CELLmatic 1502 GSV/GSF

User Manual

Version 2.1

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CONTENTS

INTRODUCTION

This operating manual is primarily intended for users of the CELLmatic 1502 computer. The manual itself describes in general how to communicate with the computer, but not how to configurate the computer for a specific control task. Reading this manual does not require any particular knowledge of computers, and the same applies to the operation of the CELLmatic 1502. However, it would be useful to test the described procedures of the CELLmatic 1502, while going through this manual.

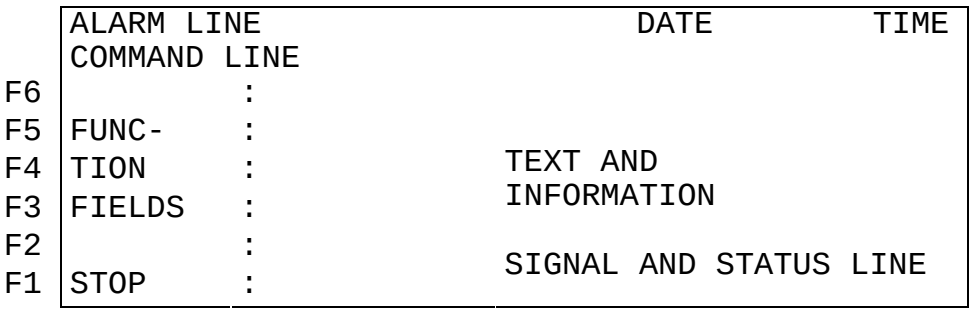
Operating the microprocessor
The microprocessor is operated from the keyboard on the control panel. Here is also found the display, which normally shows operating conditions.

The front of the panel with keyboard and display is as shown in the picture below.

The emergency stop is at the extreme right.

DISPLAY

The display has been divided into more fields:



1. Text and information
This field may consist of a text alone, which will be clearly bound up with the function fields.

In some menus the field will be consisting of a text with corresponding values, as for example "P-SUCT 20.0°C".

When entering set points and set up values there will also be a text with corresponding values. If the set point or the set up value concerned is altered the new value will appear on the display.

2. Signal and status line
On the status line it is possible to show a number of texts stating the working condition of the compressor.

If capacity is adjusted up or down a "C" followed by a plus (+) or a minus (-) will appear in this line. In case of volume ratio control a "V+" or a "V-" will appear.

At the back of this description of control there is a list for signal texts.

3. Command line
The command line shows whether a scrolling of display modes has taken place, and how far it has proceeded.

Here a possible new set point is also shown before the value is updated and moved into the field "Text and information".

4. Alarm line
In case of an alarm or a cutout this will be indicated in this line. See list of alarm and cutout texts at the back of this description.

5. Function fields
The actual functions, which can be performed by means of the keys F1 - F6 are shown here.

If no text appears the key has no function.

KEYBOARD

The keyboard is provided with three types of keys:

1. Function keys
2. Fixed function keys
3. Numeric keys

1. Function keys (F1-F6)
When a function key is pushed, the function shown in the display opposite the key is performed.

F1 is generally identical with stop. If F1 is pushed once, and the text "STOP" is shown opposite the key, the compressor will stop after expiry of the stop time, and the signal "MAN.STOP" will appear in the bottom line of the display. In order to start the compressor again it is necessary to push the <CLA> key.

F6 is used for resetting an alarm, if the text "CLA" is shown opposite the key.

2. Fixed function keys
The keyboard is provided with 3 fixed function keys.

🡐🡐 (Reset) is used for scrolling immediately from an arbitrary menu to the initial picture.

🡐 (Recall) will delete the latest entry. It means that it is used for scrolling back to the previous menu.

When entering set points the <🡐> key can be used for deleting the value entered provided that the <ENTER> key has not been pushed.

ENTER (Enter) is used for updating. If you want to change a set point and the new value, which will be shown in the command line, has been entered the value is updated by pushing the <ENTER> key.

3. Numeric keys
The numeric keys are used for change of set points, and choice of refrigerant, compressor type, type of duty etc.

DIODES

There are three diodes on the front of the panel:

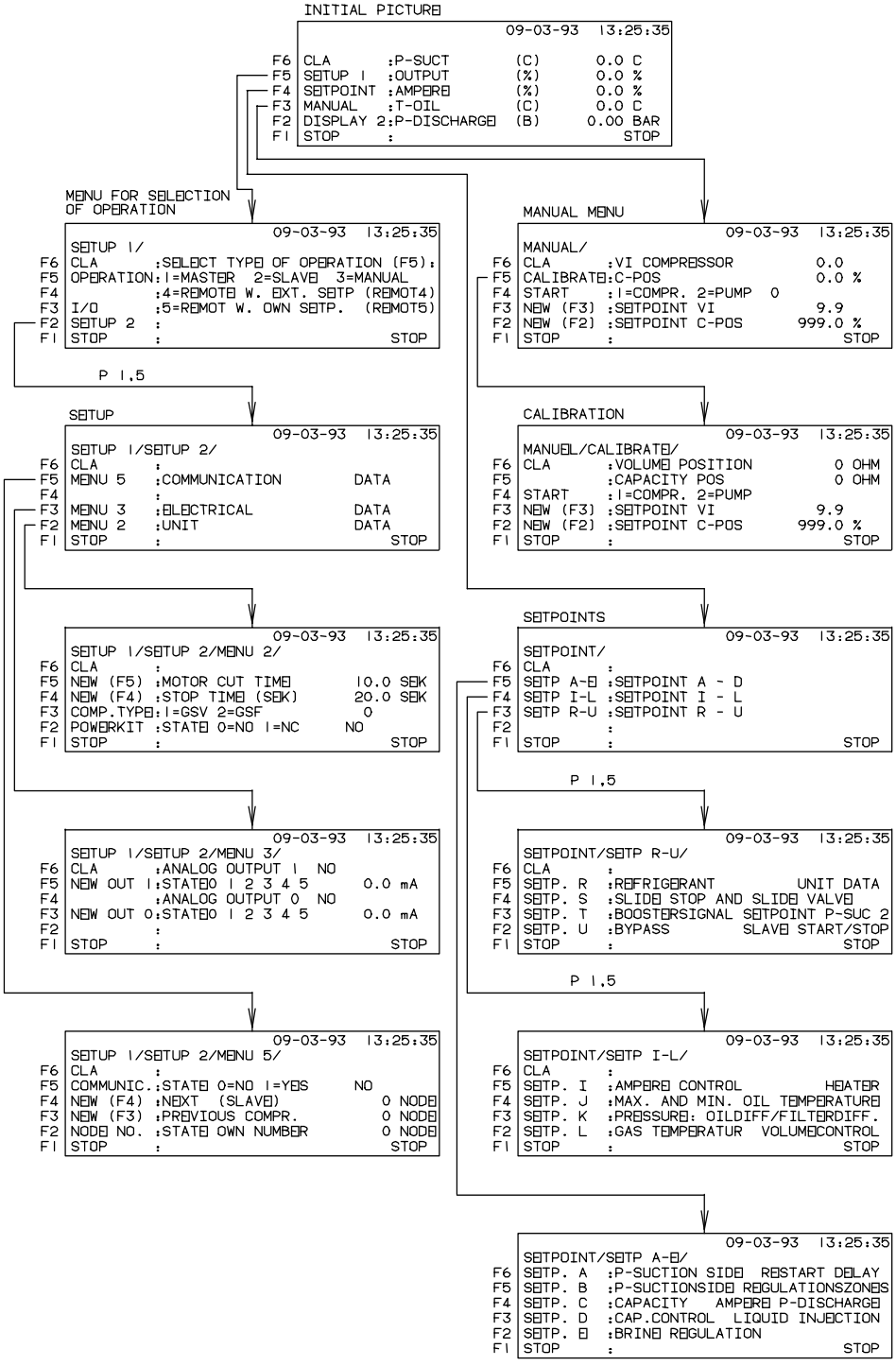
RED DIODE
The red diode lights up when a cutout occurs in the system.

YELLOW DIODE
The yellow diode lights up when an alarm occurs in the system.

GREEN DIODE
The green diode lights up during standstill to indicate that the compressor is ready to start. This assumes that no cutout, restart delay or other factors will prevent the compressor starting when required. If C_{ABS} is less than 15%, the green diode will not light up. During operation the lamp is of no significance, but it will go out when a cutout occurs.

MENU TREE

The connection between function fields for selection of operation, set up and set points are shown below. For the I/O pictures a menu tree is shown at the beginning of the section "I/O pictures".



PASSWORD

To protect the system against use by unauthorised persons, certain menus are protected by a password. In daily use of the control panel it is not necessary to use the password, reading off and start/stop can be performed without using passwords. However, if important setpoints or set-ups have to be changed the password might be necessary. The extent to which this is necessary is indicated in the menu tree on the previous page, i.e. "P" is given, followed by the password.

A password can be entered by going to the initial picture <◄◄> and then keying <ENTER>, <F1>, <password>, <ENTER> and, finally, <◄◄> in order to return to the initial picture. If the necessary password is not entered, the function fields for the "password-demanding" menus concerned will remain empty. An entered password will "hold" for about half an hour. If a password is to be deleted before leaving the machine, the procedure is as follows: Go to the initial picture <◄◄> and key <ENTER>, <F1>, <ENTER> and <◄◄>. The password will then be deleted.

The panel operator might have to use two passwords.

PASSWORD "1.5"
This password must be used when changing important setpoints and machine set-up. When the password is used it becomes possible to show the I/O pictures which gives the status of analog and digital inputs and outputs (I/O = Input/Output).

PASSWORD "1.8"
This password is used very rarely, typically only for the first start-up when in error the wrong type of compressor has been entered and must be changed under SETUP2/MENU2. The reason that password 1.5 cannot be used for the change is that when the compressor type is changed, certain pictures and setpoints are also changed and must then be checked.
The password "1.8" can also be used if a node number which is an identification number allocated to the panel when coupled to a network is to be changed; see below for a description of communication in the section "Set-up of compressor".

SETTING OF CLOCK AND DATE

Clock and date can be set as follows: Go to the start menu picture with <◄◄> and key <ENTER>, <F1>, password <1.5> and then <ENTER>. The function field against key F4 will now show "TIME" and the function field against key F3 will show "DATE".
If, for example, the time must be 14.53.20, key <F4> followed by "14.53.20". The time can then be entered by keying <ENTER>.
If the date is to be 15 January 1994, key <F3> followed by "15.01.94". The date can then be entered by keying <ENTER>.
Return to the initial picture by keying <◄◄>.

CONTROL

The CELLmatic 1502 control panel is equipped with a microprocessor. The microprocessor monitors and adjusts the operation of the compressor, and facilitates communication between operator and the machine.

MONITORING

The microprocessor monitors and reacts to error conditions in the compressor. The following conditions are monitored:

- Suction temperature
- Suction pressure
- Discharge pressure
- Oil differential pressure
- Pressure drop over oil filter
- Oil temperatures
- Oil level in oil separator
- Pressure pipe temperature

If the threshold limit value of the set point is exceeded, possibly with a delay for the individual operating parameter, a message will be sent either through an alarm or a cutout (the compressor will stop).

ALARM

An alarm message means that a preset limiting value has been exceeded, and something might go wrong shortly. I.e. a warning.

In the event of an alarm the message "P1 ALARM" will appear in the upper left-hand corner followed by the operating parameter causing the alarm.

The alarm and the time of alarm will be stored in the memory of the control, and can be read out if the computer is connected to a main control unit.

An alarm is reset by pushing the <CLA> (= Clear Alarm; F6), but it will appear again immediately, if the error causing the alarm is not removed from the system.

CUTOUT

Cutout means that an operating situation has risen, which require the compressor to be stopped. Cutout conditions are shown in the same way as alarms, and are to be reset at the <CLA> before the compressor can be restarted. If a picture with the operating parameter concerned is not already shown in the display, there will automatically be scrolled to a display picture showing the operating parameter together with a "frozen" cutout value.

EMERGENCY STOP

In the event of an emergency stop the compressor and the oil pump will stop immediately, but it will not prevent the next slave from starting.

After deactivation of the emergency stop, <CLA> must be keyed before the compressor can be restarted.

STARTING UP

If a cold start is attempted, i.e. the voltage supply has been connected to the panel after the microprocessor battery back up has been disconnected the following picture (the cold start picture) will appear.

```
                      01-01-94  17:25:35

F6          :Screw compr. Control CELLmatic
F5 COMP.TYPE:  1=GSV   2=GSF              0
F4 COMP.SIZE:State size                   0
F3 REFRIGER.:State type                   0
F2 NODE NO. :State own number             0
F1 CONTINUE :The above has to be completed
```

In this picture, the following questions must be answered:

1=GSV
2=GSF

If the compressor is with variable volumen control – select 1.
If the compressor is with fixed volume control – select 2.

Compressor size: Possibilities are: 50, 65, 84, 111, 147, 185, 263, 331, 412 and 562.
Ex.: 64 means that the compressor has a swept volume of 640 m^3/hour.

Refrigerant: Possibilities are: 12=R12, 22=R22, 134=R134a, 404=R404a, 502=R502 and 717=R717.

Node number: Here, give the identification number the panel can be allocated if communication is by network.

When these questions have been answered with values the computer can accept and <F1> must be keyed to continue. If a value has been given that subsequently must be altered without cold start, the operation can be performed under setup or setpoints.
When <F1> is keyed, the picture shown is the "initial picture". This picture is also shown when control voltage is connected to the panel while there is battery back up on the microprocessor, i.e. a "hot start".

```
                      01-01-94  17:25:35

F6 CLA      :P-Suction     (C)     0.0 C
F5 SETUP.   :Output        (%)     0.0 %
F4 SET POINT:Ampere        (%)     0.0 %
F3 MANUAL   :T-oil compr   (C)     0.0 C
F2 DISPLAY 2:P-discharge   (B)    0.00 Bar
F1 STOP     :                        STOP
```

```
                      01-01-94  17:25:35
   SETPOINT/SETP I-L/SETP. I/
F6 CLA      :
F5 NEW (F5) :Transform. factor        0 %
F4 NEW (F4) :Ampere max.          110.0 %
F3 NEW (F3) :Switch on heater      40.0 C
F2 HEAT SYST:Activ 0=NO 1=YES      NO
F1 STOP     :                        STOP
```

The left-hand corner might then show "CUTOUT I-DATA". This means that a transformer factor must be entered. Enter password "1.5" and go to SETP/I:

When picture "SETP/I" appears, key <F5> followed by the transformer factor.

The transformer factor is determined by:

$$\text{Transformer factor} = \frac{\text{(input current corresponding to 20 mA output on the current converter instrument)}}{\text{Full load current of motor}}$$

The current converter instrument must have a range of input current there go higher than the full load motor current, so an over load can be measured. A range there goes up to 25% higher will be very suitable.

Example: When using an instrument transformer where the primary current is 200 A and a motor with a rated current of 180 A

The transformer factor will make = $\frac{200}{180}$ = 1,11

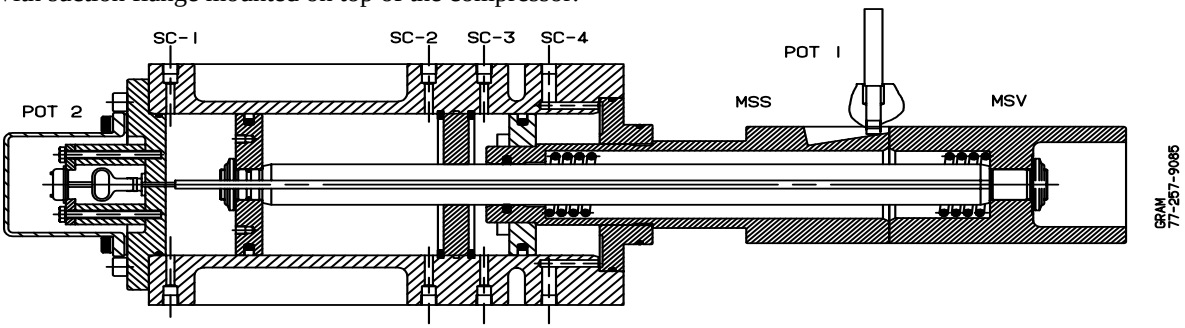
When the factor has been entered, push <ENTER> to update and then <◄◄> to return to the initial picture.

The text "CUTOUT I-DATA" is removed from the initial picture by pushing the <F6> (Clear alarm). In principle the compressor is now ready for start, but in most cases the set points are to be altered, and the type of duty has to be indicated; see following section.

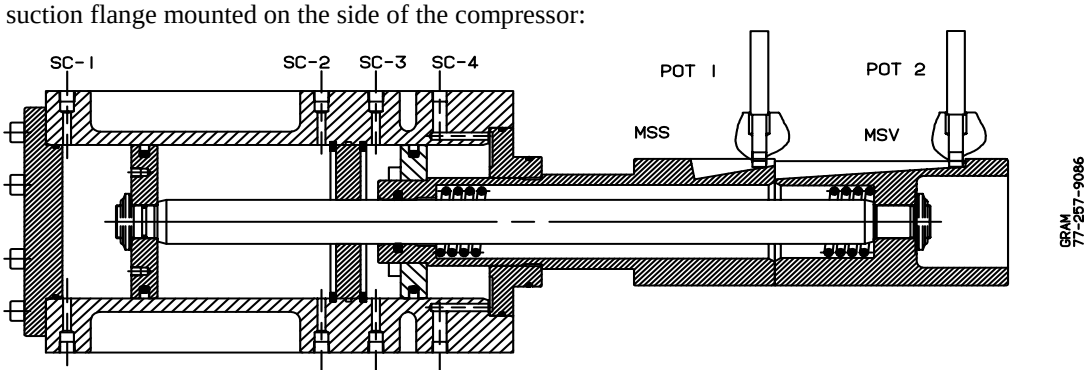
CONNECTION BETWEEN CAPACITY AND VOLUME RATIO

The programme is operating with 3 values for capacity, output, C-abs and C-pos. To demonstrate the connection between these values the below sketches indicate the regulation and control of the slide stop and the slide valve.

With suction flange mounted on top of the compressor:



With suction flange mounted on the side of the compressor:



The slide stop (MSS) provides the lowest volume ratio, when in its outermost left-hand position. Conversely, the highest volume ratio is obtained in the outermost right-hand position. The actual position is measured by a sliding potentiometer (POT 1).

As far as the slide valve (MSV) is concerned, the lowest capacity is obtained, when the piston is in its outermost right-hand position. A 100% capacity is obtained when the slide valve is run so far to the left that it runs against the slide stop. The position is measured by means of a rotary potentiometer (POT 2) or a sliding potentiometer.
The slide valve has its longest travel when the slide stop is in a outermost left-hand position. For all other positions of the slide stop, the travel of the slide valve will be shorter.
The longest possible travel of the slide valve is called the absolute travel, C-abs, and goes from 0 to 100%. The value can be read in the display 2 picture.

The actual travel, C-pos, which is dependent on the position of the slide stop, goes also from 0 to 100%. The value can be read in the MANUAL picture or in the display 4 picture.

The output is a calculated value indicating the partial load at which operation is taking place. The calculation is performed on the basis of the relative position and the actual volume ratio. The output can be seen in the initial picture.

TYPES OF DUTY

CELLmatic offers the possibility of 4 types of duty:

1. MASTER OPERATION
2. SLAVE OPERATION
3. REMOTE CONTROL OPERATION
4. MANUAL OPERATION

F5 is activated from the initial picture and you go to SETUP 1

```
                        01-01-94  17:25:35
   SETUP 1/
F6 CLA      :Select type of operation (F5):
F5 OPERATION:1=Master  2=Slave  3=Manual
F4          :4=Remote w. ext. setp (remot4)
F3 I/O      :5=Remote w. own setp  (remot5)
F2 SETUP 2  :
F1 STOP     :                          STOP
```

Note: In the SETUP 1 picture the whole text field is attached to the F5 key "OPERATION". The type of duty is selected by entering <F5> followed by a number from 1 to 5 dependent on the required type of duty.

1. Master operation
If master operation is selected the message "MASTER" will appear on the bottom of the report line.

This type of duty can be selected if the compressor is not connected with other compressors (also called "stand alone"), and you want it to run according to its own set point.

The master compressor is able to control one or more subsequent compressors (slaves). The slaves will all be controlled by the setpoint of the master compressor.

For master operation the following conditions have to be fulfilled before the compressor will start:

-Restart period expired

- Call for capacity, that is $P_{SUCTION}$ [°C] > ($P_{SUCT-SETP}$+$P_{SUCT-START}$)
  T_{BRINE} > ($T_{BRINE-SETP}$+$T_{BRINE-START}$)
- Reset of possible cutout <CLA>
- Slide valve at its minimum (C_{ABS} < 15%)
- Oil pump is started and the oil pressure are greater than (Oildiff. Alarm)

Under setp E a choice can be made: control in accordance with the suction pressure or the brine temperature, see description of setpoints.
If the compressor has started it will stay in its minimum until the motor is in delta. After this the capacity will be increased until it has reached its "minimum capacity" (Setp. C). The internal volume ratio of the compressor will now adjust to the volume ratio of the plant (Vi), and the capacity is controlled by the suction pressure. This is done by sending electrical signals to two solenoid valves mounted on the oil manifold of the compressor.

If the slide valve or the slide stop is adjusted upwards, a "C+" or a "V+" is shown in the display. In case of a downward adjusting a "K-" or a "V-" is shown. If the suction pressure is within the dead zone there will be no regulation of capacity. If the suction pressure lies within the dead zone, capacity will not be regulated and "CN" will be shown on the display.

When the motor current exceeds the rated current (setp. C/F4) less 10 % the capacity up signals will be halved. When the motor current exceeds the rated current less 3% the capacity up signals will be locked. When the motor current exceeds max. ampere consumption (setp. I) the capacity will be adjusted downwards by forced operation till rated current is reached again.

If the compressor receives signals to stop the following will take place:

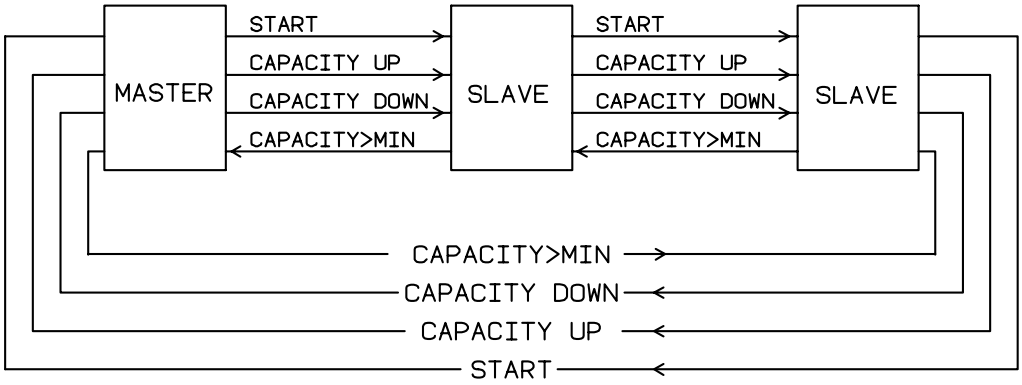
- the oil pump will start (if it is OFF)
- a constant signal is set to the capacity-down solenoid valve
- a constant signal is set to the volume-down solenoid valve

and the compressor will not stop until minimum capacity (C-ABS > 15%) has been reached, but not later than after the stopping delay which can be variably set under SETUP2/MENU 2. The pump will continue to run for 5 minutes, calculated from the start of run-down. The solenoid valves for the down-regulation of capacity and volume ratio remain activated for 120 minutes, provided C_{ABS} is not less than 15%.
In most cases this will ensure that the compressor is ready for start.

2. Slave operation
Slave operation is selected by activating the F5/2 in the SETUP 1 picture.

If the compressor is to run as a slave, a master compressor must be available. The slave must be connected to the master compressor either via a hardware connection or a network (Profibus). The master compressor can be a compressor set for the operating form "MASTER" or "REMOTE".

The connection between master and slave is as shown below:



When the master compressor has reached 100% and there is still call for refrigeration the slave will receive a signal to start after a preset delay (setp. U). The slave will now run up to its preset minimum setpoint C at the same time as the master might be adjusted a little downwards to avoid excess capacity. If there is a call for more refrigeration the master will first be adjusted up to 100%, and then the slave will be adjusted upwards.

In case of downward adjustment the slave will first be regulated to its minimum after which further downward adjustment will be taking place at the master compressor.

When the master has reached "SLAVE STOP" (setp. U/ F3) the slave will stop, and adjustment will take place at the master alone.

Signals to the slave about upward and downward regulation of capacity will be sent by the master compressor, which at the same time will start the slave in the event of a cutout or voltage limitation.

Before a slave can start, in addition to a start signal, and a slave cap.-up signal from the master, the following conditions must be fulfilled:

- Restart delay expired
- Reset of cutout, if any
- Slide valve at minimum (C-ABS < 15%)

When the slave is stopped the oil pump etc. will start as when stopping a master compressor.

In the event of operation with more slaves, slave no. 1 will work as a master for slave no. 2, and so on. However, the suction pressure, registered by the "real" master, will be adjusted unless, for the master compressor it is a question of remote control operation with external set point.

3. Remote control operation

The CELLmatic 1502 offers the possibility of running remote operation in 2 different ways:

I. Remote control according to its own setpoint (select OPERATION/5).
The compressor must receive a start signal before it will run, and then it will react as if it was a compressor preset for the "MASTER" operation, that is it runs according to its own setpoint.

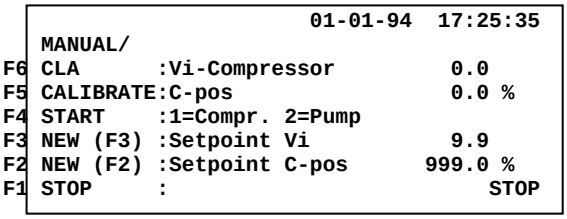
Note: The compressor will only start if suction pressure $P_{SUC}[°C] > (P_{SUC\ SETP} + P_{SUC\ START})$ or if brinetemperature $T_{BRINE} > (T_{BRINE\ SETP} + T_{BRINE\ START})$ and will stop again if $P_{SUC}[°C] < (P_{SUC\ SETP} - P_{SUC\ STOP})$ or $T_{BRINE} < (T_{BRINE} + SETP + T_{BRINE\ STOP})$

II. Remote control according to external setpoints (select OPERATION/4).
The compressor will start via an external signal and run according to external setpoints. The signals for capacity up and down are sent from the main panel. The CELLmatic 1502 is converting these signals into pulse interval signals for the solenoid valves of the compressor.

4. Manual operation

Manual operation can be selected by entering OPERATION/3 in SETUP 1, but in order to operate the compressor by hand you have to enter into the MANUAL menu. Push the <◄◄> key in order to go back to the initial picture and activate <F3>.

Note: If you are running master operation and want to change into manual operation this can be done without having to select "MANUAL" operation under SETUP 1. From the initial picture the <F3> key is activated, and at the moment the "START" (F4) key is pushed you change into manual operation.



If the compressor or the pump are to be started, push "START" <F4> followed by 1 or 2. If the compressor is started the oil pump will also be running dependent on which type of pump has been chosen, see setpoint R.

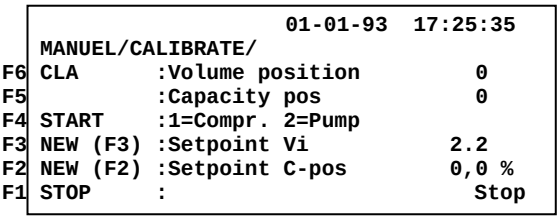
The desired capacity, at which the compressor is to run, can be stated by F2. After this the solenoid valve will receive pulses and the capacity slide will be adjusted to the desired capacity. If -10 or 110 is entered here, the solenoid valve will receive constant signal to lower/ increase the capacity. If the value 999 is given, capacity regulation will be a master operation, but ignoring $P_{SUG\ START}$/$P_{SUG\ STOP}$ and $T_{BRINE\ START}$/$T_{BRINE\ STOP}$.

With the F3 key the volume ratio can be selected at which you want the compressor to run. Here, the volume slide is also regulated by impulses. By entering 2.0 or 6.0 the signal to lower/ increase the volume ratio will be constant. If the value 9.9 is entered the computer will compute and place the slide stop at the optimum volume ratio given at the suction pressure and the discharge pressure. In the MANUAL picture the desired values and the actual values for capacity and volume ratio will appear in the text field.

F1 is used for stop of compressor and pump, and "MAN.STOP" will appear on the message line.

CALIBRATION

With the F5 key a menu, which is used when calibrating the potentiometers scanning the positions of capacity slide and slide stop, can be selected from the MANUAL picture.



Starting the compressor or oil pump makes calibrating. Enter -10 in setpoint C-pos. and 6.0 in setpoint Vi. The capacity slide will now be forced into minimum and the slide stop into maximum position. When the values of the two upper text lines are not changed any more, the limits have been reached. The values are read and noted. Enter now 110 for C-pos and 2.0 for Vi. The capacity slide will then run into maximum and the slide stop into minimum. As above, the variable values of the two upper lines are read and noted when the limits have been reached.
The 4 noted values for the maximum and minimum positions of the slides are entered under setpoint S (see section about setpoints), after which the potentiometers are calibrated.

SETUP OF COMPRESSOR

Unit data and electrical data are laid down under SETUP1/SETUP2.
Do not forget to enter the password to make SETUP2 active.

```
                        01-01-94  17:25:35
   SETUP 1/SETUP 2/
F6 CLA      :
F5 MENU 5   :Communication        data
F4          :
F3 MENU 3   :Electrical           data
F2 MENU 2   :Unit                 data
F1 STOP     :                        STOP
```

COMMUNICATION, PROFIBUS, MENU 5

Through a profibus system, with the F5 key of the SETUP2 menu access is given to data (menu 5) affecting the communication of the control panel.

```
                        01-01-94  17:25:35
   SETUP 1/SETUP 2/MENU 5/
F6 CLA      :
F5 COMMUNIC.:State 0=OFF 1=ON     OFF
F4 NEW (F4) :Next  (slave)           0 Node
F3 NEW (F3) :Previous (master)       0 Node
F2 NODE NO  :State own number        5
F1 STOP     :                         STOP
```

F5: To make this communication all CELLmatic 1502 panels involved must be provided with the communication board CELL 566, which consists of a communication adapter (a so-called profibus). If this extension has been mounted it is possible, in the above menu, to select whether the communication is to be active (1=YES) or not (0=NO).

F3/F4: Through a menu, to which there is only access for specially instructed staff, a compressor and its control panel can be given an identifier, here called "Node-No.". Through the F3 and F4 key you can tell which compressors are running as master or slave for the compressor concerned, if more compressors are provided with profibus, and they have further been given a Node-No. In F3 and F4 the panels own number must never be entered.

F2: Here the node number (identification number) the panel is to have, must be entered. To enable the entry, password "1.8" must be given.

SETUP OF COMPRESSOR

UNIT DATA, MENU 2

With the F2 key of the SETUP2 menu access is given enter 4 unit data for the compressor.

```
                        03-06-96  13:48:15
  SETUP 1/SETUP 2/MENU 2/
F6 CLA      :
F5 NEW (F5) :Motor cut time       10.0 Sek.
F4 NEW (F4) :Stop time  (sek)     20.0 Sek.
F3 KOMP TYPE:State 1=GSV 2=GSF     0
F2 POWERKIT :State  0=NO 1=NC    NO
F1 STOP     :GSV                       Stop
```

F6: **PowerKit**
Time in seconds can here be entered. PowerKit solenoid valve opens before compressor stops.

F5: **Motor cut time**
Through the feedback from the star-delta starter of the compressor (that the starter is in delta) the control panel registers that the compressor is running. If this signal disappears the control panel will give an alarm. In order to avoid the alarm message when starting up, where the starter has not yet switched from star to delta position, a time delay of the alarm message is entered here with the F5 key. The time delay is running from the moment the start signal has been given to the motor and is called "Motor cut time". Can be set from 5 to 30 seconds.

F4: **Stop time**
After STOP or CUTOUT has been set the time, according to which the compressor is to run, is set with the F4 key. The value can be set between 0 and 120 seconds and is called STOP TIME. At compressors running with a great difference between condensing pressure and suction pressure a small stop time is set.

Note: When stopping the compressor abnormal periodical noise might be observed if the stop time is too long, and at the same time there is a high differential pressure. This appears in case of "oil lapping" and should be avoided by reducing the stop time.

F3: **Compressor type**
Here the compressor type can be changed if after a cold start the wrong type has been entered. To make the change, enter password "1.8". If the compressor type is changed, certain pictures and setpoints will also be changed.

F2: **Power kit**
With the F2 (under MENU 2) it can be indicated if the solenoid valve used for POWER KIT is normally open NO or normally closed NC.
Power kit can be used if the suction/non-return valve needs help for closing when the compressor is stopped. In case of a compressor stop Power kit has the function to send high-pressure gas into the suction valve for 15 seconds in such a way that the valve is forced to close.

SETUP OF COMPRESSOR

ELECTRICAL DATA, MENU 3

With the F3 key (menu 3) of the SETUP2 menu access is given for displaying 2 analogue process variables as a 4 to 20 mA signal on channel 0 or 1.

```
                        01-01-94  17:25:35
  SETUP 1/SETUP 2/MENU 3/
F6 CLA      :Analog outp 1  NO
F5 NEW OUT 1:State:0 1 2 3 4 5      0.0 mA
F4          :Analog outp 0  NO
F3 NEW OUT 0:State 0 1 2 3 4 5      0.0 mA
F2          :
F1 STOP     :                         STOP
```

For the two channels can freely be selected between following:

0 = No displaying
1 = OUTPUT 0-100% ≈ 4-20 mA, calculated value
2 = AMPERE 0-150% ≈ 4-20 mA, measured motor current
3 = OIL DIFFERENTIAL PRESSURE 0-25 bar ≈ 4-20 mA, computed value
4 = SUCTION PRESSURE -1 to +6 bar ≈ 4-20 mA, measured value P-suction
5 = DISCHARGE PRESSURE 0-25 bar ≈ 4-20 mA, measured value P-discharge

With the F5 key it can be selected which variable you want to read out at channel 1 by indicating one of the above numbers from 0 to 5.
The selected variable for channel 1 is displayed on the upper line of the text field and on the line below the value (4 to 20 mA value) is displayed.

Correspondingly, F3 will be able to select the variable at channel 0, and variable and value for this will appear on the 2 next text lines.

SET POINTS

The specific set points regarding function will be described in this section. In general, to the set points it applies that the function keys F2 to F5 are uniquely used for selecting the value shown on the text line opposite the key concerned. In the description of the set points the number of the function key will thus be indicated followed by an explanation. At the back of this description of the control there is a summary of all set points with a specification of minimum/ maximum limits together with starting up values.

Set point A:

```
                        01-01-94  17:25:35
   SETPOINT/SETP A-E/SETP. A/
F6 CLA      :
F5 NEW (F5) :P-suc setp 1        -30.0 C
F4 NEW (F4) :P-suc relieve       -40.0 C
F3 NEW (F3) :P-suc cutout        -45.0 C
F2 NEW (F2) :Restart delay        30.0 Min.
F1 STOP     :                        STOP
```

F5: P-SUCTION SETPOINT 1

The suction pressure is set here (in °C) according to which the compressor is to be adjusted. As the compressor has the possibility to change quickly between two set points (1 and 2) for suction pressure this is the desired value if the compressor has to run according to suction pressure 1. (Suction pressure 2 is entered under "Set point T", see later in the section about set points). The extent of regulation in accordance with setpoint 1 or 2 for suction pressure (or brine temperature) is determined by the value entered for setpoint E and whether or not a signal is given on resistance input R IN 4. Notice that on switchboards provided with EPROM no. lower than 94600 a shift between setpoint 1 and 2 is performed through digital input 4, whereas on switchboards with EPROM no. 94600 or higher resistance input R IN 4 is being used. EPROM no. can be read on display picture 6.

Resistance input R IN 4	**Brine regulation SETP.E/F2 active**	**Regulation based on:**
OFF	NO	$P_{suct\ setp\ 1.}$(setp. a/F5)
OFF	YES	Brinetemperature (setp. E/F5)
ON	NO	$P_{suct\ setp.2}$(setp. T/F4)
ON	YES	$P_{suct\ setp.2}$(setp. T/F4)

F4: P-SUCTION RELIEVE

If this suction pressure (in °C) is too low the compressor will start relieving which means that it is adjusting the capacity downward. The downward adjustment is effected by sending a signal to move the slide valve to minimum until the pressure is again higher than the suction pressure set "P-SUCTION RELIEVE". At the same time the message "RELIEVE" will appear on the text line of the display picture, but there will be no alarm as this state is considered as a regulation situation.

F3: P-SUCTION CUTOUT

If this suction pressure (in °C) is too low the compressor will stop and the message "ST.PSUCT" will appear in the display. This stop mode will not give any alarm message, and will be reset when the suction pressure has again exceeded this set point (P-SUCTION CUTOUT)

F2: RESTART DELAY

The time entered here is the number of minutes with which the restart of the compressor will be delayed. The time is counted from the last compressor start, and the purpose is to protect the compressor motor against overload because of too many starts. In case the restart time has not expired, and the compressor is stopped, the text "RESTART" will appear on the message line of the display if attempts are made to start the compressor. If you are still going to force the compressor to start the restart time can be ignored by pressing the <F6> (clear alarm, "CLA").

SET POINTS

Set Point B

```
                        01-01-94  17:25:35
   SETPOINT/SETP A-E/SETP. B/
F6 CLA      :
F5 NEW (F5) :P-suct start (+)      2.0 C
F4 NEW (F4) :P-suct stop  (-)      2.0 C
F3 NEW (F3) :Proportionalzone      1.0 C
F2 NEW (F2) :Deadbandzone +/-      0.5 C
F1 STOP     :                        STOP
```

F5: P-SUCTION START (+)
At set point controlled operation the compressor will start when the suction pressure exceeds the set point (set point A/F5) by the number of degrees entered.

F4: P-SUCTION STOP
At set point controlled operation the compressor will stop when the suction pressure falls below the set point (set point A/F5) by the number of degrees entered.

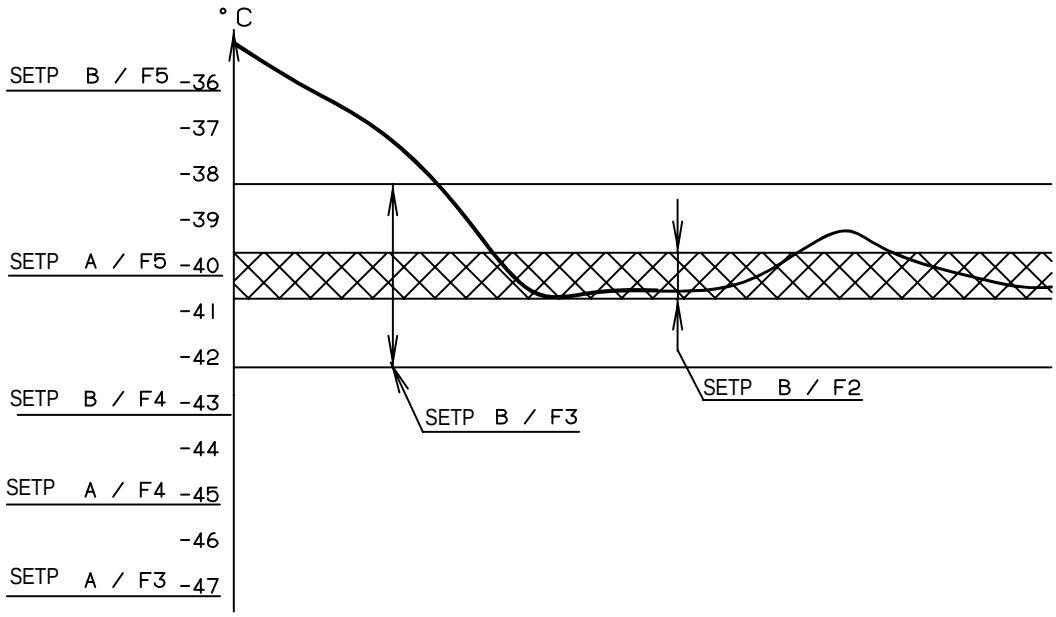
F3: PROPORTIONAL ZONE
This value indicates by how many degrees above and below the set point for suction pressure/brinetemperature, proportional zone control that there will take place. When the pressure is within the proportional zone of the set point, capacity control will proceed slower the nearer the pressure comes to the set point for suction pressure (Setp. A, F5) / brinetemperature (Setp.E/F5)

F2: DEAD BAND ZONE (+/-)
This value indicates by how many degrees above and under the set point for suction pressure / brinetemperature there will be no regulating action.

SET POINTS

An example of the compressor set points is shown below:

SETP A/F5	P-SUCT SETP 1	-40°C	SETP B/F5	P-SUCT START (+)	4,0°C
SETP A/F4	P-SUCT RELIEVE	-45°C	SETP B/F4	P-SUCT STOP (-)	3,0°C
SETP A/F3	P-SUCT CUTOUT	-47°C	SETP B/F3	PROP.ZONE (+/-)	2,0°C
			SETP B/F2	DEAD ZONE (+/-)	0,5°C



Note: When the compressor is running according to its own set point the compressor will never adjust the pressure down to "P-SUCT. RELIEVE" or "P-SUCT. CUTOUT" because of "P-SUCT. STOP". It will only be possible to achieve these two pressures if the compressor is running at manual control, or at remote control according to external set point. As "P-SUCT. CUTOUT" is resetting itself when the pressure has again exceeded set point for "P-SUCT. CUTOUT" the compressor will start at "remote control operation according to external set point". At manual operation the key for start of compressor has to be pushed again.

SET POINTS

Set point C

```
                        01-01-94  17:25:35
   SETPOINT/SETP A-E/SETP. C/
F6 NEW (F6) :Startup capacity       0.0 %
F5 NEW (F5) :Minimum capacity      50.0 %
F4 NEW (F4) :Ampere    normal     100.0 %
F3 NEW (F3) :P-disch.  alarm       40.0 C
F2 NEW (F2) :P-disch. cutout       45.0 C
F1 STOP     :
```

F6: STARTUP CAPACITY
When starting up compressor will run capacity slide forcibly up to what is entered in % (Cpos %)

F5: MINIMUM CAPACITY
When starting the compressor the capacity will always be adjusted upward to the minimum capacity indicated here. If the compressor is running as slave it will always run up to minimum 25% no matter if e.g. 20% has been entered here.

F4: AMPERE CONSUMPTION NORMAL
This set point is set in %, and indicates the normal power consumption. If for example 100% is set here it will correspond to the compressor motor having to run with full load current the whole time. When the motor current reaches this value less 10% the signals for upwards adjusting of capacity will be halved. When the motor current reaches this value less 3% the upwards adjusting is stopped, and if the motor current exceeds this value anyhow, the slide valve for relief of the compressor will be adjusted downwards. In the latter condition "AMPERE" is shown on the message line of the picture and a start signal is sent to a slave if connected.

F3: P-DISCHARGE ALARM
This outlet pressure (in degrees Celsius) triggers an alarm and at the same time the compressor capacity begins to regulate down.

F2: P-DISCHARGE CUTOUT
This discharge pressure (in °C) will stop the compressor.

Set point D

```
                        03-06-96  13:48:15
   SETPOINT/SETP A-E/SETP. D/
F6 NEW (F6) :Cap. internal         15.0 Sec.
F5 NEW (F5) :Cap. up factor        25.0
F4 NEW (F4) :Cap dowm factor       50.0
F3 NEW (F3) :Liquid inj. off       40,0 C
F2 NEW (F2) :Liquid inj. on        45,0 C
F1 STOP     :
```

F6: CAPACITY INTERNAL
The interval time between regulating pulses for capacity can here be entered

F5: CAPACITY UP FACTOR
The higher value (%) is set here, the faster upward adjustment, as this value is proportional with the pulse duration for capacity up.

F4: CAPACITY DOWN FACTOR
As F5, where it is a question of the signal for downward adjustment of capacity. The value here should typically be higher than the above value. To both set points it applies that the greater difference between discharge pressure and suction pressure the smaller has the regulating factor to be to avoid hunting of the slide valve.

F3: LIQUID INJECTION OFF

At this oil temperature, measured in the oil manifold, the solenoid valve in the liquid line closes to the injection valve (only mounted on compressors cooled by liquid injection).

F2: LIQUID INJECTION ON
At this oil temperature the solenoid valve opens for supply of liquid refrigerant for the injection valve (only mounted on compressors cooled by liquid injection).

SET POINTS

Set point E

```
                        01-01-94  17:25:35
   SETPOINT/SETP A-E/SETP. E/
F6 CLA      :
F5 NEW (F5) :T-brine setp          0.0 C
F4 NEW (F4) :T-brine start +       5.0 C
F3 NEW (F3) :T-brine stop  -       5.0 C
F2 BRINE REG:State 0=NO 1=YES     NO
F1 STOP     :                        STOP
```

F5: T-BRINE SETUP
Here, if brine temperature regulation is to be used, the brine temperature in degrees Celsius for which the compressor is to adapt capacity must be given. Can only be used with the operating forms "MASTER" and
"REMOTE WITH OWN SETPOINT" (= REMOT5)

F4: T-BRINE START
In operation where the compressor regulates in accordance with the setpoint for brine temperature, a start signal is given to the compressor when the temperature of the brine is the number of degrees given at this setpoint higher than the brine setpoint value (setp. E/F5).

F3: T-BRINE STOP
With brine regulation, the compressor stops when the brine temperature at this setpoint is the number of degrees given at this setpoint lower than the brine setpoint value (setp. E/F5).

F2: BRINE REGULATION YES/NO
If the form of operation is "MASTER" or "REMOT5" and resistance input R IN 4 is OFF, and if the answer for this setpoint is given as YES, regulation will be performed in accordance with the brine temperature.
The brine temperature is measured on analog input 5 (A IN 5) where -50 to +50°C corresponds to 4-20 mA.

SET POINTS

Set point I

```
                        03-06-96  16:48:15
   SETPOINT/SETP I-L/SETP. I/
F6 CLA      :
F5 NEW (F5) :Transform.factor      0.00
F4 NEW (F4) :Ampere max.         110.0 %
F3 NEW (F3) :Switch on heater     40.0 C
F2 HEAT SYST:Activ 0=NO 1=YES     YES
F1 STOP     :                          Stop
```

F5 TRANSFORMER FACTOR

The transformer factor is entered in order that the computer will be able to calculate the full load current of the motor. The transformer factor is determined by:

$$\text{Transformer factor} = \frac{\text{(input current corresponding to 20 mA output on the current converter instrument)}}{\text{Full load current of motor}}$$

The current converter instrument must have a range of input current there go higher than the full load motor current, so an over load can be measured. A range there goes up to 25% higher will be very suitable.

Example: When using an instrument transformer where the primary current is 200 A and a motor with a rated current of 180 A

The transformer factor will make = $\frac{200}{180}$ = 1,11

F4: AMPERE CONSUMPTION MAX

The motor current is calculated in per cent by means of the transformer factor set above. If this current is exceeding the set point for max. ampere consumption set here the capacity of the compressor is adjusted downward with a constant signal until the motor current has reached the set point for normal motor current (see set point C/ F4). Together with this down regulation the message "AMPERE" will appear on the message line of the display.

F3: SWITCH ON HEATER

At this oil temperature, measured in the oil separator, the heater will be switched on when the compressor is out of operation. The heater will switch off when the oil temperature exceeds the set point by 5°C. A temperature higher than the ambient temperature should always be entered to avoid condensation of refrigerant in the oil separator.

F2: HEATING SYSTEM

Here it is determined whether the heater is to be switched on at standstill if the oil temperature mentioned above is not reached. Furthermore, the heater will be switched off if the oil level in the oil separator is too low.

SET POINTS

Set point J

```
                        01-01-94  17:25:35
   SETPOINT/SETP I-L/SETP. J/
F6 CLA      :
F5 NEW (F5) :Min T-oil alarm      10.0 C
F4 NEW (F4) :Min T-oil cut         5.0 C
F3 NEW (F3) :Max T-oil alarm      70.0 C
F2 NEW (F2) :Max T-oil cut        75.0 C
F1 STOP     :                        STOP
```

F5: MIN T-OIL ALARM
When the compressor is operating an alarm will be reported if the oil in the oil separator does not reach this temperature. At the same time the message "ALARM LT-OIL" will appear at the top left-hand corner of the display.

F4: MIN T-OIL CUTOUT
The compressor will be stopped if the oil in the oil separator does not reach this temperature, and "CUTOUT LT-OIL" will appear at the top left-hand corner of the display.

F3: MAX T-OIL ALARM
If the oil temperature, measured in the oil manifold, is exceeding this temperature an alarm will be reported, and "ALARM HT-OIL" will appear at the top left-hand corner of the display.

F2: MAX T-OIL CUTOUT
If the oil in the manifold is exceeding this temperature the compressor will be stopped, and "CUTOUT HT-OIL" will appear at the top left-hand corner of the display. Alarm and cutout of high oil temperature has a delay of 3 minutes.

SET POINTS

Set point K

```
                        01-01-94  17:25:35
   SETPOINT/SETP I-L/SETP. K/
F6 CLA      :
F5 NEW (F5) :Filterdiff alarm      1.8 Bar
F4 NEW (F4) :Filterdiff cut        2.5 Bar
F3 NEW (F3) :Oildiff. alarm        2.0 Bar
F2 NEW (F2) :Oildiff. cutout       1.0 Bar
F1 STOP     :                        STOP
```

F5: FILTER DIFFERENCE ALARM
If the pressure drop over the oil filter is exceeding this value an alarm will be released after 30 seconds, and the message "ALARM FILTERDIF." will appear at the top left-hand corner of the display.

F4: FILTER DIFFERENCE CUTOUT
If the unit is equipped with an extra pressure transmitter that measures oil pressure (P_{OFILT}) immediately ahead of the filter, the filter pressure drop with all pump types is calculated as Filter pressure drop = $P_{OFILT} - P_{OIL}$

Otherwise the filter pressure drop is calculated as follows:

Prelube pump

Pressure drop over filter = $P_{DISCH} - P_{OIL}$, where P_{DISC} is the Discharge pressure, and P_{OIL} is the oil pressure measured in the manifold.

Cycling or full lube oil pump

When $(P_{DISCH.} - P_{SUCT}) < 4.5$ bar: Pressure drop over filter = $(P_{DISCH.} - P_{OIL}) + 1$

When $(P_{DISCH.} - P_{SUCT}) >= 4.5$ bar: Pressure drop over filter = $(P_{DISCH.} - P_{OIL})$

F3: OIL DIFF. PRESSURE ALARM
If the oil differential pressure goes below this pressure an alarm will be reported, and "ALARM OILDIFF." will appear at the top left-hand corner of the display. The oil differential pressure is calculated as:

OIL DIFF.PRESSURE = $[P_{OIL\ PRESSURE} - (1.2 \times P_{SUCTION\ PRESSURE} + 1)]$ bar

The alarm has a delay of 5 minutes during the first 12 minutes after start, after this the delay will be 2 minutes.

F2: OIL DIFF. PRESSURE CUTOUT
If the oil differential pressure goes below this pressure the compressor is stopped, and "CUTOUT OILDIFF." will appear in the display. This stop has a delay of 10 minutes during the first 12 minutes after start, then the delay will be 3 minutes.

SET POINTS

Set point L

```
                        01-01-94  17:25:35
   SETPOINT/SETP I-L/SETP. L/
F6 CLA      :
F5 NEW (F5) :T-disch.  alarm      90.0 C
F4 NEW (F4) :T-disch. cutout     100.0 C
F3 NEW (F3) :T-suction alarm    - 45.0 C
F2 NEW (F2) :Vol. reg. factor     25.0
F1 STOP     :                        STOP
```

F5: T-DISCHARGE ALARM
When the discharge gas temperature exceeds this temperature an alarm will be reported, and "ALARM T-DISCH." will appear in the top left-hand corner of the display.

F4: T-DISCHARGE CUTOUT
When the discharge temperature exceeds this temperature the compressor is stopped, and "CUTOUT T-DISCH." will appear in the display.
The discharge temperature is measured by a PT-100 sensor, which is normally placed in the discharge pipe between the compressor and the oil separator.

F3: T-SUCTION ALARM
If the suction temperature, measured by PT-100 sensor in the suction valve, goes below this value an alarm will report and "ALARM T-SUCTION" will appear in the display. This alarm is a warning that the permissible temperature of the compressor casting is being approached.

F2: VOLUME CONTROL FACTOR
The value set here in per cent is proportional to the pulse duration of the regulation of the slide stop. At compressors running with a great differential pressure between discharge pressure and suction pressure a low value is entered to avoid hunting.

SET POINTS

Set point R

```
                    03-06-96  13:48:15
   SETPOINT/SETP.R-U/SETP. R/
F6 CLA      :
F5 REFRIGER :State type              0
F4 PUMP TYPE:0=pre 1=cyc 2=on     PRELUBE
F3 INJECTION:State 0=NO 1=YES       NO
F2 COMP.SIZE:State size              0
F1 STOP     :                          STOP
```

F5: REFRIGERANT TYPE
Push <F5> followed by refrigerant type:
12 (=R12), 22 (=R22), 134 (=R134a), 404(=R404a), 502 (=R502), and 717 (=R717)

F4: PUMP TYPE
Here it can be selected between PRELUBE (=0), CYCLING (=1) or FULL LUBE (=2) functioning in the following way:

PRELUBE: At operation of compressor the oil pump is stopped when
$P_{DISCHARGE} - P_{SUCTION} > 4.3$ bar and started again when
$P_{DISCHARGE} - P_{SUCTION} < 3.3$ bar

CYCLING: At operation of compressor the oil pump is stopped when
$P_{DISCHARGE} - P_{SUCTION} > 6.5$ bar and started again when
$P_{DISCHARGE} - P_{SUCTION} < 5.5$ bar

FULL LUBE:The pump is always running when the compressor is running.

F3: INJECTION YES/NO
If the compressor unit is provided with liquid injection cooling a “YES” (=1) is selected here.

F2: COMPRESSOR SIZE
The size of the compressor is to e entered here. The size of the compressor can be read from the name-plate placed at the compressor block. Possible GSV sizes are: 50, 64, 84, 111, 147, 185, 263, 331, 412 and 562.

Set point S

As described under **Calibration** of compressor (see the section about Types of duty) through a special menu it is possible to run the slide valve and the slide stop into minimum and maximum by forced operation, and after that to read the values of these positions. These values are entered under set point S as shown below.

GSV:

```
                    01-01-93  17:25:35
   SETPOINT/SETP R-U/SETP S/
F6 CLA      :
F5 NEW (F5) :Slide stop min        250 Ohm
F4 NEW (F4) :Slide stop max       2500 Ohm
F3 NEW (F3) :Slide valve min       250 Ohm
F2 NEW (F2) :Slide valve max      2500 Ohm
F1 STOP     :GSV                     STOP
```

F5: Position for slide stop in minimum
F4: Position for slide stop in maximum
F3: Position for slide valve in minimum
F2: Position for slide valve in maximum

GSF:

```
                      01-01-93  17:25:35
   SETPOINT/SETP R-U/SETP S/
F6 CLA      :
F5 NEW (F5) :Vi compressor          2.6
F4 NEW (F4)
F3 NEW (F3) :Slide valve min        250 Ohm
F2 NEW (F2) :Slide valve max       2500 Ohm
F1 STOP     :GSF                        Stop
```

F3: Position for slide valve in minimum
F2: Position for slide valve in maximum

SET POINTS

Set point T

```
                      03-06-96  13:48:15
   SETPOINT/SETP R-U/SETP. T/
F6 STARTBOOS:AT Ready to run        NO
F5 NEW (F5) :Cap. min.reg free      5.0 %
F4 NEW (F4) :P-suct setpt 2       -10.0 C
F3 NEW (F3) :Booster start          0.7 Bar
F2 NEW (F2) :Booster stop           4.5 Bar
F1 STOP     :
```

F6: START BOOSTER
Start the Booster compressor. When the compressor is in mode “Ready to Run”, Yes/No can be chosen.

F5: CAP. MIN. REG.FREE
In case of master/slave operation this set point is important. When a slave is moving downward at a time it will reach its minimum entered for capacity (entered under set point C/F5). When minimum has been reached the master will receive a message and further downward adjusting is now taking place at the master, see description of master/slave operation under types of duty. If the slave should go under its minimum it will receive a capacity up signal. To avoid hunting at this set point "MIN REG.FREE" it is possible to indicate by how many per cent over the minimum of the slave you will give a signal to the master that the slave has reached its minimum.

F4: P-SUCTION SETP 2
As mentioned under set point A it is possible to run according to an alternative set point for suction pressure; "SUCTION PRESSURE 2" (in °C) which is entered here. It is adjusted according to set point for suction pressure 2, when resistance input R IN 4 is ON.

F3: BOOSTER START
When the suction pressure has reached this pressure signal is given for start of booster (= low-pressure compressor). This signal is sent to digital output 18 (OUT18).

F2: BOOSTER STOP
The booster compressor is stopped when the suction pressure of the high-pressure compressor reaches this pressure that is OUT 18 goes "OFF". In case of stop of the high-pressure compressor the booster compressor will be stopped too.

SET POINTS

Set point U

```
                        01-01-94  17:25:35
   SETPOINT/SETP R-U/SETP. U/
F6 CLA      :
F5 Economize:State 0=NO 1=YES     NO
F4 NEW (F4) :Startpressure        20.0 Bar
F3 NEW (F3) :Slave stop           70.0 %
F2 NEW (F2) :Slave startdelay       30 sek
F1 STOP     :                         STOP
```

F5: ECONOMIZER YES/NO
If the compressor unit is provided with an economizer YES (=1) is selected here.
At output > 90% solenoid valve for economizer is opened (OUT 4 ON), and solenoid valve is closed again when the output goes below 80% (OUT 4 OFF).

F4: START PRESSURE (B)
If the pressure in the oil separator is exceeding the pressure set under this set point the compressor cannot be started. When attempts are made to start the message "BY-PASS" will appear in the message line of the display and output OUT 5 will go "ON". This output will then be able to activate a solenoid valve placed in a tube between the oil separator and the suction line of the compressor.

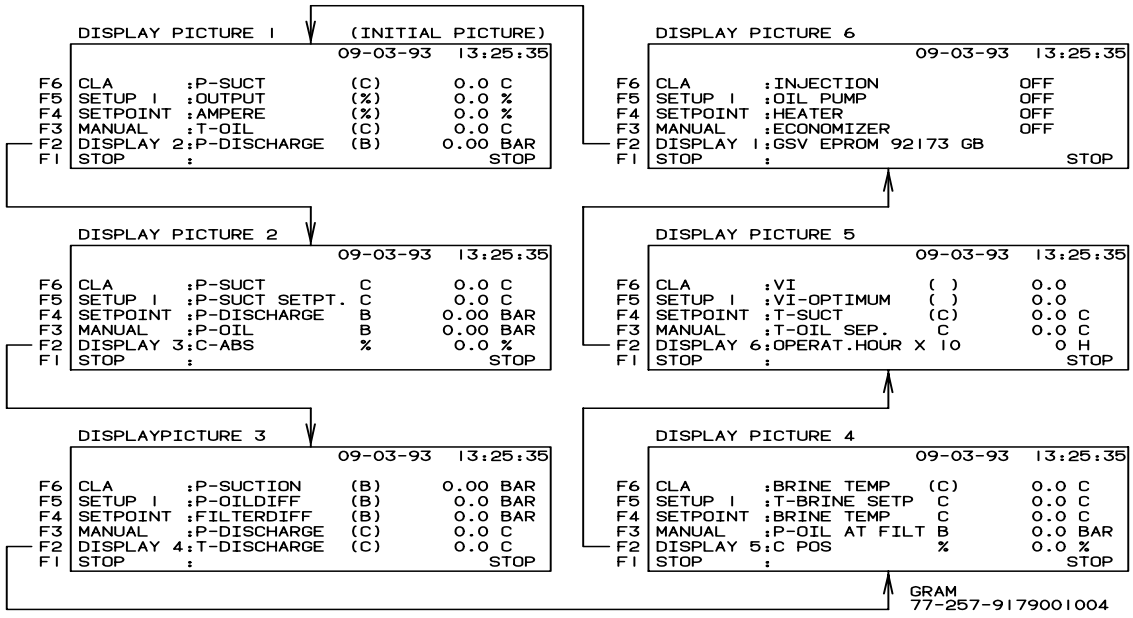
F3: SLAVE STOP
In case of master/slave operation this set point is of importance. In a downward adjusting situation where the slave reached its minimum and the master is moving downwards the slave will be stopped when the capacity of the master is reaching this set point.

F2: SLAVE START DELAY
At master/slave operation where the master compressor has reached 100%, and there is a call for further capacity the slave will be started after a delay of the number of seconds entered under this set point.

DISPLAY PICTURES

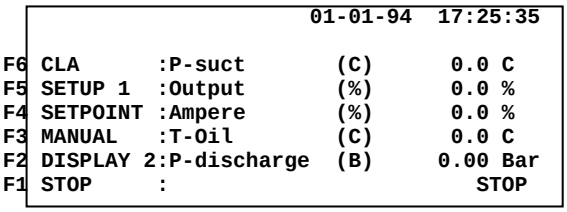
It is possible to select between 6 different display pictures informing about the working condition of the compressor.
When the compressor has stopped some of the operating parameters will be "frozen". It means that they will continue showing the value registered at the time where the compressor was asked to stop either because of a cutout or another stop. To be able to see the operating parameters updated during a standstill the "frozen" values will be shown in putting a bracket around the unit indicating the parameter against the value.

The initial picture can be considered as the first display picture indicating the operating parameters. With the <F2> key it is possible to scroll both from the initial picture as well as from the other display pictures to a new display picture without altering the function of the function keys. All display pictures are placed in a loop, for which reason it is possible to keep on scrolling with the <F2>.



DISPLAY PICTURES

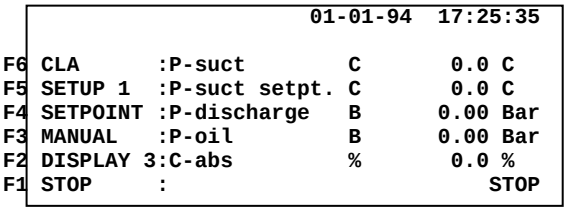
Initial picture



P-SUCTION (C)
The suction pressure measured is shown here converted into degree Celsius.
OUTPUT (%)
The output is a calculated value indicating the output of the compressor in per cent.
AMPERE (%)
Showing the load of the compressor motor. Is indicated in per cent of the rated current of the motor.
T-OIL (C)
Indicating the oil temperature registered by the PT-100 sensor in the oil manifold.
P-DISCHARGE (C)
Indicating the discharge pressure in bar (normally measured in the oil separator).

All current values in this display picture are "frozen" in case of a cutout or a stop.

Display picture 2



P-SUCTION C
The suction pressure measured is shown here converted into degree Celsius.
P-SUCTION SET POINT C
Here the set point for suction pressure is shown after which the compressor is adjusting provided it is adjusting according to its own set point.
P-DISCHARGE B
Discharge pressure in bar measured with the pressure transmitter at the oil separator.
P-OIL PRESSURE B
Oil pressure in bar measured by the pressure transmitter in the oil manifold.
C-ABS %
If the slide stop is in minimum (Vi = 2.2) the slide valve has its longest possible travel. C-ABS is then a linear output of this travel (0-100%). If the slide stop has been adjusted to a higher Vi the value of the C-ABS will never reach 100%.

All values in display picture 2 are updated during standstill.

DISPLAY PICTURES

Display picture 3

```
                        01-01-94  17:25:35

F6 CLA      :P-suction    (B)     0.00 Bar
F5 SETUP 1  :Oildiff      (B)      0.0 Bar
F4 SETPOINT :Filterdiff   (B)      0.0 Bar
F3 MANUAL   :P-discharge  (C)      0.0 C
F2 DISPLAY 4:T-discharge  (C)      0.0 C
F1 STOP     :                        STOP
```

P-SUCTION PRESSURE (B)

Suction pressure in bar measured by the pressure transmitter in the suction pipe.

OIL DIFFERENTIAL PRESSURE (B)

This oil differential pressure is calculated as [$P_{OIL\ PRESSURE}$ - (1,2 * $P_{SUCTION\ PRESSURE}$ + 1)] and is indicated in bar.

FILTER DIFFERENCE (B)

The pressure drop over the oil filter is calculated as shown under set point K/F4 and is here indicated in bar.

P-DISCHARGE (C)

This discharge pressure, measured by the pressure transmitter concerned, can be converted into a temperature, which is here indicated in degree Celsius.

T-DISCHARGE (C)

Here the temperature, which is measured by the PT-100 sensor placed in the pressure pipe, is shown.

All values in display picture 3 are "frozen" in case of a cutout.

Display picture 4

```
                        01-01-94  17:25:35

F6 CLA      :Brine temp   (C)      0.0 C
F5 SETUP 1  :T-brine setp. C       0.0 C
F4 SETPOINT :Brinetemp.    C       0.0 C
F3 MANUAL   :P-oil at filt C       0.0 Bar
F2 DISPLAY 5:C-pos                 0.0 %
F1 STOP     :                      STOP
```

BRINETEMP (C)

This is the brine temperature measured in degrees Celsius. The value is "frozen" on stop.

T-BRINE SETP

Here the setpoint is shown for required brine temperature, as entered for setp. E/F5.

BRINE TEMP C

This value is not "frozen" on stop.

P-OIL AT FILTER

On certain units a pressure transmitter is used to measure the oil pressure just ahead of the oil filter. If this is the case, measured oil pressure can be read off here. If the pressure transmitter is not installed, -5.25 bar is displayed.

C-POS

This is a linear reading of the actual movement of the capacity slide. Because C_{POS} is a calculated value, which takes account of the position of the volume slide, C_{POS} will always go from 0 to 100% when the capacity slide is moved from minimum to maximum.

DISPLAY PICTURES

Display picture 5

```
                      01-01-94  17:25:35

F6 CLA      :Vi-compr.    ( )      0.0
F5 SETUP 1  :Vi-optimum   ( )      0.0
F4 SETPOINT :T-suct       (C)      0.0 C
F3 MANUAL   :T-oil sep.    C       0.0 C
F2 DISPLAY 6:Operat.hour X 10        0 h
F1 STOP     :                       STOP
```

Vi COMPR. ( )

Here the volume ratio is shown corresponding to the actual position of the slide stop. Steeples the compressor can place the slide stop in positions corresponding to an internal volume ratio in the compressor from 2.2 to 5.0.

Vi-OPTIMUM ( )

Here the volume ratio is shown which can be calculated on the bases of the discharge pressure and the suction pressure. At the same time it is the optimum position of the slide stop.

T-SUCTION (C)

Is showing the suction temperature, measured by the PT-100 sensor placed in the suction valve.

T-OIL SEPARATOR C

The temperature measured of the oil in the oil separator.

OPERATING HOURS X 10

Here the number of operating hours is read resolved into 10 hours.

Display picture 6

```
                      01-01-94  17:25:35

F6 CLA      :Injection            OFF
F5 SETUP 1  :Oil pump             OFF
F4 SETPOINT :Heater               OFF
F3 MANUAL   :Economizer           OFF
F2 DISPLAY 1:EPROM XXXX
F1 STOP     :                        STOP
```

INJECTION

If the injection cooling is activated that is at oil temperatures above set point for "liquid injection ON" (set point D/F2) "ON" will appear to the right on the text line in the display.

OIL PUMP

If the oil pump is running "ON" will appear to the right on the text line.

HEATER

If the heater is switched on "ON" will appear to the right on the text line.

ECONOMIZER

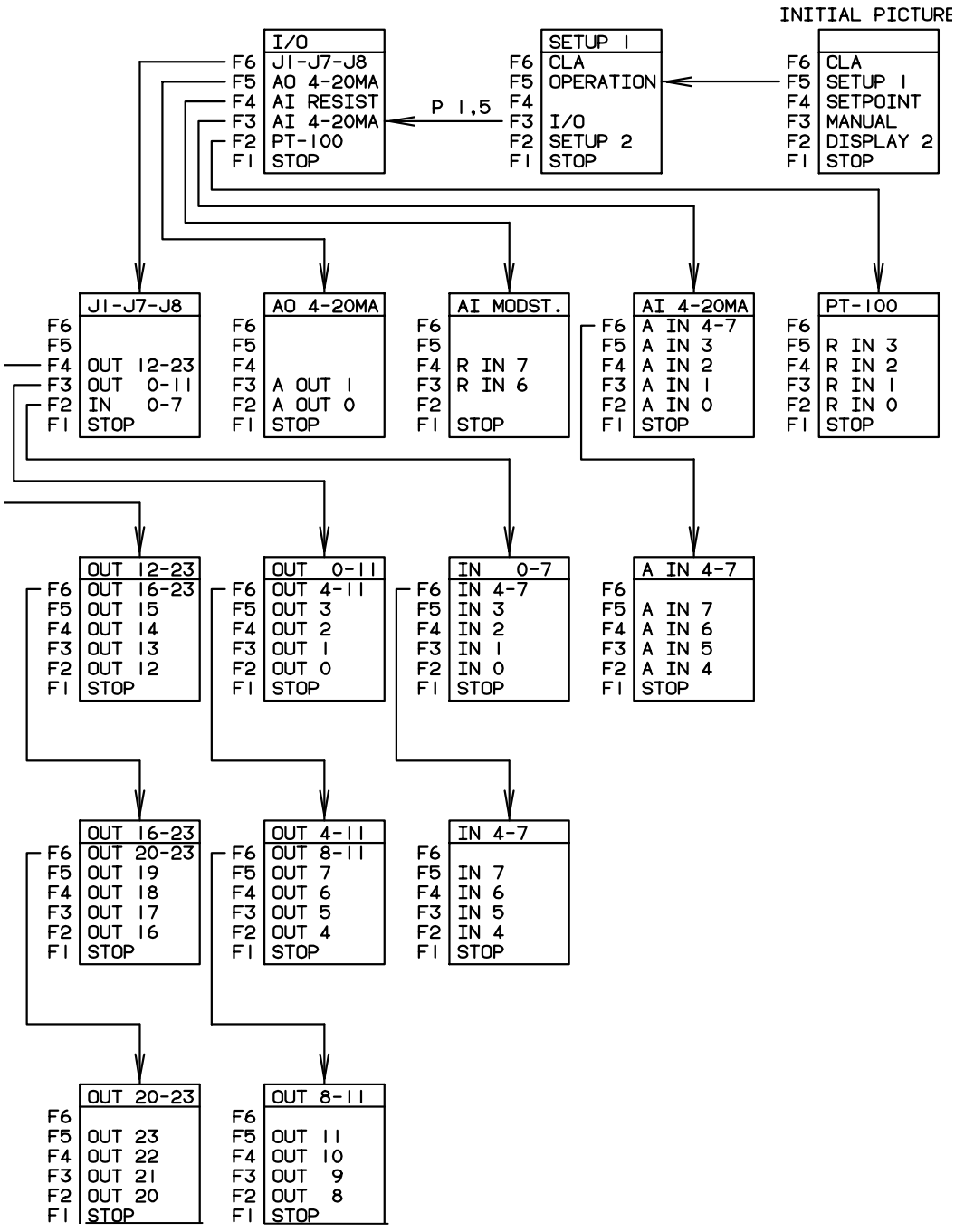
If the solenoid valve in the economizer line is open "ON" will appear to the right in the display picture. This means that the economizer is working.

EPROM XXXX

Here the programme version of the computer is indicated.

I/O PICTURES

The signals of the analogue and digital Inputs and Outputs are shown in the I/O pictures (Input/Output). The menu tree for the I/O pictures is shown below.



I/O PICTURES

PT-100 Sensors, Setp 1/2

PT 100 sensors give signals on resistance inputs designated "R IN 0" to "R IN 3". These designations can be found at the terminals in the electrical panel. The I/O picture for these inputs appears as follows:

```
                        01-01-94  17:25:35
   SETUP 1/I/O/PT-100/
F6 R IN 4   :Change setp. 1/2      OFF
F5 R IN 3   :T-oil compr           0.0 C
F4 R IN 2   :T-suction             0.0 C
F3 R IN 1   :T-oil sep.   C        0.0 C
F2 R IN 0   :T-discharge           0.0 C
F1 STOP     :                        STOP
```

R IN 4 CHANGE SETPOINT 1/2
If under the operating forms MASTER or REMOTE WITH OWN SETPOINT it is necessary to regulate the compressor in accordance with setpoint 2 for suction pressure (entered under setp. T) a signal is applied at this input. When the input is OFF, regulation is in accordance with setpoint 1 for suction pressure (entered under setp. A) or in accordance with the brine temperature (entered under setp. E).

R IN 3 T-OIL COMPRESSOR
Oil temperature in degree Celsius measured by PT-100 sensor in oil manifold.

R IN 2 T-SUCTION
The suction gas temperature in degree Celsius measured with PT-sensor in suction valve.

R IN 1 OIL SEPERATOR
Oil temperature measured by PT-100 sensor at the bottom of oil separator.

R IN 0 T-DISCHARGE PIPE
Discharge pipe temperature in degree Celsius normally measured by PT-100 sensor in discharge pipe between compressor and oil separator.

ANALOG INPUTS

The analog inputs (4-20 mA) cover pressure measurements and, if applicable, brine temperature measurement and motor current measurement.

```
                        01-01-94  17:25:35
   SETUP 1/I/O/ 4-20MA
F6 A IN 4-7 :Analog input 4-7
F5 A IN 3   :Motor ampere          0.0 %
F4 A IN 2   :P-oil pressure        0.00 Bar
F3 A IN 1   :P-discharge   B       0.00 Bar
F2 A IN 0   :P-suction     B       0.00 Bar
F1 STOP     :                         STOP
```

A IN 4-7 ANALOG INPUTS 4-7
The terminals in the panel are designated "A IN 0" to "A IN 7".

A IN 3 MOTOR AMPERE
Displays the signal on analog input 3 (A IN 3), where 4-20mA corresponds to 0-100%. If this value is multiplied with the transformer factor (setp. I/F5) you will get the motor current, which is displayed on the initial picture (= display picture 1).

A IN 2 P-OIL PRESSURE B
The oil pressure in bars measured by the pressure transmitter in the oil manifold. 0-25 bar gauge (= 1-26 bar absolute) corresponds to a signal from the transmitter of 4-20 mA.
Note: The read-off displayed is the absolute pressure (bar a).

A IN 1 P-DISCHARGE B
The oil pressure in bars measured by the pressure transmitter in the oil separator. 0-25 bar gauge corresponds to a signal from the transmitter of 4-20 mA.

A IN 0 P-Suction
The suction pressure in bars measured by the pressure transmitter in suction valve. -1-+6 bar gauge (=0-7 bar a) corresponds to a signal from the transmitter of 4-20 mA.

I/O PICTURES

```
                    10-01-96  12:52:10
  SETUP. 1/I/O/AI 4-20MA/A IN 4-7
F6          :
F5 A IN 7   :Available
F4 A IN 6   :T-brine inlet C       0.0 C
F3 A IN 5   :T-brine outl. C       0.0 C
F2 A IN 4   :P-Oil at filt C     -5,25 Bar
F1 STOP     :                      STOP
```

A IN 7 AVAILABLE
This input are not used.

A IN 6 T-BRINE INLET
Brine temperature at the inlet. 4-20 mA corresponds to -50 to +50°C. If no signal is given at the input, -75°C will be displayed.

A IN 5 T-BRINE OUTL.
If compressor regulation is to be based on brine temperature, the measurement of temperature must be registered at this input. 4-20 mA corresponds to -50 to +50°C. If no signal is given at the input, -75°C will be displayed.

A IN 4 P-OIL AT FILTER
On certain versions of compressor units, there are four pressure transmitters instead of three. The extra pressure transmitter is placed in the oil line immediately ahead of the point where oil enters the oil filter. It registers pressure in bars. On machines without the extra pressure transmitter, -5.25 bar is displayed in the field.

```
                    13-06-96  13:48:15
  SETUP. 1/I/O/AI WID.ST/
F6          :
F5          :
F4          :
F3 R IN 7   :Capacity slide pos.     0
F2 R IN 6   :Volume slide pos.       0
F1 STOP     :
```

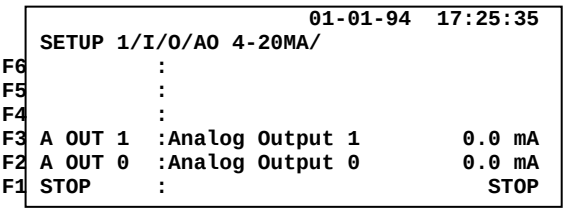
R IN 7 CAPACITY SLICE POS.
A potentiometer under the cover nearest the compressor input shaft or at the end of the cylinder registrers a resistance value between 0 and 2200 ohm depending on where the capacity slide is positioned. The measured resistance can be read off here. If an hermetic transmitter with inductive registration is used, the value is converted to the value corresponding to a registration of a resistance value.

R IN 6 VOLUME SLIDE POS.
A potentiometer under the cover farthest away from compressor input shaft registers a resistance value between 0 and 2200 ohm depending on where the volume slide is positioned. The measured resistance can be read off here. If an hermetic transmitter with inductive registration is used, the value is converted to the value corresponding to at registration of a resistance value.

I/O PICTURES

ANALOG OUTPUTS

It is possible to read off a parameter as a 4-20 mA signal on two analog outputs. It is not possible to see which parameter has been selected on this I/O picture, but the selection can be seen by leafing to SETUP 2/MENU 3.



A OUT 1 ANALOG OUTPUT 1

The signal depends on which operating parameters have been selected for reading off: Output, Amperes, Oil differential pressure, Suction pressure or Discharge pressure. See also the section "ELECTRICAL DATA" under "Setup of compressor".

A OUT 0 ANALOG OUTPUT 0

Here, as with A OUT 1, which signal is shown for one of the five given operating parameters that can be seen.

I/O PICTURES

DIGITAL INPUTS, 24V DC

```
                        01-01-94  17:25:35
   SETUP 1/I/O/J1-J7-J8/ IN 0-7/
F6 IN 4-7 :  DIGITAL INPUTS 4-7, 24V DC
F5 IN 3     :Start compr.     OFF
F4 IN 2     :Previous > min   OFF
F3 IN 1     :Compressor run   OFF
F2 IN 0     :Oil level        OFF
F1 STOP     :                          STOP
```

IN 4-7 DIGITAL INPUT 4-7, 24V DC

Function key F6 can be used to leaf to the I/O picture showing digital inputs "IN 4" to "IN 7".

IN 3 START COMPRESSSOR

If the compressor is set for the operating form REMOTE the start signal is applied to the compressor via this input.

IN 2 PREVIOUS > MINUMUM

With master-slave operation, the slave sends a signal to the master compressor via this input - when the slave is higher than its setpoint for minimum capacity.

IN 1 COMPRESSOR RUN

A signal from the star/delta starter of the compressor motor is applied at this input when the motor is in delta position.

IN 0 OIL LEVEL

A signal at this input is a sign that the oil level in the oil separator is OK.

```
                        03-06-96  13:48:15
   SETUP. 1/I/O/J1-J7-J8/IN 0-7/IN 4-7/
F6          :
F5 IN  7    :External error   OFF
F4 IN  6    :Capacity down    OFF
F3 IN  5    :Capacity up      OFF
F2 IN  4    :START Slave      OFF
F1 STOP     :
```

IN 7 EXTERNAL ERROR

If the safety pressure control KP7ABS stops the compressor due to a too high pressure in the oil separator, or if the emergency stop is activated, an external fault will appear, as the connection to IN 7 then will be disconnected. In 7 can furthermore be used to stop the compressor due to an external fault. See the electrical diagram how to connect emergency stop and safety pressure control or how external fault reports can be made.

IN 6 CAPACITY DOWN

With the operating form SLAVE or REMOTE WITH EXTERNAL SETPOINT the signal arrives from an external source when an increase or reduction in compressor capacity is required. If the requirement is a reduction in capacity, the signal is applied at this input.

IN 5 CAPACITY UP

Whit the operating forms described under IN 6, a signal is applied at this input when compressor capacity is to be increased.

IN 4 START SLAVE

If the compressor is set for the operation form SLAVE the start signal is applied to the compressor via this input.

I/O PICTURES

DIGITAL OUTPUTS 0-11, 220V AC

```
                        03-06-96  13:48:15
   SETUP. 1/I/O/J1-J7-J8/OUT 0-11/
F6 OUT 4-11 :Digital output  4-11, 220V AC
F5 OUT 3    :Volume down      OFF
F4 OUT 2    :Volume up        OFF
F3 OUT 1    :Capacity down    OFF
F2 OUT 0    :Capacity up      OFF
F1 STOP     :
```

OUT 4-11 DIGITAL OUTPUTS 4-11, 220V AC
Function key F6 can be used to leaf to the I/O picture showing digital inputs "OUT 4" to "OUT 11"

OUT 3VOLUME DOWN
Here the signal to the solenoid valve to reduce the volume ratio on the compressor is applied.

OUT 2 VOLUME UP
Here the signal to the solenoid valve to increase the volume ratio on the compressor is applied.

OUT 1 CAPACITY DOWN
Here the signal to the solenoid valve to reduce compressor capacity is applied.

OUT 0 CAPACITY UP
Here the signal to the solenoid valve to increase compressor capacity is applied.

```
                        01-01-94  17:25:35
   SETUP 1/I/O/J1-J7-J8/OUT 0-11/OUT 4-11/
F6 OUT 8-11 :Digital outputs 4-11, 220V AC
F5 OUT 7    :Available
F4 OUT 6    :Available
F3 OUT 5    :BYPASS           OFF
F2 OUT 4    :Economizer       OFF
F1 STOP     :                          STOP
```

OUT 8-11 DIGITAL OUTPUTS 8-11, 220V AC
Function key F6 can be used to leaf to the I/O picture showing digital inputs "OUT 8" to "OUT 11"

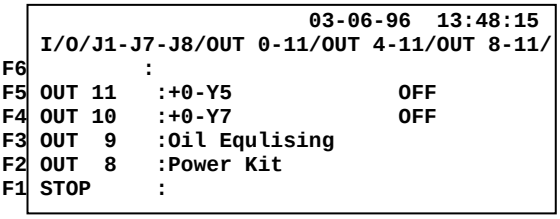
OUT 7 LOW LIQUID INJ
If the volume ratio is less than 4.5 and OUT 6 is ON, "low liquid injection" is selected and the output goes "ON". The signal is significant only when "dual liquid injection" is concerned, see description of liquid injection elsewhere in the manual.

OUT 6 HIGH LIQUID INJ
This output controls the solenoid valve for liquid injection. When the oil temperature in the oil manifold exceeds the temperature entered under setpoint D/F2, and the output goes ON and the solenoid valve in the liquid injection line opens. This leads refrigerant into the compressor which then becomes cooled.

OUT 5BYPASS
When the output goes "ON", the solenoid valve in the start bypass line opens. The output is "ON" when pressure in the oil separator exceeds the start pressure given under setpoint U/F4 and a start attempt is made.

OUT 4 ECONOMIZER
When the output goes "ON", the economizer is in operation. The output goes "ON" when compressor capacity exceeds 90% and goes "OFF" when the capacity fall under 80% again.

I/O PICTURES



OUT 11 SOLENOID VALVE IN OILLINE

On units where a check valve is located between compressor and oil separator instead of on the compressor suction side, solenoid valves must be installed in diverse oil lines from the oil separator to the compressor. The solenoid valves must be connected to the output that closes them when the compressor stands still. At the same moment as a start signal is given to the compressor, the output goes ON and the solenoid valves open.

OUT 10 SOLENOID VALVE IN OIL LINE TO SB2

In certain compressor units a solenoid valve is located with a pressure regulating valve in the oil line to SB2. The purpose of this arrangement is to ensure that the correct oil pressure is applied to the oil pistons in the compressor in order to relieve the axial bearings. The solenoid valve must be connected to this output so that it goes ON when $C_{POS} > 70\%$, that it goes OFF again when $C_{POS} < 65\%$, and also goes off during standstill.

OUT 9 OIL EQUALIZING

If the refrigerating plant is built up by more compressor units (with an oil separator each) running parallel operation it may happen that the oil is gradually moved into one of the oil separators. By mounting a pipe with a solenoid valve between the oil separator of one of the compressors and the suction line of the second, and vice versa it is possible to make oil equalizing. If a low oil level is registered for 30 seconds the solenoid valve between the suction line of the compressor concerned and the oil separator of the second oil separator will open. The oil separator will now be filled up with oil until the level switch is registering normal oil level again. Note: Fill up for 30 seconds.
When the solenoid valve is activated this output will be "ON".

OUT 8 POWER KIT

When the compressor stops the output will be "ON" for 15 seconds in case the NC-valve under POWER KIT in the SETUP/MENU 2 has been selected. However, if the NO-valve has been selected the output will be "OFF" for 15 seconds after the compressor has stopped.

I/O PICTURES

DIGITAL OUTPUTS 12-23, CONTACTORS

```
                        01-01-94  17:25:35
   SETUP 1/I/O/J1-J7-J8 OUT 12-23/
F6 OUT 16-23:Digital output 16-23
F5 OUT 15   :Common alarm     OFF
F4 OUT 14   :Oil heater       OFF
F3 OUT 13   :Oil pump start   OFF
F2 OUT 12   :Compressor start OFF
F1 STOP     :                          STOP
```

OUT 16-23 DIGITAL OUTPUTS 16-23

Function key F6 can be used to leaf to the I/O picture showing digital inputs "OUT 16" to "OUT 23"

OUT 15 OIL HEATER

"ON" means that the heater in the oil separator is switched on.

OUT 14 COMMAN ALARM

If an alarm has appeared on the unit the output will go "ON". The signal can for instance be used for a remote message that there is an alarm at the compressor unit.

OUT 13 PUMP START

When this output goes "ON" the oil pump is started. The pump is stopped again when the output goes "OFF".

OUT 12 COMPR. START

When this output goes "ON" the compressor is started. It is stopped again when the output goes "OFF".

```
                      03-06-96  13:48:15
   /I/O/J1-J7-J8/OUT 12-23/OUT 16-23
F6 OUT 20-23:Digital output  20-23
F5 OUT 19   :Start Slave      OFF
F4 OUT 18   :Booster start    OFF
F3 OUT 17   :Common cutout    OFF
F2 OUT 16   :Max. Output      OFF
F1 STOP     :
```

OUT 20-23 DIGITAL OUTPUTS 20-23

Function key F6 can be used to leaf to the I/O picture showing digital inputs "OUT 20" to "OUT 23"

OUT 19 SLAVE START

If this compressor panel is to control a subsequent slave compressor, the start signal is sent via this output which then goes ON.

OUT 18 BOOSTER START

If the compressor panel is to control a booster compressor (low-pressure compressor) the start signal to the booster compressor is applied at this output. When the signal goes "OFF" the booster is stopped.

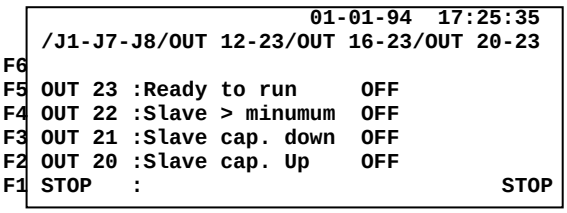
OUT 17 COMMON CUTOUT

"ON" means that there is a cutout at the unit. This signal can for instance be used for calling the operator.

OUT 16 MAX. OUTPUT

If a digital signal is required to show that the compressor is running at maximum capacity, this output can be used. The output goes ON when yield is >97%.

I/O PICTURES



OUT 23 READY TO RUN
This is a "Ready to run" signal to denote that all conditions are in order and the compressor is ready to start. The output goes ON at the same time as the green lamp on the front of the panel lights up.

OUT 22 SLAVE MINIMUM
With master-slave operation, the master compressor needs to "know" whether the slave has reached more than its minimum capacity. The condition is signalled via this output (on the slave) which goes ON when compressor capacity is more than the sum of [setp. C/F5 + setp. T/F5].

OUT 21 SLAVE CAPACITY DOWN
If this output is "ON" the next slave will be adjusted downwards.

OUT 20 SLAVE CAPACITY UP
If this output is "ON" the next slave will be adjusted upwards.

SURVEY OF SET POINTS

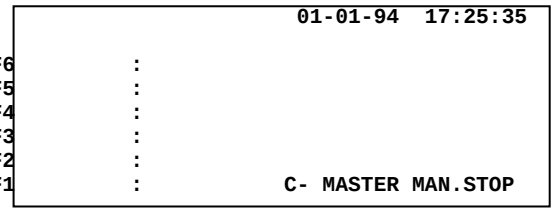
SETPOINT	MENU / FUNCTION KEY	LOW LIMITING VALUE	HIGH LIMITING VALUE	PRESET VALUE
RESTART DELAY	SETP A/ F2	0 minutes	60 minutes	30 minutes
P-SUCTION CUTOUT	SETP A/ F3	-60 °C	60 °C	-45 °C
P-SUCTION RELIEVE	SETP A/ F4	-60 °C	60 °C	-40 °C
P-SUCTION SETP 1	SETP A/ F5	-60 °C	60 °C	-30 °C
DEAD BAND ZONE	SETP B/ F2	0 °C	10 °C	0,5 °C
PROPORTIONAL ZONE	SETP B/ F3	0 °C	10 °C	1,0 °C
P-SUCTION STOP (-)	SETP B/ F4	0 °C	10 °C	2,0 °C
P-SUCTION START (+)	SETP B/ F5	0 °C	10 °C	2,0 °C
P-DISCH. CUTOUT	SETP C/ F2	0 °C	55 °C	45 °C
P-CISCH.. ALARM	SETP C/ F3	0 °C	55 °C	40 °C
AMP. NORMAL	SETP C/ F4	0 %	100 %	100%
MINIMUM CAPACITY	SETP C/ F5	0 %	100 %	50 %
LIQUID INJECTION ON	SETP D/ F2	0 °C	100 °C	45 °C
LIQUID INJECT. OFF	SETP D/ F3	0 °C	100 °C	40 °C
CAP. DOWN FACTOR	SETP D/ F4	0	100	50
CAP. UP FACTOR	SETP D/ F5	0	100	25
BRINE REGULATION	SETP E/F2	0=NO	1=YES	0=NO
T-BRINE STOP-	SETP E/F3	0 °C	10 °C	5 °C
T BRINE START+	SETP E/F4	0 °C	10 °C	5 °C
T BRINE SETP.	SETP E/F5	-50°C	+50°C	0 °C
HEAT SYSTEM ACTIV	SETP I/ F2	0=NO	1=YES	0=NO
SWITCH ON HEATER	SETP I/ F3	0 °C	100 °C	40 °C
AMPERE MAXIMUM	SETP I/ F4	0 %	150 %	110 %
TRANSFORMER FACT	SETP I/ F5	0	5	0
MAX T-OIL CUT OUT	SETP J/ F2	0 °C	100 °C	75 °C
MAX T-OIL ALARM	SETP J/ F3	0 °C	100 °C	70 °C
MIN T-OIL CUT OUT	SETP J/ F4	0 °C	100 °C	5 °C
MIN T-OIL ALARM	SETP J/ F5	0 °C	100 °C	10 °C

SURVEY OF SET POINTS

SETPOINT	MENU / FUNCTION KEY	LOW LIMITING VALUE	HIGH LIMITING VALUE	PRESET VALUE
OIL DIFF.PRESS CUT	SETP K/ F2	1,0 BAR	5,0 BAR	1.0 BAR
OIL DIFF.PRESS ALARM	SETP K/ F3	1,5 BAR	5,0 BAR	2,0 BAR
FILTERDIFF CUTOUT	SETP K/ F4	0 BAR	2,5 BAR	2,3 BAR
FILTERDIFF ALARM	SETP K/ F5	0 BAR	2,5 BAR	1,8 BAR
VOLUME REG.FAKT	SETP L/ F2	0	100	25
T-SUCTION ALARM	SETP L/ F3	-60 °C	0 °C	-45 °C
T-DISCH. CUTOUT	SETP L/ F4	0 °C	150 °C	100 °C
T-DISCH ALARM	SETP L/ F5	0 °C	150 °C	90 °C
COMPRESSOR SIZE	SETP R/ F2	0	562	0
INJECTION YES/NO	SETP R/ F3	0=NO	1=YES	0=NO
OILPUMP TYPE	SETP R/ F4	0	2	0=PRELUBE
REFRIGERANT TYPE	SETP R/ F5	0	717	0
SLIDE VALVE MAX	SETP S/ F2	0	2500	1800
SLIDE VALVE MIN	SETP S/ F3	0	2500	250
SLIDE STOP MAX	SETP S/ F4	0	2500	1800
SLIDE STOP MIN	SETP S/ F5	0	2500	250
BOOSTER STOP	SETP T/ F2	0 BAR	10 BAR	4,5 BAR
BOOSTER START	SETP T/ F3	0 BAR	5 BAR	0,7 BAR
P-SUCTION SETP. 2	SETP T/ F4	-60 °C	60 °C	-10 °C
CAP MIN REG.FREE	SETP T/ F5	0 %	20 %	5 %
SLAVE START DELAY	SETP U/ F2	1 sec	900 sec	30 sec
SLAVE STOP	SETP U/ F3	25 %	95 %	70 %
STARTPRESSURE	SETP U/ F4	0 BAR	25 BAR	20 BAR
ECONOMIZER	SETP U/ F5	0=NO	1=YES	0=NO

SURVEY OF MESSAGE TEXTS

The below picture is an example of placing of message texts on the report and status line.



This section is a survey of possible message texts appearing on the report and status line (on the bottom line in the display). Each message text has a brief description and eventually a reference to other sections.

Gives which compressor type has been selected (SETUP 2/MENU 2).

STOP

The unit has stopped and <CLA> has **not** to be pushed until it can be started. The cause of stop is either that the suction pressure/brine temperature is under the stop limit or that the necessary start signal to the compressor has not been given, unless a cutout message is shown in the upper left corner.

MAN. STOP

The unit has stopped according to a message from the keyboard (<F1> has been pushed) and <CLA> has to be pushed before the compressor can be started again.

ST.P-SUCTION

The compressor has stopped because the suction pressure is below the set point for "P-SUCTION CUTOUT" (set point A/F3).

RELIEVE

The compressor is adjusting capacity downward (unloading) because the suction pressure is below set point for "P-SUCTION RELIEVE" (set point A/F4).

AMPERE

The compressor is adjusting capacity downwards because the power consumption is exceeding the set point for "AMPERE CONSUMP.NORMAL" (set point C/F4).

LIMIT

This message will only appear if the compressor is provided with liquid injection. If the volume ratio is <3.0 and the capacity (C-POS) is exceeding 90% the compressor will adjust down to 90% if the oil temperature exceeds (T-OIL MAX ALARM -5). At the same time the message "LIMIT" will appear in the display.

BYPASS

The compressor is not able to start because the pressure in the oil separator is exceeding the set point for "START PRESSURE" (set point U/F4).

SURVEY OF MESSAGE TEXTS

MINIMUM

At starting up of compressor it will always adjust up to its minimum capacity (set point C/F5) and "MINIMUM" will appear in the display.

RUN

When the compressor is exceeding minimum capacity (mentioned above) the message line will change from "MINIMUM" into "RUN". This message will always be shown in the display during operation unless another message text appears overwriting "RUN".

RESTART

If attempts are made to start the compressor before the restart time (set point A/F2) has expired "RESTART" will appear in the display and the compressor does not start. Can be reset with "Clear alarm", <F6>.

PUMP

This text will appear in the display if the oil pump is only running. Could for instance be during starting up or at manual operation.

START

The text is shown in the picture during start-up. That is to say, from the moment the start signal is given to the compressor motor until feedback from the starter is received. Then MINIMUM is shown.

V+ or V-

If the optimum Vi is higher than that on which the compressor runs, V+ will be shown. At the moment the signal to the solenoid valve arrives V+ flashes twice. If a constant signal is sent to the solenoid valve, V+ will continue to flash.
Correspondingly, V- indicates that the optimum Vi ratio is less than that on which the compressor runs.

C+ or C-

If the suction pressure or brine temperature is over the actual setpoint, C+ will be shown in the display, because the capacity should be increased. At the moment the signal to the solenoid valve arrives, C+ will flash twice. If a constant signal is sent to the solenoid valve, C+ will continue to flash.
Correspondingly, C- indicates that the compressor is adjusting the capacity downwards.

KN

The suction pressure/brine temperature is within the dead band zone (set point B/F2) and there will be no capacity adjustment.

MASTER

Master operation has been selected, see description of types of duty.

SLAVE

Slave operation has been selected, see description of types of duty.

MANUAL

Manual operation has been selected, see description of types of duty.

REMOT4

Remote control operation with external set point, see description of types of duty.

REMOT5

Remote control operation according to own set point, see description of types of duty.

SURVEY OF ALARM AND CUTOUT TEXTS

In case of an alarm or a cutout the text "ALARM" or "CUTOUT" will appear in the top left-hand corner of the display followed by the alarm cause. Here you find a survey of alarm and cutout messages.

CUTOUT FILTERDIF.
Pressure drop over oil filter too high (set point K/F4).
This cutout has a delay of 5 minutes.

CUTOUT HT-OIL
Maximum oil temperature (set point J/F2), measured in the oil manifold, has been exceeded.
This cutout has a delay of 3 minutes.

CUTOUT I-DATA
Transformer factor under set point I/F5 not entered.

CUTOUT LT-OIL
Below minimum temperature in oil separator (set point J/F4).

CUTOUT MOTOR
No feedback from the compressor motor that it is running.

CUTOUT LEVEL
Oil level in oil separator too low.

CUTOUT P-DISCH.
Maximum permissible discharge pressure (set point C/F2) exceeded.

CUTOUT OIL DIFF.
The necessary oil differential pressure entered under set point K/F2 not available. Delay: 3 minutes.
This cutout text will also appear, if the oil differential pressure si < 0 (zero), delay 45 sec during start up.

CUTOUT R-DATA
Refrigerant (set point R/F5) or compressor type (set point R/F2) not entered.

CUTOUT T-DISCH.
Maximum permissible discharge pipe temperature (set point L/F4) exceeded.

CUTOUT EXTERN
IN 7 is OFF, which means that the emergency stop, the safety pressure control KP7ABS or another external fault has stopped the compressor.

CUTOUT VALVE
At starting up of compressor the oil pump is started to press the capacity slide to minimum. If the slide is not in its minimum after 5 minutes the oil pump is stopped, and the text "CUTOUT VALVE" appears in the display.

SURVEY OF ALARM AND CUTOUT TEXTS

CUTOUT POIL-PSUC

If the difference between oil pressure and suction pressure falls to less than 1 bar, the compressor stops after 20 seconds and the message CUTOUT POLIE-PS appears on the alarm line.

ALARM P-DISCH.

Discharge pressure too high (above set point C/F3).

ALARM T-DISCH.

High discharge pipe temperature (above set point L/F5).

ALARM HT-OIL

High oil temperature measured in oil manifold (above set point J/F3).
This alarm has a delay of 3 minutes.

ALARM LT-OIL

Low oil temperature in oil separator (below set point J/F5).

ALARM T-SUCTION

Temperature of suction gas (measured by PT-100 sensor placed in suction valve) too low (below set point L/F3).

ALARM OIL DIFF.

Low oil differential pressure (below set point K/F3).
This alarm has a delay of 2 minutes.

ALARM FILTERDIF.

High pressure drop across oil filter (above set point K/F5).
This alarm has a delay of 30 seconds.