Technical Manual
Compound/Brine-Chiller Systems Controller

ELREHA

VPR-5000 / 5140

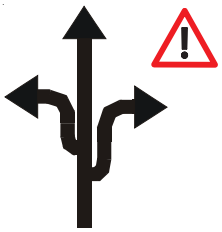
Software Version: /118

No. 5311265-00/04e

Preliminary

- Controls 2 complete Compressor Compound systems or max. 2 Chiller Systems
- Controls compressors and condenser fans and up to 64 networked cold storage controller devices
- LC-screen for all plant information
- Uses cold storage controller data for optimization procedures
- Integrated alarm message processing sytem
- Integrated 12-channel time-switch

Guide



Please note

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Introduction

Dear Customer !

With this VPR-5000 Compound Master Control Unit you get a modern, highly complex product, which differs clearly from other products in technical details and capabilities.

This complexity and the high number of plant parameters makes it absolutely necessary coming to know the system because at first you feel 'struck dead' by the capabilities.

This manual constitutes the trial to procure you the most important knowledge about the system.

If you have any question, don't hesitate to contact us.

Your ELREHA Team

Please read Safety Instructions on Page 106 before Start-up!

Pictograms used in this manual:


Common Safety Note


Danger of Life !


Important Note

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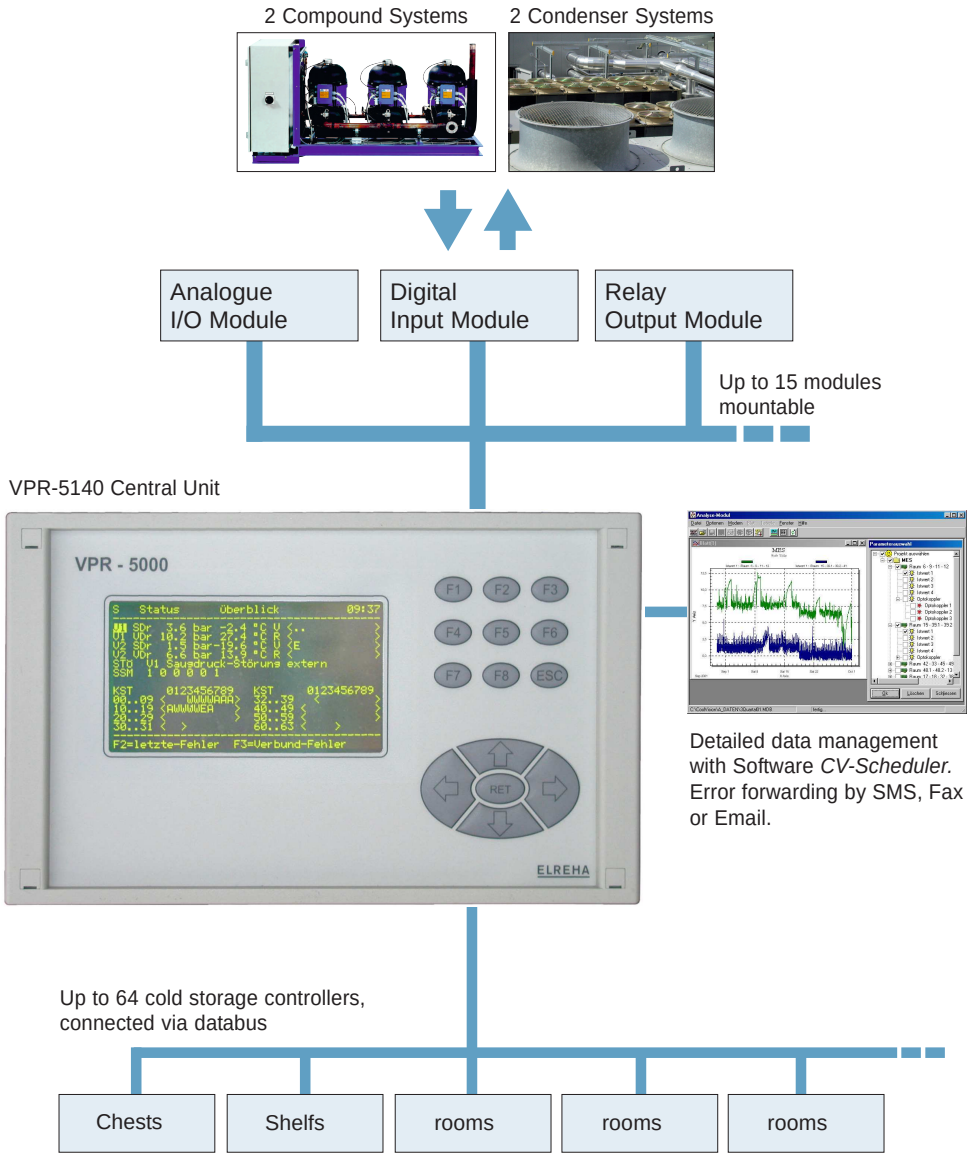
VPR-System Overview

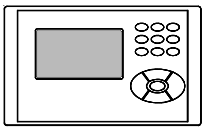
The VPR 5000 system has the capability to control a complete, bigger refrigeration plant. The VPR system is exceptionally suitable for all kind of grocery companies and supermarkets. The control possibilities range from cold production up to the single cold storages.

Which kind of machinery can be controlled ?

- One (1) or two (2) complete compressor compounds including their condenser systems, which can have up to 48 stages/machines. Both compounds are completely independent.
- One (1) or two (2) complete chiller systems, equipped with 1, 2 or 3 circuit generation of cooling energy by compound systems.
  (4 circuits max., i.e. if chiller system 1 has 3 circuits, chiller system 2 can have 1 circuit only.)

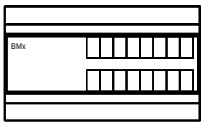


VPR 5000- System Components



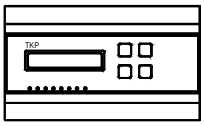
The VPR-5000 Central Unit comes with a metal housing for mounting in e.g. doors of electrical cabinets. It has 5 relay outputs and several communication interfaces only, so wiring to the door is less complex. The Central Unit contains the complete system control, a data logger system (optional) and a comfortable display, where all system information can be read.

1. VPR-5000 Central Unit



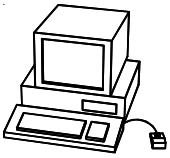
Capturing of states and measuring values is done by specialized Bus Modules (BMx model series), rail mounted in the electrical cabinet, which allows short wiring. This modules have a certain number of inputs /outputs (relays, analogue inputs/outputs, digital inputs, etc.), which can be assigned to functions by configuration. This Bus Modules transmit their information by an independent databus (ICOM) to the Central Unit.

2. Expansion Modules Series BMx



Up to 64 autarkic working Cold Storage Controllers of the model series **TKP/ TKC x130**, **EVP** or **TEV** are connected to the Central Unit by another databus. These controllers can be mounted at any place, the databus can be up to 1 kilometers in lenght. As a further device, the energy counter module **VBZ 19000** can be added.

3. Cold Storage Controllers, data capture components



A computer (PC) is not necessary, but suggestive if the plant must be remote controlled, e.g. to spare journeys or to get logged data for quality purposes. By the help of this PC and the software packages "***CV-Scheduler***" or "***COOLVision***" full remote control and graphical processing of data is possible.

4. Computer

How to configure and to order a VPR-5000

Only you, the planner, know how many compressors, fans or pumps must be controlled or how many messages should be processed. First, you don't know anything about the number and type of the necessary Expansion Modules, because their inputs and outputs are not assigned to specific functions. This information deliveres the free-of-charge planning software "**VPR50PLAN**".

So you are on the right way:

- Start the software '**VPR50PLAN**' on your PC. This program runs on each MS-Windows from 98SE. '**VPR50PLAN**' can be ordered free-of-charge.

- Enter all important data, like number of compressors and fans, alarm message processing, sensors, etc.

- As a result you get :
  1. A system overview with all ressources of the VPR-system.
  2. A **Connection Table**, which you can use to create your electrical plans
  3. A **parts list**, which can be used for ordering the VPR-System
  4. A **parameter listing** containing the most important parameter values which must be entered at start-up

'Standard' Compound Control System

If the VPR-System is provided to control Standard Compound Systems, then two complete, independent systems, e.g. a refrigeration compound (C1) and a freezing compound (C2) can be controlled at the same time.

For each compound a suction pressure controller with max. 12 stages is provided.
The built-in stage sequencing supports both single types and multi-stage types. Analogue outputs allow connecting frequency inverter controlled compressors.

Additionally, there is a condenser pressure controller available for each compound, which is able to control up to 12 single fans or multi-stage fans. Also speed-controlled fans can be controlled by analogue outputs.

The VPR gets information by the following values and states:

- Actual suction pressure of each compound
- Actual condenser pressure of each compound
- Status signal of each compressor
- Status signal of each fan
- Fast-backrun signal
- Peak load limitation signal from energy supplier
- Compressor error messages
- Single error messages
- Error messages of cold storages

Chiller Controller

If the VPR-System is configured for brine-/chiller systems, then 2 complete, independent systems can be controlled.

Chiller Configurations

Each chiller system can consist of multiple refrigeration circuits.
Four (4) refrigeration circuits maximum are possible.
Here are the possible configurations:

Chiller 1 (C1)	Chiller 2 (C2)
1 circuit	1 circuit
2 circuits	1 circuit
3 circuits	1 circuit
1 circuit	2 circuits
2 circuits	2 circuits

Compressors

In each chiller system up to 12 compressors or compressor stages can be controlled.
(Note: In a three circuit chiller-set only 12 stages are possible).

- The actual temperature is measured by a temperature sensor in the reflux of the brine circuit.
- At the brine outlet a temperature limit sensor can be positioned.
- The heat exchanger of each refrigerant circuit can be equipped with a frost protection sensor. Additionally, digital inputs for external frost protection units are provided.

Condenser Fans

For each refrigerant-compound a fan set with an individual pressure transmitter can be installed. Each fan set can consist of 12 fans or fan stages maximum.

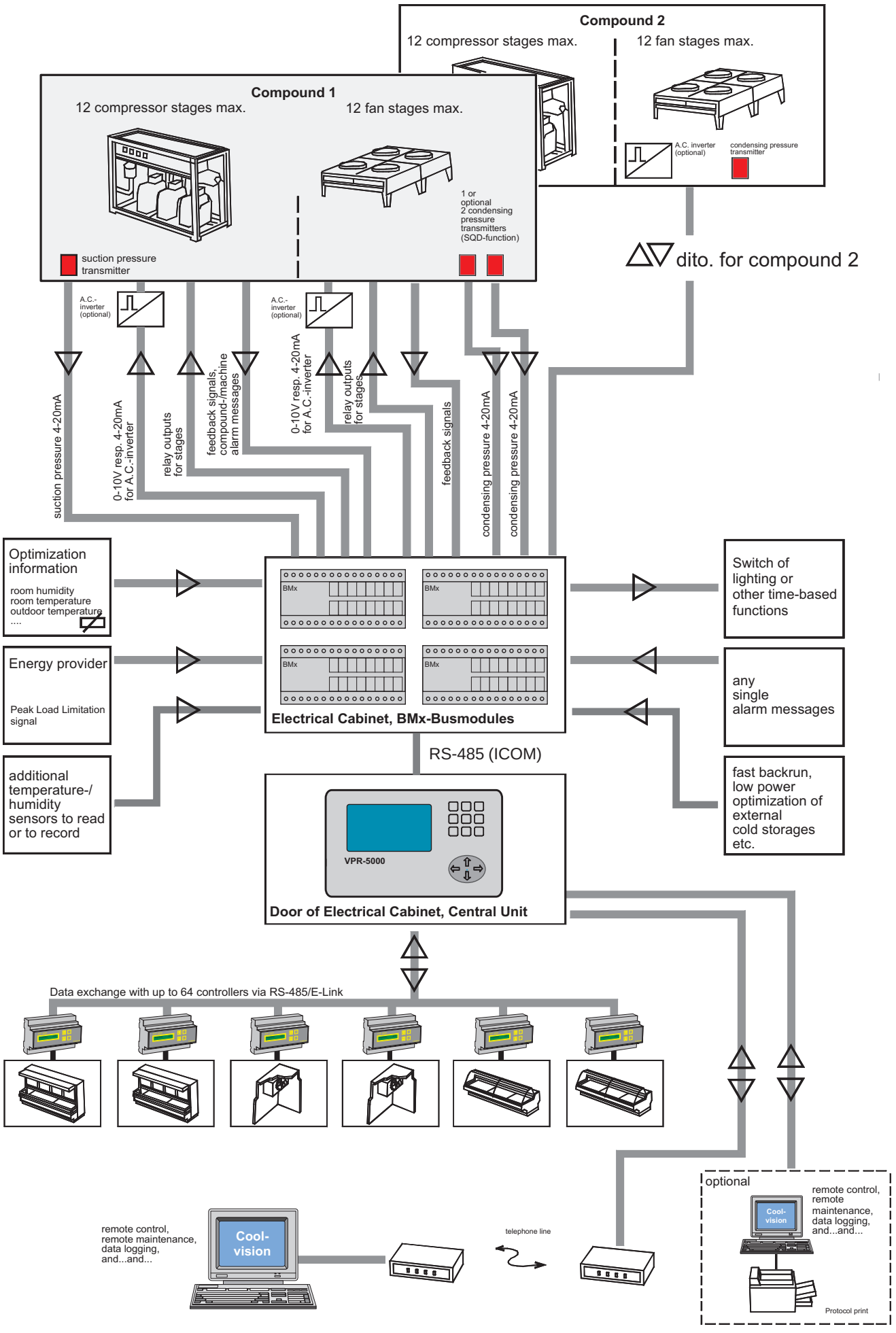
- Controlling of fans can be done independent for each compound or via a chiller refered priority function (CPD-function), which controls all fans by using the highest measured pressure of all compounds.
- Each refrigerant circuit can be disabled by digital input.

Brine Pumps

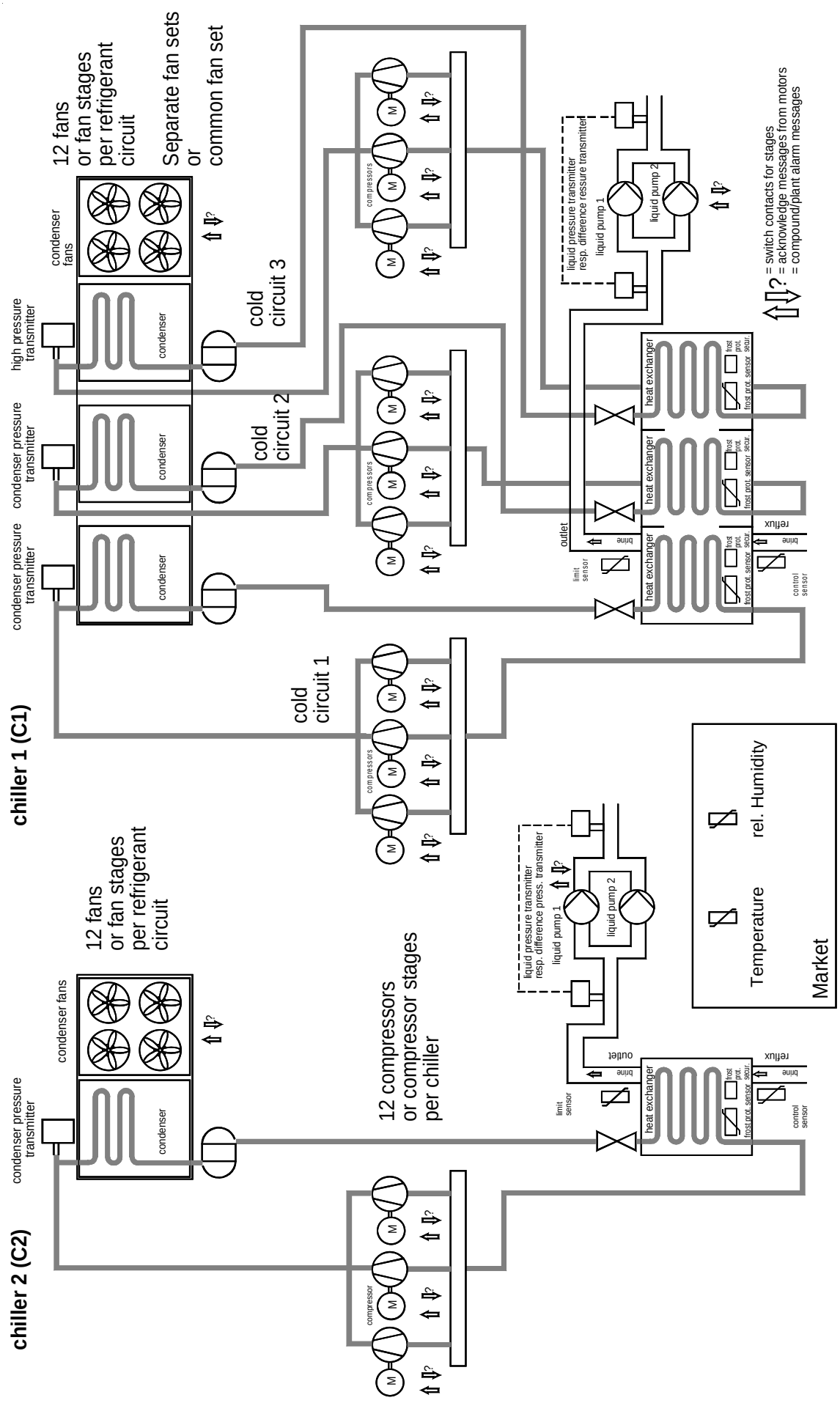
Two liquid pumps may work in each chiller set, they can work permanently at the same time or can be alternated daily or while an alarm occurs.

- By using a matching pressure-transmitter the brine pressure can be monitored and corresponding functions can be initiated.
- Brine pumps are always controlled by the N/C contact of the corresponding relay.

The next pages show a simplified diagram of a possible chiller system, for a better survey the cold storage controllers are not displayed.


Compound 2
12 compressor stages max.
12 fan stages max.
A.C. inverter (optional)
condensing pressure transmitter
Compound 1
12 compressor stages max.
12 fan stages max.
1 or optional 2 condensing pressure transmitters (SQD-function)
suction pressure transmitter
dito. for compound 2
A.C.-inverter (optional)
A.C.-inverter (optional)
suction pressure 4-20mA
0-10V resp. 4-20mA for A.C.-inverter
relay outputs for stages
feedback signals, compound-/machine alarm messages
0-10V resp. 4-20mA for A.C.-inverter
relay outputs for stages
feedback signals
condensing pressure 4-20mA
condensing pressure 4-20mA
Optimization information
room humidity
room temperature
outdoor temperature
....
Energy provider
Peak Load Limitation signal
additional temperature-/ humidity sensors to read or to record
BMx
BMx
BMx
BMx
Electrical Cabinet, BMx-Busmodules
Switch of lighting or other time-based functions
any single alarm messages
fast backrun, low power optimization of external cold storages etc.
RS-485 (ICOM)
VPR-5000
Door of Electrical Cabinet, Central Unit
Data exchange with up to 64 controllers via RS-485/E-Link
remote control, remote maintenance, data logging, and...and...
Cool-vision
telephone line
optional
remote control, remote maintenance, data logging, and...and...
Cool-vision
Protocol print

Simplified Diagram of a Chiller System



Co-operation of Central Unit and Cold Storages

Data interchange with the cold storage controllers is done via an RS-485 based databus. The used transmission protocol is *E-LINK*, developed by ELREHA. The RS-485 interface allows an interference-safe data transmission up to a distance of 1000 m.

Cold Storage Controllers

Each cold storage is equipped with an own cold storage controller (CST) of the series TKP, TKC, EVP or TEV. These controllers work autarkic (independent), it means that the present solenoid valves, fans, defrost heaters, roller blinds and pane heaters will be controlled by the unit without asking the central unit 'what to do'. Please refer to the technical manual of the cold storage controller to get further information about it.
So the control of the cold storages is secured also in case of a discontinuance of the data flow between the central unit and the cold storage controllers.

Parameters and setpoints which are essential for cold storage controllers can be read on the screen. New values can be entered via keypad at the Central Module and then transmitted back. The Central Unit backups and controls the settings, that means that all values entered directly at the controller unit, except the address, will be overwritten by the VPR !

All connected controllers provide the central unit with information about measured values, alarm states and operating parameters. This information can be processed by the VPR, e.g. to display, to forward error messages or to optimize control processes.

Assignment of Cold Storage Controllers

Each cold storage controller (CST) can be assigned to one of the both compound systems (C1/C2). If the central unit is used as a chiller control system, the CST can be assigned to one of the both brine sets.

Advantage: Optimization functions of the compounds can work based on the values of the assigned controllers.
If a disturbance occurs at one of the compounds, only those controller units will be affected which are assigned to this compounds.

To bind also single controller units (e.g. in refrigerated cases with own compressor), the assigment can be disabled.

Central alarm messaging

Each cold storage controller transmits its alarm states to the VPR-unit. The alarms will be displayed in plain text on the VPR's error page and can be assigned to different priority levels. If the data transmission to a cold storage controller is disturbed for a longer time, this controller will be reported as 'Out of Order'.

Data transmission disturbances/ Central Unit Malfunction

If the controller unit gets no new information from the central unit, the controller continues working with the existing parameters.
If no data transmission restarts within 30 minutes (e.g. in case of a technical defect or breakdown of the central unit), the cold storage controller annuls an order to de-activate the solenoid valves which the VPR unit has given before. So the controller unit is able to operate normally.
If data transmission starts again and the compounds are still disabled, the solenoid valves will be de-activated again immediately.

The most important function blocks of the VPR Central Unit

- A large LC-Screen shows all parameters of the plant. The parameters of all components can be displayed and edited in menues.
- Foil-keypad to enter and change values
- A User Management System controls Access Rights

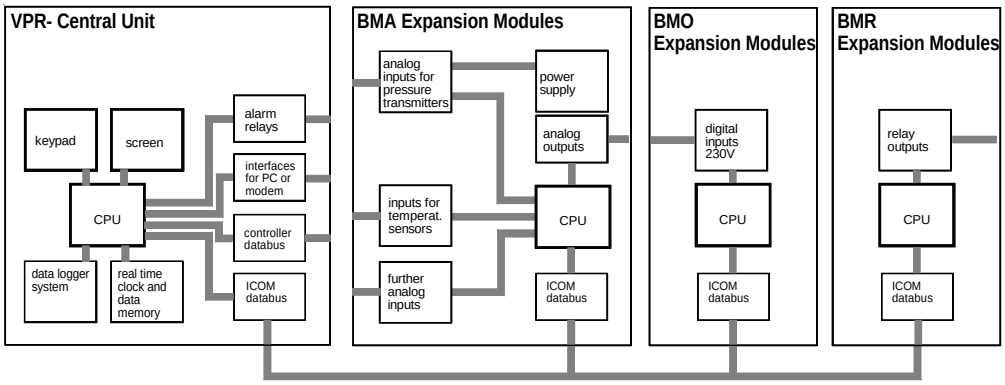
Suction Pressure

- For each compound there is a compressor stage controller with an automatic stage sequencing control available, which cares for nearly equal machine-runtimes. This feature works with any number of compressor stages. Alternately, frequency inverters can be controlled by analogue outputs. Various optimization methods are available to improve the suction pressure course.

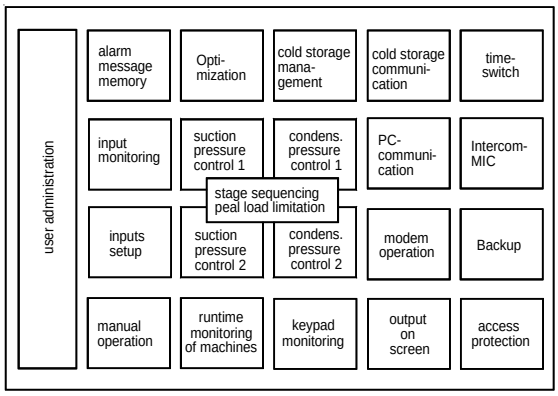
Condensing Pressure

- For each compound there is a condenser fan stage controller available, also with a stage sequencing control function. You can set an individual setpoint for each stage. Alternately, 2 analogue outputs for speed-controlled condenser fans are offered.

The most important functions of the hardware



The most important functions of the software



Manual Operating

- All connected components like compressors, fans and cold storages can be switched off/on manually without additional installation of mechanical switches.

Superior Cold Storage Management

- States and parameters of all connected cold storage controllers can be displayed and edited on the screen. Compound disturbances trigger e.g. a shutdown of all solenoid valves switched by the cold storage controller units.

Safety- and Monitoring Functions.

- All sensor- and transmitter inputs are monitored in the way that the VPR-Unit starts control functions in an emergency mode if one or more signals are out of range.

Operating- and Error Messages

- Plant messages like compressor error messages, common messages and machine run-times are recorded and processed. The messages can be assigned to different priority levels and forwarded by modem and an automatic telephone dialing function.

Failure Archive

- The last 150 error- and status-messages are stored in memory with name, date and time of their occurence.

Interfaces

- All necessary interfaces for connecting controller units, expansion modules, PC and modem are available. So the plant (including the cold storages) can be monitored, supervised and remote controlled by a host with matching software.

Operating

Operating the VPR 5000 is very easy using a simple keypad. All information can be read in plain text (partly condensed) on individual pages. Navigation is done by using arrow-keys.

If you don't push a button of the keypad for about 30 minutes, the backlighting of the screen will switch off.

Energy saving mode

If any button is pushed, the backlight switches on and you can see the main menue.
The marked menue (Status) is highlighted.

Power-On

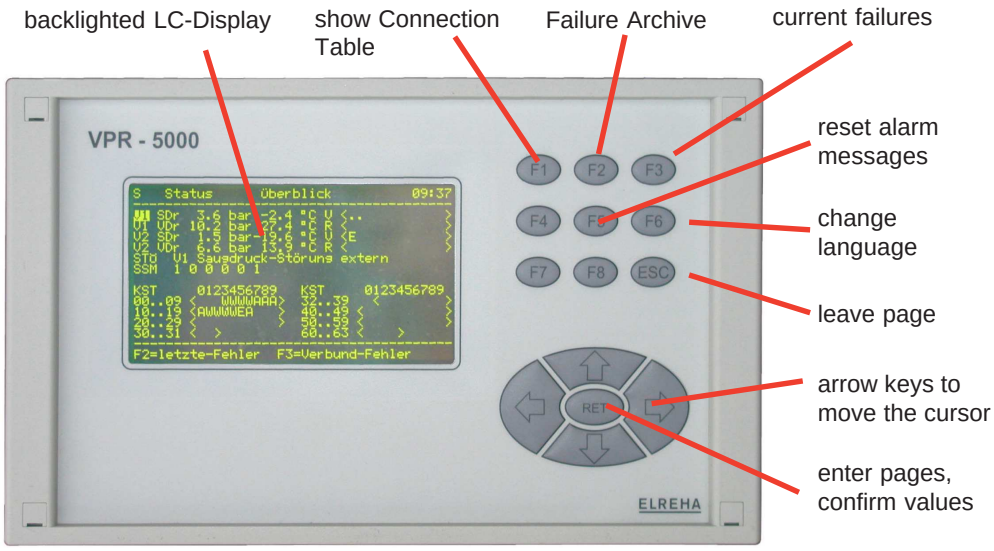
Push button "⇨" and the next menue will be marked. This marker we call the '**Cursor**'.

Navigation

"**RET**" ..... Entry key. Calls up pages, starts programming or confirms entries.

"⇦⇨⇧⇩" ..... Cursor keys. Moves cursor on/to the individual position lines. Holding the cursor keys increases cursor moving speed more and more.
'**ESC**' ..... You leave the page and return to the previous page.

Operating Elements



Programming

"⇦⇨⇧⇩" ..... Moves the cursor to the desired parameter
"**RET**" ..... At first the VPR asks for an access code (User Page opens).
After entering the correct code, slow blinking of the cursor shows programming standby
"⇧⇩" ..... Changes parameter value
"RET" ..... Confirms the new value, blinking stops.

Text Entry

"⇦⇨⇧⇩" ..... Moves the cursor to the line with the text to change
"**RET**" ..... The VPR asks for an access code (User Page opens).
After entering the correct code, slow blinking of the cursor shows programming standby
"⇦⇨" ..... Moves the cursor on the character to change
"⇧⇩" ..... Selects desired character
"⇦⇨" ..... Moves the cursor to the next character to change
"⇧⇩" ..... Select desired character, and so on.
"RET" ..... Confirms the new text, blinking stops.

User Administration

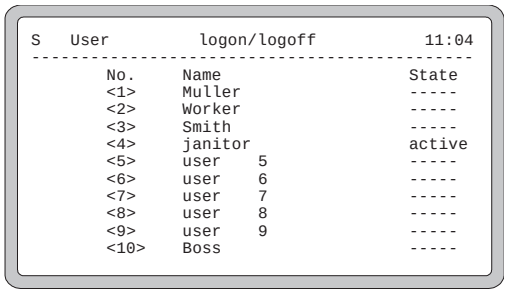
The VPR is a complex system with a lot of adjustable parameters and so a lot of failure sources. Because of that, all parameters are protected by a user administration system. Only personel which got specific rights is able to adjust parameters.

The integrated user administration system of the VPR is able to manage the access rights of up to **10** users.

If a user tries to change a parameter the first time, a logon page appears.

This logon page contains for up to 10 users:
- name
- access level
- PIN-code (=password)

The access levels predefine which parameters resp. parameter groups are allowed to change by the specific user.



Example of a logon page. Announced users are marked as 'active'.

Access Levels in the VPR-System

1.	**read only**	Everybody can read, no logon necessary
2.	**setpoints CST**	like 1. + programming of cold storage controller setpoints
3.	**setpoints**	like 2. + programming of compound setpoints
4.	**configuration**	like 3. + programming of configuration parameters + programming of the PIN's from users with levels 1-3 + programming of the Access Levels up to 4 max.
5.	**all**	unrestricted access

The PIN-Code

The PIN-Code is your password, please memorize it carefully!

If you would forget the PIN-Codes, the user administration system can be reset to factory settings, but with this, all user rights and PIN's are lost.

- Every user access is recorded on the 'historic failures'-page
- Every user is authorized to change its own username and PIN
- A standard user is not able to change its own access level

End of access authorization

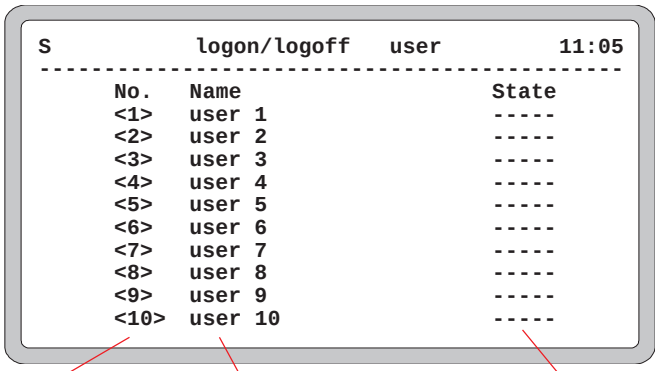
- If no key is hit for about 15 minutes, the user will be logged out automatically. For a new access, the PIN-Code must be re-entered.
- If a user enters an invalid PIN-Code for himself, the access authorization will be disabled immediately.

User	Access level	PIN
1	1	0
2	2	1
3	3	2
4	4	3
5 to 9	1	0
10	5	Serial No. VPR

Factory settings of the user administration system

Open the User Access Page

You will find the logon page via the 'Parameter'-page and '*Configuration <system users>*".
The logon page opens automatically, if you want to change a parameter and you are not authorized yet.



User Access Page with factory settings

"No":
Branch to the specific user configuration pages from here.

"Name":
The set name for this user.

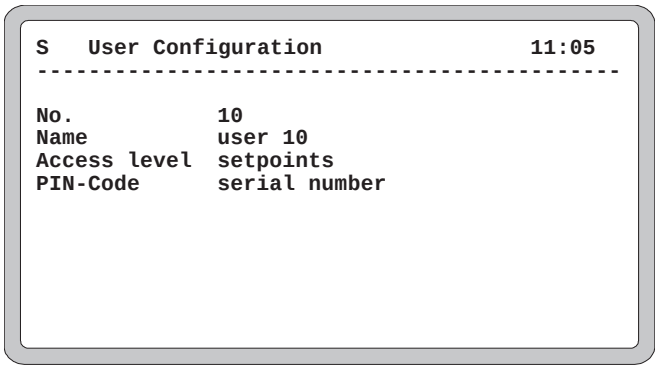
"State":
Here the PIN-code must be entered. 'active' indicates that the entered code is correct and the user is authorized to change parameters.

"Superuser" definition

The Superuser is the one who has unrestricted access to the system and so the right to define further users. In the factory settings the Superuser is user no.10.

In this example we expect that you work at a VPR with factory settings.

- Place cursor on 'state' of user #10
- Enter PIN-code *(factory setting = serial number, you will find it on page 'parameter/ service data/ Elreha-test data')*
- Place cursor on <10>
- open configuration page of this user by 'RET'



Configuration page of user 10 with the factory settings

On this page you can define a new name for user #10 and a new PIN-code. The name can be up to 20 characters long.

Change User Name

- Place cursor on the name of user #10
- Push **RET**
- Select character to change by '⇦⇨'
- Change character by '⇧⇩'
- Confirm by **RET**

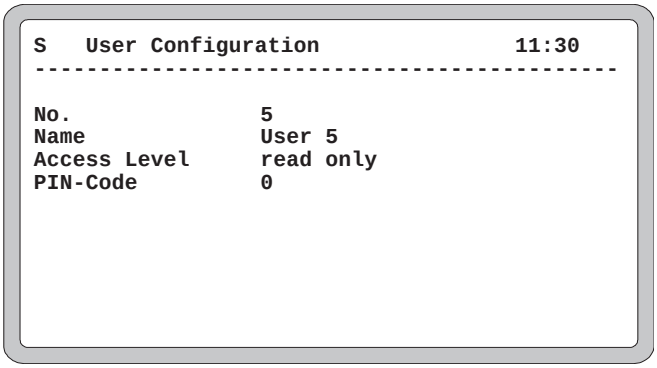
Change PIN-Code

- Place cursor on PIN-Code resp. "Status" on the User Administration Page
- Push **RET**
- Select character to change by '⇦⇨'
- Enter desired PIN-Code by '⇧⇩'
- Confirm by **RET**

Create further Users

To create further users, do the following:

- Login as "Superuser" if you want to create any users
  or
- Login as user with the level 4, to create new users with levels 1-4.
- Open configuration page of the desired user (example: user 5)



Change User Name

- Place cursor on the name of user 5
- Push **RET**
- Select character to change by '⇦⇨'
- Enter desired character by '⇧⇩'
- Confirm by **RET**

Change Access Level

- Place cursor on "Access level"
- Push **RET**
- Choose Level by "⇧⇩"
- Confirm by **RET**

Change PIN Code

- Place cursor on desired PIN-Code
- Push **RET**
- Enter desired PIN by "⇧⇩"
- Confirm by **RET**

Reset User Authorization to Factory Settings

- Contact your Superuser *or*
- Contact the ELREHA Customer Service

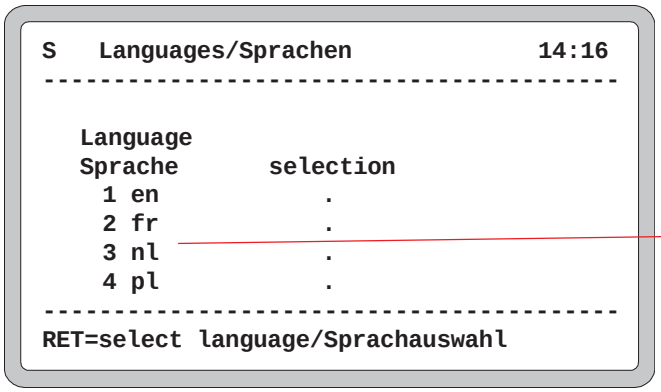
Language Selection

The VPR Central Unit contains, additionally to the installed standard language (mostly german) up to **4** foreign screen languages.
The languages can be changed while normal operation, all texts and messages appear in this language.

By the help of the PC service software 'Flashloader' addtional languages can be uploaded at any time.

Change language

From main menu, branch to the 'Languages'-page by '**F6**'. The tagged language under 'selection' then replaces the standard language.

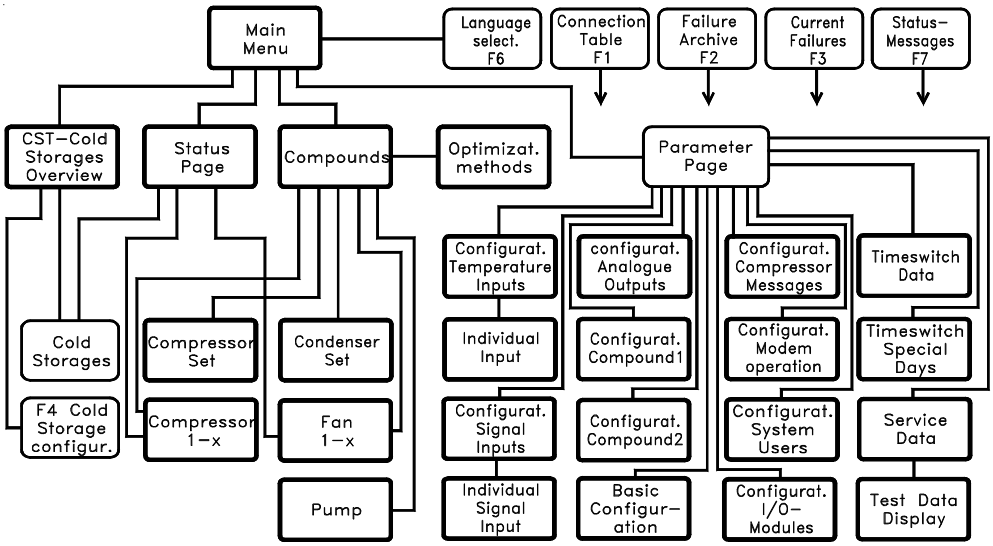


In this example the VPR contains the additional language modules english (en), french (fr), dutch (nl) and polish (pl).
If the position is tagged by "--" then no additional language module is installed.

Error Message Information Pages

The VPR informs about current or former error messages on different Information Pages, which can be read by the keys F2, F3 and F7:

F2 The last 150 Error- and All Clear messages in plain text.
F3 The current error and status messages.
F7 The current external error messages without assigned priority levels.



Structure of Parameter Pages

This is an overview of the available screen pages and the ways to reach them.

Will be displayed after power up, from here you branch to submenues and pages	**Main Menu**
Selection out of 4 different languages	**F6 Language Selection**
Listing of all possible cold storage controllers. Enabled positions are marked by an ""E"".	**Cold Storage Overview (CST)**
Short overview with actual values of the compounds, current error messages as well as states of machines, cold storages and failure signal priorities.	**Status Page**
Status overview of the single stage controllers as well as common parameters of the compounds as a whole	**Compounds Page**
Status information of the liquid pumps	**Pumps Page**
Parameters of all optimization methods	**Optimization Functions**
This page contains parameters which are important for the start-up procedure of the VPR	**Parameter Page**
This page contains the parameters of teh connected cold storage controllers. Depending on controller type, this page may contain sub-pages.	**Cold Storages Page**
Selection of cold storage controller type.	**F4 Cold Storages Configuration**
Contains operation setpoints of this compressor set	**Compressor Set Page**
Contains operation setpoints of this condenser set	**Condenser Set Page**
Configuration data of compressors and condenser fans of compound 1 (e.g. refrigeration compound)	**Configuration Compound 1**
Configuration data of compressors and condenser fans of compound 1 (e.g. freezing compound)	**Configuration Compound 2**
Basic configurations of the system which affects to the terminal assignment	**Basic Configuration**
Overview, actual values and functionality of all standardized signal inputs (4-20mA)	**Configuration 4-20 mA IInputs**
Actual value, functionality and correction of the individual signal input	**Individual 4-20 mA Input**
Overview, actual values and functionality of all temperature sensor inputs	**Configur. Temperature Probes**
Actual value, functionality and correction of the individual temperature sensor input	**Individual Temperature Probes**
Configuration of all analogue outputs	**Configuration Analogue Outputs**
Listing of the compressors error messages which should be processed	**Configur. Compressor Messages**
Listing of the telephone modem parameters	**Configuration Modemoperation**
Page to register users and their access rights	**Configuration System Users**
Page with times and data of the integrated time switch	**Time Switch Data**
Page with a listing of special days and holidays	**Time Switch Special Days**
Page with parameters for service and start-up	**Service Data**
Overview and registration of I/O-Modules	**Configuration Input/Outp.- Modules**
Contains information for diagnosis and test routines of the factory	**ELREHA-Test Data**
Individual page for each selected compressor with all important data like error messages, etc.	**Compressor Page**
Individual page for each selected condenser fan with all important data like error messages, etc.	**Fan Page**
Page with the last 150 error- and "all clear"-messages as plain text	**F2, page "Failure Archive"**
Page with the current error messages	**F3, page "Current Failures"**
Listing of all external error messages without assigned priority	**F7, page "Status Messages"**
Page with a listing of the current terminal assignment, depending on the set parameters	**Connection Table**

Information about Pages and Parameter Listings

On the following pages you will find all available screen pages with all possible parameters as listings.

At positions marked by the 'RET'-key (RET) you are able to call a sub page.

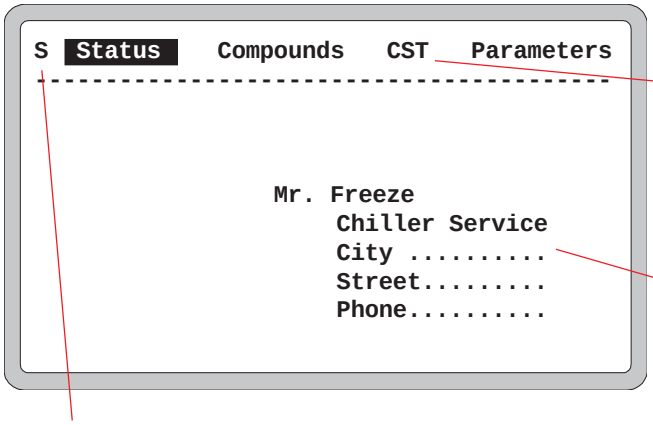
Depending on configuration, the VPR shows only the relevant data.

The names of the two compounds are factory set to C1 resp. C2. If you change this name on the Parameter Page, the name will be changed on all parameter pages automatically.

Data Display

Compound Names

Main Menue

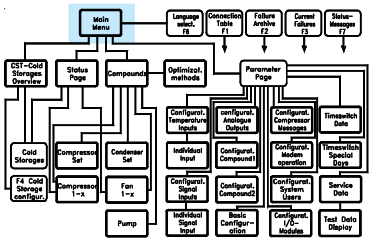


'Status': Branch to the Status Page
'Compounds' : Branch to the Compound Page
'CST': Branch to the Cold Storages
'Parameters': Calls the Parameter Page

Service information for the customer. Any text can be entered, 20 character per line, 6 lines possible max. To change the text, mark characters by cursor and change as described under 'Operating'.

Status indicator, appears on each page:

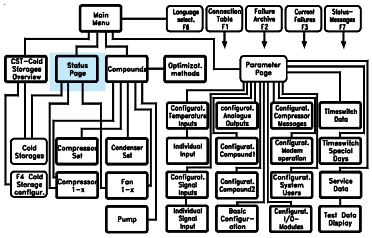
'**M**': (=malfunction), if a warning or a disturbance is present.
'**P**': While a data transfer to the internal permanent memory (e.g. while programming)



This page will appear after power-up of the unit resp. after a system reset. By pushing any key, the background lighting switches on.

From this position, the language selection page can be called by '**F6**'.

Status Page



This page shows an overview of all actual compound values, the current failures and the states of machines, cold storages and error message priorities.
This page is larger than the screen, you can scroll it if necessary.

Information
'**M**': if an error message is present
'**P**': data transfer to the permanent memory

Actual Compound Values

State of Stage Controller
'F' = Forward
'N' = Neutral (dead zone)
'R' = Backrun (reverse)

States of stages 1-12
'.' = selected
'R' = switched on
'r' = switched on, but no feedback
'W'= warning
'M' = malfunction
'1' = switched on manually
'0' = switched off manually

Moving the cursor on one of these positions and pushing 'RET' brings you to the compressor- or fan pages with the corresponding details.

```
M  State          Overview        16.01.00
-----------------------------------------
C1 SPr   3.2 bar    -5.5 °F F <EEEE....  >
C1 CPr   13.0 bar   35.6 °F N <EE..      >
C2 SPr    3.2 bar   -5.5 °F R <SSee      >
C2 CPr   13.0 bar   35.6 °F F <EEe.      >
ALM  EmergOFF
SSM 1 1 0 0 0 0

CST    0123456789       CST    0123456789
00-09 <CCCC       >     32-39 <           >
10-19 <           >     40-49 <           >
20-29 <           >     50-59 <           >
30-31 <           >     60-63 <           >
-----------------------------------------
F2  Fail.History       F3  CurrentFailures
```

On each page:
Cyclic alternating of date and time

Current Failure

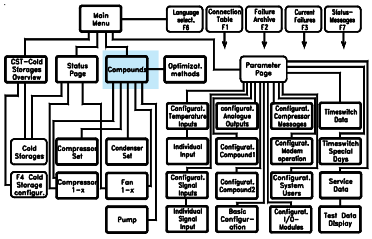
Error Message Priorities,
'1'= relay is ON

Status Line
With the described buttons you move to the corresponding information

States of Cold Storages
'.' = available (selected)
'O' = switched on
'M' = out of order (no data connection)
'C' = refrigeration on
'D' = defrost event on
'W' = warning

Moving the cursor on one of these positions and pushing 'RET' calls the page with the details of this cold storage controller.

Compounds Page



The compound page contains common parameters of the compound- and condenser controls resp. chiller systems, e.g. the parameters for the suction pressure optimization.

From here you can move to the working parameters of compressor- and fan sets and the individual compressor pages and fan pages.

The parameter listing is larger than the screen area, please scroll by the cursor keys.

Information
'**M**':
if an error message is present
'**P**':
data transfer to the permanent memory (Initialization)

State of Stage Controller
'F' = Forward
'N' = Neutral
'R' = Backrun (reverse)

Moving the cursor to one of these positions and pushing 'RET' calls the pages with the setpoints of the corresponding control system.

State of Stages
'.' = selected
'R' = switched on
'r' = switched on, but no feedback
'W'= warning
'M' = malfunction
'1' = switched on manually
'0' = switched off manually

Moving the cursor to one of these positions and pushing 'RET' calls the individual compressor- and fan pages.

```
M   Compounds
-----------------------------------------
C1   <Compressor>           <N  R...      >
     <Condenser Circuit 1> <N. R...       >
     <Condenser Circuit 2> <F  ....       >

C2   <Compressor>           <N  R...      >
     <Condenser Circuit 1> <N. R...       >

C1  Brine Pumps             <R            >


-----------------------------------------
F2=Fail.History        F3=Current Failures
```

Pump States
'.' = selected
'R' = switched on
'r' = switched on, but no feedback
'M' = malfunction

Moving the cursor to one of these positions and pushing 'RET' calls the individual compressor- and fan pages.

Moving the cursor to one of these positions and pushing 'RET' calls the individual compressorset- and fan set pages.

Status Line
With the described keys you move to the corresponding information

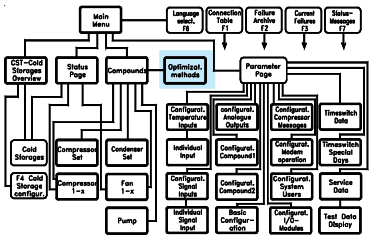
Parameter terms	Description	Possible values / range	Your value
C1 compressor RET	Current operating state of this stage controller **"RET"** calls the 'compressor set'-page of this compound	F= forward N= neutral R= reverse (backrun)	1
C1 compressor RET	Current states of the single controller stages. **"RET"** calls the corresponding 'compressor'-page	see previous page	2
C1 condenser circ. 1 RET	Current operating state of this stage controller **"RET"** calls the 'condenser set'-page of this compound. (Brine-Chiller systems: condenser circ. 1)	F= forward N= neutral R= reverse (backrun)	3
C1 condenser circ. 1 RET	Current states of the single controller stages. **"RET"** calls the corresponding 'fan'-page	see previous page	4
C1 condenser circ. 2 RET	Current operating state of this stage controller **"RET"** calls the 'condenser set'-page of this compound. (Brine-Chiller systems: condenser circ. 2)	F= forward N= neutral R= reverse (backrun)	5
C1 condenser circ. 2 RET	Current states of the single controller stages. **"RET"** calls the corresponding 'fan'-page	see previous page	6

Parameter terms	Description	Possible values / range	Your value
C1 condenser circ. 3 RET	Current operating state of this stage controller **"RET"** calls the 'condenser set'-page of this compound. (Brine-Chiller systems: condenser circ. 3)	F= forward N= neutral R= reverse (backrun)	7
C1 condenser circ. 3 RET	Current states of the single controller stages. **"RET"** calls the corresponding 'fan'-page	see previous page	8
C2 compressor RET	Current operating state of this stage controller **"RET"** calls the 'compressor set'-page of this compound	F= forward N= neutral R= reverse (backrun)	9
C2 compressor RET	Current states of the single controller stages. **"RET"** calls the corresponding 'compressor'-page	see previous page	10
C2 condenser circ. 1 RET	Current operating state of this stage controller **"RET"** calls the 'condenser set'-page of this compound. (Brine/chiller systems: condenser circ. 1)	F= forward N= neutral R= reverse (backrun)	11
C2 condenser circ. 1 RET	Current states of the single controller stages. **"RET"** calls the corresponding 'fan'-page	see previous page	12
C2 condenser circ. 2 RET	Current operating state of this stage controller **"RET"** calls the 'condenser set'-page of this compound. (Brine/chiller systems: condenser circ. 2)	F= forward N= neutral R= reverse (backrun)	13
C2 condenser circ. 2 RET	Current states of the single controller stages. **"RET"** calls the corresponding 'fan'-page	see previous page	14

Parameter Terms	Note	Possible values / range	Your value
C1 Brine Pumps RET	Operating mode brine pumps of chiller 1	Pump 1 + 2 permanent Pump 2 (1 stand-by) Pump 1 (2 stand-by) alternating	15
C2 Brine Pumps RET	Operating mode brine pumps of chiller 2	like above	16
CPD-Function	If this function is enabled, the C1-analogue output delivers the highest value of the connected condenser pressure transmitters	on/off	21
Load balancing	Effectuates a different switching sequence of the circuits in multicircuit chiller systems: OFF: Circuit 1 > circuit 2 > then circuit 3 ON: Each circuit runs with possibly the same number of machines	on/off	22
Optimization methods RET	Calls the page with the parameters of the optimization methods		
eco heater lock C1			
eco heater lock C2			

Parameter terms	Description	Possible values / range	Your value
VBZ unit present	Register a VBZ module at the VPR	yes, no	
Active rating	State of the rate change function via digital input at the VBZ	NT = standard rate HT = high rate	
VBZ Counter 1	Sum of the detected units + text term of the unit (3 characters)	0...9999999 - - -, any text (e.g. KWh)	
Counter NT (Counter 1)	Sum of the "standard rate" units	0...9999999	
Counter HT (Counter 1)	Sum of the "high rate" units	0...9999999	
Pulses / Digit (Counter 1)	Quantity of pulses which are necessary to capture a unit.	0...59999	
Value (Counter 1)	Captured counter pulses up to now	0...pulses per digit	
NT/HT selectable	If you select "yes", the NT/HT counter states are shown. If "no", you can read the counter state "VBZ Counter" only	yes, no	
Decimals (Counter 1)	Decimal places of the captured units. (With energy counting always without decimal place, but selectable because the VBZ is also usable for counting other events)	1 / 0,1 / 0,01 / 0,001 Default = 1	
VBZ Counter 2	Sum of the detected units + text term of the unit (3 characters)	0...9999999 - - -, any text (e.g. KWh)	
Counter NT (Counter 2)	Sum of the "standard rate" units	0...9999999	
Counter HT (Counter 2)	Sum of the "high rate" units	0...9999999	
Pulses / Digit (Counter 2)	Quantity of pulses which are necessary to capture a unit.	0...59999	
Value (Counter 2)	Captured counter pulses up to now	0...pulses per digit	
NT/HT selectable	If you select "yes", the NT/HT counter states are shown. If "no", you can read the counter state "VBZ Counter" only	yes, no	
Decimals (Counter 2)	Decimal places of the captured units. (With energy counting always without decimal place, but selectable because the VBZ is also usable for counting other events)	1 / 0,1 / 0,01 / 0,001 Default = 1	
VBZ Counter 3	Sum of the detected units + text term of the unit (3 characters)	0...9999999 - - -, any text (e.g. KWh)	
Counter NT (Counter 3)	Sum of the "standard rate" units	0...9999999	
Counter HT (Counter 3)	Sum of the "high rate" units	0...9999999	
Pulses / Digit (Counter 3)	Quantity of pulses which are necessary to capture a unit.	0...59999	
Value (Counter 3)	Captured counter pulses up to now	0...pulses per digit	
NT/HT selectable	If you select "yes", the NT/HT counter states are shown. If "no", you can read the counter state "VBZ Counter" only	yes, no	
Decimals (Counter 3)	Decimal places of the captured units. (With energy counting always without decimal place, but selectable because the VBZ is also usable for counting other events)	1 / 0,1 / 0,01 / 0,001 Default = 1	
VBZ Counter 4	Sum of the detected units + text term of the unit (3 characters)	0...9999999 - - -, any text (e.g. KWh)	
Counter NT (Counter 4)	Sum of the "standard rate" units	0...9999999	
Counter HT (Counter 4)	Sum of the "high rate" units	0...9999999	
Pulses / Digit (Counter 4)	Quantity of pulses which are necessary to capture a unit.	0...59999	
Value (Counter 4)	Captured counter pulses up to now	0...pulses per digit	
NT/HT selectable	If you select "yes", the NT/HT counter states are shown. If "no", you can read the counter state "VBZ Counter" only	yes, no	
Decimals (Counter 4)	Decimal places of the captured units. (With energy counting always without decimal place, but selectable because the VBZ is also usable for counting other events)	1 / 0,1 / 0,01 / 0,001 Default = 1	

Optimization Functions



The parameter listing is larger than the screen area, please scroll by the cursor keys.

```
M   Optimization Functions
-------------------------------------------
Values of suction pressure optimization
 room temperature                  def °C
 room humidity                     def %rF
 C1 Compound
      Humidity low limit            40 %rH
      Humnidity high limit          60 %rH
.
.
.
.
.
-------------------------------------------
F2=Fail.History        F3=Current Failures
```

Values of the Suction Pressure Optimization Function

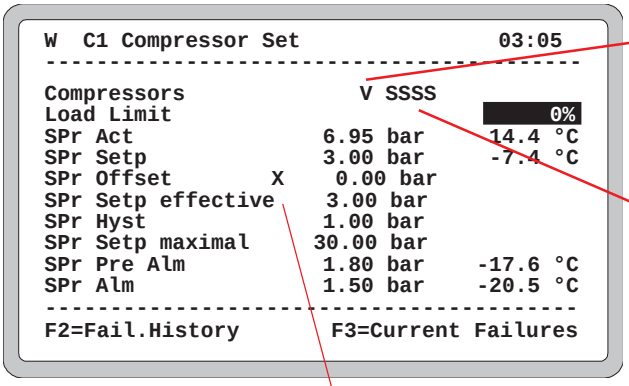
Room Temperature	Actual value of market temperature sensor	°C (°F)	23
Room Humidity	Actual value of market humidity transmitter	% r. H.	24
C1 Compound			
Humidity Low Limit	Lower limit of humidity for determining the enthalpy as the leading dimension for the suction pressure optimization of the C1-compound	% r. H.	25
Humidity High Limit	Upper limit of humidity (see above)	% r. H.	26
Temperature Low Limit	Lower limit of temperature for determining the enthalpy as the leading dimension for the suction pressure optimization of the C1-compound	°C (°F)	27
Temperature High Limit	Upper limit of temperature (see above)	°C (°F)	28
Maximum shift	Offset, the suction pressure of the C1-compound will be shifted	0.00 bar up to 10.00 bar	29
Current shift	Information about the amount of the current suction pressure shift		Display only 30
C2 Compound			
Humidity Low Limit	Lower limit of humidity for determining the enthalpy as the leading dimension for the suction pressure optimization of the C2-compound	% r. H.	31
Humidity High Limit	Upper limit of humidity (see above)	% r. H.	32
Temperature Low Limit	Lower limit of temperature for determining the enthalpy as the leading dimension for the suction pressure optimization of the C2-compound	°C (°F)	33
Temperature High Limit	Upper limit of temperature (see above)	°C (°F)	34
Maximum shift	Offset, the suction pressure of the C1-compound will be shifted	0.00 bar up to 10.00 bar	35
Current shift	Information about the amount of the current suction pressure shift		Display only 30

Values of the Low Power Optimization Function (LOP)

C1 Compound			
Function	Low Power Optimization ON/OFF	On/Off	36
Power	C1-compressor power factor (unitless)	0...100 (e.g. % or KW)	37
Max Suction Pressure	Compressors switch on without demand at	-1,00...30,00bar / default 0,5 bar	38
Min Suction Pressure	Setpoint target of the VPR if 'LOP' is enabled. Normally located below the suction pressure setpoint. Limit for the 'pump-down'-function	-1,00...30,00bar default 0,05 bar	39
Delay	Time delay after power demand to secure the demand is authentic.	0m00 to 10m00 default 1m00	40
Delay Remaining	Remaining time after start of delay		display only 41
external Refrigeration Demand	1= 'LOP' is disabled via digital input. For cold storages which are not connected to the data network	0...1	display only 42
C2 Compound			
Function	Low Power Optimization ON/OFF	On/Off	43
Power	C2-compressor power factor (unitless)	0...100 (e.g. % or KW)	44
Max Suction Pressure	Compressors switch on without demand at	-1,00...30,00bar / default 0,5 bar	45
Min Suction Pressure	Setpoint target of the VPR if 'LOP' is enabled. Normally located below the suction pressure setpoint. Limit for the 'pump-down'-function	-1,00...30,00bar default 0,05 bar	46
Delay	Time delay after power demand to secure the demand is authentic.	0m00 to 10m00 default 1m00	47
Delay Remaining	Remaining time after start of delay		display only 48
external Refrigeration Demand	1= 'LOP' is disabled via digital input. For cold storages which are not connected to the data network	0...1	display only 49

Parameter Terms			
C1 Compound			
Function			
Measuring interval status			
Measuring interval			
Interval Remain			
Current shift			
C2 Compound			
Function			
Meas.interval state			
Meas. interval			
Interval Remain			
Current shift			

Compressor-Set Page



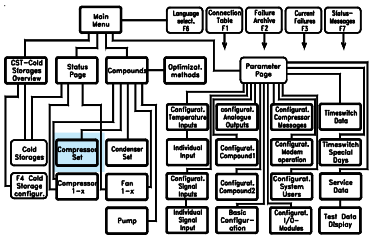
View of the page if a refrigerant is selected as media (standard compounds).

'X' = SPr Offset is active

State of stage controller
'F' = Forward
'N' = Neutral
'R' = Backrun (reverse)

States of stages 1-12
'.' = selected
'R' = switched on
'r' = switched on, but no feedback
'W'= warning
'1' = switched on manually
'0' = switched off manually

Moving the cursor to one of these positions and pushing 'RET' brings you to the individual compressor- and fan pages.



Each compressor has its individual page which contains the corresponding setpoints as well as compressor status messages.
The contents of the pages differ depending on the selection of standard compounds or brine/chiller systems.

Parameter Terms	Note	possible values / range	your value C1	your value C2
Compressor	status messages of the stage controller and the individual compressors	see 'status page'	display only 60	
Load Limit	The % amount of disabled compressors		display only 61	
SPr Act	Calculated actual suction pressure value in °C or °F. Pressure value (bar) is adjustable	bar/°C/°F	62	63
SPr Setp	Suction pressure setpoint = lower limit for suction pressure setpoint shift	bar, (°C-display depends on refrigerant)	64	65
SPr Offset	Amount the suction pressure setpoint will be shifted if digital input 'night operation' is active	**+/- 5.00 bar if an 'X' appears, the value is active**	66	67
SPr Setp effective	Calculated suction pressure setpoint. addition of SPr Setp + result of external setpoint shift	upper to lower security limit value	68 disp. only	69 disp. only
SPr Hyst	Hysteresis (dead zone) within forward and backrun	0.00 bar to 24.00 bar 70	71	
SPr Setp maximal	Upper safety limit of suction pressure setpoint	-1.00 bar to +30.00 bar	72	73
SPr Pre Alm	Setpoint of suction pressure pre-warning	bar/°C/°F	74	75
SPr Alm	Setpoint of suction pressure alarm	bar/°C/°F	76	77
Operation Feedback delay	Period, the VPR waits for a feedback signal from the compressors. After this delay, the relay contact for the compr. will be disabled, then another machine will be selected	0m05 up to 10m00	78	79
Lock after malfunction	Min. time a machine is requested after having a failure state	0m05 bis 60m00, [5m00]		

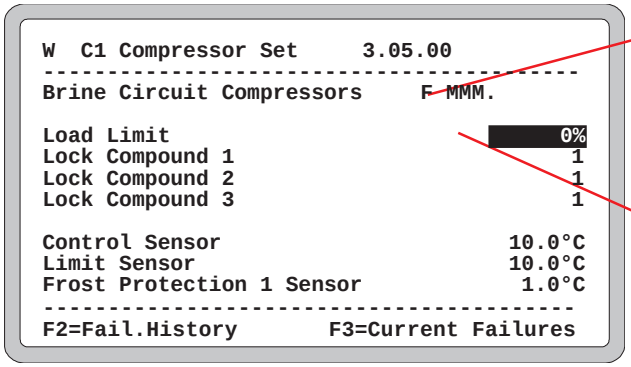
Parameter Terms	Note	Possible values / range	Your value C1	Your value C2
[3]PID-Controller	Output for frequency inverter controlled compressors			
[3] Proportional band		0.01...3.00 bar [0.50 bar]		
[3] Integral time		0m00...10m00 [1m00]		
[3] Derivative time		0...10 sec [10 sec]		
[3] Actuator response time		0...10.0 sec [2.0 sec]		
[3] Output value		0...100%	disp. only	disp. only
Utilization Rate Compound	Information about the current power output. ⓘ Only usable if the compressors are equipped with 'power factors'	0...100%	80 disp. only	81 disp. only
Variable Forw/Backrun Delay (**VFR**)	Switch frequency optimization by VFR on/off	on / off	82	83
[1] Forward Zone	Pressure range above the hysteresis range, where the forward delay will be varied within	0.05 up to 2.00 bar	84	85
[1] Backrun Zone	Pressure range below the hysteresis range, where the forward delay will be varied within	0.05 up to 2.00 bar	86	87
[1]Forw/Backr. Delay time max.	Maximum forward/backrun delay time	0m01 up to 60m00	88	89
[1]Forw/Backr. Delay time min.	Minimum forward/backrun delay time	0m01 up to 60m00	90	91
[1]Forw/Backr. Delay time act.	Current delay time, calculated depending on Forward Zone, Backrun Zone and actual pressure		disp. only 92	disp. only 93
[2] Forward Delay Stage 1	Time delay before this stage will switch on	max. 60 min : 00 sec	94	106
[2] Forward Delay Stage 2	Time delay before this stage will switch on	max. 60 min : 00 sec	95	107
[2] Forward Delay Stage 3	Time delay before this stage will switch on	max. 60 min : 00 sec	96	108
[2] Forward Delay Stage 4	Time delay before this stage will switch on	max. 60 min : 00 sec	97	109
[2] Forward Delay Stage 5	Time delay before this stage will switch on	max. 60 min : 00 sec	98	110
[2] Forward Delay Stage 6	Time delay before this stage will switch on	max. 60 min : 00 sec	99	111
[2] Forward Delay Stage 7	Time delay before this stage will switch on	max. 60 min : 00 sec	100	112
[2] Forward Delay Stage 8	Time delay before this stage will switch on	max. 60 min : 00 sec	101	113
[2] Forward Delay Stage 9	Time delay before this stage will switch on	max. 60 min : 00 sec	102	114
[2] Forward Delay Stage 10	Time delay before this stage will switch on	max. 60 min : 00 sec	103	115
[2] Forward Delay Stage 11	Time delay before this stage will switch on	max. 60 min : 00 sec	104	116
[2] Forward Delay Stage 12	Time delay before this stage will switch on	max. 60 min : 00 sec	105	117

ⓘ [1] only visible if VFR is switched on, [2] only visible if VFR is switched off, [3] only visible if analog output is selected for FI-control

Parameter Terms	Note	Possible values / range	Your value C1	Your value C2
[2] Backrun Delay Stage 1	Time delay before this stage will switch off	max. 60 min : 00 sec	118	130
[2] Backrun Delay Stage 2	Time delay before this stage will switch off	max. 60 min : 00 sec	119	131
[2] Backrun Delay Stage 3	Time delay before this stage will switch off	max. 60 min : 00 sec	120	132
[2] Backrun Delay Stage 4	Time delay before this stage will switch off	max. 60 min : 00 sec	121	133
[2] Backrun Delay Stage 5	Time delay before this stage will switch off	max. 60 min : 00 sec	122	134
[2] Backrun Delay Stage 6	Time delay before this stage will switch off	max. 60 min : 00 sec	123	135
[2] Backrun Delay Stage 7	Time delay before this stage will switch off	max. 60 min : 00 sec	124	136
[2] Backrun Delay Stage 8	Time delay before this stage will switch off	max. 60 min : 00 sec	125	137
[2] Backrun Delay Stage 9	Time delay before this stage will switch off	max. 60 min : 00 sec	126	138
[2] Backrun Delay Stage 10	Time delay before this stage will switch off	max. 60 min : 00 sec	127	139
[2] Backrun Delay Stage 11	Time delay before this stage will switch off	max. 60 min : 00 sec	128	140
[2] Backrun Delay Stage 12	Time delay before this stage will switch off	max. 60 min : 00 sec	129	141
Hysteresis location	Position of the hysteresis range of the setpoint	symmetrical, above, below		
Oil pressure switch delay				
Rem. Compound standstill time				
Continuous runtime				
Pumpdown limit				

[1] only visible if VFR is switched on, [2] only visible if VFR is switched off, [3] only visible if analog output is selected for FI-control

Compressor-Set Page Brine Circuit Compressors



State of stage controller
'F' = forward
'N' = neutral
'R' = reverse

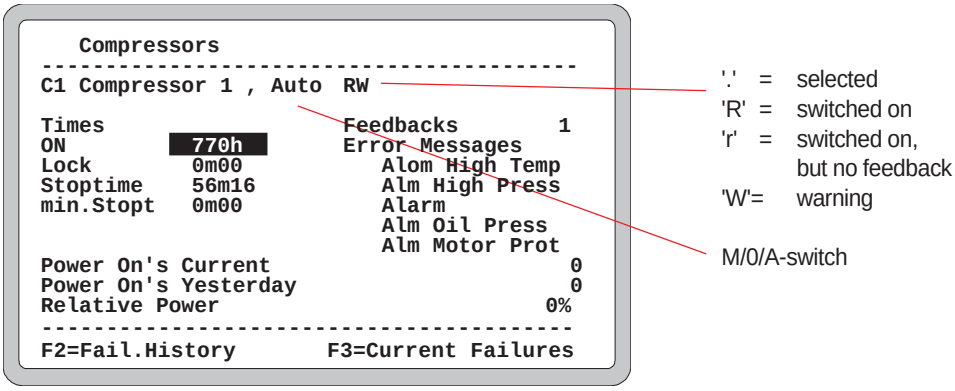
States of stages 1-12
'.' = selected
'R' = switched on
'r' = switched on, but no feedback
'W'= warning
'1' = switched on manually
'0' = switched off manually

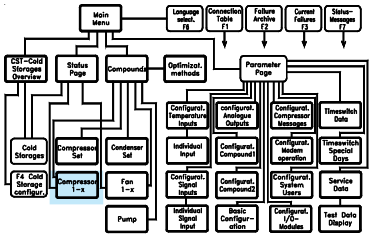
View of the compressor (brine circuit) page if 'X-circuit chiller' is selected as media.

Parameter Terms	Note	Possible values / range	Your value C1	Your value C2
Brine Circuit Compressors	Status messages of stage controller and the individual compressors	see 'status page'	disp only	142
Load Limit	The % amount of disabled compressors		disp only	143
Lock Compound 1	'1' indicates that this compound is locked by an external signal	1/0	144 disp only	145
Lock Compound 2	'1' indicates that this compound is locked by an external signal	1/0	146 disp only	147
Lock Compound 3	'1' indicates that this compound is locked by an external signal	1/0	148 disp only	149
Control Sensor	Actual value of control sensor	°C (correctable)	150	151
Limit Sensor	Actual value of limitation sensor	°C (correctable)	152	153
Frost Protection Sensor 1	Actual value of freeze protection sensor in heat exchanger 1	°C (correctable)	154	155
Frost Protection Sensor 2	Actual value of freeze protection sensor in heat exchanger 2	°C (correctable)	156	157
Freeze Protection Sensor 3	Actual value of freeze protection sensor in heat exchanger 3	°C (correctable)	158	
Brine Pressure	Actual value of media pressure transmitter	bar	159 disp only	160
Brine Pressure Limit	If the pressure value falls short of this limit, an error message appears resp. the brine circuit pumps will switch off	bar	161	162
Brine Pressure Limit Shutdown	'On' fixes that the brine pumps switch off if the brine pressure falls short of 'Brine Pressure Limit'	on/off	163	164
Setpoint Location	relative = Setp 2...12 are offsets to Setp 1	absolutely, relative		
Setp 1	Control setpoint of compressor/stage 1	°C / °F	165	166
Setp 2	Control setpoint of compressor/stage 2	°C / °F	167	168
Setp 3	Control setpoint of compressor/stage 3	°C / °F	169	170
Setp 4	Control setpoint of compressor/stage 4	°C / °F	171	172
Setp 5	Control setpoint of compressor/stage 5	°C / °F	173	174
Setp 6	Control setpoint of compressor/stage 6	°C / °F	175	176
Setp 7	Control setpoint of compressor/stage 7	°C / °F	177	178
Setp 8	Control setpoint of compressor/stage 8	°C / °F	179	180
Setp 9	Control setpoint of compressor/stage 9	°C / °F	181	182
Setp 10	Control setpoint of compressor/stage 10	°C / °F	183	184
Setp 11	Control setpoint of compressor/stage 11	°C / °F	185	186
Setp 12	Control setpoint of compressor/stage 12	°C / °F	187	188

Parameter Terms	Note	Possible values / range	Your value C1	Your value C2
Offset	Amount, the control setpoint will be shifted if digital input 'Night Operation' is active	**+/- 10.0 °C if an 'X' appears, the value is active**	189	190
Hysteresis	Hysteresis of stage setpoints	K	191	192
Hysteresis location	Defines if hysteresis is located below, above or around the setpoints	below, above, symmetrical	193	194
Setp Limit	If the actual value falls short of this setpoint, a backrun will be initiated	°C	195	196
Setp Frost Protection	If the actual value falls short of this setpoint, compound will be switched off	°C	197	198
Forward Delay Stage 1	Time delay before this stage will switch on	max. 60 min : 00 sec	199	211
Forward Delay Stage 2	Time delay before this stage will switch on	max. 60 min : 00 sec	200	212
Forward Delay Stage 3	Time delay before this stage will switch on	max. 60 min : 00 sec	201	213
Forward Delay Stage 4	Time delay before this stage will switch on	max. 60 min : 00 sec	202	214
Forward Delay Stage 5	Time delay before this stage will switch on	max. 60 min : 00 sec	203	215
Forward Delay Stage 6	Time delay before this stage will switch on	max. 60 min : 00 sec	204	216
Forward Delay Stage 7	Time delay before this stage will switch on	max. 60 min : 00 sec	205	217
Forward Delay Stage 8	Time delay before this stage will switch on	max. 60 min : 00 sec	206	218
Forward Delay Stage 9	Time delay before this stage will switch on	max. 60 min : 00 sec	207	219
Forward Delay Stage 10	Time delay before this stage will switch on	max. 60 min : 00 sec	208	220
Forward Delay Stage 11	Time delay before this stage will switch on	max. 60 min : 00 sec	209	221
Forward Delay Stage 12	Time delay before this stage will switch on	max. 60 min : 00 sec	210	222
Backrun Delay Stage 1	Time delay before this stage will switch off	max. 60 min : 00 sec	223	235
Backrun Delay Stage 2	Time delay before this stage will switch off	max. 60 min : 00 sec	224	236
Backrun Delay Stage 3	Time delay before this stage will switch off	max. 60 min : 00 sec	225	237
Backrun Delay Stage 4	Time delay before this stage will switch off	max. 60 min : 00 sec	226	238
Backrun Delay Stage 5	Time delay before this stage will switch off	max. 60 min : 00 sec	227	239
Backrun Delay Stage 6	Time delay before this stage will switch off	max. 60 min : 00 sec	228	240
Backrun Delay Stage 7	Time delay before this stage will switch off	max. 60 min : 00 sec	229	241
Backrun Delay Stage 8	Time delay before this stage will switch off	max. 60 min : 00 sec	230	242
Backrun Delay Stage 9	Time delay before this stage will switch off	max. 60 min : 00 sec	231	243
Backrun Delay Stage 10	Time delay before this stage will switch off	max. 60 min : 00 sec	232	244
Backrun Delay Stage 11	Time delay before this stage will switch off	max. 60 min : 00 sec	233	245
Backrun Delay Stage 12	Time delay before this stage will switch off	max. 60 min : 00 sec	234	246
CPD-Function for Brine Condensers	'On' fixes that the condenser fans are controlled by the highest available pressure transmitter value	on/off		
Operation Feedback Delay	Waiting period for a feedback signal from the compressors. After this time, the compressor relay contact will be disabled and another machine will be selected	0m05 up to 10m00	247	248
Lock after malfunction	Min. time a machine is requested after having a failure state	0m05 bis 60m00, [5m00]		
Utilization Rate Compound	Information about the current power output. ⓘ Only usable if the compressors are equipped with 'power factors'	0...100%	249 disp. only	250 disp. only
Oil pressure switch delay				
Rem. Compound standstill time				
Continuous runtime				
Pumpdown limit				
below				

Compressor Page



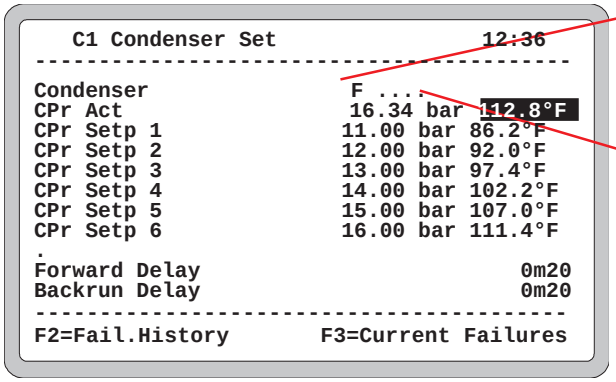


This page contains all information about the individual compressors. One page is available for each compressor.

Parameter Terms	Note	Possible values / range	Your value
(xx) Compressor (No)	No. of compressor whose operation parameters are located on this page		
right aside the Compr. No.	manual operation of the compressor	off, automatic, on	
same line, right side	status messages of the stages	'.', 'R', 'W', (see above)	display only
Messages			
[3]Feedback	indicator for the feedback signal via security chain	'1'=feedback signal detected	display only
[3]Alm High Temp.	status of this digital input	'1'=feedback signal detected	display only
[3]Alm High Press.	status of this digital input	'1'=feedback signal detected	display only
[3]Alarm	status of this digital input	'1'=feedback signal detected	display only
[3]Alm Oil Press.	status of this digital input	'1'=feedback signal detected	display only
[3]Alm Motor Prot	status of this digital input	'1'=feedback signal detected	display only
Times			
On	run time counter of this compressor		display only 251
Lock	remaining time until the compressor will restart after an alarm has been occured		display only 252
Stoptime	time the compressor is already disabled		display only 253
min.Stopt	minimum idle time after the compressor was disabled		
Power Up's Current	All power up sequences of the compressor within 0 and 24:00 of today		display only 254
Power Up's Yesterday	All power up sequences of yesterday		display only 255
Relative Power	Power in % of the overall power of this compressor. This is the necessary value for the 'Utilization Rate Compound'-display (compressor-set page)		256

[3]Here the messages appear which are selected and named under "*Configuration Compressor <Messages>*"

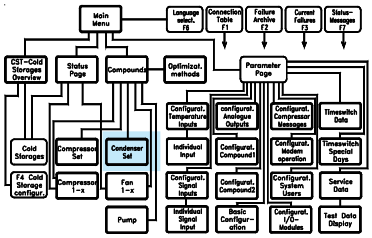
Condenser-Set Page



State of stage controller
'F' = Forward
'N' = Neutral
'R' = Backrun (reverse)

States of stages 1-12
'.' = selected
'R' = switched on
'r' = switched on, but no feedback
'W'= warning
'1' = switched on manually
'0' = switched off manually

Moving the cursor to one of these positions and pushing 'RET' calls up the individual compressor- and fan pages.

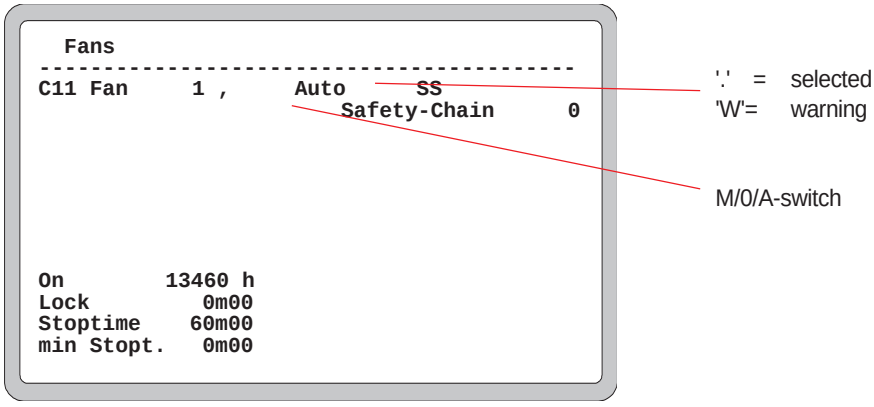


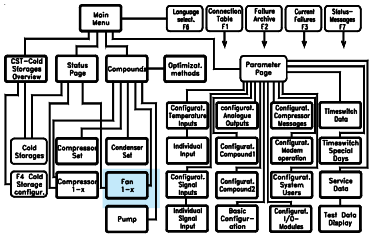
Each condenser set page contains the matching control setpoints as well as fan state messages.

Parameter Terms	Note	Possible values / range	Your value C1	Your value C2
Condenser	Status messages of the stage controller	see above	display only 257	
CPr Act	Actual condenser pressure The pressure value (bar) is adjustable (in case of tolerances)	bar / °C	258	259
CPr Setp 1	Condenser pressure setpoint of this stage	-1.00...80.00 bar / + °C	260	261
CPr Setp 2	"	-1.00...80.00 bar / + °C	262	263
CPr Setp 3	"	-1.00...80.00 bar / + °C	264	265
CPr Setp 4	"	-1.00...80.00 bar / + °C	266	267
CPr Setp 5	"	-1.00...80.00 bar / + °C	268	269
CPr Setp 6	"	-1.00...80.00 bar / + °C	270	271
CPr Setp 7	"	-1.00...80.00 bar / + °C	272	273
CPr Setp 8	"	-1.00...80.00 bar / + °C	274	275
CPr Setp 9	"	-1.00...80.00 bar / + °C	276	277
CPr Setp 10	"	-1.00...80.00 bar / + °C	278	279
CPr Setp 11	"	-1.00...80.00 bar / + °C	280	281
CPr Setp 12	"	-1.00...80.00 bar / + °C	282	283
CPr Offset	Amount the condenser pressure setpoint will be shifted if digital input '2nd setpoint' is activated	**+/- 5 bar if an 'X' appears, the value is active**	284	285
CPr Hyst	Hysteresis of the stages	-1...+30 bar	286	287
Hysteresis location	Defines if hysteresis is located below, above or around the setpoints	below, above, symmetrical		
CPr Pre Alm	Setpoint of high pressure pre-warning	bar / °C	288	289
CPr Alm	Setpoint of high pressure alarm	bar / °C	290	291
Forward Delay	Time delay before one of the stages will switch on	minutes : seconds	292	293
Backrun Delay	Time delay before one of the stages will switch off	minutes : seconds	294	295

Parameter Terms	Note	Possible values / range	Your value C1	Your value C2
Operation Feedback delay	Period, the VPR waits for a feedback signal from the fan motor. After this time, the relay contact for the fan will switch OFF and another motor will be selected	0m05 up to 10m00	296	297
Lock after malfunction	Min. time a machine is requested after having a failure state	0m05 bis 60m00, [5m00]		
Analog Out Range low	With this value, the analog output delivers 2 V resp. 4 mA	Lower limit of press.transmitter to 'Analog-Out Range high'	17	19
Analog Out Range high	With this value, the analog output delivers 10 V resp. 20 mA	Upper limit of press.transmitter to 'Analog-Out Range low'		
Setpoint Shift by Outdoor Temperature				
Outdoor Temperature Act.	Actual temperature at the outdoor sensor	℃	disp.only	disp.onl 298
Temperature threshold	Temperature limit where a temperature shift begins	0...60°C	299	300
Temperature range	Temperature shift range above 'Temperat. Threshold'	0.00...20.00 K	301	302
Factor	Factor of the temperature shift in K per K	0.00...5.00 K	303	304
Current Setpoint-Offset	Offset, calculated from 'Outdoor Temp. Act., Temperature range and Factor This offset is added to the setpoints	K	305 disp.only	306 disp.only
Reflux Brine Chiller Act.	Actual temperature at the control sensor (e.g. sensor C1 Cond. Circ. 1)	℃	307 disp.only	308 disp.only

Fan Page





This listing contains all information about the individual fans. Each selected fan has its own page.

Parameter Terms	Note	Possible values / range	Your value
(Compnd) Fan (No) (Compound) fan (No)	No. of fan whose operation parameters are located on this page		
right aside the fan No.	Manual operation of the fan	off, automatic, on	309
same line, right side	Status messages of the stages	'.', 'W', (see above)	display only
Feedback	Indicator of feedback signal via safety chain	'1'=feedback signal detected '0'=feedback signal not available	display only
On	Run time counter of this fan		display only 310
Lock	Delay time until the fan will be enabled again after an alarm has been occured		display only 311
Stoptime	Time the fan is already disabled		display only 562
min. Stopt.	Minimum idle-time after the fan has been disabled	max.60 minutes 00 seconds	312

Cold Storages Overview (CST)

```
   Cold Storages                    12:44
-----------------------------------------
Adr   Cold Storages                 Status
00    <Meat Room 1>           R      -24.3
01    <Fruit Packaging>       R        4.0
02    <ColdStorage 02>        C      -22.0
03    <ColdStorage 03>        D        5.2
04    <ColdStorage 04>
05    <ColdStorage 05>
06    <ColdStorage 06>
07    <ColdStorage 07>
08    <ColdStorage 08>
09    <ColdStorage 09>
-----------------------------------------
F4 - Cold Storages Config.
```

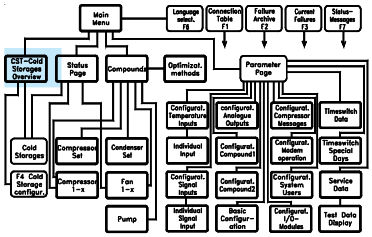
Name of the cold storage
This name can be entered on the 'Cold Storage Controller Page'. Moving the cursor to one of these positions and a push on 'RET' branches to corresponding Cold Storage Controller Pages.

Actual Value
These are the actual values of the Temperature probes 1 of the cold storages.

Kind of Cold Storage Controller
Set type of the connected controller unit here (Cold Storage Configuration)

State of the cold storage controllers

"R"= switched on
"0" = swiched off (or not connected)
"C" = refrigeration ON
"D" = defrost ON
"W" = warning

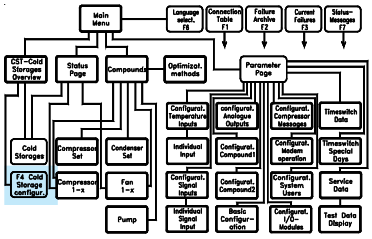


This page contains a listing of all connectable cold storage controllers with the adresses 0-63. This listing is easy-to-follow because of the clear text position names.

Cold Storage Configuration

```
   Cold Storages                    12:44
-----------------------------------------
Adr   Cold Stor.                    Status
00    <Meat Room 1>           R      -24.3
01    <Fruit Packaging>       R        4.0
02    <ColdStorage 02>        C      -22.0

      Cold Storage
      Adr:  0     Type: TKP/TKC


-----------------------------------------
F4 - Cold Storages Config.
```

- Push '**F4**', a configuration window opens
- set desired network address
- set type of cold storage controller
- Question "Fetch data from CST?" appears
- "yes" transfers data from the controller to the parameter memory of the VPR



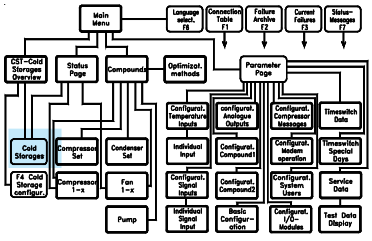
If you set "**---**" as controller type, this cold storage will be erased from the Overview Page. All parameter settings of this cold storage will be lost!

Remove controller unit from Overview Listing.

Cold Storage Controller Page

```
M  Cold Storage
-----------------------------------------
Adr.:     00      Cold Storage 00
Controller available                  no
Control is        on    Request       on

Current failure:              - No Failure -

Sensor      1     2     3     4     5     6
         Con1  De11  Con2  De21  ---   Dis.
          0.0   0.0   0.0   0.0   0.0   0.0

                 Cir1  Cir2  Cir3  Cir4
Curr.Setpoint    32.0  32.5  32.0  32.0

SV State         off   off
```

This page may contain subpages with assignment and defrost data of the controller unit.



Contains all parameters of the individual controller, the meanings of these parameters are described in the matching technical manual. From this location the parameters can be remote controlled.

Parameter Listing of Cold Storage Controllers type **TKP/TKC x130,** please read manual for further information

Parameter terms	Note	Possible values / range	Your value
Adr.:	Controller adress in network	0 - 63	display only
Unit available	Select if a controller unit is available at this adress.	yes, no	313
Control functions state		on, off	display only 314
Control functions	Control functions can be disabled by 'off'	on, off	315
Actual failure	The actual failure with the highest priority	no failure, ...	display only 316
Sensor 1	Function and actual value of the sensor		317
Sensor 2	Function and actual value of the sensor		318
Sensor 3	Function and actual value of the sensor		319
Sensor 4	Function and actual value of the sensor		320
Sensor 5	Function and actual value of the sensor		321
Sensor 6	Function and actual value of the sensor		322
Act.setpoint Ch.1	Control setpoint dep. on 'night' and 'level'		display only
Act.setpoint Ch.2	Control setpoint dep. on 'night' and 'level'		display only
Act.setpoint Ch.3	Control setpoint dep. on 'night' and 'level'		display only
Act.setpoint Ch.4	Control setpoint dep. on 'night' and 'level'		display only
SV Status	State of the solenoid valve	on, off	display only 323
Runtime rel	Relative runtime of the solenoid valve	hh:mm	display only 324
Runtime abs	Absolute runtime of the solenoid valve	hhh	display only 325
Night operation state	off		display only 326
Setpoint Layer 2 is	off		display only 327
Request	on, off		328
Setpoint Layer 2			
Defrost Data RET	branches to this page	„RET“	
Assignment Data RET	branches to this page	„RET“	
Setp. Ch 1	-50.0...+50.0		329
2nd Setp. Ch 1	-50.0...+50.0		330
alt. Setp. Ch 1	-50.0...+50.0		331
alt. 2nd Setp. Ch 1	-50.0...+50.0		332
Setp. Ch 2	-50.0...+50.0		333
2nd Setp. Ch 2	-50.0...+50.0		334
alt. Setp. Ch 2	-50.0...+50.0		335
alt. 2nd Setp. Ch 2	-50.0...+50.0		336
Setp. Ch 3	-50.0...+50.0		337
2nd Setp. Ch 3	-50.0...+50.0		338
alt. Setp. Ch 3	-50.0...+50.0		339
alt. 2nd Setp. Ch 3	-50.0...+50.0		340
Setp. Ch 4	-50.0...+50.0		341
2nd Setp. Ch 4	-50.0...+50.0		342
alt. Setp. Ch 4	-50.0...+50.0		343
alt. 2nd Setp. Ch 4	-50.0...+50.0		344
hysteresis		0.1...20.0	345
warning offset		0.0...35.0	346
warn low limit		-50.0...+50.0	347
alt. warn offset		0.0...35.0	348
alt. warn low limit		-50.0...+50.0	349

Parameter Listing of Cold Storage Controllers type **TKP/TKC x130,** please read manual for further information

Parameter terms	Note	Possible values / range	Your value
warning delay		0m00...120m00	350
warning delay remaining			display only 351
fan start delay		0m00...30m00	352
fan off delay		0m...30m	353
frame period		10m00...30m00	354
frame pulse day		0%...100%	355
frame pulse night		0%...100%	356
OC input alm delay		0m...120m	357
door input alm delay		1m...240m	358
cooling limit		00:00...24:00	359
door time limit		00:00...24:00	360
runtime mess at		0h...23	361
night setp ON		00:00...24:00	362
night setp OFF		00:00...24:00	363
sensor type		TF 201, PT1000/TF501	364
warn low limit		on, off	365
compound	assigned to compound	C1, C2, --	366
cooling mode		refrigeration, freezing	367
fan operation		permanent, interval	368
language		deutsch, dutch, english, french	369
emergency operation		0%...100%	370
compressor pause		0m00...30m00	371
rem compr . pause Ch.1			display only 372
rem compr . pause Ch.2			display only 373
rem compr . pause Ch.3			display only 374
rem compr . pause Ch.4			display only 375
rem door open 1			display only 376
rem door open 2			display only 377
rem door open 3			display only 378
rem door open 4			display only 379
sec chain delay		0m00...1m00	380
rem strt sec ch(ain)			display only 381
PID propor band		0.1k...30.0k	382
PID integr time		0m00...10m00	383
PID attack time		0s...10s	384
PID delay		0.0s...10.0s	385
Low power optimization power factor		0...99	386
Low power optimization safety temperature		-55.0...55.0	387
Suction press. shift temperature limit		-35.0...35.0	388
Pressure offset		0.00...1.00	389
Analogue output	output is x% of the selected range	0.0%...100.0%	390
Text:	enter texts here		391
Software version			display only 392

Defrost data of Cold Storage Controllers type **TKP/TKC x130,** please read manual for further information

Parameter terms	**Note**	**Possible values / range**	**Your value**
Adr.:	Controller adress in network		display only
Circuit/Defrost	1.character is the control circuit, 2.char. is the number of the defrost heater in that control circuit		
Defrost state	of the single heater elements	on/off	display only 393
Heater pulse	of the single heater elements	on/off	display only 394
Last duration	actual resp. last defrost duration of the elements		display only 395
Rem fan start delay	rem. time up to fan starts after defr. of the elements		display only 396
Remain defr time			display only 397
manual defrost		0, start	398
fan during defrost (defrost type)		on, off	399
Defrost mode	external only, extern+intern, differential meth., dem def by opti, adaptive		400
Defr temp limit Ch 1		0.0...50.0	401
Defr temp limit Ch 2		0.0...50.0	402
Defr temp limit Ch 3		0.0...50.0	403
Defr temp limit Ch 4		0.0...50.0	404
Defrost time 1		00:00...23.59, off	405
Defrost time 2		00:00...23.59, off	406
Defrost time 3		00:00...23.59, off	407
Defrost time 4		00:00...23.59, off	408
Defrost time 5		00:00...23.59, off	409
Defrost time 6		00:00...23.59, off	410
Pause after defrost		0m00...30m00	411
Max. defrost time		0m00...240m00	412
n/o defr. events up to alarm			413
Defrost alarm delay		0m00...60m00	414
Demand defr. diff		0.0...20.0	415
Demand defr period		1m00...10m00	416
Pulse defr. temperature limit		-5.0...50.0	417
Max time for adaptive defrost		2h00...48h00	418
Adaptive defrost forerun		0m...15m	419

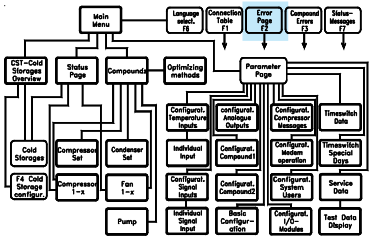
Assignment data of Cold Storage Controllers type **TKP/TKC x130,** please read manual for further information

Parameter terms	Note	Possible values / range	Your value
Adr.:	Controller adress in network		
Sensor S1...S6 first function		—, control sens1 - control sens4, defrost11, defrost12, defrost13, defrost14, defrost21, defrost22, defrost23, defrost24, defrost31, defrost32, defrost33, defrost34, defrost41, defrost42, defrost43, defrost44, demdefr sens co1, dem defr sens wa1, alarm1 - alarm4, display only, Inlet sensor, Outlet sensor	420
Sensor S1...S6 2nd function		—, control sens1 - control sens4, defrost11, defrost12, defrost13, defrost14, defrost21, defrost22, defrost23, defrost24, defrost31, defrost32, defrost33, defrost34, defrost41, defrost42, defrost43, defrost44, demdefr sens co1, dem defr sens wa1, alarm1 - alarm4, display only, Inlet sensor, Outlet sensor	421
Sensor S1...S6 3rd function		—, control sens1 - control sens4, defrost11, defrost12, defrost13, defrost14, defrost21, defrost22, defrost23, defrost24, defrost31, defrost32, defrost33, defrost34, defrost41, defrost42, defrost43, defrost44, demdefr sens co1, dem defr sens wa1, alarm1 - alarm4, display only, Inlet sensor, Outlet sensor	422
Relay functions relays 1...6		—,refrig.1, refrig.2, refrig.3, refrig.4, defrost11, defrost12, defrost13, defrost14, defrost21, defrost22, defrost23, defrost24, defrost31, defrost32, defrost33, defrost34, defrost41, defrost42, defrost43, defrost44, fan1, fan2, fan3, fan4, alarm, frame heater, roller blind, light, heater 1, EEXP-valve	423
Digital input functions 1..4		-, defrost, night settings, unit off (ah), safety chain, setpoint layer, door contact1, door contact2, door contact3, door contact4, alarm input1, alarm input2, alarm input3, alarm input4, circuit1 off, circuit2 off, circuit1+2 off, circuit3 off, circuit1+3 aus, circuit2+3 off, circuit1+2+3 off, circuit4 off, circuit1+4 off, circuit2+4 off,circuit1+2+4 off, circuit3+4 off,circuit1+3+4 off, circuit2+3+4 off,circuit1+2+3+4 off, analog value	424
Digital input state 1..4		Status disp. for each OC-input, ., X	425
Analog function		act.img 0-10V, act.img 4-20mA, PID 0-10V, PID 4-20mA, PID 10-0V, PID 20-4mA, continuous 0V/0mA, continuous 2V/4mA, continuous 10V/20mA	426

Failure Archive (F2)

```
M  State                  Failure Archive
-----------------------------------------
Date   Time   Event
*25.06.10:49  Def. C1 Limit Sensor
*25.06.10:50  MIC Adr. 00: Malfnct.
 16.06.17:38  Asymmetric
 15.05.18:20  EmergOff
```

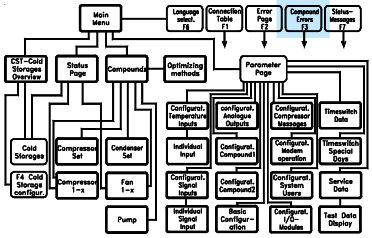
Marked with '*' = Error occured at (date/time)
without '*' = Reset at (date/time)



Contains a listing of the last 150 occured error- and "all clear" messages.
Call up this page by key '**F2**' (except from F3)

Current Failures (F3)

```
M  State                Current Failures
-----------------------------------------

Def.Sens. PL. BrinePress
Malfnct.CST-Line
Phase Error
EmergOff
```

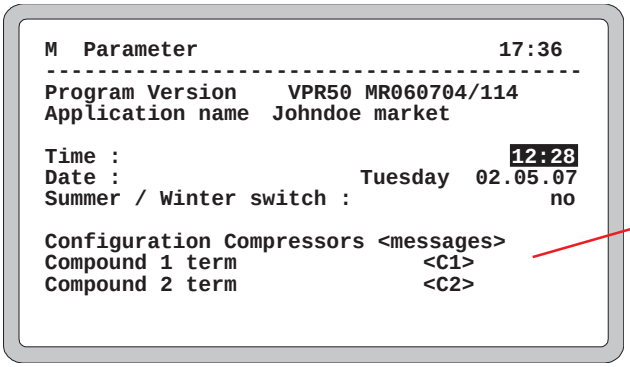


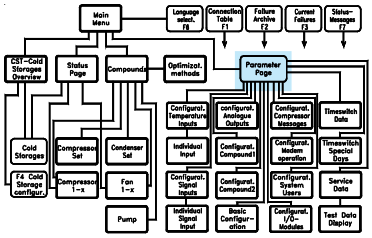
Contains all current errors of the system.

Call up this page by key '**F3**'

Key '**F4**' Reset Error Messages. 'Alarm Refresh Function' will be enabled if selected.

Parameter Page



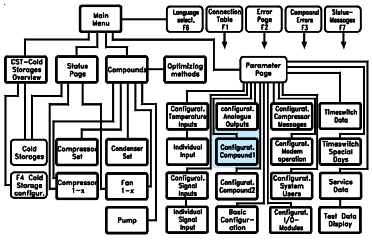


Contains the configuration parameters of the VPR and is larger than the screen area. Scroll items by the cursor keys.

Parameter Terms	Note	Possible Value / Range	Your Value
Program Version	VPR50 MRxxxxxxxxxxxxxxxxx	VPR50 (compiler)(year)(month)(no.)	--
Application name	e.g. name of the plant	up to 20 characters text	
Time	hours : minutes	00:00 ... 23 : 59	
Date	Day of the week, day, month, year	00.00.00. ...31.12.06	
Summer/winter switch	Standard for the internal clock	no (off), EU since 96	
Configuration Compound <C1> RET	Branch to this page	--	--
Configuration Compound <C2> RET	Branch to this page	--	--
Config. Compressor <Messages> RET	Branch to this page	--	--
Configuration <System Users> RET	Branch to this page	--	--
Configuration <4-20 mA Inputs> RET	Branch to this page	--	--
Config. <Temperature probes> RET	Branch to this page	--	--
Configuration <Analog Outputs> RET	Branch to this page	--	--
Configuration <Modem operation> RET	Branch to this page	--	--
Configuration <Input/Output Modules> RET	Branch to this page	--	--
<Time-Switch Data> RET	Branch to this page	--	--
<Time-Switch Special Days> RET	Branch to this page	--	--
Time switch period P1	Switchtime limitation period 1	01.01 (day, month)...31.12	
Time switch period P2	Switchtime limitation period 2	01.01 (day, month)...31.12	
<Service Data> RET	Branch to this page	--	--
<Basic Configuration> RET	Branch to this page	--	--
Failure-No	No. of the error, which should have the following priority	0...512	--
Priority	"*" (asterisk) marks the desired priorities of the error with the shown number	1...6	
Text	Designation of the error with the shown number, as plain text		
Blocksize to forward Err. Prio 4+5	Only if this quantity of errors with the priorities 4+5 is accumulated, they will be forwarded at a single blow	1...1000	
Apply also to SSM 4+5	Function enabled for error message relays 4+5	yes / no	
Ext. message input no.	Number of the error, which should get the following designation.		
Text	Designation of the ext. mess. with the shown number, as plain text		

How to assign designation texts for external error messages: See page "Operating"

Configuration Page Compound 1



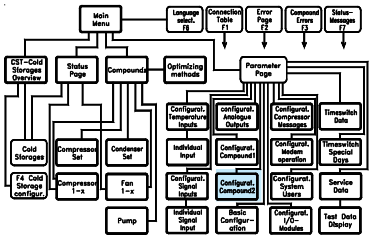
Contains configuration data for compound #1 (e.g. C1-compound for refrigeration).

```
S  C1-Compound Configuration
----------------------------------------
Refrigerant :                        R507
                              Forw Back Opt
Compr switch sequence :      idle/run/on
Fan switch sequence :        idle/run/off
Load Limit 1 :                        25%
Load Limit 2 :                        50%
Media :                     Refrigerant

Compressors :                       1 1 1
             No. 1 2 3 4 5 6 7 8 9 0 1 2
  Quantity stages  1 1 1 1 0 0 0 0 0 0 0 0
  Circuit      No. 1 1 1 1 1 1 1 1 1 1 1 1
```

Parameter Terms	Note	Possible Value / Range	Your Value
Refrigerant	The refrigerant in this compound	R22, NH3, R134a, R23, R123, R290, R402a, R402b, R404a, R407c, R507, CO2	--
Compressor Mode	Mode of switch sequence and optimization switch sequence on/off	run/run/on, idle/run/on, off/off/off, run/run/off, idle/run/off	
Fan Mode	Mode of switch sequence and optimization switch sequence on/off	run/run/on, idle/run/on, off/off/off, run/run/off, idle/run/off	
Base load limit 1	How many % of the selected compressors should be disabled, if digital input 'Load Limitation 1' is active	0...100%	
Base load limit 2	How many % of the selected compressors should be disabled, if digital input 'Load Limitation 2' is active	0...100%	
Media	Kind of plant the stage controller should work for (refrigerant = standard compound)	refrigerant, 1-circuit chiller, 2-circuit chiller, 3-circuit chiller	
Compound break time			
Name (of the) Compound	Name of the compound, 2 characters	e.g. C1	
Compressor			
No. Stages	Quantity of stages of the compressor with the number X	0, 1...12	
No.	Compressor is assigned to the refrigerant circuit #X (multi-circuit brine chillers)	1...3	
No. inverted stages	Quantity of compressor stages switched by an N/C contact	1...12	
No. prior. compressor	# of the compressor with lesser power in compound 1		
Condenser Fans Circuit 1			
No. stages	Quantity of stages of the fans with no. X	0, 1...12	
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	1...12	
Condenser Fans Circuit 2			
No. stages	Quantity of stages of the single fans in circuit 2 (double circuit brine chillers)	0, 1...12	
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	1...12	
Condenser Fans Circuit 3			
No. stages	Quantity of stages of the single fans in circuit 3 (3-circuit brine chillers)	0, 1...12	
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	1...12	

```
S  C2-Compound Configuration
-----------------------------------------
Refrigerant :                        R507
                                Forw Back Opt
Compr switch sequence :      idle/run/on
Fan switch sequence :        idle/run/off
Load Limit 1 :                        25%
Load Limit 2 :                        50%
Media :                       Refrigerant

Compressors :                         1 1 1
              No. 1 2 3 4 5 6 7 8 9 0 1 2
  Quantity stages  1 1 1 1 0 0 0 0 0 0 0 0
  Circuit      No. 1 1 1 1 1 1 1 1 1 1 1 1
```

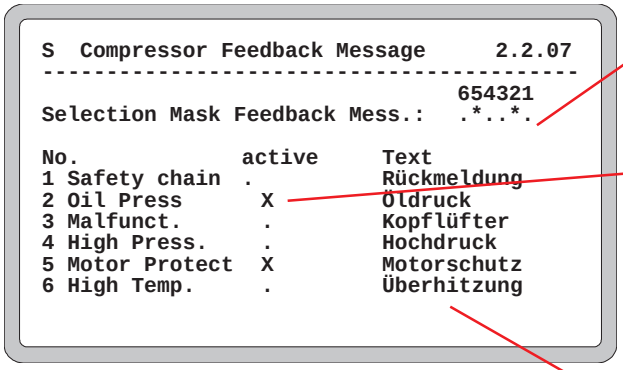
Configuration Page Compound 2



Contains configuration data for compound #2 (e.g. C2-compound for freezing).

Parameter Terms	Note	Possible Value / Range	Your Value
Refrigerant	The refrigerant in this compound	R22, NH3, R134a, R23, R123, R290, R402a, R402b, R404a, R407c, R507, CO2	--
Compressor Mode	Mode of switch sequence and optimization switch sequence on/off	run/run/on, idle/run/on, off/off/off, run/run/off, idle/run/off	
Fan Mode	Mode of switch sequence and optimization switch sequence on/off	run/run/on, idle/run/on, off/off/off, run/run/off, idle/run/off	
Base load limit 1	How many % of the selected compressors should be disabled, if digital input 'Load Limitation 1' is active	0...100%	
Base load limit 2	How many % of the selected compressors should be disabled, if digital input 'Load Limitation 2' is active	0...100%	
Media	Kind of plant the stage controller should work for (refrigerant = standard compound)	refrigerant, 1-circuit chiller, 2-circuit chiller, 3-circuit chiller	
Compound break time			
Name (of the) Compound	Name of the compound, 2 characters	e.g. C2	
Compressor			
No. Stages	Quantity of stages of the compressor with the number X	0, 1...12	
No.	Compressor is assigned to the refrigerant circuit #X (multi-circuit brine chillers)	1...3	
No. inverted stages	Quantity of compressor stages switched by an N/C contact	1...12	
No. prior. compressor	# of the compressor with lesser power in compound 1		
Condenser Fans Circuit 1			
No. stages	Quantity of stages of the fans with no. X	0, 1...12	
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	1...12	
Condenser Fans Circuit 2			
No. stages	Quantity of stages of the single fans in circuit 2 (double circuit brine chillers)	0, 1...12	
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	1...12	

Configuration Compressor Messages

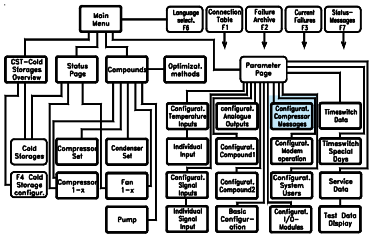


With an asterisk "*" at this position, the desired compressor mesages can be fixed.

Here you can read the current state. x = active.

At the same time, the system books the matching digital inputs and maps them on the terminal plan.

Here you see the assigned text for the message. Can be changed at any time.



Here you preset which compressor messages must be processed.

- Highlight text
- Push 'RET', position flashes
- "⇧⇩" change characters
- "⇦⇨" change character position
- Push 'RET', new text is stored

Change message designation

Configuration 4-20 mA Inputs

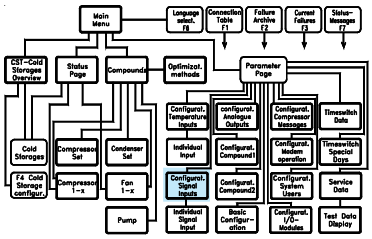
```
S  Configuration 4-20 mA Inputs      21.10
-----------------------------------------
 No.  Function          Adr/Type  Value
<1>   Room Hunidity     3/BMA     50 %r.H.
<2>   C1 P-Suct         3/BMA     2.00 bar
<3>   C1 P-Cond.Circ.1  3/BMA     def bar
<4>   C2 P-Sole         3/BMA     2.00 bar
<5>   C2 P-Brine        3/BMA     2.40 bar
<6>   C2 P-Cond.Circ.2  ---       def bar
<7>   C2 P-Cond.Circ.3  ---       def bar
<8>   aus               ---       def bar
<9>   aus               ---       def bar
<10>  aus               ---       def bar
<11>  aus               ---       def bar
<12>  aus               ---       def bar
```

Function of the input, can be selected here as well as on the individual page.

Branches to the individual pages

Address and type of the I/O-module containing this input

Measured value and state of the input



Contains configuration-/correction parameters of all 4-20mA inputs of the system.

Parameter terms	Note	Possible Values / Range	Your Value
<No. x> RET	<Number of the 4-20mA input, branch to the individual page		
Function	Functional description of the inputs. Can be changed here or on the individual page.	off, C1 P-suct, C1 P-cond.cir.1, C2 P-suct, C2 P-cond.cir.1, C1 P-brine, C2 P-brine, C1 P-cond.cir.2, C1 P-cond.cir.3, C2 P-cond.cir.2, Room Humidity, 4-20mA Display 1, 4-20mA Display 2, 4-20mA Display 3, 4-20mA Display 4, 4-20mA Display 5, 4-20mA Display 6, 4-20mA Display 7, 4-20mA Display 8, 4-20mA Display 9, 4-20mA Display 10, 4-20mA Display 11	
Adr/Typ	Address and type of the I/O module where this input is located.	Example: 3/BMA. I/O module series BMA with address 3 on the internal bus system	
Value	Measured value resp. state of the 4-20 mA input	Result/Phys. Value, off = switched off / not available, def = failure	--

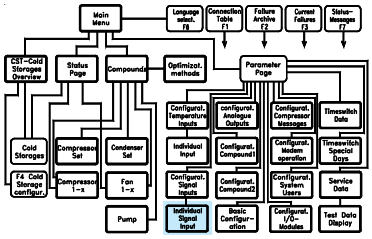
Individual 4-20 mA Input

```
S  Parameter Analog Input            9:13
-----------------------------------------
Input No.: 1   Unit: 3/BMA

Function             Value     Correction
C1 P-suct            3.63 bar  0.00 bar

Press.Sens. Range    low       high
                     -1.00 bar  9.00 bar
```

Address and type of the I/O module where this input is located

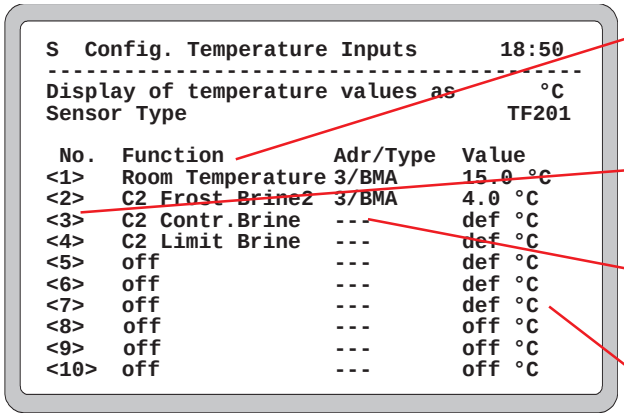
Correction value for this input.
As humidity input: ± 10%
As pressure input: ± 1 bar

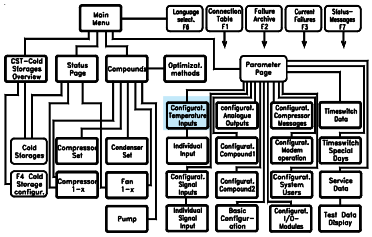
Thresholds of the used pressure transmitter according to 4-20mA:
Lower threshold from -1 bar
Upper threshold up to 300 bar



This pages contain the function, the actual value and the correction value for the individual inputs.
Such a page is available for each 4-20mA input.

Configuration Temperature Probes

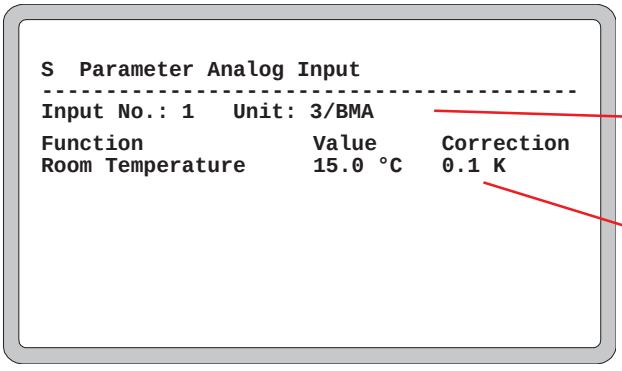


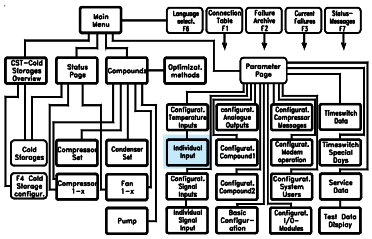


Contains configuration-/correction parameters of all temperature sensors of the system.

Parameter terms	Note	Possible Values / Range	Your Value
Display of temperature values as	Physical Value of the temperature readings	°C, °F	
Sensor Type	Kind of used sensor, **Note!** All connected sensors must be identical, different sensors will not work.	TF 201, TF 501(Pt1000)	
<No. x> RET	<Number of the temperature sensor input> Branch to the individual page		
Function	Functional description of the input. Can be changed here as well as on the individual page.	off, Room Temperature, C1 Control Brine, C1 Limit Brine, C2 Control Brine, C2 Limit Brine, C1 Frost Brine1, C2 Frost Brine1, C1 Frost Brine2, C2 Frost Brine2, C1 Frost Brine3, C1 T-Cond.Circ.1, C2 T-Cond.Circ.1, C1 T-Cond.Circ.2, C2 T-Cond.Circ..2, C1 T-Cond.Circ.3, Outdoor Temperature, Temp.-Display 1 to Temp.-Display 15	
Adr/Type	Address and type of the I/O- module where this input is located	Example: 3/BMA. I/O-module series BMA with address 3 on the internal bus system	
Value	Actual Value resp. state of the temperature input	Actual Value/Phys. Value, off = switched off/not available, def = failure	--

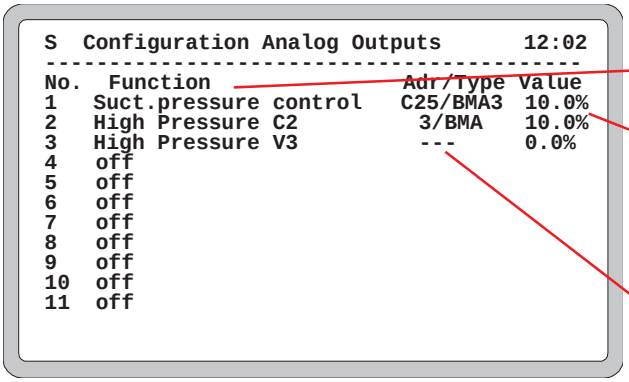
Individual Temperature Input

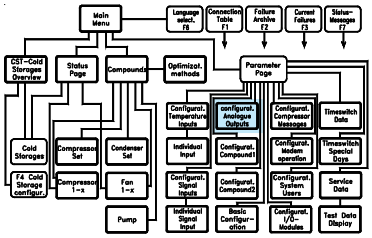




This pages contain the function, the actual value and the correction value for the individual inputs.
Such a page is available for each temperature input.

Configuration Analog Outputs





Preset of the duties for the analogue outputs of the VPR-System.

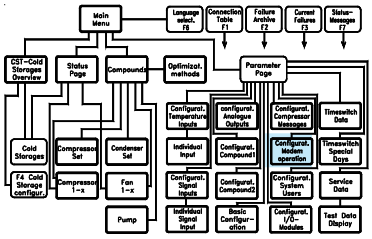
Parameter terms	Note	Possible Values / Range	Your Value
Function	Functional description of this output	off, High Pressure C1, High Pressure C2, High Pressure C1.2, High Pressure C1.3, High Pressure C2.2, Suct.pressure C1 (mA), Suct.pressure C2 (mA)	
Adr/Type	Address and type of the I/O- module where this input is located.	Example: 3/BMA. I/O-module series BMA with address 3 on the internal bus system	
Value	Actual value resp. state of the analog output	Act.Value/Phys. Value/%-Part, off = switched off/not available	--

Configuration Modem Operation

```
W  Configuration Modem
-----------------------------------------
SMS-Modem used:                       yes

Init Command
AT&FX3S0=1

Messaging 1       Type:                SMS
Protocol used                        D1-Tap
Timeframe  from   6h to                 6h
Service Center
          01712521002
Phone No.
          01717714123
```

The screen content depends on this selection.

The initstring and the dial commands can be entered via keypad

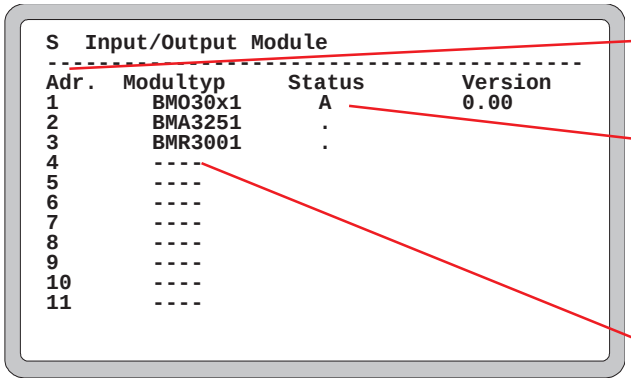


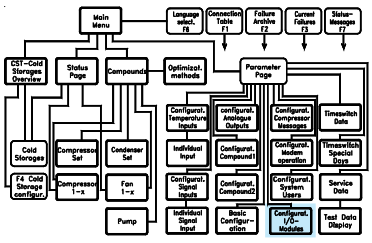
This is a listing of the necessary parameters for a telephone modem.

Parameter terms	Note	Possible Values / Range	Your Value
SMS-Modem used	With an SMS-Modem you are able to send messages as SMS, Fax or Email over "SMS in landline networks". The further screen content depends on this selection.	yes = SMS-Modem, no = Standard Modem	
Init Command	Modem initialization (init string). Will be send to the modem once after power-up of the VPR, then in intervals and additionally always 10 sec. before a dial command. The init string depends on type and manufacturer of the modem	39 characters text Example for the MDM 1002: *AT+tixi=0S0=1x3&W* Example for standard modem: *AT&FX3S0=1*	
SMS-Modem used = no			
Dial command 1	This dial command string/phone # will be send to the modem if an error mess. should be transmitted	29 characters max.	
Dial command 2	This dial command string/phone # will be send to the modem if an error mess. should be transmitted	29 characters max.	
Dial command 3	This dial command string/phone # will be send to the modem if an error mess. should be transmitted	29 characters max.	
Dial command 4	This dial command string/phone # will be send to the modem if an error mess. should be transmitted	29 characters max.	
Control message time	At this point in time an "all clear" message will be transmitted via modem, also if no error is present.	00:00 - 23:59, aus	
Baudrate of modem-interface	Data transmission speed from and to the modem	1200 - 57600	
SMS-Modem used = yes			
Messaging 1			
Type	Failure forwarding as	off, SMS, Fax, Email	
Protocol used	Kind of protocol to use for the service provider	Automatic, D1-TAP, D2-UCP, PSTN, Mobilcom A-TAP	
Timeframe	Space of time where messages can be transmitted	0 h - 0 h (=24 hrs.)	
Service center	PhoneNo. of the providers for SMS / eMail / Fax	e.g. 01712092522 (Germany)	
Phone-No.	Telephone number of the addressee and/or additional code for the type of message.	For sending SMS: enter mobile phone no. only For sending a Fax: **99** + fax no. For sending an Email: Enter Code **8000** here	
E-Mail-Address	Email-Address of the addressee. (Please enter additional Code 8000 at "Phone-No.")		

Parameter terms	Note	Possible Values / Range	Your Value
Messaging 2			
Type	Failure forwarding as	off, SMS, Fax, Email	
Protocol used	Kind of protocol to use for the service provider	Automatic, D1-TAP, D2-UCP, PSTN, Mobilcom A-TAP	
Timeframe	Space of time where messages can be transmitted	0 h - 0 h (=24 hrs.)	
Service center	PhoneNo. of the providers for SMS / eMail / Fax	e.g. 01712092522 (Germany)	
Phone-No.	Telephone number of the addressee and/or additional code for the type of message.	For sending SMS: enter mobile phone no. only For sending a Fax: **99** + fax no. For sending an Email: Enter Code **8000** here	
E-Mail-Address	Email-Address of the addressee. (Please enter additional Code 8000 at "Phone-No.")		
Messaging 3			
Type	Failure forwarding as	off, SMS, Fax, Email	
Protocol used	Kind of protocol to use for the service provider	Automatic, D1-TAP, D2-UCP, PSTN, Mobilcom A-TAP	
Timeframe	Space of time where messages can be transmitted	0 h - 0 h (=24 hrs.)	
Service center	PhoneNo. of the providers for SMS / eMail / Fax	e.g. 01712092522 (Germany)	
Phone-No.	Telephone number of the target and/or additional code for the type of message.	For sending SMS: enter mobile phone no. only For sending a Fax: **99** + fax no. For sending an Email: Enter Code **8000** here	
E-Mail-Address	Email-Address of the addressee. (Please enter additionally Code 8000 at "Phone-No.")		
No. of forwardings	Quantity of forwardings by the SMS-Modem	0...63 , [2]	
Forwarding interval	The message will be repeated in this time interval	10 min-17h, [15 min]	
Control Message Time	Daily at that point in time the VPR send an "All clear"-message to the PC.	--:-- = off 00:00 to 23:59	off
Baudrate of modem interface	Data transmission speed of the modem interface "Modem 232"	1200 - 57600	

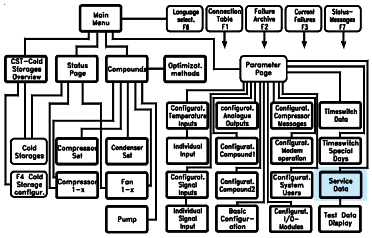
Configuration Input/Output Modules





Service Data

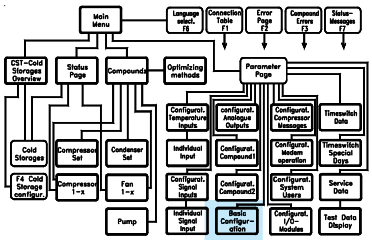
```
M   Service Data                    12:14
-----------------------------------------
Access Code DDC                          0
Baudrate of PC-interface              9600
Own DDC network address                  1
Reset runtime counters                   0
Reset failure history                    0
                                     11111
Change line address of CST:             78
Recording Interval Actual values       0h15
Recording Interval Setpoints           24 h
Recording Duration Approx.   1643h      off

Night operation state                   off
```



Contains parameters for service purposes and communication.

Parameter terms	Note	Possible values / range	Your value
Access Code DDC	Code to contact the VPR by remote. No remote access without this code	0...9999, 0 = access is possible without code	
Baudrate of PC-interface	Data transmission speed from/to the connected PC	1200, 2400, 4800, 9600 (standard) 19200, 38400 , 57600 Baud	
Own DDC-network address	VPR-address in network, necessary if multiple VPR's or other controller units are connected to a RS-485 bus.	1...79	
Reset runtime counters	Resets the runtime counters of all compressors, fans and motors to "0"	Enter "**45**" and confirm it by pressing "RET"	
Clear Failure Archive	Erases the error memory	Enter "**1**" and confirm it by key "RET"	
Change Line Address of CST	**Service function** to change the line addr. of CSTs without display, factory set to addr. Connect only one CST at the same time !	0...63 [78]	
Recording Interval Actual Values	The recording interval for actual values by the internal data logger system	off, 0h02...[0h15]...24h00	
Recording Interval Setpoints	The recording interval for setpoints by the internal data logger system	off, 1...24h	
Approx. Recording Duration	Estimated recording duration before the logged data must be backuped to a PC (dep. on interval settings)	xxxxx h	
Night operation state	off: VPR work in standard mode on: VPR is set to night mode by digital inp.		display only
Configuration memory			
Access-Code	Preparation for a read/write operation from/to the backup memory.	With the value "**13**" and a confirmation by "RET" you unlock the backup memory	
Write-Code	Stores the current VPR-configuration into the backup memory, previous contents will be overwritten	The value "**17**" and a confirmation by "RET" starts writing	
Read-Code	Reads a configuration from the backup memory, current parameter settings will be overwritten	The value "**28**" and a confirmation by "RET" starts reading	
Erase-Code	Erases a configuration. Because this is a critical process, parameter "Access-Code" must be set to "14" additionally.	The value "**39**" and a confirmation by "RET" starts the erasing	
Internal	Listing of the stored configuration sets	"1" unlocks and enables action	
Load default values	All parameters will be set to default values (factory settings)	The value "**1**" and a confirmation by "RET" erases the parameter memory (extended code necessary)	
<ELREHA test data>	Branch to the Test Data Page		
Notes / Memo	Any text. Can be entered here, or, the more comfortable way, by PC-Software		

Basic Configuration



This page contains basic settings for the complete system.

```
S  Basic Configuration            26.03.07
-----------------------------------------
External 2. setpoint                  yes
Modem relay                    no
Defrost-lock signal for:               -----
Error message inputs          Quantity  48
Neuwertmeldung aktiv                  nein
   Verzögerung SSM1                    0 m
   Verzögerung SSM2                    0 m
   Verzögerung SSM3                    0 m
   Verzögerung SSM4                    0 m
   Verzögerung SSM5                    0 m
Anzahl Störmelderelais                   5
```

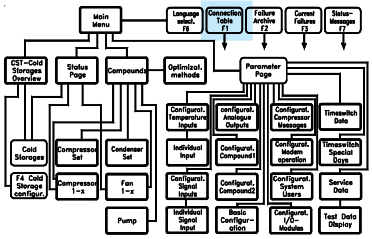
Attention ! Most of this settings change the terminal plan!

Parameter terms	Note	Possible values / range	Your value
External 2nd setpoint	yes = reserves 2 digital inputs per compound	no, yes	
Modem relay used	About 40 sec. before a ring, the supply voltage of the modem will be switched off for a few seconds by a reserved relay. This ensures a defined state of the modem.	no, yes	
Defrost-Lock Signal for	Digital input LAB1 locks additional defrost cycles at the cold storages of this compound	---, Compound 1, Compound 2, Compounds 1+2, all CST	
Message Inputs Quantity	Quantity of the available inputs which can be used for any messages	0...48	
Alarm refresh active		no, yes	
Delay SSM 1	Time delay up to alarm relay 1 comes on again (reinstate of alarm, alarm refresh)	[0]...60 minutes, 0 = OFF	
Delay SSM 2	Time delay up to alarm relay 2 comes on again	[0]...60 minutes, 0 = OFF	
Delay SSM 3	Time delay up to alarm relay 3 comes on again	[0]...60 minutes, 0 = OFF	
Delay SSM 4	Time delay up to alarm relay 4 comes on again	[0]...60 minutes, 0 = OFF	
Delay SSM 5	Time delay up to alarm relay 5 comes on again	[0]...60 minutes, 0 = OFF	
No. of alarm relays	Quantity of alarm relays to forward error messages	0...5	
No. of time-switch channels	Quantity of relays reserved for the time-switch	0...12	
Man. switch for channel 1 to	Quantity of reserved digital inputs for connection of external switches to realize manual switching of time-switch channels	0...12	
Position of spare relay 1		off, 0...99	
Position of spare relay 2		off, 0...99	
Position of spare relay 3		off, 0...99	
Position of spare relay 4		off, 0...99	
Position of spare relay 5		off, 0...99	
Position of spare relay 6		off, 0...99	
Position of spare relay 7		off, 0...99	
Position of spare relay 8		off, 0...99	
Position of spare relay 9		off, 0...99	
Position of spare relay 10		off, 0...99	
Position of spare relay 10		off, 0...99	
Delay Err. Low Refrigerant	minutes, seconds	0m00...300m00	
Shutdown at Low Refrigerant	0 = error message only, 1 = error message + plant OFF	0, [1]	

Connection Table

```
S  ConnectTable                          11:42
-----------------------------------------
Terminal Plan <Digital Inputs>
Terminal Plan <4-20 mA inputs>
Terminal Plan <Temperature probes>
Terminal Plan <Relays>




-----------------------------------------
F2=Fail.History   F3=Current Failures
```

Enter subpages by using key "RET"



Read it with "**F1**".
This page contains the current terminal listing, related to the current parameter settings.
The single input/output groups reside on subpages.

```
S  ConnectTable Relays                   11:46
-----------------------------------------
Item                 Type Adr Term     S
Alarm mess. relay 1  VPR 0    6        .
Alarm mess. relay 2  VPR 0    9        *
Alarm mess. relay 3  VPR 0    12       *
Alarm mess. relay 4  VPR 0    15       *
Alarm mess. relay 5  VPR 0    18       *
C1 compr. 1.1        BMR 1    10       *
C1 compr. 2.1        BMR 1    13       .
C1 cond.1.1          BMR 1    16       *
C1 cond.2.1          BMR 1    19       *
-----------------------------------------
F2=Fail.History   F3=Current Failures
```

Notation of input or output

Type and address on the internal bus where this input/out is located

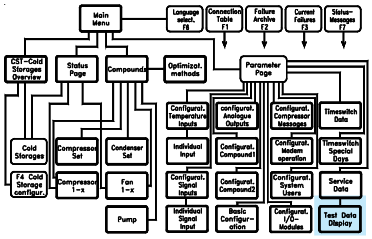
Terminal number of input/output

Current state:
" " = not connected
"." = switched OFF
"*" = switched ON

Test Data

```
S  Test Data
-----------------------------------------
Serial No.:                         6554
Date of check:          9.07.07    14:16
```

Serial Number of the unit, an important information for configuring user management.



This page contains specific data for maintenance purposes of the manufacturer.

VPR 5000 Functions

Not all of the functions explained in this section are necessarily present in your system. Their availability depends on either the configuration or on the type of your system.

Compound Operation Mode

The VPR is able to control 2 independent refrigerant compound units. This can be either standard refrigerant compounds or chiller systems with different refrigerant circuits (subcircuits). The operating mode will be set by parameter "*Media*" (compound configuration pages).

- Refrigerant — Suction pressure controlled refrigerant compound unit
- 1-circuit chiller — Chiller with 1 refrigerant circuit (12 compressors / 12 fans max.)
- 2-circuit chiller — Chiller with 2 refrigerant circuits (12 compressors / 12 fans max.)
- 3-circuit chiller — Chiller with 3 refrigerant circuits (12 compressors / 12 fans max.)

Only up to 4 refrigerant circuits can be controlled, that means if compound 1 has 3 circuits, compound 2 can be operated with 1 circuit only.

Suction Pressure Control

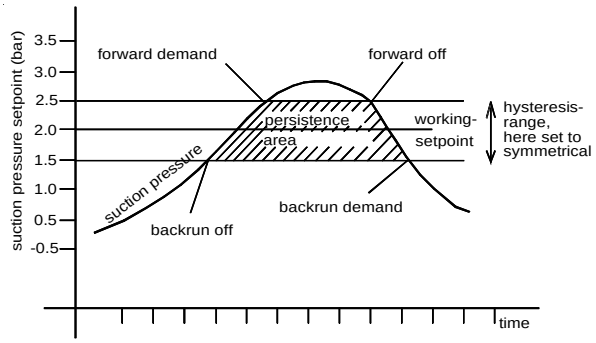
Two suction pressure controllers are available within one system. They work independent from each other. Controlled compressors may be of single or multi-stage type.

Suction Pressure Actual Values

The actual suction pressure value is measured by a transmitter/transducer and transfered to the controller as a normalized (4 ...20 mA) signal. The actual value is displayed on the STATUS page as well as on the 'Compressor Set' page (*C1/C2 SPr Act*). By using the correlation table of the selected refrigerant (Compound Config. page) the pressure is converted into a temperature value which is displayed too. Nearly any 4...20 mA transmitter can be used, because the pressure range can be set on page "*Configuration 4-20 mA Inputs*".

Suction Pressure Setpoints

Suction pressure setpoints must be entered as pressure values ('Compressor Set'-page, *C1/C2 SPr Setp*). Next to them the equivalent temperature value is displayed. The hysteresis area (*C1/C2 SPr Hyst*) can be preset to symmetrical, above or below the set value. Within this area the controller is in neutral state, this means there is no forward or backrun switching command generated. As soon as the actual pressure value increases the hysteresis range, the controller generates a 'forward' signal, asking for more compressor stages to become active.



If the actual value falls and leaves the hysteresis area, a 'backrun' signal is generated.

Because the suction pressure setpoints can be affected by the various optimization methods, the controller always works with the calculated value "SPr Setp effective".

To prevent the controller from calculating a non-suggestive working setpoint, because of the sum of the optimization methods, an upper limit is set by "SPr Setp maximal"

Stage Controllers for Suction Pressure Control

The type of compressor used in the system must be entered on the 'Configuration Compound Cx' pages (*Compressor No.X, No.of Stages*) by programming the number of compressor stages. The assignment of compressor stages and relay outputs can be read in the wiring diagrams or on screen by pushing **F1**.
On the STATUS and COMPOUND pages, the VPR shows the current switching mode ('forward', 'neutral', 'backrun') for each single control system. Switching delays are set individually for each compressor stage, where forward and backrun delay may have different settings (Compressor-set-page resp. compressor brine-circuit page). When the 'forward' command becomes active (F), the next compressor stage switches ON after a forward delay. The switching event starts the delay timer for the next stage.
With the actual pressure reaching the neutral zone (N), all timers are reset and no switching is scheduled. A backrun signal (R) starts the 'backrun' delay timer before a compressor stage switches off, etc.

Suction Pressure Monitoring

If the actual suction pressure value drops below the '*C1/C2 SPr Pre Alm*' setting, a warning message is generated. The type of message can be set individually (see chapter 'Assignment to prio...levels'). Dropping below '*C1/C2 SPr Alm*' causes a so-called 'hazard return' which switches off all compressor stages immediately.

Compound Utilization Display

The VPR offers an information about the current compound utilization rate in % (Compressor Set Page) if machines run. For this purposes, while start-up each compressor gets a "*Relative Power*" value which represents the power of this machine as a % share of the overall power.

Examples for power factors:

4 identical compressors : Enter 25% for each compressor at "*Relative Power*"
6 identical compressors : Enter 17% for each compressor at "*Relative Power*"

Influencing the Setpoint / Optimization Functions

The following optimization methods serve for energy saving and machine sparing to increase their lifetime.

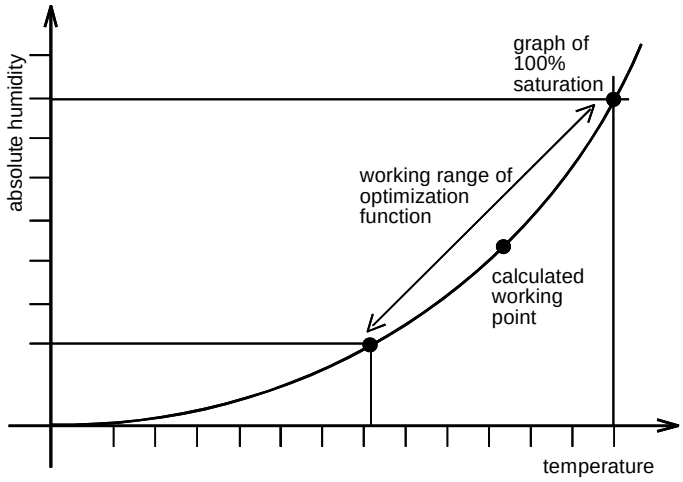
Your customer is grateful for this purposes, use them!

2. Setpoint (Day-/ Night Shift)

For energy saving purposes, e.g. at night, you can off-set the pressure setpoint values by an "Offset" parameter (on each 'COMPRESSOR-Set' and 'CONDENSER-Set' page). Positive settings cause increasing of setpoint and negative settings will decrease the setpoints if the digital input "2nd setpoint" becomes active.

Suction Pressure Optimization by Enthalpy

Suction pressure optimization of the compound control is based on enthalphy as the command variable. The necessary values are calculated from measured temperature and humidity of the plant. The (simplified) sketch below shows the 100% saturation curve line with the operation range limits.



Temperature Setpoint Optimization

The range limits are defined (separately for C1/C2) by setting upper and lower limits of temperature and humidity (*High/Low Limits*, Optimizing Functions Page).

According to the actual values the VPR calculates a working point on a (nonlinear) 100% curve. If the working point is located near the upper limit of the working range, the suction pressure setpoint will not be shifted. If the working point is located near the lower limit of the working range, the suction pressure setpoints will be increased by factor (*C1/C2 max. shift*).

In water chiller systems we use a temperature setpoint shifting instead of a pressure set point shifting.

Customer specific

Customer specific

Low Power Optimization (KLOPT)

Conventional systems with a variety of cold storages with small power requirement suffer from the fact that each time a load requires coolant energy, an 'oversized' compressor switches on, runs for a short time and cuts off again. This short cycling effect causes energy wasting because the compressor never runs under optimal conditions. So the goal is to get longer idle times for compressor control.

With the Low Power Optimization Function the switching frequency of a single running compressor can be reduced by up to 80%. This has been verified in field testing. Longer cycles are the reason for better performance and energy savings. As a base we choose a compound system with same size compressors and the automatic load exchange (sequencing) being activated.

Switching Frequency -80%

Criteria for the start of 'Klopt'

1. The sum of energy demand is smaller than the power of one compressor
2. Maximum 1 compressor is running
3. No cold storage is warmer than the set safety limit
4. Communication with the cold storages is not interrupted
5. The suction pressure is not higher than the set maximum limit
6. The actual pressure is below switch-off threshold

If these criteria are true, all solenoid valves at the cold storages connected to this compound will be closed, regardless of power demand of single cold storages.

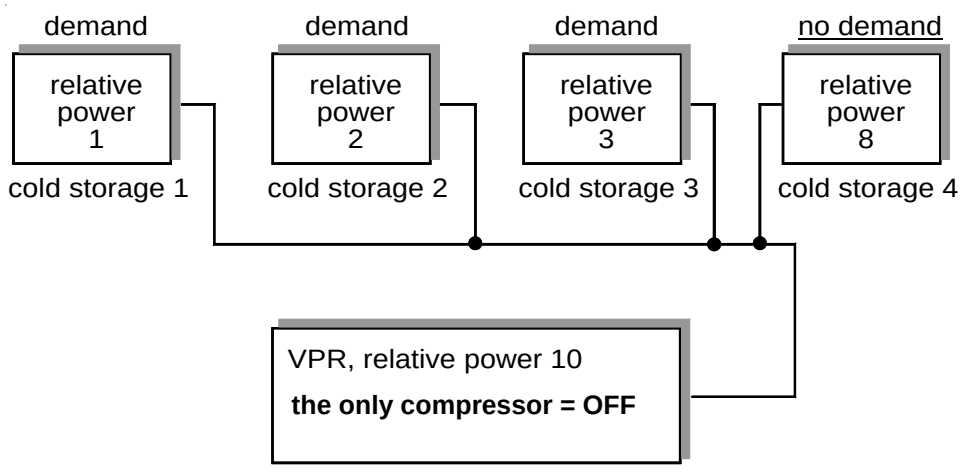
Solenoid Valves will be closed

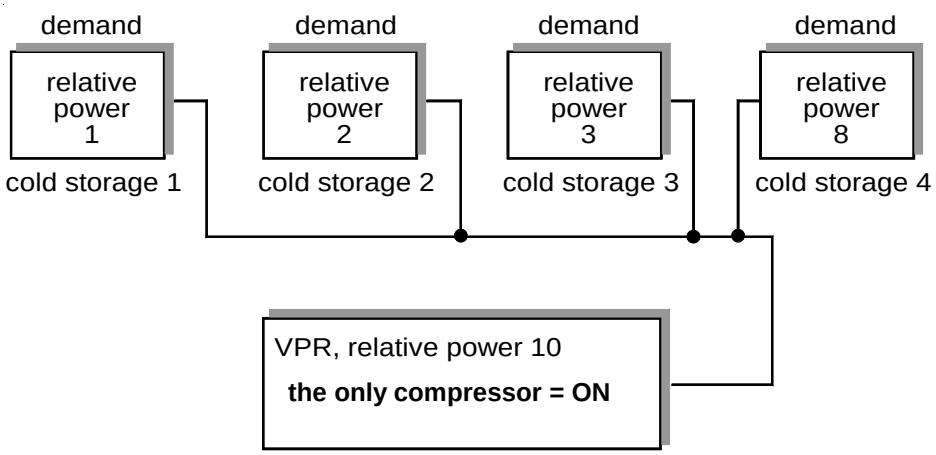
The power demand of all activated cold storage controllers will be transmitted via the data link. If one of the following steps is true, the solenoid valves will be unlocked and the compound can work normally :

Solenoid Valves will be released

1. The power demand of all avtivated cold storages has reached the power of one compressor. Since every cold storage is listed in the VPR (Cold Storages Page) with a specific relative power, the system knows the total power by adding the relative power of those stations having a cooling demand.
The relative power for the stations and the compressor are of no specific dimension. They may be defined as kilowatts (kW) or percent (%) as long as the definition is the same for all units. Additionally, each compound gets a relative power factor within 0...100 too, which represents the power of a compressor (Compound Page).
If all compressors are OFF, the controller generates a forward signal as soon as the sum of the relative power of the cold storages increases the relative power of one compressor.

Example 1:
Sum of relative power = 6





Example 2:
Sum of relative power = 14

or

2. Minimum 1 cold storage has exceeded the preset safety temperature limit.
Although the sum of relative power values has not yet reached the relative power of the compressor, it is possible that one or more storages increase in temperatures.
This can be tolerated for a short time, but as soon as one storage reaches the temperature safety limit, the solenoid valves will release.

Avoid wide temperature variations

3. The communication between cold storage and VPR fails. or

4. An external demand is present via digital input. or

5. The suction pressure reaches the safety limit value ('*Max-Suction Pressure*').

Cold storage controllers, sharing the same system but without being part of the communication network, are not a part of the optimization system.
If these storages have a demand, a compressor will be activated not before '*Max Suction Pressure*' is reached.
To go round this situation it is possible to switch off the 'Klopt'-function short-dated by a digital input of the VPR if such a controller demands cooling power.

Cold storage controllers without data link

Parameters of the Low Power Optimization System:

Parameters

Function ..... Low Power Optimization ON/OFF

Power ..... Relative power of compressor. All compressors in compound have same size

There is one of these parameter sets available for each compound

Max Suction Pressure ..... This limit overrides optimization function

Min Suction Pressure ..... Pump-down setpoint of last active compressor, normally located below suction pressure setpoint

Delay ..... Delay time to check if a demand is valid. This is to reassure the control process additionally.

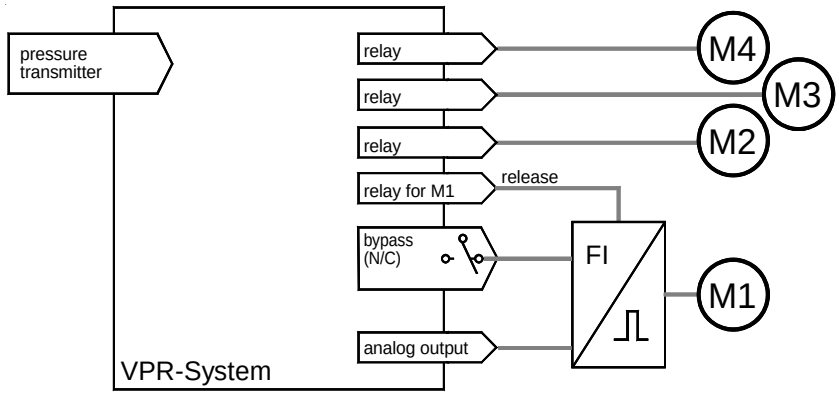
Delay Remaining ..... Remaining time for this delay (display only)

external Refrigeration Demand ..... Indicates if the corresponding external demand input is active (display only)

Customer specific

Drive of Frequency Inverters

More and more plants are equipped with compressors driven by Frequency Inverters (FI). This Inverters usually need standard signals like 4...20mA or 0...10V.
The VPR system offers such an analog output to select for both possible compounds. It is also possible to use a variable speed compressor as a supplement of a standard compound, that means all other compressors are switched types. So the speedcontrolled compressor fills the 'power gaps' between the single machines.



Example:
4-stage compound with one speedcontrolled compressor

Analog Output Signal

The signal of each analog output is calculated by a PID module, additionally it depends on actual suction pressure, suction pressure setpoint and hysteresis.

Activate FI drive

The PID module is activated, if the desired output is assigned to function "*suction pressure control Cx*" (Page 'Configuration Analog Outputs', Cx= compound C1 or compound C2).

Release FI

The relay, which is normally used for switching compressor M1, can now be used to release the Frequency Inverter.

PID-Control

The parameters for the PID modules can be found on each 'compressor set' page.

"*PID-Controller Proportional Band*" ..... range of the analogue output in 'bar'
"*PID-Controller Integral Time*" ..... I-part
"*PID-Controller Derivative Time*" ..... D-part
"*PID-Controller Actuator Response Time*" .. Influence of the low pass filter
"*PID-Controller Output Value* " ..... The value at the analogue output
in 1/10% of the range.
Example:
A displayed value of 50% means at an 4...20mA output (Range 16mA, 50% = 8mA)
4mA + 8mA = 12mA
An 0...10V would deliver 5V.

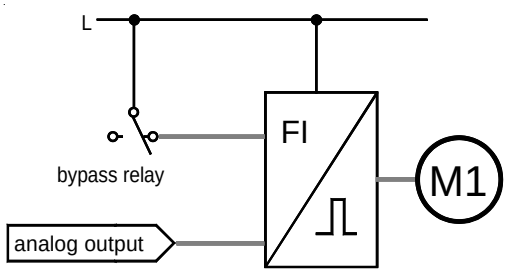
Safety function FI-Bypass

A longtime setpoint deviation may be caused by a FI malfunction or compressor damage. With activating the FI drive, the VPR books a bypass relay for each compound, which is able to initiate the safety bypass function of the FI.

The bypass will be activated under the following conditions:

- The actual suction pressure is longer than 15 minutes out of the neutral zone (preset setpoint ± preset hysteresis)
- Suction pressure transmitter is damaged or disabled

At the same time, an error message will be generated.



The N/C-contact of the relay must be used

Control Sequence

Forward

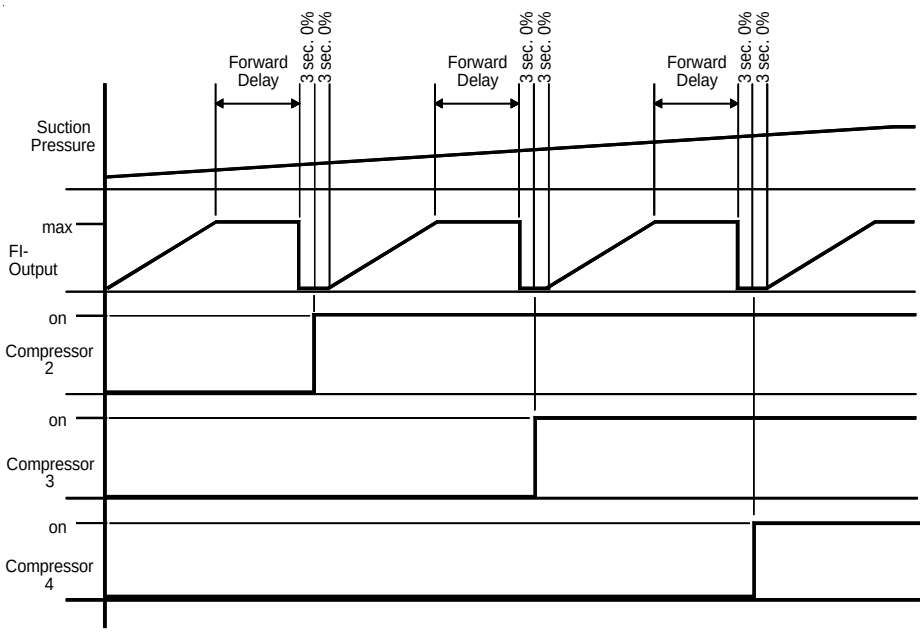
- 1. compressor starts speed controlled (possibly after FI release by relay for M1)
- Actual pressure value is above the hysteresis range and the analog output delivers 100% = Forward delay starts.
- Before the next compressor switches on, the analog output shuts down to 0% for 3 seconds.
- The next compressor switches on.
- Analog output stays at 0% for another 3 seconds.
- PID-Module starts control depending on actual suction pressure.
- If there is further power demand, the procedure repeats.

Neutral

Within the preset forward resp. backrun limits, no compressor will switch on or off, independent from the value of the analogue output.

Backrun

- Actual pressure value is below the hysteresis range and the analogue output delivers 0% = backrun delay starts.
- A compressor switches off.
- PID-Module starts control depending on actual suction pressure.



Principle:

Analog output and switching characteristic of the further compressors

For a better comprehension the analog output is plotted with PI-control only.

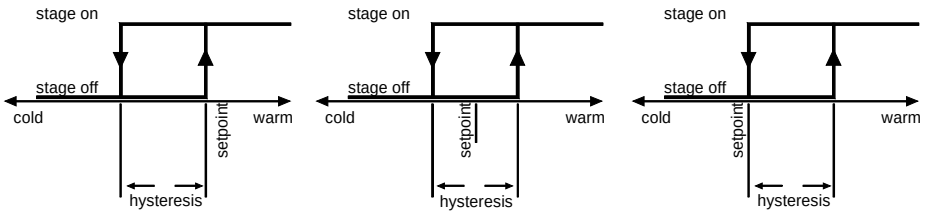
The calculation of the forward-/backrun delays remains unchanged.

If a compound has only one speedcontrolled compressor and a load limitation is initiated by a digital input, the analog output signal (=FI) will be reduced to the demanded load limitation value.

Chiller Temperature Control

The VPR-System is able to control several refrigerant circuits (sub-compounds) in each compound. The temperature is measured by control sensor located in the return pipe. The actual temperature value is displayed at '*xx Compressor Set /Brine Circuit Compressors*' (*Control Sensor*). The temperature is controlled by means of switching ON and OFF compressors or compressor stages of the same compound system.
Each compressor or compressor stage works with its own predefined setpoint (*Setp 1 to Setp 12*), the preset hysteresis (*Hysteresis*) is valid in common.

If necessary, the position of the hysteresis can be set to above, below or symmetrically (*Hysteresis location*).



If the actual temperature exceeds the setpoint of the first stage/compressor (*Setp 1*), a delay timer starts (*Forward Delay Stage 1*). At the end of the delay time the first compressor switches ON. With the temperature still rising over setpoint of stage 2 (*Setp Stage 2*), the delay of this stage (*Forward Delay Stage 2*) starts, etc. A new stage can switch ON only if the lower order stage is ON. With the actual value falling below the setpoints, the stages switch OFF with their individually backrun time delay settings.

On several pages of the VPR display you will find information about the state of the controller system. The display shows if the controller is in 'forward' (F), 'neutral' (N) or 'backrun' (R) mode.

Control Characteristic

With standard settings the controller acts as a proportional controller with remaining setpoint-offset.

Frost Protection

Sensors can be placed in each of the three heat exchangers. If one of the sensors (*Frost Protection Sensor 1 - 3*) senses a temperature below the set limit (*Setp Frost Protection*), all compressors will stop immediately and an error message will be generated and forwarded.
As soon as the temperature rises above warning setpoint again, the frost warning message is cancelled and the controller works as usual. The hysteresis setting for this function is identical with the control function hysteresis.

Limitation

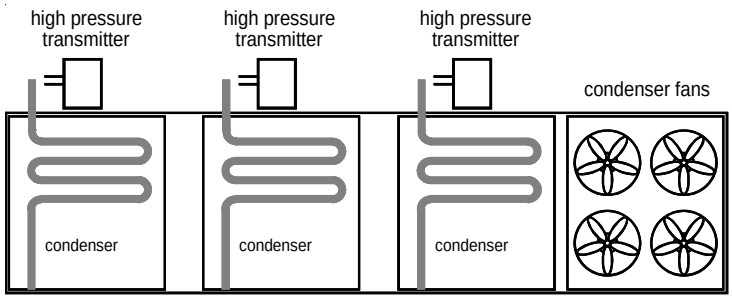
An outlet sensor is optional. Whenever the outlet temperature (*Limit Sensor*) falls short of a limit value (*Setp Limit*), the controller goes to 'backrun' mode, switching off stage by stage after the preset backrun delays. This function uses the same hysteresis as the controller, no error message will be generated.

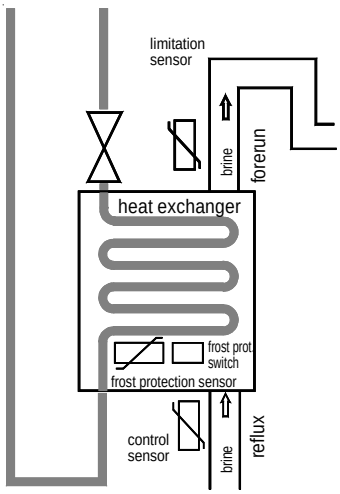
Stage Controllers for brine temperature control

In compound systems for chillers, single stage compressors as well as multi stage compressors can be used (configuration on 'PARAMETER' page).

Brineset depending priority function (CPD)

If only one fan set is planned for several refrigerant circuits, the function "*CPD-Function for Brine Condensers*" (Compressor Set Page Brine Circuit Compressors) can be used.
In this case, the highest available value of the 3 possible high pressure transmitters is used for controlling the condenser set.





Compound / Compressor assignment

Within a chiller up to 3 refrigerant circuits (subcompounds) may work. In common, this 3 circuits can have up to 12 compressors resp. compressor stages. Each compressor can be assigned to one of these subcompounds. This assignment can be made on the compound configuration page, at the position where the number of compressor stages are adjustable.

Load balancing of the compounds

With less power demand and multicircuit chillers, different runtimes of the circuits may occur. To prevent this, the function "*Load balancing*" (compound page) can be used.
Normally, stage sequencing depends on the runtime of the individual stages, without notice of the circuit assignment. If the function is activated, the runtimes of the circuits will be considered additionally, that means that one circuit will switch off and another starts to equalize their runtimes.

Exception

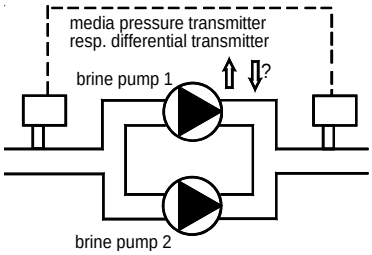
If multistage compressors are used, all its stages must have been switched ON or OFF completely up to another circuit can be activated.

Brine Pump Control / Brine Pressure Monitoring

The VPR-System is able to control the brinepumps in chillers (**!: with the N/C-contact of the relay**).
Within each chiller two of this pumps can be controlled. For each brine pump the system holds an own runtime counter.
Four (4) operation modes are selectable by parameters "*C1/C2 Brine Pumps*" (Compounds Page):

Operation Modes

- Pump 1 + 2 perman. : ..... Both pumps run continuously
- Pump 2 (1 stand-by): ..... Pump 2 runs continuously, Pump 1 switches on if the feedback signal of pump 2 fails and the delay has been run down.
- Pump 1 (2 stand-by): ..... Pump 1 runs continuously, Pump 2 switches on if the feedback signal of pump 1 fails and the delay has been run down.
- Alternating: ..... Every 24 hours the other pump run contiuously



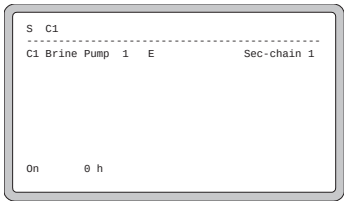
Change of operation mode and runtime counter need a feedback signal at a selected digital input.

Minimum 1 pump runs continuously if the VPR has been switched on. It is impossible to switch off the pumps manually.

Brine pressure monitoring

Each chiller can get a brine pressure transmitter if necessary. (Function of the analog input "*P-Brine*"). If the pressure falls below the limit "*Brine Pressure Limit*" (Page "Compressor Set Brine Circuit Compressors"), the pump switches off and an error message is forwarded.
If you set "*Brine Pressure Limit Shutdown*" to "ON", the compound shuts down additionally.

Each brine pump has its own screen page which contains states and runtime information.



Compound Lock at Chillers

By the following input information, one or more refrigerant circuits (subcompounds), configured for chillers, can be locked (disabled). The current state (ON/OFF) is displayed on the "Compressor Set" page at "*Lock Compound 1-3*".

- External Lock Signal
- " Frost protection Signal
- " Suction Pressure Signal
- " Overpressure Signal
- " Brine Pressure Signal
- Internal Brine Pressure malfunction, if a shutdown has been selected
- " Frost Protection
- " High Pressure

Condenser (High) Pressure Control

The stage controllers for the high pressure part of the compound are able to work both with single stage fans as well as multi stage fans.

A pressure transmitter in the high pressure line transmits the actual pressure value (condensing pressure) to the VPR as a 4-20 mA signal. This value is displayed on the 'Status' and the '*Condenser Set*'-pages (*"CPr Act"*). Next to the pressure value you will find the temperature equivalent which is calculated depending on the selected refrigerant.

Condensing Pressure Setpoints

The condensing pressure set points are programmed individually for each stage ('Condenser Set'-pages, *CPr Setp*). Here you can read the equivalent temperature value too.
A hysteresis setting (*CPr Hyst*) is considered to be common for all stages. Also common are the time delays for forward and backward switching.

Priority Decoder (CPD-Function)

If your system uses only one set of fans for two compound systems, it is necessary to use the highest system pressure as the command variable for the controller. In this case you can select a priority decoder function ('Compounds' - page, *CPD-Function*), which uses the highest signal out of max three high pressure transmitter signals as command variable for C1-Analog Output and the C1-Condenser Stage Controller. The C2-Analog Output works independently with its own transmitter signal.

Switching will be done by the relays of C1 condenser, circuit 1.

Analog Outputs / rpm controlled fans

RPM-controlled fans use an analog signal from each compound. This signal is available as 0-10 V DC and 4-20 mA signal. The output range can be selected within the transmitter range. With parameters '*Analog-Out Range low*' and '*Analog-Out Range high'* (Condenser Set-page, for C1 resp. C2) you select the range of the output signal.

Example: You use a transmitter with a range from 2 to 24 bar
You have set '*Analog-Out Range low*' = 6 bar
You have set '*Analog-Out Range high*' = 14 bar
Now your analog output signals are:
- 4 mA resp. 2V at 6 bar
- 20 mA resp. 10V at 14 bar

If the CPD function has been activated, the output signal at '*C1 analog out*' is the highest actual signal of any connected condensing pressure transmitters.
The '*C2 analog output*' only delivers the value of the C2-compound condensing pressure transmitter.

Multi Stage Controllers for Condensing Pressure Control

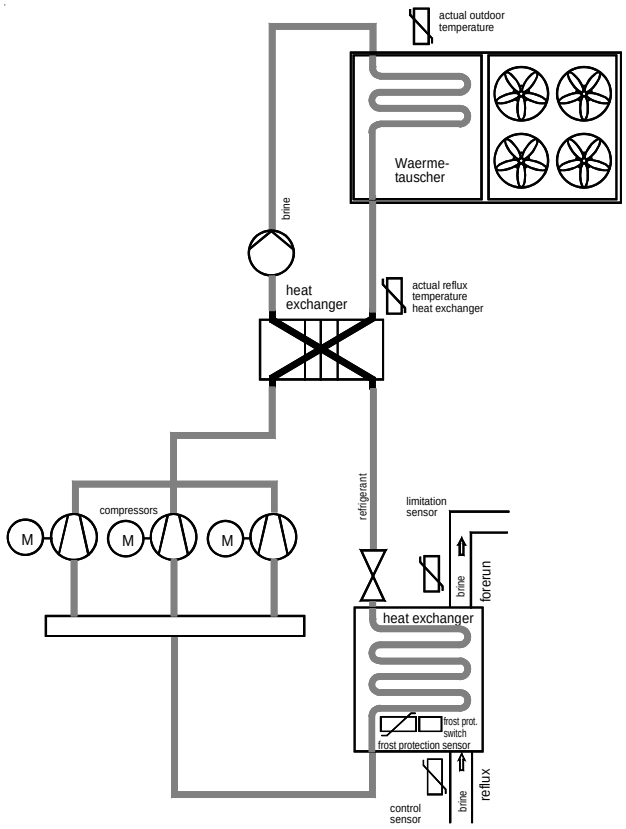
On the 'Compound Configuration' Page you select the type of fan by programming parameter '*Circuit xx Condenser Fans*' accordingly.
There are up to 3 sets of fans selectable for the C1-compound and up to 2 sets of fans on the C2-compound. Each fan set can have up to 12 fans or fan stages.
As soon as the actual pressure value exceeds the setpoint value, the 'forward' delay timer starts (*Forward Delay x,* Condenser Set page). The fan stage switches ON if the set time delay (*Forward Delay x*) has been run down.
The switching hysteresis (*CPr Hyst*) is common for all stages, located above, below or symmetrical (presettable by "Hysteresis Location") around the setpoint. All current states (forward, neutral, backrun) of the system can be read on the 'STATUS' page.

High Pressure Monitoring

If the actual pressure rises to a critical value, the system is able to react with 2 procedures.
- If the pressure value exceeds the prewarning setting (*CPr Pre Alm*), a warning is initiated (see chapter 'Failure Codes'). At the same time 25% of the active compressor power will be disabled.
- With the condensing pressure reaching the alarm setting (*CPr Alm*), a backrun is initiated and all remaining compressors switch off automatically.

The condenser fans keep on running, but an error message will be generated and stored on the error pages to process them as desired.

Chillers with Re-Cooling Heat Exchanger



In chillers with re-cooling heat exchanger the condenser pressure control gets no information about the states of the condenser, because there is no pressure transmitter available.
Instead of this, the VPR calculates a "virtual" pressure depending on the measured temperature values.

Activate Function

Assign the function "*T-cond cir.x*" (x = ' of circuit) to a temperature sensor input.
The actual value of the sensor can be read on the condenser set page at "*Actual Brine Reflux Temp.*".

Available high pressure transmitters remain disregarded.

Automatic Load Change of Stage Controllers (Sequencing)

Funktion

In a well dimensioned system not all compressors and fans will run all the time. By using standard stage controllers, some motors run continuously and others never. In order to equalize the running times of compressors and fans, there is an automatic load change function available, also called 'sequencing'.

All running times and idle times of each motor are memorized in the system. This is the basic information for the controller to decide which motor should start or stop next.
The total running hours of each motor are displayed ('*On*', 'Compressor'-page resp. 'Fan'-page). If a motor has been switched off, it can be restarted first after a minimum, individual idle period ('*min. Stopt.*').

Activation of Load Change

To activate the load change function there are different switching modes for the automatic load change available.
The corresponding parameters are:
'*Compressor Mode*'- '*For. Back. Opt*' and '*Fan Mode'* ('Compound-Configuration C1/C2'-pages).
Since the VPR has all run time information stored, the decision is easy which stage must be switched ON or OFF next. For the forward sequence of the stage controller you can select if the stage with the lowest quantity of run time hours (RunTm) or that one with the longest idle time (StopTm) should be next. In backrun sequence the controller always selects the motor with the longest run time.

Load Control

The VPR accepts single speed motors as well as such with multiple stages. So it is ensured that speed stages are switched in the correct order even with activated sequencing.

Switching Frequency Optimization

If multi stage compressors or fans are used, you can select the 'optimization' (OPT) function to optimize switching frequency. If activated, in the backrun sequence any active speed stage is shut off before a motor is shut down.

Exclude Compressors from Sequencing

For each compound, one compressor can be excluded from sequencing. This compressor will ever shut on first and shut down last. Other available compressor are able to shut on if required even if the feedback signal of the excluded compressor fails.

Parameter "*Number of the prioritized compressor*" (Compound Configuration Pages) selects the compressor which should be excluded. Parameter "*switch characteristic*" below must be set to "permanent".

Activate the function

Important: This function is only usable for single compressors, not for multistage compressors.

Set parameter "*No. prior. compressor*" to "0".

Disable the function

Emergency Operation

The VPR normally switches the loads with the N/O-contacts of its output relays.

Inverted Stages

Setting a certain number of inverted stages ('*No. inverted stages*') on the 'Compound Configuration'-pages results in changing the output of these stages to the N/C-contact (active OFF).

Whenever the VPR has a power failure, the motors connected to this outputs will be forced to run.

If you set the parameter e.g. to '1', the first stage is inverted. If you select '2', the first two stages are inverted, etc.

Analogue Inputs/ Outputs and Digital Inputs

Extension modules of the series BMA offer inputs/outputs for 4-20 mA -signals or for temperature sensors (TF 201 / TF 501 selectable), digital inputs (optical decoupled) and relays are realized by modules of the series BMO (digital inp.) and BMR (relays).

This in/outputs have no fixed tasks, the task of each input and output can be selected. We call this "free ressource assignment". Additionally, each input/output can be disabled that way. This technique allows to adapt the VPR system to different refrigeration systems, without having unused inputs/outputs.

Analog Inputs (4-20mA)

The parameters for the analog inputs can be set on the pages "*Configuration 4-20 mA inputs*":

- Functionality to assign inputs to a task
- Address and type of the used extension module
- The thresholds of the 4-20mA inputs
- Calibration values of each input
- State and measured value of the input

The following tasks can be assigned to 4...20 mA-inputs:

- C1 P-suct (suction pressure transmitter, refrigeration compound 1)
- C1 P-cond.cir.1 (condenser pressure transmitter, compound/chiller 1, circuit 1)
- C1 P-cond.cir.2 (condenser pressure transmitter, chiller 1, circuit 2)
- C1 P-cond.cir.3 (condenser pressure transmitter, chiller 1, circuit 3)
- C1 P-brine (media pressure in the brine circuit of chiller set 1)

- C2 P-suct (suction pressure transmitter, refrigeration compound 2)
- C2 P-cond.cir.1 (condenser pressure transmitter, compound/chiller 2, circuit 1)
- C2 P-cond.cir.2 (condenser pressure transmitter, chiller 2, circuit 2)
- C2 P-brine (media pressure in the brine circuit of chiller set 2)
- Room Humidity (e.g. humidity in the market, needed for optimization via enthalpy)
- Pressure Display01 to Pressure Display11 (pressure transmitters which affect to no functions, measured values are displayed and recorded only)

Temperature sensor inputs

The parameters for the temperature sensor inputs can be set on the page "Configuration Temperature probes". There you can find:

- The functions to preset the task of each input
- Address and type of the used I/O-module
- Preset of sensor type and physical value (°C/°F)
- Calibration values of each input
- State and current measured value of the input

The following tasks can be assigned to temperature sensor inputs:

- Room temperature (e.g. temperature in the market for optimization purposes via enthalphy)
- C1 control brine (reflux sensor at the heat exchanger of chiller set 1)
- C1 limit brine (forerun sensor at the heat exchanger of chiller set 1)
- C1 frost prot brine1 (frost protection sensor at the heat exchanger of chiller set 1, circuit 1)
- C1 frost prot brine2 (frost protection sensor at the heat exchanger of chiller set 1, circuit 2)
- C1 frost prot brine3 (frost protection sensor at the heat exchanger of chiller set 1, circuit 3)

- C2 control brine (reflux sensor at the heat exchanger of chiller set 2)
- C2 limit brine (forerun sensor at the heat exchanger of chiller set 2)
- C2 frost prot brine1 (frost protection sensor at the heat exchanger of chiller set 2, circuit 1)
- C2 frost prot brine2 (frost protection sensor at the heat exchanger of chiller set 2, circuit 2)

- C1 T-cond.cir.1 (temp. sensor at the re-cooling heat exchanger of chiller set 1, circuit 1)
- C1 T-cond.cir.2 (temp. sensor at the re-cooling heat exchanger of chiller set 1, circuit 2)
- C1 T-cond.cir.3 (temp. sensor at the re-cooling heat exchanger of chiller set 1, circuit 3)

- C2 T-cond.cir.1 (temp. sensor at the re-cooling heat exchanger of chiller set 2, circuit 1)
- C2 T-cond.cir.2 (temp. sensor at the re-cooling heat exchanger of chiller set 2, circuit 2)
- Outdoor Temperature (sensor for measuring the outdoor temperature, needed e.g. for condensing pressure setpoint shift)
- Temp.Display 1 to Temp.Display 15 (Temperature sensors which affect to no functions, measured values are displayed and recorded only)

Analog Outputs

The task of each function can be preset on the pages "*Configuration Analog Outputs*".

the following tasks can be assigned to all 4...20 mA-outputs:

- off
- High Pressure V1 - V2 - V1.2 - V1.3 - V2.2
- Suct.pressure contr. V1 - V2

Digital Inputs for Compressor Error Messages

The parameters for the compressor error messages can be found on page "*Configuration Compressor Messages*". Here you select, which of the messages

- Feedback
- Oil Pressure
- Error
- Overpressure
- Motor Protection
- Overheat

} factory set names

must be captured and processed. By marking a message, the system reserves a digital input which can be seen on the terminal plan immediately.

This settings are valid for both compounds, that means a different processing of messages in both compounds is not possible.

Change Name

The names of the compound messages can be altered.

Select desired notation under column "Text" on page "*Configuration Compressor Messages*".
- Push "**RET**", the first character is marked.
- Select desired character by "⇧⇩",
- Select next character position by "⇨",
- Select desired character by "⇧⇩", etc.
- "**RET**" stores the new notation.

Free usable error message (digital) inputs

On page "Basic Configuration" you select up to 48 of the digital inputs which do not affect on control functions of the VPR. The system reserves the selected number of digital inputs (readable in the Connection Table). This inputs are active ON.
Each of this error message inputs may get a name with up to 20 characters, which is displayed on the error message pages and the PC-Software. This inputs have the failure numbers 400-447 and can be forwarded on different priority levels like all other error messages.

Change name for error message inputs

- Select the number of the desired error message on the "*Parameter*"-Page (Ext. Message Input No.:), preselected text appears
- highlight text
- push "**RET**", the first character is marked.
- select desired character by "⇧⇩",
- select next character position by "⇨".
- select desired character by "⇧⇩", etc.
- "**RET**" stores the new designation.

Use the free of charge PC-Software "COOLVision-MES" for a comfortable configuration.

- Select next error message (Ext. Message Input No.:), etc.

Intervention to the relay order by "Spare Relays"

The system automatically determines the order of assigment of tasks and output relays and their position in the terminal plan. The outcome of this is that the system also determines on which I/O-module an output is located.
The distribution of the positions depends on the "save ressources" policy. If some functions should be structured (e.g. all time-switch relays on the same BMR-module), this automatism must be changed. For this purpose, you can assign up to 11 "spare relays" to any positions ("*Pos. of spare relay x*", Basic configuration page). This "spare relays" are virtual, but the following relays are moved by one position.
Example: After a basic configuration (e.g. with the software **VPR50Plan**) you notice that 2 of your 5 selected time-switch channels are located on the first BMR and 3 on the 2nd BMR, but you want to have them all on BMR 2. To change this, enter 2 spare relays before the time-switch relays, all following relays move by 2 positions.

External Error Messages and Signals

In opposite to the free error message inputs, the following inputs have fixed tasks and cannot be renamed. Most of this inputs are available in all configurations and cannot be disabled.

2nd Setpoint

Setpoint shift by the value "*SPr-shift*" resp. "*CPr-shift*" if this input is connected to mains.

Load Limitation

By connecting voltage to one of the two inputs '*C1/C2 Load Limit*' a load limitation is initiated. Each input has an own parameter (same name) which can be programmed in percent (1% steps) of compressor power to be cancelled via signal. The total amount of compressors in a compound is 100%.

Defrost Lock while Emergency Operation

A defrost-lock signal prevents the plant from additional energy demand by defrost cycles at cold storages e.g. while running with emergency power generators. The digital input "*Defrost lock signal for*" (Basic Configuration Page) initiates the selected additional function. This doesn't affect the load cancellation function.

- "-----" The function is disabled
- "Compound 1" The digital input "C1 Load Limit 1" inhibits all defrost cycles at cold storages assigned to compound 1.
- "Compound 2" The digital input "C2 Load Limit 1" inhibits all defrost cycles at cold storages assigned to compound 2.
- "Compound 1+2" Both digital inputs "C1/C2 Load Limit 1" inhibit all defrost cycles at cold storages assigned to compounds.
- "all CST" Digital input "C1 Load Limit 1" **or** "C2 Load Limit 1" inhibits all defrost cycles at all cold storages, also cold storages which are not assigned to compounds.

Fast Backrun

When the inputs "C1/C2 Fast backrun" are connected to mains, all compressors in this compound shut OFF without delay. High pressure control is not affected.

Suction Pressure Monitoring

This input is normaly connected to mains. As soon as the external pressure limiter switch interupts this voltage, all compressors of this compound shut OFF without delay.

High Pressure Monitoring

This input is normally connected to mains. As soon as the external pressure switch interrupts this voltage, all compressors of this compound shut OFF.

Loss of Refrigerant

This input is normally connected to mains. If refrigerant is low, this voltage is interrupted by an external, matching switch. After a delay time has been run down (0...300 min, Basic Configuration Page) an error message will be forwarded or the compressors of this compound will shut off additionally.
Special case: If the refrigerant is low while the VPR starts, the error message will be forwarded without delay.

Emergency Cut-Off

While the normal position of the emergency switch, this input must be connected to mains. If someone pushes the switch, this voltage is interrupted. In this case the system switches off all compressors and fans. Some error messages will be suppressed in this case, you will find them marked in the listing.

Phase Monitoring / Asymmetrical Load Condition

This input is normally connected to mains. If a phase is lost, this voltage is interrupted by the contact of the phase monitoring unit. In this case all compressors and fans will shut OFF.

Night Mode (Blinds Operation)

If this input is connected to mains, the VPR sends a 'night operation' signal to all cold storage controllers via data link. The cold storage controllers use this signal for switching from daytime to overnight mode with different setpoints and close the roller blinds at the same time.

External Anti-Frost Unit

There is an anti-frost input available for each heat exchanger. This inputs are normally connected to mains. If the signal failes by an activated anti-frost switch, the corresponding compound shuts OFF and an error message is initiated.

Compound Lock

For each refrigerant circuit within a chiller set, there is an 'external lock' input available.
If this input is connected to mains, the compound switches OFF without an error message.
This function allows the operator to shut-off a compound by means of a simple control switch.

Compressors and Fans

The stage controllers in the VPR system expect feedback signals from each compressor and fan. This signal must be available as soon as a motor is switched ON to give the system an information about the current state.

Feedback Signals

Only if this information is available, stages can be switched and runtime information can be stored. A feedback signal can be captured by a digital input as well as calculated (compressors only) depending on compressor error messages (Page "Configuration Compressor messages")**.**

Generating Feedback Signals

1. Feedback signal is generated by a free contact of the motor relay connected to a matching digital input.
2. Only the compressor messages 'Oil Pressure', 'Error', 'Overpressure', 'Motor protection' and 'Overheat' are processed, a feedback signal is not available. In this case the system assumes a positive feedback, as long as no error message is present.
   The signals from the contacts of the safety chain can be captured and assigned, so each compressor can be monitored individually.
   In case of an overheat message, all following signals would fail too (see sketch in chapter 'Installation'), but the VPR suppresses this messages. They are displayed after the top message disappears. THus, the first electrical contact after the phase connection has priority.
   For this reason, the order of the error message contacts must be observed.
3. The feedback signal will be captured via safety chain, as well as the compressor error messages. Select operation mode on page "*Configuration Compressor Messages*"

If the VPR switches an output relay for a motor and no feedback appears at the digital feedback input within the time set by "*Operation delay*" (Compressor Set/Condenser Set pages), because this motor has a malfunction or is switched OFF manually, the VPR tries to power-up the next available motor without delay. The VPR checks the failing motor periodically, if a power demand remains available.
If the VPR gets no feedback via safety chain, an error message is generated after having checked this state 3 times. This message can be processed and appears on the error message pages.

Manual Operation

Each compressor and fan can be switched manually. On the individual compressor/fan pages you will find the current state (ON/OFF/Automatic) beside the motor designation (e.g C2 compressor 2). Changing this value affects like a manual switch. The switching state keeps stored.

If you shut off a compressor/fan by an external switch you also cause an error message, because the feedback signal is interrupted the same time.
With switching off the compressor/fan on its individual page this problem doesn't occur.

Runtime Counter

Each compressor/fan owns a runtime counter (Parameter "*ON*", Compressor/Fan Pages).

Lock Times

If a motor has been shut off, it can be restarted after the "*min Stopt*" delay.

If an error message occurs, the motor is disabled for a certain time (default: 5:00 min.). This time can be changed by PC-software only.

Statistics about the compressor power up sequences

At parameter "*Power On's current*" all compressor power up sequences of the day (within 0 and 24:00) are added. "*Power On's yesterday*" shows the sum of the compressor power-up sequences of the previous day.

Co-operation Functions VPR <> Cold Storages

These are functions which affect to the total system.

Day /Night Mode

Each Cold Storage Controller can be equipped with individual switch-on times for night operation. If digital input "*Night operation*" at the VPR is active, all connected cold storage controllers will be forced to night operation, independent from the programmed switch times.

Assignment to compounds

Each cold storage controller connected to the system can be assigned to one of the compounds (C1 or C2). When the VPR is used for chiller control, the cold storage controller can be assigned to the chiller sets.
This assignment can be defined on the individual 'Cold storage Controller Page (CST)', subpage 'Assign Data'. This assignment allows the VPR to get information for the optimization methods of the matching compound, on the other hand it is able to affect to the controllers assigned to this compound only, if malfunctions occur.

See chapter "Handling of system failures"

Assignment of independent cold storages

To allow a connection of independent controllers (e.g. in refrigerators with own compressor), the assignment can be switched off.

The Timeswitch

The VPR-System contains a (year) time-switch with up to **12** switch channels. This timeswitch does not affect to control functions, it works exclusively with up to 12 relays which can be reserved for this purpose.

Timeswitch data

Switch Channels ..... Selectable from 0 to 12
Switch-time pairs (ON/OFF) 50
Day Types ..... 7 (Mo-Fr) + 5 special day types
Special days/holidays ..... 50 within a year
Fleeting contacts ..... Each switch-time pair can be configured for a pulse

Reserving timeswitch relays (switch channels)

On page "Parameters/Basic Configuration" you will find "*No. of time-switch channels*". This parameter specifies the quantity of relays reserved for timeswitch purposes. Find the matching terminals for electrical connection by **F1** or by printing out the connection table.

Additional reserving of relays change the terminal plan!

Switch times

50 switch-time pairs are available. This switch-time pairs can be assigned to any channels, days, combinations of days or special days (holidays) and additionally, to 2 periods in a year.

Day Types

The time-switch offers 7 day types for the weekdays from monday to sunday. With this day types according to the calendar (single days or combination of days) the time-switch manages the regular switch tasks within a week. Additionally, 5 special day types, assignable to different switch times.

Special days/Holidays

By setting a date, it is possible to determine 50 special days within a year, which can be assigned to any day type. At this date, the standard day type will be replaced by the new day type.

Fleeting Contact

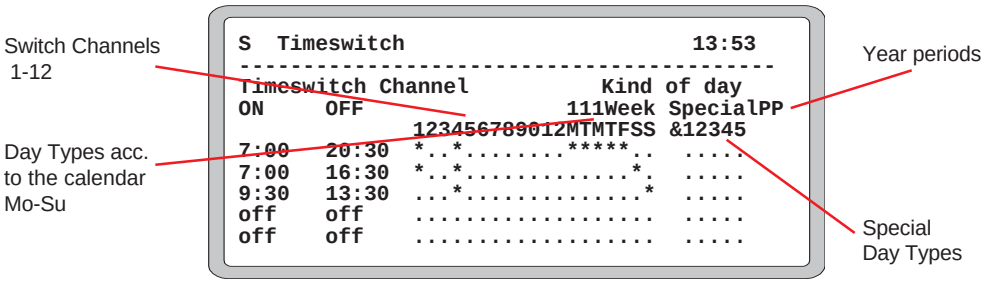
If switch-on and switch-off times are equal, the output relay works as a fleeting contact (~10 sec.) at this point in time.

Deactivate Switch-time pairs

If switch-on and switch-off times are set to 'OFF' (= 24:00 o'clock), switching operations are disabled.

The time-switch parameters you will find on page "Parameters/Timeswitch data".

Parameter Page for Timeswitch



Setting a mark

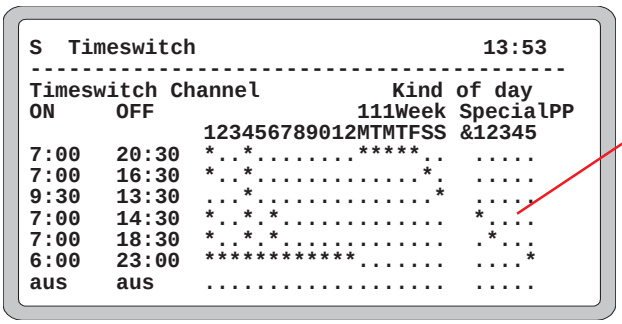
⇦⇨⇧⇩ ..... Highlight position
Ret ..... prepare change
⇦⇨ ..... Highlight mark
⇧ ..... Set mark
⇩ ..... Remove mark

In this example channels 1 + 4 switch ON daily from monday to friday at 7:00 o'clock and switch OFF always at 20:30 o'clock. At saturday, different switch-times are valid. At sunday, channel #4 switches ON between 9:30 and 13:30 o'clock.

Special Days, Holidays

For periodic special days or single holidays the necessary switch times can be pre-entered for the whole year. For this, enter the necessary switch times first and then assign them to one of the special days 1-5.

Setting special days



The example from above is here supplemented by a switch time which should engage the channels 1,4 and 6 within 7:00 and 14:30 o'clock.
This switch time is assigned to special day mode 1.
In addition, this channels should be switched on at special day 2 within 7:00 and 18:30 o'clock. The 3rd new switch time engages all channels within 6:00 and 23:00 o'clock.

Activate switch-times at a specific date

Branch to page "*Parameters/Timeswitch Special Days*" and enter a date for the special day. At this date, the timeswitch uses the times assigned to the new day type.

```
S  Time-Switch                        16:50
----------------------------------------
Date          Kind of day
19.06         Sunday
07.12         Special 2
14.12         Special 2
21.12         Special 2
24.12         Special 1
30.12         Special 5
31.12         Special 2
```

Practise Example:

19.6. is a holiday, the timer switches like sundays. The 7.12., 14.12. and 21.12. are saturdays with extended opening times, here assigned to special day 2.
At Christmas Eve (24.12.) and at New Year's Eve (31.12.) one work only a half day. Unfortunately, the lamps must light particular long at inventory day (30.12.).

Linking of days / daytypes and special switch times

For a further specialization of switch times there is an "And" operation available. By this, switch times which are assigned to one or multiple special days, can be limited to any combination of week days. This can be suggestive for fixed, annual public holidays with special switch times like e.g. christmas, which change the week day every year. Switch times must be entered once for such days, if the weekday changes next year (e.g christmas at sunday), the timer will not switch even though this is not programmed .

```
S  Timeswitch                         13:53
----------------------------------------
Timeswitch Channel          Kind of day
ON     OFF                111Week SpecialPP
             123456789012MTMTFSS &12345
7:00   20:30  *..*........*****..  .....
7:00   16:30  *..*.............*.  .....
9:30   13:30  ...*.............*  .....
7:00   14:30  *..*.*......******. &*....
7:00   18:30  *..*.*.............  .*...
6:00   23:00  ************.......  ....*
off    off    ...................  .....
```

In this example, special day 1 (we have set the 24.Dec. for it) is "And" linked to the set day modes by the "&"-symbol. Now the switch times for the channels 1,4 and 6, which should be valid at special day 1, are active if the special day is within monday and saturday.
If it is sunday, the switch times are locked.

Linking to periods

With the dates set at parameters "*Time switch periodP1 and ...P2*" (Parameter Page) 2 time periods are defined. Switch times can be limited to this periods if necessary.

```
S  Timeswitch                         13:53
----------------------------------------
Timeswitch Channel          Kind of day
ON     OFF                111Week SpecialPP
             123456789012MTMTFSS &12345
7:00   20:30  *..*........*****..  .....*
7:00   16:30  *..*.............*.  .....*
9:30   13:30  ...*.............*  .....*
7:00   14:30  *..*.*......******. &*.... *
7:00   18:30  *..*.*.............  .*... *
```

By setting this marks, switch times are assigned to period 1 resp. 2.

Manual switching of channels with external hardware switches

For each time switch channel a digital input can be reserved, which can be connected to an external switch(*Basic Configuration/Man. switch for channel 1 to*). To switch the channel manually, voltage must be connected to the digital input for 1 sec. minimum (short pulse).

Examples:

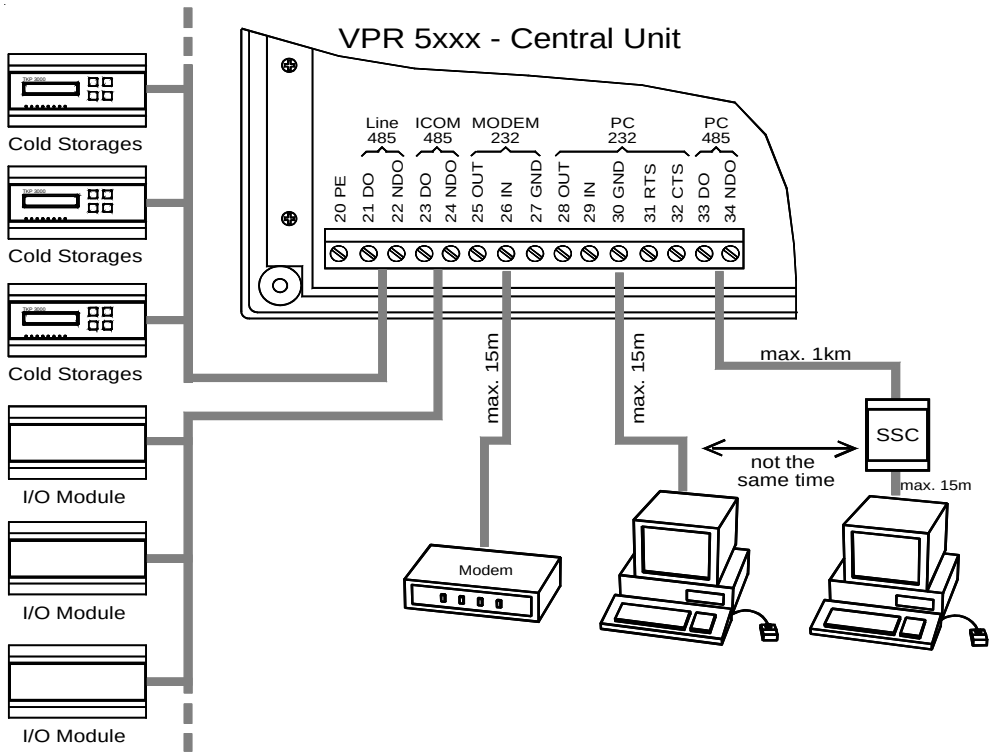
Channel switched OFF	->	Short pulse	->	Channel switches ON
	->	another short pulse	->	Channel switches OFF
Channel switched OFF	->	Short pulse	->	Channel switches ON and, at the next programmed OFF-time, OFF again
Channel switched ON	->	Short pulse	->	Channel switches OFF
	->	another short pulse	->	Channel switches ON.
Channel switched ON	->	Short pulse	->	Channel switches OFF and, at the next programmed point in time, ON again

If mains voltage is lost while a channel is switched manually, the VPR works with the programmed switch times after power-up again.

Summary

Reserve no. of switching channels on page	"*Parameter/Basic configuration*"
Preset no. of digital inputs for external switches on page	"*Parameter/Basic configuration*"
Enter switch times on page	"*Parameter/Time-switch data*"
Preset special days on page	"*Parameter/Time-switch special days*"

Data Exchange with other Components



For data exchange with other system components there are 5 serial interfaces available.

I/O-modules (e.g. series BMx) communicate via an independent ICOM-bus. Each module has an individual address on the bus, preset by an incremental switch.

Connection of the I/O Modules

Up to 64 cold storage controllers are able to communicate with the VPR Central Module via interface "*Line-485*" .

VPR <> Cold Storage Controllers

For remote control and data exchange with a standard PC, an RS-232 and an RS-485-interface is available. For distances PC <-> VPR < 15m the PC-232-inteface can be used, for longer distances the PC-485-interface must be used. For this purpose the PC must be equipped with such an interface (e.g. by external interface converter or add-on card).

PC-Connection

Only one of the PC-Interface types can be used the same time.

By the help of the MS-Windows-Software '***COOLVision-MES***' (from vers. 1.6) a complete configuration can be created in advance and can be uploaded to the VPR. Furthermore it is possible to download a running parameter-set to the PC for editing or backup purposes.
The data transfer speed to the VPR-Central Module is 9600 Baud (factory set), but can be varied if necessary (*Baudrate of PC-Interface,* Service-Data-Page).
Data transfer speed will be reset to standard automatically if communication is interrupted for more than 30 seconds.

Maintenance by PC

If various VPR or other controllers should be connected to a PC at the same time, the VPR must have a network address, which allows specific communication. The network address can be set on the 'Service-Data'-Page by '*Own DDC Network Address*'.

VPR in a network with a PC and other controllers

For remote control, remote maintenance and data recording, 2 different access topologies are possible:

Operation and Data Logging by PC

1: VPR-5000 with software "***COOL-Vision***", which runs continuously.
"***COOLVision***" works as Error Message Central, logs data and forwards messages via the most important communication lines (Modem, SMS, etc.).

2: VPR-5140 with software "***CV-Scheduler***". The software downloads data from the VPR, processes and visualizes them. Message forwarding is done by the VPR itself.

The Telephone Modem

To connect a modem there is an specialized RS-232-interface available (modem-232).
All modern telephone modems can be used. With the **VPR-5140** we use the SMS-Modem *MDM1002* exclusively, which allows to forward messages as SMS, Fax and Email.

All modems on the market differ a little bit in interfaces and instruction sets. By this, problems may occur, mostly the "initialization string" of the modem is the problem.

Initialization (Initstring)

Examples of Initstrings from standard modems

Modem type	Initstring	Date
ELSA Microlink 56 K	**ATS0=1X3S31.7=1*W**	MR000216
OLITEC SpeedCom 2000	**AT&F B9 &Q0 %E &K &A1 S0=1 &W**	MR011012
	AT &F X3 S0=1 &W	MR 011012

In case of system state changes like error messages, "all clear"-messages or similar, the VPR dials one of four preselected phone numbers (Dial command 1-4) via modem and tries to transmit the information. If the line to a PC with running **'COOLVision'** software is established, the PC will receive the message and sends a feed-back information to the VPR in order to cancel further dialing.
In case the VPR does not receive a confirmation, because the PC-software does not run or the phone line has a malfunction, it dials the next phone number after 5 minutes, etc., until a confirmation is received from '**COOLVision**'.

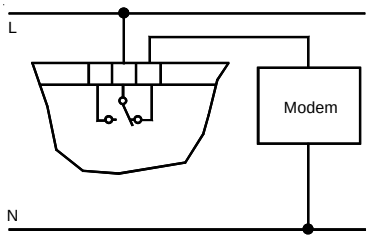
Transmission of Error Messages VPR -> Standardmodem

To ensure reliable standby operation of the connected modem, there are 2 safety functions available.

1. While power-up of the VPR, the initstring (Page "Configuration Modemoperation") will be transfered to the modem and then repeated in intervals.
2. The supply voltage of the modem can be switched by an reserved relay. 40 seconds before a connection attempt this relay shuts down the modem for 5 seconds. This resets all locks and sets the modem to a defined state. ("Modem relay used" = yes, page "Basic configuration").

The data transfer speed from and to the modem can be reduced while working in an environment with extreme disturbances.

Modem hardware setup



- Select desired position on page "*Configuration Modemoperation*"
- Push "**RET**", the first character position is marked (eventually, the systems asks her for an access code)
- Select desired character by "⇧⇩"
- Push "⇨", the next character position is marked
- Select next desired character by "⇧⇩", etc.
- Push "**RET**" to store the new text.

Enter Initstrings and Dial Commands at the VPR

By a daily check message at a specific time of day ("Control message time", Page "Configuration Modemoperation") the service technician knows that error message forwarding runs properly, even if no error message is present.

Check Message (all clear mess.)

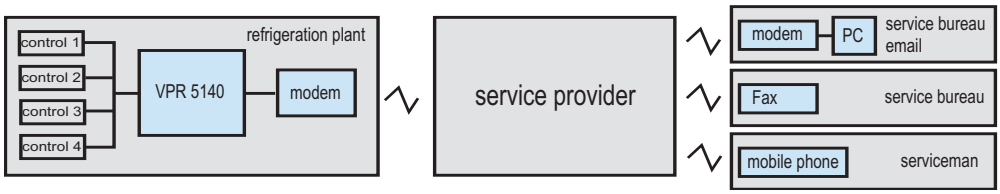
To prevent from changing system parameters by unauthorized persons via phone line, the VPR expects a special access code. You may preset this code on the '*Service-Data*'-Page (*Access Code DDC*). If the preset value is '**0**', the code is not activated.

Connect the VPR via Modem, Access Code

A call without knowing the code allows reading of parameters without changes only.

The SMS-Modem

The SMS-Modem "MDM 1002" is different from a standard modem because of an expanded instruction set. This allows to forward messages via providerservice "SMS in landline networks" as SMS, Fax and Email. These services are not possible with standard modems.



SMS in Landline Networks

The SMS-technology does not allow a direct transfer of messages to an addressee. To forward the message, the feature "SMS in Landline Networks" of a service provider needs to be used.

Servicecenter (Provider) and Services for SMS, SMS-Fax and SMS-eMail with the modem MDM-1002

Attention: the following numbers may differ or may changed by the provider at any time. The most reliable provider during our test was DTAG (Deutsche Telekom).

Provider	Country	Service	Phone No.	Protocol
DTAG (Telekom)	Germany	SMS in **all** mobile networks + Fax (Code 99) and Email (8000)	0193010	PSTN
Anny Way (Siemens)	Germany	SMS in **all** mobile networks	019001504	PSTN
D1 Telekom	Germany	SMS to the own network only + Fax (Code 99) and Email (8000)	0171 2521002	D1_TAP
E-Plus	Germany	SMS to the own network only	0177 1167	D1_TAP
Viag Interkom	Germany	SMS to the own network only	0179 7673425	D2_UCP
Vodaphone D2	Germany	SMS to the own network only	0172 2278020	D2_UCP
A1 Austria	Austria	SMS to the own network only	0900664914	Mobicom_A1_TAP

At this time for „SMS in Landline Networks“ no international standard exists. Because the development of this service is not completed, changes of protocols, phone numbers and codes may occur.
Using the feature „SMS“ inside the national networks is unproblematic, but a transmission to foreign networks may cause problems.
In germany, only the providers ‚DTAG‘ and ‚AnnyWay‘ are able to forward to all networks at this time. Only the providers ‚D1‘ and ‚DTAG‘ are able to forward messages as Fax and Email.

The VPR offers 3 reporting channels (Page "*Configuration Modemoperation*"). Via each channel, an SMS/Fax/eMail can be send. This allows e.g. to send 3 SMS to different addressees at different times or an error message as SMS, Fax or eMail at the same time.
The messages can be sent several times ("*No. of forwardings*") and at specific points in time ("*Forwarding interval*").

Forward Messages as SMS

Forward messages as SMS

- "*SMS Modem used*" = yes (Modem MDM-1002 must be connected)
- "*Init Command*" = AT+tixi=0S0=1x3&W
- "*Type*" = SMS
- "*Protocol used*" = Matching protocol of the provider (e.g. PSTN for Germ. Telekom)
- "*Timeframe from...to...*" = Time period the messages can be send to the phone number
- "*Service center*" = Phone number of your service provider (D.Telekom: 0193010)
- "*Phone-No.*" = Number of the mobile phone which should get the message.

Additional Codes for Provider Services

A direct transfer of messages to any fax is not possible. The MDM-1002-Modem forwards messages always as SMS, independend from the destination. By an *additional* code the SMS-Provider switches the messages to the desired destination. This additional code is prefixed to the phone-no.

Additional Codes

Deutsche Telekom
When the message must be transferred as FAX:

99 (german) + Fax number of the addressee
98 (english) + Fax number of the addressee

When the message must be transferred as Email:

8000 + Email address

Forwarding messages as FAX

- "*SMS Modem used*" = yes (Modem MDM-1002 must be connected)
- "*Init Command*" = AT+tixi=0S0=1x3&W
- "*Type*" = Fax
- "*Protocol used*" = Matching protocol of the provider (e.g. PSTN for Germ. Telekom)
- "*Timeframe from...to...*" = Time period the messages can be send to the phone number
- "*Service center*" = Phone number of your service provider (D.Telekom: 0193010)
- "*Phone-No.*" = **99** + Number of the Fax which should get the message.

The transfer of messages as emails is also possible via provider only. The MDM-1002-Modem forwards messages as SMS, by the additional code, the provider switches the message to the desired email address.

Forwarding messages as Email

- "*SMS Modem used*" = yes (Modem MDM-1002 must be connected)
- "*Init Command*" = AT+tixi=0S0=1x3&W
- "*Type*" = EMAIL
- "*Protocol used*" = Matching protocol of the provider (e.g. PSTN for Germ. Telekom)
- "*Timeframe from...to...*" = Time period the messages can be send to the phone number
- "*Service center*" = Phone number of your service provider (D.Telekom: 0193010)
- "*Phone-No.*" = **8000** (CodeNo. for Email)
- "*Email Address*" = The addressee of the message

The integrated Data Logger System

(VPR-5140 only)

The VPR 5140 contains an integrated Data Logger System. This is able to log actual values and setpoints of the system and the connected cold storage controllers e.g. for quality management purposes. All data will be stored to a nonvolatile memory in preset intervals. Additionally, logged data can be transferred to a local PC or by modem to a remote PC.
The system records always all actual values and setpoints of the connected controllers, individual controllers cannot be excluded from recording.

The memory system works based on the FIFO-Principle (First In/First Out), i.e. if memory is full, the oldest stored data will be owerwritten by the newest values.

Two (2) different interval settings for actual values and setpoints serve to keep down the quantity of data. In practise, actual values must be stored in 15 minute intervals, for setpoints a daily storage is enough.

Actual Value Intervals

The parameter "*Recording Interval Actual Values*" (Service Data page) defines the interval for logging the actual values.

Setpoint Intervals

The parameter "*Recording Interval Setpoints*" (Service Data page) defines the interval for logging the setpoints of the connected controllers.

Storage Capacity

The storage capacity of the VPR depends on number and type of the connected controller unit and the set recording interval. An extreme example would be 64 connected TKP controllers, in this case the memory has a capacity of 11 days only (15min/24h interval). Within this period, the data must be downloaded by a host.
Parameter "*Recording duration approx.*" (Service Data page) forms an estimate of data storage capacity depending on the assigned inputs and interval settings.

See some practise examples in the following table:

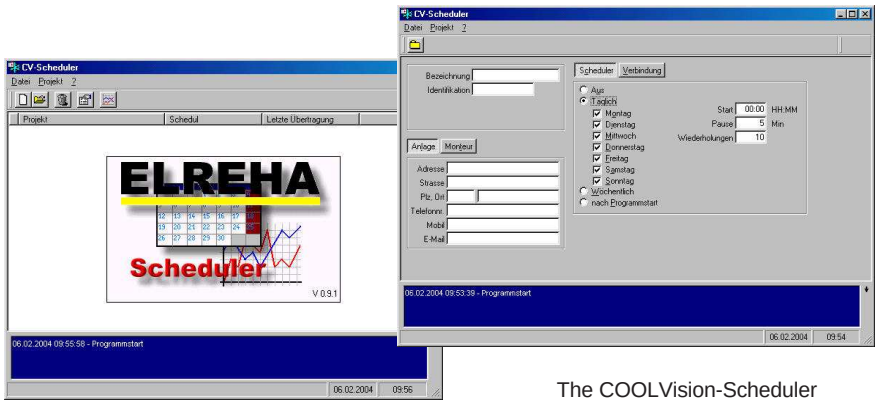
Act.Val-Interv. 15 min, Setp.-Interval 24h	Number of units	Storage Capacities
	64	11 days
	32	22 days
	10	50 days

Fetching data by a PC

To download data from the VPR the software „COOLVison-Scheduler“ is used. COOLVision-Scheduler cares for automatic download of recorded data from any number of cooling plants. This enables you to operate an „Alarm Head Office“, which need no operation by personnel.
The fetched data is stored in several databases to be processed by the ‚Analysis Module’.

Unlock the Data Logger System

Download and presentation of recorded data is only possible, if the VPR data logger was unlocked before. For this purpose, you must enter an Unlock-Code via PC-Software, which you got before.
This code is suitable to unlock one VPR only. If there is no Unlock Code available, the software can be used to read current data and to configure controller units only.



The COOLVision-Scheduler

Handling of (System)-Failures

In case of a malfunction at analog inputs and certain digital inputs the VPR-System behaves as follows:

Pressure Transmitter Failures (Suction Pressure)

If the transmitter signal leaves its nominal range (<4 or >20 mA), a transmitter failure is assumed and the following functions start:

- The stage controller feigns a high input signal which causes forward staging.
- The load limitation function becomes active and limits the power output to 55%
- Since the internal pressure limiters are out of order then, the suction pressure is limited by the external limiter switch
- The matching display reading for suction pressure shows 'def'

Pressure Transmitter Failures (High Pressure)

If the transmitter signal leaves its nominal range (<4 or >20 mA), a transmitter failure is assumed and the following functions start:

- The stage controller feigns a high input signal which forces a rapid forward staging of fans.
- To avoid excessive pressure dropping, the fan power is reduced to 55% by load limitation function.
- The functions '*C1/C2 CPr Pre Alm'* and'*C1/C2 CPr Alm*' are cancelled (suppressed) in this case.

Analog Outputs

If a transmitter signal leaves its nominal range (<4 or >20 mA), a transmitter failure is assumed and the analog output shuts down to a value below the specified range.
That means that the 2-10 V output delivers 1-1.5 V and the 4-20 mA output delivers 2-3 mA. Of course, in case of a power supply failure the output signals are 0 V / 0 mA. Any device using these outputs must identify this signal as faulty to initiate its own safety precautions.

Analog Output Malfunction

If you use the analog output to drive a fan speed controller without built-in override function: Add a fan stage with a high setpoint to the VPR configuration.
If the speed controller stops the fans because of a failed input signal, the pressure will increase until it exceeds the setpoint of this special stage. The output relay of this stage will be activated and is able to force the speed controller into override operation.

Warning Time Delay

All sensor and transmitter malfunction reactions are delayed by 60 seconds.

Cold Storage Controller Reaction upon Compound Failures

If the Cold Storage Controller is assigned to a compound system and one of the following failures is detected:

- Emergency OFF
- Asymmetrical load (phase lost)
- C1 high pressure switch (external)
- C2 high pressure switch (external)
- total compound malfunction

then the controller reacts as follows:

- solenoid valves close
- fans shut down
- a current defrost cycle will be terminated; no new defrost cycle is initiated before the failure situation is cleared.

Data Line Failure / Central Unit Shutdown

In case of a total shut off of the central unit, the compounds will run continuosly with those compressors which have been configured as 'emergency' compressors (inverted stages controlled by N/C relay contacts).
The Cold Storage Controllers (CST) run continuosly with the latest transmitted information.
If data connection between Central Module and CST is interrupted for more than 30 minutes, the CST's cancel a prior command for closing the solenoid valves by itself and work in standard mode.

Assignment of Messages/ Warnings to Priority Levels

The system is able to forward error messages via 5 potential-free relay contacts and a modem interface. Any message generated by the VPR system can be assigned to a single relay/relay groups and/or the modem.

Assignment

Assignment procedure using the VPR display:

- Each possible message within the VPR system has its own failure code (see listings next pages)
- '*No. of Alarm Relays*' (Page 'Basic Configuration') predefines up to **5** relays for alarm forwarding
- Codes can be assigned to one or more priority levels #1...#5 (relays 1 to 5). If you choose level #6, only the modem is assigned.
- At the end of the 'Parameters'- page you will find the items '*Failure-No*'. At this position you can enter the code number of the message to forward.
- Next to this item you find '*Priority*'. An asterisk (*) marks which relay or relay combination (1-5) should forward the message of that failure code.

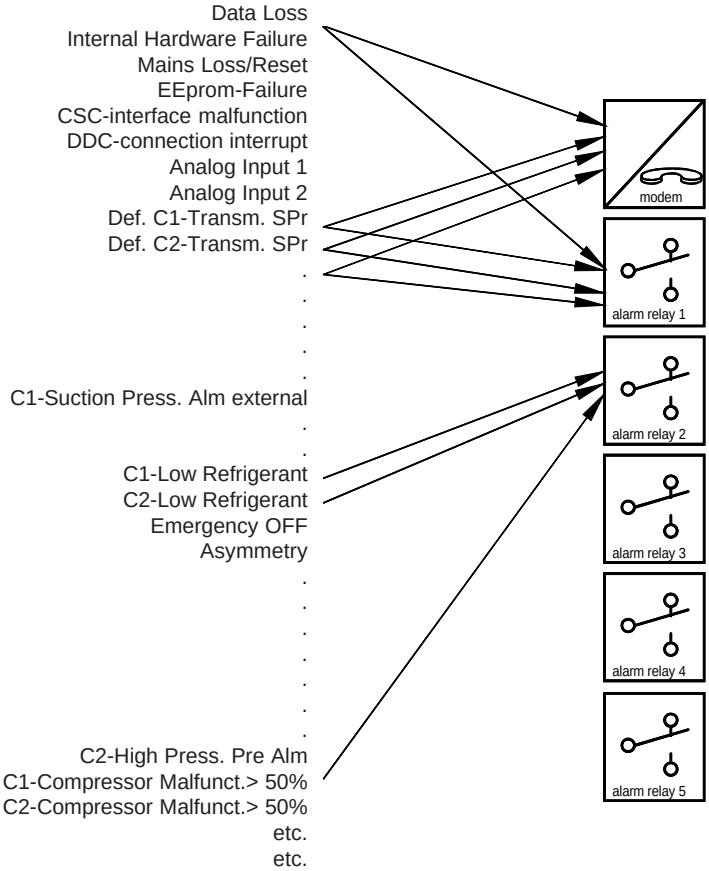
If no priority is marked, no error message will be forwarded. The assignment marks will be displayed using the up/down-keys after having pressed the 'PROG' key.

Examples

Example 1: *You want to forward error messages from a cold storage controller with address #10 to relay #1 and relay #3 and via modem.*
- The code for errors from the controller with address #10 is 160. Enter '160' at '*Failure-No*'.
- At '*Priority*' set marks at level 1 and level 3.

Example 2: *An error message from a single compressor of compound C1 must be forwarded via relay #1:*
- Pick out this code from the listing (=300) and enter it at '*Failure-No*'.
- At '*Priority*' set mark at level 1.

Principle of Assignment



You can also use the PC-Software "COOLVision" or "CV-Scheduler" to enter this assignments.

Alarm Refresh Function

To forward an error message an assigned alarm relay (SSM) normally shuts off permanently up to a reset. If a another failure occurs with the same priority, while the first messages is still present, this message is "covered" by the first one and no additional message can be forwarded.
If following error messages with identical priority should be forwarded by the same relay/relay group, the function 'Alarm Refresh' can be used, which is selectable for each SSM.

Switching Characteristic

Switching characteristic of an SSM with activated 'Alarm Refresh:

- Normal operation (no failure): ..... SSM is active ON
- A failure occurs: ..... SSM will be de-activated, time delay for refresh message runs down.
- An additional failure occurs: ..... SSM engages for 10 seconds (fleeting contact). Only possible, if time delay for refresh message has been run down.
- If a reset is released: ..... SSM engages
- New alarm: ..... SSM is able to cut off immediately

Disabling the function

The time delay for reinstated messages can be set individually for each SSM within 1...60 minutes (page "Basic Configuration"). The value '0' disables the function for the matching SSM.

A reset affects on all SSM with 'Alarm Refresh' function. A Reset can be made by:

Reset

- Key **F4** (Compound Failures Page)
- Digital input
  If the function is selected for at least one SSM, one digital input is reserved automatically.
  You can read it on the Connection Table (The system uses always the first unused digital input).

Quote amounts for Error Message Forwarding by Modem

This function serves for reducing the quantity of less important messages individually transferred by modem. Messages will be forwarded only, if they comply to specific criteria.

If this function is active, message forwarding via modem is only possible if:

- an incident (error message / all clear-message) with priority #6 (Modem) occurs
  or
- an (adjustable) quantity of incidents (error messages / all clear-messages) with priority #5 has occurred
  or
- an (adjustable) quantity of incidents (error messages / all clear-messages) with priority #4 has occurred and the system doesn't run in night mode.

  Error messages assigned to the other priority levels (1-3) will not be forwarded by the modem. This priority assignment is independent from the selected quantity of alarm relays (SSM).

Arranging of Error Message Codes from Cold Storage Controllers

To enable a more refined processing of error messages, the cold storage messages are subdivided in two groups.

- Failure codes of temperature warnings (at a TKP: Failure codes >=42, at an EVP: Failure codes >=23), will be processed with the selected priority.
- All other error messages of the cold storage will be processed with the closest lower priority, so less important messages can be suppressed e.g. during night operation.

Activate function, set quote of group

The parameter "*Blocksize to forward Err.prio 4+5*" (Parameter Page) represents the quantity of messages with priority 4+5, which cause forwarding if reached. Each value >1 switches the function ON.

De-activate function

Set parameter "*Blocksize to forward Err.prio 4+5*" (Parameter Page) to "1".

Quote amounts for Error Message Forwarding by Relays

This function serves for reducing the quantity of less important messages individually transferred by alarm (SSM) relays. Messages will be forwarded only, if they comply to specific criteria. This function is alike the previously described function 'Quote amounts for Error Message Forwarding by Modem'.

If matching alarm relays are reserved ("*No. of Alarm Relays*", Basic Configuration Page, set to 4 resp. 5) and the function is enabled, message forwarding via the alarm relays 4 and 5 is only possible under the following conditions:

- Set parameter "*Apply also to SSM 4+5*" (Parameter Page) to "yes"
  If this value is set to "no", the relays switch depending on the priority settings as usual.

  Enable the function

- SSM-5: Error messages with priority 5 will be counted and compared with the value set at "*Blocksize to forward Err.Prio4+5* " (Parameter Page). If the counter reaches this value, the alarm relay will switch with the next error message, the counter resets at the same time.

  Alarm relay SSM-5

- SSM-4: Error messages with priority 4 will be counted and compared with the value set at "*Blocksize to forward Err.Prio4+5*" (Parameter Page). During night operation, SSM-4 is disabled. If the preset amount of error massages is reached during night mode, SSM-4 will switch if the VPR changes to day mode and a current error is present. If there is no current error present at that point in time, the alarm relay will switch with the next occurring priority 4 error message. At the same time, the counter resets.

  Alarm relay SSM-4

Failure Codes

The following page(s) show the failure codes for each possible failure message. Some messages are of general nature and others are split into more detailed fragments. These additional messages are listed too, but they can not be assigned to a priority.

1 ..... SystemBreakdown
2 ..... Hardware-Failure
3 ..... Reset / Mains Fail.
4 ..... Data Failure
5 ..... Malf. C1, Circ.1 Cond. Temp.sensor
6 ..... Malf. C2, Circ.1 Cond. Temp.sensor
7 ..... Malf. C1, Circ.2 Cond. Temp.sensor
8 ..... Malf. C2, Circ.2 Cond. Temp.sensor
9 ..... Malf. C1, Circ.3 Cond. Temp.sensor
10 ..... Access Code

The message 'Identification' will be extended by the following items: (extended code)

10_1 ..... DDC ok
10_2 ..... DDC has failed 3 times
10_3 ..... DDC modified)
10_4 ..... ok
10_5 ..... Configuration ok
11 ..... Malfunct. C1 brine pressure transmitter
12 ..... Malfunct. C2 brine pressure transmitter
13 ..... Mains ON
15 ..... EEprom-Malfunction
16 ..... Malfunction CST-Line (VPR<>CST)
17 ..... Malfunction ICOM Line (VPR<>BMx)
18 ..... Malfunction DDC-Line (VPR<>PC)
19 ..... Mains Lost > 3 Seconds

20 ..... Malfunction Parameter Memory
21 ..... Malf. Humidity Transmitter
22 ..... Malf. Room Temperature Sensor
23 ..... Malf. Transm. C1 Suction pressure
24 ..... Malf. Transm. C1, Circ.1 High pressure
25 ..... Malf. Transm. C2 Suction pressure
26 ..... Malf. Sensor C2 High pressure
27 ..... Malf. C1 Control Sensor
28 ..... Malf. C1 Limit Sensor

29* ..... C1 Suction Pressure Alarm external
30* ..... C2 Suction Pressure Alarm external

31 ..... Malf. C1, Circ.1 Frost Protection Sens.
32 ..... Malf. C2 Frost Protection Sensor
33 ..... Malf. C1, Circ.2 Frost Protection Sens.
34 ..... Malf. C1, Circ.2 High Pressure Transm.
35 ..... Malf. C1, Circ.3/ C2, Circ.2 Frost-Prot.Sensor
36 ..... Malf. C2, Circ.2/ C1, Circ.3 Cond. Press.Transmitter
37 ..... Malf. C2-Control Sensor
38 ..... Malf. C2 Limit Sensor
39 ..... Malf. Outdoor temperature sensor

40* ..... C1 Suction Pressure Failure external
41* ..... C2 Suction Pressure Failure external
42* ..... C1 High Pressure Failure external
43* ..... C2 High Pressure Failure external
44* ..... C1 Low Refrigerant
45* ..... C2 Low Refrigerant
46* ..... Emergency OFF
47* ..... Asymmetrie
48* ..... C1 Brine Pressure Alarm internal
49* ..... C2 Brine Pressure Alarm internal

50* ..... C1 Suction Pressure Alarm internal
51* ..... C2 Suction Pressure Alarm internal
52 ..... C1 High Pressure Alarm internal
53 ..... C2 High Pressure Alarm internal
54* ..... C1 Pre-Alarm Suction Press. internal
55* ..... C2 Pre-Alarm Suction Press. internal
56 ..... C1 Pre-Alarm High Pressure internal
57 ..... C2 Pre-Alarm High Pressure internal
58 ..... C1, Circ.2 High Press. Alarm internal
59 ..... C1, Circ.2 Pre-Alarm High Press. int.

60 ..... C1, Circ.3 High Press. Alarm internal
61 ..... C1, Circ.3 Pre-Alarm High Press. int.
62 ..... C2, Circ.2 High Press. Alarm internal
63 ..... C2, Circ.2 Pre-Alarm High Pressure internal
64* ..... C1 Compressor Malfunction > 50%
65* ..... C2 Compressor Malfunction > 50%
66 ..... C1 Frost Protection internal
67 ..... C1, Circ.2 Frost Protection internal
68 ..... C1, Circ.3 Frost Protection internal
69 ..... C2 Frost Protection internal

70 ..... C2, Circ.2 Frost Protection internal
71* ..... C1 Frost Protection external
72* ..... C1, Circ.2 Frost Protection external
73* ..... C1, Circ.3 Frost Protection external
74* ..... C2 Frost Protection external
75* ..... C2, Circ.2 Frost Protection external
76* ..... C1 Compressor Malfunction 100%
77* ..... C2 Compressor Malfunction 100%
78 ..... Language data error

80 ..... Malfunction CSC Adr.00
81 ..... ' Adr.01
82 ..... ' Adr.02
83 ..... ' Adr.03
84 ..... ' Adr.04
85 ..... ' Adr.05
86 ..... ' Adr.06
87 ..... ' Adr.07
88 ..... ' Adr.08
89 ..... ' Adr.09

90 ..... ' Adr.10
91 ..... ' Adr.11
92 ..... ' Adr.12
93 ..... ' Adr.13
94 ..... ' Adr.14
95 ..... ' Adr.15
96 ..... ' Adr.16
97 ..... ' Adr.17
98 ..... ' Adr.18
99 ..... ' Adr.19

100 ..... ' Adr.20
101 ..... ' Adr.21
102 ..... ' Adr.22
103 ..... ' Adr.23
104 ..... ' Adr.24
105 ..... ' Adr.25
106 ..... ' Adr.26
107 ..... ' Adr.27
108 ..... ' Adr.28
109 ..... ' Adr.29

110 ..... ' Adr.30
111 ..... ' Adr.31
112 ..... ' Adr.32
113 ..... ' Adr.33
114 ..... ' Adr.34
115 ..... ' Adr.35
116 ..... ' Adr.36
117 ..... ' Adr.37
118 ..... ' Adr.38
119 ..... ' Adr.39

120 ..... ' Adr.40
121 ..... ' Adr.41
122 ..... ' Adr.42
123 ..... ' Adr.43
124 ..... ' Adr.44
125 ..... ' Adr.45
126 ..... ' Adr.46
127 ..... ' Adr.47
128 ..... ' Adr.48
129 ..... ' Adr.49

130 ..... ' Adr.50
131 ..... ' Adr.51
132 ..... ' Adr.52
133 ..... ' Adr.53
134 ..... ' Adr.54
135 ..... ' Adr.55
136 ..... ' Adr.56
137 ..... ' Adr.57
138 ..... ' Adr.58
139 ..... ' Adr.59

140 ..... ' Adr.60
141 ..... ' Adr.61
142 ..... ' Adr.62
143 ..... ' Adr.63

150 ..... CSC Alarm Adr.00
151 ..... ' Adr.01
152 ..... ' Adr.02
153 ..... ' Adr.03
153 ..... ' Adr.04
155 ..... ' Adr.05
156 ..... ' Adr.06
157 ..... ' Adr.07
158 ..... ' Adr.08.
159 ..... ' Adr.09

160 ..... ' Adr.10
161 ..... ' Adr.11
162 ..... ' Adr.12
163 ..... ' Adr.13
164 ..... ' Adr.14
165 ..... ' Adr.15
166 ..... ' Adr.16
167 ..... ' Adr.17
168 ..... ' Adr.18
169 ..... ' Adr.19

170 ..... ' Adr.20
171 ..... ' Adr.21
172 ..... ' Adr.22
173 ..... ' Adr.23
174 ..... ' Adr.24
175 ..... ' Adr.25
176 ..... ' Adr.26
177 ..... ' Adr.27
178 ..... ' Adr.28
179 ..... ' Adr.29

180 ..... ' Adr.30
181 ..... ' Adr.31
182 ..... ' Adr.32
183 ..... ' Adr.33
184 ..... ' Adr.34
185 ..... ' Adr.35
186 ..... ' Adr.36
187 ..... ' Adr.37
188 ..... ' Adr.38
189 ..... ' Adr.39

190 ..... ' Adr.40
191 ..... ' Adr.41
192 ..... ' Adr.42
193 ..... ' Adr.43
194 ..... ' Adr.44
195 ..... ' Adr.45
196 ..... ' Adr.46
197 ..... ' Adr.47
198 ..... ' Adr.48
199 ..... ' Adr.49
200 ..... ' Adr.50
201 ..... ' Adr.51

Failure Codes

202 ..... ' Adr.52
203 ..... ' Adr.53
204 ..... ' Adr.54
205 ..... ' Adr.55
206 ..... ' Adr.56
207 ..... ' Adr.57
208 ..... ' Adr.58
209 ..... ' Adr.59

210 ..... ' Adr.60
211 ..... ' Adr.61
212 ..... ' Adr.62
213 ..... ' Adr.63

214* ..... C1, Circ.1 Suction Press. Alarm ext.
215* ..... C1, Circ.1 High Pressure Alarm ext.
216* ..... C1, Circ.2 Suction Press. Alarm ext.
217* ..... C1, Circ.2 High Pressure Alarm ext.
217* ..... C1, Circ.3 Suction Press. Alarm ext.
219* ..... C1, Circ.3 High Pressure Alarm ext.
220* ..... C2, Circ.1 Suction Press. Alarm ext.
221* ..... C2, Circ.1 High Pressure Alarm ext.
222* ..... C2, Circ.2 Suction Press. Alarm ext.
223* ..... C2, Circ.2 High Pressure Alarm ext.

Error Messages of the additional temperature and pressure display inputs.

224 ..... Malf. Pressure Input 1
225 ..... Malf. Pressure Input 2
226 ..... Malf. Pressure Input 3
227 ..... Malf. Pressure Input 4
228 ..... Malf. Pressure Input 5
229 ..... Malf. Pressure Input 6
230 ..... Malf. Pressure Input 7
231 ..... Malf. Pressure Input 8
232 ..... Malf. Pressure Input 9
233 ..... Malf. Pressure Input 10
234 ..... Malf. Pressure Input 11
235 ..... Malf. Temperature Input 1
236 ..... Malf. Temperature Input 2
237 ..... Malf. Temperature Input 3
238 ..... Malf. Temperature Input 4
239 ..... Malf. Temperature Input 5
240 ..... Malf. Temperature Input 6
241 ..... Malf. Temperature Input 7
242 ..... Malf. Temperature Input 8
243 ..... Malf. Temperature Input 9
244 ..... Malf. Temperature Input 10
245 ..... Malf. Temperature Input 11
246 ..... Malf. Temperature Input 12
247 ..... Malf. Temperature Input 13
248 ..... Malf. Temperature Input 14
249 ..... Malf. Temperature Input 15

250 ..... C1 Runtime Suction Pressure Shift
251 ..... C2 Runtime Suction Pressure Shift

256* ..... C1, Circ.2 Cond. Fan 1 Safety Chain
257* ..... C1, Circ.2 Cond. Fan 2 Safety Chain
258* ..... C1, Circ.2 Cond. Fan 3 Safety Chain
259* ..... C1, Circ.2 Cond. Fan 4 Safety Chain
260* ..... C1, Circ.2 Cond. Fan 5 Safety Chain
261* ..... C1, Circ.2 Cond. Fan 6 Safety Chain
262* ..... C1, Circ.2 Cond. Fan 7 Safety Chain
263* ..... C1, Circ.2 Cond. Fan 8 Safety Chain
264* ..... C1, Circ.2 Cond. Fan 9 Safety Chain
265* ..... C1, Circ.2 Cond. Fan 10 Safety Chain
266* ..... C1, Circ.2 Cond. Fan 11 Safety Chain
267* ..... C1, Circ.2 Cond. Fan 12 Safety Chain

268* ..... C1, Circ.3 Cond. Fan 1 Safety Chain
269* ..... C1, Circ.3 Cond. Fan 2 Safety Chain
270* ..... C1, Circ.3 Cond. Fan 3 Safety Chain
271* ..... C1, Circ.3 Cond. Fan 4 Safety Chain
272* ..... C1, Circ.3 Cond. Fan 5 Safety Chain
273* ..... C1, Circ.3 Cond. Fan 6 Safety Chain
274* ..... C1, Circ.3 Cond. Fan 7 Safety Chain
275* ..... C1, Circ.3 Cond. Fan 8 Safety Chain
276* ..... C1, Circ.3 Cond. Fan 9 Safety Chain
277* ..... C1, Circ.3 Cond. Fan 10 Safety Chain
278* ..... C1, Circ.3 Cond. Fan 11 Safety Chain
279* ..... C1, Circ.3 Cond. Fan 12 Safety Chain

280* ..... C2, Circ.2 Cond. Fan 1 Safety Chain
281* ..... C2, Circ.2 Cond. Fan 2 Safety Chain
282* ..... C2, Circ.2 Cond. Fan 3 Safety Chain
283* ..... C2, Circ.2 Cond. Fan 4 Safety Chain
284* ..... C2, Circ.2 Cond. Fan 5 Safety Chain
285* ..... C2, Circ.2 Cond. Fan 6 Safety Chain
286* ..... C2, Circ.2 Cond. Fan 7 Safety Chain
287* ..... C2, Circ.2 Cond. Fan 8 Safety Chain
288* ..... C2, Circ.2 Cond. Fan 9 Safety Chain
289* ..... C2, Circ.2 Cond. Fan 10 Safety Chain
290* ..... C2, Circ.2 Cond. Fan 11 Safety Chain
291* ..... C2, Circ.2 Cond. Fan 12 Safety Chain

300* ..... C1 Compressor 1 Malfunction
301* ..... C1 Compressor 2 Malfunction
302* ..... C1 Compressor 3 Malfunction
303* ..... C1 Compressor 4 Malfunction
304* ..... C1 Compressor 5 Malfunction
305* ..... C1 Compressor 6 Malfunction
306* ..... C1 Compressor 7 Malfunction
307* ..... C1 Compressor 8 Malfunction
308* ..... C1 Compressor 9 Malfunction
309* ..... C1 Compressor 10 Malfunction
310* ..... C1 Compressor 11 Malfunction
311* ..... C1 Compressor 12 Malfunction

312* ..... C1 Brine Pump 1 Security Chain
313* ..... C1 Brine-Pump 2 Security Chain

320* ..... C2 Compressor 1 Malfunction
321* ..... C2 Compressor 2 Malfunction
322* ..... C2 Compressor 3 Malfunction
323* ..... C2 Compressor 4 Malfunction
324* ..... C2 Compressor 5 Malfunction
325* ..... C2 Compressor 6 Malfunction
326* ..... C2 Compressor 7 Malfunction
327* ..... C2 Compressor 8 Malfunction
328* ..... C2 Compressor 9 Malfunction
329* ..... C2 Compressor 10 Malfunction
330* ..... C2 Compressor 11 Malfunction
331* ..... C2 Compressor 12 Malfunction

Compressor failure messages will be extended by the following items (X= alarm code of failure):

x_8 ..... Motor protection
x_9 ..... Security Chain
x_10 .... Suction pressure
x_11 .... Öil pressure
x_12 .... High Pressure

332* ..... C2 Brine-Pump 1 Safety Chain
333* ..... C2 Brine-Pump 2 Safety Chain

340* ..... C1, Circ.1 Condenser 1 Safety Chain
341* ..... C1, Circ.1 Condenser 2 Safety Chain
342* ..... C1, Circ.1 Condenser 3 Safety Chain
343* ..... C1, Circ.1 Condenser 4 Safety Chain
344* ..... C1, Circ.1 Condenser 5 Safety Chain
345* ..... C1, Circ.1 Condenser 6 Safety Chain
346* ..... C1, Circ.1 Condenser 7 Safety Chain
347* ..... C1, Circ.1 Condenser 8 Safety Chain
348* ..... C1, Circ.1 Condenser 9 Safety Chain
349* ..... C1, Circ.1 Condenser 10 Safety Chain
350* ..... C1, Circ.1 Condenser 11 Safety Chain
351* ..... C1, Circ.1 Condenser 12 Safety Chain

360* ..... C2, Circ.1 Condenser 1 Safety Chain
361 ..... C2, Circ.1 Condenser 2 Safety Chain*
362* ..... C2, Circ.1 Condenser 3 Safety Chain
363* ..... C2, Circ.1 Condenser 4 Safety Chain
364* ..... C2, Circ.1 Condenser 5 Safety Chain
365* ..... C2, Circ.1 Condenser 6 Safety Chain
366* ..... C2, Circ.1 Condenser 7 Safety Chain
367* ..... C2, Circ.1 Condenser 8 Safety Chain
368* ..... C2, Circ.1 Condenser 9 Safety Chain
369* ..... C2, Circ.1 Condenser 10 Safety Chain
370* ..... C2, Circ.1 Condenser 11 Safety Chain
371* ..... C2, Circ.1 Condenser 12 Safety Chain

400 ..... Message Input 0
401 ..... Message Input 1
402 ..... Message Input 2
403 ..... Message Input 3
404 ..... Message Input 4
405 ..... Message Input 5
406 ..... Message Input 6
407 ..... Message Input 7
408 ..... Message Input 8
409 ..... Message Input 9

410 ..... Message Input 10
411 ..... Message Input 11
412 ..... Message Input 12
413 ..... Message Input 13
414 ..... Message Input 14
415 ..... Message Input 15
416 ..... Message Input 16
417 ..... Message Input 17
418 ..... Message Input 18
419 ..... Message Input 19

420 ..... Message Input 20
421 ..... Message Input 21
422 ..... Message Input 22
423 ..... Message Input 23
424 ..... Message Input 24
425 ..... Message Input 25
426 ..... Message Input 26
427 ..... Message Input 27
428 ..... Message Input 28
429 ..... Message Input 29

430 ..... Message Input 30
431 ..... Message Input 31
432 ..... Message Input 32
433 ..... Message Input 33
434 ..... Message Input 34
435 ..... Message Input 35
436 ..... Message Input 36
437 ..... Message Input 37
438 ..... Message Input 38
439 ..... Message Input 39

440 ..... Message Input 40
441 ..... Message Input 41
442 ..... Message Input 42
443 ..... Message Input 43
444 ..... Message Input 44
445 ..... Message Input 45
446 ..... Message Input 46
447 ..... Message Input 47

450 ..... BMx Addr. 0 : malfunction
451 ..... BMx Addr. 1 : malfunction
452 ..... BMx Addr. 2 : malfunction
453 ..... BMx Addr. 3 : malfunction
454 ..... BMx Addr. 4 : malfunction
455 ..... BMx Addr. 5 : malfunction
456 ..... BMx Addr. 6 : malfunction
457 ..... BMx Addr. 7 : malfunction
458 ..... BMx Addr. 8 : malfunction
459 ..... BMx Addr. 9 : malfunction
460 ..... BMx Addr. 10 : malfunction
461 ..... BMx Addr. 11 : malfunction
462 ..... BMx Addr. 12 : malfunction
463 ..... BMx Addr. 13 : malfunction
464 ..... BMx Addr. 14 : malfunction
465 ..... BMx Addr. 15 : malfunction

Failure Codes

470 ..... BMx Addr. 0 : error
471 ..... BMx Addr. 1 : error
472 ..... BMx Addr. 2 : error
473 ..... BMx Addr. 3 : error
474 ..... BMx Addr. 4 : error
475 ..... BMx Addr. 5 : error
476 ..... BMx Addr. 6 : error
477 ..... BMx Addr. 7 : error
478 ..... BMx Addr. 8 : error
479 ..... BMx Addr. 9 : error
480 ..... BMx Addr. 10 : error
481 ..... BMx Addr. 11 : error
482 ..... BMx Addr. 12 : error
483 ..... BMx Addr. 13 : error
484 ..... BMx Addr. 14 : error
485 ..... BMx Addr. 15 : error

486 ..... Assignment - Relays
- Digital Inputs
- Analog Output
- 4-20mA Input
- Temperature Input

TKP Cold Storage Controllers (CSC)
Cold storage alarms will be extended by the following items (X= alarm code of CSC address):

x_1 ..... Data Init (first initialisation)
x_2 ..... Hardware failure
x_3 ..... Mains supply on / Reset
x_4 ..... Mains supply cut off
x_5 ..... Security chain
x_6 ..... Digital input 1
x_7 ..... Digital input 2
x_8 ..... Digital input 3
x_9 ..... Digital input 4
x_10 ..... Door contact 1
x_11 ..... Door contact 2
x_12 ..... Door contact 3
x_13 ..... Door contact 4
x_14 ..... Runtime door 1
x_15 ..... Runtime door 2
x_16 ..... Runtime door 3
x_17 ..... Runtime door 4
x_18 ..... Runtime K1
x_19 ..... Runtime K2
x_20 ..... Runtime K3
x_21 ..... Runtime K4
x_22 ..... Runtime Defrost 1
x_23 ..... Runtime Defrost 2
x_24 ..... Runtime Defrost 3
x_25 ..... Runtime Defrost 4
x_30 ..... Sensor F1 broken
x_31 ..... Sensor F2 broken
x_32 ..... Sensor F3 broken
x_33 ..... Sensor F4 broken
x_34 ..... Sensor F5 broken
x_35 ..... Sensor F6 broken
x_36 ..... Sensor F1 short circuit
x_37 ..... Sensor F2 short circuit
x_38 ..... Sensor F3 short circuit
x_39 ..... Sensor F4 short circuit
x_40 ..... Sensor F5 short circuit
x_41 ..... Sensor F6 short circuit
x_42 ..... Sensor K1 low temperature
x_43 ..... Sensor K2 low temperature
x_44 ..... Sensor K3 low temperature
x_45 ..... Sensor K4 low temperature
x_46 ..... Sensor K1 high temperature
x_47 ..... Sensor K2 high temperature
x_48 ..... Sensor K3 high temperature
x_49 ..... Sensor K4 high temperature
x_51 ..... Line Address
x_52 ..... Controller on
x_53 ..... Controller off
x_54 ..... Assignment
x_55 ..... internal
x_56 ..... Circuit 1 OFF
x_57 ..... Circuit 2 OFF
x_58 ..... Circuit 3 OFF
x_59 ..... Circuit 4 OFF

EVP-Cold Storage Controllers (CSC)
Cold storage alarms will be extended by the following items (X= alarm code of CSC address):

x_1 ..... Data Init (first initialisation)
x_2 ..... Hardware failure
x_3 ..... Mains supply on / Reset
x_4 ..... Mains supply cut off
x_5 ..... Safety chain
x_6 ..... Digital input
x_7 ..... Door contact
x_8 ..... Runtime door
x_9 ..... Runtime Defrost
x_15 ..... Sensor F1 broken
x_16 ..... Sensor F2 broken
x_17 ..... Sensor F3 broken
x_18 ..... Sensor F4 broken
x_19 ..... Sensor F1 short circuit
x_20 ..... Sensor F2 short circuit
x_21 ..... Sensor F3 short circuit
x_22 ..... Sensor F4 short circuit
x_23 ..... Low temperature
x_24 ..... High temperature
x_27 ..... Line Address
x_28 ..... Controller on
x_29 ..... Controller off
x_30 ..... Assignment
x_31 ..... Internal

If failure No.46 'EnergencyOFF' is active, all error messages marked with (*) will be suppressed.

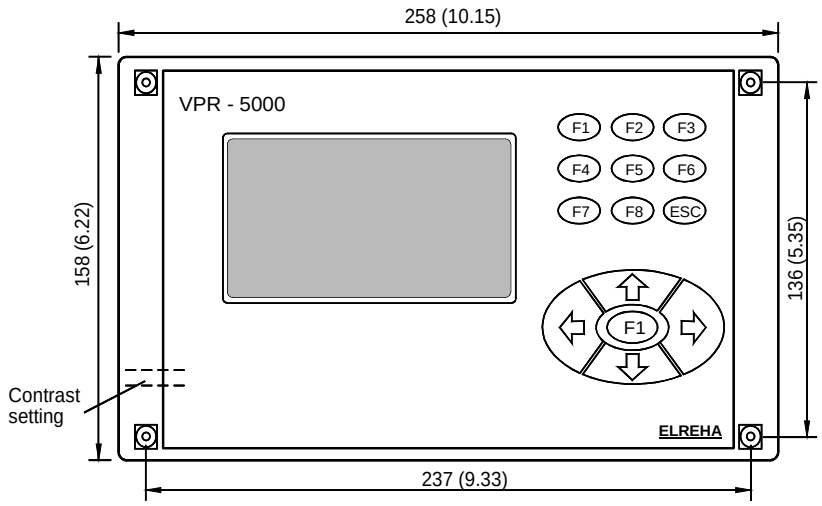
VPR-Central Unit

The central unit of the VPR-Systems is a metal housing for mounting in panels or doors.
All electrical connections can be made by pluggable 2,5mm² screw terminals on the rear side.

The central unit contains LC-screen, keypad, mains power supply, 5 interfaces and 5 relay outputs. The unit is available in 2 versions:

VPR-5000 Standard version
VPR-5140 Version with integrated Data Logger System

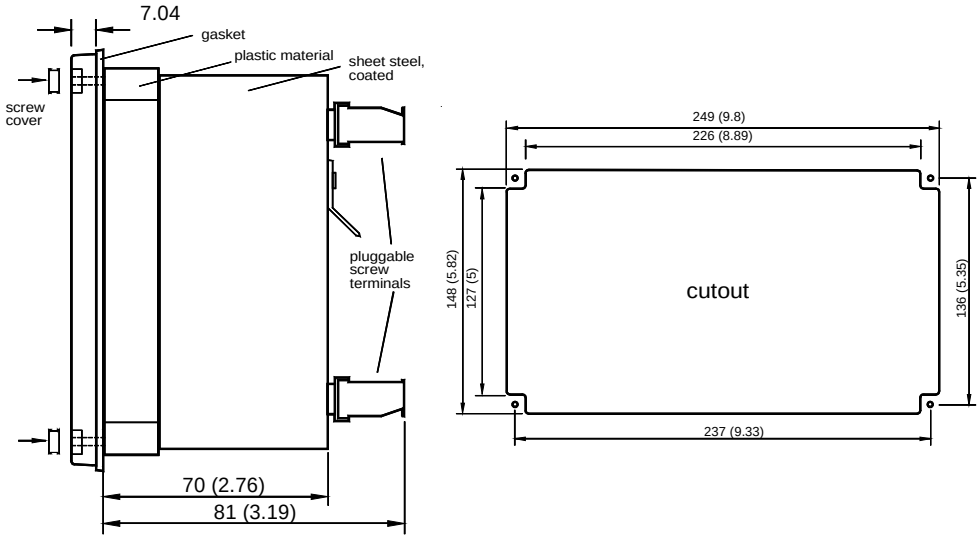
Versions



Front View

Assembly Note

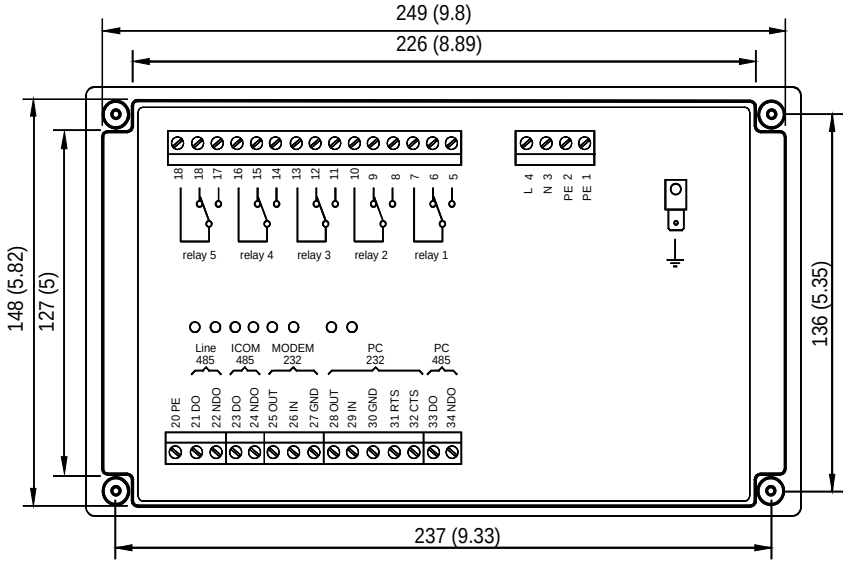
The 4 mounting screws can be covered by the delivered plastic caps.



Side View

Assembly Note

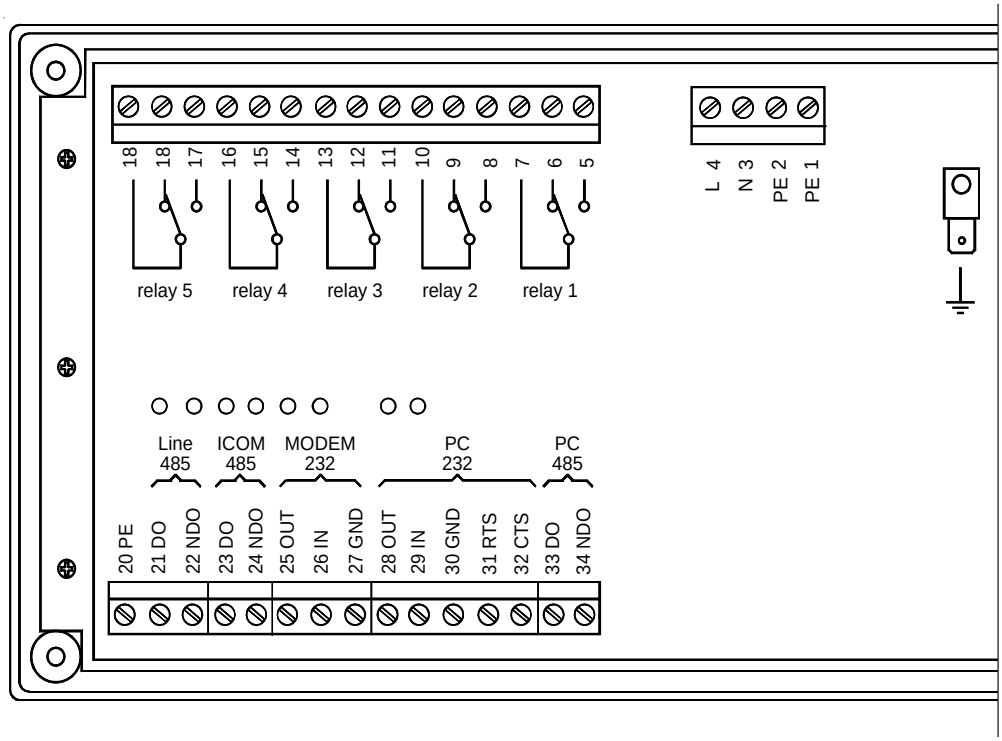
Please note the special cutout for the cabinet door/panel!



Rear View

Electrical Connection

Electrical connections are made by pluggable screw terminals 2,5 mm² (except the main ground terminal). The housing may not be opened, there are no operating elements inside.



Technical Data

Supply Voltage	230V~ / 50-60 Hz
Power Consumption	max. 25 VA
Operating-/Storage Temperature	0...50°C
Display Resolution	1/100 bar resp. 0.1K.
Physical Values (Temperature)	°C or °F
Real Time Clock	x-tal, automatic summer/winter switch
Data Storage without mains supply	Data: unlimited, Real Time Clock: typ. 10 years
Relay Outputs	5x SPDT
Contact Rating	8 A (cos phi = 1), 3 A ind. / 230V AC
Interfaces	**2**x RS-232, **3**x RS 485
Housing	Metal/Plastic for panel or door mounting

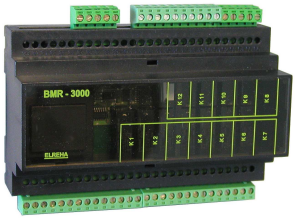
Digital inputs of the I/O-modules can be used as follows:

	status signals from compressors and condenser fans
external alarm messages like	oil pressure, hot gas, low / high pressure, motor protection
message inputs for each compound	(C1/C2), pressure limiter, emergency pressure limiter, low refrigerant, suction pressure monitor
system messages like	global alarm message inputs , peak load limit 1+2, emergency OFF, loss of phase /asymmetry, setpoint shift, and much more.

Refrigerant Tables	R22, R134a, NH3, R23, R123, R507 (AZ50, HP62), R402a (HP80), R402b (HP81), R404a (HP62, FX70) R407c, R290, CO_2 (others on demand)

I/O-Modules

The I/O-Modules of the series BMx for DIN-rail mounting are able to capture states and analog values, to control plant components or to forward error messages. The modules are connected to the Central Unit via databus (e.g. to the VPR 5140).
All terminals are pluggable for easy electrical connection. At this time, 4 different I/O modules are available.



BMR 3001 - Relay Module

- Housing for rail mounting (35 mm)
- 12x Output Relays (SPDT), 8A
- RS-485-Interface

BMO 3xxx - Digital Input Module

- Housing for rail mounting (35 mm)
- RS-485-Interface
- **BMO 3011** - 24x digital inputs for mains voltage
- **BMO 3031** - 24x digital inputs for 24V AC

BMA 3251 - Analog Module

- Housing for rail mounting (35 mm)
- 1x Temperature probe input Pt1000 (TF 501)
- 5x 4...20 mA standard signal inputs
- 2x Analogue output channels with a 4...20mA and a 0...10V output each
- RS-485-Interface

BMA 3206 - Analog Module

- Housing for rail mounting (35 mm)
- 6x Temperature probe input Pt1000 (TF 501)
- 2x Analogue output channels with a 4...20mA and a 0...10V output each
- RS-485-Interface

Relay Module BMR 3001

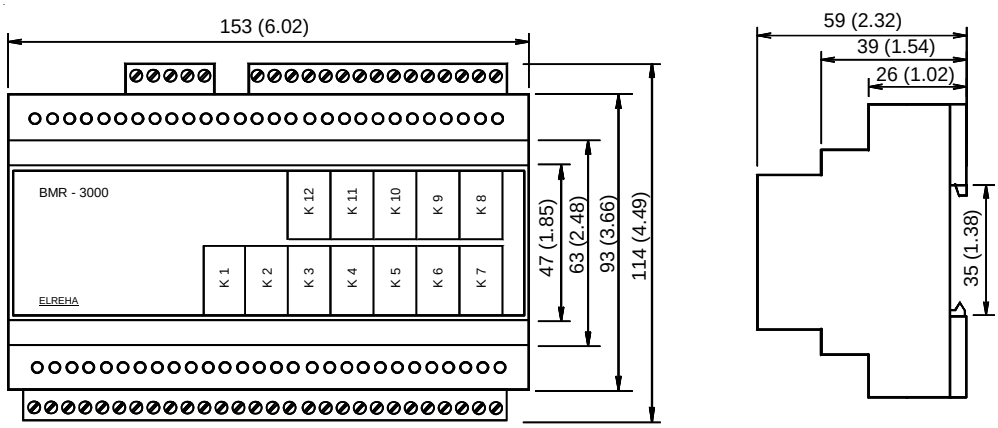
The relay module BMR 3001 serves to control plant components, therefore it is equipped with 12 SPDT output relays.

Databus Connection / Address Setting
The BMR is connected to the ICOM-databus of the central unit by its RS-485-interface. The module gets an individual address, which can be set by two incremental switches at the upper side of the housing. The red LED „Mains“ indicates the readiness for operation, the LED „Com“ indicates communication with the central unit.

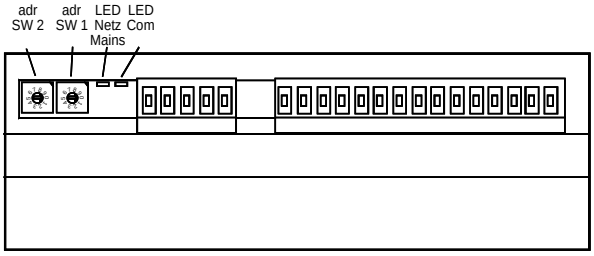
Switching States
The status of each relay is indicated by a LED (LED on = relay activated), which is visible through the transparent cover.

Technical Data
Supply Voltage / Power Consumption ..... 230V 50Hz / appr. 5VA
Ambient Temperature ..... 0...+50°C (32...122°F)
Max. Ambient Humidity ..... 85% r.F., not condensing
Switching Outputs ..... 12x SPDT, potential free, 8A cos phi=1/250VAC
Relay indicators ..... LED
Interface ..... RS 485 (ICOM)
Housing ..... ABS with transparent cover, IP 30

Dimensions



Address-Switch / Address Setting

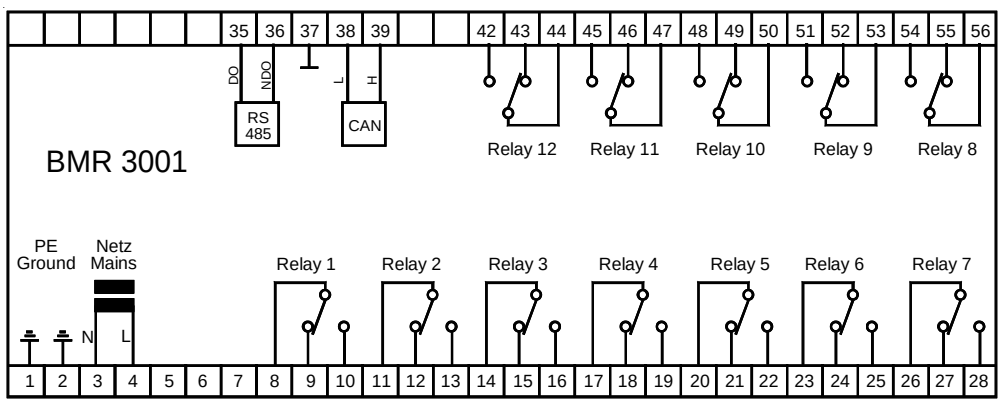


Setting an databus-address

	adrSW 2	adrSW 1
0	0	0
1	0	1
2	0	2
3	0	3
4	0	4
etc....		
10	1	0
11	1	1
12	1	2
and so on. The highest usable address is '77'		

LED-Functions:
After power-up: Mains-LED blinking: tens column of the address
Com-LED blinking: ones column of the address
Normal Operation: Mains-LED blinks slowly
Module sends data: Com-LED continous ON

Electrical Connection



Digital Input Modules BMO 30x1

The I/O-Modules of the series BMO for DIN-rail mounting are able to capture status messages by 24 opto-decoupled digital inputs.

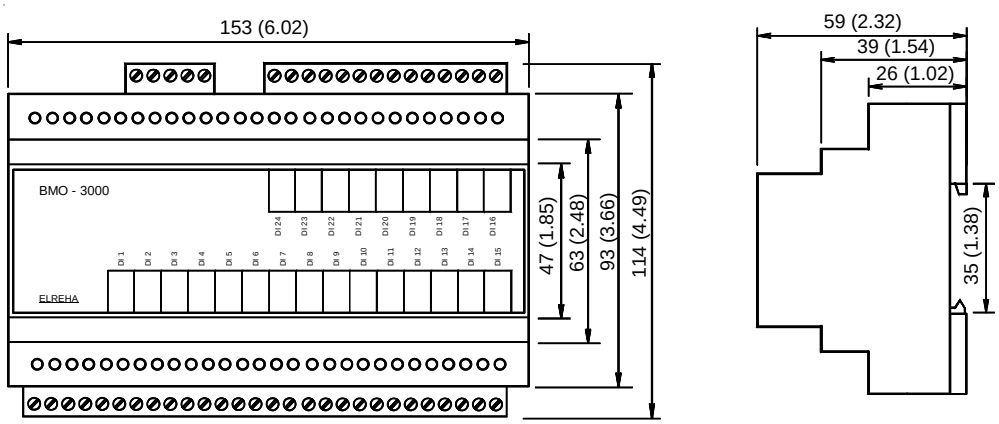
Databus Connection / Address Setting
The BMO is connected to the ICOM-databus of the central unit by its RS-485-interface. The module gets an individual address, which can be set by two incremental switches at the upper side of the housing. The red LED „Mains“ indicates the readiness for operation, the LED „Com“ indicates communication with the central unit.

State of the Inputs
One LED per input shows the current state (LED on = voltage present), the LED's are visible through the transparent cover.

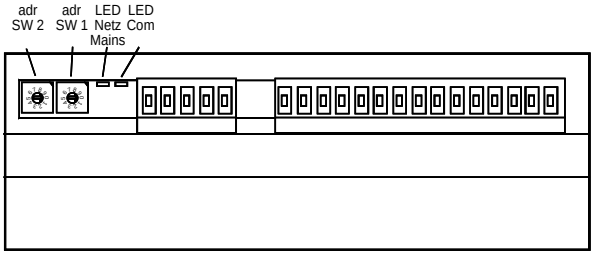
Technical Data

Supply Voltage / Power Consumption		230V 50Hz / appr. 5VA
Ambient Temperature		0...+50°C (32...122°F)
Max. Ambient Humidity		85% r.F., not condensing
Digital Inputs	BMO 3011	24x mains voltage, max. 2 mA
	BMO 3031	24x 24V AC, max. 2 mA
Input Indicators		LED
Interface		RS 485 (ICOM)
Housing		ABS with transparent cover, IP 30

Dimensions



Address-Switch / Address Setting



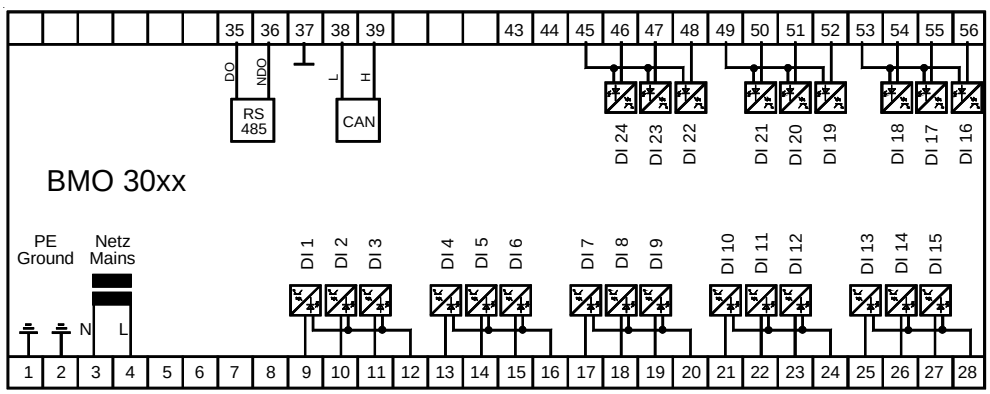
LED-Functions:

After power-up:	Mains-LED blinking: tens column of the address
	Com-LED blinking: ones column of the address
Normal Operation:	Mains-LED blinks slowly
Module sends data:	Com-LED continous ON

Setting an databus-address

	adrSW 2	adrSW 1
0	0	0
1	0	1
2	0	2
3	0	3
4	0	4
etc....		
10	1	0
11	1	1
12	1	2
and so on. The highest usable address is '77'		

Electrical Connection



Analog Modules BMA 3251 and BMA 3206

The Analog Input Modules of the BMA 32xx series are able to capture actual values from 4-20 mA sources (pressure-/humidity transmitters) and/or temperatures. 2 analog output channels are able to control plant components like e.g. frequency inverters. Each output channel is equipped with an 0-10V and 4-20 mA output.

Databus Connection / Address Setting
The BMA is connected to the ICOM-databus of the central unit by its RS-485-interface. The module gets an individual address, which can be set by two incremental switches at the upper side of the housing. The red LED „Mains“ indicates the readiness for operation, the LED „Com“ indicates communication with the central unit.

Technical Data

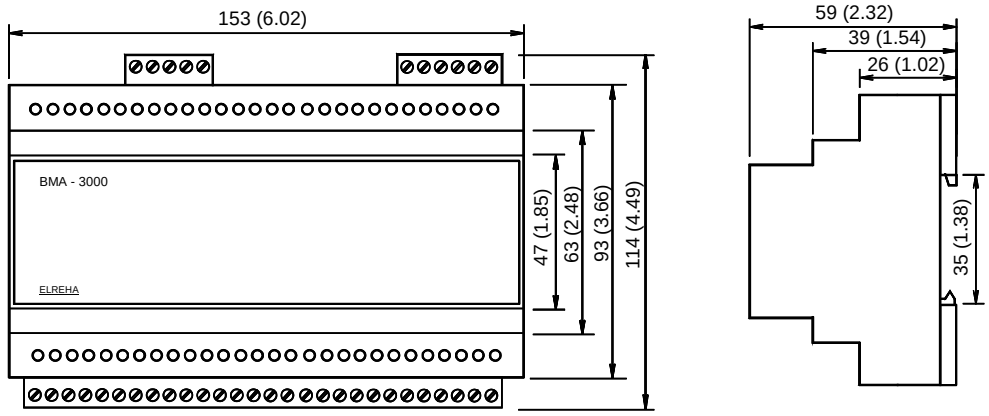
Supply Voltage / Power Consumption		230V 50Hz / ca. 8VA
Ambient Temperature		0...+50°C (32...122°F)
Max. Ambient Humidity		85% r.F., not condensing
Temperature sensor input	BMA 3251	1x TF 501 (Pt1000)
	BMA 3206	6x TF 501 (Pt1000)
Standard signal inputs		5x 4-20mA, Ri 100 Ohm
Analogue Outputs		2 output channels with a 0/10V and a 4/20mA output each
Transmitter Supply		18V, **max. 100mA**
Interface		RS 485 (ICOM)
Housing		ABS with transparent cover, IP 30

Important note about Transmitter Supply

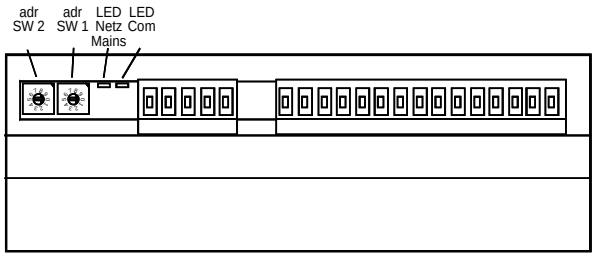
The power supply is able to deliver max. 100 mA DC at 195V mains voltage. If there is more current needed, an additional, external power source must be planned.

Examples for 100mA load:
- 3x two-wire pressure transmitters + 2x 4-20mA outputs or
- 5x two-wire pressure transmitters + 2x 0-10V outputs

Dimensions



Address-Switch / Address Setting



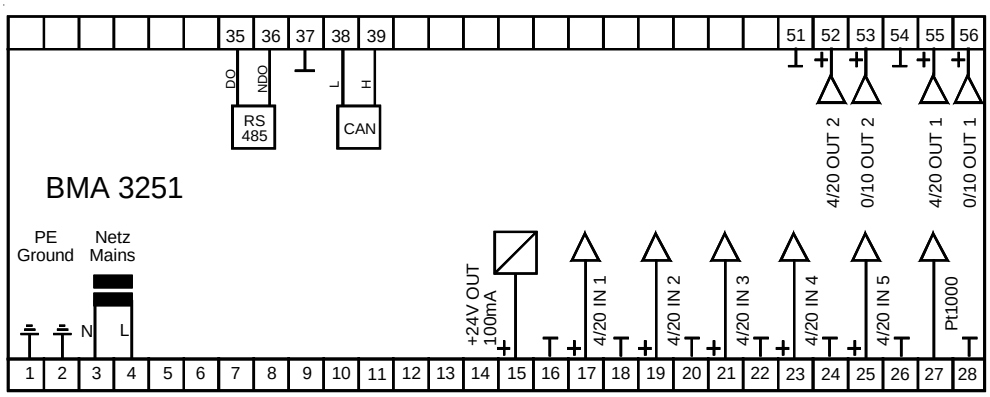
Setting an databus-address

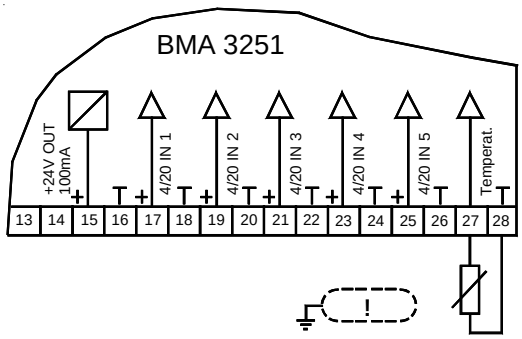
	adrSW 2	adrSW 1
0	0	0
1	0	1
2	0	2
3	0	3
4	0	4
etc....		
10	1	0
11	1	1
12	1	2
and so on. The highest usable address is '77'		

LED-Functions:

After power-up:	Mains-LED blinking: tens column of the address Com-LED blinking: ones column of the address
Normal Operation:	Mains-LED blinks slowly
Module sends data:	Com-LED continous ON

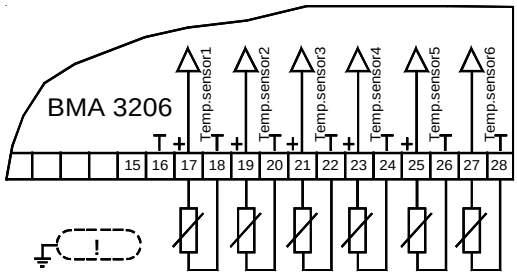
Electrical Connection

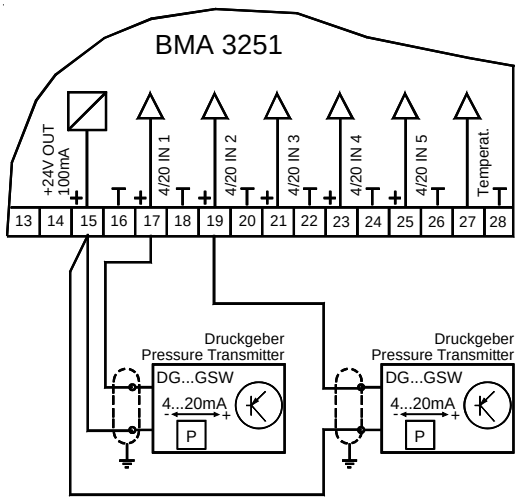




Temperature Sensor Connection

The type of the matching sensor must be set on the page "Configuration Temperature Probes".





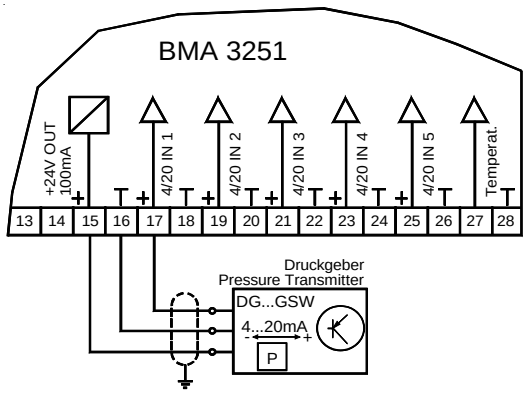
2-wire Pressure Transmitter Connection

Important note about Transmitter Supply

The power supply is able to deliver max. 100 mA DC at 195V mains voltage. If there is more current needed, an additional, external power source must be provided.

Examples for 100mA load:

- 3x two-wire pressure transmitters + 2x 4-20mA outputs or
- 5x two-wire pressure transmitters + 2x 0-10V outputs



3-wire Pressure Transmitter Connection

Assembly

While planning machinery and assembling electrical components please observe the EMC basics. The most important information you can find on a separate data sheet which can be downloaded from our website.

- The VPR-5xxx-Central Unit is designed for panels or doors of electrical cabinets. It is mounted in a cutout and fixed by 4 screws. The screw holes in the mounting frame can be covered by 4 delivered plastic caps.

VPR-Central Unit

- There should be a free space of at least 15 cm above the housing for the warm air outlet. Take care that the max. operation temperature of the system cannot be exceeded.
  Overheating decreases the life of electronic components !
  If the inner temperature of the cabinet (measured at the upper side of the VPR) increases the nominal value, you must use a blower fan to ventilate the unit with ambient air.

Ventilation

- The I/O modules are designed for rail mounting and must be mounted at a position where a ground terminal is close to each module.

I/O-Modules

- Avoid placing the units next to big contactors or transformers.
  Never use a position in the cabinet sector with the main power switch and the mains power input.

Mounting Position

- While the assembly of central unit and I/O-modules not a short distance is the most important thing but in fact the correct grounding.

Distances VPR <-> I/O-Modules

Electrical Installation, Mains Voltage

ELREHA has made its electronic products as interference proof as possible to ensure a maximum of safety in function. But in the end an electronic device is only a part of a complete electric system which includes wiring and other electric components as well.
No electronic unit can be made so safe that you can neglect the wiring conditions. You can safe costs for further immunity provisions if you just follow some rules for achieving a good function.

Separate Power Switch

- There should be a switch or a fuse in the mains supply to the VPR which allows the user to cut the supply separately from the other electric devices.
  Switching OFF the complete plant with just one main switch results in high energy sparks which are able to destroy data memories.
  The same might happen when the supply for the VPR is buffered by a generator or a UPS.

PE-Terminals

- "Ground (PE)"-terminals of the units must be connected to the closest ground terminals in the cabinet. If a unit demands for several ground wires, the reason is to ensure a low resistance connection, which is not always possible inside the unit.

- In the cabinet the resistance between the N and the Ground(PE)-terminal is **not allowed to be higher than 0.1 ohms** to prevent voltage drops.

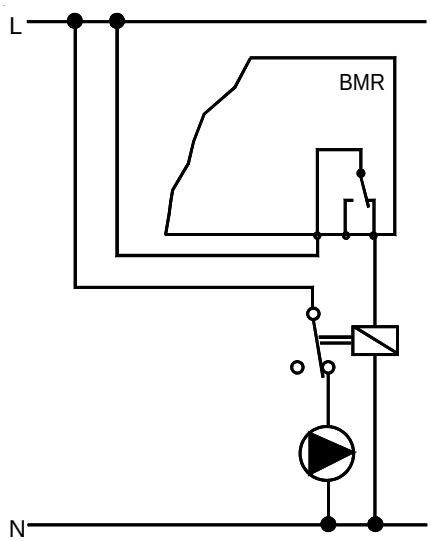
Ground Equalization

- If parts of the system are located in different cabinets and/or in different buildings, the ground (PE) voltage levels must be equalized to ensure a good data transmission.
  Equalizing currents flowing in the shielding of data cables may cause data failures.

If there is no separate balancing of PE's installed, you should run an equalizing cable of at least 6 mm² with the bus line to guarantee a common level PE.

Brine Pump Connection

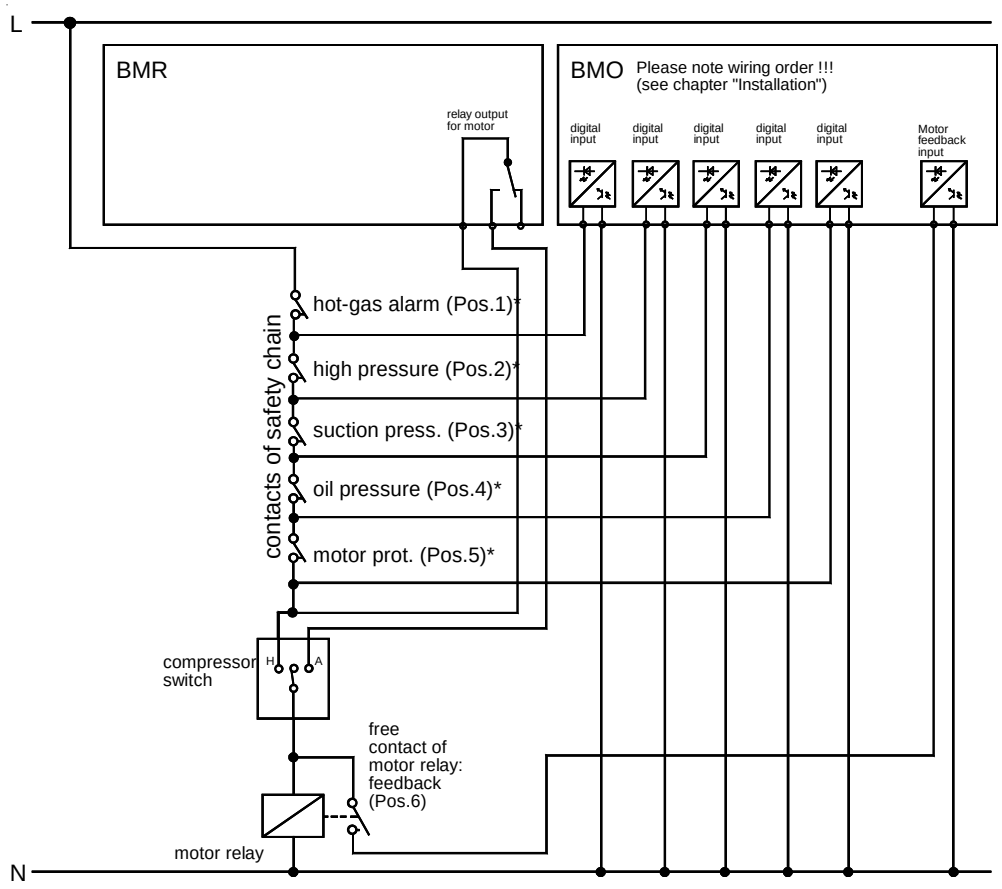
- Please note that brine pumps are always switched by the N/C-contact of the assigned relay.



While planning machinery and assembling electrical components please observe the EMC basics. You can find the most important information on a separate data sheet which can be downloaded from our website.

- Take a motor feedback signal from a point where the contacts of the safety chain are included and employ a free contact of the motor contactor too. This keeps the VPR informed about all motor interrupts.

Generating Feedback Signals



Single Error Messages and Feedback Signals

(simplified,
see chapter 'compressors and fans')

*** see printed Connection Table**

CAUTION!
The VPR recognizes the first input after an open contact as faulty. Because of that, the order of the connected signals is very important. For the order of error messages on the safety chain use only this circuit diagram, even if your printed terminal plan shows a different order.

Electrical Installation, Signal wires

- Make wire connections as short as possible. This saves material and costs and limits the risk of malfunction. Avoid hot 'reserve' cables, they affect like an antenna.

- Signal and sensor cables must not run in parallel and in the same cable duct with those cables which carry mains voltage.

- To connect pressure transmitters, temperature sensors or other analogue sources use shielded cable only. Please note the cable requirements.
  The necessary diameters are not critical, 0,5mm² of each core is adequate.

- Connect the shielding of sensor cables to PE at one end only, the best PE-location is close to the controller in the electrical control cabinet. Please note upon the need to shield the cable up to the controller, not only up to the input terminals of the electrical control cabinet.

While planning machinery and assembling electrical components please observe the EMC basics. You can find the most important information on a separate data sheet which can be downloaded from our website.

For sensor wires, shielded cable must be used, but the cores needn't to be twisted.
If shielded, the lenght of sensor wires can be increased almost unlimited, no problems occur with lenghts up to 100m (328 ft). The following qualities should be observed:

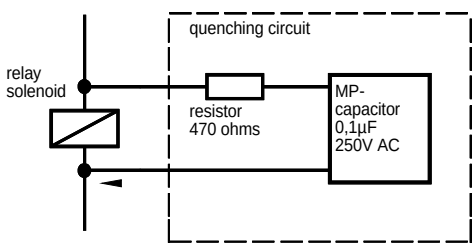
Cable Requirements for Analog Signal Transmission

- *Minimum diameter each core: 0,5 sqmm (.02 sq.inch)*
- *Shielding: min. 95 % optical cover, (ideal: foil=100 %)*

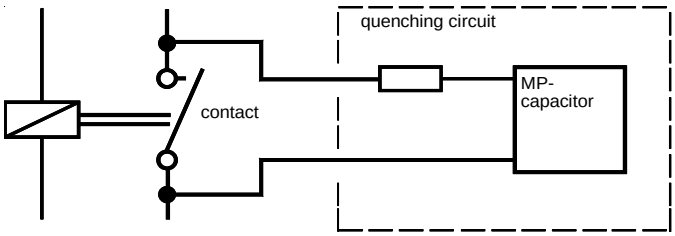
The correct wiring of signal cables solve 90% of the problems. But persistent cases may require eliminating the disturbances at the source. Frequently occuring causes:

How to prevent disturbances by adding electronic components

- **Relay solenoids** are able to produce high inductive voltages while switching.
  This can be compensated by adding quenching circuits.



- **Relay contacts** produce 'sparks', quenching circuits will damp them extraordinary.
  A positive, additional effect is the increased lifetime of the contact.



Attention: If the load need low power only, the current through the quenching circuit can be enough to produce undesirable side effects (e.g. holding of a power relay even though the control relay contact is open)

Electrical Installation, Data Wires

In an industrial environment, installation of data wires demands specific attention. Some basics you will find on the next page. For wiring, only special data cable may be used. Eminently important is the correct grounding.

Shielding

- Both ends of data cable shieldings have to be connected to ground.
  Note that the unshielded parts at the ports of the controller units must be as short as possible.

Cable Requirements

For data transmission, twisted pair cable with shielding must be used. This cable must have the following minimum qualities:

Core ..... min. 2x CU, flexible, twisted pair
Shielding / optical cover ..... netting + foil / 100%
Cable Resistance DC, each core ..... max. 80 ohms/km
Shielding resistance DC ..... max. 11 ohms/km
Core to core capacity ..... appr.. 39,4 nF/km
Examples are the cable types "82841“ and "89841“ of the BELDEN Company

While planning machinery and assembling electrical components please observe the EMC basics. You can find the most important information on a separate data sheet which can be downloaded from our website.

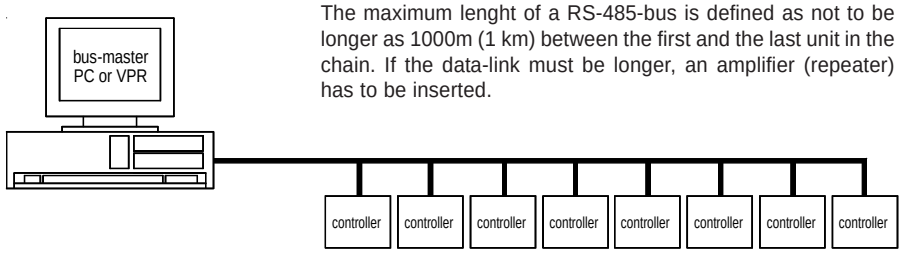
Communication Lines

Data Transmission Protocol

In the VPR system the Central Module works as a 'bus master' and the controllers are the 'slave' devices. Data transmission from and to the devices is made by a RS-485 bus system. The data is transfered symmetrically which makes this bus fairly uneffected by noise. Up to 64 devices can be linked to this system, communicating via the *E-Link*-Protocol.
The arrangement of the controllers on this bus system is generally inline. i.e the controller units are connected parallel on the bus, similar to a party lighting system. This is the origin of the name 'partyline' bus.

Partyline

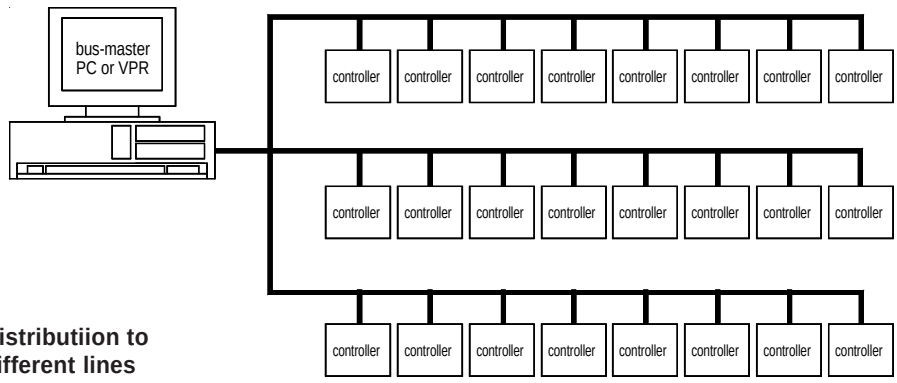
Party-line



The maximum lenght of a RS-485-bus is defined as not to be longer as 1000m (1 km) between the first and the last unit in the chain. If the data-link must be longer, an amplifier (repeater) has to be inserted.

The wiring allows several lines, that means the master unit needs not to be placed at the end of the line absolutely.

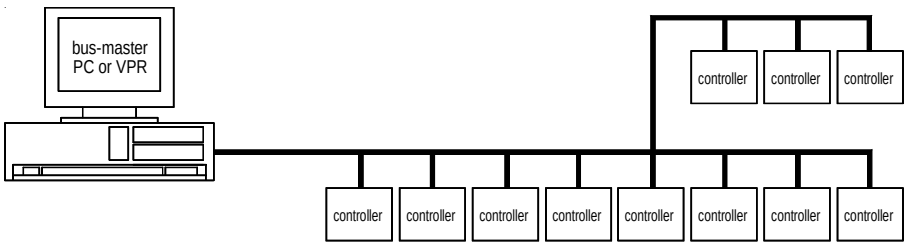
Bus Dividing



Distributiion to different lines

If necessary, branching lines from single units to the bus are allowed too.

Branching Lines



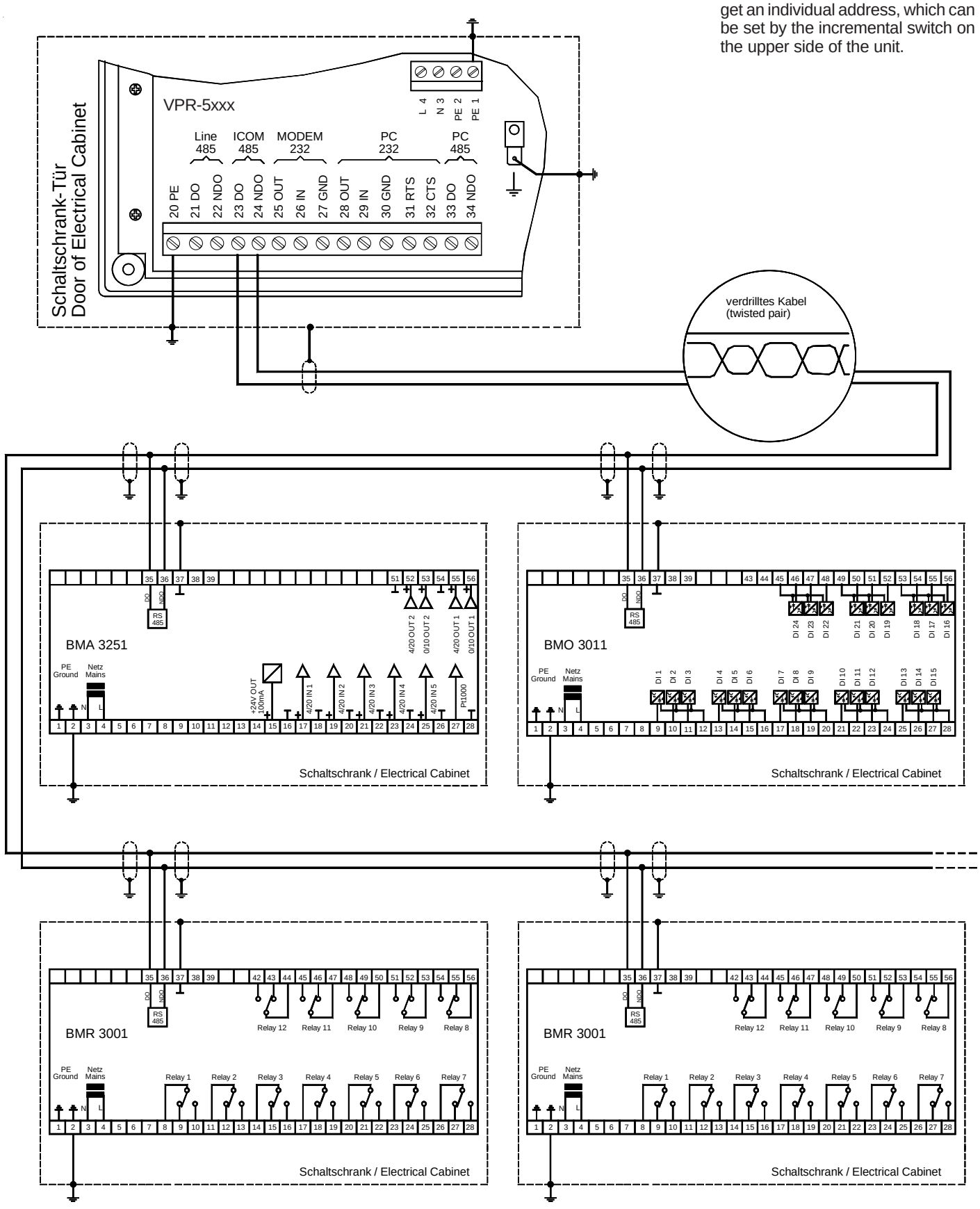
Local branching lines

ICOM-Bus for I/O-Modules

The ICOM-bus is reserved to connect I/O-modules only:

- Standard "twisted pair" data cable
- Each connected module gets an individual address
- Each PE/ground terminal has to be connected to the closest ground terminal in the cabinet.
- The unshielded part at the controllers interface terminals must be as short as possible.

Note polarity!
Each I/O-module must get an individual address, which can be set by the incremental switch on the upper side of the unit.



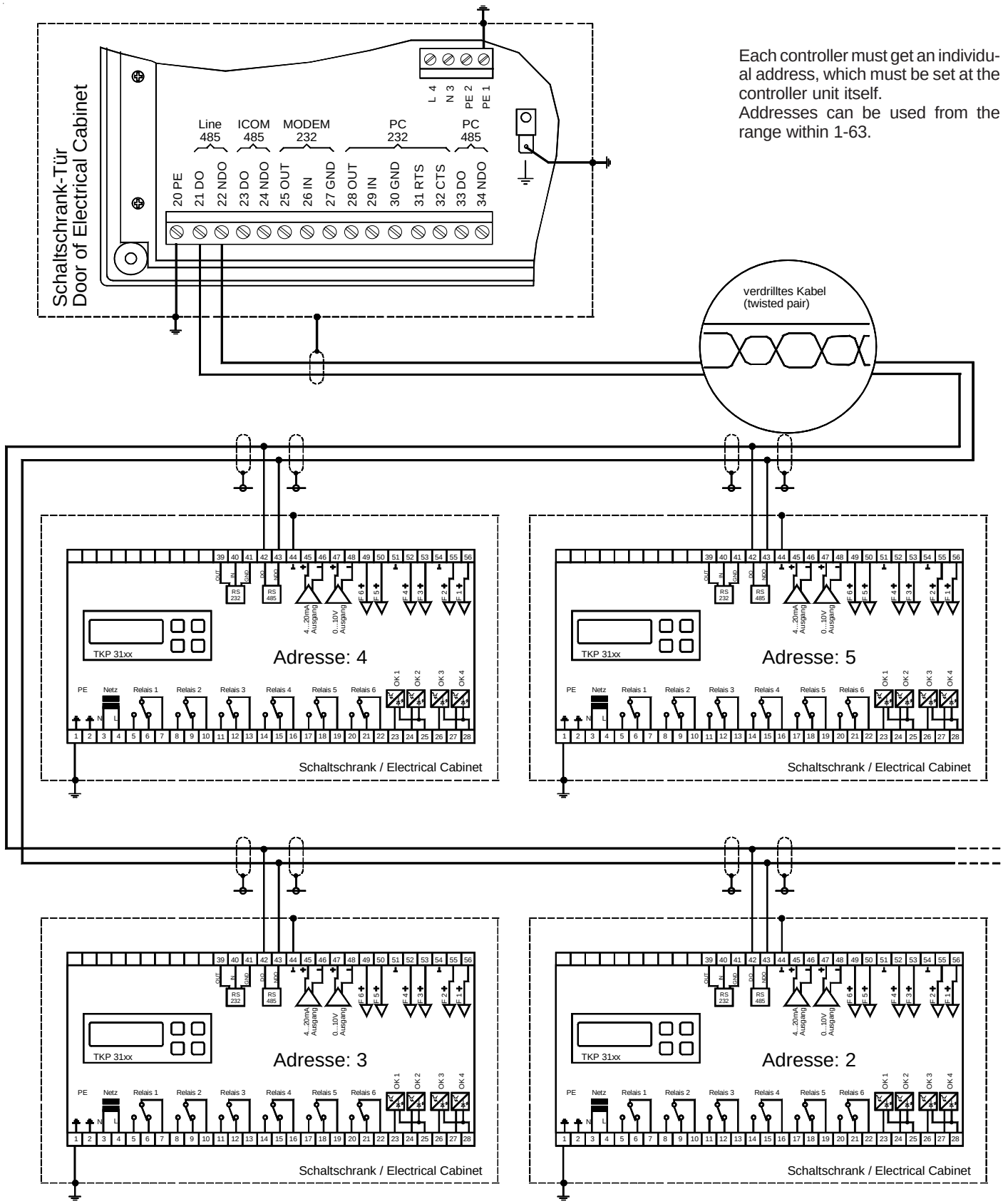
Line-Bus for Controller Connection

The LINE-bus is reserved to connect cold storage controllers or data capture modules only:

- Standard "twisted pair" data cable
- Each connected controller unit gets an individual address
- Each PE/ground terminal has to be connected to the closest ground terminal in the cabinet.
- The unshielded part at the controllers interface terminals must be as short as possible.

Note polarity!

Each controller must get an individual address, which must be set at the controller unit itself.
Addresses can be used from the range within 1-63.



Energy Counter Module VBZ 19000

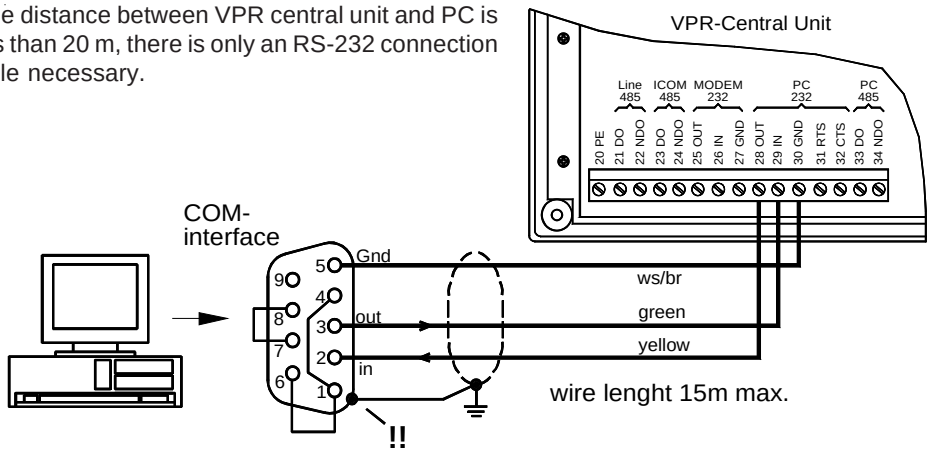
There are special guidelines for connecting a VBZ 19000 energy counter module.
It must be connected via Line-Bus too, but function is only possible with fixed address -**65**-.

Actual values and setpoints can be read on the subpages "Compounds".

Further information you will find in the manual of the VBZ.

Data Line to a PC

If the distance between VPR central unit and PC is less than 20 m, there is only an RS-232 connection cable necessary.



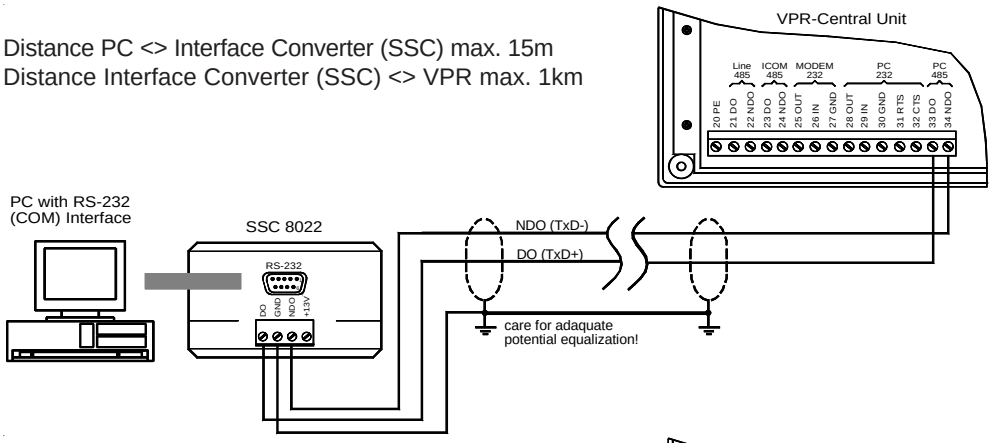
Data line PC <> VPR via RS-232, wire lenght 15m max.

Matching cable:
OrderNo.: **PC-VPR5000**
Cable lenght 5m

If the distance is longer than 20 m, more outlay is necessary. In this case different variations are imaginable. So a safe data transfer over up to 1000 m can be realized.

Data line PC <> VPR via RS-485, wire lenght > 15m

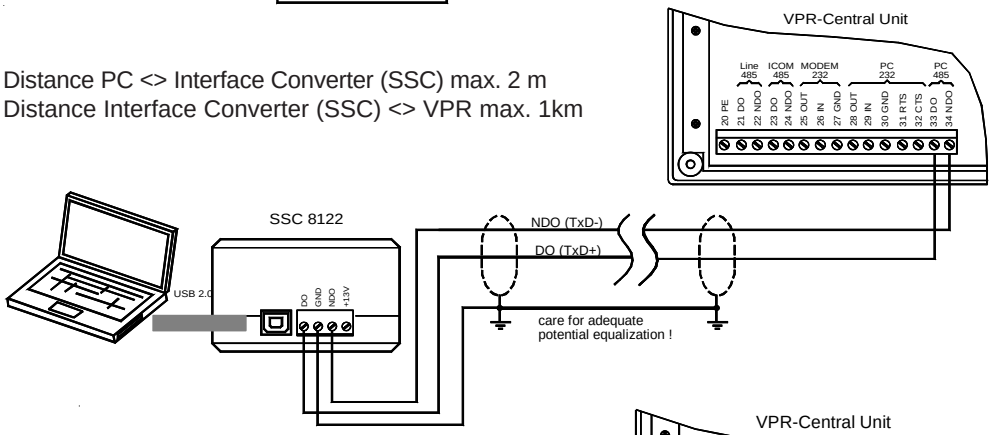
Distance PC <> Interface Converter (SSC) max. 15m
Distance Interface Converter (SSC) <> VPR max. 1km



PC with conventional COM-interface

Matching ELREHA-interface converters:
SSC 1022 or SSC 8022

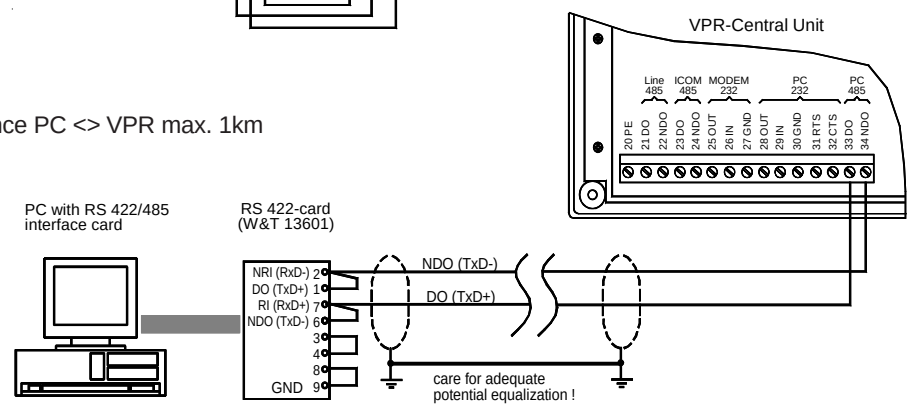
Distance PC <> Interface Converter (SSC) max. 2 m
Distance Interface Converter (SSC) <> VPR max. 1km



PC with USB-interface.

Matching ELREHA-interface converter:
SSC 8122

Distance PC <> VPR max. 1km



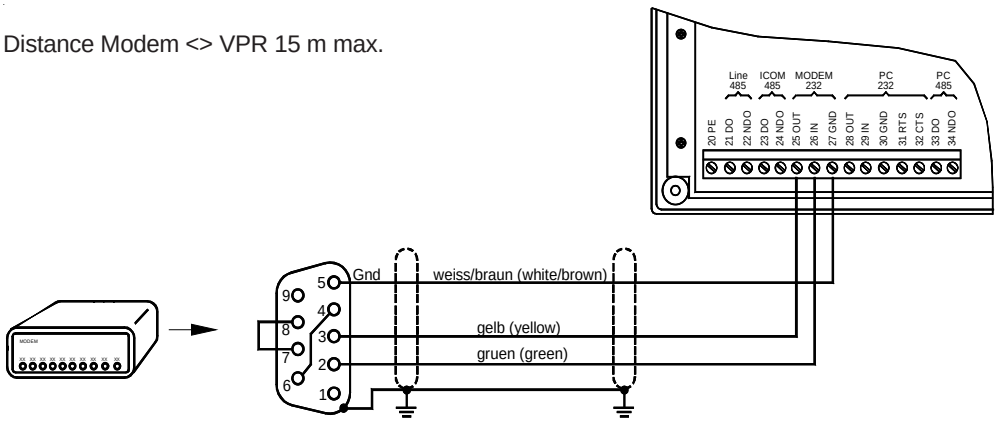
PC with RS-485-Add-on Card

This example depends on the card type **13601** from *Wiesemann & Theis*. Other products may have different pin assignments!

Matching cable PC-Card <> VPR:
OrderNo.: **RS-485/PC**
Cable lenght 5m

Data Line to a Modem

Distance Modem <> VPR 15 m max.



Matching cable:
OrderNo.: **Modem-VPR5000**
Cable lenght 5m

Incoming Components Inspection

A proper and safe operation of the product requires correct transport, storage, assembly and careful handling before. If you assume that a riskless operation is not longer possible, e.g. :

- with visible damages or
- if the product does'nt work correctly in spite of available mains voltage supply
- if the product was stored under unfavourable environment conditions (e.g. storage outside the allowed climate limits -> condensing water, or similar) or unfavourable transport conditions (fall from a high level even without visible damages)

the product must be set out of order immediately and must be protected against accidental start-up.

SAFETY INSTRUCTIONS

Please read before Start-up

- Limit of Application: This product is not designed nor manufactured for use in equipment or systems that are intended to be used under such circumstances that may affect human life.
  For applications requiring extremely high reliability, please contact the manufacturer first
- Use this product for the described purpose only, otherwise a correct function can't be guaranteed.
- Electrical installation and putting into service must be done from authorized personnel.
- Please note the local safety instructions and standards!
- Before installation: Check the limits of the controller and your application. Before starting up we recommend to read the following instructions for use, since only by doing so you can avoid damage or malfunction and you will benefit all the advantages offered by this product.
- **During installation and wiring never work when the electricity is not cut-off !**
- **Never operate unit without housing.**
- Mounting the controller close to power relays is unfavourable in case of the electro-magnetic interference.
- Before applying voltage to the controller: Make sure that all wiring has been made in accordance with the wiring diagram in this manual.
  Check, if the supply voltage corresponds to the value printed on the type label.
- Connect the ‘PE’ terminal carefully to ground because otherwise the operation of the internal noise filter will be disabled.
- Respect the environmental limits for temperature and humidity. Outside these limits malfunctions may occur.
- In case of malfunction or doubts please contact our technical support.
- Observe the maximum admitted current rate for the relays (see technical data). Compare with the peak start-up current of the controlled devices (valve, fan, compressor, heater..)
- Sensor cables may be up to some hundred meters in length. Use shielded sensor cable only. Don’t install them in parallel with high-current cables to prevent inductive interference. A cross section of min. 0,5mm² is sufficient.
- Shielding has to be connected to PE at the end near the controller
- All used temperature sensors must be identical. Never use PTC (TF 201) and PT1000 (TF 501) mixed. This will not work.
- TF-type sensors are moisture-proof but they are not designed for being immersed in water for a long period of time (not pressure-proof). In such a case, always use dip-fittings.
- Be care that the wiring of interface lines meets the requirements

VPR Start-Up Procedure

You have configured the VPR system with the software "**VPR50plan**". This program has generated a Terminal Plan / Connection Table, a parts list and a parameter listing for you.

Make sure once more, that all wiring corresponds to your terminal plan.

1 **Connection Table + Addresses**

Check that all power switches are OFF and fuses are OPEN to prevent motors from being switched ON, because at this point in time the assignments of functions and in/outputs are not yet configured.

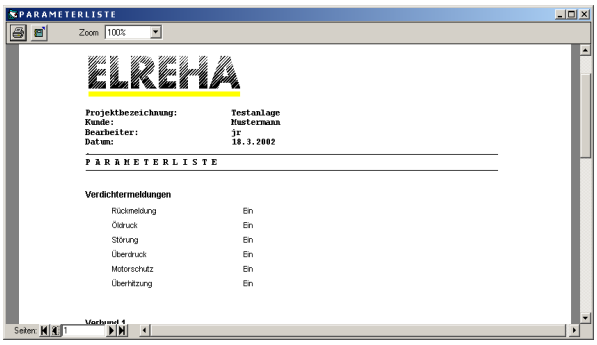
2 **Power OFF**

After supplying mains power to the VPR, a selftest starts. After about 5 seconds the 'Status '-screen appears. Select the 'PARAMETER' page first and enter current date and time.

3 **Power Up**

Enter now the values from your printed parameter listing.

By doing this, functions will be assigned to the desired inputs and outputs



4 **Enter Parameters**

Example for an order to enter:

Parameters on the printed listing	**can be found on screen page**
Compressor Error Messages	Configuration Compressor <Messages>
Compound 1	Configuration Compound <C1>
Compound 1 Compressors	Configuration Compound <C1>
Compound 1 Circuit x Fan	Configuration Compound <C1>
Compound 2	Configuration Compound <C2>
Compound 2 Compressor	Configuration Compound <C2>
Compound 2 Circuit x Fan	Configuration Compound <C2>
Analog inputs	Configuration <4-20mA inputs>
Analog inputs MIC Adr. X	Configuration Page of Analogue Inputs
Common	
Modem relay	Configuration Modemoperation
2. Setpoint	Parameter Page
Digital inputs	Parameter Page
Alarm relays	Parameter Page
Time switch	Timeswitch Page
Low Power Optimization Compound x	Compound Page <Optimization Methods>

First of all is to enter the parameters which affect the connection table. By that, the assignment of functions and in/outputs is fixed.
If you read the connection table on the screen by pressing 'F1', the displayed data must correspond to the printed data.

5 **Adapting pressure transmitters**

- Call up page "*Configuration 4-20 mA Inputs*" and branch to the subpages of each single pressure transmitter. Set the corresponding pressure values for 4 and 20 mA transmitter output.

  Example: You use a DG 0/10 type transmitter on the low pressure side of your refrigeration compound. It delivers 4 mA output with 0 bar input and 20 mA output with 10 bar at its input.
  In this case you set the lower value of the 'C1 P-Suct'- parameter to '-1,00' and the higher value to '+9,00' (relative pressure).

  Together with the information on used refrigerant, a correct temperature reading will be calculated.

Select Temperature Probes

- Call up page "*Configuration Temperature Probes*" preset type of sensor and physical value for the display. On the individual subpages the displayed values can be corrected.

6 **Assigning Error Messages**

- Call up '*Parameter*' Page and assign the system error messages to different priority levels.
  Fill in the code of an error at '*Error number*' and assign it to a priority level by marking it with an asterisk (*).

VPR is ready for operation

After entering the control setpoints on the 'Compounds' page and the parameters for the motors on the 'Compressor' and 'Fans' pages, your VPR is able to control your refrigeration system.

Start-up of Cold Storage Controllers

7

After having started the compounds successfully, you can start your Cold Storage Controllers (CST) now:

- All controller fuses for storage control are OPEN,
- Supply voltage for the cold storage controllers ON.
- Only two settings are necessary at the cold storage controllers:

  - sensor correction factor (if needed),
  - MOST IMPORTANT: the address in network (see controller manual).

Each controller connected to a VPR system must have a network (device) address within 1 and 63. This address is needed for being identified by the VPR central unit.

Network Address for Cold Storage Controllers

Important Notes: **Never use an address twice.**

For a VBZ-19000 energy counter module use address "65" only.

You can set each CST-parameter from the VPR display (CST-page).

- Call cold storage configuration on the CST-page by pressing F4 (ev. code necessary)

Parameter Setting for Cold Storage Controllers

- Select address and type of a new controller, with it, this controller is applied.

Register a Controller

- If you have entered a new controller type, the systems demands for "Fetch data from CST?"
  "yes" = All setting will be read from the controller and transferred to the parameter memory of the VPR. Old data will be overwritten.
  "no" = No data migration from the new controller

Data migration from a new, connected controller

- With '*Control is*' = 'ON' you release the controller for operation according to your settings.

Release controller

- With '*Control is*' = 'OFF' all control functions are disabled, but actual values remain visible.
- The VPR transfers all settings to the controller within some seconds.

- Call up cold storage configuration on the CST-page by pressing F4 (ev. code necessary).
- Select address of the controller to erase and set type to "- - -".
  After the following safety inquiry the controller and **all its data is erased in the VPR.**

Erase controller

If you want to change a CST at a certain address, e.g. because of a malfunction, then set parameter "*unit available*" on the individual CST-page to "No". This disconnects this CST from the data transmission, but data will not be erased.
After a replacement of a CST with this address, set "*unit available*" back to "yes". With this, the stored data set will be transmitted to the new controller.

Changing of a controller

Upon closing the necessary fuses your cooling/freezing controller should work correctly now.

Ready for Operation

Frequently, you want to start-up the controllers, while the compound still runs manually and the VPR is off. In this case you must runup the controllers as single devices. (see technical manual)

Controllers Running, Compounds run manually

Please note that as soon as the VPR is powered and the unit status is set to 'available', the controller settings are overwritten by the VPR data.

At the end of the start-up procedure, after all parameters and setpoints are set correctly, you should backup all settings permanently (**Parameter-Backup**).
After later 'trials' or a data loss this settings can be recalled. How to backup is described in chapter '*Store Configuration /Backup*' .

Finish Start-up

Troubleshooting

In practice it might be necessary to solve some problems, here are the most frequently ones:

Because each occuring failure generates a message in plain text on the failure pages (buttons F2/F3), it should be easy to find them.

The current connection table can be read at any time by pressing F1.

Central Unit doesn't work

- If your central unit does not work, check if all matching terminals are connected to the necessary supply voltage.

I/O-Module doesn't work

- If one or more I/O-modules do not work, but the supply voltage is ok, check the following:

  LED 'Mains' blinking slowly, LED 'Line' blinking slowly:
  Communication seems to be o.k., check configuration, inputs / output might be OFF.

  LED 'Mains' blinking slowly, LED 'Line' is OFF:
  Communication VPR <-> I/O-module failed.
  1. Check ICOM data cable and polarity.
  2. Check the correct connector position (*ICOM RS-485*)
  3. Check if the yellow LED next to the interface connector flashes.
     If this LED flashes, the VPR sends data and the I/O-module cannot respond because of a failed or incorrect connection or because it is defect.

Hints for Trouble Shooting on Data Lines

You can use a simple multimeter with high input resistance for measuring on data lines. **Never use a simple voltage tester (e.g.' DUSPOL' or similar equipment). Never use the resistance range of the multimeter on hot circuits.**

Never connect or disconnect data lines (also plugs) as long as the devices are powered. Switch both end devices OFF before (also the PC).

Indicators for data transmission

Both, VPR and I/O-modules, indicate data transmission by LED's. Next to the VPR's interface connectors you will find the LED's '**transmit (yellow)**' or '**receive (green)**'.
The I/O-modules indicate data transmission by their '**Com**' LED.

Voltages for data transmission

Data transmission is done by voltage pulses in the range within 1 to 5 V DC (RS 485) and 7 to 15 V DC (RS 232). Data transfer occurs in intervals of up to some seconds and can be checked by using a multimeter.

- Check using a voltmeter (DC) if you can see a change in voltage on the data bus which is within the above mentioned range. No change means probably no data transfer.
- Shut power OFF and check resistance between DO and NDO of the RS 485 interface. Resistance must be in the range of some hundred ohms.
- **If data transfer is interrupted only temporarily, please check wiring and wiring instructions again.**

Note Wiring Instructions!

No stages come on

With power up, the compounds should start running. If one of the compressors or fans does not work although they are in demand, check as follows:

- Cross check your wiring with the connection table, configuration alternated ?
- If a stage comes ON and switches OFF again after a short time (30 seconds) although a 'Forward' signal is still present, no feedback signal comes back from the motor. With a failing feedback signal, the VPR tries to switch ON the stage again after a 'Failure lock time' (factory set: 5 min) plus the 'Forward Delay' time. Check also, if the 'N'-terminals are connected as prescribed.

Information about tasks of inputs and outputs you always get by F1.

Testing of Inputs

- The state of each digital input can be checked easily. The I/O-module shows the inut state by LED and on the Connect Table (by F1) you will find the state of each configured input.

Transmitter Failures

If a pressure transmitter doesn't work check the following:

- Operating voltage for the transmitter.
  BMA 3251-Module: Terminal 15 -> 16, voltage 18...24V DC.
- By an easy measuring of the voltage over the input you can check if the pressure transmitters delivers a signal current.
  The internal load resistor at the BMA-inputs is 100 ohms. This means that with a current of 4 mA the voltage at the terminals is 400 mV DC and with a current of 20 mA the voltage is 2 V DC. So if the measured voltage is within 0.4 and 2 Volts the function of the transmitter seems to be ok.

Temperature Sensor Failures

All temperature sensors used with the VPR system may be both TF 201 or TF 501 (Pt1000) type (not mixed). You can check them by measuring their resistance (see table below), but you must disconnect the sensor from the terminal before.

Temperature / Resistance Table

Temp.°C	Resistance			Temp.°C	Resistance	
-50	1032	803,06		40	2244	1155,41
-45	1084	822,9		45	2330	1174,7
-40	1135	842,71		50	2415	1193,97
-35	1191	862,48		55	2505	1213,21
-30	1246	882,22		60	2595	1232,42
-25	1306	901,92		65	2689	1251,6
-20	1366	921,6		70	2782	1270,75
-15	1430	941,24		75	2880	1289,87
-10	1493	960,86		80	2977	1308,97
-5	1561	980,44		85	3079	1328,03
0	1628	1000		90	3180	1347,07
5	1700	1019,53		95	3285	1366,08
10	1771	1039,03		100	3390	1385,06
15	1847	1058,49		105	-	1404
20	1922	1077,94		110	-	1422,93
25	2000	1097,35		150	-	1573,25
30	2080	1116,73		200	-	1758,56
35	2162	1136,08				
Core	**201**	**501**		**Core**	**201**	**501**
Charact.	PTC	Pt1000		Charact.	PTC	Pt1000

Service Functions

All parameters and setpoints are stored in nonvolatile memories and cannot be changed without the processor.
To change stored data, you must enter some security codes before. the following service functions are available:

- Erasing the runtime counters of compressors, fans and pumps
- Erasing the Error Memory
- Backup of the current configuration into a specialized memory
- Erasing of the configuration, reset to factory settings

Erasing runtime counters

- Select '*erase runtime counter*' on "Service data"-Page
- Push key "RET" (the VPR asks for an access code)
- Set value "45" by the up/down keys
- Push "Ret" again

Now all runtime counters are reset to 0.

Erasing Error Memory

- Select '*Erase error history*' on "Service data"-Page
- Push key "RET" (the VPR asks for an access code)
- Set value "1" by the up/down keys
- Push "Ret" again

Now all errors are definitely erased from the history.

Service Information at the main menu

At the main menu screen, there is a text area reserved for a service address.

Enter text:

- Call main menu screen
- Select text line by the cursor keys
- Select characters as described in chapter 'Operating'

Backup the VPR Configuration

All set parameters and setpoints are stored in a nonvolatile memory to ensure that they cannot be changed. Nevertheless, in practice there are imaginable situations which may change settings, the first is an unintendent operation of the user (e.g. trying out something and forgetting to reset value) or rare extremely situations like thunderstorms, etc.

To restore the set parameters from start-up every time, the VPR contains an additional **Security Memory** (**Backup-Memory**), where the complete parameter-set of VPR and Cold Storage Controllers is stored a second time.

Prepare Backup / Restore

Data transmission to or from this memory must be done in 2 steps:

- Unlock reading resp. writing
- Write or read parameter set

Conditions

This can be done by a user with appropriate access rights only

Backup Configuration

Steps to **backup** a parameter set permantly in the security memory:

- Enter '**13**' at '*Access Code*' (Service-Data-Page) and confirm by 'RET'.
- Enter '**17**' at '*Write Code*' (Service-Data-Page) and confirm by 'RET'.
- Behind "Internal" set a "1" and confirm by 'RET'.

Write process will be started, this will last a few seconds. After that, the name of the stored configuration appears some lines below under 'internal'.

Restore Configuration

Steps to **restore** a parameter set from the security memory:

- Enter '**13**' at '*Access Code*' (Service-Data-Page) and confirm by 'RET'.
- Enter '**28**' at '*Read Code*' (Service-Data-Page) and confirm by 'RET'.
- Behind "Internal" set a "1" and confirm by 'RET'.

Read process will be started, this will also last a few seconds.

Reset to Factory Settings

Steps to **reset** the parameter set to factory settings:

- Select '*Load default values*' (Service-Data-Page) and confirm by 'RET'.
- Enter '**1**' and confirm by 'RET'.

Now all parameters are **reset to factory settings**. The settings stored in the security memory are still present.

Erase stored Configuration

Steps to **erase** a parameter set in the security memory:

- Enter '**14**' at '*Access Code*' (Service-Data-Page) and confirm by 'RET'.
- Enter '**39**' at '*Erase Code*' (Service-Data-Page) and confirm by 'RET'.
- Select desired parameter set (located under 'internal'), enter '**1**' and confirm by 'RET'.

Now the security copy of the parameter set is erased from the security memory.

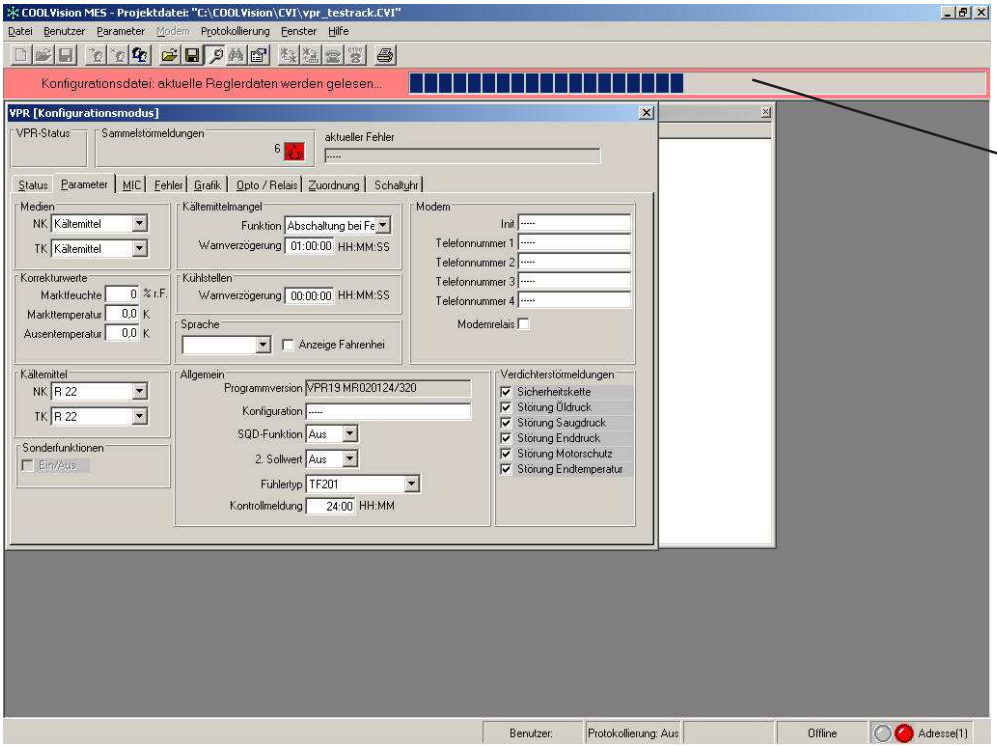
After the end of a backup or restore process the entered codes will be reset automatically.

Configuration Backup with COOLVision-MES

In many cases a refrigeration plant is equipped with a PC for remote control and data logging. So you have the condition to backup the parameter set to a PC after start-up. For this purpose, the software 'COOLVision-MES' contains a 'Configuration Mode'.

Open the VPR-window. Click on 'Parameter/Configuration Mode', mark 'Load data from unit' and confirm by 'ok'.

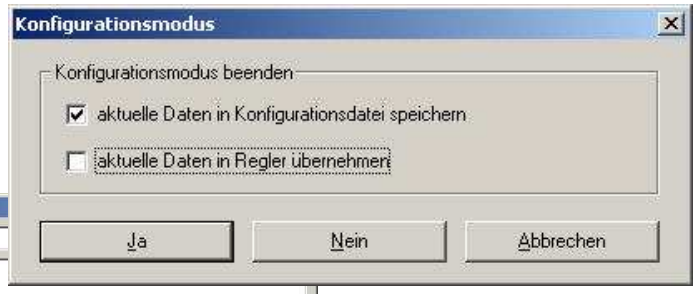
Call Configuration Mode



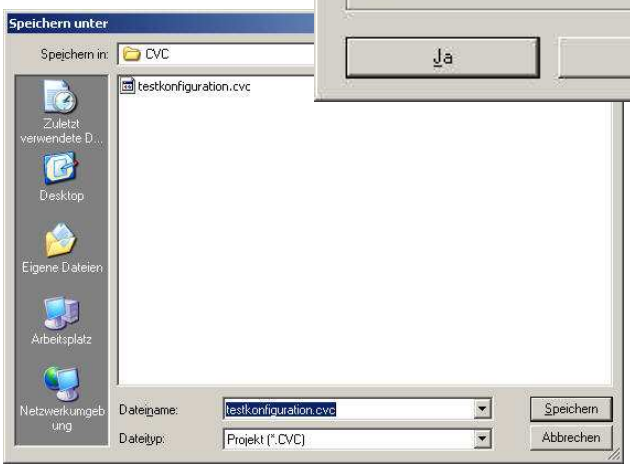
Download Configuration

This progress bar shows the state of data transmission.

Open the VPR-window. Click on 'Parameter/Configuration Mode'. Confirm preselected value '*store data in configuration file*' by 'ok'.



Store Configuration as file



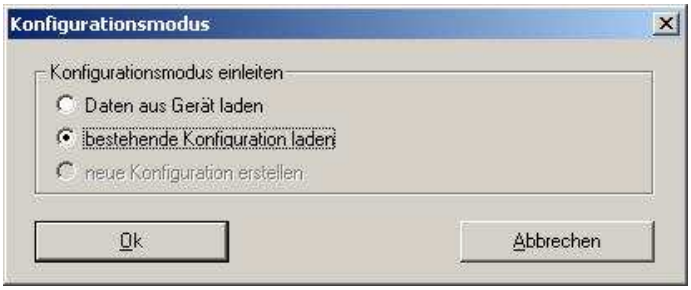
Choose a name for the file and confim by 'store'.
Now the configuration will be stored on the harddisk with the extension '.cvc'.

Configuration Restore with COOLVision-MES

This functios are suitable for:

- Transmitting existing configuration data to a new plant.
- Restore configuration data after 'experiments'.
- Restore configuration data after VPR-Central Module interchange.

Open the VPR-window. Click on 'Parameter/Configuration Mode', mark 'Transmit existing configuration' and confirm by 'ok'.

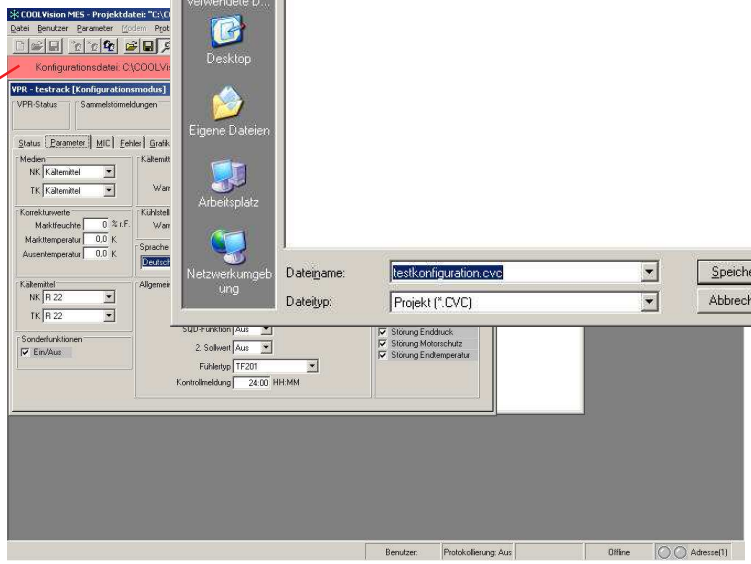


Konfiguration aus Datei laden

Select desired configuration.

The red bar shows that the software is in configuration mode.

At this time, the values in the arrays can be changed.

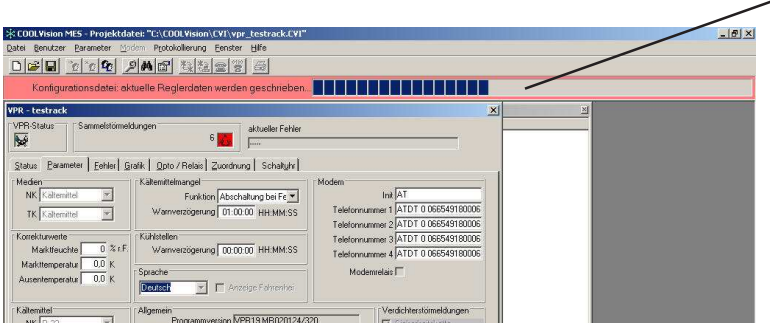


Open the VPR-window. Click on 'Parameter/ Configuration Mode'. Confirm preselected value '*store configuration in VPR-System*'. Now data is transmitted to the VPR.

Transmit configuration data to the VPR

This progress bar shows the state of data transmission.

After the end of the transmission, the red bar disappears and COOLVision-MES works in operation mode again.



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Symbols

2. Sollwert 54, 70
4-20mA 53

A

soon coming.....

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Maintenance Notes

Tests

The unit was tested multiple times before delivery. If a unit must be opened, all test must be repeated.

Attention!
We don't guarantee for units which are opened by the user.

Repair / Adjustment

Repair and adjustment can be made at factory only.

Foiled front panel of the Central Module

Cleaning of the front can be made by a soft cloth and household agents. Never use acids or acidic liquids!

Accessories

Not included in delivery

- Standard telephone modem or SMS-Modem MDM 1002
- Software **COOLVision** for PC (MS-Win 98SE,ME,2000,XP, from Vers. 1.64), for operating, configuration, up-/download, data logging and error forwarding

Note The software part "**COOLVision-MES**" for operating / configuration is available free-of-charge on each INFO-CD.

- VPR planning software "VPR50PLAN" (MS-Windows) to create terminal listing, hardware requirement and parameter listing is also available free-of-charge on each INFO-CD or can be downloaded from "*www.elreha.de*" .

Appendix

Connection Table

On the next pages you should find a listing with a connection table, individually created for this plant.

If this listing is not longer available, it can be recreated by the software "VPR50PLAN".

EG-Statement of Conformity

CE

We state the following: When operated in accordance with the technical manual, the criteria have been met that are outlined in the guidelines of the council for alignment of statutory orders of the member states on electro-magnetic consistency (89/336/EWG) and the Low Voltage Directive (73/23/EWG) as amended by (93/68/EWG). This declaration is valid for those products covered by the technical manual which itself is part of the declaration. To meet the requirements, the currently valid versions of the relevant standards have been used.

This statement is made from the manufacturer / importer

ELREHA Elektronische Regelungen GmbH
D-68766 Hockenheim
name / address)

by:

Werner Roemer, *Technical Director*

Hockenheim.....**19.05.2006**.....
city *date* *sign*

This manual, which is part of the product, has been set up with care, but mistakes may occur. Technical details can be changed without notice, especially the software. Please note that the described functions are only valid for units containing the software with the version-number shown on page 1. Units with an other software number may work a little bit different.

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