- **Compound Control System for Cooling Systems**
  Able to control 3 complete Compressor Compound Systems or max. 3 Chiller Systems
- **Controls compressors and condenser fans and up to 128 networked cold storage controller devices**
- **Heat pump control possible**
- **Cascade control possible**
- **LC-Display for all plant information**
- **Includes storage controller data for optimization prodedures**
- **Integrated alarm message processing system**
- **Integrated 12-channel time-switch**

ELREHA
ELEKTRONISCHE REGELUNGEN GMBH

Technical Manual **5311265-02/08E**
Compound Control System
from Softw.Version /S 02.07.09

Type: **VPR 5240-2**

Dear Customer !

With this VPR-5240-2 Compound Master Control Unit you get a new generation of our VPR-Series, which have been enhanced by many modern functions.
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

Guide from page

How to configure and to order a VPR-52xx-2 Central Unit

Only you, the planner, know how many compressors, fans or pumps must be controlled and 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 '**VPR52PLAN**'. So you are on the right way:

- Start the software '**VPR52PLAN**'. This program runs on MS-Windows XP, W7, W8 and W8.1. You can request it for free or download it from our webpage '*www.elreha.de*'.
- 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

Accessories *(not included)*

- Standard telephone modem or SMS modem
- Software **CV-Scheduler** for Win XP, W7, 8, 8.1, for operating, configuration, up-/download, data logging and error forwarding

Note Free of charge on each INFO-CD or '*www.elreha.de*':

- The software part '**COOLVision-MES**' of the DEMO version (for operating / configuration) runs unlimited after the test time has been expired.
- VPR planning program 'VPR52PLAN' (Win XP, W7, 8, 8.1) to create terminal listing, hardware requirement and parameter listing.

More information about mounting and wiring of controllers and mains voltage / data cables you can find on our info sheet:
"Verdrahtungsvorschriften und Tipps für Spannungsversorgung, Datenverbindungen und Messleitungen von Reglern."
(geman only) which can be found on our webpage and on each Info-CD under 'Service'.

This may be a brief version of the technical manual. A complete version with the pages 45...106 you can find on www.elreha.de or our free INFO-CD.

Please note Safety Instructions !

Please note that the described functions are only valid for units containing the software with the version-number shown on page 1 of this manual. This version number you will find on the 'Parameter Page'.

Contents

CONNECTION INFORMATION & SAFETY INSTRUCTIONS

Notice

The guarantee will lapse in case of damage caused by failure to comply with these operating instructions! We shall not be liable for any consequent loss! We do not accept liability for personal injury or damage to property caused by inadequate handling or non-observance of the safety instructions! The guarantee will lapse in such cases.

This manual contains additional safety instructions in the functional description. Please note them!

If you notice any damage, the product may not be connected to mains voltage! Danger of Life!
A riskless operation is impossible if:

- The device has visible damages or doesn't work
- After a long-time storage under unfavourable conditions
- The device is strongly draggled or wet
- After inadequate shipping conditions

Danger

- Never use this product 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.

- **Electrical installation and putting into service must be done from qualified personnel.**
- **During installation and wiring never work when the electricity is not cut-off ! Danger of electric shock!**
- **Never operate unit without housing. Danger of electric shock!**
- **All 'PE' terminals must be connected to ground. Danger of electric shock!** Without PE the internal noise filter will not work, faulty indicated values may occur.
- The product may only be used for the applications described on page 1.
- Please note the safety instructions and standards of your place of installation!

Caution

- Before installation: Check the limits of the controller and the application (see tech. data). Check amongst others:
  - Make sure that all wiring has been made in accordance with the wiring diagram in this manual.
  - Supply voltage (is printed on the type label).
  - Environmental limits for temperature/humidity.
  - Maximum admitted current rate for the relays. Compare it with the peak start-up currents of the controlled loads (motors, heaters,etc.).

  Outside these limits malfunction or damages may occur.
- Sensor/probe cables must be shielded. Don't install them in parallel to high-current cables. Shielding must be connected to PE at the end close to the controller. If not, inductive interferences may occur.
- Please note for elongation: The wire gauge is not critical, but should have 0,5mm² as a minimum.
- Mounting the controller close to power relays is unfavourable. Strong electro-magnetic interference, malfunction may occur!
- Take care that the wiring of interface lines meets the necessary requirements.
- TF-type sensors are not designed for being immersed in fluids permanently. In such a case, always use dip-fittings. With extreme temperature variations, the sensor may be damaged.

Maintenance Instructions

Tests

The device is subjected to various tests before delivery. If a device is opened, all the tests must be repeated.

Attention! For devices which are opened by the customer, the manufacturer cannot guarantee.

Caution

Repair and Adjustment

Repair and adjustment procedures can be made by the manufacturer only.

Front foil / Cleaning

The use of a dry, lint-free cloth is sufficient to clean the product. Never use liquids or acidic fluids! Risk of damage!

Operating

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

Switch On

After the VPR has been switched on, a graphic appears and after appr. 15 seconds the main manue appears.

Energy Saving Mode

If no button of the keypad is pushed for about 30 minutes, the backlighting of the screen switches off. If any button is pushed, the backlight switches on again and you can see the main menue.

Cursor

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

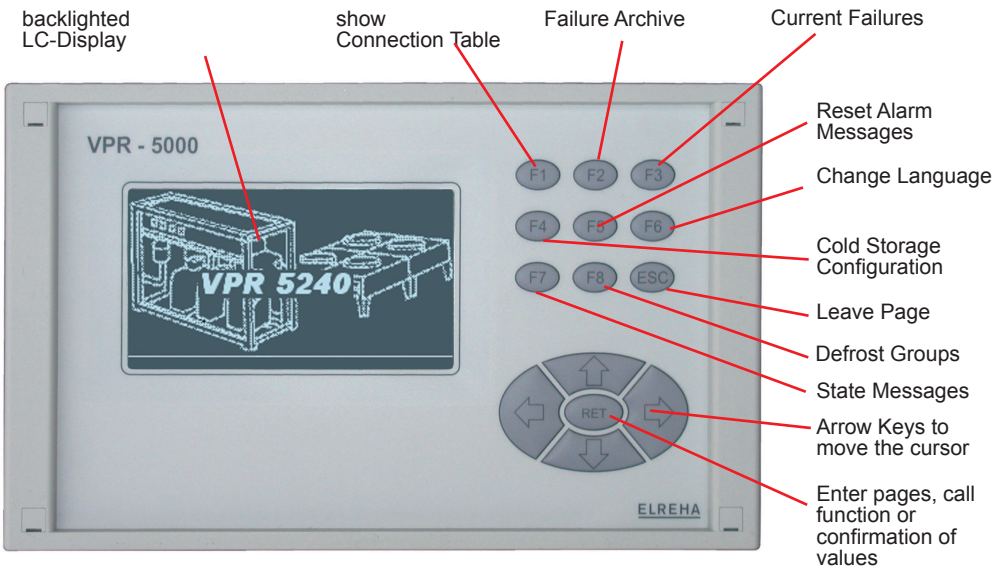
Navigation

'**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 readiness
'⇧⇩' ..... 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 readiness
'⇦⇨' ..... 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.

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

Change language

```
S   Languages/Sprachen                14:16
----------------------------------------

   Language
   Sprache            selection
     1 en             .
     2 fr             .
     3 nl             .
     4 pl             .
----------------------------------------
RET=select language/Sprachauswahl
```

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.

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.

```
S   User      logon/logoff          11:04
-----------------------------------------
        No.    Name                 State
        <1>    Mueller              -----
        <2>    Worker               -----
        <3>    Smith                -----
        <4>    janitor              active
        <5>    user 5               -----
        <6>    user 6               -----
        <7>    user 7               -----
        <8>    user 8               -----
        <9>    user 9               -----
        <10>   Admin                -----
```

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 is your password, please memorize it carefully !

The PIN-Code

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 ... 9	1	0
10	5	Last 3 digits of the serial no.

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.

```
S   User      logon/logoff          11:05
-----------------------------------------
        No.    Name                 State
        <1>    user 1               -----
        <2>    user 2               -----
        <3>    user 3               -----
        <4>    user 4               -----
        <5>    user 5               -----
        <6>    user 6               -----
        <7>    user 7               -----
        <8>    user 8               -----
        <9>    user 9               -----
        <10>   user 10              -----
```

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.

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.

'Superuser' definition

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'

```
S   Configuration User                    11:05
-----------------------------------------------

No.              10
Name             user 10
PIN-Code         last 3 digits of the ser.no.
```

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)

```
S   Configuration User                    11:30
-----------------------------------------------

No.                    5
Name                   user 5
Access level           read only
PIN-Code               0
```

Change User Name

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

Change PIN Code

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

Reset User Authorization to Factory Settings

- Ask your Superuser *or*
- Connect the ELREHA customer service

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.

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 press. transmitter
12 .....Malfunct. C2 brine press. transmitter
13 .....Mains ON
15 .....EEprom-Malfunction
16 .....Malfunction Line (controller bus)
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 press.
25 .....Malf. Transm. C2 Suction pressure
26 .....Malf. Transm 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 Protect. Sens.
32 .....Malf. C2 Frost Protection Sensor
33 .....Malf. C1, Circ.2 Frost Protect. Sens.
34 .....Malf. C1, Circ.2 High Press. 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.....phase error
*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, Circ.1 High Press. Alarm internal
53 .....C2 High Pressure Alarm internal
*54.....C1 Pre-Alarm Suction Press. internal
*55.....C2 Pre-Alarm Suction Press. internal
56 .....C1, Circ.1 Pre-Alarm High Press. int.
57 .....C2, Circ.1 Pre-Alarm High Press. int.
58 .....C1, Circ.2 High Press. Alarm intern.
59 .....C1, Circ.2 Pre-Alarm High Press. int.
60 .....C1, Circ.3 High Press. Alarm internal
61 .....C1, Circ.3 Pre-Alarm High Pressure internal
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, Circ.1 Frost Protection internal
67 .....C1, Circ.2 Frost Protection internal
68 .....C1, Circ.3 Frost Protection internal
69 .....C2, Circ.1 Frost Protection internal

70 .....C2, Circ.2 Frost Protection internal
*71.....C1, Circ.1 Frost Protection external
*72.....C1, Circ.2 Frost Protection external
*73.....C1, Circ.3 Frost Protection external
*74.....C2, Circ.1 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 .....Failure CSC Addr.00
81 ..... , Addr.01
82 ..... , Addr.02
83 ..... , Addr.03
84 ..... , Addr.04
85 ..... , Addr.05
86 ..... , Addr.06
87 ..... , Addr.07
88 ..... , Addr.08
89 ..... , Addr.09

90 .....Failure CSC Addr.10
91 ..... , Addr.11
92 ..... , Addr.12
93 ..... , Addr.13
94 ..... , Addr.14
95 ..... , Addr.15
96 ..... , Addr.16
97 ..... , Addr.17
98 ..... , Addr.18
99 ..... , Addr.19

100 .....Failure CSC Addr.20
101 ..... , Addr.21
102 ..... , Addr.22
103 ..... , Addr.23
104 ..... , Addr.24
105 ..... , Addr.25
106 ..... , Addr.26
107 ..... , Addr.27
108 ..... , Addr.28
109 ..... , Addr.29

110.....Failure CSC Addr.30
111 ..... , Addr.31
112..... , Addr.32
113..... , Addr.33
114..... , Addr.34
115..... , Addr.35
116..... , Addr.36
117..... , Addr.37
118..... , Addr.38
119..... , Addr.39

120 .....Failure CSC Addr.40
121 ..... , Addr.41
122 ..... , Addr.42
123 ..... , Addr.43
124 ..... , Addr.44
125 ..... , Addr.45
126 ..... , Addr.46
127 ..... , Addr.47
128 ..... , Addr.48
129 ..... , Addr.49

130 .....Failure CSC Addr.50
131 ..... , Addr.51
132 ..... , Addr.52
133 ..... , Addr.53
134 ..... , Addr.54
135 ..... , Addr.55
136 ..... , Addr.56
137 ..... , Addr.57
138 ..... , Addr.58
139 ..... , Addr.59

140 .....Failure CSC Addr.60
141 ..... , Addr.61
142 ..... , Addr.62
143 ..... , Addr.63
144 .....Failure VBZ
145 .....Warning 'Pressure Display 4'
146 .....Warning 'Pressure Display 5'

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

160 .....Alarm CSC Addr.10
161 ..... , Addr.11
162 ..... , Addr.12
163 ..... , Addr.13
164 ..... , Addr.14
165 ..... , Addr.15
166 ..... , Addr.16
167 ..... , Addr.17
168 ..... , Addr.18
169 ..... , Addr.19

170 .....Alarm CSC Addr.20
171 ..... , Addr.21
172 ..... , Addr.22
173 ..... , Addr.23
174 ..... , Addr.24
175 ..... , Addr.25
176 ..... , Addr.26
177 ..... , Addr.27
178 ..... , Addr.28
179 ..... , Addr.29

180 .....Alarm CSC Addr.30
181 ..... , Addr.31
182 ..... , Addr.32
183 ..... , Addr.33
184 ..... , Addr.34
185 ..... , Addr.35
186 ..... , Addr.36
187 ..... , Addr.37
188 ..... , Addr.38
189 ..... , Addr.39

190 .....Alarm CSC Addr.40
191 ..... , Addr.41
192 ..... , Addr.42
193 ..... , Addr.43
194 ..... , Addr.44
195 ..... , Addr.45
196 ..... , Addr.46
197 ..... , Addr.47
198 ..... , Addr.48
199 ..... , Addr.49

200 .....Alarm CSC Addr.50
201 ..... , Addr.51
202 ..... , Addr.52
203 ..... , Addr.53
204 ..... , Addr.54

Failure Codes

205 ..... , Addr.55
206 ..... , Addr.56
207 ..... , Addr.57
208 ..... , Addr.58
209 ..... , Addr.59

210 .....Alarm CSC Addr.60
211..... , Addr.61
212 ..... , Addr.62
213 ..... , Addr.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 Safety Chain
*313.....C1 Brine-Pump 2 Safety 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

372 .....Safety shutdown Suction press. C1
373 .....Safety shutdown Cond. press C1
374 .....Safety shutdown external C1
375 .....Safety shutdown Suction press. C2
376 .....Safety shutdown Cond. press C2
377 .....Safety shutdown external C2
378 .....Safety shutdown Suction press. C3
379 .....Safety shutdown Cond. press C3
380 .....Safety shutdown external C3
384 .....Safety shutdown Suct. press. low C1

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

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 of teh BMx modules
- .... Relays
- .... Digital Inputs
- .... Analog Output
- .... 4-20mA Input
- .... Temperature Input

500 ..... Failure CSC Addr.00/Line2
501 ..... , Addr.01/Line2
502 ..... , Addr.02/Line2
503 ..... , Addr.03/Line2
504 ..... , Addr.04/Line2
505 ..... , Addr.05/Line2
506 ..... , Addr.06/Line2
507 ..... , Addr.07/Line2
508 ..... , Addr.08/Line2
509 ..... , Addr.09/Line2

510 ..... Failure CSC Addr.10/Line2
511 ..... , Addr.11/Line2
512 ..... , Addr.12/Line2
513 ..... , Addr.13/Line2

Failure Codes

514 ..... , Addr.14/Line2
515 ..... , Addr.15/Line2
516 ..... , Addr.16/Line2
517 ..... , Addr.17/Line2
518 ..... , Addr.18/Line2
519 ..... , Addr.19/Line2

520 ..... Failure CSC Addr.20/Line2
521 ..... , Addr.21/Line2
522 ..... , Addr.22/Line2
523 ..... , Addr.23/Line2
524 ..... , Addr.24/Line2
525 ..... , Addr.25/Line2
526 ..... , Addr.26/Line2
527 ..... , Addr.27/Line2
528 ..... , Addr.28/Line2
529 ..... , Addr.29/Line2

530 ..... Failure CSC Addr.30/Line2
531 ..... , Addr.31/Line2
532 ..... , Addr.32/Line2
533 ..... , Addr.33/Line2
534 ..... , Addr.34/Line2
535 ..... , Addr.35/Line2
536 ..... , Addr.36/Line2
537 ..... , Addr.37/Line2
538 ..... , Addr.38/Line2
539 ..... , Addr.39/Line2

540 ..... Failure CSC Addr.40/Line2
541 ..... , Addr.41/Line2
542 ..... , Addr.42/Line2
543 ..... , Addr.43/Line2
544 ..... , Addr.44/Line2
545 ..... , Addr.45/Line2
546 ..... , Addr.46/Line2
547 ..... , Addr.47/Line2
548 ..... , Addr.48/Line2
549 ..... , Addr.49/Line2

550 ..... Failure CSC Addr.50/Line2
551 ..... , Addr.51/Line2
552 ..... , Addr.52/Line2
553 ..... , Addr.53/Line2
554 ..... , Addr.54/Line2
555 ..... , Addr.55/Line2
556 ..... , Addr.56/Line2
557 ..... , Addr.57/Line2
558 ..... , Addr.58/Line2
559 ..... , Addr.59/Line2

560 ..... Failure CSC Addr.60/Line2
561 ..... , Addr.61/Line2
562 ..... , Addr.62/Line2
563 ..... , Addr.63/Line2

570 ..... Alarm CSC Addr.00/Line2
571 ..... , Addr.01/Line2
572 ..... , Addr.02/Line2
573 ..... , Addr.03/Line2
574 ..... , Addr.04/Line2
575 ..... , Addr.05/Line2
576 ..... , Addr.06/Line2
577 ..... , Addr.07/Line2
578 ..... , Addr.08/Line2
579 ..... , Addr.09/Line2

580 ..... Alarm CSC Addr.10/Line2
581 ..... , Addr.11/Line2
582 ..... , Addr.12/Line2
583 ..... , Addr.13/Line2
584 ..... , Addr.14/Line2
585 ..... , Addr.15/Line2
586 ..... , Addr.16/Line2
587 ..... , Addr.17/Line2
588 ..... , Addr.18/Line2
589 ..... , Addr.19/Line2

590 ..... Alarm CSC Addr.20/Line2
591 ..... , Addr.21/Line2
592 ..... , Addr.22/Line2
593 ..... , Addr.23/Line2
594 ..... , Addr.24/Line2
595 ..... , Addr.25/Line2
596 ..... , Addr.26/Line2
597 ..... , Addr.27/Line2
598 ..... , Addr.28/Line2
599 ..... , Addr.29/Line2

600 ..... Alarm CSC Addr.30/Line2
601 ..... , Addr.31/Line2
602 ..... , Addr.32/Line2
603 ..... , Addr.33/Line2
604 ..... , Addr.34/Line2
605 ..... , Addr.35/Line2
606 ..... , Addr.36/Line2
607 ..... , Addr.37/Line2
608 ..... , Addr.38/Line2
609 ..... , Addr.39/Line2

610 ..... Alarm CSC Addr.40/Line2
611 ..... , Addr.41/Line2
612 ..... , Addr.42/Line2
613 ..... , Addr.43/Line2
614 ..... , Addr.44/Line2
615 ..... , Addr.45/Line2
616 ..... , Addr.46/Line2
617 ..... , Addr.47/Line2
618 ..... , Addr.48/Line2
619 ..... , Addr.49/Line2

620 ..... Alarm CSC Addr.50/Line2
621 ..... , Addr.51/Line2
622 ..... , Addr.52/Line2
623 ..... , Addr.53/Line2
624 ..... , Addr.54/Line2
625 ..... , Addr.55/Line2
626 ..... , Addr.56/Line2
627 ..... , Addr.57/Line2
628 ..... , Addr.58/Line2
629 ..... , Addr.59/Line2

630 ..... Alarm CSC Addr.60/Line2
631 ..... , Addr.61/Line2
632 ..... , Addr.62/Line2
633 ..... , Addr.63/Line2

*640 .....C3 Compressor 1 single fault
*641 .....C3 Compressor 2 single fault
*642 .....C3 Compressor 3 single fault
*643 .....C3 Compressor 4 single fault
*644 .....C3 Compressor 5 single fault
*645 .....C3 Compressor 6 single fault
*646 .....C3 Compressor 7 single fault
*647 .....C3 Compressor 8 single fault
*648 .....C3 Compressor 9 single fault
*649 .....C3 Compressor 10 single fault
*650 .....C3 Compressor 11 single fault
*651 .....C3 Compressor 12 single fault

*652 .....C3 Brine-Pump 1 Safety Chain
*653 .....C3 Brine-Pump 2 Safety Chain

*660 .....C3, Condenser Fan 1 Safety Chain
*661 .....C3, Condenser Fan 2 Safety Chain
*662 .....C3, Condenser Fan 3 Safety Chain
*663 .....C3, Condenser Fan 4 Safety Chain
*664 .....C3, Condenser Fan 5 Safety Chain
*665 .....C3, Condenser Fan 6 Safety Chain
*666 .....C3, Condenser Fan 7 Safety Chain
*667 .....C3, Condenser Fan 8 Safety Chain
*668 .....C3, Condenser Fan 9 Safety Chain
*669 .....C3, Condenser Fan 10 Safety Chain
*670 .....C3, Condenser Fan 11 Safety Chain
*671 .....C3, Condenser Fan 12 Safety Chain

680 ..... Malf. C3 Cond. Temperature Probe
681 ..... C3 malf. transducer brine pressure
682 ..... C3 malf. transducer suct. pressure
683 ..... C3 malf. transducer high pressure
684 ..... C3 malf. control probe
685 ..... C3 malf. limitation probe
686 ..... C3 brine pressure error external
687 ..... C3 malf. freeze protection probe
688 ..... C3 suction pressure fault external
689 ..... C3 high pressure fault external
690 ..... C3 lack of refrigerant
691 ..... C3 brine pressure fault internal
692 ..... C3 suction pressure fault internal
693 ..... C3 high pressure fault internal
694 ..... C3 prior warning suct. pressure internal
695 ..... C3 prior warning high pressure internal
696 ..... C3 compressor failure > 50%
697 ..... C3 frost protection internal
698 ..... C3 frost protection external
699 ..... C3 compressor failure 100%
700 ..... C3 suction pressure failure ext. (brine)
701 ..... C3 high pressure failure external (brine)
702 ..... C3 suction pressure shift runtime

710 ..... Malf. Pressure Input 12
711 ..... Malf. Pressure Input 13
712 ..... Malf. Pressure Input 14
713 ..... Malf. Pressure Input 15
714 ..... Malf. Pressure Input 16
715 ..... Malf. Pressure Input 17
716 ..... Malf. Pressure Input 18
717 ..... Malf. Pressure Input 19
718 ..... Malf. Pressure Input 20
719 ..... Malf. Pressure Input 21
720 ..... Malf. Pressure Input 22
721 ..... Malf. Pressure Input 23
722 ..... Malf. Pressure Input 24
723 ..... Malf. Pressure Input 25

725 ..... Malf.: Temperature Input 16
726 ..... Malf.: Temperature Input 17
727 ..... Malf.: Temperature Input 18
728 ..... Malf.: Temperature Input 19
729 ..... Malf.: Temperature Input 20
730 ..... Malf.: Temperature Input 21
731 ..... Malf.: Temperature Input 22
732 ..... Malf.: Temperature Input 23
733 ..... Malf.: Temperature Input 24
734 ..... Malf.: Temperature Input 25

740 ..... BMx Addr. 16 : malfunction
741 ..... BMx Addr. 17 : malfunction
742 ..... BMx Addr. 18 : malfunction
743 ..... BMx Addr. 19 : malfunction
744 ..... BMx Addr. 20 : malfunction
745 ..... BMx Addr. 21 : malfunction
746 ..... BMx Addr. 22 : malfunction
747 ..... BMx Addr. 23 : malfunction
748 ..... BMx Addr. 24 : malfunction
749 ..... BMx Addr. 25 : malfunction
750 ..... BMx Addr. 26 : malfunction
751 ..... BMx Addr. 27 : malfunction
752 ..... BMx Addr. 28 : malfunction
753 ..... BMx Addr. 29 : malfunction
754 ..... BMx Addr. 30 : malfunction
755 ..... BMx Addr. 31 : malfunction
756 ..... BMx Addr. 32 : malfunction
757 ..... BMx Addr. 33 : malfunction
758 ..... BMx Addr. 34 : malfunction
759 ..... BMx Addr. 35 : malfunction
760 ..... BMx Addr. 36 : malfunction
761 ..... BMx Addr. 37 : malfunction
762 ..... BMx Addr. 38 : malfunction
763 ..... BMx Addr. 39 : malfunction
764 ..... BMx Addr. 40 : malfunction
765 ..... BMx Addr. 41 : malfunction
766 ..... BMx Addr. 42 : malfunction

770 ..... BMx Addr. 16 : failure
771 ..... BMx Addr. 17 : failure
772 ..... BMx Addr. 18 : failure
773 ..... BMx Addr. 19 : failure
774 ..... BMx Addr. 20 : failure
775 ..... BMx Addr. 21 : failure
776 ..... BMx Addr. 22 : failure
777 ..... BMx Addr. 23 : failure
778 ..... BMx Addr. 24 : failure
779 ..... BMx Addr. 25 : failure
780 ..... BMx Addr. 26 : failure
781 ..... BMx Addr. 27 : failure
782 ..... BMx Addr. 28 : failure
783 ..... BMx Addr. 29 : failure
784 ..... BMx Addr. 30 : failure
785 ..... BMx Addr. 31 : failure
786 ..... BMx Addr. 32 : failure
787 ..... BMx Addr. 33 : failure
788 ..... BMx Addr. 34 : failure
789 ..... BMx Addr. 35 : failure
790 ..... BMx Addr. 36 : failure
791 ..... BMx Addr. 37 : failure
792 ..... BMx Addr. 38 : failure
793 ..... BMx Addr. 39 : failure
794 ..... BMx Addr. 40 : failure
795 ..... BMx Addr. 41 : failure
796 ..... BMx Addr. 42 : failure

Cold Storage alerts will be complemented by the following messages (X= alarm code of the CSC-address):

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

Failure Codes

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-3150 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 cooling
x_10..... Runtime defrost
x_13..... Sensor F5 broken
x_14..... Sensor F5 short circuit
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

HR-Controller
x_1..... Data init (first initialisation)
x_2..... Hardware failure
x_3..... Mains supply on / Reset
x_4..... Mains supply cut off
x_9..... Battery failure
x_10..... Assignment failure
x_11..... Internal
x_16..... Sensor F1 broken
x_17..... Sensor F2 broken
x_18..... Sensor F3 broken
x_19..... Sensor F4 broken
x_20..... Sensor F5 broken
x_21..... Sensor F6 broken
x_22..... Sensor F1 short circuit
x_23..... Sensor F2 short circuit
x_24..... Sensor F3 short circuit
x_25..... Sensor F4 short circuit
x_26..... Sensor F5 short circuit
x_27..... Sensor F6 short circuit
x_34..... Low temp clima
x_35..... Low temp heat 2
x_36..... Low temp heat 3
x_37..... Low temp heat 4
x_38..... Low temp forerun 1
x_39..... Over temp clima
x_40..... Over temp heat 2

x_41..... Over temp heat 3
x_42..... Over temp heat 4
x_43..... Over temp forerun 1
x_44..... Alarm clima
x_45..... Alarm heat 2
x_46..... Alarm heat 3
x_47..... Alarm heat 4
x_48..... Alarm forerun 1

EVP-3160 Cold Storage Controller (CSC)
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 cooling
x_10..... Runtime defrost
x_11..... BattStepper
x_12..... CommStepper
x_13..... CommMaster
x_14..... CommSlave1
x_15..... CommSlave2
x_16..... CommSlave3
x_17..... CommSlave4
x_18..... CommSlave5
x_21..... Sensor F1 broken
x_22..... Sensor F2 broken
x_23..... Sensor F3 broken
x_24..... Sensor F4 broken
x_25..... Sensor F5 broken
x_26..... Sensor F1 short circuit
x_27..... Sensor F2 short circuit
x_28..... Sensor F3 short circuit
x_29..... Sensor F4 short circuit
x_30..... Sensor F5 short circuit
x_31..... Low temperature
x_32..... High temperature
x_33..... Line Address
x_34..... Controller on
x_35..... Controller off
x_36..... Assignment
x_37..... Internal

EVP 1130 Cold Storage Controller (CSC)
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..... Optokoppler
x_7..... Door contact
x_8..... Runtime door
x_9..... Runtime cooling
x_15..... Sensor F1 broken
x_16..... Sensor F2 broken
x_19..... Sensor F1 short circuit
x_20..... Sensor F2 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

EVP 1140 Cold Storage Controller (CSC)
x_1..... Daten 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 cooling
x_10..... 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 F5 broken
x_20..... Sensor F1 short circuit
x_21..... Sensor F2 short circuit
x_22..... Sensor F3 short circuit
x_23..... Sensor F4 short circuit
x_24..... Sensor F5 short circuit

x_25..... Low temperature
x_26..... High temperature
x_29..... Line Address
x_30..... Controller on
x_31..... Controller off
x_32..... Assignment
x_33..... Internal

EVP 3167 Cold Storage Controller (CSC)
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 cooling
x_10..... Runtime defrost
x_13..... Sensor F1 broken
x_14..... Sensor F2 broken
x_15..... Sensor F3 broken
x_16..... Sensor F4 broken
x_17..... Sensor F5 broken
x_18..... Sensor F6 broken
x_21..... Sensor F1 short circuit
x_22..... Sensor F2 short circuit
x_23..... Sensor F3 short circuit
x_24..... Sensor F4 short circuit
x_25..... Sensor F5 short circuit
x_26..... Sensor F6 short circuit
x_29..... Low temperature
x_30..... High temperature
x_31..... Line Address
x_32..... Controller on
x_33..... Controller off
x_36..... BattStepper
x_38..... CommStepper
x_39..... CommMaster
x_40..... CommSlave1
x_41..... CommSlave2
x_42..... CommSlave3
x_43..... CommSlave4
x_44..... CommSlave5
x_49..... Assignment
x_50..... Internal

EVP 3168 CSC/Plate Heat Exchanger
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 cooling
x_10..... Runrime defrost
x_13..... Sensor F1 broken
x_14..... Sensor F2 broken
x_15..... Sensor F3 broken
x_16..... Sensor F4 broken
x_17..... Sensor F5 broken
x_18..... Sensor F6 broken
x_21..... Sensor F1 short circuit
x_22..... Sensor F2 short circuit
x_23..... Sensor F3 short circuit

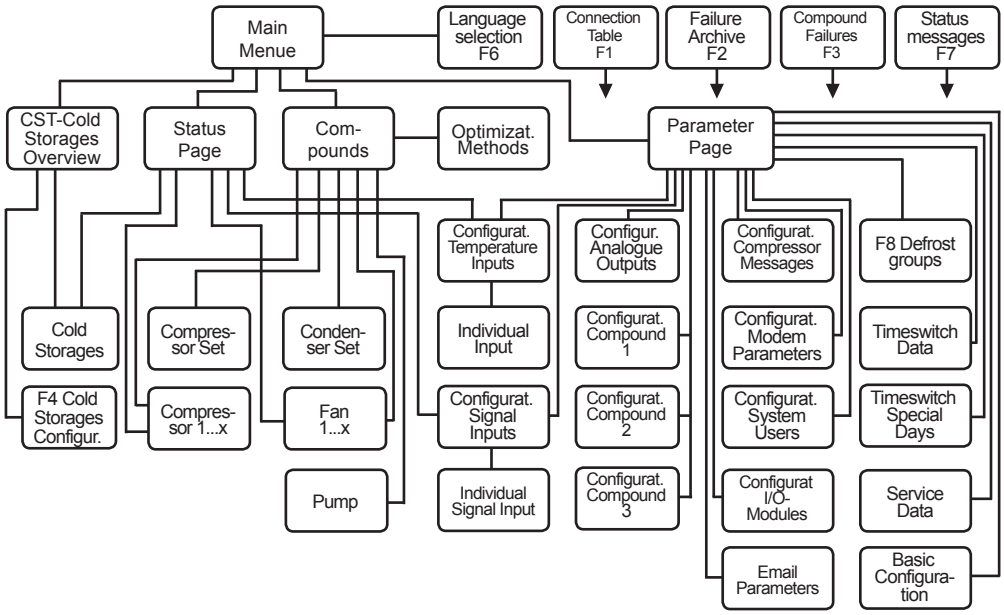
Failure Codes

x_24.....Sensor F4 short circuit
x_25.....Sensor F5 short circuit
x_26.....Sensor F6 short circuit
x_29.....Low temperature
x_30.....High temperature
x_31.....Line Address
x_32.....Controller on
x_33.....Controller off
x_36.....BattStepper
x_38.....CommStepper
x_39.....CommMaster
x_40.....CommSlave1
x_41.....CommSlave2
x_42.....CommSlave3
x_43.....CommSlave4
x_44.....CommSlave5
x_49.....Assignment
x_50.....Intern

TEV-Controllers

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.....Alarm input 1
x_7.....Alarm input 2
x_8.....Alarm input 3
x_9.....Alarm 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 defr1
x_23.....Runtime defr2
x_24.....Runtime defr3
x_25.....Runtime defr4
x_26.....Runtime defrSl1
x_27.....Runtime defrSl2
x_28.....Runtime defrSl3
x_29.....Runtime defrSl4
x_32.....Sensor F1 broken
x_33.....Sensor F2 broken
x_34.....Sensor F3 broken
x_35.....Sensor F4 broken
x_36.....Sensor F5 broken
x_37.....Sensor F6 broken
x_38.....Sensor S1F1 broken
x_39.....Sensor S1F2 broken
x_40.....Sensor S1F3 broken
x_41.....Sensor S2F1 broken
x_42.....Sensor S2F2 broken
x_43.....Sensor S2F3 broken
x_44.....Sensor S3F1 broken
x_45.....Sensor S3F2 broken
x_46.....Sensor S3F3 broken
x_47.....Sensor S4F1 broken
x_48.....Sensor S4F2 broken
x_49.....Sensor S4F3 broken
x_56.....Sensor F1 short circuit
x_57.....Sensor F2 short circuit
x_58.....Sensor F3 short circuit
x_59.....Sensor F4 short circuit
x_60.....Sensor F5 short circuit
x_61.....Sensor F6 short circuit
x_62.....Sensor S1F1 short circuit
x_63.....Sensor S1F2 short circuit
x_64.....Sensor S1F3 short circuit
x_65.....Sensor S2F1 short circuit
x_66.....Sensor S2F2 short circuit
x_67.....Sensor S2F3 short circuit
x_68.....Sensor S3F1 short circuit
x_69.....Sensor S3F2 short circuit
x_70.....Sensor S3F3 short circuit
x_71.....Sensor S4F1 short circuit
x_72.....Sensor S4F2 short circuit
x_73.....Sensor S4F3 short circuit
x_80.....Low temp K1
x_81.....Low temp K2
x_82.....Low temp K3
x_83.....Low temp K4
x_84.....Low temp S1
x_85.....Low temp S2
x_86.....Low temp S3
x_87.....Low temp S4
x_90.....High temp K1
x_91.....High temp K2
x_92.....High temp K3
x_93.....High temp K4
x_94.....High temp S1
x_95.....High temp S2
x_96.....High temp S3
x_97.....High temp S4
x_100.....Line Address
x_101.....Controller on
x_102.....Controller off
x_103.....Assignment
x_104.....AssignmentSl
x_107.....Internal
x_108.....Circuit 1 off
x_109.....Circuit 2 off
x_110.....Circuit 3 off
x_111 .....Circuit 4 off
x_114.....CommunicSl1
x_115.....CommunicSl2
x_116.....CommunicSl3
x_117.....CommunicSl4

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



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**
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 the connected cold storage controllers. Depending on controller type, this page may contain sub-pages.	**Cold Storages Page (CSC)**
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 2 (e.g. freezing compound))	**Configuration Compound 2**
Configuration data of compressors and condenser fans of compound 3	**Configuration Compound 3**
Basic configurations of the system which affects to the terminal assignment, also the network configuration	**Basic Configuration**
Overview, actual values and functionality of all standardized signal inputs (4-20mA)	**Configuration 4-20 mA Inputs**
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 as well as functions for data backup	**Service Data**
Overview and registration of I/O-Modules	**Configuration In/Outp.- Modules**
Central defrost group control at the cooling positions	**F8 Defrostgroups**
Contains reporting periods, addresses and setups for sending emails	**Configuration E-Mail**
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'**
Auf dieser Seite sehen Sie die im Moment anstehenden Fehler der Anlage.	**F3, page 'Compound 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	**F1 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 you are able to call a sub page.

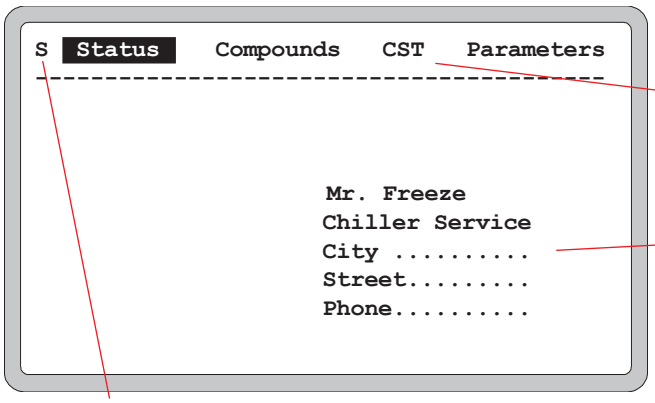
Depending on configuration, the VPR shows only the relevant data.

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.

Factory settings are denoted as 'default values' or shown in brackets [...].

To simplify operating resp. overview of parameters, parameters depending on configuration will not be displayed, if the corresponding function is not activated. To see more parameters, the parameter '*Suppress unused Parameters*' (Page Parameter/Service Data) can be set to "off".

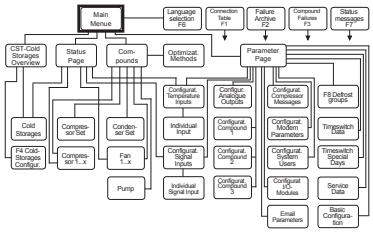
Main Menue



‚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 characters per line, 6 lines possible max.
To change the text, mark characters by cursor and change as described under ‚Operating'.

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 powerup 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

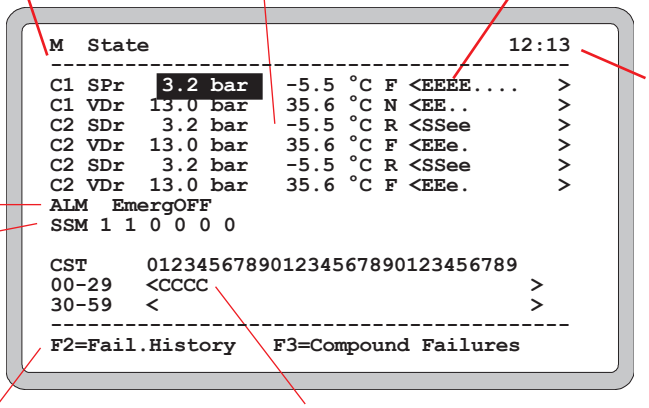
On each page
'M': if an error message is present
'P': data transfer to the permanent memory (e.g. while programming)

Actual Compound Values
'def' = failure

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



On each page
Cyclic alternating of date and time

Current Failure

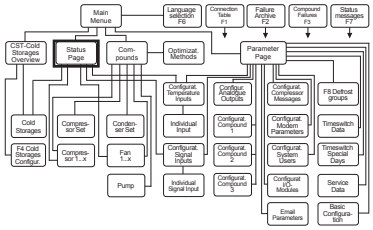
Error Message Priorities,
'1'= relay is ON

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.

CST 00-63 = Cold Storage Controllers on the interface 'Line 1'
CST 100-163 = Cold Storage Controllers on the interface 'Line 2'



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.

At the end of the listing you get the possibility, as in the parameter menu, to configure current and temperature inputs

Compounds Page

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 + feedback
‚r' = switched on, but no feedback
‚W' = warning
‚M' = malfunction
‚1' = switched on manually
‚0' = switched off manually

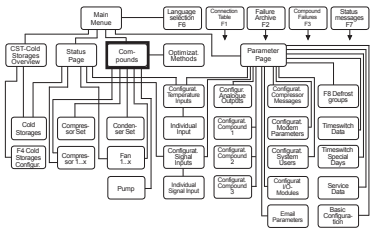
Moving the cursor to one of these positions and pushing ‚RET' calls the individual compressor- and fan pages.

```
S   Compounds
-------------------------------------------
C1  <Compressor>          <N  E..          >
    <Condenser>           <N  E...         >
C2  <Compressor>          <N  E...         >
    <Condenser>           <N  E...         >
C3  <Compressor>          <N  E...         >
    <Condenser>           <N  E...         >

C1  Brine Pumps   Pump 1 & 2 continuous   <RM>

                    <Optimization Methods>
-------------------------------------------
F2=Fail.History          F3=Compound Failures
```

Pump States
'.' = selected, not requested
‚R' = switched on + feedback
‚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 compressor set- and fan set pages.

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



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.

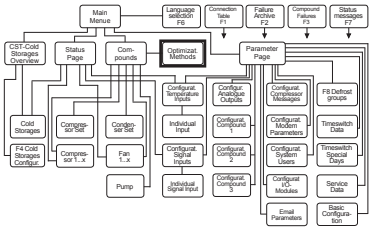
The parameter listing is larger than the screen area, please scroll by the cursor keys.

Parameter terms	RET	Description	Possible values / range
<C1 compressor>	X	Current operating state of this stage controller and its stages	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C1 condenser circ. 1>	X	Current operating state of this stage controller and its stages (Brine-Chiller systems: condenser circ. 1)	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C1 condenser circ. 2>	X	Current operating state of this stage controller and its stages (Brine-Chiller systems: condenser circ. 2)	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C1 condenser circ. 3>	X	Current operating state of this stage controller and its stages (Brine-Chiller systems: condenser circ. 3)	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C2 compressor>	X	Current operating state of this stage controller and its stages	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C2 condenser circ. 1>	X	Current operating state of this stage controller and its stages (Brine-Chiller systems: condenser circ. 1)	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C2 condenser circ. 2>	X	Current operating state of this stage controller and its stages (Brine-Chiller systems: condenser circ. 2)	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C3 compressor>	X	Current operating state of this stage controller and its stages	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C3 condenser>	X	Current operating state of this stage controller and its stages (Brine-Chiller systems: condenser)	F= forward, N= neutral, R= reverse (backrun) R, r, W, etc. see above
<C1 Brine Pumps>	X	Operating mode brine pumps of chiller 1	Pump 1 + 2 permanent, alternating, Pump 2 (1 stand-by), Pumpe 1 (2 stand-by)
<C2 Brine Pumps>	X	Operating mode brine pumps of chiller 2	like above
CPD-Function C2		If this function is enabled, the C2-analogue output delivers the highest value of the connected condenser pressure transmitters	on / off
CPD-Function C3		as above, but for circuit 3	on / off, C1, C2
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
<Optimization Methods>	X	Calls the page with the parameters of the optimization methods	
Cascade control			
Cascade control used C2		Using the cascade control in cooperation with C2	yes/no
Cascade control used C3		Using the cascade control in cooperation with C3	yes/no
Precooler feedback used.			yes/no
Safety time			0...60 sec. (default = 6)
Fast backrun threshold C1			-1...300 bar (default = 80:00 bar)
Forerun delay stage 1 C1			0...60 sec. (3 sec.)
Precooler demand C2		display only !	on/off
Precooler demand C3		display only !	on/off
Safety time remain.		display only !	X sec
Emergency-off of CSTs			
Minimum P-Suct C1			-1...300 bar (default = -1.00 bar)
Maximum P-Suct C1			-1...300 bar (default = 80 bar)
Maximum P-Cond C1			-1...300 bar (default = 80 bar)
Maximum P-Suct C2			-1...300 bar (default = 80 bar)
Maximum P-Cond C2			-1...300 bar (default = 80 bar)
Maximum P-Suct C3			-1...300 bar (default = 80 bar)
Maximum P-Cond C3			-1...300 bar (default = 80 bar)
External signal C1			yes/no
External signal C2			yes/no
External signal C3			yes/no

X = From here, a subpage can be called up with 'RET'

Optimization Functions

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



The parameters for the various optimization methods have been summarized here.
The parameter listing is larger than the screen area, please scroll by the cursor keys.

Parameter terms	Description	Possible values / range
Values of the Suction Pressure Optimization Function (Suction pressure optimization dep. on room air enthalpy)		
Room Temperature	Actual value of the room temperature sensor	°C
Raumfeuchte	Actual value of the room humidity transducer	% r. H.
C1 Compound		
Humidity Low Limit	Lower limit of humidity for determining the enthalpy as the leading dimension for the suction pressure optim. of the C1-compound	0...100 % r. H.
Humidity High Limit	Upper limit of humidity (see above)	0...100 % r. H.
Temperature Low Limit	Lower limit of temperature for determining the enthalpy as the leading dim. for the suction pressure optim. of the C1-compound	-50...+50 °C
Temperature High Limit	Upper limit of temperature (see above)	-50...+50 °C
Maximum shift	Offset, the suction pressure of the C1-compound will be shifted	0.00 ... 10.00 bar
Current shift	Information about the amount of the current suction pressure shift	Display only
C2 Compound	Parameters are displayed in an identical manner	
C3 Compound	Parameters are displayed in an identical manner	
Values of the Low Power Optimization Function (LOP)		
C1 Compound		
Function	Low Power Optimization ON/OFF	on/off
Power	C1-compressor power factor (unitless)	0...100 (e.g. % or kW)
Max Suction Pressure	Compressors switch on without demand at	-1,00...30,00bar / default 0,5 bar
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
Delay	Time delay after power demand to secure the demand is authentic, after that function off.	0m00 ... 10m00 / default 1m00
Delay Remaining	Remaining time after start of delay	Display only
external Refrigeration Demand	1= ‚LOP' is disabled via digital input.	0...1, display only
Power CST	For cold storages which are not connected to the data network The sum of the currently requested power of the cold storages in this compound	Display only
C2 Compound	Parameters are displayed in an identical manner	
C3 Compound	Parameters are displayed in an identical manner	
Values of the suction pressure shift function (SPS)		
C1 Compound		
Function	Activate SPS for this compound	off/on
Measuring interval status	Shows, if the function is still measuring or waiting	0= waiting, 1= just Measuring (Display only)
Measuring interval	Period of time the functions checks the cold storage setpoints	01m00 ... 60m00
Interval Remain	Remaining time of measuring interval	Display only
Current shift	Amount the suction pressure setpoint of this compound is currently shifted	0...SPr-setp max. (Display only)
C2 Compound	Parameters are displayed in an identical manner	
C3 Compound	Parameters are displayed in an identical manner	

```
W C1   Compressor Set                 03:05
-------------------------------------------
Compressors                V SSSS
Load Limit                                0%
SPr Act                  6.95 bar    14.4 °C
SPr Setp                 3.00 bar    -7.4 °C
SPr Offset             X 0.00 bar
SPr Setp effective       3.00 bar
SPr Hyst                 1.00 bar
SPr Setp maximal        30.00 bar
SPr Pre Alm              1.80 bar   -17.6 °C
SPr Alm                  1.50 bar   -20.5 °C


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

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

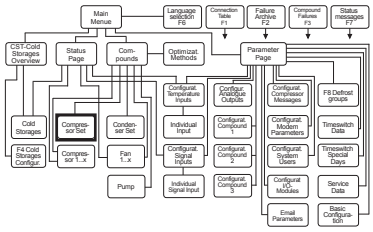
'X' = SPr Offset is active

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.

Compressor-Set Page



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.

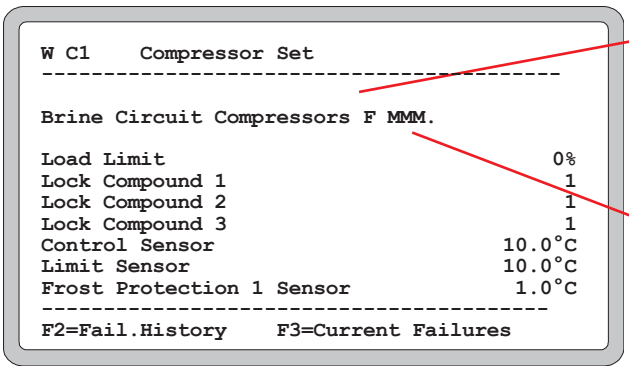
Parameter terms	Description	Possible values / range
Compressor	status messages of the stage controller/individual compressors	Display only (see above)
Load Limit	The % amount of disabled compressors	Display only
SPr Act	Calculated actual suction pressure value in °C/bar. Pressure value (bar) is adjustable	bar / °C
SPr Setp	Suction pressure setpoint	bar, (°C-display depends on refrigerant)
SPr Offset	Amount the suction pressure setpoint will be shifted if digital input 'night operation' is active	**+/- 5.00 bar.** Erscheint ein "X" vor dem Eintrag, dann ist dieser Wert aktiv
SPr Setp effective	Calculated suction pressure setpoint. Addition of SPr Setp + offset + external setpoint shift from optimizing functions	Oberer...Unterer Sicherheitsgrenzwert (nur Anzeige)
SPr Hyst	Hysteresis (dead zone) within forward and backrun	0.00 ... 24.00 bar
SPr Setp maximal	Upper safety limit of suction pressure setpoint	-1.00 ... +30.00 bar
SPr Pre Alm	Setpoint of suction pressure pre-warning	bar/°C
SPr Alm	Setpoint of suction pressure alarm	bar/°C
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 ... 10m00
Lock after malfunction	Min. time a machine is requested after having a failure state	0m05 bis 60m00, [5m00]
Persistency time	If no forerun or backrun time is requested, after this time an automatic backrun will be initiated to allow to change the base load.	10m00...540m00, [540m00]
³ PI-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	(in sec.)	0...100 sec [20 sec.]
³ max. step width	(in %)	0...10.0 % [10 %]
³ Output value		0...100% (displ. only)
Utilization Rate Compound	Information about the current power output. *Only usable if the compressors are equipped with 'power factors' !*	0...100% (displ. only)
Variable Forw/Backrun Delay (**VFR**)	Switch frequency optimization	on / off
¹ Forward Zone	Pressure range above the hysteresis range, where the forward delay will be varied within	0.05 ... 2.00 bar
¹ Backrun Zone	Pressure range below the hysteresis range, where the backrun delay will be varied within	0.05 ... 2.00 bar
¹ Forw/Backr. Delay time max.	Maximum forward/backrun delay time	0m01 ... 60m00
¹ Forw/Backr. Delay time min.	Minimum forward/backrun delay time	0m01 ... 60m00
¹ Forw/Backr. Delay time act.	Current delay time, calculated depending on Forward Zone, Backrun Zone and and current pressure	0m00 ... 60m00 (display only).
² Forward Delay Stage 1 up to	Time delay before this stage will switch on	max. 60 min : 00 sec
² Forward Delay Stage 12	Time delay before this stage will switch on	max. 60 min : 00 sec
² Backrun Delay Stage 1 up to	Time delay before this stage will switch off	max. 60 min : 00 sec
² Backrun Delay Stage 12	Time delay before this stage will switch off	max. 60 min : 00 sec
Hysteresis Location	Position of the hysteresis range of the setpoint	symmetrical, above, below
Verzögerung Oldruckschalter		
Mindeststandzeit Verbund Rest		
Dauerlaufzeit Verbund		
Grenzwert Absaugung		

-->

¹ only visible if Variable Forw/Backrun Delay (VFR) = on, ² only visible if Variable Forw/Backrun Delay (VFR) = off
³ only visible if the analogue output is selected is selected for FI-control

Parameter terms	Description	Possible values / range
Heatpumpfunction parameter	(only visible if on page 'Configuration compound x' the parameter 'Heatpump function enabled' is set to 'yes')	
Variable Forw/Backrun Delay	Switching frequency optimization	on / off
Forward Delay Stage 1	Time up to this stage switches on	max. 60 min : 00 sec.
up to		
Forward Delay Stage 12	Time up to this stage switches on	max. 60 min : 00 sec.
Backrun Delay Stage 1	Time up to this stage switches off	max. 60 min : 00 sec.
up to		
Backrun Delay Stage 12	Time up to this stage switches off	max. 60 min : 00 sec.
SPr Hyst	Hysteresis (neutral zone) within forward and backrun	0.00...24.00 bar
Time interval PI-controller		0...100 sec. [20 sec.]
step width PI-controller		1...100% [10%]
Optocoupler (digital input)	Current state of the heat pump digital input	on, off
P-Suct depend. on outdoortemp.	Parameter for the suct. press. shift. dep. on outdoor temperature	on = visible / effective
Lower limit	Lower limit of the suction pressure shifting	-100,0...+300,0°C
Upper limit	Upper limit of the suction pressure shifting	-100,0...+300,0°C
Offset (Delta T)	By this value, the suction pressure will be hold below the outdoor temperature	± 20K
Output value		0,00 bar
P-Suct depend. on return temp.	Parameter for the suct. press. depending on the backrun temperature	on = visible / effective
Threshold value	Above this limit, the suction pressure setpoint will be shifted up by the following factor	-100,0...+300,0°C
Factor	Shifting factor in bar per K	0,00...10,00 bar/K
Output value		0,00 bar
P-Suct depending on P-Cond.	Parameter for the suction pressure limitation over the condensation pressure	on = visible / effective
Threshold value	Above this limit the suction pressure setpoint will be shifted up by the fllowing factor	-10,00...+ 299,99 bar, off
Factor	Shifting factor in bar per bar	0,00...10,00 bar/bar
Output value		0,00 bar
All further compressor sets will be displayed in the same way		
Oil pressure switch delay		
Rem. Compound standstill time		
Continuous runtime		
Pumpdown limit		

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.

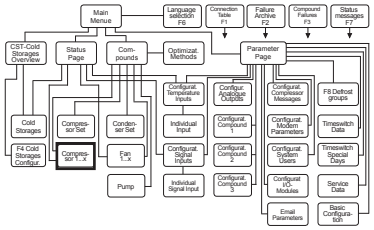
Parameter terms	Description	Possible values / range
Brine Circuit Compressors	Status messages of stage controller and the individual compressors	Display only (see above)
Load Limit	The % amount of disabled compressors	Display only
Lock Compound 1	1 = refrigerant circuit 1 is locked by an external signal	1 / 0 (display only)
Lock Compound 2	1 = refrigerant circuit 2 is locked by an external signal	1 / 0 (display only)
Lock Compound 3	1 = refrigerant circuit 3 is locked by an external signal	1 / 0 (display only)
Control Sensor	Actual value of control sensor	°C / correctable
Limit Sensor	Actual value of limitation sensor	°C / correctable
Frost protection Sensor 1	Actual value of freeze protection sensor in heat exchanger 1	°C / correctable
Frost protection Sensor 2	Actual value of freeze protection sensor in heat exchanger 2	°C / correctable
Frost protection Sensor 3	Actual value of freeze protection sensor in heat exchanger 3	°C / correctable
Brine Pressure	Actual value of media pressure transmitter	bar (display only)
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
Brine Pressure Limit Shutdown	'On' fixes that the brine pumps switch off < 'Brine Pressure Limit'	on / off
Setpoint Location	relative = Setp 2...12 are offsets to Setp 1	absolutely, relative
Setp 1 up to Setp 12	Control setpoint of compressor/stage 1 up to Control setpoint of compressor/stage 12	°C
Offset	Amount, the control setpoint will be shifted if digital input 'Night Operation' is active	+/- 10.0 °C. If an 'X' appears, this value is active
Hysteresis	Hysteresis of stage setpoints	K
Hysteresis Location	Defines if hysteresis is located below, above or around the setpoints	below, above, symmetrical
Setp Limit	If the actual value falls short of this setpoint, a backrun will be initiated.	°C
Setp Frost Protection	If the actual value falls short of this setpoint, compound will be switched off	°C
Forward Delay Stage 1 up to Forward Delay Stage 12	Time delay before this stage will switch on	max. 60 min : 00 sec
Backrun Delay Stage 1 up to Backrun Delay Stage 12	Time delay before this stage will switch off	max. 60 min : 00 sec
CPD-Function for Brine Condensers	'On' fixes that the condenser fans are controlled by the highest available transducer 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 ... 10m00
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% (display only).
Verzöger. Öldruckschalter		
Rem. Compound standstill time	The time the compound still makes a break	mm:ss (display only)
Continuous runtime	After this time the compound will be switched off by force	180 minutes (fixed)
Suction threshold	At this value, the compound will be started to pump down, even while a break	off, -0,1...19,99 bar
Suction threshold lower	Here the compound switches off again	off, -0,1...19,99 bar

Compressor Page

```
Compressors
-------------------------------------------
C1 Compressor 1 , Auto RW

       Times                  Messages
ON              770h           Feedback          1
Lock             0m00      Alm High Temp
Stoptime        56m16     Alm High Press
min.Stopt        0m00              Alarm
                         Alm Oil Press
                        Alm Motor Prot
Power On's Current                                0
Power On's Yesterday                              0
-------------------------------------------
F2=Fail.History     F3=Current Failures
```

'.' = switched on
'W' = warning

M/0/A-switch



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

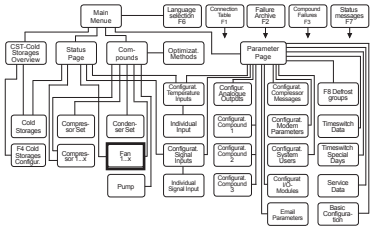
Parameter terms	Description	Possible values / range
(xx) Compressor (No)	No. of compressor whose operation parameters are located on this page	
right aside the Compr. No.	manual operation of the compressor, matches to a M/0/A-switch	off, automatic, on
same line, right side	status messages of the stages of this compressor	'.'= switched on, 'W'= warning (display only)
Messages ([3] Here the messages appear which are selected and named under 'Configuration Compressor <Messages>')		
[3] Feedback	indicator for the feedback signal via security chain	'1' = feedback signal detected '0' = feedback signal not available
[3] Alm High Temp.	status of this digital input	'1' = feedback signal detected (displ. only)
[3] Alm High Press.	status of this digital input	'1' = feedback signal detected (displ. only)
[3] Alarm	status of this digital input	'1' = feedback signal detected (displ. only)
[3] Alm Oil Press.	status of this digital input	'1' = feedback signal detected (displ. only)
[3] Alm Motor Prot	status of this digital input	'1' = feedback signal detected (displ. only)
Times		
On	run time counter of this compressor	Display only
Lock	rem. time until the compressor will restart after an alarm	Display only
Stoptime	time the compressor is already disabled	Display only
min.Stopt	minimum idle time after the compressor was disabled	max. 60:00 minutes
Power Up's Current	All power up sequences of the compressor within 0 and 24:00 of today will be added here	Display only
Power Up's Yesterday	All power up sequences of yesterday	Display only
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)	0...100%

Fan Page

```
Fans
-------------------------------------------
C1 Fan  1 ,      Auto     SS

                 Safety-Chain              0




On 13460 h
Lock 0m00
Stoptime 60m00
min Stopt. 0m00
```

'.' = selected
'W' = warning

M/0/A-switch



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

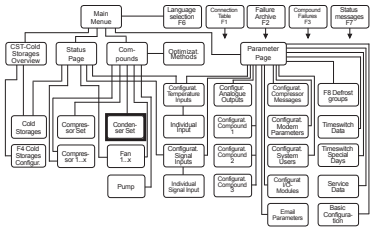
Parameter terms	Description	Possible values / range
(compound) Fan (No)	No. of fan whose operation parameters are located on this page	
right aside the fan No.	Manual operation of the fan, matches to a M/0/A-switch	off, automatic, on
same line, right side	Status messages of the stages	'.' = switched on (display only) 'W' = warning
Feedback	Indicator of feedback signal via safety chain	'1' = feedback signal detected '0' = feedback signal not available (disp.only)
On	Run time counter of this fan	Display only
Lock	Delay time until the fan will be enabled again after an alarm has been occured	Display only
Stoptime	Time the fan is already disabled	Display only
min Stopt.	Minimum idle-time after the fan has been disabled	max. 60:00 minutes

Condenser-Set Page

```
C1 Condenser Set                          12:36
-------------------------------------------

Condenser                F WWWW
CPr Act                    3.98 bar      -0,6 °C
CPr Setp 1                11.00 bar      29,5 °C
CPr Setp 2                12.00 bar      32,6 °C
CPr Setp 3                13.00 bar      35,6 °C
.
.
.
Forward Delay                              0m20
Backrun Delay                              0m20
-------------------------------------------
F2=Fail.History      F3=Current Failures
```

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

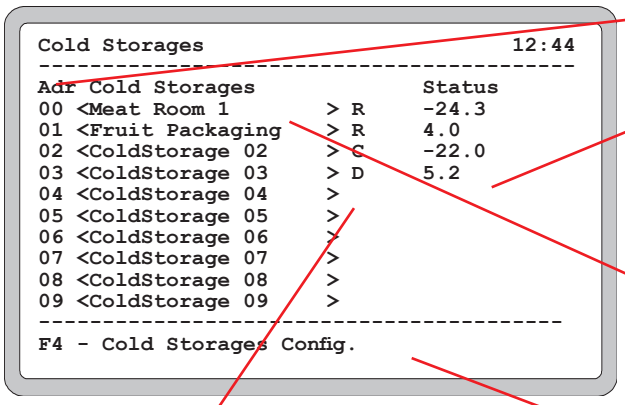


Each condenser set page contains the matching control setpoints as well as fan state messages.

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

Parameter terms	Description	Possible values / range
Condenser	Status messages of the stage controller	see above (display only)
CPr Act	Actual condenser pressure The pressure value (bar) is adjustable (in case of tolerances)	bar / °C
CPr Setp 1	Condenser pressure setpoint of this stage	-1.00...300.00 bar / + disp. as °C
up to		
CPr Setp 12	Condenser pressure setpoint of this stage	-1.00...300.00 bar / + disp. as °C
CPr Offset	Amount the condenser pressure setpoint will be shifted if digital input '2nd setpoint' is activated	+/- 50 bar if an ‚X' appears, the value is active
CPr Hyst	Hysteresis of the stages	-1...+30 bar
Hysteresis Location	Defines if hysteresis is located below/above/around the setpoints	below, above, symmetrical
CPr Pre Alm	Setpoint of high pressure pre-warning	bar / °C
CPr Alm	Setpoint of high pressure alarm	bar / °C
Forward Delay	Time delay before one of the stages will switch on	minutes : seconds
Backrun Delay	Time delay before one of the stages will switch off	minutes : seconds
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 ... 10m00
Lock after malfunction	Min. time a machine is requested after having a failure state	0m05 ... 60m00, [5m00]
Persistency time	If no forerun or backrun time is requested, after this time an automatic backrun will be initiated to allow to change the base load.	10m00...540m00, [540m00]
PI-Controller	(only visible if the Analog Output was configured with Condens.P-Ctr. xx (xx))	
Time interval		[0]...100 sec.
step width		1...[100] %
Output value	display only (only visible if the Analog Output was configured with cond. pressure control)	0.0...100%
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'
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	°C (display only).
Temperature threshold	Temperature limit where a temperature shift begins	0..60°C
Temperature range	Temperature shift range above ‚Temperat. Threshold' within this shift can be done.	0.00...20.00K
Factor	Factor of the temperature shift in K per K Outdoor temperature change	0.00...5.00K / K
Current Setpoint-Offset	Offset, calculated from ‚Outdoor Temp., Act., Temperature range and Factor. This offset is added to the setpoints	K (Display only).
Reflux Brine Chiller Act.	Actual temperature at the control sensor (e.g. sensor C1 Cond. Circ. 1)	°C (Display only).

Cold Storages Overview (CST)



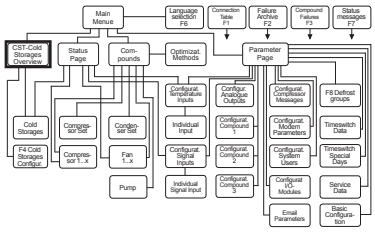
Address of the Cold Storage
0xx = Address on Line1
1xx = Address on Line2

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

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.

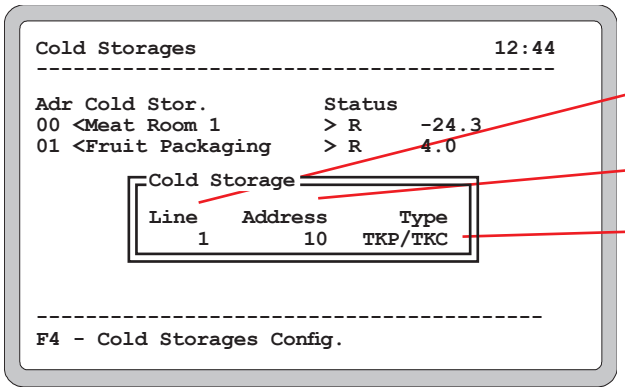
State of the cold storage controllers
'R'= switched on '0' = swiched off (or not connected)
'C' = refrigeration ON 'D' = defrost ON
'W' = warning

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

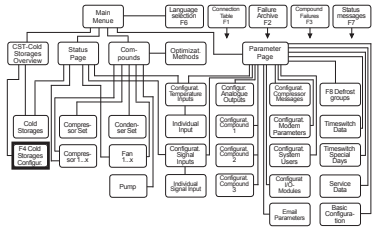


This page contains a listing of all connectable cold storage controllers with the addresses 0-128. This listing is easy to follow because of the clear text position names.

Cold Storage Configuration (F4)



- Push '**F4**', a configuration window opens
- set the number of the databus where the controller is connected (Line 1 or 2)
- set desired network address of the cold storage controller
- set the type of cold storage controller
- Question „Fetch data from CST?" appears
- „yes" transfers data from the controller to the parameter memory of the VPR.

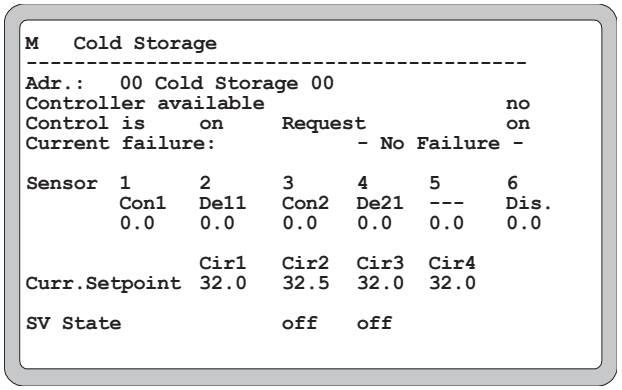


Here connections, communication addresses and type of the connected cold storage controllers will be determined.

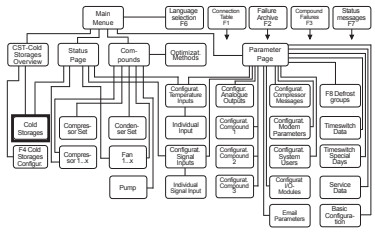
If you set „---" as controller type, this cold storage will be erased from the Overview Page. All parameter settings of this cold storage will be lost!

Remove controller unit from Overview Listing.

Cold Storage Controller Page



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

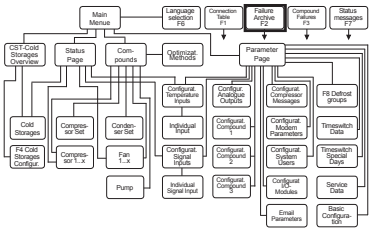


Contains all parameters of the individual controller, the meanings of these parameters are described in the matching technical manual. From this location the parameters can be remote controlled.

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)

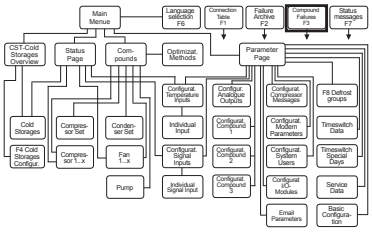


Contains a listing of the last 150 occured error- and 'all clear' messages.

Key **F2**: Calls up this page. (Not reachable from the current failures page **F3**)

Current Failures F3

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

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

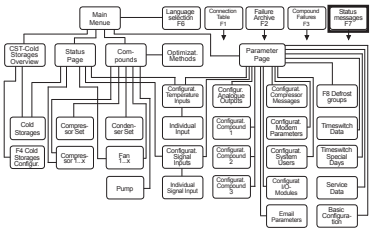


Contains all current errors of the system.

Key **F3**: Calls up this page

Status Messages F7

```
S  Status Messages
-----------------------------------------




-----------------------------------------
```

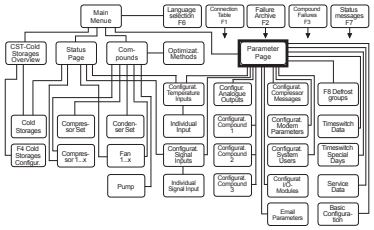


Key **F7**: If no failure priority is assigned to an external alarm message input, the failure message does appear here, but not under 'Current Failures'.

Parameter Page

```
M Parameter                              17:36
-----------------------------------------
Program Version                VPR52 011507 790
Application name                    test market
Time :                                    12:28
Date :                         Tuesday 02.05.14
Configuration Compound                      <C1>
Configuration Compound                      <C2>
Configuration Compound                      <C3>

Configuration Compressor                <Messages>

Configuration                        <System users>
```

Selectable compound designations

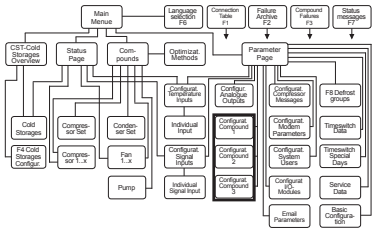


Contains the configuration parameters of the VPR and is larger than the screen area. Scroll items by the cursor keys.

Parameter terms	RET	Description	Possible values / range
Program Version		VPR52 MRxxxxxxxxxxxxxxxx	VPR52 (compiler)(year)(month)(no.)
Application name		e.g. name of the plant, can be entered here	up to 20 characters text
Time		hours : minutes	00:00 ... 23 : 59
Date		Day of the week, day, month, year	00.00.00. ...21.12.14 (14 = 2014)
Configuration Compound <C1>	X	Branch to this page	--
Configuration Compound <C2>	X	Branch to this page	--
Configuration Compound <C3>	X	Branch to this page	--
Config. Compressor <Messages>	X	Branch to this page	--
Configuration <System Users>	X	Branch to this page	--
Configuration <4-20 mA Inputs>	X	Branch to this page	--
Config. <Temperature probes>	X	Branch to this page	--
Configuration <Analog Outputs>	X	Branch to this page	--
Configuration <Modem operation>	X	Branch to this page	--
Configuration <E-Mail Parameters>	X	Branch to this page	--
Configuration <Input/Output Modules>	X	Branch to this page	--
Configuration <Defrostgroups>	X	Branch to this page	--
<Time-Switch Data>	X	Branch to this page	--
<Time-Switch Special Days>	X	Branch to this page	--
Time switch period P1 from ... up to ...		Switchtime limitation period 1	01.01. (day.month) up to 31.12.
Time switch period P2 from ... up to ...		Switchtime limitation period 2	01.01. (day.month) up to 31.12.
<Service Data>	X	Branch to this page	--
<Basic Configuration>	X	Branch to this page	--
Failure-No		No. of the error, which should have the following priority	0...640
Priority		' * ' (asterisk) marks the desired priorities of the errors with the shown number	1...6
Text		Designation of the error with the shown number	
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 text description **To assign Text / Name for this alam messages:** See page 'Operating'	

X = From here, a subpage can be called up with 'RET'

Configuration Page Compound 1-3

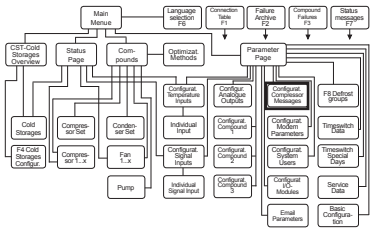


For each of the 3 possible compounds such a site is available which contains configuration data for them.

```
S C1-Compound Configuration            15:10
-----------------------------------------
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
```

Parameter terms	Description	Possible values / range
Refrigerant	The refrigerant in this compound	R22, NH3, R134a, R23, R123, R290, R402a, R402b, R404a, R407c, R410A, R502, R507, R723, 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
Lüfterschaltung	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
Base load limit 3	How many % of the selected compressors should be disabled, if digital input 'Load Limitation 3' 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
Partly malf. error Compound at		1...99%, aus
Mindeststandzeit Verdichter		
Heatpump function enabled	yes = the function is active, further parameter are visible	yes, no
FU-control powerstages F/B at	Behaviour of the analog output for Frequency Inverters at F/B	0/0%, 100/100%, 100/0%
Speedlimiter condensor used	yes = function is active, more parameters visible	yes, [no]
Analog output Condens. max	(only visible if "Speedlimiter condensor" is set to 'yes')	0...100%
Name (of the) Compound	Name of the compound, 2 characters	e.g. C1
Compressor		
No. Stages Compressor 1-12	Number of stages of the compressor x	0,1...12
No.	Compressor is assigned to the refrigerant 1...3 circuit #X (multi-circuit brine chillers)	1...3
No. inverted stages	Quantity of compressor stages switched by an N/C contact	0...12
No. prior. compressor	# of the compressor with lesser power in compound 1	0...12
Switching behaviour		interval / permanent
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	0...12
Condenser Fans Circ. 2 (comp.1+2 only)		
No. stages	Quantity of stages of the fan, circuit 2 at 2-circuit brine compound	0,1...12
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	0...12
Condenser Fans Circ. 3 (comp. 1 only)		
No. stages	Quantity of stages of the fan, circuit 3 at 2-circuit brine compound	0,1...12
No. Inverted Stages	Quantity of fan stages which control their load by the N/C contact	0...12

Configuration Compressor Messages



Here you preset which compressor messages must be processed.

Change message designation

```
S   Compressor Feedback Message        8:53
-----------------------------------------

No.              active      Text
1 Safety chain     .         Rückmeldung
2 Oil Press        X         Öldruck
3 Malfunct.        .         Kopflüfter
4 High Press.      .         Hochdruck
5 Motor Protect    X         Motorschutz
6 High Temp.       .         Überhitzung
```

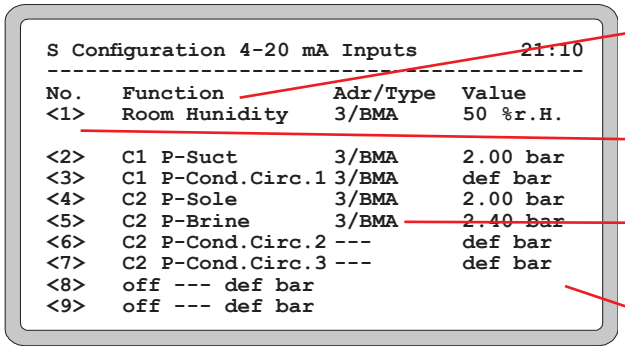
With an 'x' under 'active', it can be defined which of this messages are/should be active.

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 which can be changed at any time.

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

Configuration 4-20 mA Inputs

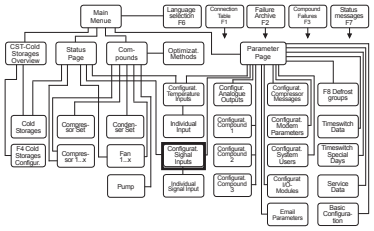


Function of the input, can be selected here as well as on the individual page.

Branches to the individual pages

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

Measured value and state of the input

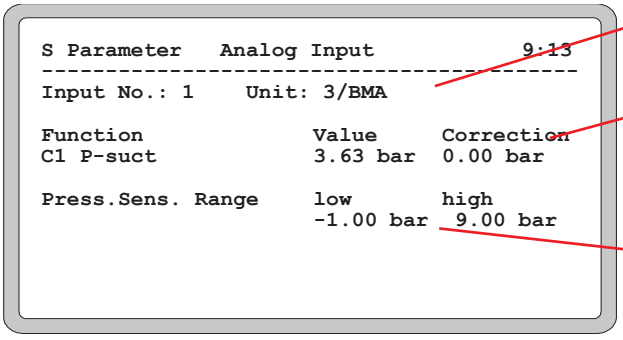


Contains configuration-/correction parameters of all 4-20mA inputs of the system.

Parameter terms	RET	Description	Possible values / range
<No. x>	X	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, Press.Display 1..11, C3 P-brine, C3 P-suct, C3 P-cond.cir.1, Press.Display 12...25
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	off = switched off / not available, def = failure

X = From here, a subpage can be called up with 'RET'

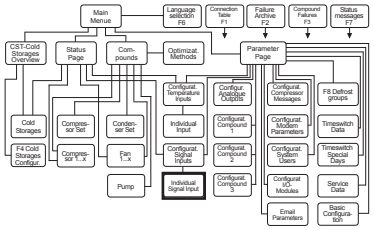
Individual 4-20 mA Input



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 Analog Outputs

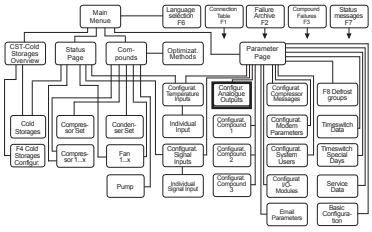
```
S Configuration Analog Outputs 12:02
-------------------------------------------
No. Function                    Adr/Type Value
1   High Pressure C1 (V)        3/BMA    10.0%
2   High Pressure C2 (V)        3/BMA    10.0%
3   High Pressure C3 (mA)       ---      0.0%
4   off
5   off
6   off
7   off
8   off
9   off
10  off
11  off
```

Function of the output

Output delivers this %-part of its maximum value.
e.g.: 10%:
4-20-outputs: 5,6mA
0-10V-outputs: 1V

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

The type of the analogue output, which delivers this information



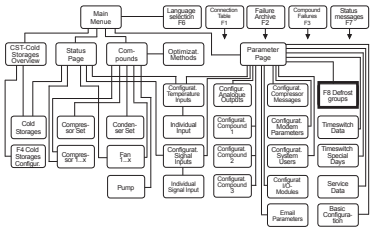
Preset of the duties for the analogue outputs of the VPR-System.

Parameter terms	Description	Possible values / range
Function	Functional description of this output	off, High Pressure C1 (V), High Pressure C2 (V), High Pressure C1.2 (V), High Pressure C1.3 (V), High Pressure C2.2 (V), Suct.press control C1 (V), Suct.press control C2 (V), High Pressure C1 (mA), High Pressure C2 (mA), High Pressure C1.2 (mA), High Pressure C1.3 (mA), High Pressure C2.2 (mA), Suct.press control C1 (mA), Suct.press control C2 (mA), High Pressure C3 (V), Suct.press control C3 (V), High Pressure C3 (mA) Suct.press control C3 (mA), Brinetemp.Control V1 (V), Brinetemp.Control V2 (V), Brinetemp.Control V3 (V), Brinetemp.Control V1 (mA), Brinetemp.Control V2 (mA), Brinetemp.Control V3 (mA), Condens.P-Ctr. V1 (V), Condens.P-Ctr. V1.2(V), Condens.P-Ctr. V1.3 (V), Condens.P-Ctr. V2 (V), Condens.P-Ctr. V2.2 (V), Condens.P-Ctr. V3 (V), Condens.P-Ctr. V1 (mA), Condens.P-Ctr. V1.2 (mA), Condens.P-Ctr. V1.3(mA), Condens.P-Ctr. V2 (mA), Condens.P-Ctr. V2.2 (mA), Condens.P-Ctr. V3 (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 F8
Defrost Groups

```
S  Defrostgroups                        4.2.15
-----------------------------------------------

                              <Defrost times>

                          <Defrostgroup names>

                    <Defrostgroup assignments>
```

Subscreens for the defrost groups



Here can be defined defrost groups for cold storages, which can be started at any time and days.

This screen can be called also by the button **F8**.

```
S  Defrost times                          08:50
-----------------------------------------------
                                    Weekdays
No.  Defrost group           Time   MTWTFSS

 1   Defrost group Mo        23:30  *......
 2   Defrost group 2         23:30  .*.....
 3   Defrost group 3         22:00  ......*
 4   -----                   off    .......
 5   -----                   off    .......
 6   -----                   off    .......
 7   -----                   off    .......
 8   -----                   off    .......
```

Here can be defined up to 120 different defrost times and days for any Defrost Groups.

The individual defrost times at the assigned cold storages are still active.
If the defrost times of the VPR should be used exclusively, the individual defrost times of the controller must be erased or set to 'external only'.

Parameter terms	Description	Possible values / range
No.	Number of the Defrost group	120 groups possible
Defrost group	Name of the Defrost group	Selection of them, group names are entered in the subscreen 'Defrostgroup names'.
Time	Time at which the defrost of this group should be started	[off], 00:00...23:59
Weekdays	MTWTFSS (Monday, Tuesday, Wednesday,...), Day at which the defrost should be started	"." = off, "*" = selected at this day

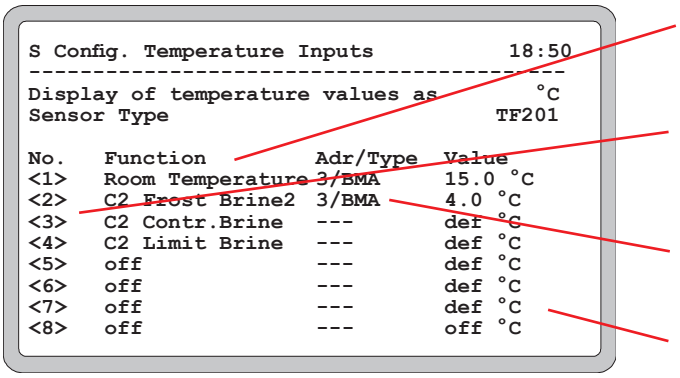
```
S  Defrostgroup names                   09:00
-----------------------------------------------
No.  Name

 1   Defrost group Mo
 2   Defrost group 2
 3   Defrost group 3
 4
 5
 6
 7
 8
```

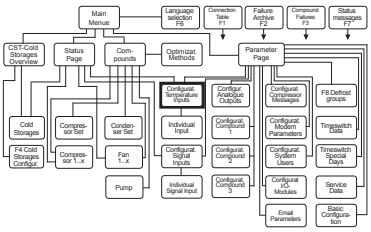
Here can be defined any names for the 32 possible defrost groups.

```
S  Defrostgroup assignments             09:00
-----------------------------------------------
                                Cold storage
Defrostgroup                    Adr  Name

 Defrost group Mo               001  Meat KR
 Defrost group 2                002  Room 1
 Defrost group 3                003  Room 2
 -----
 -----
 -----
 -----
 -----
```

Overview list of the cooling positions which are assigned to the defrost groups.
These items are only visible, if on the individual pages of the cold storage controllers a group is assigned at the parameter 'Defrostgroup' in the subdirectory <Defrost Data>.

Configuration Temperature Probes



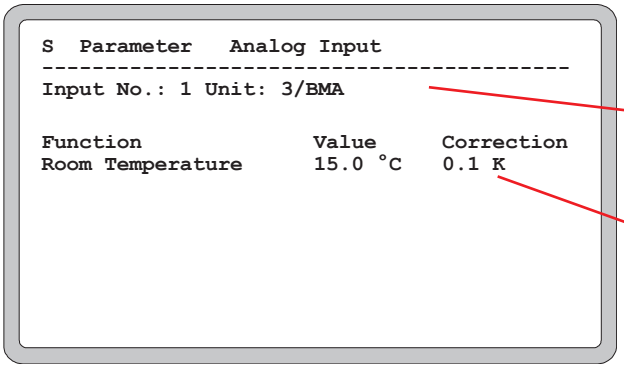


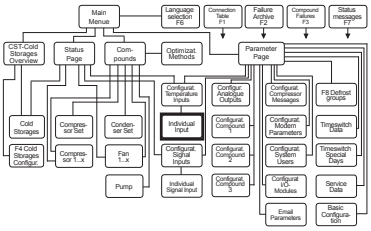
Contains configuration-/correction parameters of all temperature sensors of the system.

Parameter terms	RET	Description	Possible values / range
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>	X	<Number of the temperature sensor input>> Branch to the individual page	
Function		Functional description of the input. Can be chenged 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...15, C3 Control Brine, C3 Limit Brine, V3 Frost Brine1, C3 T-Cond.Circ.1, Temp.-Display 16...25
Adr/Type		Address and type of the I/O- module where this input is located	Example: 3/BMA. I/O-module type BMA with address 3 on the internal bus
Value		Actual Value resp. state of the temperature input	Actual Value/Phys. Value, off = switched off/not available, def = failure

X = From here, a subpage can be called up with 'RET'

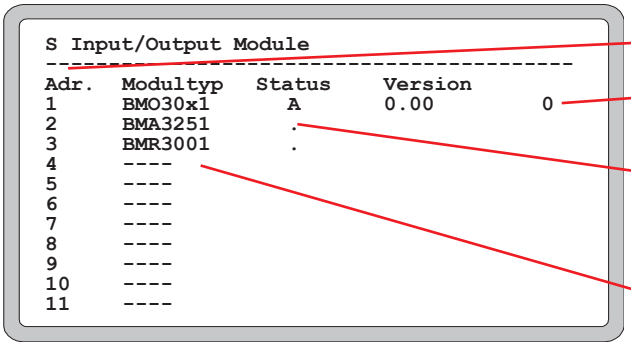
Individual Temperature Input

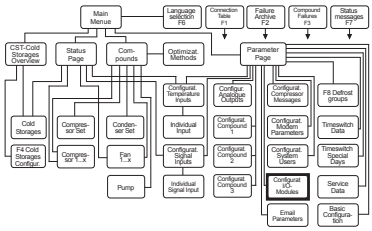




This pages contain the function, the actual value and the correction value for the individual inputs. Such a page is available for each temperature input.

Configuration Input/Output Modules



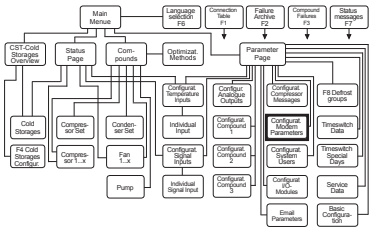


Configuration Modem Operation

```
W  Configuration Modem
-----------------------------------------
SMS-Modem used:                      no

Init Command
AT&FX3S0=1
Dialing Command 1
          ATDT 0620520090
Dialing Command 2
          ATDT 0620520090
Dialing Command 3
          ATDT 0620520090
Dialing Command 4
          ATDT 0620520090
Control Message                      on
```

The screen content depends on the selection of „no“, „TIXI“, „INSYS“ or „GSM“.

The initstring and the dial commands can be entered via keypad



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

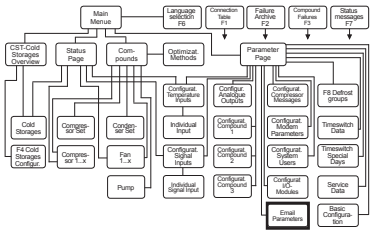
Parameter terms	Description	Possible values / range
SMS-Modem used	With an SMS-Modem you are able to send messages as SMS, Fax or Email over „SMS in landline networks“ or GSM. The further screen content depends on this selection.	tixi (SMS-Modem), insys (SMS-Modem) no = standard modem, GSM (radio modem)
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 a 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 message should be transmitted.	29 characters max.
Dial command 2	ditto. This command will be send to the modem, if dial command 1 gets no connection.	29 characters max.
Dial command 3	ditto. This command will be send to the modem, if dial command 2 gets no connection.	29 characters max.
Dial command 4	ditto. This command will be send to the modem, if dial command 3 gets no connection.	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, off
Baudrate of modem interface	Data transmission speed from and to the modem	1200 - 57600
SMS-Modem used = TIXI / INSYS		
Init command	Initialization code, individual for each modem	Defaults: Tixi: AT+TIXI=0 S0=1 X3 &W INSYS: AT&FX3S0=1
Messaging 1		
Type	Failure forwarding as	off, SMS, Fax, Email
Protocol used	Kind of protocol to use for the service provider	Automatisch, D1-TAP, D2-UCP, PSTN, Mobilcom A-TAP
Timeframe from ... to	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.	Sending SMS: enter mobile phone no. only **Only tixi:** Sending a fax: **99** + fax no. For sending an Email: Enter code **8000** here
Email-Address	Email-Address of the addressee. (Please enter additional Code 8000 at „Phone-No.“)	
Messaging 2		
Type	Failure forwarding as	off, SMS, Fax, Email
Protocol used	Kind of protocol to use for the service provider	Automatisch, D1-TAP, D2-UCP, PSTN, Mobilcom A-TAP
Timeframe from ... to	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.	Sending SMS: enter mobile phone no. only **Only tixi:** Sending a fax: **99** + fax no. For sending an Email: Enter code **8000** here
Email-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	Automatisch, D1-TAP, D2-UCP, PSTN, Mobilcom A-TAP
Timeframe from ... to	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.	Sending SMS: enter mobile phone no. only **Only tixi:** Sending a fax: **99** + fax no. For sending an Email: Enter code **8000** here
Email-Address	Email-Address of the addressee. (Please enter additional Code 8000 at „Phone-No.“)	

more -->

Parameter terms	Description	Possible values / range
SMS-Modem used = GSM	SMS only	
Init command	Initializing code, individal for each modem	Preferences: GSM: AT+CPIN=0000
Messaging 1		
Timeframe from ... to	Space of time where messages can be transmitted	0 h - 0 h (=24 hrs.)
Telefon-Nr	Phone number of destination	insert mobile phone no. only
Messaging 2		
Timeframe from ... to	Space of time where messages can be transmitted	0 h - 0 h (=24 hrs.)
Telefon-Nr	Phone number of destination	insert mobile phone no. only
Messaging 3		
Timeframe from ... to	Space of time where messages can be transmitted	0 h - 0 h (=24 hrs.)
Telefon-Nr	Phone number of destination	insert mobile phone no. only
INFO, independent from the modem		
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 ... 23:59
Baudrate of modem interface	Data transmission speed of the modem interface "Modem 232"	1200 - 38400, [9600]

Configuration E-Mail-Parameters

```
S  E-Mail Parameter
-----------------------------------------
Messaging 1
  Timeframe  from       0 h     to     0 h
  Control message                     off h
  Email Address


Messaging 2
  Timeframe  from       0 h     to     0 h
  Control message                     off h
  Email Address


Messaging 3
```

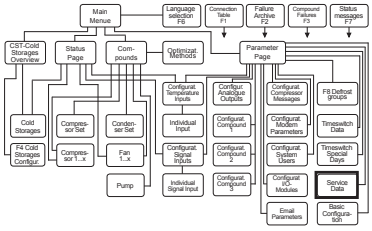


This is a listing with the necessary parameters to send information by an email.

Parameter terms	Description	Possible values / range
Messaging 1		
Timeframe	Space of time, within failure and ok message can be send by email	from (off, 0...23 h) to (0...24 h)
Control message time	A message will be send once a day to inform the recepient that the connection works	off, 0...23 h
E-Mail Address	The email address of the recipient	xxxxxx@xxxx.xxx (any email address)
Messaging 2		
Timeframe	Space of time, within failure and ok message can be send by email	from (off, 0...23 h) to (0...24 h)
Control message time	A message will be send once a day to inform the recepient that the connection works	off, 0...23 h
E-Mail Address	The email address of the recipient	xxxxxx@xxxx.xxx (any email address)
Messaging 3		
Timeframe	Space of time, within failure and ok message can be send by email	from (off, 0...23 h) to (0...24 h)
Control message time	A message will be send once a day to inform the recepient that the connection works	off, 0...23 h
E-Mail Address	The email address of the recipient	xxxxxx@xxxx.xxx (any email address)
E-Mail Sender Settings		
SMTP-Server Name / IP	Name resp. IP-Address (TCP/IPv4) of the SMTP-Server, via this emails can be sent	Name or xxx.xxx.xxx.xxx
E-Mail Address	Own E-Mail Address of the VPR-System	any specified address
Username	The user name, necessary for sending	any
Password	The password, necessary for sending	any
Send HACCP-Report automatically	Will be sent daily at this hour	0...23 h, [oFF]
sent	Information when the last report was sent	
Request report manually		yes, [no]
Send report, first date		xx.xx.xx (dd.mm.yy)
Send report, last date		xx.xx.xx (dd.mm.yy)
E-Mail Address 1	Email address of the 1st recipient	xxxxxx@xxxx.xxx (any Email Address)
E-Mail Address 2	Email address of the 2nd recipient	xxxxxx@xxxx.xxx (any Email Address)
E-Mail Address 3	Email address of the 3rd recipient	xxxxxx@xxxx.xxx (any Email Address)

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

Change line address of CST:             78
Change line address of CST 1XX:         78

Recording Interval Actual values        0h15
Recording Interval Setpoints            24h
```

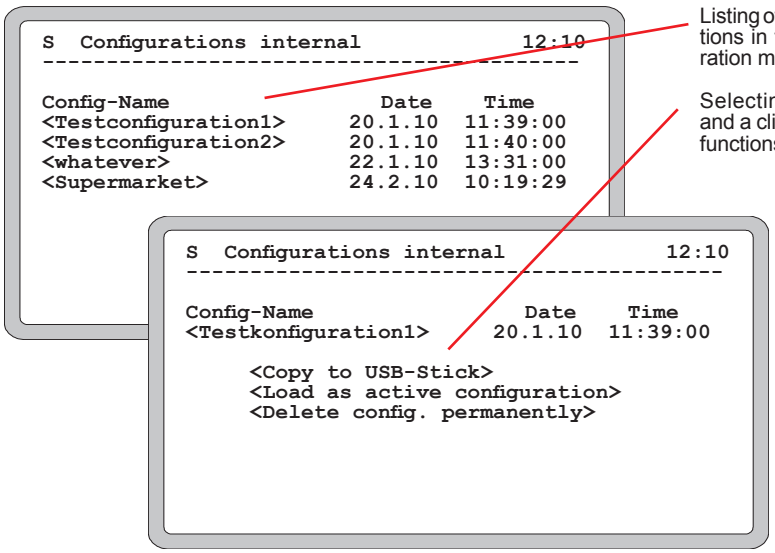


Contains parameters for service purposes, backup and communication.

Parameter terms	RET	Description	Possible values / range
Suppress unused Parameters		off = all parameters of compressor stages and setpoints will be displayed, on = unused parameters are not shown	off, [on]
Access Code DDC		Code to contact the VPR via PC/interface resp. modem. No remote access without this code.	0...9999, 0 = access possible without code
Baudrate of the USB/SSC interface		Data transmission speed from/to the connected PC in baud	1200, 2400, 4800, [9600] 19200, 38400, 57600 Baud
Own DDC-network address		VPR-address in network, necessary if multiple VPRs or other controller units are connected via the same RS-485 bus.	0...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 which are connected to 'Line 1'. Connect only one CST at the same time ! **(Factory Setting / known address)**	0...63 [78]
Change Line Address of CST 1xx		Service function to change the line addr. of CSTs without display which are connected to 'Line 1'. Connect only one CST at the same time ! **(Factory Setting / known address)**	0...63 [78] (= 100...163)
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
Recording Duration Approx.		Estimated recording duration before the logged data must be backuped to a PC. (dep. on interval settings)	xxxxx h (display only)
Delete recording storage		**Erases all recorded data of the data logger !!**	Sign in as user 10, enter here the value -2, then confirm with RET
Night operation state		off: VPR works in standard mode, on: VPR works night mode	off, on (display only)
Storage media		Display of the recognized external storage media (e.g. USB-Stick or SD/MMC-Card)	
Configuration memory			
<Save act. Configuration>	X	Branch to this page	
<Configurations internal>	X	Branch to this page. Appears only, if via 'Save act. Configuration' the configuration has been backuped internal.	
<Configurations USB-Stick>	X	Branch to this page. Appears only, if a USB stick has been inserted and recognized and if a configuration file is stored on this stick	
Load default values		All parameters will be set to default values (factory settings) Stored configurations are not affected and will remain.	The value '**1**' and a confirmation by 'RET' erases the parameter memory
Daylight saving mode		EU from 96, no, variable	see description
UTC-Timezone shift		+720 min....-720 min.	see description
<ELREHA test data>	X	Branch to the Test Data Page	
Notes / Memo		Any text. Can be entered here, or, the more comfortable way, by PC-Software	

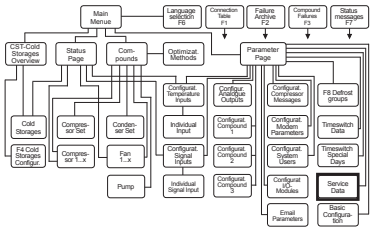
X = From here, a subpage can be called up with 'RET'

Configurations internal



Listing of all stored configurations in the internal configuration memory.

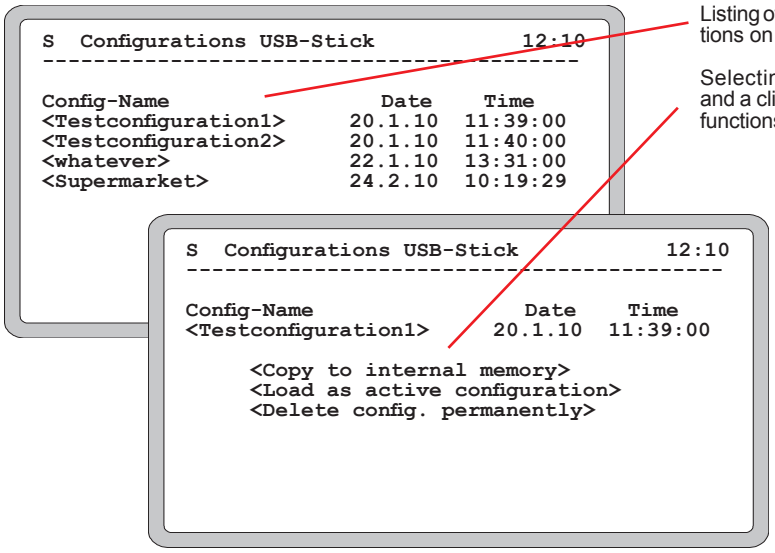
Selecting a configuration and a click on 'RET' calls the functions.



Backup memory for system configurations. This function helps to store all current settings, to get the possibility to experiment with new settings and then to restore them from the backup.

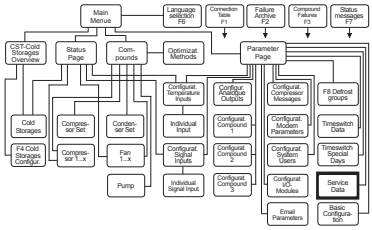
Parameter terms	RET	Description	Possible values / range
<Copy to USB-Stick>	X	Copies the selected configuration to the connected USB-stick/disc	Security check yes/no
<Load as active configuration>	X	Takes the stored configuration and works with it directly Security check necessary.	Security check 'Overwrite act. Config.' yes/no
<Delete config. permanently>	X	Erases the selected configuration from the internal memory	Security check yes/no

Configurations USB-Stick



Listing of all stored configurations on an USB stick.

Selecting a configuration and a click on 'RET' calls the functions.



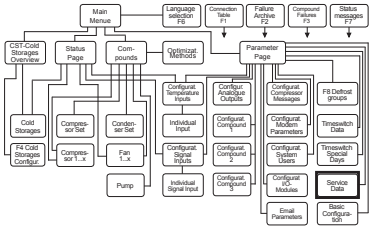
Contains an overview about configurations, which has been stored e.g. on an external USB stick.

Parameter terms	RET	Description	Possible values / range
<Copy to internal memory>	X	Copies the configuration, which is stored on the USB-Stick, to the internal configuration memory	Security check yes/no
<Load as active configuration>	X	Copies the the configuration, which is stored on the USB stick to the VPR, apllies all settings and works with them directly. Security check necessary.	Security check 'Overwrite act. Config.' yes/no
<Delete config. permanently>	X	Erases the the selected configuration from the USB-Stick	Security check yes/no

Test Data

```
S Test Data
-------------------------------------------
Serial No.:                          520013
Date of check:                12.07.13 14:16

Program date                         091023
```

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

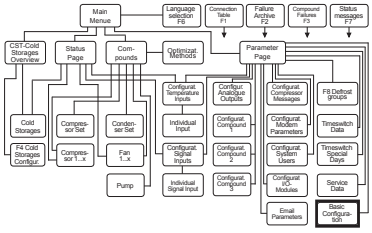


This page contains specific data for maintenance purposes of the manufacturer.

Basic Configuration

```
S Basic Configuration                26.03.13
-------------------------------------------
External 2. setpoint                      yes
Modem relay used                           no
Defrost-lock signal for:                  -----
Defr.Lock signal for compound 3:           no
Message inputs                  Quantity 48
   Delay                                0 m
Alarm refresh active                       no
   Delay SSM1                           0 m
   Delay SSM2                           0 m
   Delay SSM3                           0 m
   Delay SSM4                           0 m
```

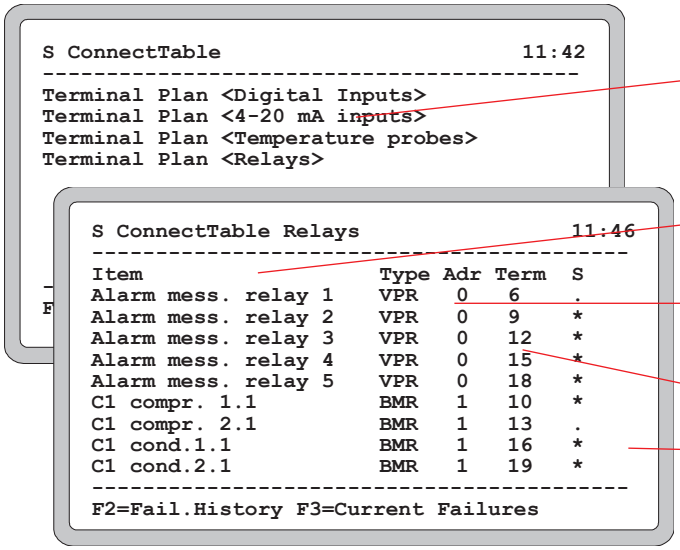
Attention ! Most of this settings change the terminal plan!

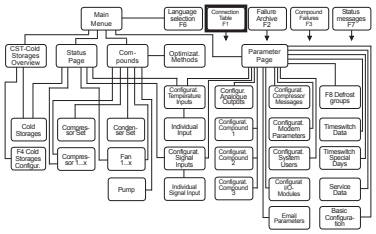


This page contains basic settings for the complete system.

Parameter terms	Description	Possible values / range
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
Defrost-Lock Signal for Compound 3	Digital input LAB1 locks additional defrost cycles at the cold storages of compound 3	yes, no
Message Inputs Quantity	Quantity of the available inputs which can be used for any messages	0...48
Delay	Time delay, identical for all alarm message inputs	[0]...60 minutes, 0=switched off
Alarm refresh active		yes, no
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 (reinstate of alarm, alarm refresh)	[0]...60 minutes, 0=off
Delay SSM 3	Time delay up to alarm relay 3 comes on again (reinstate of alarm, alarm refresh)	[0]...60 minutes, 0=off
Delay SSM 4	Time delay up to alarm relay 4 comes on again (reinstate of alarm, alarm refresh)	[0]...60 minutes, 0=off
Delay SSM 5	Time delay up to alarm relay 5 comes on again (reinstate of alarm, alarm refresh)	[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 up to	Spare relay 1 will be inserted at the relay position X of the connection diagram to shift all following relays	[off], 0-99
Position of spare relay 11	Spare relay 11 will be inserted at the relay position X of the connection diagram to shift all following relay	[off], 0-99
Delay Err. Low Refrigerant	minutes, seconds	0m00...300m00
Shutdown at Low Refrigerant	Action at lack of refrigerant:	[Error message], switch off (of the plant + alarm message)
Cst-error delay	Time delay at alarm messages of cold storages	0...60 minutes
CST-Frameheaters automatic util.		yes, no
Network Configuration		
MAC-Address		xx:xx:xx:xx:xx:xx
IP-Address	Address in an internal Ethernet-Network	any [192.168.0.1]
Netmask		any [255.255.255.0]
Broadcast Address	Broadcast address in the network	any [192.168.0.255]
Gateway Address	Address of the gateway (e.g. router) for transfer of data to the internet	any [192.168.0.1]
Activate by System-Reset	By 'yes' the VPR will be switched off briefly, so the new network settings can be taken. **Always to do with changes at 'IP-Address', 'Netmask' and 'Broadcast Address'**	[no]...yes
DNS-Address	Address of the DNS service (Domain Name System) for name resolution	any [192.168.0.1]
UDP Port No.		50000-60000 [55555]

Connection Table F1





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.

Internal Clock

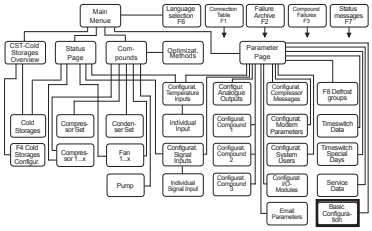
The VPR system contains a real time clock as basis for data logging or the triggering of functions. It has a buffer for min. 3 years without mains voltage. Date and time can be set on the '*Parameter Page*' also an automatic daylight-saving time/standard time (summer/winter time) switch is possible.
By default, a GMT +01:00 is set ('UTC-Timezone shift' = 60 min.), which is standard for the Central European Space. If the product is used in other countries, this value can be changed.

Daylight saving mode
- no No switch, clock runs without any changes
- EU from 96 An automatic summer/winter switch considers the current EU-rules from 1996 (EU 96)
- variable The 'Daylight saving mode' works according to the following parameters:
  'Daylight saving On month' (fact.set: march).....
  .....The month when daylight saving time begins
  'Daylight saving On day' (fact.set: sunday).....
  .....The day of the week when daylight saving time begins
  'Daylight saving On x-day' (fact.set: last).....
  .....The day no. x in the month set with 'summerOn day'
  'Daylight saving On hour' (fact set: 2, (2:00 am))
  .....The hour of the beginning of the daylight saving time
  'Daylight saving Off month' (fact.set: october)
  .....The month of the end of the daylight saving time
  'Daylight saving Off day' (fact.set: monday)
  .....The day of the week where daylight saving time ends
  'Daylight saving Off x-day' (fact.set: last sunday)
  .....The day no. x in the month set with 'summerOff day'
  'Daylight saving Off hour' (fact.set: 3, 3:00 am)
  .....The hour of the end of the daylight saving time

UTC-Timezone shift.....60 m (minutes)

All time settings are preset in standard time, only the end of the daylight saving time is preset as summertime.

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.

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

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.

Reserving timeswitch relays

Additional reserving of relays change the terminal plan!

50 switch-time pairs are available. This switch-time pairs can be assigned to any channels, days, combinations of days or special days (e.g. holiday).

Switch times

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 are available, assignable to different switch times.

Day times

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.

Special days/Holidays

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

Fleeting Contact

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

Deactivate Switch-time pairs

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

Parameter Page for Timeswitch

Switch Channels 1-12

Day Types acc. to the calendar Mo-Su

```
S  Timeswitch                              13:53
-------------------------------------------
Timeswitch    Channel   111  Kind of day
ON     OFF    123456789012   Week   SpecialPP
                              MTMTFSS &1234512
7:00   20:30  *..*........   *****..  .....
7:00   16:30  *..*........   .....*.  .....
9:30   13:30  ...*........   ......*  .....
off    off    ............   .......  .....
off    off    ............   .......  .....
```

Special Day Types

Setting a mark

Arrow keys..... Highlight position
Ret ..... prepare change
Arrow keys..... Highlight mark
Arrow key up..... Set mark
Arrow key down .. 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.

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.

Special Days, Holidays

```
S  Timeswitch                              13:53
-------------------------------------------
Timeswitch    Channel   111  Kind of day
ON     OFF    123456789012   Week   SpecialPP
                              MTMTFSS &1234512
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    ............   .......  .....
```

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.

Setting special days

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   111  Kind of day
ON     OFF    123456789012   Week   SpecialPP
                              MTMTFSS &1234512
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 24th 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   111  Kind of day
ON     OFF    123456789012   Week   SpecialPP
                              MTMTFSS &1234512
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

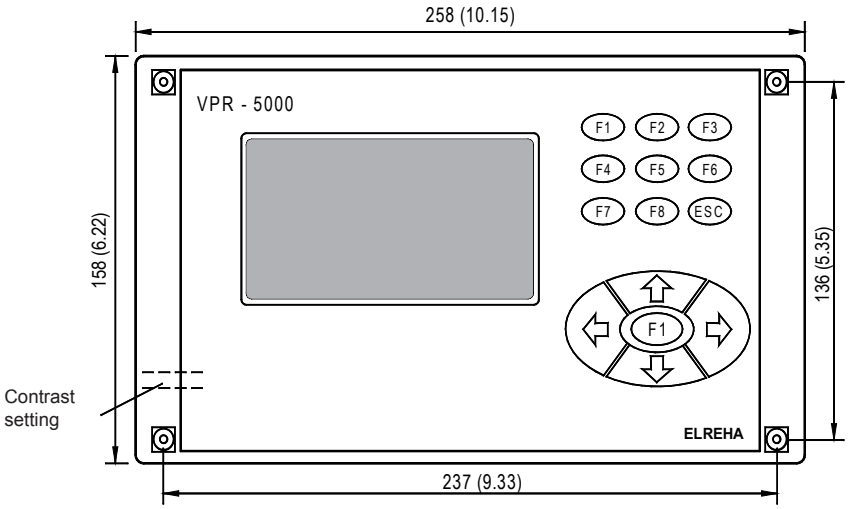
If mains voltage is lost while a channel is switched manually, the VPR works with the programmed switch times after power-up again.

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'

Central Unit Dimensions / Connection

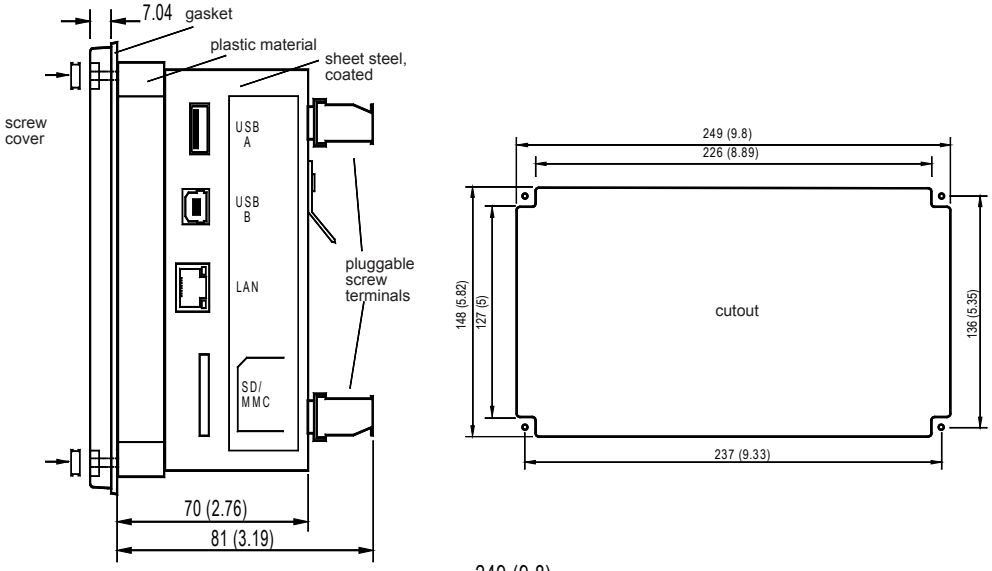
The central unit of the VPR-Systems is a metal housing for mounting in panels or doors.
All electrical connections can be made by pluggable 2,5mm² screw terminals on the rear side.
The central unit contains LC-screen, keypad, mains power supply, 5 interfaces and 5 relay outputs.



Front View

Assembly Note

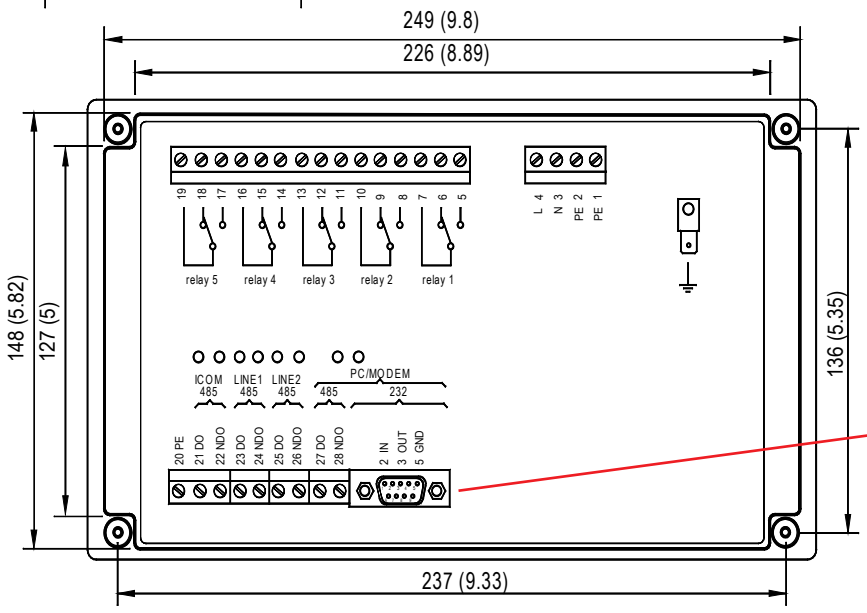
The 4 mounting screws can be covered by the delivered plastic caps.



Side View

Assembly Note

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

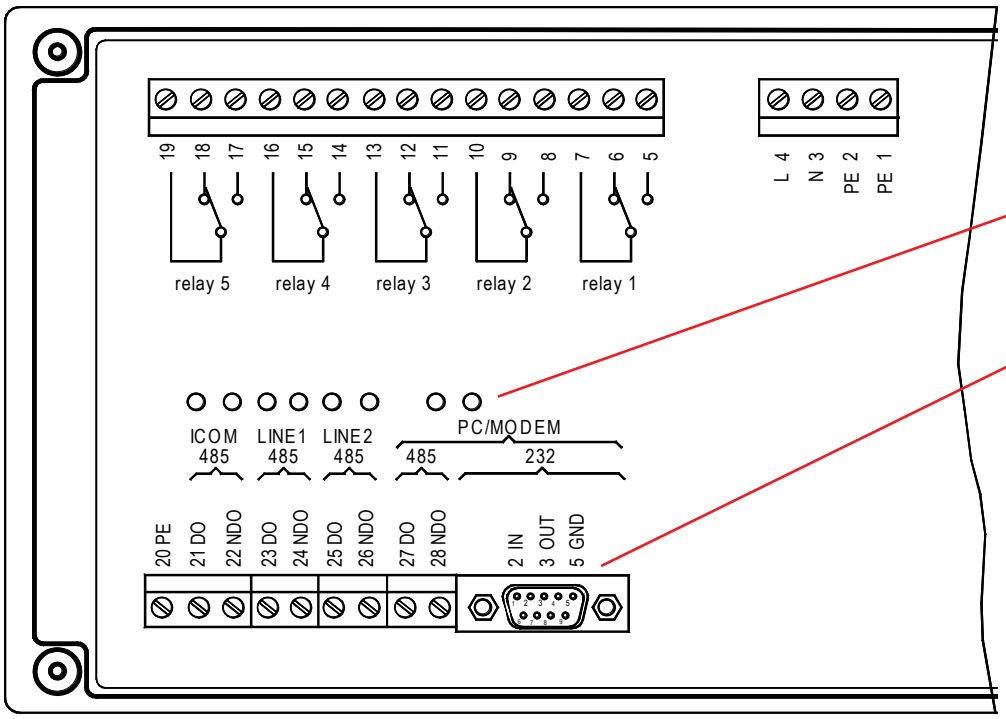


Rear View

Connector SUB-D9 male

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.

Electrical Connection



The interfaces PC/Modem 485 and 232 cannot be used at the same time. If e.g. a modem must be used for remote control and a PC on-site at the same time, the PC can be connected via this ways:

- **VPR-USB-A-Port -> SSC 8122 -> RS-485 -> PC** *or*
- **USB-B-Port to PC-USB**

Technical Data

Supply Voltage	230V~ / 50-60 Hz
Power Consumption	max. 25 VA
Operating-/Storage Temperature	0...50°C
Ambient Humidity	max. 80% r.H., not condensing
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: min. 3 years
Relay Outputs	5x SPDT
Contact Rating	8 A (cos phi = 1), 3 A ind. / 230V AC
Interfaces	1x RS-232 (SUB-D9 male), 4x RS 485 **1**x USB-A, **1**x USB-B, **1**x Ethernet (RJ-45)
Memory Card Slot	SD cards, MMC cards
Housing	Metal/Plastic for panel or door mounting
Protection Class	IP 54 from front

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/C3), 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, R407f, R290, CO_2, R723, R410A (others on demand)

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
- Erasing the data logger 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 the '*Service data*'-Page
- Push key 'RET' (possibly 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 the '*Service data*'-Page
- Push key 'RET' (possibly 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.

Erasing Data Logger Memory

- On the 'Service Data' page select parameter '*Delete recording storage'*
- Sign in as user 10 (Administrator)
- Enter here the value -2 and confirm it by 'RET'
- With this, all recorded data of the data logger system has been erased

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'

Configuration Saving

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.

Internal Configuration Memory

To restore the set parameters from start-up every time, the VPR contains an additional backup memory, where the complete parameter-sets of VPR and Cold Storage Controllers can be stored multiple. So it is possible for you to experiment, to take these settings as a configuration and to jump back to these settings at any time.

Saving the configuration internal (internal backup)

- Select 'Service Data' page, select 'Save act. Configuration'..... **'RET'**
- Demand: 'Save act. Configuration?' ..... **'RET/↑'** -> **'yes'**
  With the note 'Action succeeded' the current VPR configuration has been stored with name, data and time to the internal memory and listed under 'Configurations internal'

Restore a backuped configuration

- Select 'Service Data' page, select 'Configurations internal' ..... **'RET'**
  A listing of the available configuration will be displayed
- Select desired functions ..... **'RET'**
- Select 'Load as active configuration'..... **'RET'**
- Demand: 'Overwrite act. Config.' ..... **'RET/↑'** -> **'yes'**
  With the note 'Action succeeded' the configuration was successfully adopted.
  All functions of the VPR will be adapted, all values will be overwritten which has been entered manually before.

Erase a configuration from the memory

If a configuration is not longer needed, it can be erased from the internal memory.

- Select 'Service-Data' page, select 'Configurations internal' ..... **'RET'**
  A listing of available configurations will be displayed.
- Select desired configuration to erase ..... **'RET'**
- Select 'Delete config. permanently'..... **'RET'**
- Confirm security check..... 'yes**/no'**

External backup of a configuration

If configurations should be stored to an external storage medium or transferred to another VPR, this can be done by an external USB memory (mostly an USB-Stick).

- Under 'Storage media' it is displayed which external memory is available
- Select 'Configurations internal' ..... **'RET'**
  A listing of available configurations will be displayed.
- Select desired configuration to store ..... **'RET'**
- Select 'Copy to USB-Stick'..... **'RET'**
- Confirm security check..... 'yes**/no'**

The used USB-Stick must be formatted with FAT16 or FAT32. (Standard)

Restore a configuration from an external memory

With this you can transmit configurations, e.g. from other plants, to the internal configuration memory or to use them immediately.

- Under 'Storage media' it is displayed which external memory is available
- Select 'Configurations USB-Stick' ..... **'RET'**
- Select configuration, which you want to transfer to the VPR..... **'RET'**
- Now you can decide:
  'Copy to the internal memory' (transfer only)..... **'RET'**
  'load as active configuration' (will be used at once) ..... **'RET'**
- Confirm security check..... 'yes**/no'**
- With the note 'Action succeeded' the configuration has been loaded.
  With the decision 'Load as active configuration', all functions of the VPR has been adapted, all values are overwritten which has been entered manually before.

Configurations can only be used if they come from the same VPR software version or has been made by the direct previous version.

Achtung

Reset to factory settings

Steps to reset the parameter settings to factory settings:

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

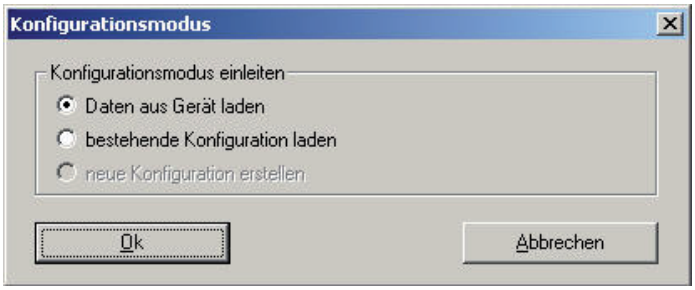
Now all parameters are finally reset to factory settings. The settings stored in the internal configuration/security memory are still present.

All described backup/restore functions can be done only with the authorization stages 4+5.

Configuration Backup with COOLVision-MES

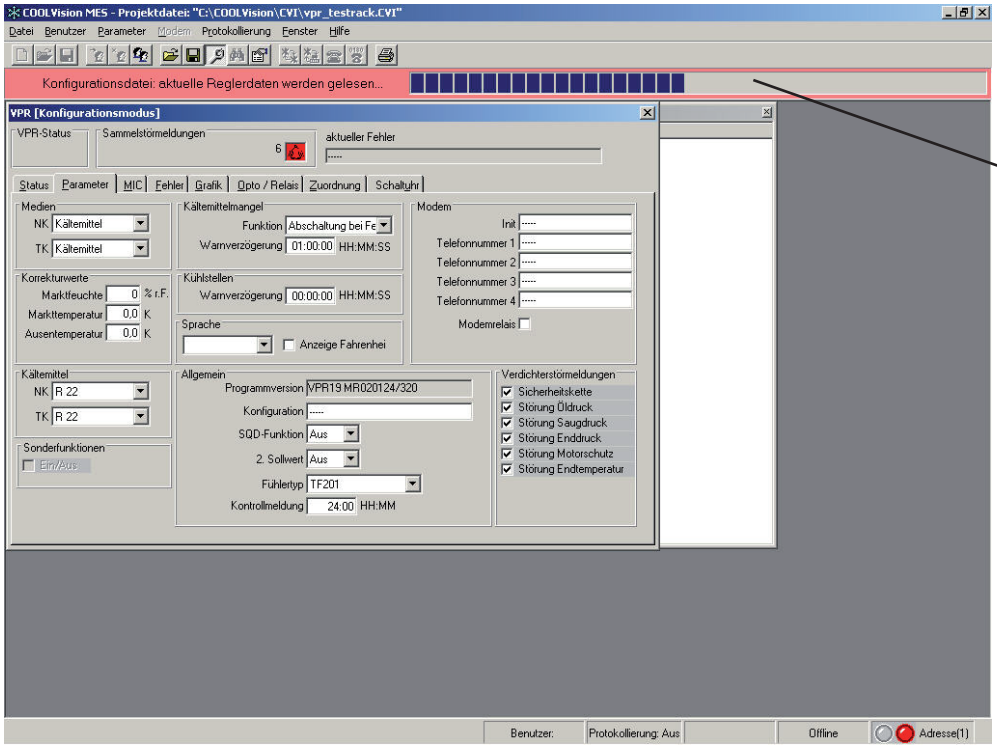
In many cases a refrigeration plant is equipped with a PC for remote control and data logging.
So you have the condition to backup the parameter set to a PC after start-up.
For this purpose, the software ‚COOLVision-MES' contains a 'Configuration Mode'.

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



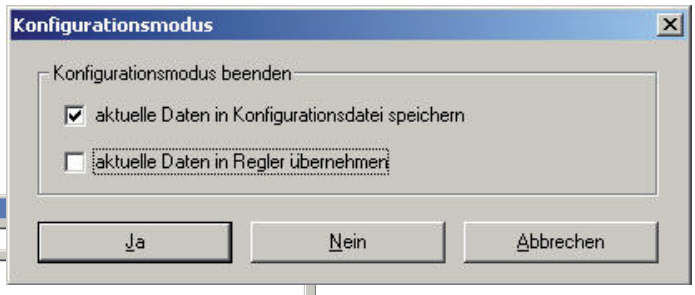
Call Configuration Mode

Download Configuration from the VPR

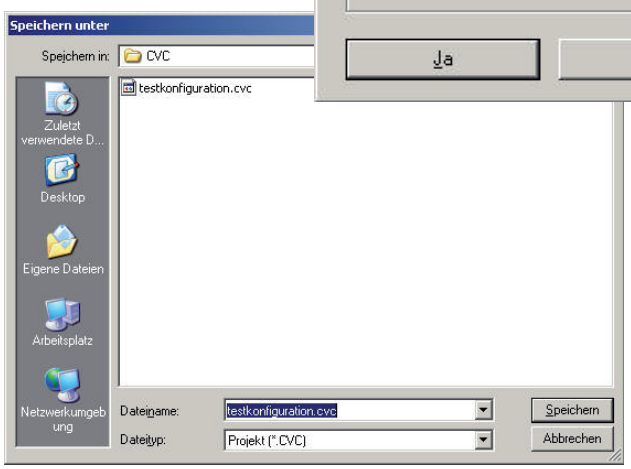


This progress bar shows the state of data transmission.

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



Store Configuration as file



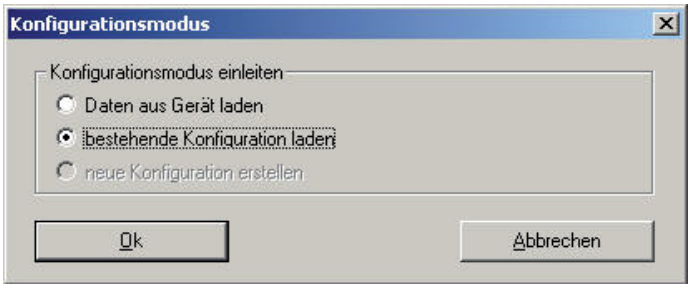
Choose a name for the file and confim by ‚*store*'.
Now the configuration will be stored on the harddisk with the extension '.cvc'.

Configuration Restore with COOLVision-MES

This function is suitable for:

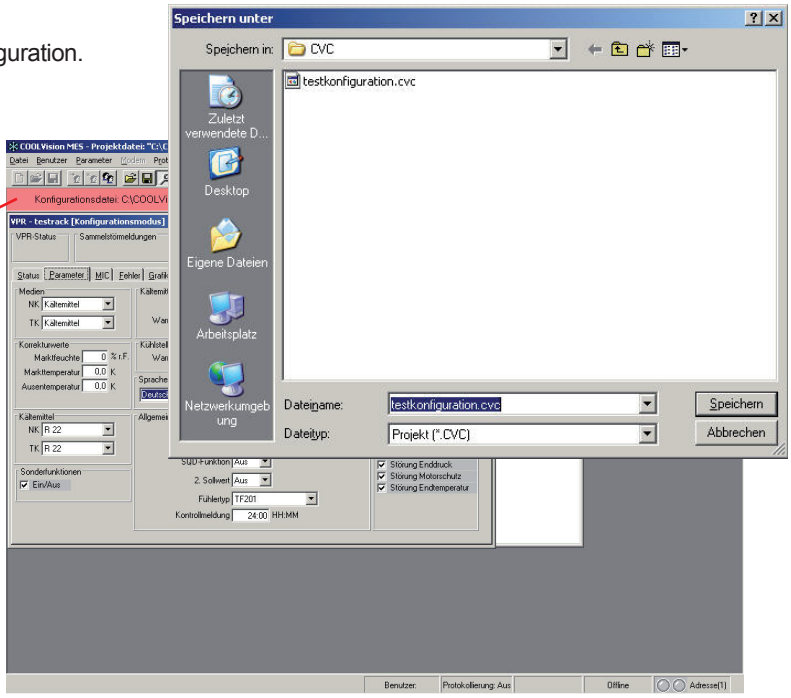
- Transmitting existing configuration data to a new plant.
- Restore configuration data after 'experiments'.
- Restore configuration data after VPR-Central Module interchange.

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



Load a configuration from a file

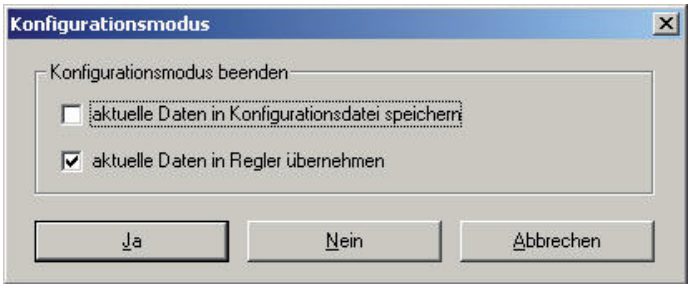
Select desired configuration.



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

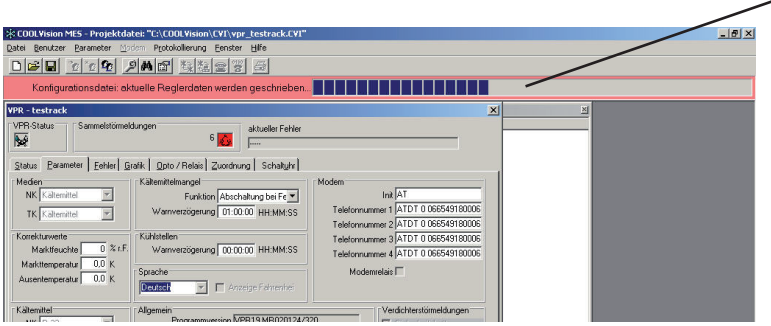
At this time, the values in the arrays can be changed.

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



Transmit configuration data to the VPR

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



This progress bar shows the state of data transmission.

EG-Conformity

CE

For all described products there is a declaration of conformity which describes that, 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 EMC-Directive (2004/108/EC) and the Low Voltage Directive (LVD 2006/95/EC). This declarations are 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 *by:*

ELREHA Elektronische Regelungen GmbH
D-68766 Hockenheim, Germany
www.elreha.de
(*name / address*)

Werner Roemer, *Technical Director*

Hockenheim.....**24.09.2009**.....
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. Trademarks, which are mentioned in the text are the property of their respective owners.

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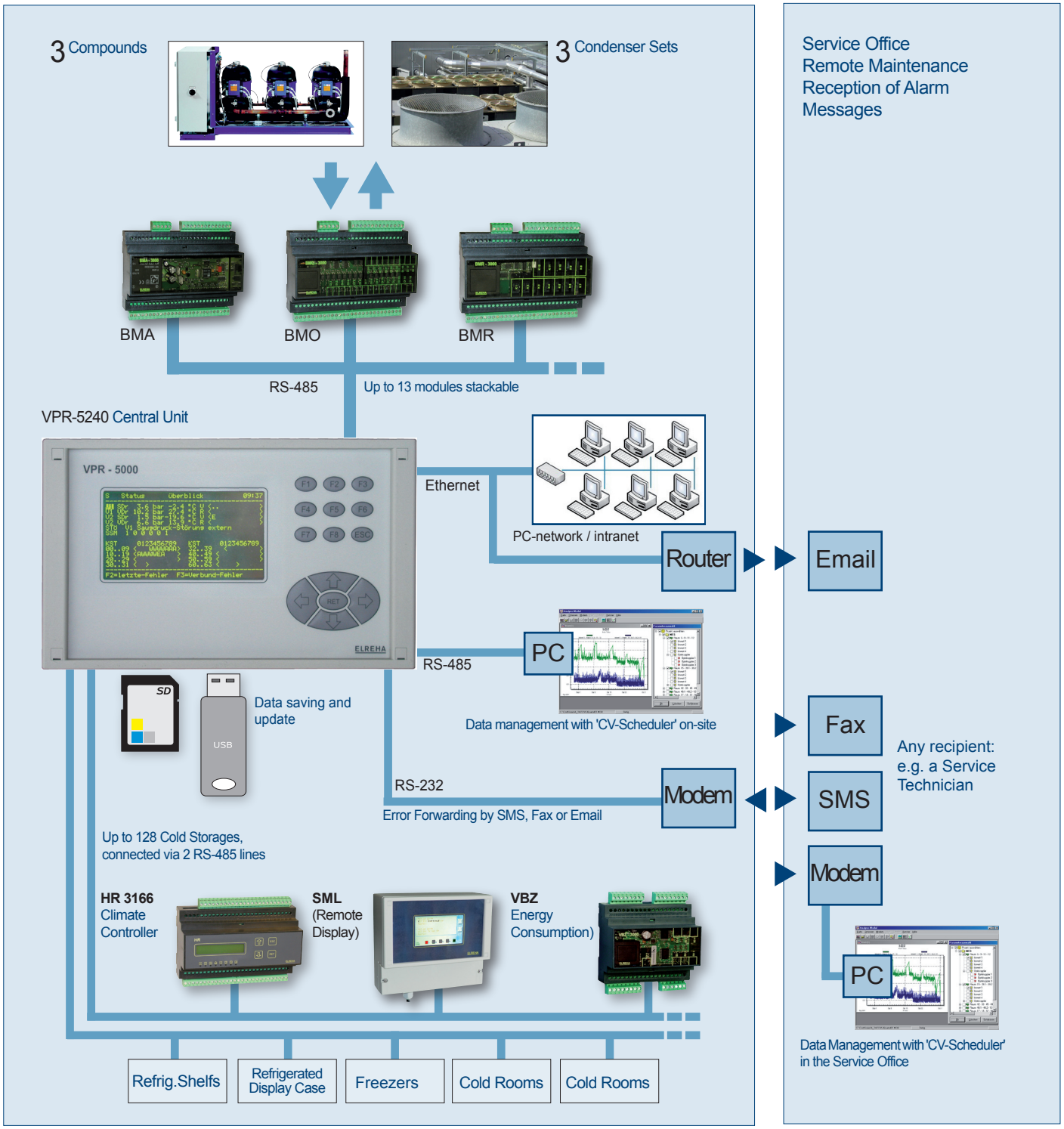
checked: 29.4.2015	by: ek/mr
released:	by:
corr.: 8.7.2015	by: tkd/jr

VPR-System Overview

The VPR 5240-2 system has the capability to control a complete, large 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.

- Up to three (3) complete compressor compounds including their condenser systems, which can have up to 72 stages/machines. All compounds are completely independent.
- Up to three (3) 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.)

Which kind of machinery can be controlled ?



System Components

The VPR 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 and a comfortable display, where all system information can be read.

1. VPR 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. At present four (4) different module types can be used.:

2. Expansion Modules of the Series BMx

BMR 3001 - Relay Module
- Housing for DIN rail mounting, 35 mm
- 12x relays (SPDT), 8A
- RS-485 data interface

BMO 3xxx - Digital I/O Module
- Housing for DIN rail mounting, 35 mm
- RS-485 data interface
- BMO 3011 - 24x dig. inputs for mains voltage
- BMO 3031 - 24x digital inputs for 24V AC

BMA 3251 - Analog Module
- Housing for DIN rail mounting, 35 mm
- 1x probe input Pt1000 (TF 501)
- 5x standard signal inputs 4...20 mA
- 2x analog output channels each with a 4...20mA and 0...10V output
- RS-485 data interface

BMA 3206 - Analogmodul
- Housing for DIN rail mounting, 35 mm
- 6x probe inputs Pt1000 (TF 501)
- 2x analog output channels each with a 4...20mA and 0...10V output
- RS-485 data interface

Detailled information you will find on the data sheets of the individual products.

Up to 128 independent Cold Storage Controllers of the model series **TKP/TKC x130**, **EVP 11xx, EVP 316x, HR, HMR** or **TEV** can be connected via 2 data interfaces (LINE) to the Central Unit. These controllers can be mounted at any place, the databus can be up to 1000 m in lenght. The controllers work autonomously, but they change their data to respond quickly and to control foresightful.

3. Cold Storage Controllers, data capture components

Operation/Settings of the controllers must be done from the VPR. If parameters will be changed directly at the controller, the VPR notes that and overwrites them again!

Energy Counter Modules of the serie **VBZ 3006-2** can also be connected to the Central Unit via the data interface. So the energy demand of the plant can be determined and logged.

4. Energy consumption logging

Older modules of the series VBZ 19000 and VBZ 3004/3004-2 can be connected as a single module only via the fixed address - **65** - .

By an USB-stick it is possible to backup and to restore one or more configurations of the VPR-system. So it is possible 'to experiment' and then to return to previous settings immediately.

5. Backup

By the help of a PC/laptop and the software packages ***'CV-Scheduler'*** or '***COOLVision***' full remote control and graphical processing of data is possible.

6. Remote Control, graphical presentation of data

'Standard' Compound Control System

If the VPR-System is provided to control Standard Compound Systems, then up to three 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 available. 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

Heat Pump Control System

The VPR-System can also be used to control Heat Pump Systems. The control functions are based on the available suction pressure control and condenser pressure control functions.

Chiller Controller

If the VPR-System is configured for brine-/chiller systems, then 3 complete, independent systems can be controlled.

Chiller System Configurations

The chiller systems 1 + 2 can consist multiple refrigeration circuits (chiller system 3: one circuit only). Five (5) refrigerant circuits maximum are possible.
Here are the possible configurations:

Chiller C1	Chiller C2	Chiller C3
1 circuit	1 circuit	1 circuit
2 circuits	1 circuit	1 circuit
3 circuits	1 circuit	1 circuit
1 circuit	2 circuits	1 circuit
2 circuits	2 circuits	1 circuit

Compressors

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

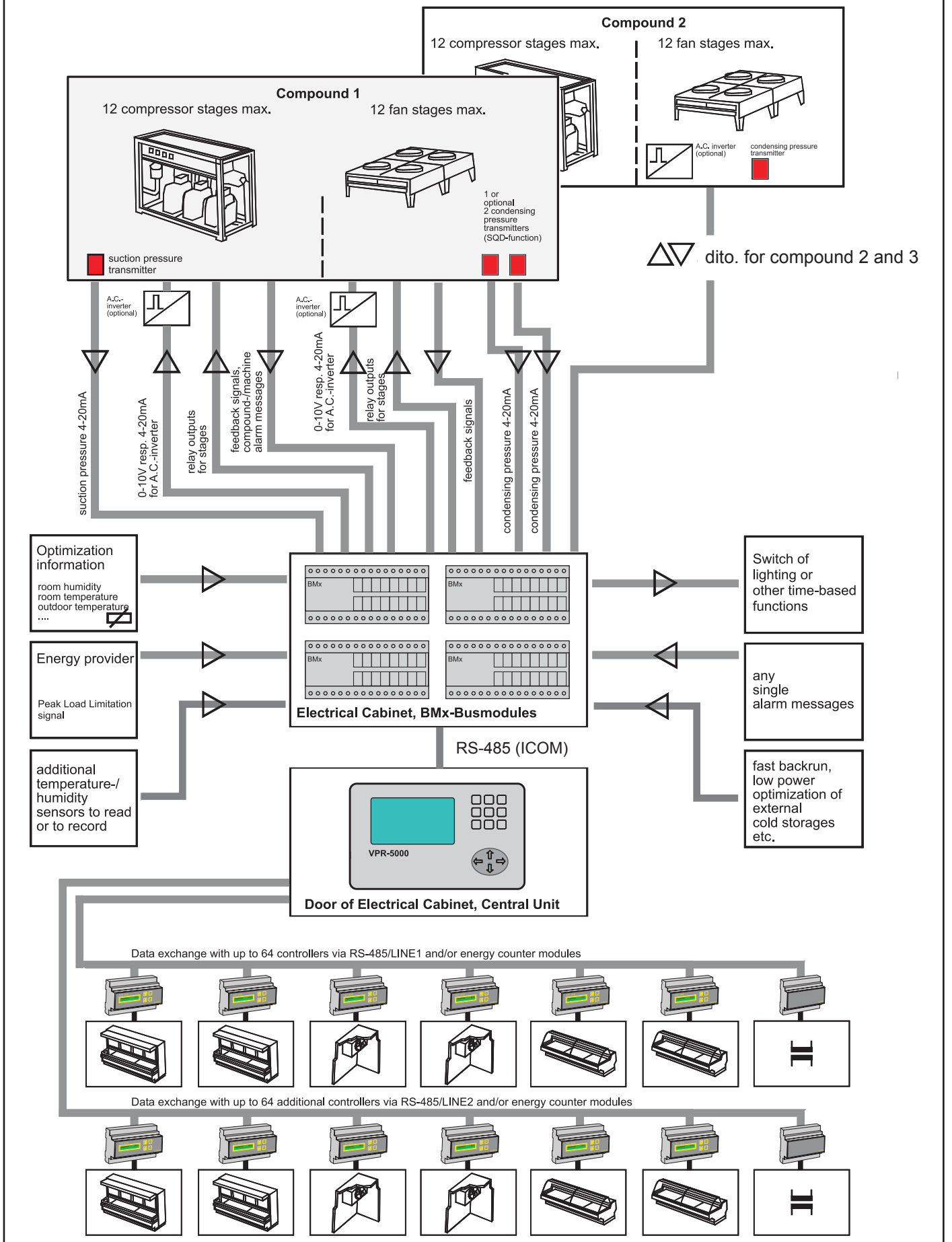
- Controlling of fans can be done independent for each compound or via a chiller refered priority function (CPD-function), which controls all fans by using the highest measured pressure of all compounds.
- Each refrigerant circuit can be disabled by a digital input.

Brine P-umps

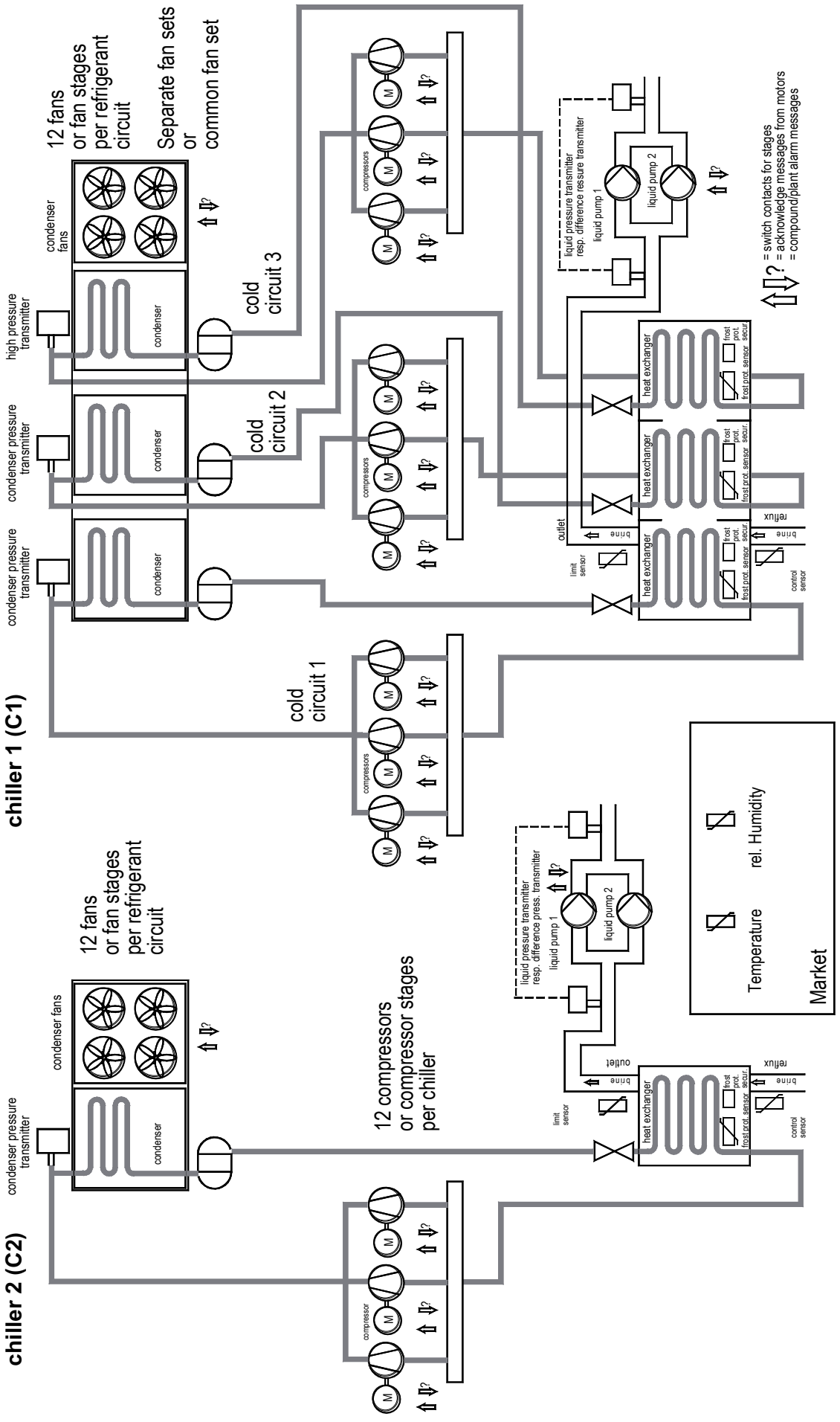
Two liquid pumps may work in each chiller set, they can work permanently at the same time or can be alternated daily or while an alarm occurs.

- 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 and 3
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
RS-485 (ICOM)
VPR-5000
Door of Electrical Cabinet, Central Unit
Switch of lighting or other time-based functions
any single alarm messages
fast backrun, low power optimization of external cold storages etc.
Data exchange with up to 64 controllers via RS-485/LINE1 and/or energy counter modules
Data exchange with up to 64 additional controllers via RS-485/LINE2 and/or energy counter modules

Simplified Diagram of a Chiller System



Co-operation of Central Unit and Cold Storages

Data interchange with the cold storage controllers is done via two (2) RS-485 based data interfaces (Line 1/2). 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'.
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 of cold storage controllers can be read on the screen. New values can be entered via keypad at the VPR Central Module and then transmitted back. The VPR Central Unit backups and controls this settings, that means that all values entered directly at the controller unit, except the address, will be discovered by the VPR and then 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 three (3) compound systems.
If the central unit is used as a chiller control system, the CST can be assigned to one of the 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'.

Support of the frame heaters at cold storages

Frame heaters of cabinets/doors can be controlled by the cold storage controllers in a cyclic operation. To optimize the energy requirement of the connected heaters, the controller adapts the cycle ratio automatically to the market temperature and the air humidity.
The information about market temperature and humidity the VPR delivers to the controllers.

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.
- **Insensitive Foil-Keypad** to enter and to change values
- A **User Management System** controls Access Rights

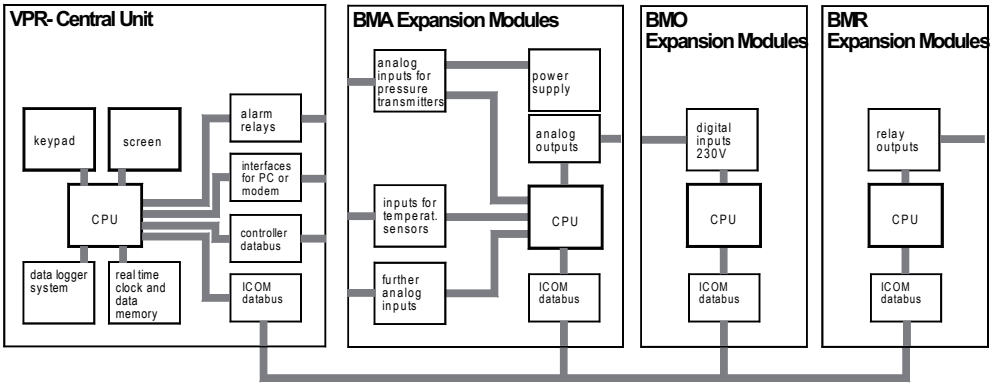
Suction Pressure

- 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. Various optimization methods are available to improve the suction pressure course.

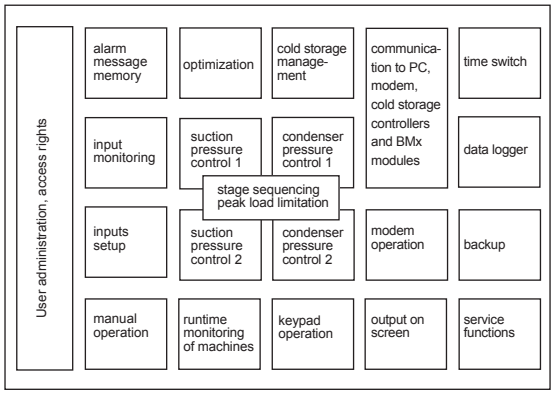
Condensing Pressure

- 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. Additionally, an analogue output for speed-controlled condenser fans is offered for each compound.
- For each compound a heat pump control system is available, which are based on the available suction pressure control and condenser pressure control functions.

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. Cold storage information will be used for optimization functions.

Safety- and Monitoring Functions

- All probe 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 runtimes 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, modem and external memories are available. So the plant (including the cold storages) can be monitored, supervised and remote controlled by a host.

VPR 5240-2 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 three (3) 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 five (5) refrigerant circuits can be controlled, that means if compound 1 has 3 circuits, compound 2 can be operated with 2 circuits only. Also compound 3 can be operated with 1 circuit only.

Suction Pressure Control

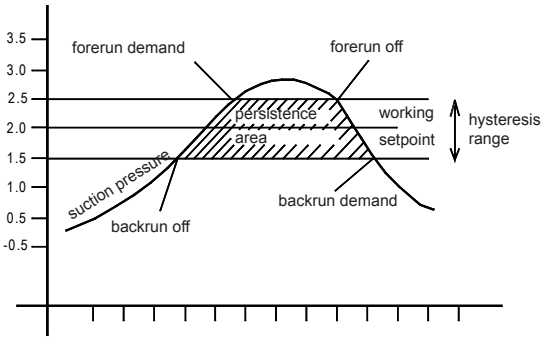
Two suction pressure controllers are available within one system. They work independent from each other. Controlled compressors may be of single or multi-stage type.

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 transducer 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. Within the hysteresis area (*C1/C2 SPr Hyst*) which is located symmetrical around the set value, 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 will be 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.

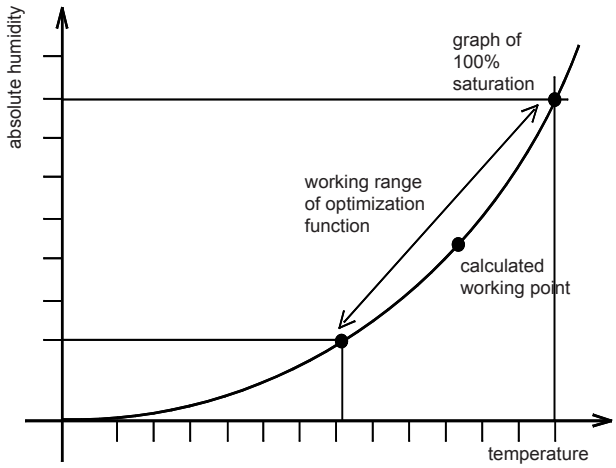
Your customer is grateful for this purposes, use them!

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.



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).

Temperature Setpoint Optimization

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

SDS - Suction Pressure Optimization by Setpoint Shift

While a decreased power requirement, the suction pressure of the compound should rise to a higher value than preset.
If the cold storages demand power, it must be ensured that the suction pressure is able to fall enough to allow the cold storages to work on deep temperatures. This function exists for both compounds.

Activate SDS

C1 resp. C2 function ON (Optimization Methods Page, SDS values).

Test method

- Within an adjustable time interval (*C1/C2/C3 Measuring interval*) the function checks, if the actual temperature values of all cold storages are below a certain limit (*Threshold temperature,* on each cold storage page).
- In this case, the suction pressure setpoint of this compound can be increased by a certain amount (*Pressure Offset, on each cold storage page*). The function works with the smallest 'Pressure offset' value preset on the pages.
- This 'Pressure offset' value must be selected depending on the individual power demand of the cold storage.
- If, within the measuring interval, just one of the cold storages exceeds the threshold value, then the suction pressure of the compound will be lowered by the highest preset 'Pressure offset' value.

Resulting suction pressure setpoint

The setpoint '*SPr Setp effective*', used for compressor control, consists of the adjusted setpoint (*SPr Setp, Compressor Set Page*) plus the offset values, which are calculated by the optimization functions.

Information

The resulting offset is displayed by '*C1/C2/C3 current shift*'.

Monitoring

If no offset has been occured for the last 24 hours, that means the function had nothing to do, then at 6:30 am the VPR generates an error message (C1/C2/C3 Suction Pressure Shift runtime).

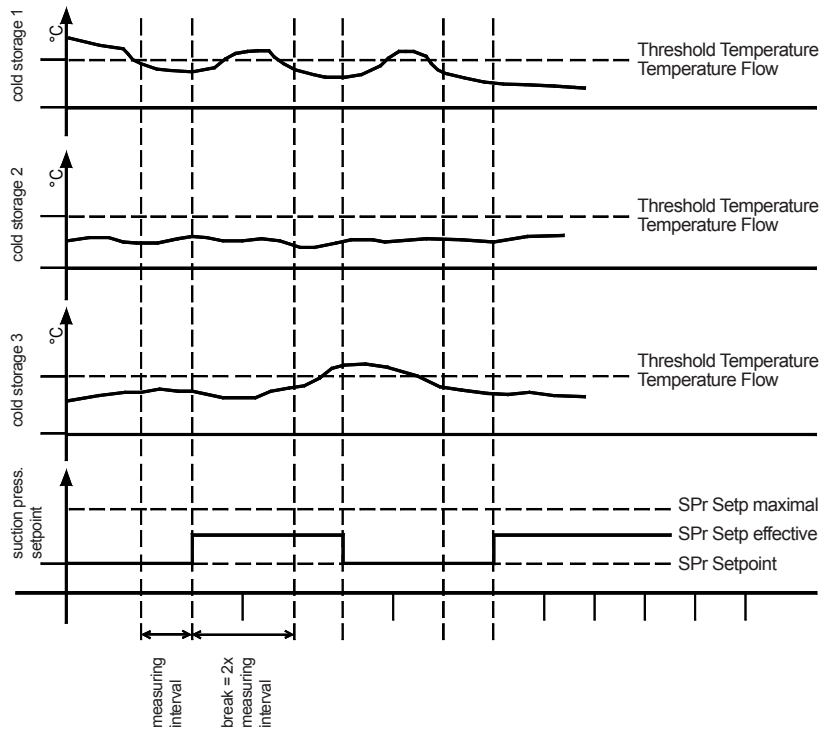
Safety Limits

The maximum suction pressure is fixed by '*SPr Setp. maximal*' (Compressor Set Page). Independent from the results of the optimization methods, '*SPr Setp.*' (Compressor Set Page) represents the lowest possible suction pressure.

Interval Course

The states of the cold storages are tested within a preset measuring interval, indicated by '*C1/C2 Meas. interval state*' = 1 (Optimizing Functions Page), followed by an idle period which is twice the preset interval. '*C1/C2/C3 Interval Remaining*' shows the remaining time up to the end of the interval.

Overview



Switching Rate Optimization by variable Forward-/ Backrun Delays (VFR)

With only little deviations of the suction pressure the switching rate of the compound should be lowered.
However, with rapid deviations of the suction pressure, enough power must be available resp. power surplus must be abolished.
Variable forward-/backrun delay times, which depend on setpoint deviations, are suited for this purpose.

Activate function

'*VariableForwBackrun Delay*' (Compressor Set pages) = ON

Method description

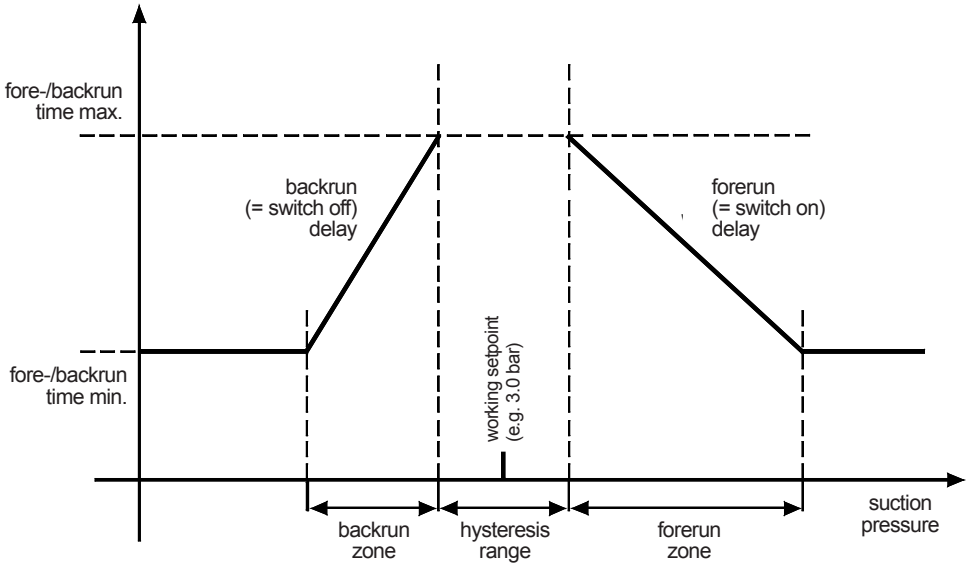
The delay times start running as soon as the suction pressure leaves the neutral (hysteresis) zone. Above and below of the hysteresis area there is a definable area (*Forward Zone* resp. *Backrun Zone*). If the actual suction pressure value moves within this areas, the forward-/ backrun delay times will be varied within the limits set by ('*Delay times min/max*', Compressor Set pages).

Information

The delay times become shorter the more the actual value leaves the setpoint. If the actual value moves outside the preset zone, the controller uses the smallest preset delay times.

For Information purposes '*Current delay time*' shows the current calculated delay times.

Example



Low Power Optimization

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%. 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 'Low Power Optimization'

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

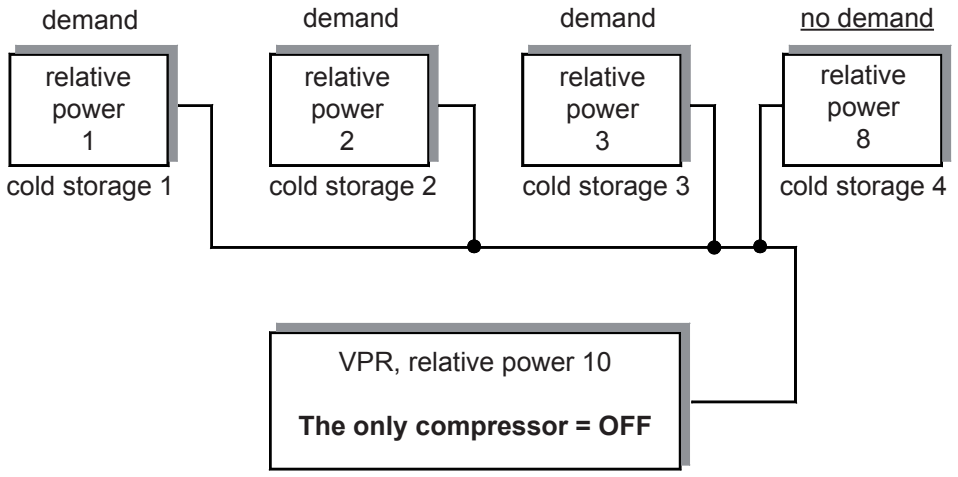
If these criteria are true, all solenoid valves at the cold storages connected to this compound will be closed, regardless of power demand of single cold storages.

Solenoid Valves will be closed

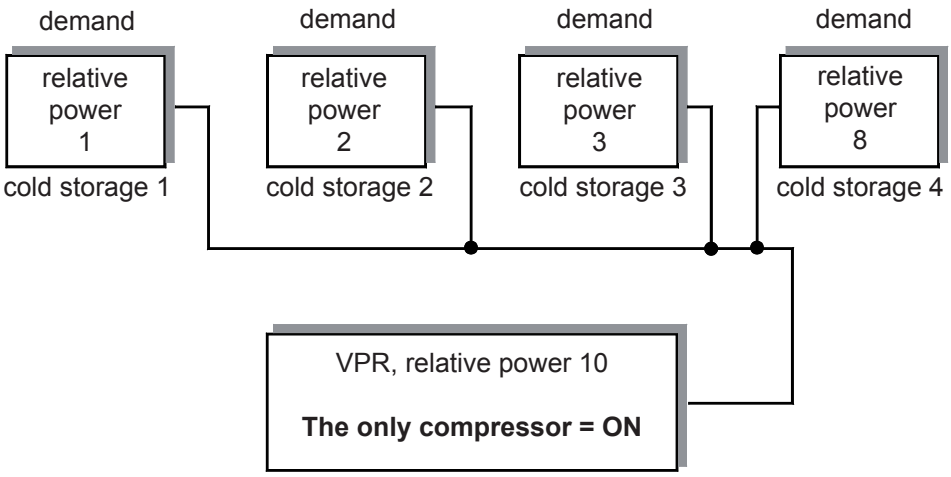
The power demand of all activated cold storage controllers will be transmitted via the data link. If one of the following steps is true, the solenoid valves will be unlocked and the compound can work normally and switches on the first compressor. If the power requirements remains low, the compressor reduces the pressure and switches off at the 'Min SuctPressure' limit (pump down).

Solenoid Valves will be released

1. The power demand of all activated 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 ('*Power*', Optimization 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 1:
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

or

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 'Low Power Optimization'-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 the compound have same the size

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)

There is one of these parameter sets available for each compound. (Optimization Functions Page)

More cautious control by 'prioritized' compressor

The usual application of equal compressors in a compound system frequently causes an increased switching number resp. excessive or lessened power offer.
This effect can be improved by the method 'prioritized compressor'. Here you use a compressor with small power to 'fill' the 'gaps' between the stages.
This method accepts increased switching of a small compressor for the benefit of decreased switching of stronger compressors.

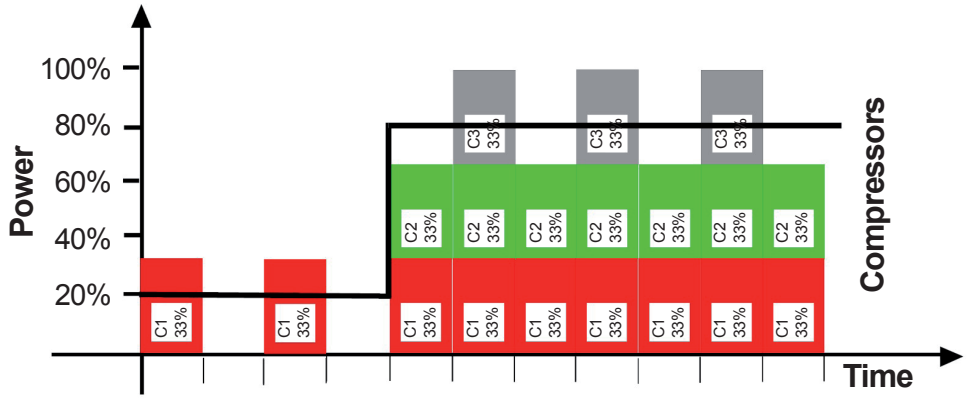
Advantages / Disadvantages

Advantages:
- Finer power graduation
- Less switching of stronger compressors

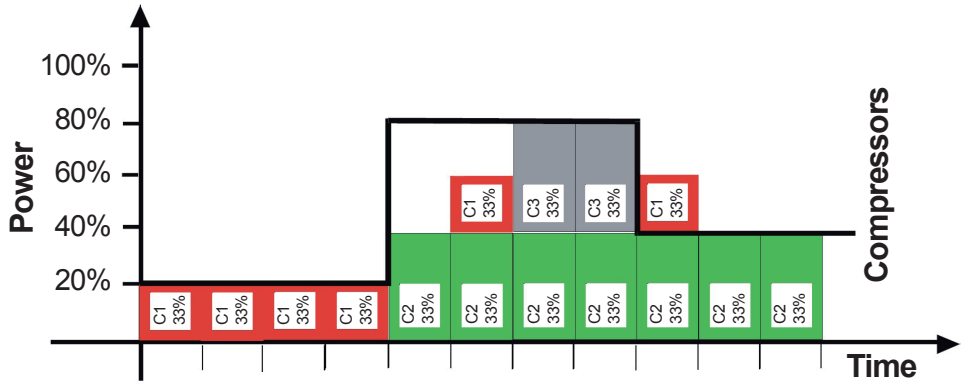
Disadvantages:
- Increased switching of the ‚prioritized' compressor
- The ‚prioritized' compressor will be ignored by the sequencing function
- The ‚prioritized' compressor can be a single stage type only
- The function is not available for multi-circuit chillers

Examples

Example 1: Standard application. Compound system with 3 equal compressors.
Change of power demand from 20% to 80%.
For a better comprehension, we have disabled sequencing here.



Example 2: K1 is the ‚prioritized' compressor with 20% power. Compressors K2/K3 have 40% of the power, Power demand change from 20% to 80% and back to 40%.
Also here we have disabled sequencing for a better comprehension.



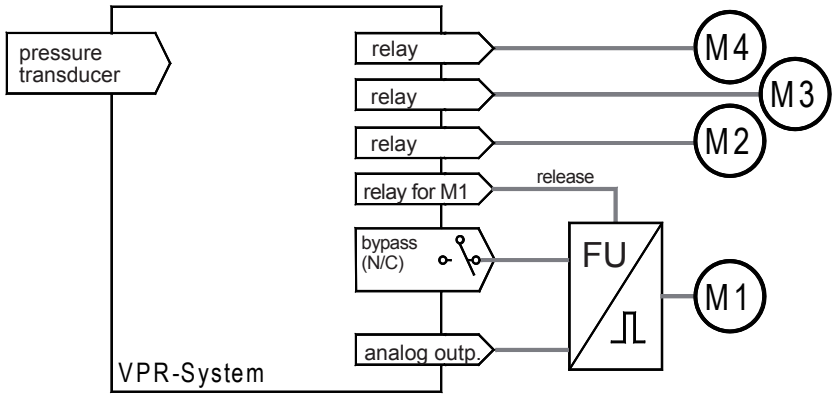
Activate function

With the parameters '*C1/C2 No. prior.compressor*' (Compound Configuration Pages) you preset the number of the compressor with less power. The value '0' disables the function.
Parameter '*Switch characteristic*' below must be set to 'interval'.

By using this method the minimum idle time of the prioritized compressor must be as small as possible (not 0, but about 2-4 seconds).

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 each possible compound. 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 PI module, additionally it depends on actual suction pressure, suction pressure setpoint and hysteresis.

Activate FI drive

The PID module is activated automatically, if the desired output is assigned to function '*suction pressure control Cx*' (Page 'Configuration Analog Outputs', Cx= compound C1, C2 or C3).

Release FI

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

Specify behaviour

With the parameter '*FU-control powerstages F/B at*' (Configuration Page Compound x) it can be defined how the analogue output behaves while forerun/backrun.

0/0% (Standard)	Output begins while forerun/backrun at 0% each
100/100%	Output begins while forerun/backrun with full power each and controls then depending on the specifications
100/0%	Begins at forerun with full power and at backrun with 0%

PID-Control

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

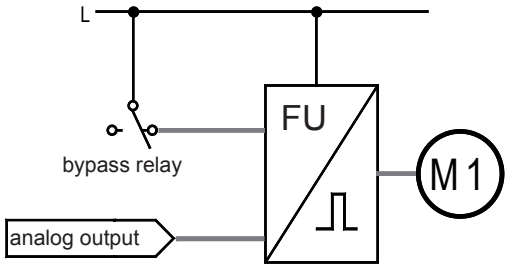
'*PID-Controller Proportional Band*'	range of the analogue output in ‚bar'
'PID-Controller Integral Time'	I-part
'PID-Controller Derivative Time'	D-part
'PID-Controller Actuator Response Time'	Influence of the low pass filter
'PID-Controller Output Value'	The value at the analogue output in 1/10% of 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. So you have the possibility to bridge the FI in the event of a fault oder to let it work on a fixed frequency.
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.



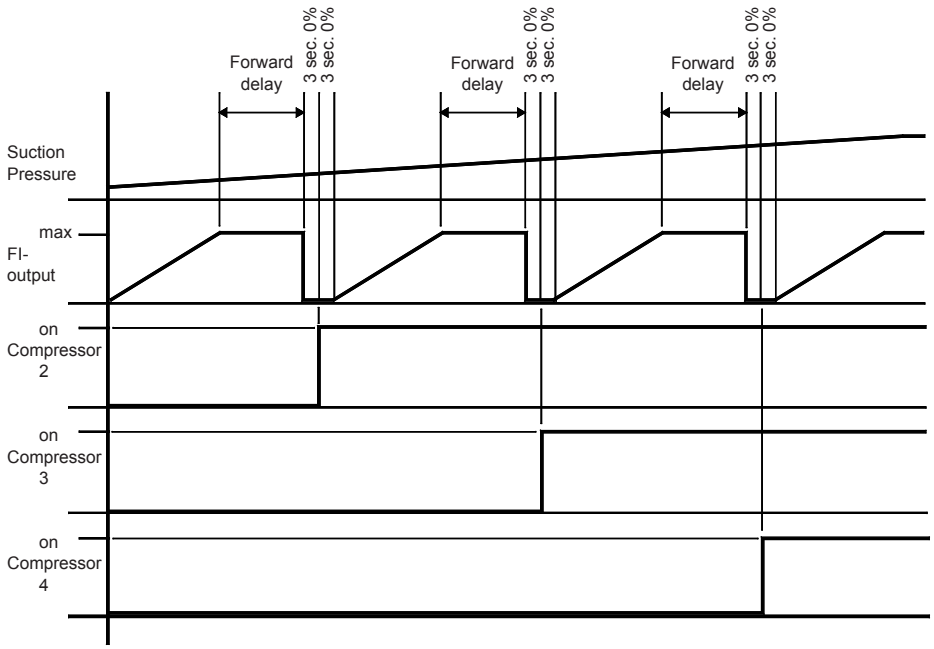
The N/C-contact of the relay must be used

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.
- PI-Module (analog output) 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.
- PI-Module starts control depending on actual suction pressure.



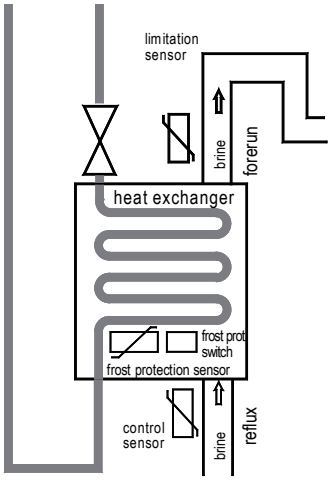
Principle:

Analog output and switching characteristic of the further compressors

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

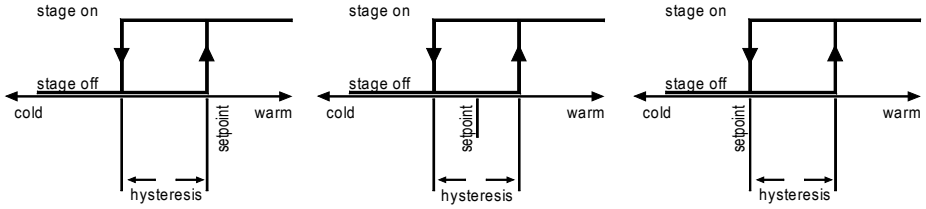
If a compound has only one speedcontrolled compressor and a load limitation is initiated by a digital input, the analog output signal (= FI) will be reduced to the demanded load limitation value.

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*...*Setp 12*), the preset hysteresis (*Hyst*) 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 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 the 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

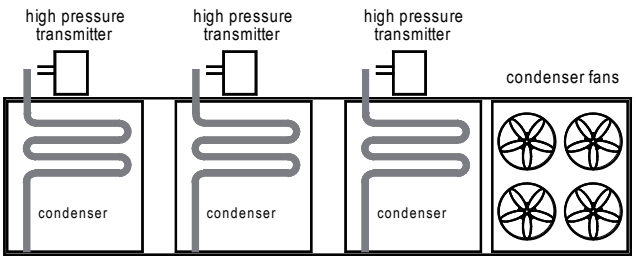
An outlet sensor is optional. Whenever the outlet temperature (*Limit Sensor*) falls short of a limit value (*Setp Limit*), the controller goes to 'backrun' mode, switching off stage by stage after the preset backrun delays. This function uses the same hysteresis as the controller, no error message will 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 up to three (3) possible high pressure transducers 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.

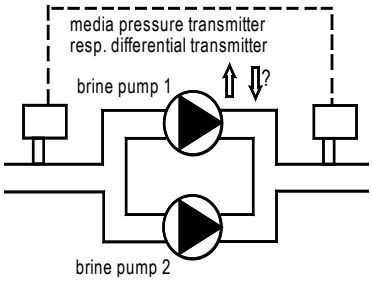
Brine Pump Control / Brine Pressure Monitoring

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):

- Pump 1 + 2 permanent .....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 it will be changed from one pump to the other

Pump Operation Modes

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

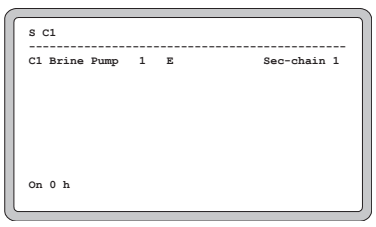


Minimum 1 pump runs continuously if the VPR has been switched on. It is impossible to switch off the pumps manually.

Brine pressure monitoring

Each chiller can get a brine pressure transducer if necessary.
(Function of the analog input 'PBrine'). 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
- Internal Brine Pressure malfunction, if a shutdown has been selected
- External Brine Pressure Signal
- Internal Frost Protection
- Internal 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 transducer 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 setpoints 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 transducer signal.

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

Analog Outputs / rpm controlled fans

To control RPM-controlled fans an analog signal from each compound is available. The measured values with the condensing pressure transducers will be forwarded to the matching output channel. Each output channel is able to transmit the signals via an 0-10 V DC and 4-20 mA output. The output range can be selected within the transmitter range.

Standard Mode

With the 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. The output signal will be scaled linearly within this range, that means the output signal is proportional to the relative position of the input signal between the limits. By activation of a setpoint offset, the range is shifted accordingly.
These parameters are only displayed if on the page 'Configuration Analog Outputs' a 'High pressure xx (xx)' has been entered.

Example: You use a transmitter with a range from 2...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.

Condenser Control via Analogue Output in a Proportional Mode

This proportional controller includes an adjustable delay of the output signal.
Depending on the number of running condenser stages, the resulting switch on/off points are used as proportional range limits of the output signal.
Example: If a condenser stage runs, the first switch-off point (setpoint1 - hysteresis) will be used as the lower limit. The upper limitation value is the switch-on point for the next stage (setpoint 2 + hysteresis). The hysteresis location is considered when the range limits are calculated. This method applies to all condenser stages.

Limitation Value Determination

If all configured condenser stages are switched on, for the determination of the upper limitation value the setpoint of the last stage + the hysteresis (Hysteresis location will be considered) will be used.

Setpoint Offset

A set and by DI/OK input activated setpoint offset of the condenser control affects the method, that means the calculated limitation values will be shifted by this offset value.

Output Signal Delay

The slew rate of the output signal can be influenced by 2 parameters ('*Time interval*' and '*step width*', Condenser-Set Page).
These parameters are only displayed, if on the page 'Configuration Analog Outputs' a '*Condens.P-Ctr. xx(xx)*' has been entered.
In the set time interval, the output signal may change max. only by the set percentage in the step width. If the step width is set to 100% and the time interval is set to 0, the output signal follows the

input signal directly. The next switching of a condenser stage is only possible if the analogue output signal has reached 100%. Otherwise a forerun signal is not generated.

The shutdown of a condenser stage is only possible, if the analogue output has reached 0%. Otherwise a backrun signal is not generated.

This function is assigned on the page 'Configuration Analog Outputs' with the parameters '*Condens. P-Ctr xx (x)*' to certain circuits and the analogue output "V" or "mA".

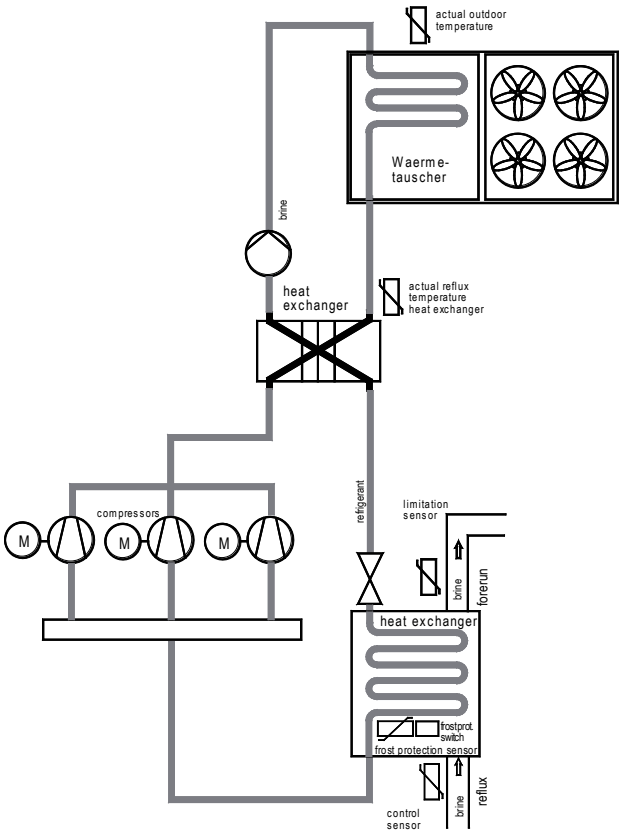
Multi Stage Controllers for Condensing Pressure Control

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 has been run down.
The switching hysteresis (CPr Hyst) is common for all stages, symmetrical 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 transducer 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 transducers remain disregarded.

Heat Pump Control

The VPR-System can also be used to control heat pumps.
The control functions are based on the available suction pressure control and condensing pressure control functions.

Activate the function

The heat pump control function can be activated by the parameter '*heat pump function enabled*' on each compound configuration page by 'yes'.
On the assigned 'Compressor Set' pages the necessary parameters can be found under '*Heat-pumpfunction parameter*' .

Operation Mode changing

The function can be switched by a digital input for each compound within normal refrigeration and heat pump operation.
Digital input without voltage..... Refrigeration function active
Digital input with voltage..... Heat pump function active

Setpoint Shift depending on Outdoor Temperature

The setpoint of the suction pressure control can be shifted based on the current outdoor temperature. The input value for all compounds delivers the outdoor temperature probe.
All existing suction pressure optimization functions are also active while this operating mode and can be parameterized or deactivated.

Activate the function: ..... Set '*P-Suct depend. on outdoortemp.*' *to* 'on'

The range for the suction pressure shift via outdoor temperature can be set by the parameter '*P-Suct depend. on outdoortemp...Lower limit/Upper limit*' . Within this limits the suction pressure will be hold by the value 'Offset (*Delta T*)' below the outdoor temperature.

Shifting

Within lower limit and upper limit ..... Suction press. setpoint = outdoor temp. + Delta T
Above the upper limit ..... Suction press. setpoint = upper limit + Delta T
Below the lower limit..... Suction press. setpoint = lower limit + Delta T

At a malfunction of the outdoor temperature probe, the suction pressure setpoint will be hold at the value '*lower limit + Delta T*'.

Limitation function via temperature

The setpoint of the suction pressure control can be shifted here based on the backrun temperature of the circuit. The input value comes from the respective probes for the backrun temperature.
Also here all existing suction pressure optimization functions are active and can be parameterized or deactivated. Up to a selectable backrun temperature (*Threshold value/°C*) the control system works with the setpoint. Above this limit the setpoint will be shifted by a factor *(bar/K)*, so the setpoint shifts with a rising backrun temperature.

Activate the function: ..... Set '*P-Suct depend. on return temp.*' to 'on'.

At a malfunction of the backrun temperature probe, the setpoint will not be shifted.

Limitation function via condensing pressure

The setpoint of the suction pressure control can also be influenced by the condensing pressure. The input value comes from the respective condensing pressure probe.
Also here all existing suction pressure optimization functions are active. Up to a specific limit (Threshold value [bar]) the normal setpoint is used. Above this limit, the setpoint will be shifted up with an increasing condensing pressure by a set factor *(bar/bar)*.

Activate the function: ..... Set '*P-Suct depending on P-Cond.*' to 'on'.

At a malfunction of the condensing pressure probe, the setpoint will not be shifted.

2nd, independent Parameter Set

In the heat pump mode, a separate, independent parameter set for the forerun/backrun times, the hysteresis, period time and step widths of the speed control are used.
All other parameters are identical.

Automatic Load Change of Stage Controllers (Sequencing)

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'.

Function

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 pages).

Since the VPR has all runtime 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.

Persistency Time

If, for a longer time, no pressure values change in the plant, no forerun or backrun appears and so no sequencing is possible, the '*Persistency time'* (Compressor Set page) initiates a short backrun after the set time to allow to change the base load.

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 compressors are able to switch on if required even if the feedback signal of the excluded compressor fails.

Activate the function

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'.

Disable the function

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

Emergency Operation

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

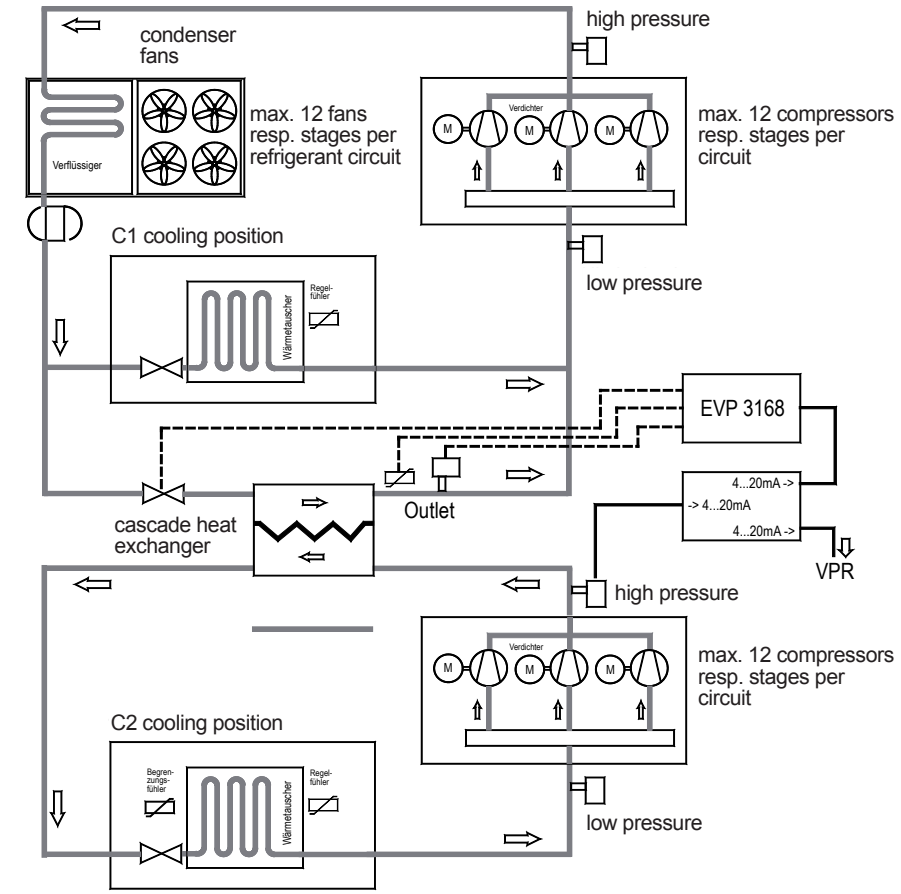
Inverted Stages

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.

Cascade Control, cascaded Compounds

Cascade Controls consist of two (2) circuits, which are thermally connected by a heat exchanger. The heat from the freezing circuit will be transported to the standard cooling circuit via this way. Cascade Heat Exchangers must be considered as a combined condenser and evaporator.

Cascading will be applied to compound C1 and compound C2, this can also be applied to C3 additionally or alternatively. In this case, C3 will be handled like C2 and can be used for the cascading function independent from C2. Therefore, the following remarks for C2 (= deep cooling) also apply to C3 analogously.



Simple overview of a Cascade Control with VPR and EVP 3168

Cascading can be switched on in the configuration for C2 and C3 independently by parameters.
A heat exchanger will be used, which works at one site as a condenser for the high pressure circuit of the C2 compound, at the other site as an evaporator of the C1 compound over which the available energy is dissipated. Because only the heat exchanger ensures cooling and condensation of the hot gas of the C2 compound, this compound can only work if the C1 compound ensures the cooling of this heat exchanger.

Sequence

Based on a switched-off C2 compound, at a cooling request within this compound a forerun signal will be generated based on the rising suction pressure.
Simultaneously, a safety time will be started. This time is running out if:

- no 'Precooler feedback' is present and
- the C1 compound doesn't run.

If the C1 compound runs or 'Precooler feedback' is present, the safety time will be set to 0. As long as the safety time has not been expired, the forerun of the C2 compound remains locked, that means even though the forerun time has been run down, the compound does not start.

With an activated 'cascade', this 'forerun' signal goes through a release step. The forerun signal of the C2 compound will be processed by the cascade control and the heat exchanger (evaporator part) will be activated by a 'precooling relay' after the '*Forward Delay*' has been run down.
Now the solenoid valve of the cascade heat exchanger (evaporator part) will be switched on.
The relay will be selected if 'cascade' is activated. This 'precooling relay' is activated in the idle mode and de-activated at an active precooling.

The forerun signal of the C2 compound will be disabled up to the heat exchanger has got its working temperature. This will be considered as achieved if an adequate precooling of the heat exchanger is confirmed by a matching signal (e.g. digital input '*precooling feedback'*) or a maximum time has been run down. Then the forerun signal of the C2 compound will be released and the first compressor is able to switch on.

The input 'precooling feedback' can be deselected to reduce hardware ressources.

As soon as the C2 compound works with at least one compressor, all forerun/backrun signals will be performed by default. If the last C2 compressor switches off, and so the C2 compound is switched off completely, also the heat exchanger will be switched off at the evaporator part.
With an activated precooling relay the forerun time of the first C1 stage will be set to a very short (separately adjustable) time, to achieve a quick reaction of the C1 compound to the performance requirement of the C2 compound.
This value (typically very short) acts independently from the settings of the forerun times, also if variable forerun/backrun times are activated.

C1/C2 Backrun Delay

If while the cascade operation (at active precooling relay) only one stage of the C1 compound runs, a backrun will be supressed as long as the lower limit of the suction pressure is reached (*Fast backrun threshold*). This is necessary to avoid a disproportionate number of switching operations of the C1 compound. With reaching the '*Fast backrun threshold*' the last stage will be switched off without any delay. If the '*Fast backrun threshold*' is higher than the normal backrun limit (which results from setpoint, hysteresis and optimizing functions), it has no effect and the backrun works like at normal operation.

Alarm Messages

At an activated 'cascade', certain alarm messages of the C2 compound will be suppressed, which are foreseeable as subsequent faults.

Behaviour at Low Power Optimization

At an activated 'Low Power Optimization' of the C1 compound, a power demand while standard operation works with a time delay only.
With an activated precooling relay a power demand will be generated, which is so large that the C1 compound switches also to forerun at an activated 'Low Power Optimization'.

Parameters (Compound page)

[default] = standard values

Cascade control used C2.....yes / [no]
Cascade control used C3.....yes / [no]
Precooler feedback used .....yes / [no]
Safety time .....0...60 sec. [6 sec]
Fast backrun threshold C1 .....-1...300 bar [80:00 bar]
Forerun dealay stage 1 C1.....0...60 sec. [3 sec.]

Actual Values (display only)
Precooler demand C2 .....on/off
Precooler demand C3 .....on/off
Safety time remain.....X sec

Safety Shutdown CO_2

With using the refrigerant CO2, this function allows an automatic 'Emergency-off' of the cooling function of the assigned cold storages at certain operating conditions of the compound.

CO_2 compounds owns a pressure relief valve each at the suction pressure and the high pressure position. To avoid a refrigerant loss by releasing this valves with a resulting blow-off of the CO_2, the actual values of the suction pressure and the condensing pressure must be strictly monitored.

For this, the suction pressure and condensing pressure setpoints will be provided with limitation values. The cooling positions of the matching compound will then be locked if:
- the suction pressure is located above the corresponding limitation value or
- the condensing pressure is located above the corresponding condensing pressure value.

Function of the Safety Shutdown

Particularly at cascade plants with CO_2, a shutdown of the CO_2 compound should take place as early as possible, if the C1 compound could not dissipate energy sufficiently.
A shutdown of the CO_2 compounds by the high pressure limit may release a blow-off of the CO_2.
To avoid this, at an improper rising of the suction pressure of the C1 compound the safety shutdown of the cooling positions of the CO_2 compounds should be activated.
For this, the VPR uses (while cascade operation) the suction pressure limit value of the C1 compound to lock the cooling positions of CO_2 compounds.
The safety shutdown function is not assigned to a specific refrigerant. Optimization functions of the VPR, which affects to suction pressure resp. condensing pressure setpoints, have no affect on the limitation values of the safety shutdown function.

At each compound, a digital input for an external requirement of a safety shutdown function is available, also a relay for a signal to external systems.
At each compound a digital input signal and relay will be selected if the parameter '*External Signal Cx'* is set to 'yes'.

The function 'Safety Shutdown' is devided into two areas:
- The monitoring of the suction pressure and condensing pressure with switch-off of assigned cooling positions is basically available for all compunds (C1, C2, C3).
- While the cascading operation the suction pressure limit value of the the C1 compound will be used for switching off the cooling positions of the cascade compounds C2 and/or C3.

Function for C1 <u>without</u> Cascade Control

The suction pressure and condensing pressure actual values of C1 will be compared with a limitation value. If one of the limitation value has been exceeded, a shutdown command will be send via the data bus to the cooling positions of the C1 compound.
Additionally, the suction pressure actual value will be compared with a <u>lower</u> limit value. If this value has fallen below, also a shutdown command will be send via the data bus to the cooling positions of the C1 compound.

Function for C1 <u>with</u> Cascade Control

If the cascading operation for C2 and/or C2 is activated, the limitation value of the suction pressure actual value of the C1 compound will be compared with an adjustable upper limitation value.
If the actual value is located above the limitation value, a shutdown command will be send to all cooling positions of the matching compounds (C1 and/or C3) via the data interface.
Additionally, the suction pressure actual value will be compared with a <u>lower</u> limit. If the limitation value has fallen below, a shutdown command for all cooling positions of the concerned compounds (C2 and/or C3) will be send.

The suction pressure and condensing pressure values of C2 resp. C3 will be compared with individual limitation values. If one of the limitation values has been exceeded, a shutdown command will be send via the data bus to the cooling positions of C2 resp. C3.
Regardless of this, the 'Low Power Optimization' may cause a switch-off of the cooling positions.
In this case, the cooling position/controller will be released only, if the 'Low Power Optimization' switches off a lock function which is possibly present.

Using external signals

If the parameter '*External signals Cx*' is set to 'yes', for each compound a digital input 'Cx Emergency-off of CSTs' and a relay 'Cx Emergency-off of CSTs' will be selected and provided.
If voltage is connected to one of the digital inputs, the safety shutdown of the matching compound will be activated, in the same way as if one of the limitation values will be increased.
The behaviour at the cascading operation is also identical as at an increasing of a safety limitation value. With an activated 'Emergency-off', the relay will be activated which is assigned to the compound whose cooling positions are locked. The relay will be de-activated if the 'Emergency-off' has been finished.

Minimum P-Suct C1 ..... -1...300 bar (default = -1.00 bar)
Maximum P-Suct C1 ..... -1...300 bar (default = 80 bar)
Maximum P-Cond C1 ..... -1...300 bar (default = 80 bar)
Maximum P-Suct C2 ..... -1...300 bar (default = 80 bar)
Maximum P-Cond C2 ..... -1...300 bar (default = 80 bar)
Maximum P-Suct C3 ..... -1...300 bar (default = 80 bar)
Maximum P-Cond C3 ..... -1...300 bar (default = 80 bar)
External signal C1 ..... yes/no
External signal C2 ..... yes/no
External signal C3 ..... yes/no

Parameters (Compound Page, Emergency-off of CSTs)

[default] = standard value

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)
- C3 P-brine .....(media pressure in the brine circuit of chiller set 3)
- C3 P-suct .....(suction pressure transmitter, refrigeration compound 3)
- C3 P-cond.cir.1 .....(condenser pressure transmitter, compound/chiller 3, circuit 1)
- Room Humidity .....(e.g. humidity in the market, needed for optimization via enthalpy)
- Pressure Display 1...25 ...(pressure transducrs which affect to no functions, measured values are displayed and recorded only)

With 'Pressure Display 4+5' it is possible to trigger an alarm, limit range and hysteresis can be edited on the configuration page of the inputs.

Temperature probe inputs

The parameters for the temperature probe 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 TF 201 / TF 501 (Pt1000) 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)
- C3 control brine .....(reflux sensor at the heat exchanger of chiller set 3)
- C3 limit brine .....(forerun sensor at the heat exchanger of chiller set 3)
- C3 frost prot brine1.(frost protection sensor at the heat exchanger of chiller set 3, circuit 1)
- C3 T-cond.cir.1 .....(temp. sensor at the re-cooling heat exchanger of chiller set 3, circuit 1)
- Outdoor Temperature .....(sensor for measuring the outdoor temperature, needed e.g. for condensing pressure setpoint shift)
- Temp.Display 1...25 .....(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*'.
This analog outputs can be scaled as 4-20mA/2-10V or 0-20mA/0-10V, this will be displayed as (mA) or (V) at the end of the function text.

The following tasks can be assigned to all analog outputs:

- off
- High Pressure C1 - C2 - C1.2 - C1.3 - C2.2 - C3
- Suct.pressure contr. C1 - C2 - C3
- Brine Temperature Controller C1 - C2 - C3
- Condenser Control / Proportional Control C1 - C1.2 - C1.3 - C2 - C2.2 - C3 (descr. page 65)

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

- Overheat
- High Pressure
- Error, factory set names
- Oil Pressure
- Motor Protection
- Feedback

names of the factory settings

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 trigger if voltage is available (active ON) and the time delay 'Delay' (Basic Configuration Page) has been run down.

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.

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

A more comfortable input option offer the PCSoftware 'COOLVision-MES' resp. 'CV-Scheduler'

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, that means as little effort as possible.
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 relay' is virtual, but the following relays are moved by one position.

Example: After a basic configuration (e.g. with the software **VPR52Plan**) 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 voltage.

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%.

Cancel a 100% Load Limitation

If a 100% shut-off of all compressors is initiated via input 'C1/C2 Load Limit 2', the compound although starts, if the limit '*Pumpdown limit*' (Compressor Set Page) is increased. The load limit is active again, as soon as the set suction pressure setpoint has been reached.

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 'Load Limit 1' of each compound initiates the selected additional function, which has been defined at '*Defrost lock signal for*' (Basic Configuration Page). This doesn't affect the load cancellation function. For C1 and C2 the following combinations can be used, for C3 the function will be activated only.

- '-----' 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/C3 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. This function is identical with the internal 'Suction Pressure Alarm'.

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 ('*Delay Err. Low refrigerant*', Basic Configuration Page) an error message will be forwarded or the compressors of this compound will shut off additionally ('*Shutdown at Low Refrigerant*', Basic Configuration Page).

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 failure code 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 e.g with different setpoints, closed roller blinds and switched off lighting 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.
On the 'Compressor Set Page' the current state (on/off) will be displayed.

Overview of the Digital Inputs with information about the switching behaviour

Function	*will be activated at*
Suction pressure alarm (compound)	0V
High pressure alarm (compound)	0V
Low refrigerant (compound)	0V
Fast backrun (compound)	230V (resp. 24V, dep. on type)
Load limit 1 (compound)	230V (resp. 24V, dep. on type)
Load limit 2 (compound)	230V (resp. 24V, dep. on type)
Emergency OFF	0V
Asymmetrie	0V
Night mode	230V (resp. 24V, dep. on type)
All Compressors	
Feedback signal OK	230V (resp. 24V, dep. on type)
Oil pressure	0V, disturbance
Suction pressure	0V, disturbance
High pressure	0V, disturbance
Motor protection	0V
Overheat	0V
All Condensers	
Feedback signal OK	230V (resp. 24V, dep. on type)
Brine Pumps	
Feedback signal OK	230V (resp. 24V, dep. on type)
Brine Circuits	
Brine pressure alarm	0V, disturbance
Suction pressure alarm	0V, disturbance
High pressure alarm	0V, disturbance
Frost protection alarm	0V, disturbance
Ext. message inputs	230V (resp. 24V, dep. on type)
2nd. setpoint inputs	230V (resp. 24V, dep. on type)
Low Power Optimization, each compound	
Demand	230V (resp. 24V, dep. on type)
Heat Pump functions, each compound	
Demand	230V (resp. 24V, dep. on type)
Cascade function, each compound	
Feedback precooling	230V (resp. 24V, dep. on type)
Safety Shutdown of the cooling positions, each compound	
Demand	230V (resp. 24V, dep. on type)

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.

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').

Feedback Signals

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 at 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 should not be smaller than the feedback delay x no. of machines ! It may be corrected automatically.

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, C2 or C3).
When the VPR is used for chiller control, the cold storage controllers can be assigned to one of the both 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.

Solenoid valve lock after continuous compound runtime

If error messages will be transmitted to the VPR from cold storage controllers, the response time can be set in the basic configuration with the parameter '*Cst-error delay*'.

Defrost Groups

If, in modern supermarkets, refrigeration cabinets with doors and covers are used, the icing will be reduced by a reduced contribution of ambient air. By this, the number of defrost processes can be reduced, so one defrost process per day might be too much and can be extended to several days.
The internal defrost release times of the cold storage controllers are based on a daily cycle only.
With the 'Defrost Group Control Function' this defrosts will be started from the VPR.
Each Cold Storage Controller can be assigned to a defrost group. Based on a weekly cycle the defrost starting requirements will be transmitted to the controller via the network and supervised.

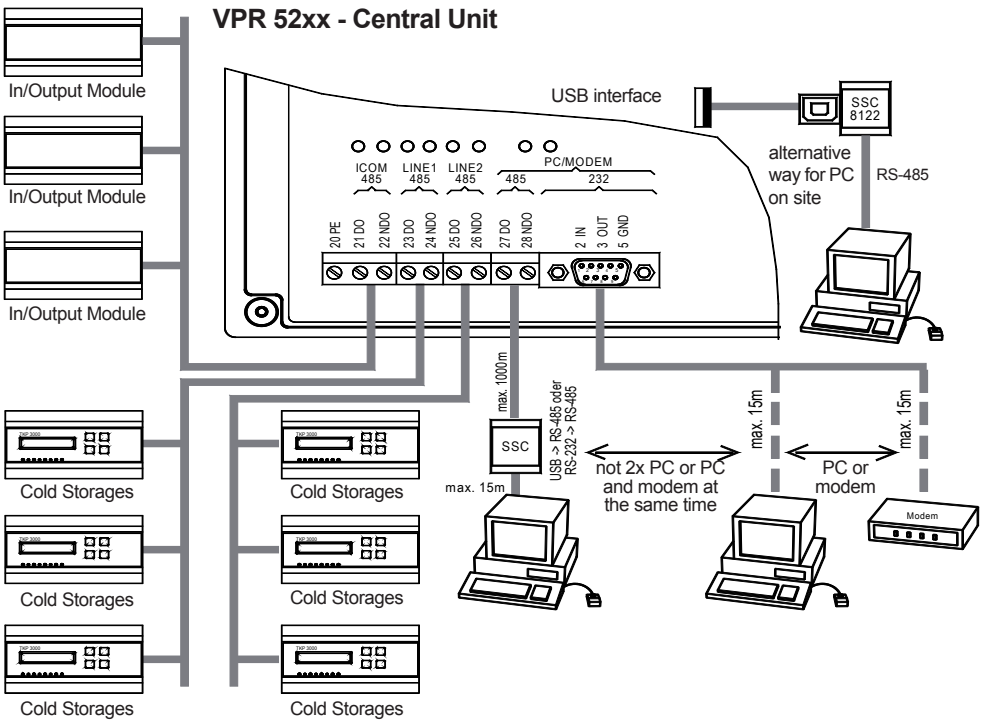
The 'Defrost Group Control Function' may contain up to 120 data sets. Each data set contains a day time, any selection of weekdays and a defrost group. Up to 32 defrost groups can be used and can be named individually (max. 20 characters).
The entries will be checked in minute intervals, transferred to the controllers and then checked based on the feedback if the transmission was successful. If the transmission was not successful after 10 trials, the failure message 'xxx *Start defrost'* appears.

Assignment to a Defrost Group

On the individial pages of the cold storage controllers under <Defrost data> at the parameter '*Defrostgroup*' the desired group will be assigned. A group can be selected by its name as defined in the list <Defrostgroup names>.

The individual defrost times at the assigned cold storages are still active. If the defrost times of the VPR should be used only, the individual defrost times of the controller must be erased or set to 'external only'.

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 '*ICOM-485*' with the central unit. Each module has an individual address on the bus, preset by an incremental switch.

Connection of the I/O Modules

Up to 128 cold storage controllers are able to communicate with the VPR Central Module via the interfaces '*Line1 485*' and '*Line2 485*', where max. 64 controllers can be connected per line.

VPR <> Cold Storage Controllers

For remote control and data exchange with a standard PC, an RS-232 and an RS-485-interface is available. This connections are possible:

- For distances PC <-> VPR < 15m the PC-232-interface can be used,
- For distances > 15m 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 a special add-on card).

Maintenance by PC

The interfaces PC/Modem 485 and 232 cannot be used at the same time. If e.g. a modem should be used for remote control and a PC should be work on site, the PC can be connected via this way:
VPR-USB-A-Port -> SSC 8122 -> RS-485 -> PC

By the help of the MS-Windows-Software '***COOLVision-MES***' (from vers. 1.6) the access can be connected via the network interface.

PC connection via ethernet

Except from an USB stick, a complete configuration can be created by the Software '***COOLVision-MES***'. Then the parameter set can be transmitted via the PC interface (upload). 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*', Modem Data Page).

Maintenance by PC

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

1: VPR with software '***CV-Scheduler***'. The software allows time-controlled downloads of data from the VPR, logging and message forwarding of alarm messages is done by the VPR itself.
2: VPR with software '***COOLVision***', which runs continuously.
'***COOLVision***' works as Error Message Central, logs data and forwards messages via the most important communication lines (Modem, SMS, etc.).
This structure is out of date, it will be used in old plants only.

Operation and Data Logging by PC

Integration into a PC-Network via Ethernet

The VPR 5240-2 owns a network interface (ethernet), so the system can be connected to a standard network. Under '*Parameter/Basic Configuration*' you will find the necessary parameter settings:

MAC-Address ..... The address of this VPR, cannot be changed
IP-Address ..... Unique address within an Ethernet-Network
Netmask..... (any, e.g. 255.255.255.0)
Broadcast Address ..... for the network, e.g. for DHCP
Gateway Address ..... Address of the gateway (e.g. router) to transmit data to the internet
Activate by System-Reset..... By 'yes' the VPR will be switched off briefly, so the new network settings can be taken.
Always to do with changes at 'IP-Address', 'Netmask' and 'Broadcast Address'
DNS-Address..... Address of the Domain Name System for name resolution

The parameters which are needed for a network integration must be agreed with the System Administrator of the customer. If any settings are used, it may cause malfunction of the entire computer network !

Data Exchange by Email

Failure-/ OK-Messages HACCP-Report

For sending emails 3 different routes are availble.

The VPR 5240-2 is able to send failure and OK messages as an email to different addresses at any time. This can be done independently by three different signal message paths.

On the page '*Parameter/Configuration E-Mail Parameter*' periods of time will be entered, within this the message can be send (Timeframe). Additionally a control message can be determined which also will send an email at this time even though no messages are present.
So the connection can be checked if it is ok.
To send emails, the following parameters must be set:

SMTP-Server Name / IP ..... The name or the IP address (TCP/IPv4) of the SMTP server, which should send the emails
E-Mail Address ..... Own email address of the VPR system, which is set in the proprietary server system or at the provider
Username ..... The necessary username for sending
Password ..... The necessary password for sending

If at parameter 'Reporting Period' are set two identical hours, then no time period is set and the message can be send at any time.

HACCP-Report

The VPR is able to create a daily PDF file (HACCP report) of the actual temperature values and to send it as an email to 3 different recipients. On the page <*Parameters/Configuration E-Mail Parameters*> the following parameters can be used for this:

Send HACCP-Report automatically..... Will be sent daily at this hour.....0...23 h, [aus]
sent ..... Information, when the last transmission was done
Request report manually ..... yes, [no]
Send report, first date ..... xx.xx.xx (dd.mm.yy)
Send report, last date ..... xx.xx.xx (dd.mm.yy)
E-Mail Address 1 .....xxxxxx@xxxx.xxx (any Email Address)
E-Mail Address 2 .....xxxxxx@xxxx.xxx (any Email Address)
E-Mail Address 3 .....xxxxxx@xxxx.xxx (any Email Address)

The Telephone Modem

To connect a modem there is an specialized RS-232-interface available (modem-232).
All modern telephone modems can be used, but to transmit failure messages SMS or GSM modems are useful which allow to forward messages as SMS, Fax and Email.

Initialization (Initstring)

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.

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

Transmission of Error Messages VPR -> Standardmodem

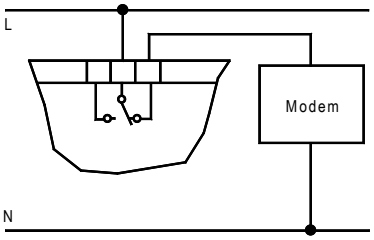
In case of system state changes like error messages, 'OK'-messages or similar, the VPR dials one of four preselected phone numbers (Dial command 1-4) via modem and tries to transmit the information. If the line to a PC with running '***COOLVision***' software is established, the PC will receive the message 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***'.

Modem Hardware Setup

To ensure reliable standby operation of the connected modem, two (2) safety functions are available:

1. While power-up of the VPR, the initstring (Page 'Configuration Modemoperation“) will be transferred 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').
3. The data transfer speed from and to the modem can be reduced while working in an environment with extreme disturbances.



Enter Initstrings and Dial Commands at the VPR

- Select desired position on page '*Configuration Modemoperation*'
- Push '**RET**', the first character position is marked (eventually, the systems asks here 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.

Check Message (all clear mess.)

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.

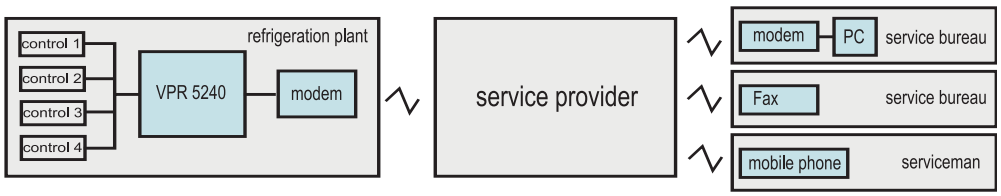
Connect the VPR via Modem, Access Code

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. After 5 minutes without any activity, the access will be locked again. If no access code has been established, the access is free and unprotected.

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

SMS/GSM-Modem

SMS/GSM modems differ from a standard modem because of an expanded instruction set. This allows to forward messages via providerservice 'SMS in landline networks' or mobile 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 an SMS message, the feature 'SMS in Landline Networks' of a service provider needs to be used. Their message transport services are often offered as a so-called value-added services, here you will find a listing (!! Always subject to change !!)

Servicecenter (Provider) and Services for SMS, SMS-Fax and SMS-eMail with SMS-Modem

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	Currently unavailable		

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' within 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.

GSM-Modem

For this, a mobile phone contract or a matching prepaid card is necessary. An operation is only useful in places where proper radio links exist. External antennas may be needed, depending on the location of the plant.

Initialization (Initstring)

As standard modems SMS-/GSM modems differ in control and instruction set. Here you can find the initstrings of modems which we have used and tested.

Examples of Initstrings

Modem type	Initstring	Date
MDM 1002 (tixi)	**AT+tixi=0S0=1x3&W**	5/2010
MDM 3002 (tixi)	**AT+tixi=0S0=1x3&W**	5/2010
INSYS	**AT&FS0=1x3**	5/2010
GSM	**AT+CPIN=0000 (0000 = pin of the sim card**	11/2011

Forwarding messages as SMS

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*').

Settings

- '*SMS Modem used*' = tixi (Modem MDM-1002 or MDM-3002) or insys
- 'Init Command' = AT+tixi=0S0=1x3&W (for modem MDM-1002 and MDM-3002)
- '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 depends on the used modem. SMS and emails always require a provider. This provider must get an *additional code* to redirect the messages to the desired destination. This additional code is prefixed to the phone-no.

Additional Codes

German Telekom
If the message should arrive as FAX:

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

If the message should arrive as an Email:

8000 + Email address

Forwarding messages as FAX with MDM 3002-Modem (tixi)

- '*SMS Modem used*' = tixi (Modem MDM-1002 or MDM-3002) or insys
- 'Init Command' = AT+tixi=0S0=1x3&W (for modem MDM-1002 and MDM-3002)
- '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 machine which should get the message.

Forwarding messages as FAX with Insys-Modem

- '*SMS Modem used*' = insys
- 'Init Command' = AT&FS0=1x3
- 'Type' = Fax
- 'Protocol used' = not adjustable
- 'Timeframe from...to...' = Time period the messages can be send to the phone number
- 'Service center' = not necessary
- 'Phone-No.' = Number of the fax machine which should get the message.

Forwarding messages as Email

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

- '*SMS Modem used*' = tixi (Modem MDM-1002 or MDM-3002) or insys
- 'Init Command' = AT+tixi=0S0=1x3&W (for modem MDM-1002 and MDM-3002)
- '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** (Code no. for email)
- '*Email Address*' = The recipient of the message

The integrated Data Logger System

The VPR 5240-2 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 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

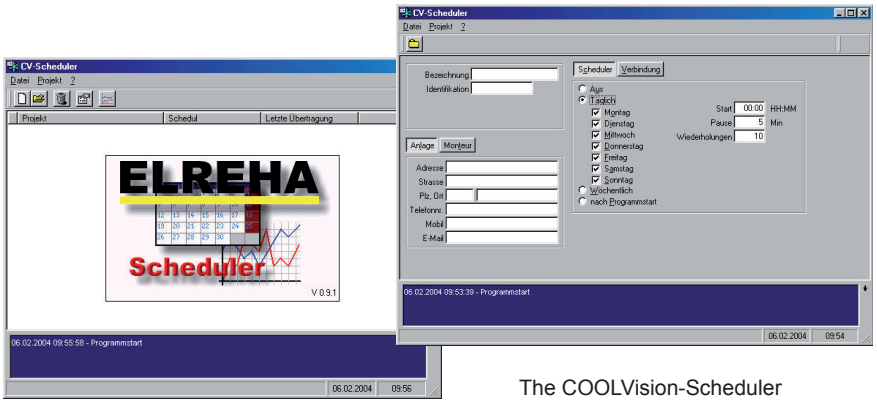
The storage capacity of the VPR depends on number and type of the connected controller units and the set recording interval. An extreme example would be 128 connected TKP controllers, in this case the memory has a capacity of 11 days only (15min/24h interval). Within this period, the data must be downloaded 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
	128	11 days
	64	22 days
	20	50 days
	10	100 days

Fetching data by a PC

To download data from the VPR the software 'COOLVison-Scheduler' is used. This software 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'.



The COOLVision-Scheduler

The internal data logger memory of the VPR can be erased completely. This is described on the 'Service Function' page of this manual.

Handling of (System)-Failures

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

Pressure Transducer Failures (Suction Pressure)

If the transducer signal leaves its nominal range (<4 or >20 mA), a transducer 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 Transducer Failures (High Pressure)

If the transducer signal leaves its nominal range (<4 or >20 mA), a transducer 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.

Behaviour of Analog Outputs

If a transducer signal leaves its nominal range (<4 or >20 mA), a transducer 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 transducer 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 continuously with those compressors which have been configured as 'emergency' compressors (inverted stages controlled by N/C relay contacts).
The Cold Storage Controllers run continuously with the latest transmitted information.
If data connection between VPR and the controllers is interrupted for more than 30 minutes, the controllers 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 from page 7)
- '*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 'RET' key.

Examples

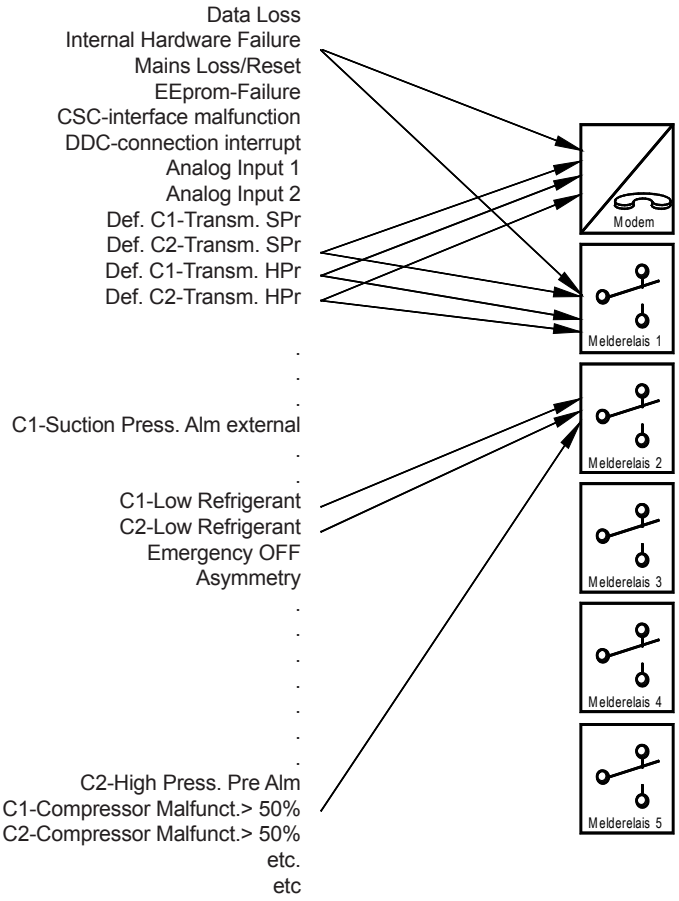
Example 1: *You want to forward error messages from a cold storage controller with address #10 to relay #1 and relay #3 and via modem.*

- 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 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.

Reset

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

- **Key F4** (Compound Failures Page)
- Digital input
  If the function is selected for at least one (1) 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 been occurred
  or
- an (adjustable) quantity of incidents (error messages / all clear-messages) with priority #4 has been 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 SSM alarm relay will switch with the next error message, the counter resets at the same time (independent from day or night mode). The next SSM-5 message is only possible, if the set number of messages will appear again.

  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, also the counter will not be reset.
  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. With triggering the SSM, the counter resets.

  Alarm relay SSM-4

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.

VPR-Central Unit

- 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.

Ventilation

- There should be a free space of at least 10 cm above the housing for the warm air outlet. Take care that the max. operation temperature of the system cannot be exceeded.
  Temperatures outside the specification 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.

Backup / Network

- Leave enough space at the right side of the housing to allow to plug in an USB stick or a network cable. Current standard USB sticks have a lenght of appr. 6 cm, therefore it would be useful to have 10 cm of space.

I/O-Modules

- 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.

Mounting Position

- 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.

Distances VPR <-> I/O-Modules

- 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.

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.

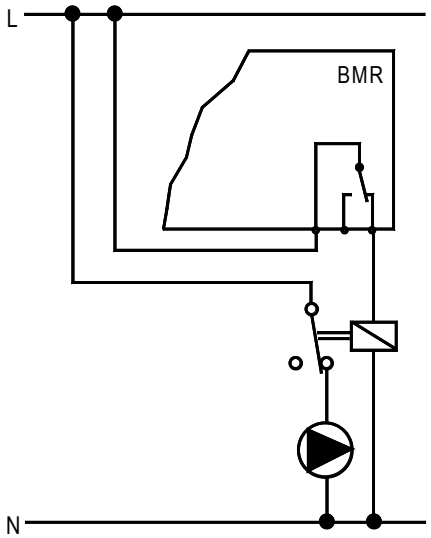
Ground Equalization

- 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.

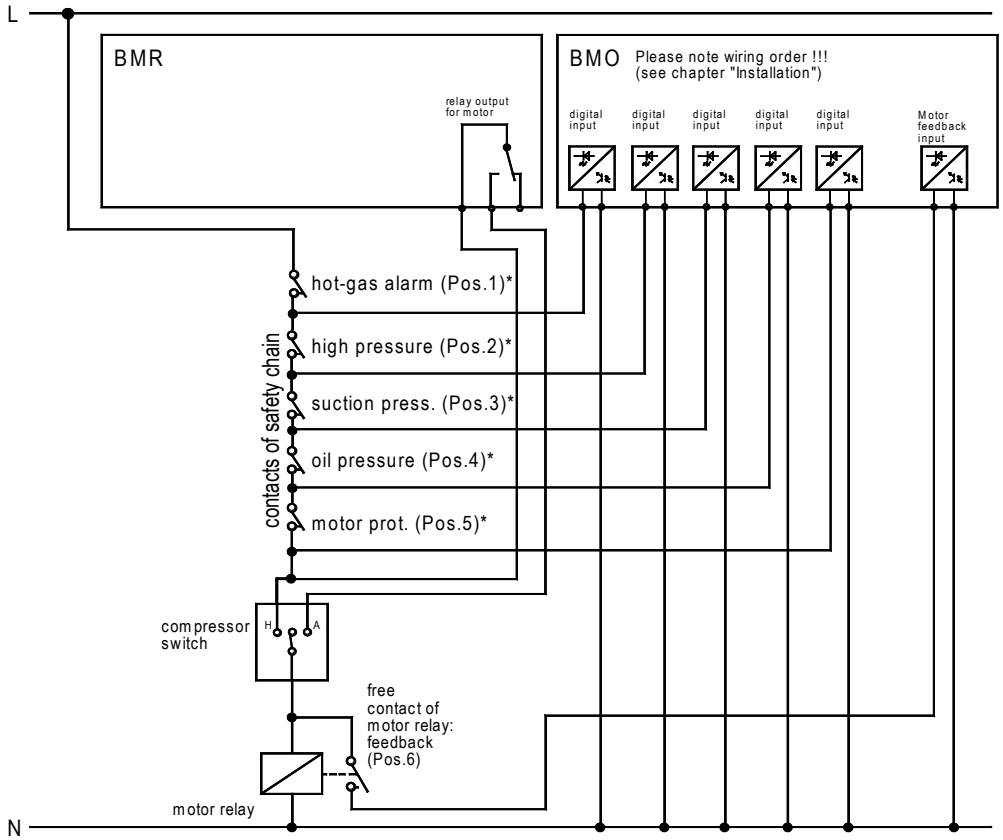


While planning machinery and assembling electrical components please observe the EMC basics.

You can find the most important information on a separate data sheet which can be downloaded from our website (as german).

- 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 transducers, 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:

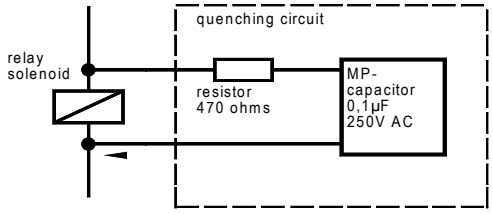
- *Minimum diameter each core: 0,5 sqmm (.02 sq.inch)*
- *Shielding: min. 95 % optical cover, (ideal: foil=100 %)*

Cable Requirements for Analog Signal Transmission

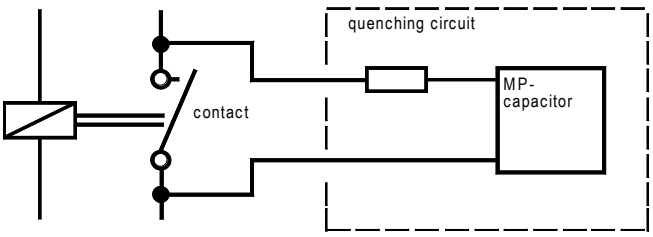
The correct wiring of signal cables solve 90% of the problems. But persistent cases may require eliminating the disturbances at the source. Frequently occuring causes:

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

How to prevent disturbances by adding electronic components



- **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. 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.

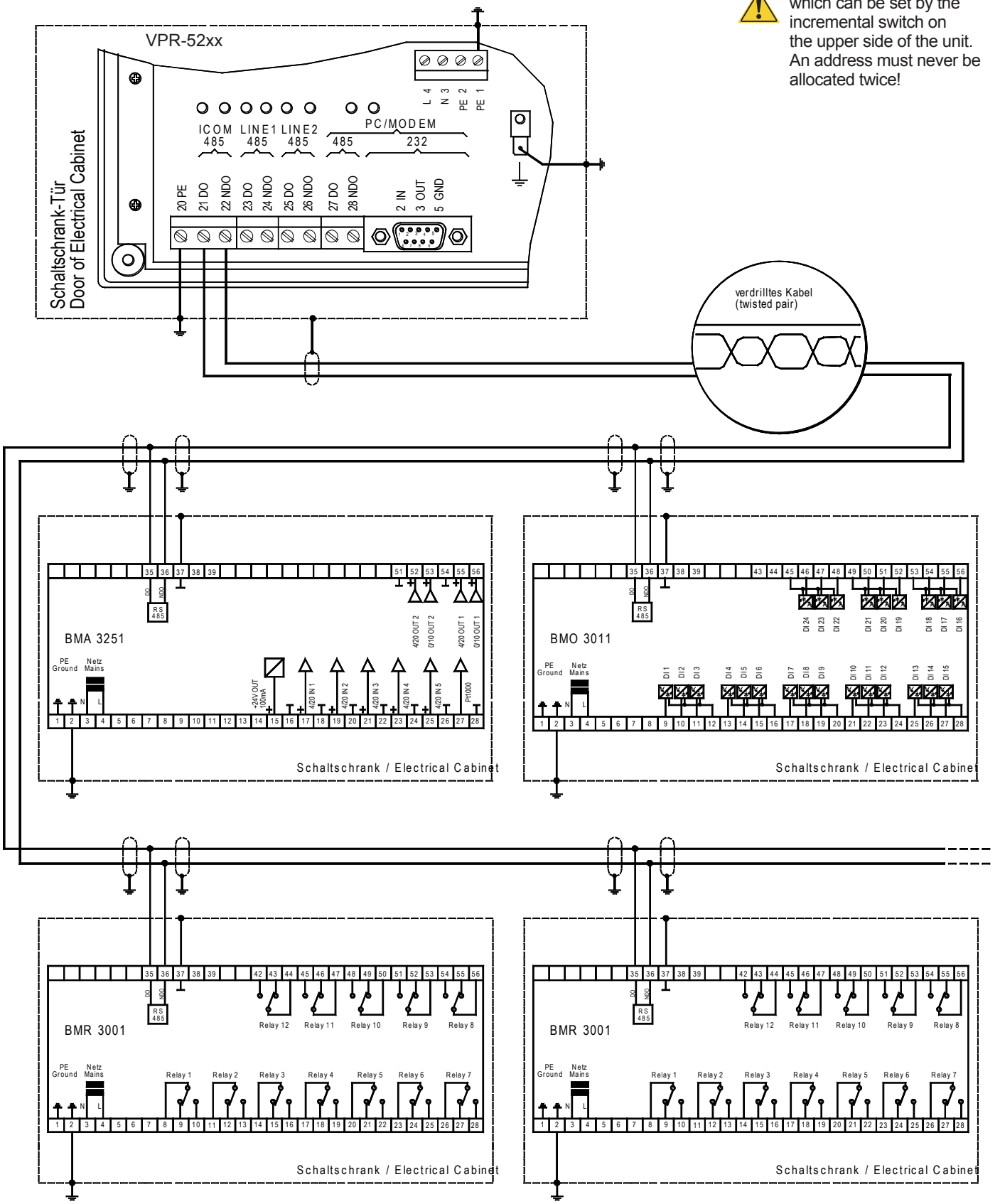
You can find the most important information on a separate data sheet which can be downloaded from our website.

ICOM-Bus for I/O-Modules

The ICOM-bus is reserved to connect I/O-modules only (BMx ...):
It is structured as follows:

- 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 controller 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. An address must never be allocated twice!



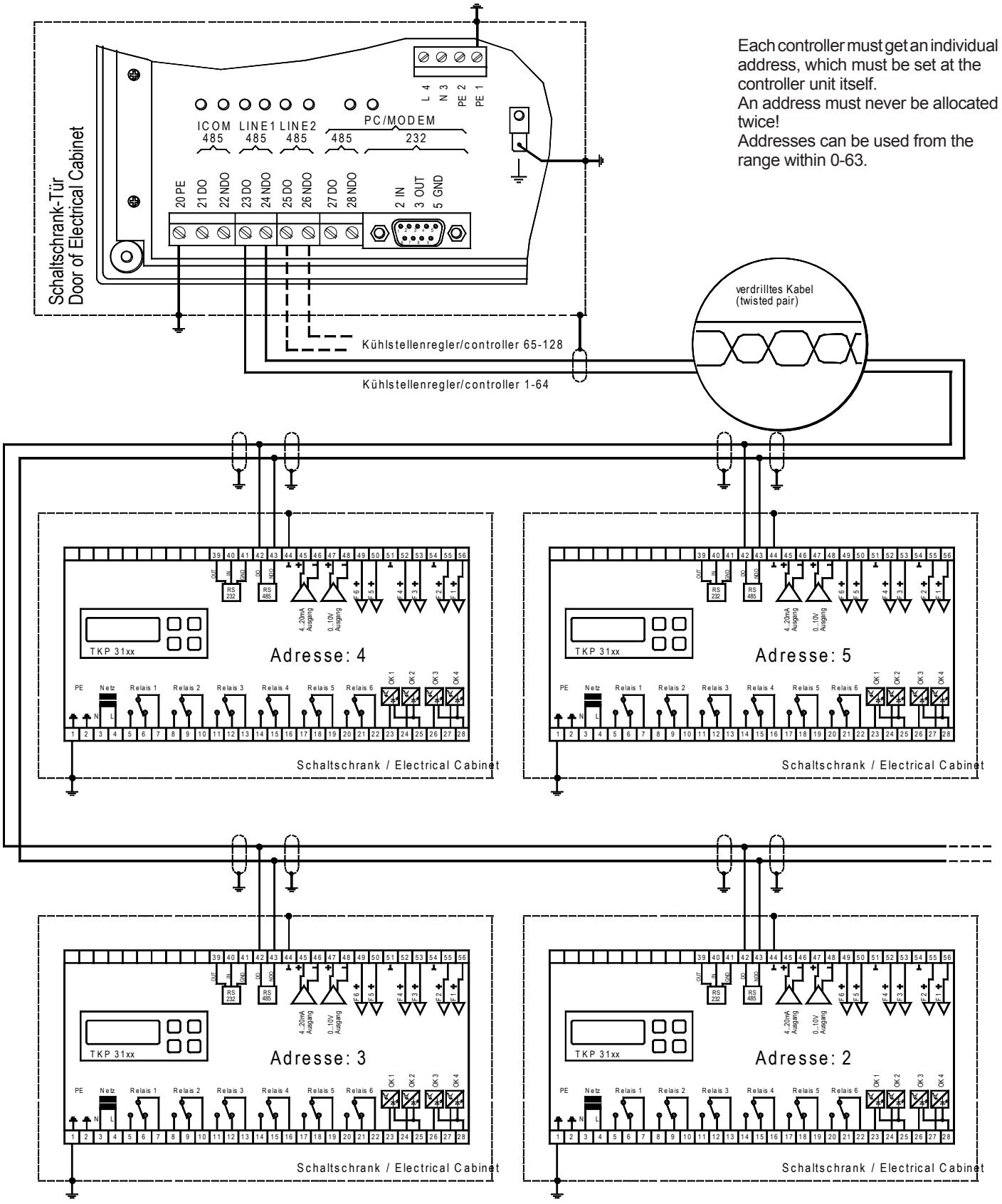
Line-Bus for Controller Connection

The LINE-bus is reserved to connect cold storage controllers or data capture modules (e.g.. VBZ 3006-2) 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.

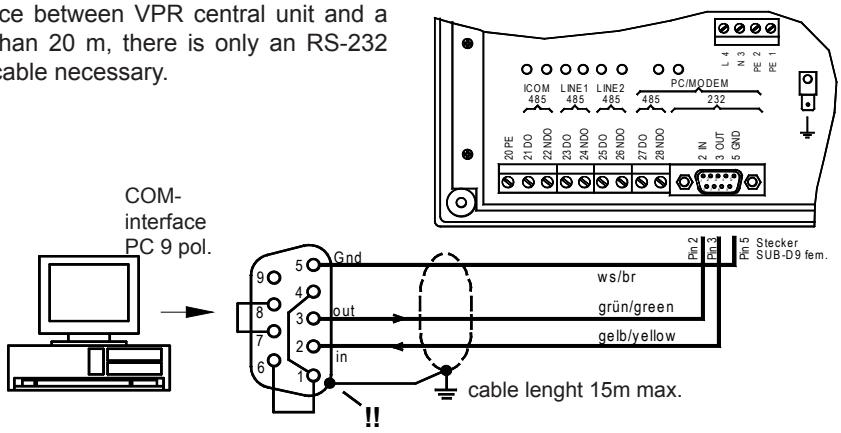
Note polarity!

Each controller must get an individual address, which must be set at the controller unit itself.
An address must never be allocated twice!
Addresses can be used from the range within 0-63.



Data Line to a PC

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



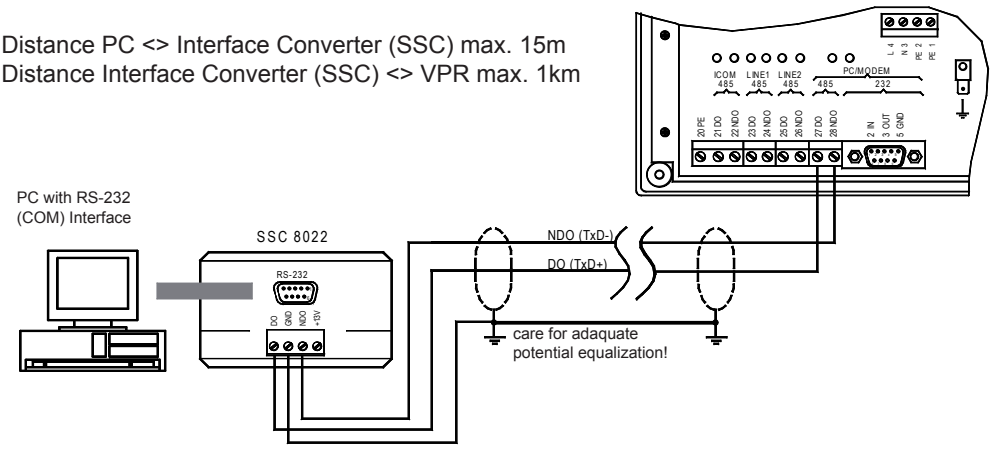
Data line PC <> VPR via RS-232, wire lenght 15m max.

Matching cable:
OrderNo.: **PC-RS232 SUB-D**
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

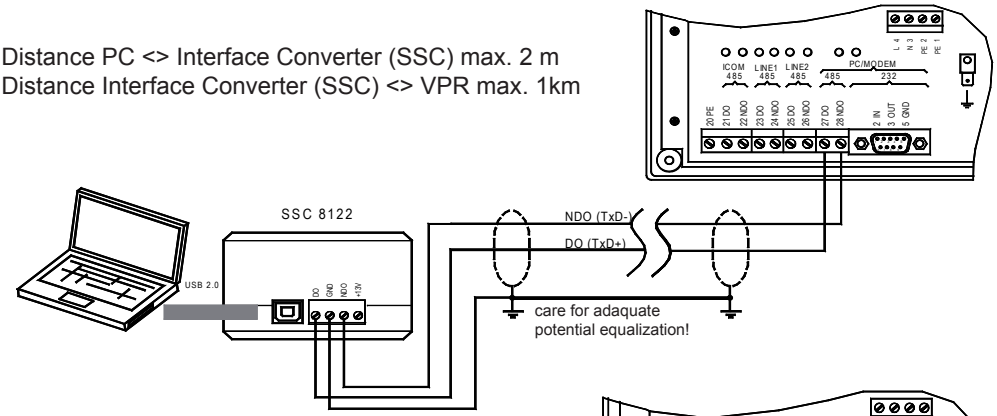
Distance PC <> Interface Converter (SSC) max. 15m
Distance Interface Converter (SSC) <> VPR max. 1km



PC with conventional COM-interface

Matching ELREHA interface converters:
SSC 1022 oder SSC 8022

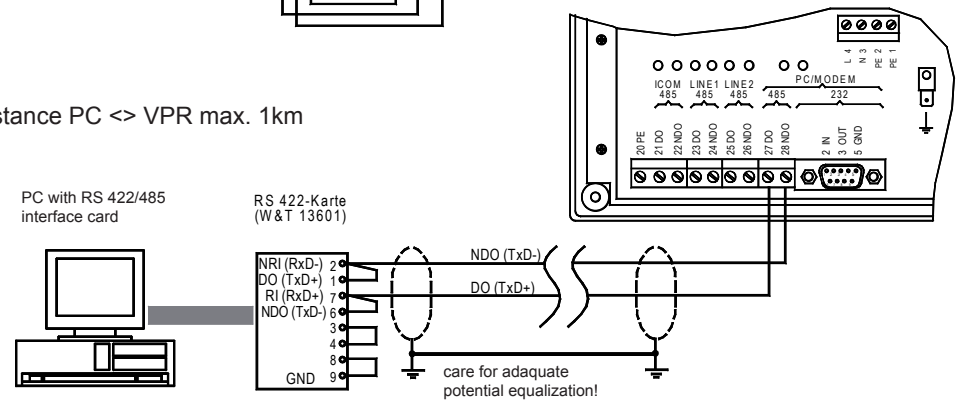
Distance PC <> Interface Converter (SSC) max. 2 m
Distance Interface Converter (SSC) <> VPR max. 1km



PC with USB-interface

Matching ELREHA-interface converter:
SSC 8122

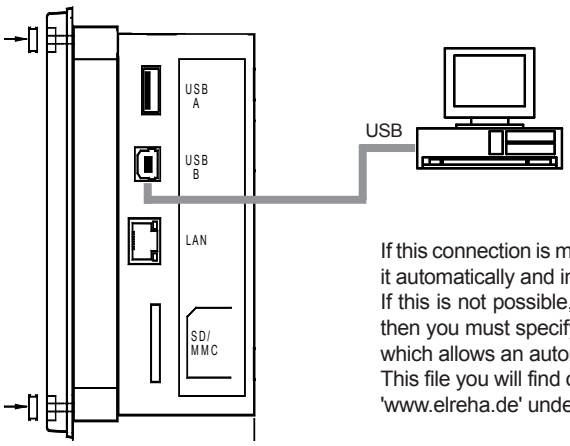
Distance PC <> VPR max. 1km



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.: **PC-RS-485**
Cable lenght 5m

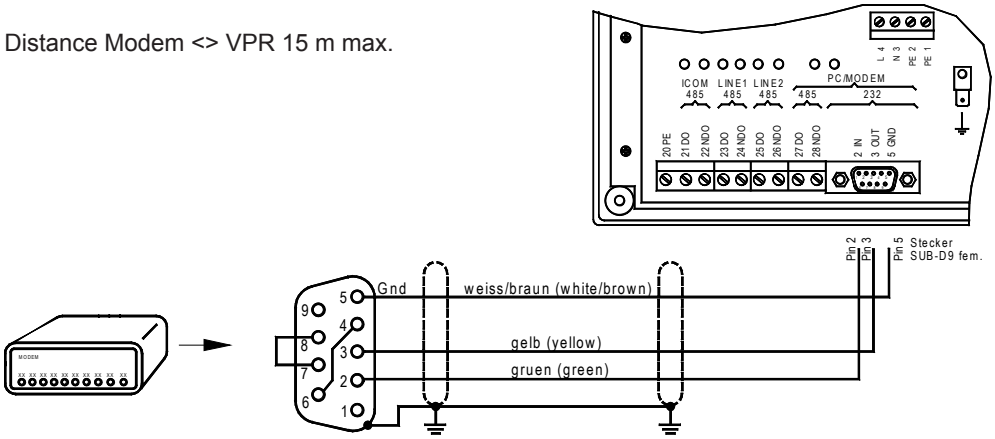


Data connection VPR <-> PC directly via USB interface

If this connection is made, the Windows Operating System detects it automatically and installs the matching driver.
If this is not possible, particularly with older versions like Win-XP, then you must specify the source file 'VPR5240-2-Serial-USB.inf', which allows an automatic installation.
This file you will find on the INFO-CD or the on website 'www.elreha.de' under 'Download/Software Download'.

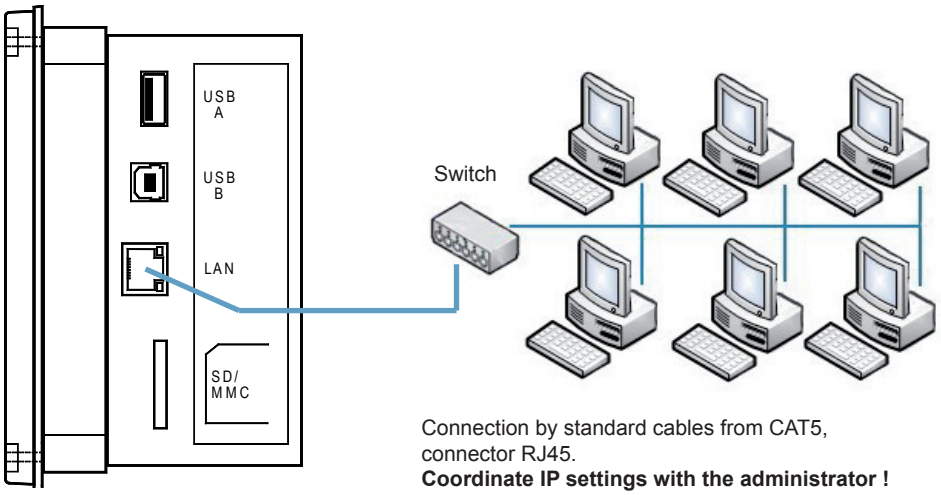
Data Line to a Modem

Distance Modem <> VPR 15 m max.



Matching cable:
OrderNo: **Mod-RS232 SUB-D**
Cable lenght 5m

Data Connection to a PC-Network



Connection by standard cables from CAT5, connector RJ45.
Coordinate IP settings with the administrator !

VPR Start-Up Procedure

You have created the configuration of your VPR-System with the planning software "**VPR52plan**". With this you have got a terminal plan, a parts list and a parameter listing.

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.

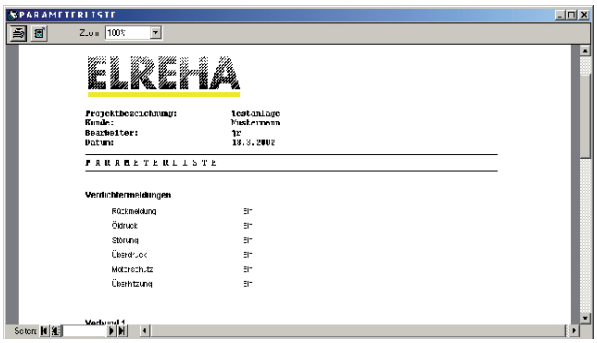
2 **Power OFF**

After supplying mains power to the VPR, a logo appears and a selftest starts.
After about 15 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 addr.X	Configuration page of Analogue Inputs
Common	
Modemrelay	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 transducers**

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

  Example: You use a DG 0/10 type transducer 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*' an dpreset 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 (*).

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.

VPR is ready for operation

Start-up of Cold Storage Controllers

7

After having started the compounds successfully, you can start-up 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, see manual of the product),
  - MOST IMPORTANT: the address in network (see controller manual).

Network Address for Cold Storage Controllers

Each controller connected to a VPR system must have a network (device) address. This address is needed for being identified by the VPR central unit. On the bus 'Line 1' these are the addresses 1-63, for 'Line 2' also 0-63 can be set (this corresponds to the addresses 100-163).

Important Note: Never use an address twice.

Note: For controllers or modules without an own display or mechanic address switches a service function for the address assignment is available (see next page).
Note: For VBZ-19000, VBZ 3004 and a VBZ 3004-2 energy counter modules 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 Settings 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 settings 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.
- 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.

Release controller

- 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 / module

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

8 Controllers Running, Compounds run manually

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)

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.

Finish Start-up

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*'.

Service function

Assigning addresses to controllers without an own display

Some controller types are available, which do not have an own display and no control element. To integrate them, the factory set address must be able to be changed if necessary.
For this, the functions '*Change Line Address of CST*' (for connections to Line1, Service Data Page) and '*Change Line Address of CST 1xx*' (for connections to Line2, Service Data Page) can be used.
Procedure:

- Connect only one cold storage controller to the line interface
- Connected to Line 1: Enter desired address at '*Change Line Address of CST*' (Service Data Page) and confirm it by RET
- Connected to Line 2: Enter desired address at '*Change Line Address of CST' 1xx* (Service Data Page) and confirm it by RET
- Remove the controller
- If necessary, connect the next controller for a setup

Troubleshooting

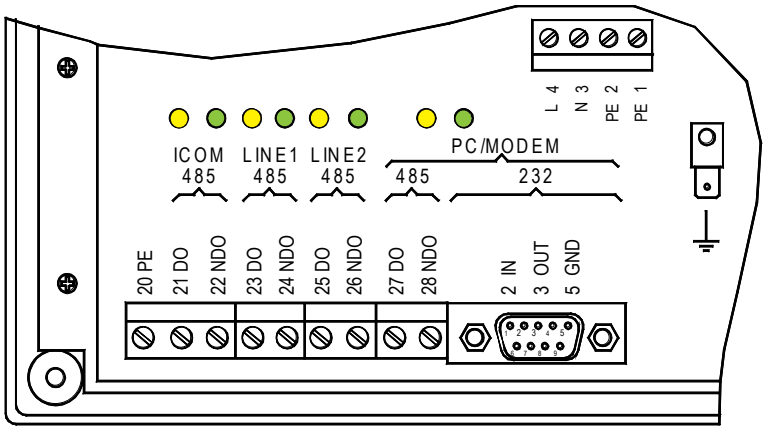
In practice it might be necessary to solve some problems, here are the most frequently ones:

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.

Communication LEDs

For each interface, two (2) LEDs are available, which signals the data transmission. The yellow LED signals 'sending', the green signals 'receiving'.



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

Central Unit doesn‘t work

- If one or more I/O-modules do not work, but the supply voltage is ok, check the following at the 'ICOM 485' interface:

I/O-Module doesn‘t work

LED 'yellow' (sending) blinking slowly, LED 'green' blinking slowly:
- At the corresponding module the polarity of the data cable is wrong
- Communication seems to be o.k., check configuration, inputs / output might be OFF.

LED 'yellow' (sending) blinking slowly, LED 'green' is off:
Communication VPR <-> I/O-module failed.
- Check ICOM data cable and polarity.
- Check the correct connector position (ICOM 485)
- 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.

- If communication problems with cold storage controller / energy counter modules occurs, this could be the cause (Line 1 / Line 2):

No communication with Cold Storage Controllers or Energy Counter Modules

LED 'yellow' (sending) blinking slowly, LED 'green' blinking slowly:
- A controller blocks the bus, because an address has been assigned twice
- The VBZ 19000/VBZ 3004/3004-2 can only be used with the fixed address -65- and a cold stotrage controller has got this address.
- At one or more controllers the polarity of the data cable is wrong
- Extreme interferences on the bus, because the grounding rule was not observed.

LED 'yellow' (sending) blinking slowly, LED 'green' is off:
- Data cable is interrupted

Troubleshooting at data cables

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).

Voltages for data transmission

Data transmission is done by voltage pulses in the range within 1...5 V DC (RS 485) and 7...15 V (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, then the communication problem has a different cause. No change means probably no data transfer.
- Shut power OFF and check resistance between DO and NDO of the RS 485 interface. The 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!

Troubles with the integration in a PC network

The network settings must be coordinated with the system administrator of the customer, he decides about the IP settings for the integration in a network.
If wrong settings has been entered, this may block the complete network !

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.
- The state of each digital input can be checked easily.
  At the 'Connection Table' you can find a status information for each input.
  ' * ' = signal available
  ' . ' = no signal

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

Testing of Digital Inputs

Transducer Failures

If a pressure transmitter doesn‘t work check the following:

- Operating voltage for the transducer.
  BMA module: Terminal 15 -> 16, voltage 18...24V DC.
- By an easy measuring of the voltage over the input you can check if the pressure transducers deliver 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...2 V DC, the function of the transducer seems to be ok.

Temperatur Probe Failures

All temperature probes 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.℃	Resistance		Temp.℃	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

Frequently Asked Questions

Pressure is ok, but the compressors will not start:
- Peak load limitation signal has been released, value is set to 100% (Compressor Set Page).
- Fast backrun has been released
- Brine chiller plant : Compound lock is activated

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set-up: 29.4.2015	by: tkd/jr
checked: 29.4.2015	by: ek/mr
released:	by:
corr.: 8.7.2015	by: tkd/jr