range around setpoint
Delay	2 min	1min	6 min	Base delay for compressor start up
Number of steps	4	2	10	Installed compressor steps
Operating mode	1	1	7	Type of compressor control
	1 = even compressors with base load change 2 = unevenly graduated compressors 3 = 2-step compressors, two windings 4 = 2-step compressors with cylinder lift off 5 = compressors without base load switchover 6 = 3-step compressors, three windings 7 = 3-step compressors with cylinder lift off			
Right column				
Condenser				Full modulation of condenser ventilator 0 -100%
Actual value Tc				Actual value condensation temperature
Set value T_C	28°C	-10°C	50°C	Setpoint condensation temperature
P-band	10K	5K	20K	Condensation pressure controller full modulation range
U start in %	0%	0%	50%	Minimum setting for condenser ventilator
Refrigerant	R404A			16 refrigerants (see description)
Address	0	0	120	Module number in bus operation
Temperature probe				Control-independent temperature probe TKR277

2. Operating level

No.	Parameter	Factory	Min.	Max.	Description
P17	Control voltage				Input voltage for voltage control
P18	Setpoint increase				Status at input set value increase $\Delta T_0 \uparrow$ bOFF =off bOn =on
P19	Fast return				Status at the fast return FR input FOFF =off FOn =on
P20	Load shedding				Number of set load shedding inputs I + II
P21	Operating time step 1				Total number of step 1 operating hours
P22	Operating time step 2				Total number of step 2 operating hours
P23	Operating time step 3				Total number of step 3 operating hours
P24	Operating time step 4				Total number of step 4 operating hours
P25	Controller type	PrEG			PrEG = suction pressure control UrEG = voltage control Ft: n = FRIGOTAKT normal cooling system Ft: t = FRIGOTAKT deep freeze system
P26	Meaning, input II Multifunctional input	LAb			LAb = load shedding ALnc =alarm failsafe principle ALno =alarm load current principle, toPd =pump-down control AGAS =alarm gas level in failsafe principle
P27	Alarm delay	10 min	0mins	240min	Delay for alarm output
P28	Alarm priority	1	0	3	Device alarm priority in the bus system
P29	Range limit for fast return flow	1K	1K	5K	Temperature difference between the lower limit of the neutral zone and the fast return
P30	Low pressure threshold E2 / Ureg	-50°C	-50°C	+10°C	Controller type suction pressure control: Suction pressure threshold for switching off the last CP step with pump down switching Controller type voltage control: Minimum suction pressure for safety operation (anti-freeze)
P31	Number of ventilators	4	2	8	Number of ventilators on ADC
P32	Cyclic forced start up	on	oFF	on	Switch for activating the cyclic forced start up of the condenser ventilator
P33	HKS address	0	0	120	Address of the demanding main module, only for FRIGOTAKT
P34	Total output	0 kW	0 kW	250 kW	Total cooling output of the compound equipment, only for FRIGOTAKT
P35	Power 1st step	0,0 KW	0,0 kW	50,0kW	Power of the 1st step, only for FRIGOTAKT
P36	Power factor	130%	100%	150%	Power factor for Tc-dependent power evaluation for Frigotakt
P37	Cascading	PLt			PLt =master, SLA =slave Pilot required in cascade operation Number of steps > 4 and/or ventilators > 4!
P38	Slave address (master) Pilot address (slave)	0	0	120	Pilot: Address of the slave to be controlled in cascade operation Slave: Address of the controlling master in cascade operation
P39	Set-actual-difference reserve	10K	0K	20K	Max. actual-setpoint difference for regular operation with optimised peak load limit
P40	Step number of regular operation	10	0	10	Max. number of compressor steps for regular operation with optimised peak load limit
P41	Monitoring, suction pressure control (Ureg)	on	oFF	on	Switch for deactivating monitoring of the suction pressure transmitter with controller type "Voltage control (Ureg)"
P42	Monitoring condensation pressure transmitter	oFF	oFF	on	Switch for activating monitoring of the suction pressure transmitter for interruption
P43	Monitoring temperature probe	oFF	oFF	on	Switch for activating monitoring of the temperature probe for interruption
P44	Monitoring time for compressor standstill	0mins	0mins	120min	Monitored dwell time of the compressors in operating mode 1 (compressor with base load change), 0 min = function inactive
P45	Plot matrix	15min	1min	15min	Storage cycle for internal data storage 1: 1 min matrix, register depth approx. 2 days 5: 5 min matrix, register depth approx. 11 days 10: 10 min matrix, register depth approx. 22 days 15: 15 min matrix, register depth approx. 33 days, mean values
P46	Interface				no IF = no communication CAn = CAN-Bus interface
P47	Bus alarm	oFF	oFF	on	Alarm over bus lines when not used for data transfer (address = 0)
P48	Version				Version of the firmware used

15 Technical data

DCC-XP

Supply voltage	230V~ +10% / -20%
Power draw	approx. 5 VA
Fusing	max. 6A
Use in three-phase currents	All connections intended for operation with 230V~ power supply be connected to the same phase conductor. 400 V~ between various connection terminals is not permitted.
Pressure transmitter	Po: -0.5...7 bar corresponds to 4...20mA Pc: 0..0.25 bar corresponds to 4...20mA
Temperature probe	Type: TRK277PLUS
Control input	0...10V= for capacity control in voltage control operating mode
Digital inputs	Inputs for voltage free contacts 1 x setpoint increase ($\Delta T_0\uparrow$) 2 x peak load shedding (I and II) of which 1 x multifunctional input (II) 1 x fast return (FR)
Output relay	4 x closing contacts, 230V~ 4(2)A
Analogue output	0...10 V= , tied to voltage, max. load 10mA, for connection of ADC (multiple contact switch) or a speed regulator or frequency converter for controlling condensation pressure
Central processing unit	Single-chip microcomputer, data memory
Monitoring system	Monitoring of connected probes Self-monitoring of data memory and microcomputer
Communication	Prepared for CAN-bus system. Socket for plugging in the BUS-CAN interface module. 3-wire CAN-bus interface
Dimensions	(WxHxD) 106 x 90 x 58 mm³, DIN 43880
Mounting	Mounting rail DIN EN 50022 35x15
Ambient temperature	0...+45°C (operation)
Weight	approx. 450 g
EC declaration of conformity	In accordance with the EC directive on electromagnetic compatibility 2004/108/EC.

ADC

Supply voltage	230V~ +10% / -20%
Power draw	approx. 2 VA
Fusing	max. 6A
Control input	0...10V= for condenser ventilator capacity control
Output relay	4 x closing contacts, 230V~ 4(2)A
Dimensions	(WxHxD) 53 x 90 x 58 mm³, DIN 43880
Mounting	Mounting rail DIN EN 50022 35x15
Ambient temperature	0...+45°C (operation)
Weight	approx. 200 g
EC declaration of conformity	In accordance with the EC directive on electromagnetic compatibility 2004/108/EC.

This description applies for devices of Version 3.3 and higher. The version is shown in parameter P48 "Version" in the 2nd operating level.

This document will automatically become invalid when superseded by a new technical description of the device.