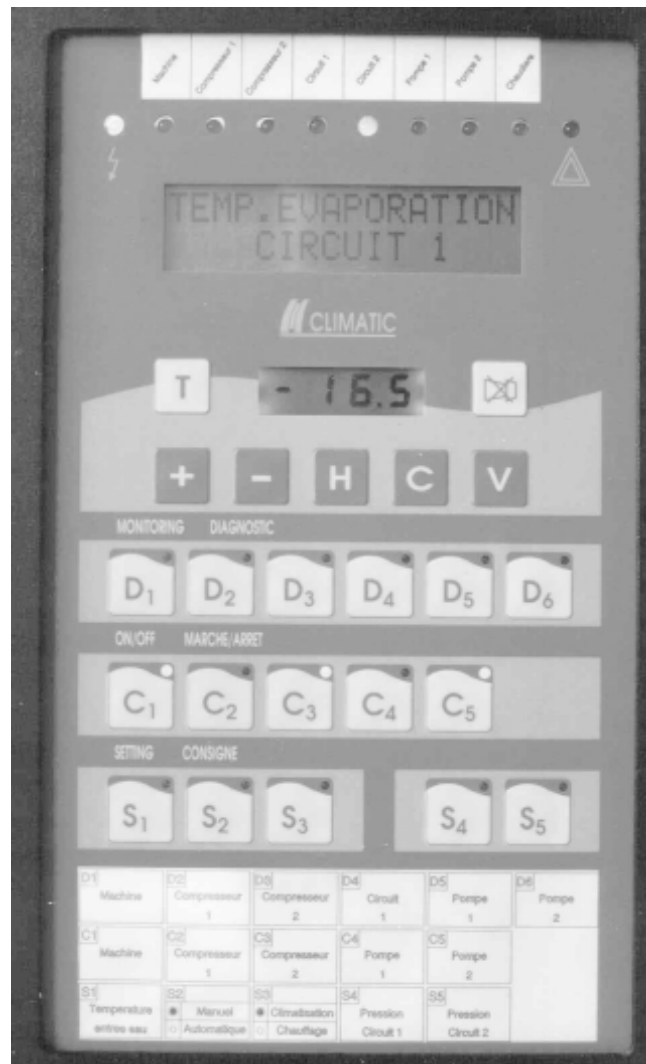
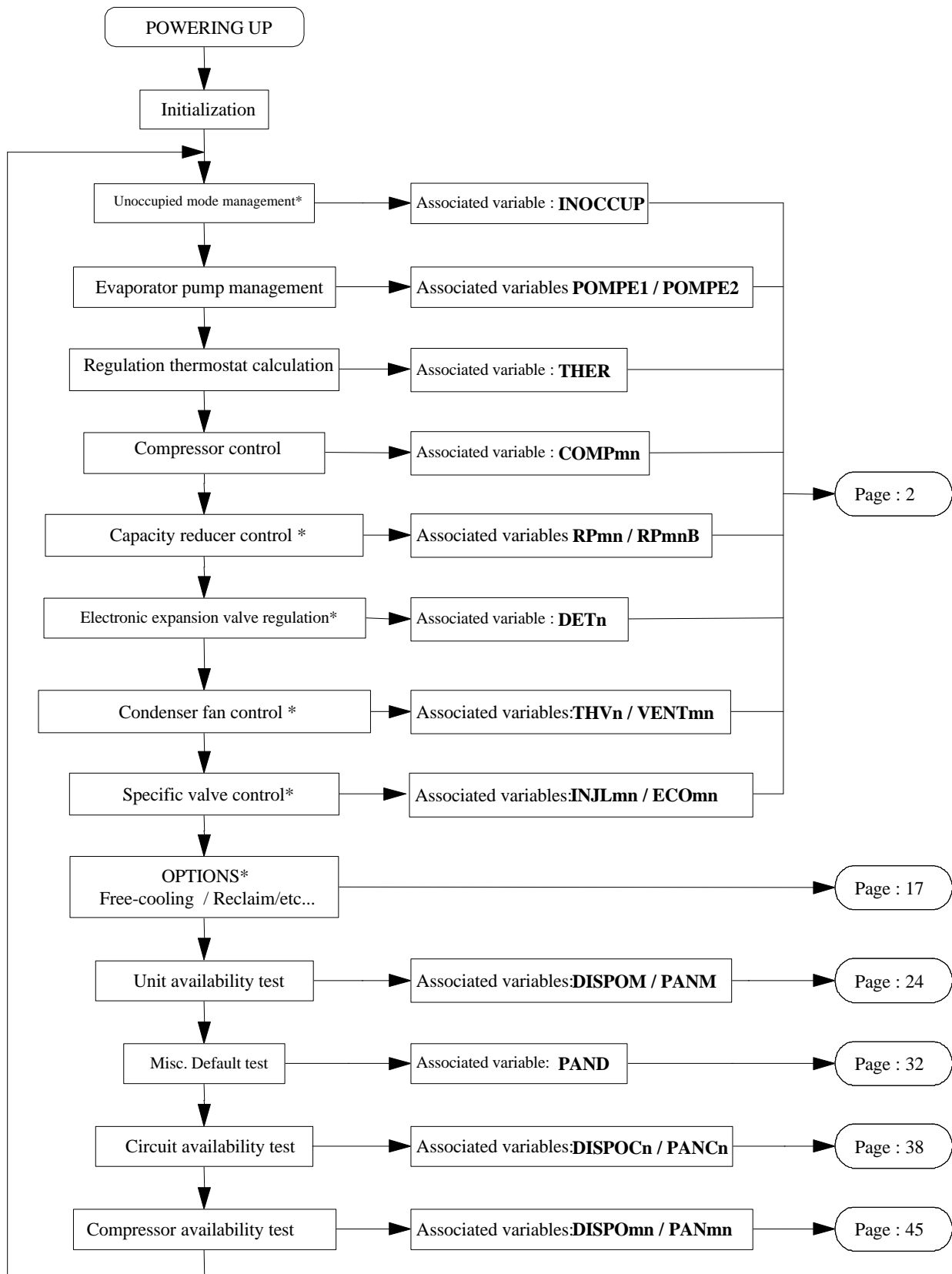


CLIMATIC (V 1.0) USER MANUAL

LIQUID CHILLER

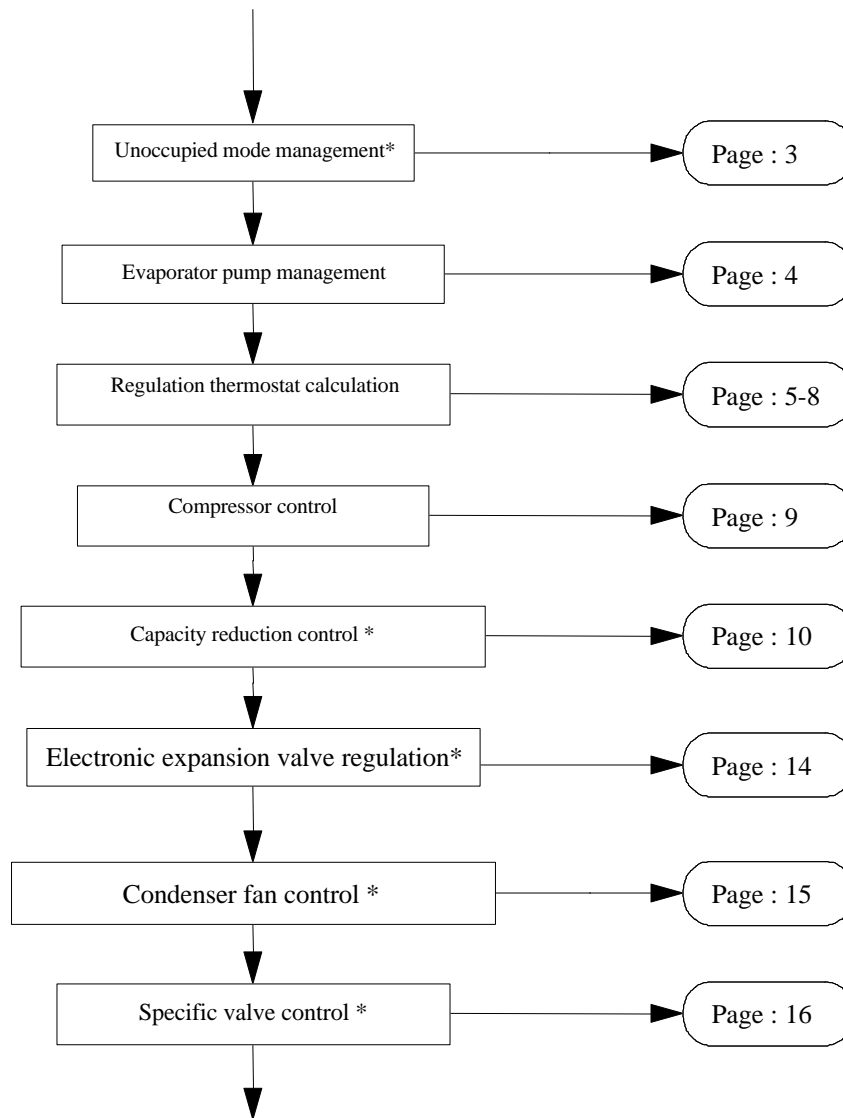


GENERAL CONTROL OF LIQUID CHILLERS



* Only if the unit is so equipped

COMMAND AND CONTROL



* Only if the unit is so equipped

UNOCCUPIED MODE FUNCTION

Function

The unoccupied mode function enables the unit to be shut down during certain hours in the day or certain days of the week. Outside the unoccupied period, the chiller generally controls according to its setpoint.

Description

The unoccupied mode function is defined by 4 setpoints:

| | | |
|---------|---|----------------------------------|
| HDEBUTI | ⇒ | daily unoccupied mode start-time |
| HFINI | ⇒ | daily unoccupied mode end-time |
| JDEBUTI | ⇒ | weekly unoccupied mode start-day |
| JFINI | ⇒ | weekly unoccupied mode end-day |

The JDEBUTI and HDEBUTI terminals are included in the unoccupied period.
By convention, Sunday is the first day of the week.

Optionally, the customer can remote-validate or remote-disable the unoccupied mode function through means of a potential free contact to be connected to an input on the 24EL board (see wiring diagram). The variable associated with this input is MAARI.

| | | |
|-----------|---|---|
| MAARI = 0 | ⇔ | the unoccupied mode clocks are ignored. |
| MAARI = 1 | ⇔ | the unoccupied mode clocks are managed. |

Example:

One wants to stop the unit:

- from Monday to Friday from 7 p.m. until the following morning at 6 a.m.
- on Saturday and Sunday, throughout the day.

☞ In this case, the setpoints should be adjusted as follows :

| | | |
|---------|---|----|
| HDEBUTI | = | 19 |
| HFINI | = | 6 |
| JDEBUTI | = | 7 |
| JFINI | = | 2 |

EVAPORATOR PUMP MANAGEMENT

Function

To ensure the flow of coolant in the evaporator.

Description

Two types of control can be carried out. They are defined by the DEUXPOMPE variable.

❶ DEUXPOMPE = 1 ⇔ the CLIMATIC manages two pumps in normal backup mode.

❷ DEUXPOMPE = 0 ⇔ the CLIMATIC manages one pump or none.

The customer must configure the DEUXPOMPE parameter by shunting or by leaving the corresponding 24EL board input open (see the wiring diagram for location of the shunt).

Case n°1:

☞ The POMPEk pump is in service if all the following conditions are satisfied:

⇒ At least one circuit n On / Off is ON (MAARn = 1).

⇒ The unit remote On / Off is ON (MAARD = 1).

⇒ Unit is not in a unoccupied period (INOCCUP = 0).

⇒ The POMPEk pump has priority (PRIP = k-1).

⇒ The pump has been idle for 1 minute or it is already running.

⇒ There are no power defaults on the pump (ELECPk = 1).

⇒ There are no flow defaults on the pump (SDEBk = 0).

Outdoors air temperature < 2°C
(Freezing-free pump reset option)

The pump priority changes automatically **once a week on Monday at 6 p.m.**

Should a default occur on the pump in service, the control switches automatically to the second pump if the latter is available.

Case n°2:

☞ POMPE1 pump is in service if:

⇒ At least one circuit n On / Off is ON (MAARn = 1).

⇒ The unit remote On / Off is ON (MAARD = 1).

⇒ The unit is not in an unoccupied period (INOCCUP = 0).

⇒ The pump has been idle for 1 minute or it is already running.

⇒ There are no power defaults on the pump (ELECP1 = 1).

⇒ There are no flow defaults on the pump (SDEB1 = 0).

Outdoors air temperature < 2°C
(Freezing-free pump reset option)

POMPE1 is always managed by the CLIMATIC even if, electrically, the installation pump is not controlled by the refrigerating unit.

Should the customer manage his pump, he must comply with the following procedures:

● The pump must be started up 1 minute before validating the unit's remote On / Off.

● The pump must be stopped at least 2 minutes after the remote On / Off has switched to OFF.

Comment: in order to avoid any risk of the evaporator freezing up, the CLIMATIC stops the pumps only 2 minutes after a request for intentional stoppage of the machine or circuits.

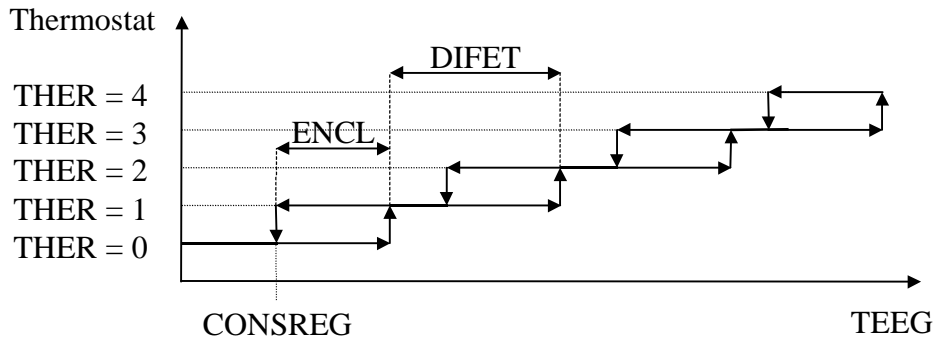
COLD THERMOSTAT

Function

To adjust the temperature of the cooled fluid as close as possible to the setpoint, by adapting the number of compressors in service to the use heat load.

Description

The thermostat controls the start-ups and shutdowns of the compressors. It is calculated according to the chilled water inlet temperature as follows:



☞ Definition of various parameters:

- ENCL ⇒ Operating differential of a stage (°K)
- DIFET ⇒ Differential between stages (°K)
- THER ⇒ Thermostat
- TEEG ⇒ Chilled water inlet temperature
- CONSREG ⇒ CLIMATIC control water outlet setpoint (°C)
This is equal to CONSEA or CONSEB, depending on the state of an input on the 24EL card with which the CHPCONS variable is associated
CHPCONS = 0 ⇒ CONSREG = CONSEA.
CHPCONS = 1 ⇒ CONSREG = CONSEB.
In case of control with PENTE, see control section with cooling load ramp.

☞ Example of control:

CONSREG = 6°C
ENCL = 1,5°C
DIFET = 1,5°C

| THER | Cut-in | THER | Cut-out |
|-----------|--------|-----------|---------|
| 000 ⇒ 001 | 7,5°C | 001 ⇒ 000 | 6°C |
| 001 ⇒ 002 | 9°C | 002 ⇒ 001 | 7,5°C |
| 002 ⇒ 003 | 10,5°C | 003 ⇒ 002 | 9°C |
| 003 ⇒ 004 | 12°C | 004 ⇒ 003 | 10,5°C |

Comment : The thermostat is authorized to increment by one stage only if the following conditions are satisfied:

- ⇒ THER has not been increased for at least **3 minutes**
- ⇒ the chilled water outlet temperature is higher than the setpoint
- ⇒ the number of compressors in service is equal to the thermostat value.

Method for determining ENCL and DIFET

$$DIFET = \frac{DT}{\text{Num.ofCompressors}}$$

DIFET is rounded down to the next half-degree.

$$ENCL = DT - (DIFET \cdot (\text{Num.ofCompressors}))$$

with $\Delta T = TEEG - TSEG$.

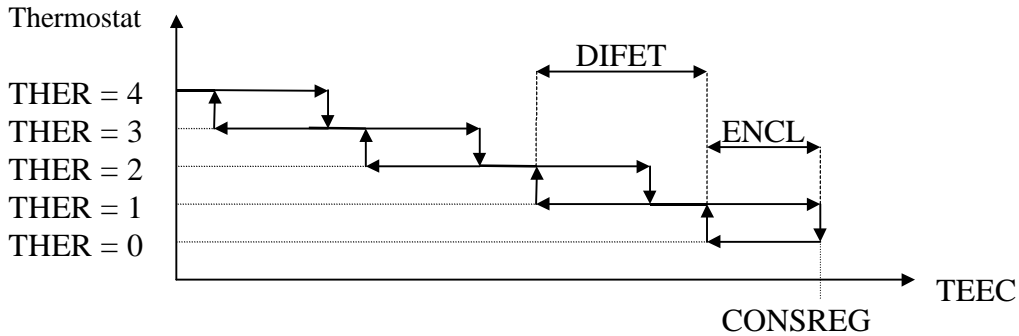
HEAT THERMOSTAT

Function

To adjust the temperature of the heated fluid as close as possible to the setpoint, by adapting the number of compressors in service to the use heat load.

Description

The thermostat controls the start-ups and shutdowns of the compressors. It is calculated according to the hot water inlet temperature as follows:



☞ Definition of various parameters:

ENCL ⇒ Operating differential of a stage (°K)

DIFET ⇒ Differential between stages (°K)

THER ⇒ Thermostat

TEEC ⇒ Hot water inlet temperature

CONSREG ⇒ CLIMATIC control water outlet setpoint (°C)

This is equal to CONSEA or CONSEB depending on the state of an input on the 24 EL card with which the CHPCONS variable is associated.

CHPCONS = 0 ⇒ CONSREG = CONSEA.

CHPCONS = 1 ⇒ CONSREG = CONSEB.

In case of control with PENTE, see control section with cooling load ramp.

☞ Example of control :

CONSREG = 45°C

ENCL = 1,5°C

DIFET = 1,5°C

| THER | Cut-in | THER | Cut-out |
|-----------|--------|-----------|---------|
| 000 ⇒ 001 | 43,5°C | 001 ⇒ 000 | 45°C |
| 001 ⇒ 002 | 42°C | 002 ⇒ 001 | 43,5°C |
| 002 ⇒ 003 | 40,5°C | 003 ⇒ 002 | 42°C |
| 003 ⇒ 004 | 39°C | 004 ⇒ 003 | 40,5°C |

Comment: The thermostat is authorized to increment by one stage only if the following conditions are satisfied:

- ⇒ THER has not been increased for at least **3 minutes**
- ⇒ the hot water outlet temperature is lower than the setpoint
- ⇒ the number of compressors in service is equal to the thermostat value.

Method for determining ENCL and DIFET

$$DIFET = \frac{DT}{\text{Num. of Compressors}}$$

DIFET is rounded down to the next half-degree.

$$ENCL = DT - (DIFET \cdot (\text{Num. of Compressors}))$$

with $\Delta T = TSEC - TEEC$.

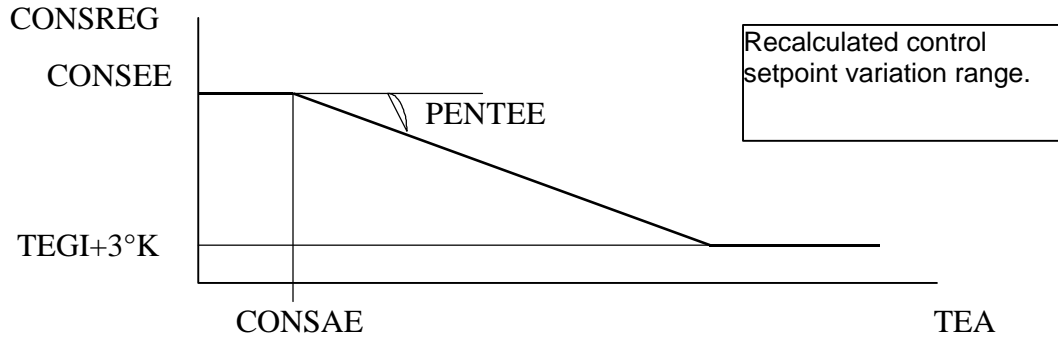
CONTROL WITH COOLING LOAD RAMP

Function

To adapt the control setpoint to the outdoor air temperature, in order to combat heat leakage more efficiently between the area to be cooled and outside ambient conditions.

Description

Calculation of the CONSREG control setpoint is carried out as follows:



☞ Definition of various parameters:

- CONSREG ⇒ Control water setpoint calculated by the CLIMATIC (°C)
- CONSEE ⇒ Maximum water setpoint authorized at evaporator inlet (°C)
- CONSAE ⇒ Beginning of ramp setpoint for start of CONSREG calculation (°C)
- PENTEE ⇒ Control ramp setpoint (%)
- TEGI ⇒ Minimum water setpoint at evaporator (°C)
- TEA ⇒ Outside air temperature (°C)

☞ Example of control:

- CONSEE = 15°C
- CONSAE = 20°C
- PENTEE = 50%

| TEA | CONSREG |
|------|---------|
| 20°C | 15°C |
| 25°C | 12,5°C |
| 30°C | 10°C |
| 35°C | 7,5°C |

Method for determining PENTEE AND CONSREG

$$\text{CONSREG} = \text{CONSEE} - \left(\frac{(\text{TEA} - \text{CONSAE})}{100} \times \text{PENTEE} \right)$$

$$\text{PENTEE} = (\text{CONSEE} - \text{CONSREG}) \times \left(\frac{100}{(\text{TEA} - \text{CONSAE})} \right)$$

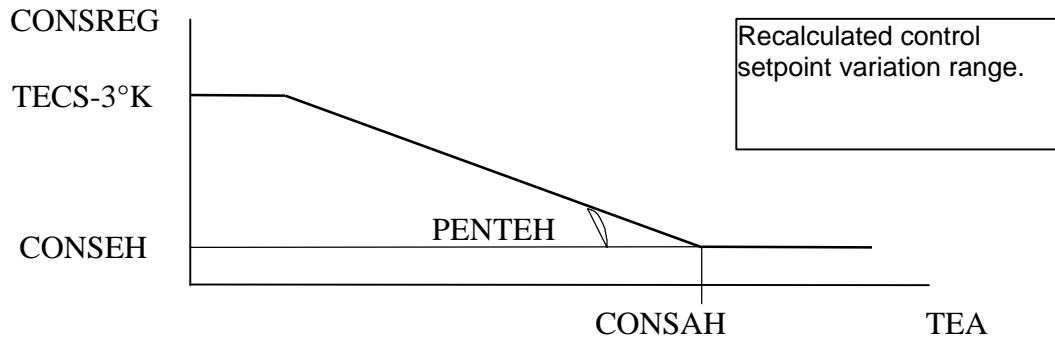
CONTROL WITH HEATING LOAD RAMP

Function

To adapt the control setpoint to the outdoor air temperature in order to combat the heat leakage more efficiently between the area to be heated and outside ambient conditions.

Description

Calculation of the CONSREG control setpoint is carried out as follows:



☞ Definition of various parameters:

- CONSREG ⇒ Control water setpoint calculated by the CLIMATIC (°C)
- CONSEH ⇒ Minimum water setpoint authorized at condenser inlet (°C)
- CONSAH ⇒ Beginning of ramp setpoint for start of CONSREG calculation (°C)
- PENTEHE ⇒ Control ramp setpoint (%)
- TECS ⇒ Maximum water setpoint at condenser (°C)
- TEA ⇒ Outside air temperature (°C)

☞ Example of control :

- CONSEH = 35°C
- CONSAH = 18°C
- PENTEHE = 50%

| TEA | CONSREG | TEA | CONSREG |
|------|---------|-----|---------|
| 18C | 35°C | 0 | 44°C |
| 15°C | 36,5°C | -5 | 46,5°C |
| 10°C | 39°C | -10 | 49°C |
| 5°C | 41,5°C | -15 | 51,5°C |

Method for determining PENTEHE AND CONSREG

$$\text{CONSREG} = \text{CONSEH} + \left(\frac{(\text{CONSAH} - \text{TEA})}{100} \times \text{PENTEHE} \right)$$

$$\text{PENTEHE} = (\text{CONSREG} - \text{CONSEH}) \times \left(\frac{100}{(\text{CONSAH} - \text{TEA})} \right)$$

COMPRESSOR CONTROL

Function

The compressors are started up and stopped in an order which takes account of the the anti-short cycle time delays and equalizes their operating times.

Description

☞ Compressor start up and shutdown order

This order is determined by a "FIFO" law (first in, first out ⇒ first one started up, first one shut down). This function integrates an automatic mode in case of unavailability of a priority compressor. This avoids waiting until the thermostat demands an additional stage before the backup compressor starts up.

☞ Example of control with 4 compressors:

| | | | | | | | | | | | | | | | | | | | |
|--|---|---|--------|-------------|------------------|-------------|------------------|-------------|--------|---|--------|-------------|--------|-------------|------------------|-------------|--------|---|---|
| Value of THER thermostat | 0 | 1 | 2 | 3 | 4 | 3 | 4 | 3 | 2 | 1 | 2 | 3 | 2 | 3 | 4 | 3 | 2 | 1 | 0 |
| Number of compressors to start up | - | 1 | 2 | 3 | 4 | - | 1 | - | - | - | 2 | 3 | - | 4 | 1 | - | - | - | - |
| Number of compressors to shut down | - | - | - | - | - | 1 | - | 2 | 3 | 4 | - | - | 1 | - | - | 2 | 3 | 4 | 1 |
| Numbers of compressors which are to operate | - | 1 | 1 2 | 1 2 3 | 1 2 3 4 | 2 3 4 | 2 3 4 1 | 3 4 1 | 4 1 | 1 | 1 2 | 1 2 3 | 2 3 | 2 3 4 | 2 3 4 1 | 3 4 1 | 4 1 | 1 | - |

☞ Compressor start up and shutdown

The COMPmn compressor starts up if all the following conditions are satisfied:

- ⇒ The evaporator pump has been running for at least 1 minute.
- ⇒ Circuit n On / Off is ON (MAARn = 1).
- ⇒ The machine is available (DISPOM = 1).
- ⇒ Circuit n is available (DISPOCn = 1).
- ⇒ Compressor mn is available (DISPOMn = 1).
- ⇒ The THER control thermostat is greater than the number of compressors in service.
- ⇒ COMPmn is the compressor that the FIFO law defines as being the next one which is to start up.
- ⇒ COMPmn is not in anti-short cycle (ACCmn = 1).

The COMPmn compressor stops if at least one of the following conditions is validated:

- ⇒ The machine remote On / Off is OFF (MAARD = 0).
- ⇒ The circuit n On / Off is OFF (MAARn = 0).
- ⇒ The machine is unavailable (DISPOM = 0).
- ⇒ Circuit n is unavailable (DISPOCn = 0).
- ⇒ Compressor mn is unavailable (DISPOMn = 0).
- ⇒ The THER control thermostat is less than the number of compressors in service and COMPmn is the compressor that the FIFO law defines as being the next one which is to stop.

CAPACITY REDUCTION CONTROL

Function

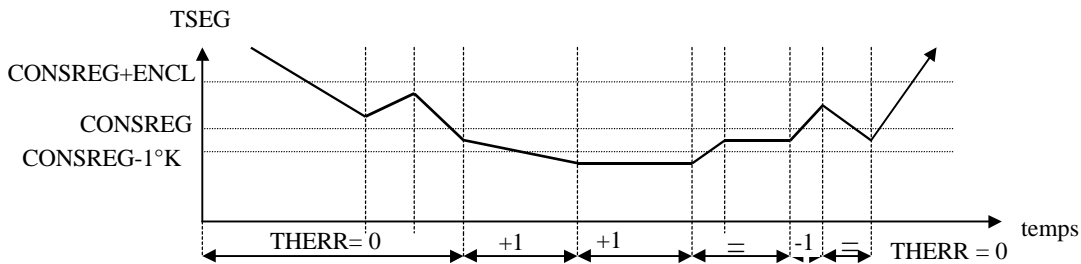
To adjust the water outlet temperature as close as possible to the setpoint by adapting the compressor capacity.

Description

① Machines equipped with reciprocating semi-hermetic compressor units

a - Control on cold

The number of compressors which must operate in capacity reduction is defined by the THERR thermostat. This is calculated as follows:



Description of the different parameters :

CONSREG ⇒ Control set point

THERR ⇒ Capacity reduction thermostat

TSEG ⇒ Chilled water outlet temperature

ENCL ⇒ Differential of capacity step operation

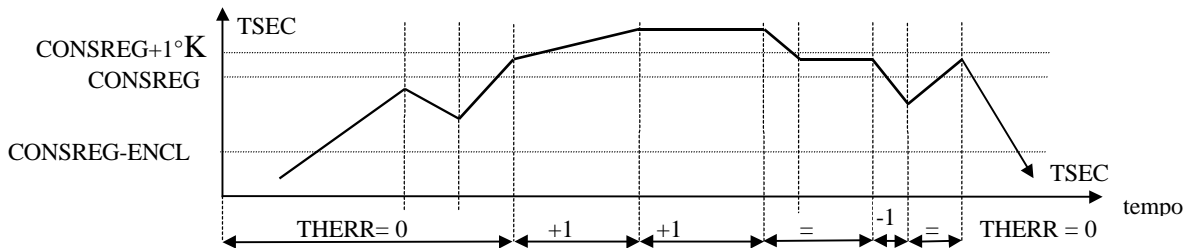
☞ As soon as TSEG is less than the control setpoint minus 1°C, a capacity reduction is activated. As long as the condition on TSEG is confirmed, an additional capacity reduction is activated (if there is one) every 6 minutes.

☞ As soon as TSEG is greater than the control setpoint, a capacity reduction is cut out. As long as the condition on TSEG is confirmed, a capacity reduction stage is deactivated every 6 minutes.

☞ As soon as TSEG is greater than the control setpoint plus one cut-in (ENCL), all the capacity reductions are deactivated.

b - Control on heat

The number of compressors which must operate in capacity reduction is defined by the THERR thermostat. This is calculated as follows :



Description of the different parameters :

CONSREG ⇒ Control set point

THERR ⇒ Capacity reduction thermostat

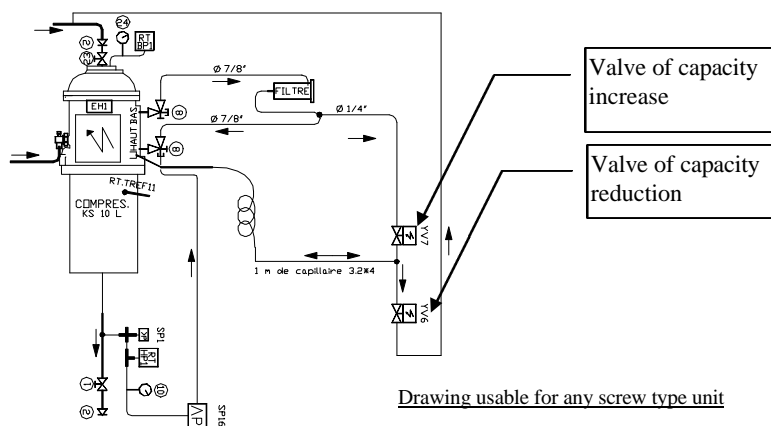
TSEC ⇒ Hot water outlet temperature

ENCL ⇒ Differential of capacity step operation

CAPACITY REDUCTION CONTROL (CONT.)

- ☞ As soon as TSEC is greater than the control setpoint plus 1°C, a capacity reduction is supplied. As long as the condition on TSEC is confirmed, an additional capacity reduction stage is activated (if there is one) every 6 minutes.
- ☞ As soon as TSEC is less than the control setpoint, a capacity reduction stage is deactivated. As long as the condition on TSEC is confirmed, one capacity reduction stage is deactivated every 6 minutes.
- ☞ As soon as TSEC is less than the control setpoint minus one cut-in (ENCL), all the capacity reductions are deactivated.

② Machines equipped with screw compressors (except MODUVIS)



a - Control principle

The compressor capacity reduction is controlled by an Proportional Integral Control law.

☞ Proportional function

The more the difference in absolute value between the chilled water outlet temperature and the setpoint increases, the greater the amplitude of the action on the capacity control spool. (Raising or lowering of the spool according to the temperature difference sign)

The proportional law can be adjusted via setpoint KPRP (magnitude of action). The higher KPRP is, the greater the action on the spool.

☞ Integral function

The more quickly the difference in absolute value between the chilled water outlet temperature and the setpoint increases, the more frequent are the actions on the capacity control spool.

The integral law can be adjusted via setpoint TIRP (frequency of action). The higher TIRP is, the shorter the time between two actions.

Comment: In order to avoid risks of instability, it is recommended that KPRP and TIRP not be increased at the same time.

CAPACITY REDUCTION CONTROL (CONT.)

b - Action on the spool's control solenoid valves

The **RPmn** actuator enables selection of the solenoid valve for raising or lowering the spool.

☞ Control on cold

If TSEG is greater than the control setpoint:

RPmn = 0 ⇔ capacity increase position.

If TSEG is less than the control setpoint:

RPmn = 1 ⇔ capacity reduction position.

☞ Control on heat

If TSEC is less than the control setpoint:

RPmn = 0 ⇔ capacity increase position.

If TSEC is greater than the control setpoint:

RPmn = 1 ⇔ capacity reduction position.

The **RPmnB** actuator controls the supply of the capacity control valves according to the PI control.

If RPmnB = 0, no valve is supplied.

If RPmnB = 1, the valve selected by RPmn is supplied.

Comments:

At start up, all semi-hermetic compressors (screw or reciprocating type) are maintained in capacity reduction for 1 minute.

On a machine including several screw compressors and a single heat-exchanger, capacity control is authorized for only a single compressor at a time.

⊗ **MODUVIS**

MODUVIS units are equipped with one plate-type evaporator per circuit. Each compressor modulates its capacity according to the water outlet temperature of its TSEGN circuit. It is therefore possible for several compressors to be in capacity control at the same time on the same machine.

The **RPmn** actuator enables the capacity control spool to be raised or lowered.

☞ Control on cold

If TSEGN remains lower than the control setpoint for more than 14 seconds:

RPmn = 1 ⇔ capacity reduction position.

If TSEGN is greater than the control setpoint for more than 14 seconds:

RPmn = 0 ⇔ capacity increase position.

CAPACITY REDUCTION CONTROL (CONT.)

☞ Control on heat

If TSECn remains greater than the control setpoint for more than 14 seconds:

RPmn = 1 ⇔ capacity reduction position.

If TSECn is less than the control setpoint for more than 14 seconds:

RPmn = 0 ⇔ capacity increase position.

The **RPmnB** actuator controls the supply of the valve selected by RPmn.

RPmnB = 1 . as soon as RPmn = 1 for at least 10 seconds

. and as long as RPmn = 1

or

. as soon as RPmn = 0 for at least 10 seconds

. and as long as RPmn = 0

⇔ the valve selected
by RPmn is supplied.

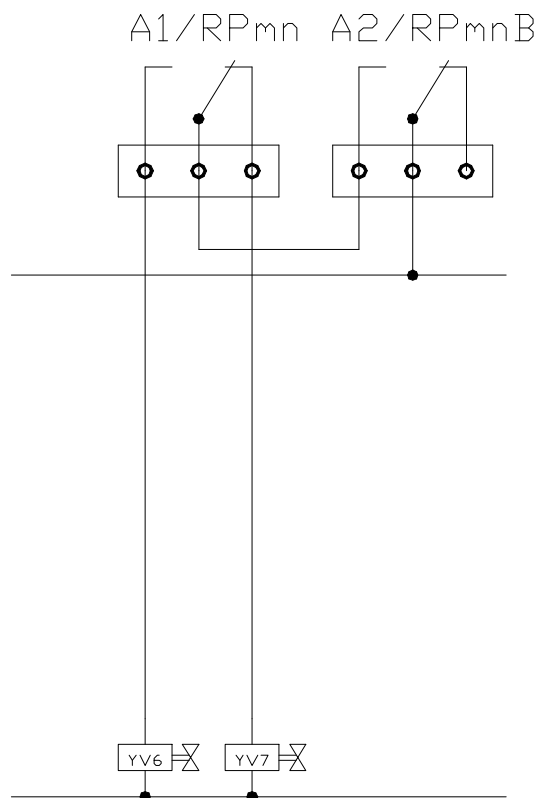
In other cases, RPmnB = 0

⇔ no valve is supplied.

Comment:

At start up, the compressors are maintained in capacity reduction for 1 minute.

Wiring diagram for capacity reduction control of screw compressors.



ELECTRONIC EXPANSION VALVE CONTROL

Function

To control the proper filling of refrigerant in the evaporator in order to obtain its best efficiency, whilst protecting the compressor from slugging.

Description

The expansion valve is controlled by an Proportional Integral Control law. This PI law culminates in the calculation of the RDETA_n ideal theoretical opening of the circuit n expansion valve.

☞ Proportional function

The more the difference between the measured superheat and the SURCHD superheat setpoint increases, the higher the added or subtracted value (depending on the sign of the difference) at RDETA_n.

The proportional law can be adjusted via setpoint KP (magnitude of action). The higher KP is, the greater the amplitude of the action.

☞ Integral function

The more quickly the difference between the measured superheat and the setpoint increases, the more frequently RDETA_n is increased or decreased.

The integral law can be adjusted via setpoint TI (frequency of action). The greater TI is, the shorter the time between two successive actions on RDETA_n.

Comment: In order to avoid risks of instability, it is recommended that KP and TI not be increased at the same time.

When RDETA_n is calculated, its value is compared to that of the opening of the RDETA_n measured expansion valve:

- ⇒ If RDETA_n > RDETA_n, the expansion valve must be heated (DETA_n=1) so that it opens to the required opening.
- ⇒ If RDETA_n < RDETA_n, the expansion valve is not heated (DETA_n=0) so that it closes.
- ⇒ If RDETA_n = RDETA_n, the expansion valve is maintained at its present opening value through means of alternating start ups and stoppages of the heating.

Before the start up of the first compressor in the circuit, the expansion valve opening is calculated depending on the low pressure in the circuit, enabling any risk of slugging when the compressor starts up to be avoided.

CONDENSER FAN CONTROL

Function

To maintain a condensation pressure as stable as possible without the fans cycling too often.

Description

The CLIMATIC calculates the number of THVn ventilation stages necessary for the proper operation of each refrigerating circuit.

THVn depends on the following parameters:

- ⇒ the condensation pressure of the PTHPn circuit n read by the sensor in bars
- ⇒ the TEA outdoor air temperature
- ⇒ the time

- ⇒ and three setpoints

| | |
|--------|---|
| HPHAUT | : high pressure limit (absolute bars) |
| HPBAS | : low pressure limit (absolute bars) |
| TEMPOV | : time-delay for raising or lowering of one ventilation stage (1U= 1 second). |

(HPHAUT-HPBAS=5 bars minimum)

☞ Starting up the fans

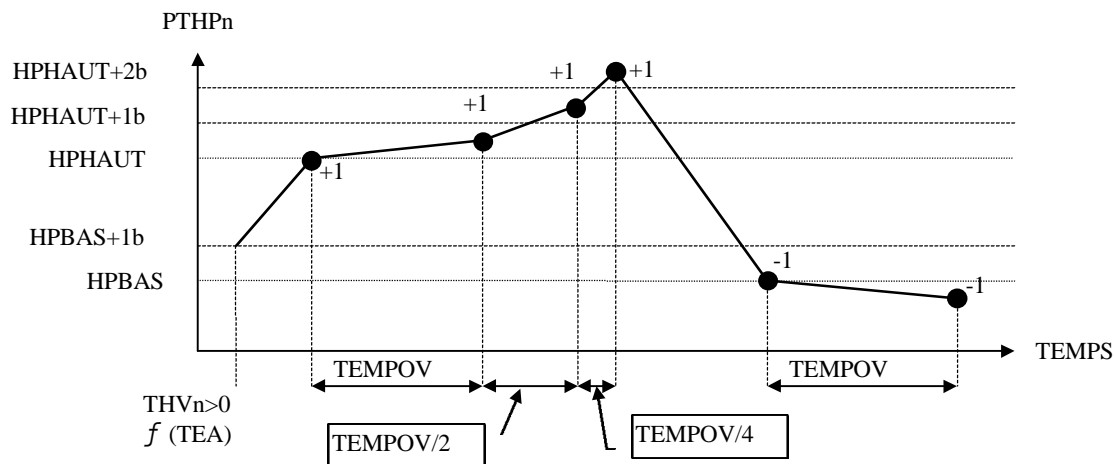
At start up of the first compressor in the circuit, as soon as the high pressure becomes greater than HPBAS+1 bar, activates a number of fans N. N depends on the outdoor air temperature.

If PTHPn exceeds HPHAUT, the thermostat is increased by one stage. If the pressure stays above HPHAUT, THVn continues to be increased by one unit every time:

- ⇒ TEMPOV if $HPHAUT < PTHPn = HPHAUT+1bar$
 - ⇒ TEMPOV/2 if $HPHAUT+1bar < PTHPn = HPHAUT+2bars$
 - ⇒ TEMPOV/4 if $PTHPn > HPHAUT+2bars$.
- Fan m in circuit n operates (VENTmn = 1) if $THVn \geq m$.

☞ Stopping the fans

As soon as PTHPn becomes lower than HPBAS, THVn is reduced by one stage. As long as PTHPn stays below HPBAS, THVn continues to be decremented by 1 every TEMPOV.



☞ Comment: when the capacity reduction of one ventilation stage involves a two-speed fan, switching from high to low speed is time-delayed by 5 seconds.

VALVES SPECIFIC TO SCREW COMPRESSORS

Liquid injection valve with intermediate suction

Function

To lower the compressor discharge temperature.

Description

The **INJLmn** liquid injection valve is open if:

- the **COMPmn** compressor is running
- and ● **TREFmn** discharge temperature is higher than 101°C (242U).

INJLmn is maintained open as long as:

- the **COMPmn** compressor is running
- and ● **TREFmn** discharge temperature is higher than 91°C (236U).

ECONOMIZER VALVE

Function

To increase refrigeration output by increasing the liquid subcooling in the circuit.

The **ECOMn** economizer valve is open if:

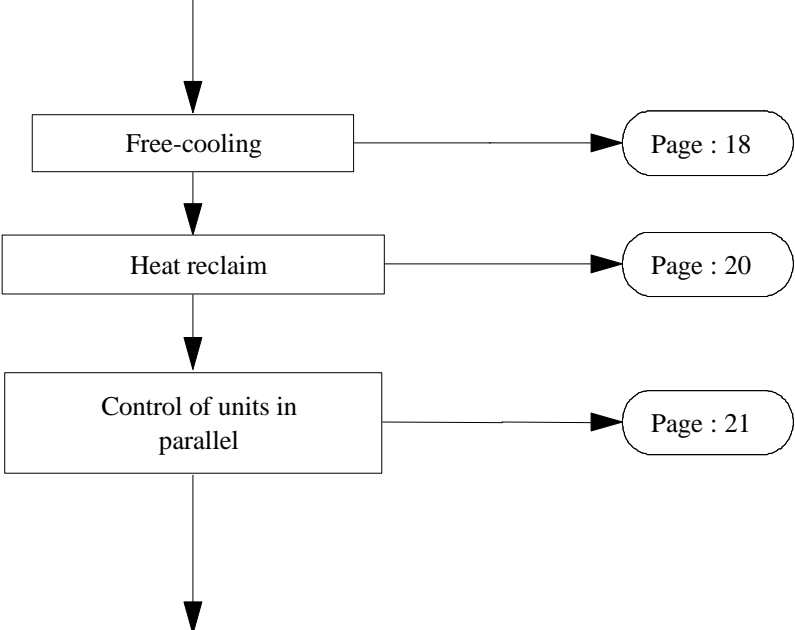
- the **COMPmn** compressor is running and has been under full capacity for 2 minutes
- and ● **TREFmn** discharge temperature is higher than θ
- and ● the high pressure in **PTHPn** circuit n is greater than P1.

ECOMn is maintained open as long as:

- the **COMPmn** compressor is running and under full capacity
- and ● **TREFmn** discharge temperature is greater ($\theta - 2^\circ\text{C}$)
- and ● the high pressure in **PTHPn** circuit n is greater than P2.

| | θ (°C) | P1 (absolute bars) | P2 (absolute bars) |
|-------|---------------|--------------------|--------------------|
| R22 | 65 | 11.9 | 11.2 |
| R134a | 40 | 7.7 | 6.7 |
| R407C | 45 | 13.5 | 11.7 |

OPTIONS



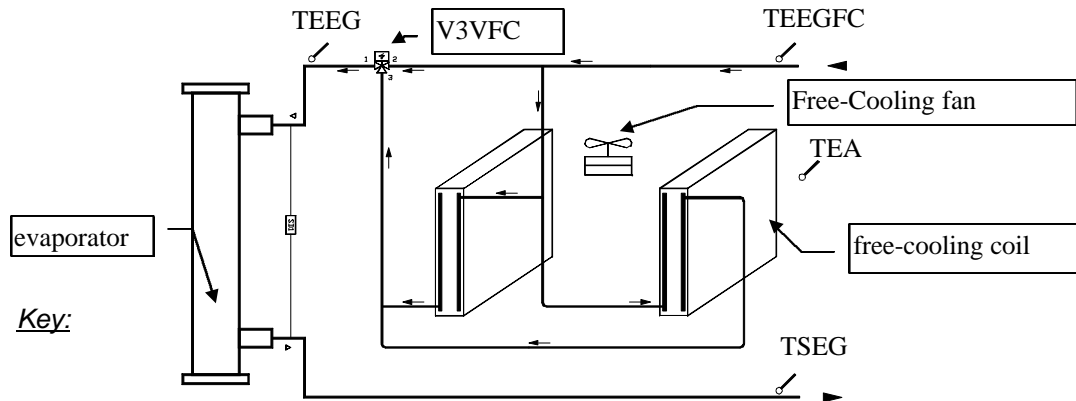
FREE-COOLING

Function

To ensure refrigeration output by optimizing the use of free-cooling, thus keeping electricity consumption to a minimum.

Description

Free-cooling functional diagram



Key:

- TEEGFC ⇨ chilled water inlet temperature at free-cooling
- TEEG ⇨ chilled water inlet temperature at evaporator
- TSEG ⇨ chilled water outlet temperature
- TEA ⇨ temperature of outside air
- V3VFC ⇨ free-cooling three-way valve

Control of free-cooling three-way valves:

V3VFC is supplied if all the following conditions are satisfied:

- ⇨ TEEGFC is greater than the control setpoint.
- ⇨ $TEA < TEEGFC - 2^{\circ}K$.
- ⇨ The pump has been running for at least 30 seconds.
- ⇨ The three-way valve has remained idle for 3 minutes.
- ⇨ The free-cooling water inlet sensor is not defective.

V3VFC is supplied as long as all the following conditions are satisfied:

- ⇨ TEEGFC is not lower than the control setpoint.
- ⇨ $TEA < TEEGFC$.
- ⇨ The pump is running.
- ⇨ The free-cooling water inlet sensor is not defective.

Control of free-cooling fans

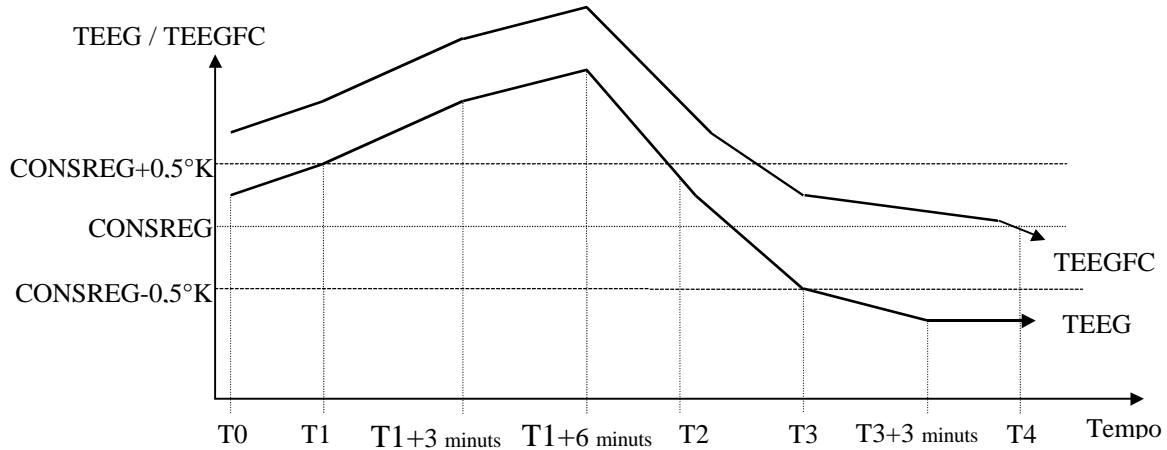
The number of ventilation stages necessary on the coils is determined by the THERFC free-cooling thermostat. This parameter depends on the water inlet temperature at the TEEG evaporator and on the setpoint control. The thermostat is increased by one stage if TEEG remains greater than the setpoint ($CONSREG + 0.5^{\circ}C$) for more than three minutes. As long as this condition on TEEG is confirmed, THERFC continues to be increased by one stage every three minutes.

FREE-COOLING (CONT.)

If TEEG remains lower than (CONSREG-0.5°C), the free-cooling thermostat is decreased by one stage every 3 minutes.

When TEEGFC drops below the setpoint, all ventilation stages are stopped.

If the THER compressor control thermostat demands at least one control stage while the free-cooling is in service, the free-cooling thermostat is forced to its maximum.



Description of different parameters:

- CONSREG ⇒ Control set point
- TEEG ⇒ Chilled water inlet temperature
- TEEGFC ⇒ Free-cooling Chilled water inlet temperature

| | |
|------------------------------|-----------------------|
| To T0 and T1 : | THERFC stays the same |
| To T1+3 minuts & T1+6 minuts | THERFC=THERFC+1 |
| to T2 & T3 : | THERFC stays the same |
| To T3 +3 minuti | THERFC=THERFC-1 |
| to T4 | THERFC=0 |

☞ Authorization for compressor start up

Authorization for compressor start up, at the same time as the free-cooling operation, is characterized by the **AUTOCP** variable.

AUTOCP depends on the following parameters:

- ⇒ the V3VFC free-cooling three-way valve
- ⇒ the THERFC free-cooling control thermostat
- ⇒ the THER compressor control thermostat
- ⇒ and the time.

AUTOCP switches to 1 if:

- THERFC is at its maximum and TEEG has been greater than CONSREG for more than **3 minutes**
- or ● V3VFC is not supplied.

AUTOCP is maintained on 1 as long as:

- THER is strictly positive
- or ● V3VFC is not supplied.

CONTROL OF UNITS IN PARALLEL

Function

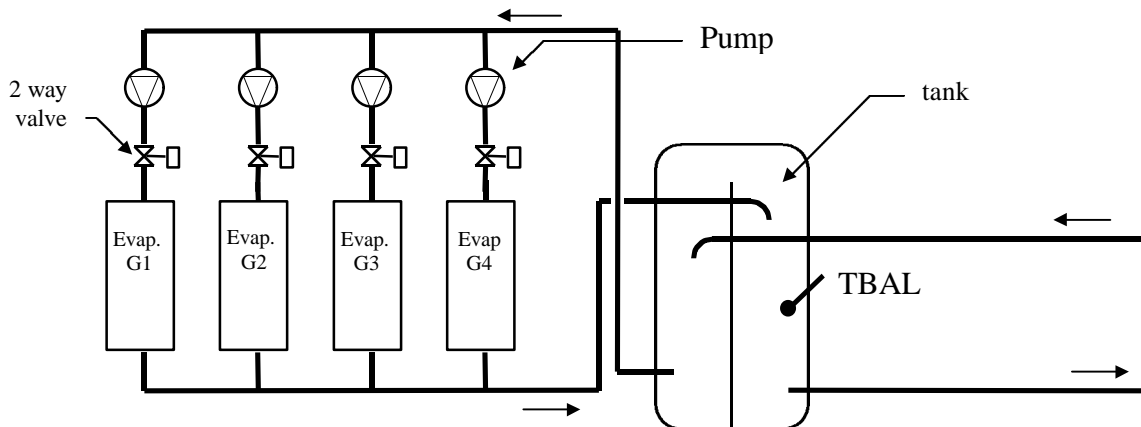
To ensure staging of the units among themselves in order to adjust the temperature of the cooled fluid as close as possible to the setpoint.

Description

① Control with an additional board (recommended configuration)

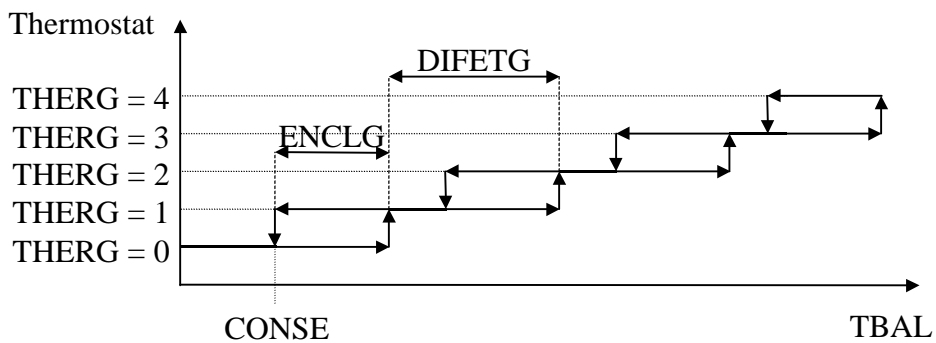
The dialogue between boards is carried out only via potential free contacts without linking. The board ensuring general control of the units is numbered 6.

a - Hydraulic functional diagram



b - Unit thermostat

The thermostat controls the start-ups and shutdowns of the units. It is calculated according to the temperature of chilled water in the tank as follows:



- ENCLG ⇒ Operating differential of one stage (°K)
- DIFETG ⇒ Differential between stages (°K)
- THERG ⇒ Unit thermostat
- TBAL ⇒ Temperature of chilled water in the tank
- CONSEG ⇒ Control water setpoint of unit (°C)

The THERG thermostat is limited by the **NBRG** setpoint (number of units in parallel (min. 2 max. 7))

CONTROL OF UNITS IN PARALLEL

☞ Example of control:

CONSEG = 6°C
 ENCLG = 1,5°C
 DIFETG = 1,5°C

| THERG | Cut-in | THERG | Cut out |
|-----------|--------|-----------|---------|
| 000 ⇔ 001 | 7,5°C | 001 ⇔ 000 | 6°C |
| 001 ⇔ 002 | 9°C | 002 ⇔ 001 | 7,5°C |
| 002 ⇔ 003 | 10,5°C | 003 ⇔ 002 | 9°C |
| 003 ⇔ 004 | 12°C | 004 ⇔ 003 | 10,5°C |

Comment:

The thermostat is authorized to increase by one stage only if it has not been increased for a minimum length of time, adjustable at **TP THERM** setpoint

THERG is authorized to decrement by one stage only if it has not been decreased for at least one time, adjustable at **TP THERD** setpoint

c - Control of evaporator isolating valves in each unit

The control board issues the order for opening valve n (**V2Vn=1**) if the THERG control thermostat demands the operation of unit n.

d - Authorization for units to operate

The control board authorizes the start up of unit n (**MAARGn=1**) according to the THERG control thermostat value and after the lapse of an adjustable time-delay, **TPV2V**, which is activated as soon as the command is sent to open 2 way valve n.

The potential free contact representing the operating authorization for unit n is to be wired to the input of the remote On/Off on the 24EL board of unit n.

e - Management of unit defaults and relè

Each unit sends an availability state back to the general control board.

Depending on the state of availability of all the units, the control board determines an optimum order of priority (machines without defaults are given top priority).

If all units are available, priority changes **automatically once a week, Monday at 6 p.m.**

f - Control of each unit

Each unit controls its own compressors according to its setpoint (see “cold thermostat” section). The setpoints of each unit must all be set on the same value as the setpoint of the general control board. Each unit manages its chilled water pump.

| Priority | Startup order |
|----------|---------------|
| 0 | 1 2 3 4 |
| 1 | 4 1 2 3 |
| 2 | 3 4 1 2 |
| 3 | 2 3 4 1 |

CONTROL OF UNITS IN PARALLEL

g - Alarm

If the tank temperature sensor is defective, all V2Vn valves are opened, and after the TPV2V time-delay, and all units are authorised to operate. Each unit will control independently.
The remote default return is time-delayed by 6 minutes.

② Control with an inter-board link

Dialogue between boards is carried out only via the linking. The board ensuring general control is the one for unit 1, numbered 0.

Control principle

The unit with board 0 sends the **VCONSE** control setpoint to the other units, as well as the **PRIG** priority order; this enables machine operating time to be equalized.

Priority changes **automatically once a week, Monday at 6 p.m.**

Setpoint VCONSE is equal to the control setpoint of unit 1.

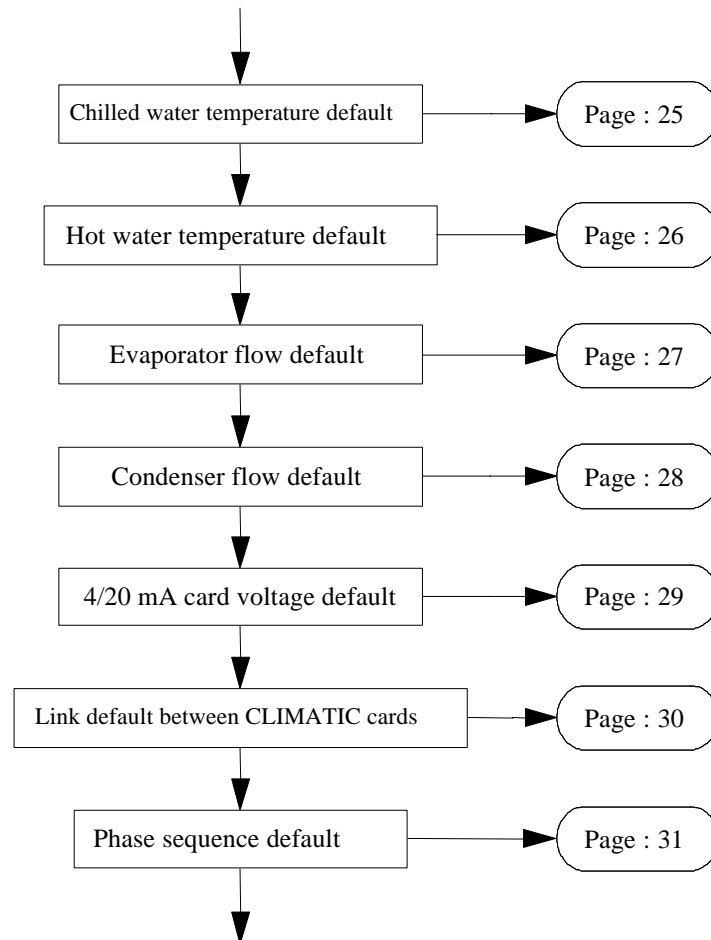
Each unit has a **DIFETG** setpoint which enables the setpoint to be offset according to start up priority (see table below).

In case of default, the relève of the units is not managed.

If a machine has lost the link with unit 0, it controls on its setpoint independently of the other units. If board 0 is absent from the linking, then all the units control independently on their own setpoint.

| Setpoint offset according to PRIG | | | | |
|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| PRIG | Unit 1 | Unit 2 | Unit 3 | Unit 4 |
| 0 | VCONSE | VCONSE+DIFETFG | VCONSE+ (2 X DIFETFG) | VCONSE+ (3 X DIFETFG) |
| 1 | VCONSE+DIFETFG | VCONSE+ (2 X DIFETFG) | VCONSE+ (3 X DIFETFG) | VCONSE |
| 2 | VCONSE+ (2 X DIFETFG) | VCONSE+ (3 X DIFETFG) | VCONSE | VCONSE+DIFETFG |
| 3 | VCONSE+ (3 X DIFETFG) | VCONSE | VCONSE+DIFETFG | VCONSE+ (2 X DIFETFG) |

MACHINE AVAILABILITY TEST



CHILLED WATER SENSOR DEFAULT

Type of default: Machine incident

Incident code: 001

Variable: PANM

Description

The chilled water inlet or outlet temperature measured by the sensor is outside the authorized range:

$TEEG < TEGI$ or $TEEG > 65^{\circ}\text{C}$

$TSEG < TEGI$ or $TSEG > 65^{\circ}\text{C}$

With:

TEEG ⇨ chilled water inlet temperature

TSEG ⇨ chilled water outlet temperature

TEGI ⇨ minimum temperature of water at evaporator

Action

- ☞ Immediate shutdown of the machine.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Automatic reset of default as soon as the water temperature measured by the sensor returns to the normal operating range:

$TEEG > TEGI+2^{\circ}\text{C}$ and $TEEG < 60^{\circ}\text{C}$

$TSEG > TEGI+2^{\circ}\text{C}$ and $TSEG < 60^{\circ}\text{C}$

Diagnosis help

Defective chilled water inlet or outlet sensor.
Faulty wiring or disconnection of sensor.

Return to normal

Replace the sensor.
Check the sensor connection.

HOT WATER SENSOR DEFAULT

Type of default: Machine incident

Incident code: 002

Variable: PANM

Description

The hot water inlet temperature measured by the sensor is outside the authorized range:

TEEC <-27°C or TEEC> TECS

With:

TEEC ⇨ hot water inlet temperature

TECS ⇨ maximum temperature of water at condenser

Action

- ☞ Immediate shutdown of the machine.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Automatic reset of default as soon as the water temperature measured by the sensor returns to the normal operating range:

TEEC > -27°C and TEEC < TECS-5°C

Diagnosis help

Defective hot water inlet sensor.
Faulty wiring or disconnection of sensor.

Return to normal

Replace the sensor.
Check the sensor connection.

EVAPORATOR FLOW DEFAULT

| | | |
|---|---|-----------------------|
| Type of default: Machine incident | Incident code: 003 | Variable: PANM |
| Description | <p>The pump supplying the evaporator has had the order to operate since 20 seconds. The “flow switch” (FSE) detects insufficient flow in the evaporator.</p> | |
| Action | <p>If the default lasts more than 3 seconds:</p> <ul style="list-style-type: none"> ☞ Immediate shutdown of the machine. ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes <p>If the default lasts more than 20 seconds:</p> <ul style="list-style-type: none"> ☞ Immediate shutdown of the pump in service. ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes. | |
| Reset | Manual reset ⇒ simultaneously press the + - V keys on the display unit | |
| <p>❶ The unit is not controlling any pump (DEUXPOMPE=0): The machine restarts automatically 20 seconds after the flow is reestablished. (The CLIMATIC detects that it is not controlling any pumps if POMPE1 = 0 and FSE = 1).</p> <p>❷ The unit is controlling one pump (DEUXPOMPE=0): If the default has lasted less than 20 seconds, the machine restarts automatically 20 seconds after the flow is reestablished. If the default has lasted more than 20 seconds, the machine can restart only after a manual reset.</p> <p>❸ The unit is controlling two pumps (DEUXPOMPE=1): If the default has lasted less than 20 seconds, the machine restarts automatically 20 seconds after the flow is reestablished. If the default has lasted more than 20 seconds, the CLIMATIC orders the second pump to restart (if it is available). If the flow is reestablished within 20 seconds, the machine restarts automatically. Otherwise, the unit can return to service only after a manual reset.</p> <p><u>With:</u> DEUXPOMPE ⇒ choice of pump number (OFF = 0 or 1 pump, ON = 2 pumps)</p> | | |
| Diagnosis help | Return to normal | |
| <p>Faulty wiring of pump control. Faulty wiring of flow controller. Water filter clogged up. Faulty adjustment of flow controller.</p> | <p>Check the pump connection. Check the flow controller connection. Clean the water filter. Adjust the flow controller.</p> | |

CONDENSER FLOW DEFAULT

Type of default: Machine incident

Incident code: 004

Variable: PANM

Description

“Flow switch” (FSC) detects an insufficient flow in the condenser.

Action

If the default lasts more than **3 seconds**:

- ☞ Immediate shutdown of the machine.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the keys on the display unit

The machine restarts **automatically** 20 seconds after the flow is reestablished.

Diagnosis help

Faulty wiring of pump control.
 Faulty wiring of flow controller.
 Water filter clogged up.
 Faulty adjustment of flow controller.

Return to normal

Check pump connection.
 Check flow controller connection.
 Clean water filter.
 Adjust flow controller.

POWER DEFAULT ON 4/20MA BOARD

Type of default: Machine incident

Incident code: 007

Variable: PANM

Description

One of the 4/20mA interface boards is not electrically supplied for more than **5 seconds** (PT420MA= 0).

Action

- ☞ Immediate shutdown of the machine.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Automatic reset of default 2 minutes after supply for all boards is reestablished.

Diagnosis help

Faulty wiring or disconnection of power supply.
 Faulty wiring of voltage presence contact.
 Melting of board fuse.

Return to normal

Check power supply connection.
 Check voltage presence contact. connection
 If necessary, check or replace the fuse (100mA).

LINK DEFAULT BETWEEN CLIMATIC BOARDS

Type of default: Machine incident

Incident code: 008

Variable: PANM

Description

The link between the CLIMATIC 0 board (master) and one or more other boards is interrupted for more than **15 seconds**.

The PRECAR variable (address 165), whose value depends on the number of boards present, shows a link default.

Each board is identified by a specific value :

| | |
|---------------------|----------------------|
| Card 0 (master) ⇒ 1 | Card 4 (slave) ⇒ 16 |
| Card 1 (slave) ⇒ 2 | Card 5 (slave) ⇒ 32 |
| Card 2 (slave) ⇒ 4 | Card 6 (slave) ⇒ 64 |
| Card 3 (slave) ⇒ 8 | Card 7 (slave) ⇒ 128 |

If the three-wire link connects boards 0, 1, 2 and 3, the value of PRECAR must be equal to 15 (addition of values). If the value is only equal to 7, this means that board 3 is not detected.

Action

☞ Immediate shutdown of the machine and resetting of boards (**3 attempts**).

☞ The default is shown on the display unit.

☞ The remote default return is time-delayed by 6 minutes.

After **3 attempts** to reinitialize the boards, only the boards still in connection with board 0 continue to operate.

Reset

Automatic reset of default, 3 minutes after the link between all the boards is reestablished.

Diagnosis help

Faulty wiring of link between boards.
Lack of voltage on one of the boards.
Faulty positioning of jumpers G6, G7.

Return to normal

Check connection of link between boards.
Check electric power-supply of boards.
Check position of jumpers (see wiring diagram).

PHASE SEQUENCE DEFAULT

Type of default: Machine incident

Incident code: 009

Variable: PANM

Description

The phase controller is tripped (PHASE = 0).
It detects a reversal or faulty phase connection.

Action

- ☞ Immediate shutdown of the machine.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the keys on the display unit

The machine can restart only after a **manual** reset and disappearance of the default.

Comment: When powered down, the incident is not memorized. Therefore, when powered back up, the unit restarts **automatically** if the default has disappeared.

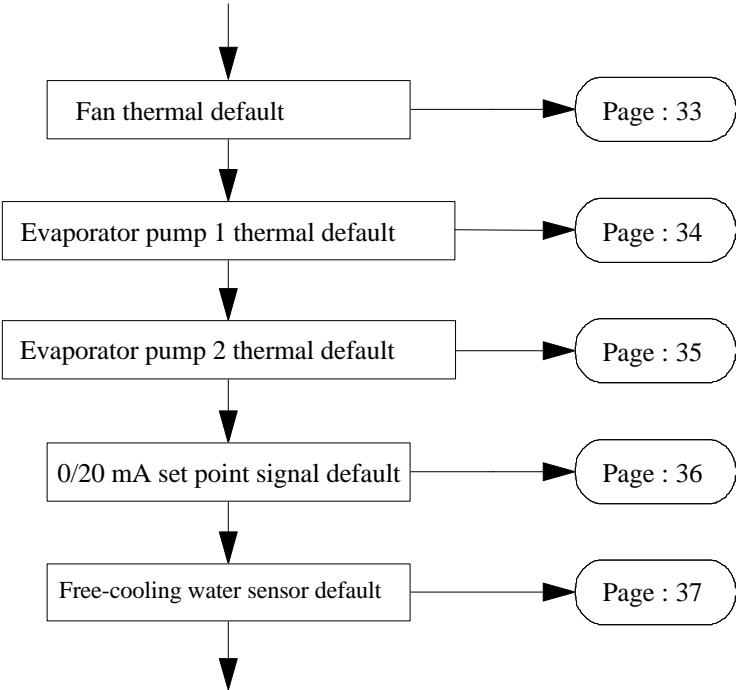
Diagnosis help

Absence of a phase on the power-supply.
Default when initially powered up.
Faulty wiring of phase presence contact.

Return to normal

Check presence of the three phases and value of voltage between phases.
Reverse two of the three phases upstream of the unit.
Check the phase presence contact wiring.

MISCELLANEOUS DEFAULT TEST



FAN POWER DEFAULT

Type of default: Miscellaneous incident

Incident code: 090

Variable: PAND

Description

The circuit-breaker of at least one fan is tripped. (ELECV=0)

Action

- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Automatic reset as soon as the default disappears.

Diagnosis help

Faulty adjustment of circuit-breaker.
Faulty wiring of default return.

Return to normal

Adjust the thermal protection device according to the fan's current rating.
Check wiring of default return.

EVAPORATOR PUMP 1 POWER DEFAULT

| | | | |
|--|--|--|-----------------------|
| Type of default: Miscellaneous incident | | Incident code: 091 | Variable: PAND |
| Description | | | |
| The thermal protection device or circuit-breaker of pump 1 is tripped. (ELECP1=0) | | | |
| Action | | | |
| <p>❶ The unit is controlling only one pump (DEUXPOMPE = 0):</p> <ul style="list-style-type: none"> ☞ Immediate shutdown of pump 1. ☞ Immediate shutdown of the machine. ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes. <p>❷ The unit is controlling two pumps (DEUXPOMPE = 1):</p> <ul style="list-style-type: none"> ☞ Immediate shutdown of pump 1. ☞ Immediate shutdown of the machine. ☞ Start up of second pump (if pump 2 is available). ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes. | | | |
| Reset | | | |
| Automatic reset of default. | | | |
| Case n°❶: | | | |
| ☞ The machine restarts automatically 20 seconds after the default has disappeared and after the CLIMATIC has restarted the pump. | | | |
| Case n°❷: | | | |
| ☞ Machine restarts as soon as pump 2 has been running for 20 seconds . | | | |
| Comment: Pump 1 can restart when the CLIMATIC gives it the order to do so, provided that the default has disappeared. | | | |
| Diagnosis help | | Return to normal | |
| <p>Faulty adjustment of thermal protection device.</p> <p>Faulty wiring of default return.</p> | | <p>Adjust the thermal protection device according to the pump's current rating.</p> <p>Check wiring of default return.</p> | |

EVAPORATOR PUMP 2 POWER DEFAULT

| | | | |
|--|--|--|-----------------------|
| Type of default: Miscellaneous incident | | Incident code: 092 | Variable: PAND |
| Description | | | |
| The thermal protection device or circuit-breaker of pump 2 is tripped. (ELECP2=0) | | | |
| Action | | | |
| The unit is controlling two pumps (DEUXPOMPE = 1). <ul style="list-style-type: none"> ☞ Immediate shutdown of pump 2. ☞ Immediate shutdown of the machine. ☞ Start up of second pump (if pump 1 is available). ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes. | | | |
| Reset | | | |
| Automatic reset of default. <ul style="list-style-type: none"> ☞ Machine restarts as soon as pump 1 has been running for 20 seconds. <p>Comment: Pump 2 can restart when the CLIMATIC gives it the order to do so, provided that the default has disappeared.</p> | | | |
| Diagnosis help | | Return to normal | |
| <p>Faulty adjustment of thermal protection device.</p> <p>Faulty wiring of default return.</p> | | <p>Adjust thermal protection device according to the pump's current rating.</p> <p>Check wiring of default return.</p> | |

4/20MA SETPOINT SIGNAL DEFAULT

Type of default: Miscellaneous incident

Incident code: 095

Variable: PAND

Description

The unit should control on the water setpoint sent by the remote customer, but the value of the latter is incorrect (SCONS<48U).

Action

- ☞ The machine is not stopped and controls on its own water setpoint.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Automatic reset as soon as SCONS > 48U.
The machine again controls according to the customer's setpoint.

Diagnosis help

Faulty wiring of 0/20mA signal.

Return to normal

Check wiring (see wiring diagram).

FREE-COOLING WATER SENSOR DEFAULT

Type of default: Miscellaneous incident

Incident code: 097

Variable: PAND

Description




The chilled water inlet temperature measured by the sensor at the free-cooling inlet is outside the authorized range:

$TEEGFC < TEGI$ or $TEEGFC > 65^{\circ}\text{C}$

With:

TEEGFC \Rightarrow chilled water inlet temperature at free-cooling
 TEGI \Rightarrow minimum water temperature at evaporator

Action

-  Immediate shutdown of free-cooling.
-  The default is shown on the display unit.
-  The remote default return is time-delayed by 6 minutes.

Reset

Automatic reset of default as soon as the water temperature measured by the sensor returns to the normal operating range:

$TEEGFC > TEGI + 2^{\circ}\text{C}$ and $TEEGFC < 60^{\circ}\text{C}$

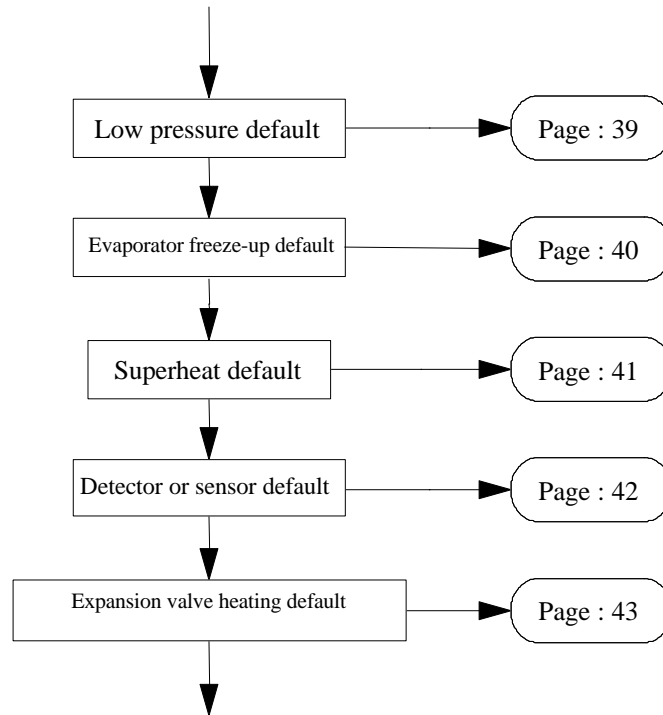
Diagnosis help

Defective free-cooling water inlet sensor.
 Faulty wiring or disconnection of sensor.

Return to normal

Replace the sensor.
 Check sensor connection.

CIRCUIT AVAILABILITY TEST



LOW PRESSURE DEFAULT

| | | |
|--|--|-----------------------------|
| Type of default: Circuit incident | Incident code: 001 | Variable: PANc _n |
| Description | <p>❶ Scroll or reciprocating compressor with +6°C ambient conditions or electronic expansion valve: No compressor in circuit n is running. The liquid valve has been open for 2 minutes, but the low pressure is insufficient.</p> <p>❷ Screw compressor: One compressor on circuit n is in start up demand, but the low pressure is insufficient.</p> <p>❸ Scroll or reciprocating compressor with -20°C ambient option and without electronic expansion valve: One compressor on circuit n has been running for more than 2 minutes. The liquid valve is open and the expansion by-pass valve has been closed for 1 minute, but the low pressure is insufficient.</p> <p>All types of machines except those equipped with -20°C operation: One compressor on circuit n has been running for more than 2 minutes and an insufficient low pressure is detected.</p> <p>All types of machines: One compressor on circuit n has been running for more than 6 minutes; all other compressors in service in the circuit have been running for at least 2 minutes and an insufficient low pressure is detected.</p> | |
| Action | <ul style="list-style-type: none"> ☞ If circuit n is not running, it is not authorized to start up. If it is running, it is immediately stopped. ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes. | |
| Reset | Manual reset ⇒ simultaneously press the + - V keys on the display unit | |
| <p>Case n°❶: <i>Two automatic resets</i> are authorized every day. After this, the machine can start up only after a manual reset.</p> <p>Case n°❷: The reset is <i>manual</i>.</p> <p>Case n°❸: <i>Four automatic resets</i> are authorized every day. After this, the reset is <i>manual</i>.</p> <p>Case n° : <i>two automatic resets are allowed</i> daily. After this, the reset is <i>manual</i>.</p> <p>Case n° : The reset is <i>manual</i>.</p> <p>Comment: The TOBP_n “low pressure” incident counters are all reset daily at 6 p.m., provided that the maximum number of authorized defaults is not reached.</p> | | |
| Diagnosis help | Return to normal | |
| <p>Insufficient charge in the circuit. Faulty operation of liquid solenoid valve. Faulty operation of expansion valve. Drier clogged up.</p> | <p>Top up the charge. Check operation of solenoid valve. Check operation of expansion valve. Change the drier.</p> | |

EVAPORATOR FREEZE-UP DEFAULT

| | | |
|---|---------------------------|--|
| Type of default: Circuit incident | Incident code: 002 | Variable: PANc _n |
| Description | | |
| <p>❶ Shell and tube heat-exchangers: Compressor m in circuit n is running, evaporation temperature (TBP_n) remains less than evaporation minimum temperature (TBPI) setpoint, and suction temperature (TASP_n) remains less than +5°C for more than 2 minutes. TBP_n < TBPI and TASP_n < +5°C</p> <p>❷ Plate heat exchangers: ● One compressor m in circuit n is running, evaporation temperature (TBP_n) remains less than evaporation minimum temperature (TBPI) setpoint and suction temperature remains less than +5°C for more than 30 seconds TBP_n < TBPI and TASP_n < +5°C or ● the water outlet (TSEG) is less than +3°C. TSEG_n < +3°C</p> <p><i>In case of a machine which is to cool a coolant to a temperature less than +5°C and for which the water necessarily includes an water/anti-freeze solution, the freeze-up default is not managed.</i></p> | | |
| Action | | |
| <p>☞ Immediate shutdown of circuit.</p> <p>☞ The default is shown on the display unit.</p> <p>☞ The remote default return is time-delayed by 6 minutes.</p> | | |
| Reset | | |
| Manual reset ⇒ simultaneously press the + - V keys on the display unit | | |
| <p>At the first default, the reset is automatic after 30 minutes, if the low pressure temperature is higher than +1°C. After this, the reset is manual.</p> <p><u>Comment:</u> The TOGEL_n “freeze-up” incident counters are all reset daily at 6 p.m., provided that the maximum number of authorized defaults is not reached.</p> | | |
| Diagnosis help | | Return to normal |
| <p>Faulty adjustment of setpoints. Defective evaporation, suction or chilled water outlet sensor. Faulty wiring or disconnection of sensor. Insufficient flow in evaporator.</p> | | <p>Check adjustment of setpoints. Replace the sensor.</p> <p>Check sensor connection. Check flow and flow controller adjustment.</p> |

SUPERHEAT DEFAULT

Type of default: Circuit incident

Incident code: 004

Variable: PANc_n

Description

The default is managed only on units equipped with electric expansion valves

Case n°1:

After 2 minutes of operation of a compressor on circuit n, the suction temperature (TASP_n) is higher than the chilled water inlet temperature (TEEG) by 3°C.

$$TASP_n > (TEEG + 3^\circ\text{C})$$

Case n°2:




After 2 minutes of operation of a compressor on circuit n, the difference between the suction temperature (TASP_n) and the evaporation temperature (TBP_n) is less than 2°C.

$$(TASP_n - TBP_n) < 2^\circ\text{C}$$

Action

- ☞ Immediate shutdown of circuit n.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the    keys on the display unit

The default reset is **manual**.

Diagnosis help

Defective evaporation, suction or chilled water inlet sensor.
Faulty wiring or disconnection of sensor.

Return to normal

Replace the sensor.
Check sensor connection.

SENSOR OR DETECTOR DEFAULT

Type of default: Circuit incident

Incident code: 006

Variable: PANc_n

Description

One or more detectors or sensors are in default: either in short-circuit, or cut out or disconnected.
The relevant sensors are:

- RDEt_n ⇒ electric expansion valve internal sensor (245U < RDEt_n < 5U)
- PTBP_n ⇒ LP pressure sensor (if sensor presence (48U < BP_n))
- TBP_n ⇒ evaporation temperature sensor (unit without LP sensor (5U < TBP_n))
- PTHP_n ⇒ HP pressure sensor (if sensor presence (48U < HP_n))
- TASP_n ⇒ suction temperature sensor (5U < TASP_n)

Comment: All of these detectors and sensors are not necessarily present on a single machine.

Action

- ☞ Immediate shutdown of circuit n.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.



Reset

Manual reset ⇒ simultaneously press the keys on the display unit

The default reset is **manual**.

Diagnosis help

Sensor defective.
Faulty wiring or disconnection of one or more sensors.

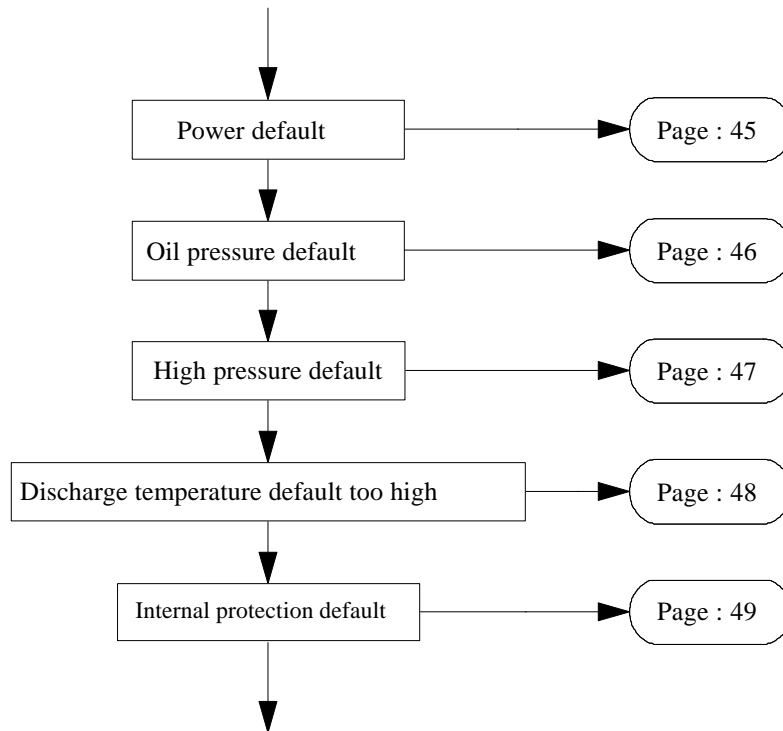
Return to normal

Replace the sensor.
Check connection of sensors.

EXPANSION VALVE HEATING DEFAULT

| | | | |
|---|--|--|------------------------|
| Type of default: Circuit incident | | Incident code: 007 | Variable: PANCn |
| Description | | | |
| <p>No compressor in circuit n is operating. One compressor is in start up demand and heating of the expansion valve is authorized. After 6 minutes, the opening value of the expansion valve necessary for start up of the compressor has not been reached.</p> | | | |
| Action | | | |
| <ul style="list-style-type: none"> ☞ Circuit n is not authorized to start up. ☞ The default is shown on the display unit. ☞ The remote default return is time-delayed by 6 minutes. | | | |
| Reset | | Manual reset ⇒ simultaneously press the <input type="button" value="+"/> <input type="button" value="-"/> <input type="button" value="V"/> keys on the display unit | |
| The default reset is manual . | | | |
| Diagnosis help | | Return to normal | |
| <p>Defective expansion valve sensor. Faulty wiring or disconnection of sensor. 24V power-supply default on expansion valve. The green LED of the static relay is lit up but the expansion valve is not heating.</p> | | <p>Replace the expansion valve. Check sensor connection. Check power-supply. Check the 8RS2ST board, or the static relay.</p> | |

COMPRESSOR AVAILABILITY TEST



POWER DEFAULT

Type of default: Compressor incident

Incident code: 001

Variable: PANmn

Description

The circuit-breaker of compressor mn has tripped.

Action

- ☞ Immediate shutdown of compressor mn.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the **+** **-** **V** keys on the display unit

The default reset is **manual**.

Diagnosis help

Faulty connection or tightening of connections.
Faulty calibration of circuit-breaker.

Return to normal

Verify the connections.
Check calibration in relation to the compressor current rating.

OIL PRESSURE DEFAULT

Type of default: Compressor incident

Incident code: 002

Variable: PANmn

Description

❶ Reciprocating semi-hermetic compressor units:

The sum of the periods for which the oil pressure switch of POILmn compressor mn remains tripped exceeds **90 seconds**. The oil pressure is too low to ensure proper lubrication of the compressor.

Comment: The low oil pressure period counter is reset if the oil pressure switch remains above its cut-in point for more than 3 minutes.

❷ Screw compressors:

The oil pressure switch of POILmn compressor mn remains tripped for more than **5 seconds**. The oil pressure is too low to ensure proper lubrication of the compressor.

Action

- ☞ Immediate shutdown of compressor mn.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the **+** **-** **V** keys on the display unit

At the first default, the reset is **automatic**. After that, it is **manual**.

Comment: The TOOILmn “oil pressure” incident counters are all **reset daily at 6 p.m.**, provided that the maximum number of authorized defaults is not reached.

Diagnosis help

Lack of oil in compressor.
 Oil filter clogged up.
 Faulty adjustment of oil pressure switch.
 Faulty wiring of oil pressure switch.

Return to normal

Check the oil charge.
 Changer the oil filter.
 Check adjustment of oil pressure switch.
 Check wiring of oil pressure switch.

HIGH PRESSURE DEFAULT

Type of default: Compressor incident

Incident code: 005

Variable: PANmn

Description

The high pressure pressure switch of PHPmn compressor mn has tripped.

Action

- ☞ Immediate shutdown of compressor mn.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the keys on the display unit

The reset of the first two defaults is **automatic**. After this, the reset is **manual**.

Comment: The TOHPmn “high pressure” incident counters are all **reset daily at 6 p.m.**, provided that the maximum number of authorized defaults is not reached.

Diagnosis help

Condenser clogged up.
 Faulty adjustment of the condensation control parameters.
 Faulty operation of liquid solenoid valve.
 Drier clogged up.
 Faulty adjustment of high pressure pressure switch.
 Faulty wiring of high pressure pressure switch.

Return to normal

Clean the condenser.
 Check adjustment of parameters.
 Check operation of solenoid valve.
 Replace the drier.
 Check adjustment of high pressure pressure switch.
 Check wiring of high pressure pressure switch.

DISCHARGE TEMPERATURE DEFAULT TOO HIGH

Type of default: Compressor incident

Incident code: 006

Variable: PANmn

Description

- ❶ Scroll or reciprocating compressor:
The discharge temperature of compressor mn **exceeds 120°C** for more than **9 seconds**.
REFmn>250U
- ❷ Screw compressor:
The discharge temperature of compressor mn **exceeds 107°C** for more than **9 seconds**.
REFmn>245U

Action

- ☞ Immediate shutdown of compressor mn.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Reset

Manual reset ⇒ simultaneously press the **+** **-** **V** keys on the display unit

The reset of the first two defaults is **automatic** after a time-delay of **30 minutes**.
After this, the reset is **manual**.

Comment: The TOREFmn “discharge too high” incident counters are all **reset daily at 6 p.m.**, provided that the maximum number of authorized defaults is not reached.

Diagnosis help

Defective discharge sensor.
Faulty wiring of sensor.
Charge in circuit insufficient.
Superheat set on a value which is too high.

Return to normal

Replace the sensor.
Check sensor connection.
Check the charge.
Check adjustment of superheat.

INTERNAL PROTECTION DEFAULT

Type of default: Compressor incident

Incident code: 007

Variable: PANmn

Description

❶ Scroll and semi-hermetic compressor units:

The thermal protection of motor windings of **PINTmn** compressor mn is tripped.

❷ Reciprocating hermetically-sealed compressor units:

Compressor mn has been running for **6 minutes** and the discharge temperature is lower than θ . This phenomenon shows that the compressor internal protection is tripped.

| | θ (°C) |
|-------|---------------|
| R22 | 40 |
| R134a | 30 |
| R407C | 40 |

Action

- ☞ Immediate shutdown of the compressor.
- ☞ The default is shown on the display unit.
- ☞ The remote default return is time-delayed by 6 minutes.

Comment: When powered down, the default is not memorized.

Reset

Manual reset ⇒ simultaneously press the **+** **-** **V** keys on the display unit

The default reset is **manual**.

Diagnosis help

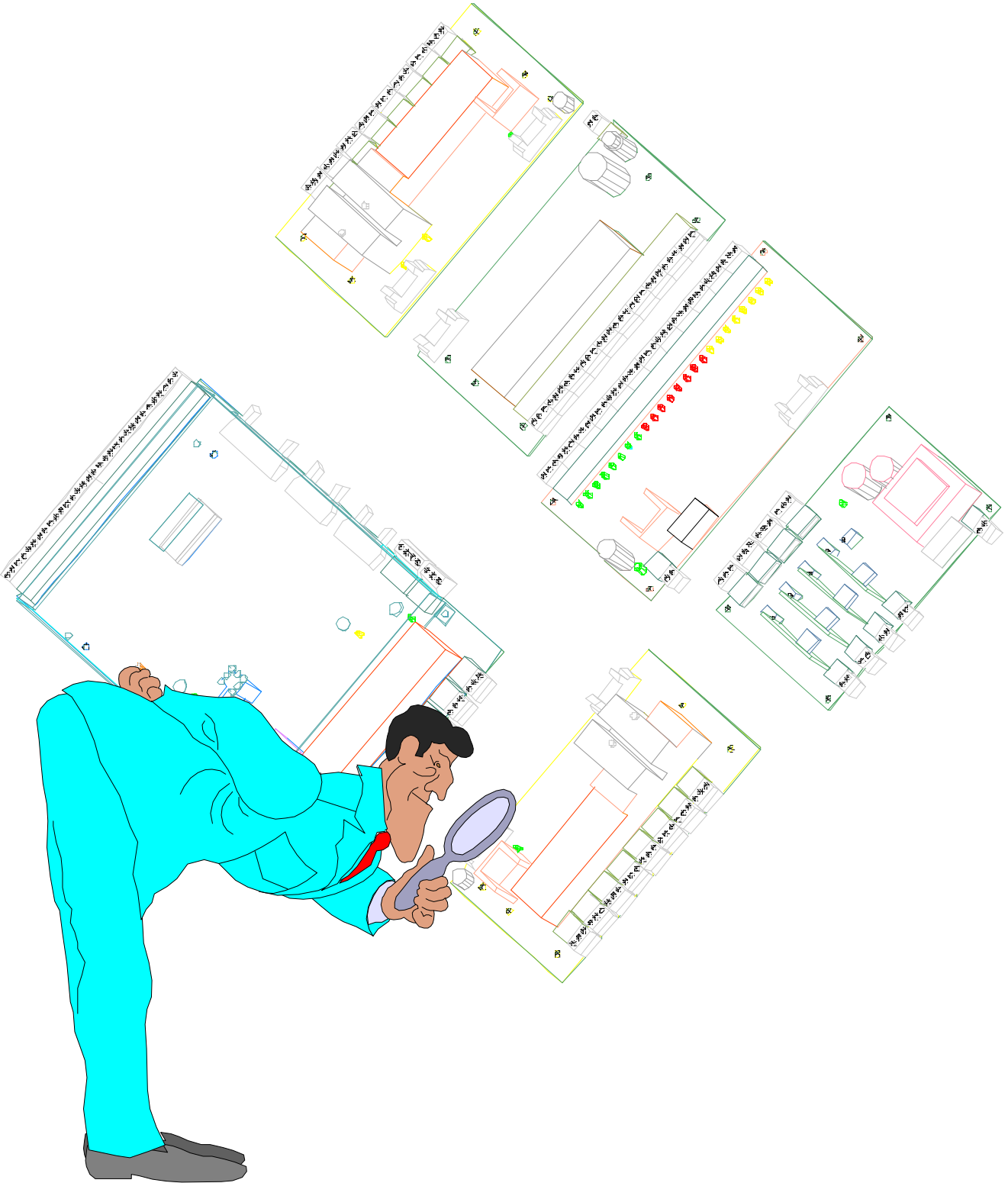
Power-supply default of the internal protection relay.
Defective discharge sensor (reciprocating hermetically-sealed compressor units).
Faulty wiring or disconnection of sensor.
Superheat set on a value which is too high.

Return to normal

Check the relay power-supply.
Replace the sensor.

Check the sensor connection.
Check adjustment of superheat.

TECHNICAL DATA SHEET



CLIMATIC BOARD

TECHNICAL DATA SHEET

① CLIMATIC overview

The CLIMATIC is a thermal control stand-alone programmable automatic controller.

Materially, it is represented by an extensible microprocessor board, with 16 analog inputs and 8 logic outputs in its basic version.

- ☞ Temperature or pressure sensors are connected to the analog inputs.
- ☞ Control relays (compressors, fans, etc...) are connected to the outputs.

The system is entirely 'stand-alone', due to:

- ☞ a 12V alternating current power-supply
- ☞ an extension for additional logic outputs (8RS 2ST board, or 8rs 2ANA board)
- ☞ a liquid crystal display unit (of the CL02 analog type, or CL07 analog and alphanumerical)
- ☞ an extension for logic inputs (24EL board)
- ☞ an interface for 0/20mA signal input (4/20mA board)
- ☞ a serial link (RS232 300 baud type) for dialogue with:
 - a microcomputer, or a modem via the RS232 interface,
 - or with a BMS through means of the JBUS gateway.

② Replacement of a CLIMATIC board

Procedure to be followed:

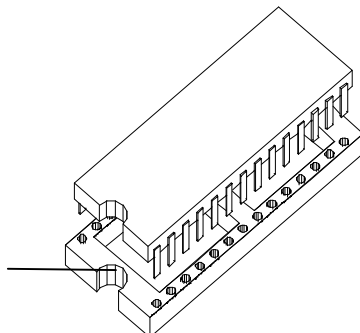
- ☞ Note the value of all setpoints.
- ☞ Cut the board power-supply off and change the board.
- ☞ Recover the EPROM from the former board and refit it on the new one (see drawing below).
- ☞ Check the configuration of switches G4 to G7.
- ☞ Reconnect all connections on the CLIMATIC, referring to the wiring diagram.
- ☞ Put the battery jumper on work position (T).
- ☞ Re-energize the board and enter the former setpoints on the new board.

Comment: It is recommended that connectors J12, J13 and J16 never be connected or disconnected when the board is energized.

Be careful not to **reverse** the connections of **J12 and J16 connectors**. This could result in the destruction of a board.

EPROM mounting direction:

Mating device



CLIMATIC BOARD

TECHNICAL DATA SHEET

Configuration of switches G4 to G7

Switches G6 and G7

If there is no link between boards: do not modify the switch configuration

If there is a link between boards (maximum of 8): position the switches as follows

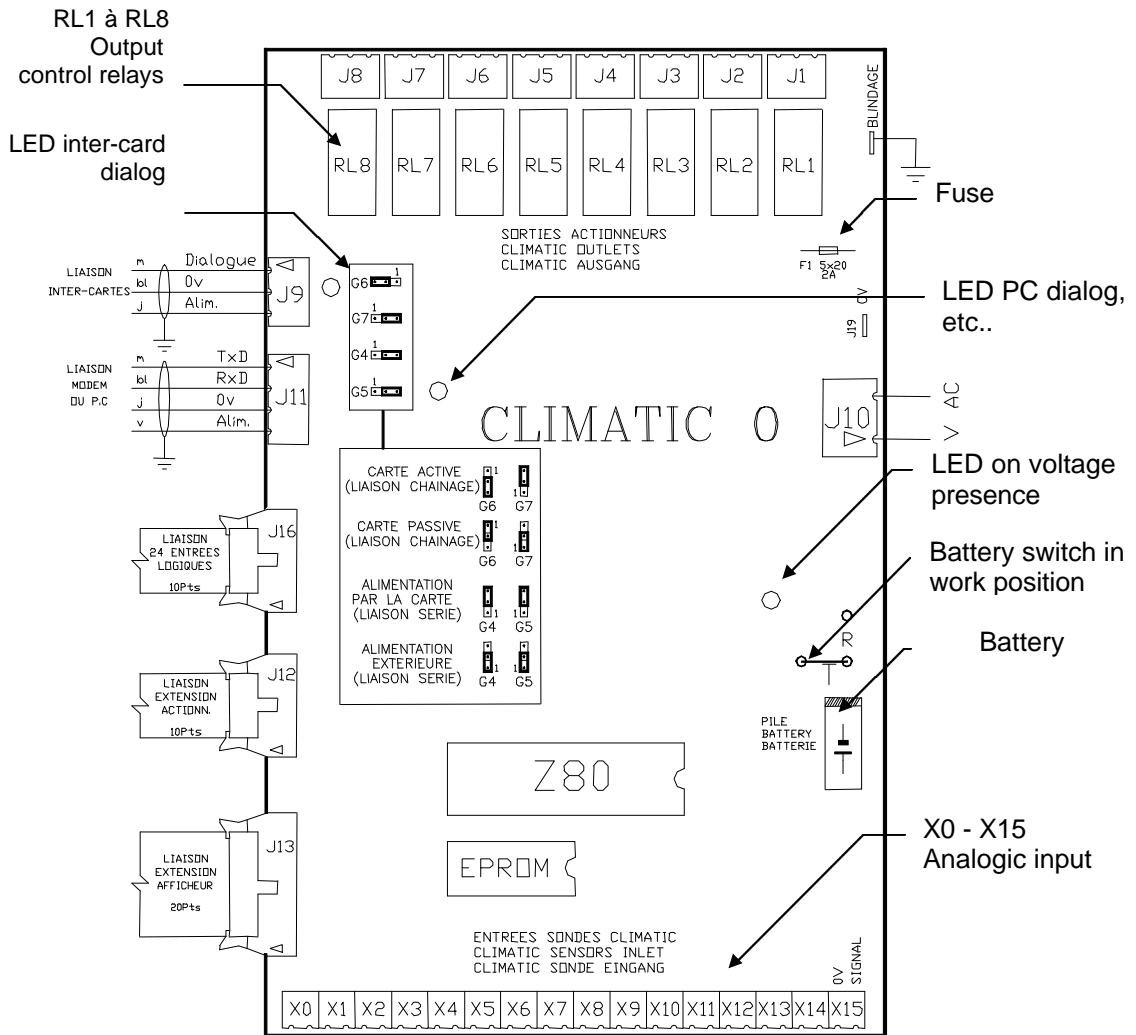
| | | | |
|-----------------|----------------------|----------------|----------------------|
| Card 0 (master) | G6 = 2-3 G7 = 2-3 | Card n (slave) | G6 = 1-2 G7 = 1-2 |
|-----------------|----------------------|----------------|----------------------|

G4 and G5 switches

If there is no link with a PC, or a modem, etc...: do not modify the switch configuration

If there is a link with a PC, etc...: position the switches as follows (maximum of 8 boards on a single link)

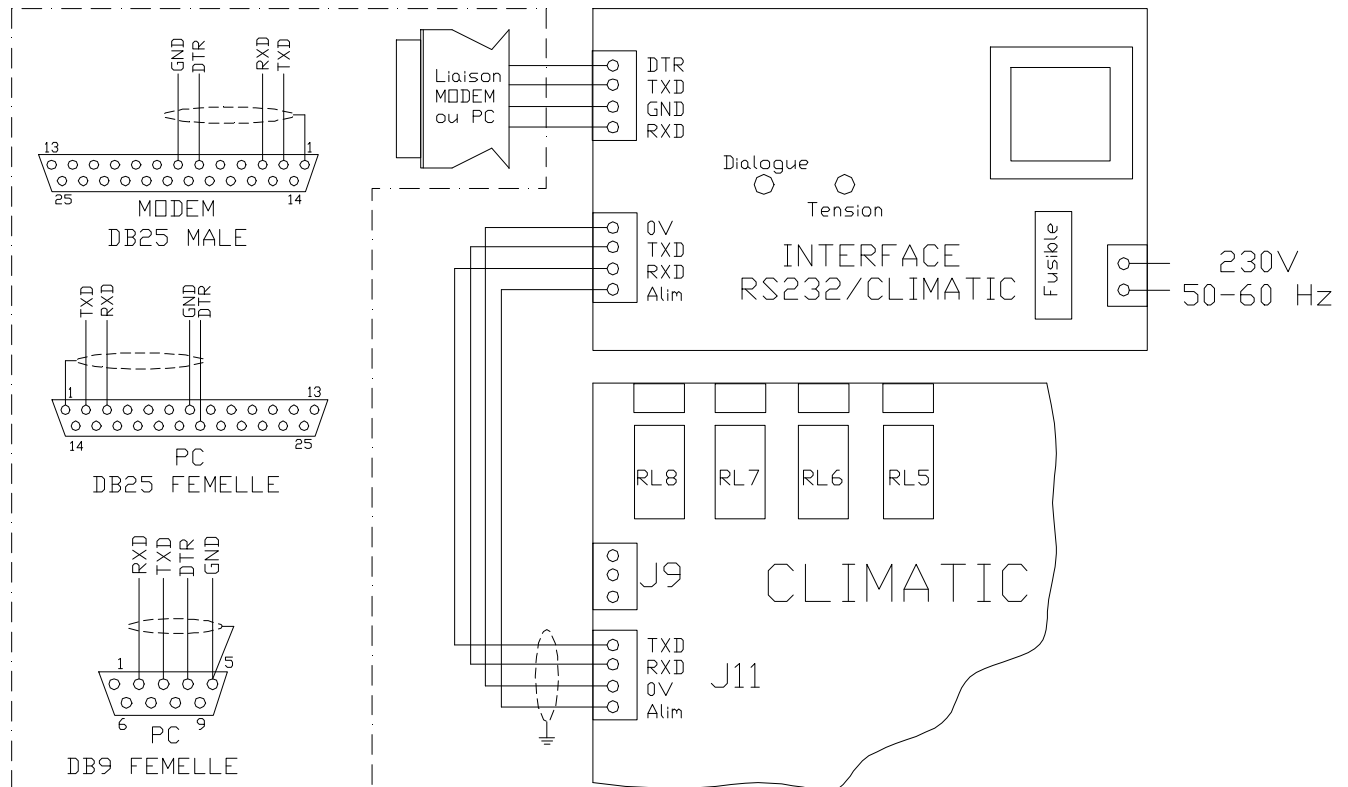
| | | | |
|-----------------|----------------------|----------------|----------------------|
| Card 0 (master) | G4 = 1-2 G5 = 1-2 | Card n (slave) | G4 = 1-2 G5 = 1-2 |
|-----------------|----------------------|----------------|----------------------|



CLIMATIC - RS232 INTERFACE TECHNICAL DATA SHEET

The RS232 interface takes the form of a rectangular, plastic box which can be positioned either next to a computer or modem, or be installed in a switch cabinet (the latter solution is not recommended). The interface's function is to shape the Climatic's dialogue signals in order to make them compatible with the EIA RS232 standard. ***It is absolutely essential to use the RS232 interface for all dialogues with a Climatic.*** This constitutes electrical insulation between the Climatic's and the computer. Its current-loop type link between the interface and the Climatic's enables a dialogue over long distances (maximum of 1000 meters).

Wiring principle



ALPHANUMERICAL DISPLAY UNIT TECHNICAL DATA SHEET

Key :

- 1 : Allocation of green LED's.
- 2 : Allocation of D1 to D6, C1 to C5 and S1 to S5 keys.
- 3 : «Voltage presence » yellow LED.
- 4 : «Unit ON» green LED (see allocation in 1)
- 5 : «Default presence » red LED.
- 6 : Digital display unit.
- 7 : Digital display unit which defines, by means of a message, the value shown on the digital display unit or an incident or an incident diagnosis.
- 8 : CLIMATIC function keys.

H: Enables reading and setting of hours, minutes and day of the week.

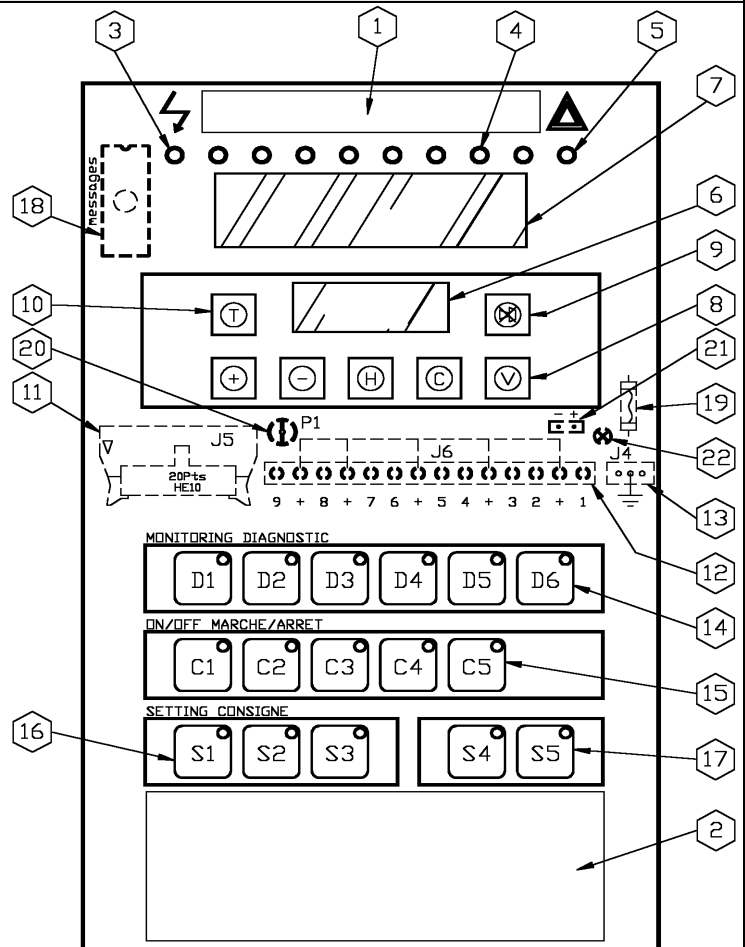
↳ *1st time pressed* : Reading of hours and minutes.

↳ *2nd time pressed* : Reading and modification of hours

↳ *3rd time pressed* : Reading and modification of minutes

↳ *4th time pressed* : Reading and modification of the day.

- | | |
|--------------|-------------|
| 1: Sunday | 5: Thursday |
| 2: Monday | 6: Friday |
| 3: Tuesday | 7: Saturday |
| 4: Wednesday | |



Modifications are carried out through means of the + and - keys.

C: Enables access to setpoints.

When the key is pressed, the number of the setpoint (00 to 15) is displayed. Each time the C key is pressed, the following setpoint is scrolled up.

When the key is released, the setpoint value is displayed. This value can be modified, within the limits authorized by the CLIMATIC, through means of the + and - keys (see list of variables, "setpoints" paragraph).

V: Enables reading of variables.

When the key is pressed, the address of the variable is displayed.

When the key is released, the value of the variable is displayed. The value of a variable cannot be modified. In order to change the address, use the + and - keys. Not all the variables used in a CLIMATIC program can be visualized on the display unit (see list of variables).

ALPHANUMERICAL DISPLAY UNIT TECHNICAL DATA SHEET

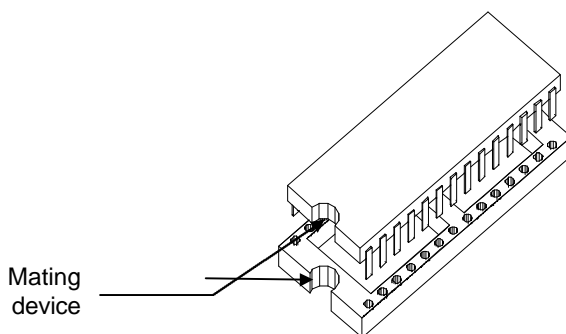
- 9 : Clearance display unit buzzer (the buzzer is available as an option).
- 10: Change of language for messages shown on the alphanumeric display unit. French and English are included in the standard version.
- 11 20-pin connector to be connected to the CLIMATIC board at J13.
- 12: Nine potential free contacts used to control the eight green LED's, item 4, and red LED, item 5. The wiring is to be carried out with non-shielded wire.
- 13: 12VAC power-supply connector, for lighting on display units and the 10 LED's.
- 14: Six diagnosis keys enabling access to a description of the operating state of the machine, the circuits and compressors (see allocation in 2).
- 15: Five "On / Off" keys in the refrigerating circuit.
- 16: Three keys for visualizing the main control setpoints. These keys may sometimes be used for various other functions (see allocation in 2).
- 17: Two keys for various functions (see allocation in 2).
- 18: Eprom containing the messages and parameter settings for the keys (see mounting direction on drawing below).
- 19: 1A fuse, delayed-action, for protection of LED's and lighting on display units.
- 20: Contrast adjustment potentiometer on alphanumeric display unit.
- 21: Buzzer connection connector on rear panel.
- 22: CLIMATIC link presence LED.

② Replacement of an alphanumeric display unit

Procedure to be followed :

- ☞ Cut off the power-supply to the CLIMATIC board and the display unit.
- ☞ Change the display unit.
- ☞ Recover the EPROM from the former display unit as well as the allocations of the LED'S and keys, item 1 and 2, and refit all items on the new display unit (see drawing below).
- ☞ Reconnect all connections on the display unit, referring to the wiring diagram.
- ☞ Power the board and display unit back up.

EPROM mounting direction:



Comment : if there is no longer any display, it is necessary to check the CLIMATIC power-supply. The 12VAC power-supply source on the display unit is used only for the lighting on the LCD display units, and ten signaling LED's.

ALPHANUMERICAL DISPLAY UNIT TECHNICAL DATA SHEET

⑧ Modification of setpoints by indirect addressing

The CLIMATIC has only 16 setpoints which can be modified directly via the display unit; this may prove to be insufficient on certain machines. For this type of unit, in order to access additional setpoints, proceed as follows:

- Press key C until obtaining the "ADDRESS" setpoint (see list of variables, "setpoints" paragraph).
- Display the address of the variable to be modified (see list of the variables, "setpoints" paragraph).
- When the required address is displayed, press key C in order to obtain the "VALUE" setpoint
- Display the required value in U units (see conversion table).
- Press the Sx* key on the alphanumerical display unit in order to validate your modification.

* see allocation of keys on the alphanumerical display unit, item 2.

Conversion table for "C", "M", "K", and "D" units into "U" units

Presentation of CLIMATIC units

| Unit | Range | Step | Name |
|------|-----------------|------|--|
| C | -28°C to 99.5°C | 0.5 | Temperature unit |
| M | -99.5°C to 28°C | 0.5 | Temperature unit |
| D | 0 to 25.5 | 0.1 | Pressure unit in bars |
| K | 0 to 127.5 | 0.5 | Temperature differential unit |
| L | 0 or 1 | | Logic variable |
| U | 0 to 255 | 1 | Numerical variable without unit |
| N | 0 to 255 | 1 | Numerical variable without unit, invisible on display-unit |

1: Conversion of "C" into "U" (range from -28°C to +99,5°C)

$$\text{Value in U} = (\text{Value } ^\circ\text{C} + 28) \times 2$$

2: Conversion of "M" into "U" (1M = 1°C, range from -99.5°C to +28°C)

$$\text{Value in U} = (\text{Value M} \times 2) + 199$$

3: Conversion of "K" into "U" (1K = 1°C, range from 0K to 127.5K)

$$\text{Value in U} = (\text{Value K} \times 2)$$

4: Conversion of "D" into "U" (range from 0 to 25.5)

$$\text{Value in U} = (\text{Value D} \times 10)$$

24EL BOARD

TECHNICAL DATA SHEET

The 24EL board provides the possibility of connecting 24 additional logic inputs to the CLIMATIC board. For each CLIMATIC board, there can be up to two 24EL boards, i.e., 48 additional logic inputs.

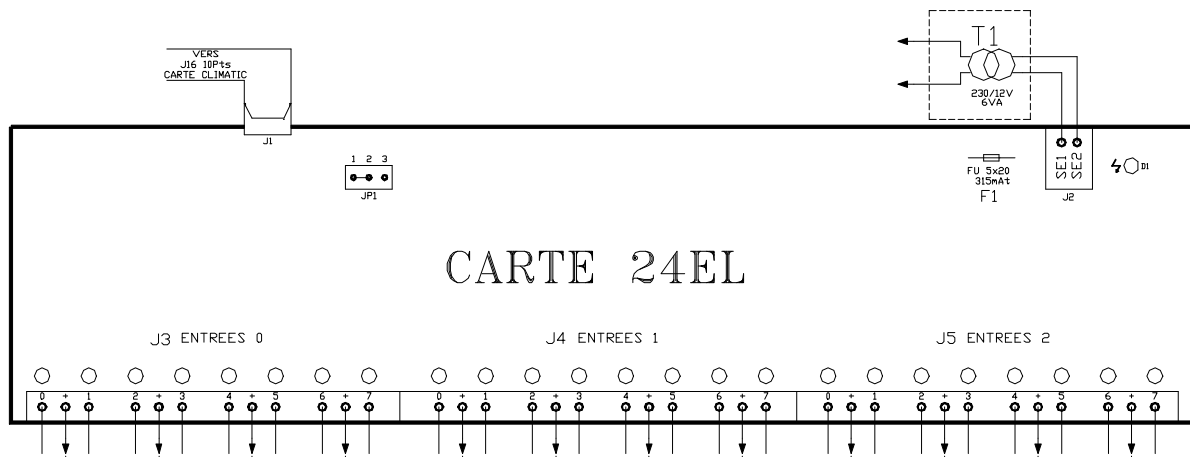
Configuration of 24EL board

For each input, there are a maximum of 8 contacts.

if the inputs in the CLIMATIC are declared at the addresses:

170 to 172, jumper JP1 must be placed between 1 and 2 (default configuration)

173 to 175, jumper JP1 is placed between 2 and 3



- Key:

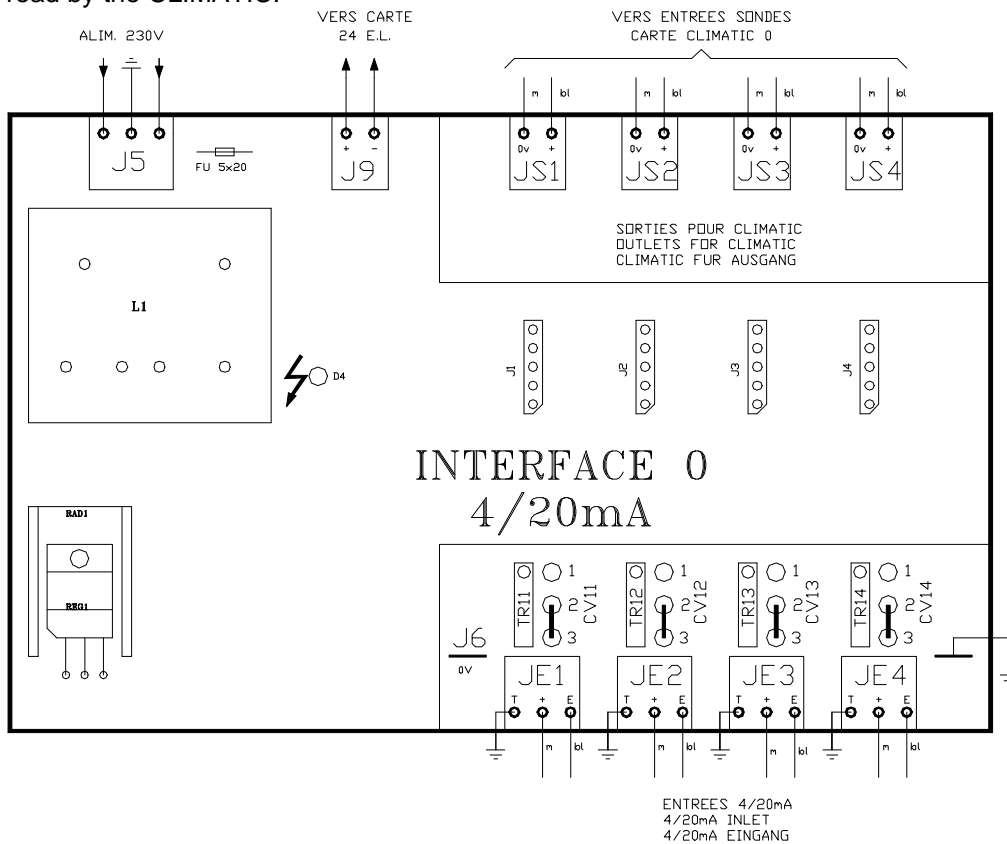
- J1: 10-pin HE connector for CLIMATIC link at J16
- J2: 12 V power-supply 2-pin connector
- J3: 12-pin connector for logic input connection on input 0
- J4: 12-pin connector for logic input connection on input 1
- J5: 12-pin connector for logic input connection on input 2
- JP1: jumper for logic input board 24 identification
- D1: voltage presence LED
- F1: 315 mA/T fuse

Verification of a contact on an input:

- ☞ Check the electric power-supply of the board (fuse), D1 LED lit up.
- ☞ Check that the LED of the input to be checked is lit up.
- ☞ Go to the CLIMATIC address corresponding to the contact (see list of variables in enclosed documentation),

4/20mA BOARD TECHNICAL DATA SHEET

The 4/20mA board enables conversion of a 0/20mA signal into a signal which is proportional in voltage and which can be read by the CLIMATIC.



- Key:

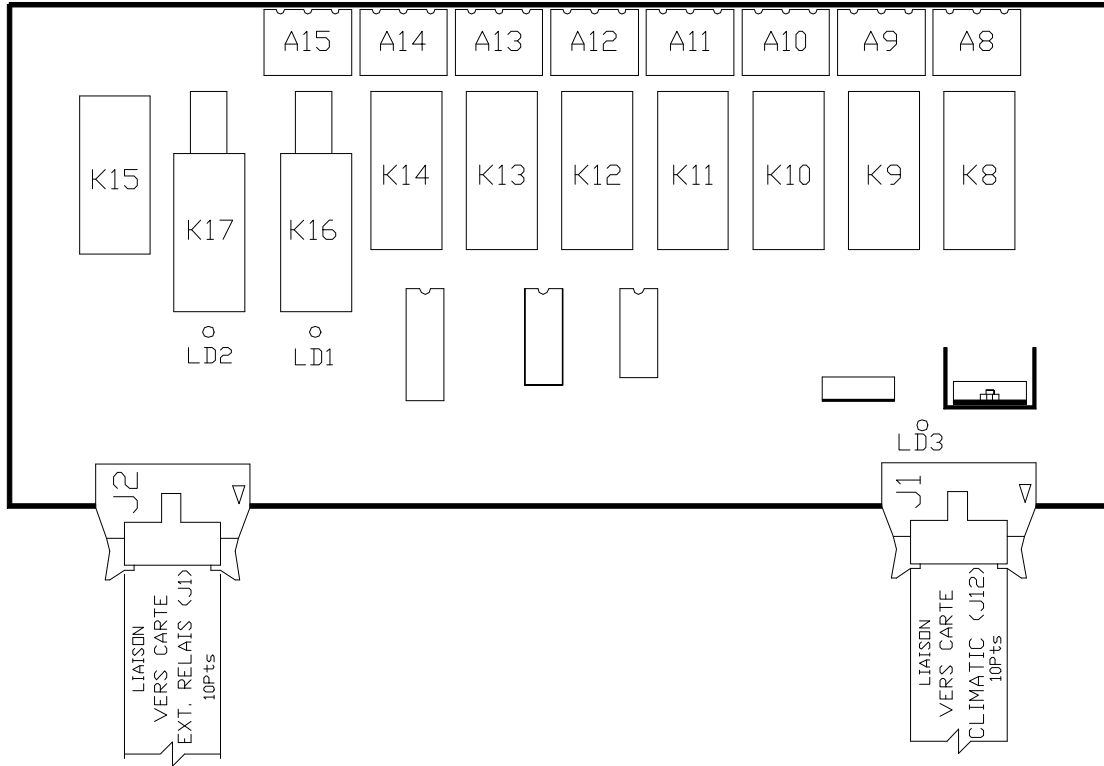
- JE1 to JE4 : connector for sensor link
T ⇨ earth
+ ⇨ 15V power-supply
E ⇨ signal input
- J1 to J4 : 0/20 mA module
- CV11 to CV14 : calibration switch (calibration in position 1-2)
- TR11 to TR14 : calibration potentiometer
- JS1 to JS4 : connector for link on CLIMATIC sensor inputs
- FU : 5x20 100mA fuse
- J9 : voltage presence contact on 4/20 mA card
- D4 : voltage presence LED

It is possible to check the calibration of the 4/20mA board by placing the CV1n jumper on position 1-2 and by checking the value of the variable associated with the JEn input. The value read must be equal to 243. Calibration is carried out using the TR1n potentiometer. Only one input can be calibrated at a time (a single CV1n jumper in position 1-2). If the CLIMATIC board or the 4/20mA board is changed, it is absolutely essential to check its calibration.

Absence of electric power-supply causes an alarm on the CLIMATIC. The default is detected by an input on the 24EL board, which is connected to the voltage presence contact on board 4/20mA (see section on power default on board 4/20mA).

8RS2ST RELAY EXTENSION BOARD TECHNICAL DATA SHEET

The 8RS2ST board includes 8 relays, two of which can be replaced by static relays. It is possible to put up to three 8RS2ST boards in tandem, i.e., 24 relays altogether.

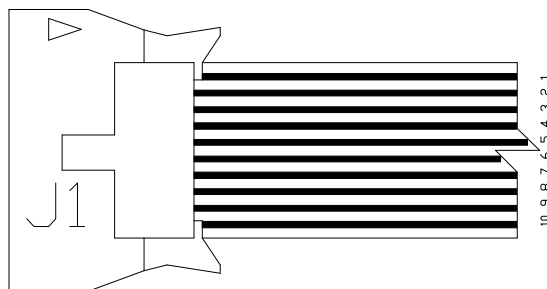


- Key:

- K8 to K15 : relay
- K16 and K17 : static relay
- LD1 and LD2 : static relay status LED
- A8 to A15 : actuator outlet connectors
- LD3 : voltage presence LED
- J1 and J2 : connectors for linking cards together and with the CLIMATIC

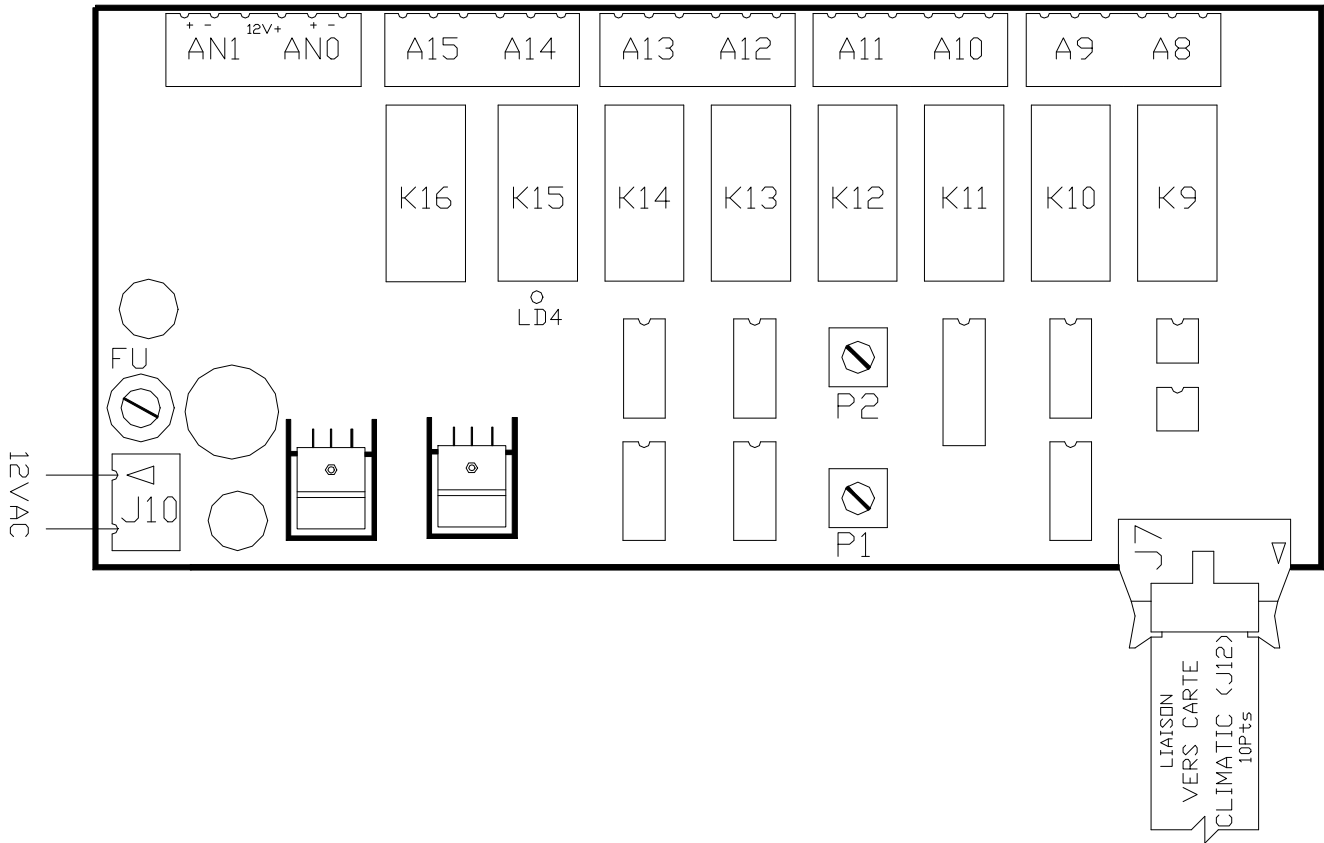
COMMENT:

When installing an 8RS2ST board, if the CLIMATIC board is not referenced 4770008V, **it is absolutely essential to cut off wire N°9 on the 10-pin ribbon cable, in order not to damage the boards.**



8RS2ANA RELAY EXTENSION BOARD TECHNICAL DATA SHEET

The 8RS2ANA board includes 8 relays and two 0/10V analog outputs. Its connection is similar to the 8RS2ST board, except for the fact that it uses a 12VAC power-supply. It is possible to put it in tandem with an 8RS2ST board, i.e., 16 relays and one analog output altogether.

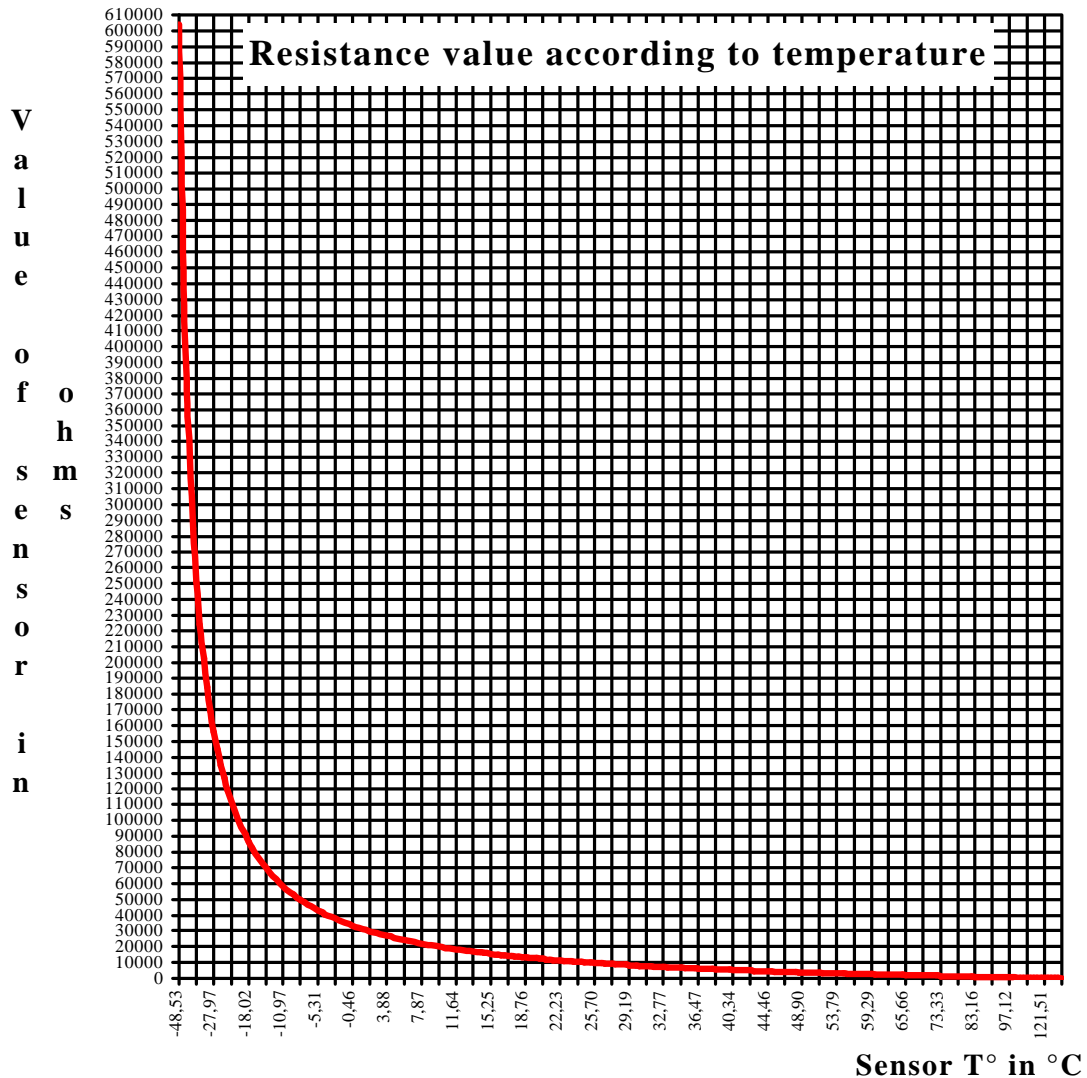


- Key:

- K9 to K16 :relay
- A8 to A15 :actuator output connectors
- AN0 and AN1 :analog outputs (0/10V)
- P1 and P2 :calibration potentiometer for analog outputs
- FU :5x20 1A/T fuse
- LD4 :voltage presence LED
- J7 :connectors for linking between the card and CLIMATIC

CLIMATIC SENSOR TECHNICAL DATA SHEET

The standard CLIMATIC sensors are thermistors. The graph below represents the progression of the resistive value of the sensor according to temperature. For a single temperature, the values of the resistors of a round sensor and a flat sensor are identical.



The CLIMATIC enables direct visualisation, in °C, at addresses 0 to 15, temperatures which may vary from -28°C to +99.5°C, (see list of variables for the sensor addresses). For a temperature higher than 99.5°C, the corresponding variable declared in °C stays blocked on the 99.5°C maximum value. Only the variable in U, whose address is between 16 and 31, is then significant. The table below gives the U/°C equivalencies for temperatures exceeding 99.°C.

CLIMATIC SENSOR TECHNICAL DATA SHEET

| U | °C |
|-----|-------|
| 242 | 101 |
| 243 | 103 |
| 244 | 105 |
| 245 | 107 |
| 246 | 109.5 |
| 247 | 112 |
| 248 | 115 |

| U | °C |
|-----|-------|
| 249 | 118 |
| 250 | 121.5 |
| 251 | 125.5 |
| 252 | 129.5 |
| 253 | 134.5 |
| 254 | 140 |
| 255 | 146.5 |

Verification of a sensor :

Select the address of the sensor to be verified (see use on the display unit)

☞ The displayed value is equal to 99.5°C.

The sensor is in short-circuit or it measures a temperature higher than 99.5°C (see equivalency table). Should the sensor be in short-circuit, it must be replaced.

☞ The displayed value is equal to -28°C.

The sensor is cut off or disconnected. In the first case, the sensor must be replaced.

☞ The displayed value is between -28°C and 99.5°C.

Check that the value displayed on the CLIMATIC corresponds to the actual temperature of the place where the sensor is positioned. If there is drift, check that the sensor is in proper contact with the piping or that it is not influenced by the sun. In the opposite case, the sensor is defective and must be replaced.

SETPOINT VIA 4/20mA SIGNAL

TECHNICAL DATA SHEET

The table below illustrates the °C value of the remote setpoint according to the value of the customer's 4/20mA signal.

| °C value | 4/20mA signal | °C value | 4/20mA signal | °C value | 4/20mA signal | °C value | 4/20mA signal | °C value | 4/20mA signal |
|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|
| -30 | 4 | -9.5 | 7.215686 | 11 | 10.43137 | 31.5 | 13.64706 | 52 | 16.86275 |
| -29.5 | 4.078431 | -9 | 7.294117 | 11.5 | 10.5098 | 32 | 13.72549 | 52.5 | 16.94118 |
| -29 | 4.156862 | -8.5 | 7.372549 | 12 | 10.58823 | 32.5 | 13.80392 | 53 | 17.01961 |
| -28.5 | 4.235294 | -8 | 7.45098 | 12.5 | 10.66667 | 33 | 13.88235 | 53.5 | 17.09804 |
| -28 | 4.313725 | -7.5 | 7.529411 | 13 | 10.7451 | 33.5 | 13.96078 | 54 | 17.17647 |
| -27.5 | 4.392157 | -7 | 7.607843 | 13.5 | 10.82353 | 34 | 14.03922 | 54.5 | 17.2549 |
| -27 | 4.470588 | -6.5 | 7.686274 | 14 | 10.90196 | 34.5 | 14.11765 | 55 | 17.33333 |
| -26.5 | 4.549019 | -6 | 7.764706 | 14.5 | 10.98039 | 35 | 14.19608 | 55.5 | 17.41176 |
| -26 | 4.62745 | -5.5 | 7.843137 | 15 | 11.05882 | 35.5 | 14.27451 | 56 | 17.4902 |
| -25.5 | 4.705882 | -5 | 7.921568 | 15.5 | 11.13725 | 36 | 14.35294 | 56.5 | 17.56863 |
| -25 | 4.784313 | -4.5 | 8 | 16 | 11.21569 | 36.5 | 14.43137 | 57 | 17.64706 |
| -24.5 | 4.862745 | -4 | 8.078431 | 16.5 | 11.29412 | 37 | 14.5098 | 57.5 | 17.72549 |
| -24 | 4.941176 | -3.5 | 8.156862 | 17 | 11.37255 | 37.5 | 14.58823 | 58 | 17.80392 |
| -23.5 | 5.019608 | -3 | 8.235293 | 17.5 | 11.45098 | 38 | 14.66667 | 58.5 | 17.88235 |
| -23 | 5.098039 | -2.5 | 8.313725 | 18 | 11.52941 | 38.5 | 14.7451 | 59 | 17.96078 |
| -22.5 | 5.17647 | -2 | 8.392157 | 18.5 | 11.60784 | 39 | 14.82353 | 59.5 | 18.03922 |
| -22 | 5.254901 | -1.5 | 8.470588 | 19 | 11.68627 | 39.5 | 14.90196 | 60 | 18.11765 |
| -21.5 | 5.333333 | -1 | 8.549019 | 19.5 | 11.76471 | 40 | 14.98039 | 60.5 | 18.19608 |
| -21 | 5.411764 | -.5 | 8.627451 | 20 | 11.84314 | 40.5 | 15.05882 | 61 | 18.27451 |
| -20.5 | 5.490196 | 0 | 8.705882 | 20.5 | 11.92157 | 41 | 15.13725 | 61.5 | 18.35294 |
| -20 | 5.568627 | .5 | 8.784313 | 21 | 12 | 41.5 | 15.21569 | 62 | 18.43137 |
| -19.5 | 5.647058 | 1 | 8.862745 | 21.5 | 12.07843 | 42 | 15.29412 | 62.5 | 18.5098 |
| -19 | 5.72549 | 1.5 | 8.941176 | 22 | 12.15686 | 42.5 | 15.37255 | 63 | 18.58824 |
| -18.5 | 5.803921 | 2 | 9.019608 | 22.5 | 12.23529 | 43 | 15.45098 | 63.5 | 18.66667 |
| -18 | 5.882352 | 2.5 | 9.098039 | 23 | 12.31373 | 43.5 | 15.52941 | 64 | 18.7451 |
| -17.5 | 5.960784 | 3 | 9.176471 | 23.5 | 12.39216 | 44 | 15.60784 | 64.5 | 18.82353 |
| -17 | 6.039215 | 3.5 | 9.254902 | 24 | 12.47059 | 44.5 | 15.68627 | 65 | 18.90196 |
| -16.5 | 6.117647 | 4 | 9.333333 | 24.5 | 12.54902 | 45 | 15.76471 | 65.5 | 18.98039 |
| -16 | 6.196078 | 4.5 | 9.411764 | 25 | 12.62745 | 45.5 | 15.84314 | 66 | 19.05882 |
| -15.5 | 6.274509 | 5 | 9.490196 | 25.5 | 12.70588 | 46 | 15.92157 | 66.5 | 19.13725 |
| -15 | 6.352941 | 5.5 | 9.568627 | 26 | 12.78431 | 46.5 | 16 | 67 | 19.21569 |
| -14.5 | 6.431372 | 6 | 9.647058 | 26.5 | 12.86275 | 47 | 16.07843 | 67.5 | 19.29412 |
| -14 | 6.509804 | 6.5 | 9.72549 | 27 | 12.94118 | 47.5 | 16.15686 | 68 | 19.37255 |
| -13.5 | 6.588235 | 7 | 9.803922 | 27.5 | 13.01961 | 48 | 16.23529 | 68.5 | 19.45098 |
| -13 | 6.666667 | 7.5 | 9.882353 | 28 | 13.09804 | 48.5 | 16.31373 | 69 | 19.52941 |
| -12.5 | 6.745098 | 8 | 9.960784 | 28.5 | 13.17647 | 49 | 16.39216 | 69.5 | 19.60784 |
| -12 | 6.823529 | 8.5 | 10.03922 | 29 | 13.2549 | 49.5 | 16.47059 | 70 | 19.68628 |
| -11.5 | 6.90196 | 9 | 10.11765 | 29.5 | 13.33333 | 50 | 16.54902 | 70.5 | 19.76471 |
| -11 | 6.980392 | 9.5 | 10.19608 | 30 | 13.41176 | 50.5 | 16.62745 | 71 | 19.84314 |
| -10.5 | 7.058823 | 10 | 10.27451 | 30.5 | 13.4902 | 51 | 16.70588 | 71.5 | 19.92157 |
| -10 | 7.137255 | 10.5 | 10.35294 | 31 | 13.56863 | 51.5 | 16.78431 | 72 | 20 |

The remote setpoint value cannot be greater or less than the CLIMATIC's internal setpoint (see list of variables, "setpoints" paragraph).

SETPOINT VIA 4/20mA SIGNAL

TECHNICAL DATA SHEET

The table below illustrates the °C value of the remote setpoint according to the value of the customer's 4/20mA signal.

| °C value | 4/20mA signal |
|----------|---------------|
| 4 | 4 |
| 4.5 | 4.5 |
| 5 | 5 |
| 5.5 | 5.5 |
| 6 | 6 |
| 6.5 | 6.5 |
| 7 | 7 |
| 7.5 | 7.5 |
| 8 | 8 |
| 8.5 | 8.5 |
| 9 | 9 |
| 9.5 | 9.5 |
| 10 | 10 |
| 10.5 | 10.5 |
| 11 | 11 |
| 11.5 | 11.5 |
| 12 | 12 |
| 12.5 | 12.5 |
| 13 | 13 |
| 13.5 | 13.5 |
| 14 | 14 |
| 14.5 | 14.5 |
| 15 | 15 |
| 15.5 | 15.5 |
| 16 | 16 |
| 16.5 | 16.5 |
| 17 | 17 |
| 17.5 | 17.5 |
| 18 | 18 |
| 18.5 | 18.5 |
| 19 | 19 |
| 19.5 | 19.5 |
| 20 | 20 |

The remote setpoint cannot be greater than or less than the CLIMATIC's internal setpoint (see list of variables, "setpoints" paragraph).

CONVERSION TABLE - 0/7 BAR R22 SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|------------------|----------|
| 52 | 0.034 | -93.8252 |
| 53 | 0.069 | -85.4088 |
| 54 | 0.103 | -80.0192 |
| 55 | 0.137 | -75.9604 |
| 56 | 0.172 | -72.6667 |
| 57 | 0.206 | -69.8752 |
| 58 | 0.240 | -67.4409 |
| 59 | 0.275 | -65.2749 |
| 60 | 0.309 | -63.3186 |
| 61 | 0.343 | -61.5309 |
| 62 | 0.377 | -59.8822 |
| 63 | 0.412 | -58.3502 |
| 64 | 0.446 | -56.9176 |
| 65 | 0.480 | -55.5709 |
| 66 | 0.515 | -54.2992 |
| 67 | 0.549 | -53.0937 |
| 68 | 0.583 | -51.9469 |
| 69 | 0.618 | -50.8527 |
| 70 | 0.652 | -49.8059 |
| 71 | 0.686 | -48.8021 |
| 72 | 0.721 | -47.8374 |
| 73 | 0.755 | -46.9086 |
| 74 | 0.789 | -46.0126 |
| 75 | 0.824 | -45.1469 |
| 76 | 0.858 | -44.3094 |
| 77 | 0.892 | -43.4979 |
| 78 | 0.926 | -42.7107 |
| 79 | 0.961 | -41.9462 |
| 80 | 0.995 | -41.2029 |
| 81 | 1.029 | -40.4796 |
| 82 | 1.064 | -39.7750 |
| 83 | 1.098 | -39.0880 |
| 84 | 1.132 | -38.4177 |
| 85 | 1.167 | -37.7631 |
| 86 | 1.201 | -37.1235 |
| 87 | 1.235 | -36.4981 |
| 88 | 1.270 | -35.8861 |
| 89 | 1.304 | -35.2869 |
| 90 | 1.338 | -34.7000 |
| 91 | 1.373 | -34.1247 |
| 92 | 1.407 | -33.5605 |
| 93 | 1.441 | -33.0070 |
| 94 | 1.475 | -32.4636 |
| 95 | 1.510 | -31.9301 |
| 96 | 1.544 | -31.4059 |
| 97 | 1.578 | -30.8907 |
| 98 | 1.613 | -30.3841 |
| 99 | 1.647 | -29.8859 |
| 100 | 1.681 | -29.3956 |
| 101 | 1.716 | -28.9131 |
| 102 | 1.750 | -28.4380 |
| 103 | 1.784 | -27.9701 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|------------------|----------|
| 104 | 1.819 | -27.5092 |
| 105 | 1.853 | -27.0549 |
| 106 | 1.887 | -26.6071 |
| 107 | 1.922 | -26.1656 |
| 108 | 1.956 | -25.7301 |
| 109 | 1.990 | -25.3005 |
| 110 | 2.025 | -24.8766 |
| 111 | 2.059 | -24.4582 |
| 112 | 2.093 | -24.0452 |
| 113 | 2.127 | -23.6374 |
| 114 | 2.162 | -23.2346 |
| 115 | 2.196 | -22.8367 |
| 116 | 2.230 | -22.4436 |
| 117 | 2.265 | -22.0552 |
| 118 | 2.299 | -21.6712 |
| 119 | 2.333 | -21.2917 |
| 120 | 2.368 | -20.9164 |
| 121 | 2.402 | -20.5453 |
| 122 | 2.436 | -20.1782 |
| 123 | 2.471 | -19.8151 |
| 124 | 2.505 | -19.4559 |
| 125 | 2.539 | -19.1004 |
| 126 | 2.574 | -18.7486 |
| 127 | 2.608 | -18.4004 |
| 128 | 2.642 | -18.0557 |
| 129 | 2.676 | -17.7144 |
| 130 | 2.711 | -17.3764 |
| 131 | 2.745 | -17.0417 |
| 132 | 2.779 | -16.7102 |
| 133 | 2.814 | -16.3819 |
| 134 | 2.848 | -16.0565 |
| 135 | 2.882 | -15.7342 |
| 136 | 2.917 | -15.4148 |
| 137 | 2.951 | -15.0983 |
| 138 | 2.985 | -14.7846 |
| 139 | 3.020 | -14.4736 |
| 140 | 3.054 | -14.1653 |
| 141 | 3.088 | -13.8597 |
| 142 | 3.123 | -13.5566 |
| 143 | 3.157 | -13.2561 |
| 144 | 3.191 | -12.9580 |
| 145 | 3.225 | -12.6624 |
| 146 | 3.260 | -12.3692 |
| 147 | 3.294 | -12.0783 |
| 148 | 3.328 | -11.7898 |
| 149 | 3.363 | -11.5035 |
| 150 | 3.397 | -11.2194 |
| 151 | 3.431 | -10.9375 |
| 152 | 3.466 | -10.6577 |
| 153 | 3.500 | -10.3801 |
| 154 | 3.534 | -10.1045 |
| 155 | 3.569 | -9.8309 |

CONVERSION TABLE - 0/7 BAR R22 SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 156 | 3.603 | -9.5593 |
| 157 | 3.637 | -9.2897 |
| 158 | 3.672 | -9.0221 |
| 159 | 3.706 | -8.7563 |
| 160 | 3.740 | -8.4924 |
| 161 | 3.775 | -8.2303 |
| 162 | 3.809 | -7.9700 |
| 163 | 3.843 | -7.7115 |
| 164 | 3.877 | -7.4548 |
| 165 | 3.912 | -7.1997 |
| 166 | 3.946 | -6.9464 |
| 167 | 3.980 | -6.6947 |
| 168 | 4.015 | -6.4447 |
| 169 | 4.049 | -6.1963 |
| 170 | 4.083 | -5.9495 |
| 171 | 4.118 | -5.7042 |
| 172 | 4.152 | -5.4605 |
| 173 | 4.186 | -5.2183 |
| 174 | 4.221 | -4.9777 |
| 175 | 4.255 | -4.7385 |
| 176 | 4.289 | -4.5007 |
| 177 | 4.324 | -4.2644 |
| 178 | 4.358 | -4.0295 |
| 179 | 4.392 | -3.7960 |
| 180 | 4.426 | -3.5639 |
| 181 | 4.461 | -3.3331 |
| 182 | 4.495 | -3.1037 |
| 183 | 4.529 | -2.8756 |
| 184 | 4.564 | -2.6488 |
| 185 | 4.598 | -2.4233 |
| 186 | 4.632 | -2.1991 |
| 187 | 4.667 | -1.9761 |
| 188 | 4.701 | -1.7543 |
| 189 | 4.735 | -1.5338 |
| 190 | 4.770 | -1.3145 |
| 191 | 4.804 | -1.0963 |
| 192 | 4.838 | -0.8793 |
| 193 | 4.873 | -0.6635 |
| 194 | 4.907 | -0.4489 |
| 195 | 4.941 | -0.2353 |
| 196 | 4.975 | -0.0229 |
| 197 | 5.010 | 0.1884 |
| 198 | 5.044 | 0.3986 |
| 199 | 5.078 | 0.6078 |
| 200 | 5.113 | 0.8159 |
| 201 | 5.147 | 1.0229 |
| 202 | 5.181 | 1.2289 |
| 203 | 5.216 | 1.4339 |
| 204 | 5.250 | 1.6379 |
| 205 | 5.284 | 1.8408 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 206 | 5.319 | 2.0428 |
| 207 | 5.353 | 2.2438 |
| 208 | 5.387 | 2.4438 |
| 209 | 5.422 | 2.6429 |
| 210 | 5.456 | 2.8410 |
| 211 | 5.490 | 3.0382 |
| 212 | 5.525 | 3.2344 |
| 213 | 5.559 | 3.4298 |
| 214 | 5.593 | 3.6242 |
| 215 | 5.627 | 3.8178 |
| 216 | 5.662 | 4.0104 |
| 217 | 5.696 | 4.2022 |
| 218 | 5.730 | 4.3931 |
| 219 | 5.765 | 4.5832 |
| 220 | 5.799 | 4.7724 |
| 221 | 5.833 | 4.9608 |
| 222 | 5.868 | 5.1483 |
| 223 | 5.902 | 5.3351 |
| 224 | 5.936 | 5.5210 |
| 225 | 5.971 | 5.7061 |
| 226 | 6.005 | 5.8904 |
| 227 | 6.039 | 6.0739 |
| 228 | 6.074 | 6.2566 |
| 229 | 6.108 | 6.4386 |
| 230 | 6.142 | 6.6198 |
| 231 | 6.176 | 6.8002 |
| 232 | 6.211 | 6.9799 |
| 233 | 6.245 | 7.1589 |
| 234 | 6.279 | 7.3371 |
| 235 | 6.314 | 7.5146 |
| 236 | 6.348 | 7.6913 |
| 237 | 6.382 | 7.8674 |
| 238 | 6.417 | 8.0427 |
| 239 | 6.451 | 8.2174 |
| 240 | 6.485 | 8.3913 |
| 241 | 6.520 | 8.5646 |
| 242 | 6.554 | 8.7372 |
| 243 | 6.588 | 8.9091 |
| 244 | 6.623 | 9.0803 |
| 245 | 6.657 | 9.2509 |
| 246 | 6.691 | 9.4208 |
| 247 | 6.725 | 9.5900 |
| 248 | 6.760 | 9.7586 |
| 249 | 6.794 | 9.9266 |
| 250 | 6.828 | 10.0940 |
| 251 | 6.863 | 10.2607 |
| 252 | 6.897 | 10.4268 |
| 253 | 6.931 | 10.5923 |
| 254 | 6.966 | 10.7571 |
| 255 | 7.000 | 10.9214 |

CONVERSION TABLE - 0/25 BAR R22 SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 52 | 0.123 | -77.5838 |
| 53 | 0.245 | -67.1167 |
| 54 | 0.368 | -60.3405 |
| 55 | 0.490 | -55.2004 |
| 56 | 0.613 | -51.0060 |
| 57 | 0.735 | -47.4351 |
| 58 | 0.858 | -44.3094 |
| 59 | 0.980 | -41.5190 |
| 60 | 1.103 | -38.9912 |
| 61 | 1.225 | -36.6754 |
| 62 | 1.348 | -34.5344 |
| 63 | 1.471 | -32.5407 |
| 64 | 1.593 | -30.6725 |
| 65 | 1.716 | -28.9131 |
| 66 | 1.838 | -27.2488 |
| 67 | 1.961 | -25.6684 |
| 68 | 2.083 | -24.1627 |
| 69 | 2.206 | -22.7239 |
| 70 | 2.328 | -21.3456 |
| 71 | 2.451 | -20.0221 |
| 72 | 2.574 | -18.7486 |
| 73 | 2.696 | -17.5208 |
| 74 | 2.819 | -16.3352 |
| 75 | 2.941 | -15.1884 |
| 76 | 3.064 | -14.0777 |
| 77 | 3.186 | -13.0004 |
| 78 | 3.309 | -11.9544 |
| 79 | 3.431 | -10.9375 |
| 80 | 3.554 | -9.9479 |
| 81 | 3.676 | -8.9840 |
| 82 | 3.799 | -8.0442 |
| 83 | 3.922 | -7.1272 |
| 84 | 4.044 | -6.2317 |
| 85 | 4.167 | -5.3565 |
| 86 | 4.289 | -4.5007 |
| 87 | 4.412 | -3.6632 |
| 88 | 4.534 | -2.8431 |
| 89 | 4.657 | -2.0397 |
| 90 | 4.779 | -1.2520 |
| 91 | 4.902 | -0.4795 |
| 92 | 5.025 | 0.2786 |
| 93 | 5.147 | 1.0229 |
| 94 | 5.270 | 1.7540 |
| 95 | 5.392 | 2.4723 |
| 96 | 5.515 | 3.1785 |
| 97 | 5.637 | 3.8729 |
| 98 | 5.760 | 4.5561 |
| 99 | 5.882 | 5.2285 |
| 100 | 6.005 | 5.8904 |
| 101 | 6.127 | 6.5422 |
| 102 | 6.250 | 7.1844 |
| 103 | 6.373 | 7.8172 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 104 | 6.495 | 8.4409 |
| 105 | 6.618 | 9.0559 |
| 106 | 6.740 | 9.6624 |
| 107 | 6.863 | 10.2607 |
| 108 | 6.985 | 10.8511 |
| 109 | 7.108 | 11.4338 |
| 110 | 7.230 | 12.0090 |
| 111 | 7.353 | 12.5770 |
| 112 | 7.475 | 13.1379 |
| 113 | 7.598 | 13.6921 |
| 114 | 7.721 | 14.2396 |
| 115 | 7.843 | 14.7807 |
| 116 | 7.966 | 15.3155 |
| 117 | 8.088 | 15.8442 |
| 118 | 8.211 | 16.3670 |
| 119 | 8.333 | 16.8841 |
| 120 | 8.456 | 17.3955 |
| 121 | 8.578 | 17.9014 |
| 122 | 8.701 | 18.4019 |
| 123 | 8.824 | 18.8973 |
| 124 | 8.946 | 19.3875 |
| 125 | 9.069 | 19.8728 |
| 126 | 9.191 | 20.3533 |
| 127 | 9.314 | 20.8290 |
| 128 | 9.436 | 21.3001 |
| 129 | 9.559 | 21.7667 |
| 130 | 9.681 | 22.2289 |
| 131 | 9.804 | 22.6867 |
| 132 | 9.926 | 23.1404 |
| 133 | 10.049 | 23.5899 |
| 134 | 10.172 | 24.0353 |
| 135 | 10.294 | 24.4768 |
| 136 | 10.417 | 24.9144 |
| 137 | 10.539 | 25.3483 |
| 138 | 10.662 | 25.7784 |
| 139 | 10.784 | 26.2048 |
| 140 | 10.907 | 26.6277 |
| 141 | 11.029 | 27.0471 |
| 142 | 11.152 | 27.4631 |
| 143 | 11.275 | 27.8757 |
| 144 | 11.397 | 28.2850 |
| 145 | 11.520 | 28.6911 |
| 146 | 11.642 | 29.0940 |
| 147 | 11.765 | 29.4937 |
| 148 | 11.887 | 29.8904 |
| 149 | 12.010 | 30.2841 |
| 150 | 12.132 | 30.6748 |
| 151 | 12.255 | 31.0627 |
| 152 | 12.377 | 31.4476 |
| 153 | 12.500 | 31.8298 |
| 154 | 12.623 | 32.2092 |
| 155 | 12.745 | 32.5859 |

CONVERSION TABLE - 0/25 BAR R22 SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 156 | 12.868 | 32.9600 |
| 157 | 12.990 | 33.3314 |
| 158 | 13.113 | 33.7003 |
| 159 | 13.235 | 34.0666 |
| 160 | 13.358 | 34.4304 |
| 161 | 13.480 | 34.7918 |
| 162 | 13.603 | 35.1507 |
| 163 | 13.725 | 35.5073 |
| 164 | 13.848 | 35.8616 |
| 165 | 13.971 | 36.2135 |
| 166 | 14.093 | 36.5632 |
| 167 | 14.216 | 36.9106 |
| 168 | 14.338 | 37.2559 |
| 169 | 14.461 | 37.5989 |
| 170 | 14.583 | 37.9399 |
| 171 | 14.706 | 38.2787 |
| 172 | 14.828 | 38.6155 |
| 173 | 14.951 | 38.9502 |
| 174 | 15.074 | 39.2829 |
| 175 | 15.196 | 39.6136 |
| 176 | 15.319 | 39.9423 |
| 177 | 15.441 | 40.2691 |
| 178 | 15.564 | 40.5941 |
| 179 | 15.686 | 40.9171 |
| 180 | 15.809 | 41.2383 |
| 181 | 15.931 | 41.5576 |
| 182 | 16.054 | 41.8752 |
| 183 | 16.176 | 42.1910 |
| 184 | 16.299 | 42.5050 |
| 185 | 16.422 | 42.8172 |
| 186 | 16.544 | 43.1278 |
| 187 | 16.667 | 43.4367 |
| 188 | 16.789 | 43.7439 |
| 189 | 16.912 | 44.0494 |
| 190 | 17.034 | 44.3534 |
| 191 | 17.157 | 44.6557 |
| 192 | 17.279 | 44.9564 |
| 193 | 17.402 | 45.2556 |
| 194 | 17.525 | 45.5532 |
| 195 | 17.647 | 45.8493 |
| 196 | 17.770 | 46.1439 |
| 197 | 17.892 | 46.4370 |
| 198 | 18.015 | 46.7286 |
| 199 | 18.137 | 47.0187 |
| 200 | 18.260 | 47.3074 |
| 201 | 18.382 | 47.5947 |
| 202 | 18.505 | 47.8806 |
| 203 | 18.627 | 48.1651 |
| 204 | 18.750 | 48.4482 |
| 205 | 18.873 | 48.7299 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 206 | 18.995 | 49.0103 |
| 207 | 19.118 | 49.2894 |
| 208 | 19.240 | 49.5671 |
| 209 | 19.363 | 49.8436 |
| 210 | 19.485 | 50.1188 |
| 211 | 19.608 | 50.3926 |
| 212 | 19.730 | 50.6653 |
| 213 | 19.853 | 50.9366 |
| 214 | 19.975 | 51.2068 |
| 215 | 20.098 | 51.4757 |
| 216 | 20.221 | 51.7434 |
| 217 | 20.343 | 52.0099 |
| 218 | 20.466 | 52.2752 |
| 219 | 20.588 | 52.5394 |
| 220 | 20.711 | 52.8024 |
| 221 | 20.833 | 53.0642 |
| 222 | 20.956 | 53.3250 |
| 223 | 21.078 | 53.5846 |
| 224 | 21.201 | 53.8430 |
| 225 | 21.324 | 54.1004 |
| 226 | 21.446 | 54.3567 |
| 227 | 21.569 | 54.6119 |
| 228 | 21.691 | 54.8660 |
| 229 | 21.814 | 55.1191 |
| 230 | 21.936 | 55.3711 |
| 231 | 22.059 | 55.6221 |
| 232 | 22.181 | 55.8720 |
| 233 | 22.304 | 56.1209 |
| 234 | 22.426 | 56.3688 |
| 235 | 22.549 | 56.6157 |
| 236 | 22.672 | 56.8616 |
| 237 | 22.794 | 57.1066 |
| 238 | 22.917 | 57.3505 |
| 239 | 23.039 | 57.5935 |
| 240 | 23.162 | 57.8355 |
| 241 | 23.284 | 58.0766 |
| 242 | 23.407 | 58.3168 |
| 243 | 23.529 | 58.5560 |
| 244 | 23.652 | 58.7942 |
| 245 | 23.775 | 59.0316 |
| 246 | 23.897 | 59.2681 |
| 247 | 24.020 | 59.5036 |
| 248 | 24.142 | 59.7383 |
| 249 | 24.265 | 59.9721 |
| 250 | 24.387 | 60.2050 |
| 251 | 24.510 | 60.4370 |
| 252 | 24.632 | 60.6682 |
| 253 | 24.755 | 60.8985 |
| 254 | 24.877 | 61.1279 |
| 255 | 25.000 | 61.3566 |

CONVERSION TABLE - 0/7 BAR R134A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 52 | 0.034 | -80.6587 |
| 53 | 0.069 | -72.0057 |
| 54 | 0.103 | -66.4700 |
| 55 | 0.137 | -62.3031 |
| 56 | 0.172 | -58.9225 |
| 57 | 0.206 | -56.0576 |
| 58 | 0.240 | -53.5595 |
| 59 | 0.275 | -51.3368 |
| 60 | 0.309 | -49.3292 |
| 61 | 0.343 | -47.4947 |
| 62 | 0.377 | -45.8027 |
| 63 | 0.412 | -44.2303 |
| 64 | 0.446 | -42.7600 |
| 65 | 0.480 | -41.3777 |
| 66 | 0.515 | -40.0723 |
| 67 | 0.549 | -38.8347 |
| 68 | 0.583 | -37.6574 |
| 69 | 0.618 | -36.5340 |
| 70 | 0.652 | -35.4592 |
| 71 | 0.686 | -34.4285 |
| 72 | 0.721 | -33.4379 |
| 73 | 0.755 | -32.4840 |
| 74 | 0.789 | -31.5638 |
| 75 | 0.824 | -30.6747 |
| 76 | 0.858 | -29.8144 |
| 77 | 0.892 | -28.9809 |
| 78 | 0.926 | -28.1723 |
| 79 | 0.961 | -27.3869 |
| 80 | 0.995 | -26.6233 |
| 81 | 1.029 | -25.8802 |
| 82 | 1.064 | -25.1562 |
| 83 | 1.098 | -24.4504 |
| 84 | 1.132 | -23.7616 |
| 85 | 1.167 | -23.0891 |
| 86 | 1.201 | -22.4318 |
| 87 | 1.235 | -21.7891 |
| 88 | 1.270 | -21.1602 |
| 89 | 1.304 | -20.5444 |
| 90 | 1.338 | -19.9412 |
| 91 | 1.373 | -19.3499 |
| 92 | 1.407 | -18.7701 |
| 93 | 1.441 | -18.2012 |
| 94 | 1.475 | -17.6427 |
| 95 | 1.510 | -17.0943 |
| 96 | 1.544 | -16.5555 |
| 97 | 1.578 | -16.0259 |
| 98 | 1.613 | -15.5052 |
| 99 | 1.647 | -14.9930 |
| 100 | 1.681 | -14.4891 |
| 101 | 1.716 | -13.9931 |
| 102 | 1.750 | -13.5047 |
| 103 | 1.784 | -13.0237 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 104 | 1.819 | -12.5498 |
| 105 | 1.853 | -12.0828 |
| 106 | 1.887 | -11.6225 |
| 107 | 1.922 | -11.1686 |
| 108 | 1.956 | -10.7209 |
| 109 | 1.990 | -10.2793 |
| 110 | 2.025 | -9.8435 |
| 111 | 2.059 | -9.4134 |
| 112 | 2.093 | -8.9888 |
| 113 | 2.127 | -8.5695 |
| 114 | 2.162 | -8.1555 |
| 115 | 2.196 | -7.7465 |
| 116 | 2.230 | -7.3423 |
| 117 | 2.265 | -6.9430 |
| 118 | 2.299 | -6.5483 |
| 119 | 2.333 | -6.1581 |
| 120 | 2.368 | -5.7723 |
| 121 | 2.402 | -5.3908 |
| 122 | 2.436 | -5.0135 |
| 123 | 2.471 | -4.6402 |
| 124 | 2.505 | -4.2710 |
| 125 | 2.539 | -3.9055 |
| 126 | 2.574 | -3.5439 |
| 127 | 2.608 | -3.1860 |
| 128 | 2.642 | -2.8317 |
| 129 | 2.676 | -2.4808 |
| 130 | 2.711 | -2.1335 |
| 131 | 2.745 | -1.7895 |
| 132 | 2.779 | -1.4488 |
| 133 | 2.814 | -1.1113 |
| 134 | 2.848 | -0.7769 |
| 135 | 2.882 | -0.4456 |
| 136 | 2.917 | -0.1174 |
| 137 | 2.951 | 0.2079 |
| 138 | 2.985 | 0.5303 |
| 139 | 3.020 | 0.8499 |
| 140 | 3.054 | 1.1667 |
| 141 | 3.088 | 1.4808 |
| 142 | 3.123 | 1.7922 |
| 143 | 3.157 | 2.1010 |
| 144 | 3.191 | 2.4073 |
| 145 | 3.225 | 2.7110 |
| 146 | 3.260 | 3.0123 |
| 147 | 3.294 | 3.3111 |
| 148 | 3.328 | 3.6076 |
| 149 | 3.363 | 3.9018 |
| 150 | 3.397 | 4.1936 |
| 151 | 3.431 | 4.4832 |
| 152 | 3.466 | 4.7706 |
| 153 | 3.500 | 5.0558 |
| 154 | 3.534 | 5.3389 |
| 155 | 3.569 | 5.6199 |

CONVERSION TABLE - 0/7 BAR R134a SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 156 | 3.603 | 5.8988 |
| 157 | 3.637 | 6.1758 |
| 158 | 3.672 | 6.4507 |
| 159 | 3.706 | 6.7236 |
| 160 | 3.740 | 6.9947 |
| 161 | 3.775 | 7.2638 |
| 162 | 3.809 | 7.5311 |
| 163 | 3.843 | 7.7965 |
| 164 | 3.877 | 8.0602 |
| 165 | 3.912 | 8.3220 |
| 166 | 3.946 | 8.5822 |
| 167 | 3.980 | 8.8405 |
| 168 | 4.015 | 9.0972 |
| 169 | 4.049 | 9.3523 |
| 170 | 4.083 | 9.6056 |
| 171 | 4.118 | 9.8574 |
| 172 | 4.152 | 10.1076 |
| 173 | 4.186 | 10.3561 |
| 174 | 4.221 | 10.6032 |
| 175 | 4.255 | 10.8487 |
| 176 | 4.289 | 11.0927 |
| 177 | 4.324 | 11.3352 |
| 178 | 4.358 | 11.5763 |
| 179 | 4.392 | 11.8159 |
| 180 | 4.426 | 12.0540 |
| 181 | 4.461 | 12.2908 |
| 182 | 4.495 | 12.5262 |
| 183 | 4.529 | 12.7603 |
| 184 | 4.564 | 12.9929 |
| 185 | 4.598 | 13.2243 |
| 186 | 4.632 | 13.4543 |
| 187 | 4.667 | 13.6831 |
| 188 | 4.701 | 13.9105 |
| 189 | 4.735 | 14.1367 |
| 190 | 4.770 | 14.3617 |
| 191 | 4.804 | 14.5854 |
| 192 | 4.838 | 14.8079 |
| 193 | 4.873 | 15.0292 |
| 194 | 4.907 | 15.2493 |
| 195 | 4.941 | 15.4683 |
| 196 | 4.975 | 15.6861 |
| 197 | 5.010 | 15.9027 |
| 198 | 5.044 | 16.1183 |
| 199 | 5.078 | 16.3327 |
| 200 | 5.113 | 16.5460 |
| 201 | 5.147 | 16.7582 |
| 202 | 5.181 | 16.9694 |
| 203 | 5.216 | 17.1795 |
| 204 | 5.250 | 17.3885 |
| 205 | 5.284 | 17.5965 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 206 | 5.319 | 17.8035 |
| 207 | 5.353 | 18.0094 |
| 208 | 5.387 | 18.2144 |
| 209 | 5.422 | 18.4184 |
| 210 | 5.456 | 18.6213 |
| 211 | 5.490 | 18.8234 |
| 212 | 5.525 | 19.0244 |
| 213 | 5.559 | 19.2245 |
| 214 | 5.593 | 19.4237 |
| 215 | 5.627 | 19.6219 |
| 216 | 5.662 | 19.8192 |
| 217 | 5.696 | 20.0157 |
| 218 | 5.730 | 20.2112 |
| 219 | 5.765 | 20.4058 |
| 220 | 5.799 | 20.5996 |
| 221 | 5.833 | 20.7924 |
| 222 | 5.868 | 20.9844 |
| 223 | 5.902 | 21.1756 |
| 224 | 5.936 | 21.3659 |
| 225 | 5.971 | 21.5554 |
| 226 | 6.005 | 21.7441 |
| 227 | 6.039 | 21.9319 |
| 228 | 6.074 | 22.1189 |
| 229 | 6.108 | 22.3051 |
| 230 | 6.142 | 22.4906 |
| 231 | 6.176 | 22.6752 |
| 232 | 6.211 | 22.8591 |
| 233 | 6.245 | 23.0422 |
| 234 | 6.279 | 23.2245 |
| 235 | 6.314 | 23.4061 |
| 236 | 6.348 | 23.5869 |
| 237 | 6.382 | 23.7670 |
| 238 | 6.417 | 23.9463 |
| 239 | 6.451 | 24.1250 |
| 240 | 6.485 | 24.3028 |
| 241 | 6.520 | 24.4800 |
| 242 | 6.554 | 24.6565 |
| 243 | 6.588 | 24.8323 |
| 244 | 6.623 | 25.0074 |
| 245 | 6.657 | 25.1817 |
| 246 | 6.691 | 25.3554 |
| 247 | 6.725 | 25.5285 |
| 248 | 6.760 | 25.7008 |
| 249 | 6.794 | 25.8725 |
| 250 | 6.828 | 26.0436 |
| 251 | 6.863 | 26.2140 |
| 252 | 6.897 | 26.3837 |
| 253 | 6.931 | 26.5528 |
| 254 | 6.966 | 26.7212 |
| 255 | 7.000 | 26.8891 |

CONVERSION TABLE - 0/25 BAR R134a SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 52 | 0.123 | -63.9696 |
| 53 | 0.245 | -53.2268 |
| 54 | 0.368 | -46.2730 |
| 55 | 0.490 | -40.9973 |
| 56 | 0.613 | -36.6914 |
| 57 | 0.735 | -33.0247 |
| 58 | 0.858 | -29.8144 |
| 59 | 0.980 | -26.9480 |
| 60 | 1.103 | -24.3510 |
| 61 | 1.225 | -21.9713 |
| 62 | 1.348 | -19.7711 |
| 63 | 1.471 | -17.7219 |
| 64 | 1.593 | -15.8017 |
| 65 | 1.716 | -13.9931 |
| 66 | 1.838 | -12.2822 |
| 67 | 1.961 | -10.6575 |
| 68 | 2.083 | -9.1096 |
| 69 | 2.206 | -7.6305 |
| 70 | 2.328 | -6.2136 |
| 71 | 2.451 | -4.8530 |
| 72 | 2.574 | -3.5439 |
| 73 | 2.696 | -2.2819 |
| 74 | 2.819 | -1.0633 |
| 75 | 2.941 | 0.1153 |
| 76 | 3.064 | 1.2567 |
| 77 | 3.186 | 2.3637 |
| 78 | 3.309 | 3.4385 |
| 79 | 3.431 | 4.4832 |
| 80 | 3.554 | 5.4997 |
| 81 | 3.676 | 6.4898 |
| 82 | 3.799 | 7.4549 |
| 83 | 3.922 | 8.3965 |
| 84 | 4.044 | 9.3159 |
| 85 | 4.167 | 10.2143 |
| 86 | 4.289 | 11.0927 |
| 87 | 4.412 | 11.9521 |
| 88 | 4.534 | 12.7936 |
| 89 | 4.657 | 13.6178 |
| 90 | 4.779 | 14.4257 |
| 91 | 4.902 | 15.2180 |
| 92 | 5.025 | 15.9952 |
| 93 | 5.147 | 16.7582 |
| 94 | 5.270 | 17.5075 |
| 95 | 5.392 | 18.2436 |
| 96 | 5.515 | 18.9671 |
| 97 | 5.637 | 19.6784 |
| 98 | 5.760 | 20.3781 |
| 99 | 5.882 | 21.0665 |
| 100 | 6.005 | 21.7441 |
| 101 | 6.127 | 22.4112 |
| 102 | 6.250 | 23.0683 |
| 103 | 6.373 | 23.7156 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 104 | 6.495 | 24.3535 |
| 105 | 6.618 | 24.9824 |
| 106 | 6.740 | 25.6024 |
| 107 | 6.863 | 26.2140 |
| 108 | 6.985 | 26.8172 |
| 109 | 7.108 | 27.4125 |
| 110 | 7.230 | 28 |
| 111 | 7.353 | 28.5800 |
| 112 | 7.475 | 29.1527 |
| 113 | 7.598 | 29.7183 |
| 114 | 7.721 | 30.2770 |
| 115 | 7.843 | 30.8290 |
| 116 | 7.966 | 31.3744 |
| 117 | 8.088 | 31.9135 |
| 118 | 8.211 | 32.4464 |
| 119 | 8.333 | 32.9734 |
| 120 | 8.456 | 33.4944 |
| 121 | 8.578 | 34.0097 |
| 122 | 8.701 | 34.5195 |
| 123 | 8.824 | 35.0238 |
| 124 | 8.946 | 35.5228 |
| 125 | 9.069 | 36.0167 |
| 126 | 9.191 | 36.5055 |
| 127 | 9.314 | 36.9893 |
| 128 | 9.436 | 37.4683 |
| 129 | 9.559 | 37.9426 |
| 130 | 9.681 | 38.4123 |
| 131 | 9.804 | 38.8775 |
| 132 | 9.926 | 39.3383 |
| 133 | 10.049 | 39.7947 |
| 134 | 10.172 | 40.2470 |
| 135 | 10.294 | 40.6951 |
| 136 | 10.417 | 41.1391 |
| 137 | 10.539 | 41.5792 |
| 138 | 10.662 | 42.0154 |
| 139 | 10.784 | 42.4478 |
| 140 | 10.907 | 42.8765 |
| 141 | 11.029 | 43.3015 |
| 142 | 11.152 | 43.7229 |
| 143 | 11.275 | 44.1408 |
| 144 | 11.397 | 44.5552 |
| 145 | 11.520 | 44.9663 |
| 146 | 11.642 | 45.3740 |
| 147 | 11.765 | 45.7785 |
| 148 | 11.887 | 46.1797 |
| 149 | 12.010 | 46.5778 |
| 150 | 12.132 | 46.9728 |
| 151 | 12.255 | 47.3648 |
| 152 | 12.377 | 47.7538 |
| 153 | 12.500 | 48.1399 |
| 154 | 12.623 | 48.5230 |
| 155 | 12.745 | 48.9034 |

CONVERSION TABLE - 0/25 BAR R134a SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 156 | 12.868 | 49.2809 |
| 157 | 12.990 | 49.6557 |
| 158 | 13.113 | 50.0278 |
| 159 | 13.235 | 50.3973 |
| 160 | 13.358 | 50.7641 |
| 161 | 13.480 | 51.1284 |
| 162 | 13.603 | 51.4901 |
| 163 | 13.725 | 51.8494 |
| 164 | 13.848 | 52.2062 |
| 165 | 13.971 | 52.5606 |
| 166 | 14.093 | 52.9126 |
| 167 | 14.216 | 53.2623 |
| 168 | 14.338 | 53.6097 |
| 169 | 14.461 | 53.9548 |
| 170 | 14.583 | 54.2976 |
| 171 | 14.706 | 54.6383 |
| 172 | 14.828 | 54.9768 |
| 173 | 14.951 | 55.3131 |
| 174 | 15.074 | 55.6474 |
| 175 | 15.196 | 55.9795 |
| 176 | 15.319 | 56.3096 |
| 177 | 15.441 | 56.6377 |
| 178 | 15.564 | 56.9638 |
| 179 | 15.686 | 57.2879 |
| 180 | 15.809 | 57.6100 |
| 181 | 15.931 | 57.9303 |
| 182 | 16.054 | 58.2487 |
| 183 | 16.176 | 58.5652 |
| 184 | 16.299 | 58.8798 |
| 185 | 16.422 | 59.1927 |
| 186 | 16.544 | 59.5037 |
| 187 | 16.667 | 59.8130 |
| 188 | 16.789 | 60.1205 |
| 189 | 16.912 | 60.4263 |
| 190 | 17.034 | 60.7304 |
| 191 | 17.157 | 61.0328 |
| 192 | 17.279 | 61.3336 |
| 193 | 17.402 | 61.6327 |
| 194 | 17.525 | 61.9302 |
| 195 | 17.647 | 62.2261 |
| 196 | 17.770 | 62.5204 |
| 197 | 17.892 | 62.8131 |
| 198 | 18.015 | 63.1043 |
| 199 | 18.137 | 63.3940 |
| 200 | 18.260 | 63.6821 |
| 201 | 18.382 | 63.9688 |
| 202 | 18.505 | 64.2540 |
| 203 | 18.627 | 64.5377 |
| 204 | 18.750 | 64.8200 |
| 205 | 18.873 | 65.1009 |

| U VALUE | PRESSURE in bars | TEMP. °C |
|---------|---------------------|----------|
| 206 | 18.995 | 65.3804 |
| 207 | 19.118 | 65.6584 |
| 208 | 19.240 | 65.9351 |
| 209 | 19.363 | 66.2104 |
| 210 | 19.485 | 66.4844 |
| 211 | 19.608 | 66.7571 |
| 212 | 19.730 | 67.0284 |
| 213 | 19.853 | 67.2984 |
| 214 | 19.975 | 67.5672 |
| 215 | 20.098 | 67.8346 |
| 216 | 20.221 | 68.1008 |
| 217 | 20.343 | 68.3658 |
| 218 | 20.466 | 68.6295 |
| 219 | 20.588 | 68.8920 |
| 220 | 20.711 | 69.1533 |
| 221 | 20.833 | 69.4133 |
| 222 | 20.956 | 69.6722 |
| 223 | 21.078 | 69.9300 |
| 224 | 21.201 | 70.1865 |
| 225 | 21.324 | 70.4419 |
| 226 | 21.446 | 70.6962 |
| 227 | 21.569 | 70.9493 |
| 228 | 21.691 | 71.2013 |
| 229 | 21.814 | 71.4522 |
| 230 | 21.936 | 71.7021 |
| 231 | 22.059 | 71.9508 |
| 232 | 22.181 | 72.1984 |
| 233 | 22.304 | 72.4450 |
| 234 | 22.426 | 72.6906 |
| 235 | 22.549 | 72.9351 |
| 236 | 22.672 | 73.1785 |
| 237 | 22.794 | 73.4210 |
| 238 | 22.917 | 73.6624 |
| 239 | 23.039 | 73.9028 |
| 240 | 23.162 | 74.1422 |
| 241 | 23.284 | 74.3806 |
| 242 | 23.407 | 74.6181 |
| 243 | 23.529 | 74.8546 |
| 244 | 23.652 | 75.0901 |
| 245 | 23.775 | 75.3247 |
| 246 | 23.897 | 75.5583 |
| 247 | 24.020 | 75.7910 |
| 248 | 24.142 | 76.0227 |
| 249 | 24.265 | 76.2536 |
| 250 | 24.387 | 76.4835 |
| 251 | 24.510 | 76.7125 |
| 252 | 24.632 | 76.9407 |
| 253 | 24.755 | 77.1679 |
| 254 | 24.877 | 77.3943 |
| 255 | 25.000 | 77.6197 |

CONVERSION TABLE - 0/7 BAR R407C SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 58 | 0.240 | liquid | -70.452 |
| | | vapor | -62.585 |
| 59 | 0.275 | liquid | -68.342 |
| | | vapor | -60.432 |
| 60 | 0.309 | liquid | -66.442 |
| | | vapor | -58.499 |
| 61 | 0.343 | liquid | -64.102 |
| | | vapor | -56.741 |
| 62 | 0.377 | liquid | -62.465 |
| | | vapor | -55.115 |
| 63 | 0.412 | liquid | -60.948 |
| | | vapor | -53.599 |
| 64 | 0.446 | liquid | -59.443 |
| | | vapor | -52.192 |
| 65 | 0.480 | liquid | -58.109 |
| | | vapor | -50.874 |
| 66 | 0.515 | liquid | -56.851 |
| | | vapor | -49.622 |
| 67 | 0.549 | liquid | -55.653 |
| | | vapor | -48.441 |
| 68 | 0.583 | liquid | -54.510 |
| | | vapor | -47.314 |
| 69 | 0.618 | liquid | -53.434 |
| | | vapor | -46.243 |
| 70 | 0.652 | liquid | -52.396 |
| | | vapor | -45.222 |
| 71 | 0.686 | liquid | -51.407 |
| | | vapor | -44.238 |
| 72 | 0.720 | liquid | -50.457 |
| | | vapor | -43.293 |
| 73 | 0.755 | liquid | -49.539 |
| | | vapor | -42.387 |
| 74 | 0.789 | liquid | -48.655 |
| | | vapor | -41.514 |
| 75 | 0.824 | liquid | -47.798 |
| | | vapor | -40.668 |
| 76 | 0.858 | liquid | -46.974 |
| | | vapor | -39.852 |
| 77 | 0.892 | liquid | -46.175 |
| | | vapor | -39.064 |
| 78 | 0.927 | liquid | -45.397 |
| | | vapor | -38.295 |
| 79 | 0.961 | liquid | -44.645 |
| | | vapor | -37.520 |
| 80 | 0.995 | liquid | -43.939 |
| | | vapor | -36.801 |
| 81 | 1.029 | liquid | -43.228 |
| | | vapor | -36.097 |
| 82 | 1.064 | liquid | -42.533 |
| | | vapor | -35.416 |
| 83 | 1.098 | liquid | -41.857 |
| | | vapor | -34.749 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 84 | 1.132 | liquid | -41.195 |
| | | vapor | -34.098 |
| 85 | 1.167 | liquid | -40.552 |
| | | vapor | -33.463 |
| 86 | 1.201 | liquid | -39.923 |
| | | vapor | -32.845 |
| 87 | 1.235 | liquid | -39.308 |
| | | vapor | -32.238 |
| 88 | 1.270 | liquid | -38.707 |
| | | vapor | -31.645 |
| 89 | 1.304 | liquid | -38.119 |
| | | vapor | -31.066 |
| 90 | 1.338 | liquid | -37.542 |
| | | vapor | -30.497 |
| 91 | 1.372 | liquid | -36.976 |
| | | vapor | -29.940 |
| 92 | 1.407 | liquid | -36.422 |
| | | vapor | -29.396 |
| 93 | 1.441 | liquid | -35.878 |
| | | vapor | -28.857 |
| 94 | 1.476 | liquid | -35.342 |
| | | vapor | -28.333 |
| 95 | 1.510 | liquid | -34.818 |
| | | vapor | -27.816 |
| 96 | 1.544 | liquid | -34.301 |
| | | vapor | -27.311 |
| 97 | 1.578 | liquid | -33.796 |
| | | vapor | -26.814 |
| 98 | 1.613 | liquid | -33.296 |
| | | vapor | -26.325 |
| 99 | 1.647 | liquid | -32.807 |
| | | vapor | -25.844 |
| 100 | 1.681 | liquid | -32.324 |
| | | vapor | -25.369 |
| 101 | 1.716 | liquid | -31.851 |
| | | vapor | -24.905 |
| 102 | 1.750 | liquid | -31.384 |
| | | vapor | -24.446 |
| 103 | 1.784 | liquid | -30.923 |
| | | vapor | -23.996 |
| 104 | 1.819 | liquid | -30.470 |
| | | vapor | -23.551 |
| 105 | 1.853 | liquid | -30.025 |
| | | vapor | -23.113 |
| 106 | 1.887 | liquid | -29.585 |
| | | vapor | -22.680 |
| 107 | 1.922 | liquid | -29.151 |
| | | vapor | -22.256 |
| 108 | 1.956 | liquid | -28.723 |
| | | vapor | -21.837 |
| 109 | 1.990 | liquid | -28.300 |
| | | vapor | -21.422 |

CONVERSION TABLE - 0/7 BAR R407C SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 110 | 2.024 | liquid | -27.885 |
| | | vapor | -21.015 |
| 111 | 2.059 | liquid | -27.473 |
| | | vapor | -20.612 |
| 112 | 2.093 | liquid | -27.068 |
| | | vapor | -20.214 |
| 113 | 2.127 | liquid | -26.668 |
| | | vapor | -19.821 |
| 114 | 2.162 | liquid | -26.274 |
| | | vapor | -19.434 |
| 115 | 2.196 | liquid | -25.886 |
| | | vapor | -19.051 |
| 116 | 2.230 | liquid | -25.501 |
| | | vapor | -18.673 |
| 117 | 2.265 | liquid | -25.119 |
| | | vapor | -18.300 |
| 118 | 2.299 | liquid | -24.744 |
| | | vapor | -17.930 |
| 119 | 2.333 | liquid | -24.372 |
| | | vapor | -17.565 |
| 120 | 2.368 | liquid | -24.006 |
| | | vapor | -17.204 |
| 121 | 2.402 | liquid | -23.642 |
| | | vapor | -16.847 |
| 122 | 2.436 | liquid | -23.283 |
| | | vapor | -16.495 |
| 123 | 2.471 | liquid | -22.928 |
| | | vapor | -16.146 |
| 124 | 2.505 | liquid | -22.576 |
| | | vapor | -15.800 |
| 125 | 2.539 | liquid | -22.229 |
| | | vapor | -15.460 |
| 126 | 2.574 | liquid | -21.884 |
| | | vapor | -15.122 |
| 127 | 2.608 | liquid | -21.543 |
| | | vapor | -14.787 |
| 128 | 2.642 | liquid | -21.207 |
| | | vapor | -14.456 |
| 129 | 2.676 | liquid | -20.873 |
| | | vapor | -14.128 |
| 130 | 2.711 | liquid | -20.544 |
| | | vapor | -13.803 |
| 131 | 2.745 | liquid | -20.215 |
| | | vapor | -13.482 |
| 132 | 2.779 | liquid | -19.891 |
| | | vapor | -13.165 |
| 133 | 2.814 | liquid | -19.571 |
| | | vapor | -12.850 |
| 134 | 2.848 | liquid | -19.253 |
| | | vapor | -12.537 |
| 135 | 2.882 | liquid | -18.937 |
| | | vapor | -12.228 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 136 | 2.917 | liquid | -18.625 |
| | | vapor | -11.922 |
| 137 | 2.951 | liquid | -18.316 |
| | | vapor | -11.619 |
| 138 | 2.985 | liquid | -18.008 |
| | | vapor | -11.318 |
| 139 | 3.020 | liquid | -17.705 |
| | | vapor | -11.020 |
| 140 | 3.054 | liquid | -17.404 |
| | | vapor | -10.724 |
| 141 | 3.088 | liquid | -17.105 |
| | | vapor | -10.432 |
| 142 | 3.123 | liquid | -16.810 |
| | | vapor | -10.142 |
| 143 | 3.157 | liquid | -16.516 |
| | | vapor | -9.854 |
| 144 | 3.191 | liquid | -16.225 |
| | | vapor | -9.568 |
| 145 | 3.225 | liquid | -15.936 |
| | | vapor | -9.285 |
| 146 | 3.260 | liquid | -15.649 |
| | | vapor | -9.005 |
| 147 | 3.294 | liquid | -15.365 |
| | | vapor | -8.728 |
| 148 | 3.328 | liquid | -15.083 |
| | | vapor | -8.450 |
| 149 | 3.363 | liquid | -14.803 |
| | | vapor | -8.177 |
| 150 | 3.397 | liquid | -14.526 |
| | | vapor | -7.905 |
| 151 | 3.431 | liquid | -14.251 |
| | | vapor | -7.636 |
| 152 | 3.466 | liquid | -13.978 |
| | | vapor | -7.368 |
| 153 | 3.500 | liquid | -13.707 |
| | | vapor | -7.103 |
| 154 | 3.534 | liquid | -13.438 |
| | | vapor | -6.839 |
| 155 | 3.569 | liquid | -13.170 |
| | | vapor | -6.579 |
| 156 | 3.603 | liquid | -12.905 |
| | | vapor | -6.319 |
| 157 | 3.637 | liquid | -12.642 |
| | | vapor | -6.061 |
| 158 | 3.672 | liquid | -12.381 |
| | | vapor | -5.805 |
| 159 | 3.706 | liquid | -12.121 |
| | | vapor | -5.551 |
| 160 | 3.740 | liquid | -11.864 |
| | | vapor | -5.299 |
| 161 | 3.774 | liquid | -11.609 |
| | | vapor | -5.049 |

CONVERSION TABLE - 0/7 BAR R407C SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 162 | 3.809 | liquid | -11.353 |
| | | vapor | -4.800 |
| 163 | 3.843 | liquid | -11.102 |
| | | vapor | -4.553 |
| 164 | 3.878 | liquid | -10.851 |
| | | vapor | -4.308 |
| 165 | 3.912 | liquid | -10.602 |
| | | vapor | -4.065 |
| 166 | 3.946 | liquid | -10.355 |
| | | vapor | -3.822 |
| 167 | 3.980 | liquid | -10.111 |
| | | vapor | -3.583 |
| 168 | 4.015 | liquid | -9.866 |
| | | vapor | -3.344 |
| 169 | 4.049 | liquid | -9.624 |
| | | vapor | -3.107 |
| 170 | 4.083 | liquid | -9.383 |
| | | vapor | -2.872 |
| 171 | 4.118 | liquid | -9.144 |
| | | vapor | -2.637 |
| 172 | 4.152 | liquid | -8.906 |
| | | vapor | -2.405 |
| 173 | 4.186 | liquid | -8.670 |
| | | vapor | -2.174 |
| 174 | 4.221 | liquid | -8.435 |
| | | vapor | -1.945 |
| 175 | 4.255 | liquid | -8.202 |
| | | vapor | -1.717 |
| 176 | 4.289 | liquid | -7.971 |
| | | vapor | -1.490 |
| 177 | 4.324 | liquid | -7.740 |
| | | vapor | -1.265 |
| 178 | 4.358 | liquid | -7.511 |
| | | vapor | -1.041 |
| 179 | 4.392 | liquid | -7.283 |
| | | vapor | -.818 |
| 180 | 4.426 | liquid | -7.058 |
| | | vapor | -.596 |
| 181 | 4.461 | liquid | -6.833 |
| | | vapor | -.377 |
| 182 | 4.495 | liquid | -6.609 |
| | | vapor | -.158 |
| 183 | 4.529 | liquid | -6.386 |
| | | vapor | .059 |
| 184 | 4.564 | liquid | -6.165 |
| | | vapor | .275 |
| 185 | 4.598 | liquid | -5.945 |
| | | vapor | .490 |
| 186 | 4.632 | liquid | -5.727 |
| | | vapor | .703 |
| 187 | 4.667 | liquid | -5.510 |
| | | vapor | .916 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 188 | 4.701 | liquid | -5.293 |
| | | vapor | 1.127 |
| 189 | 4.735 | liquid | -5.079 |
| | | vapor | 1.337 |
| 190 | 4.770 | liquid | -4.865 |
| | | vapor | 1.546 |
| 191 | 4.804 | liquid | -4.652 |
| | | vapor | 1.753 |
| 192 | 4.838 | liquid | -4.441 |
| | | vapor | 1.959 |
| 193 | 4.873 | liquid | -4.230 |
| | | vapor | 2.165 |
| 194 | 4.907 | liquid | -4.021 |
| | | vapor | 2.370 |
| 195 | 4.941 | liquid | -3.814 |
| | | vapor | 2.573 |
| 196 | 4.975 | liquid | -3.607 |
| | | vapor | 2.775 |
| 197 | 5.010 | liquid | -3.401 |
| | | vapor | 2.975 |
| 198 | 5.044 | liquid | -3.196 |
| | | vapor | 3.176 |
| 199 | 5.078 | liquid | -2.993 |
| | | vapor | 3.375 |
| 200 | 5.113 | liquid | -2.790 |
| | | vapor | 3.573 |
| 201 | 5.147 | liquid | -2.588 |
| | | vapor | 3.769 |
| 202 | 5.181 | liquid | -2.387 |
| | | vapor | 3.966 |
| 203 | 5.216 | liquid | -2.188 |
| | | vapor | 4.160 |
| 204 | 5.250 | liquid | -1.989 |
| | | vapor | 4.354 |
| 205 | 5.284 | liquid | -1.791 |
| | | vapor | 4.547 |
| 206 | 5.319 | liquid | -1.595 |
| | | vapor | 4.739 |
| 207 | 5.353 | liquid | -1.399 |
| | | vapor | 4.930 |
| 208 | 5.387 | liquid | -1.205 |
| | | vapor | 5.120 |
| 209 | 5.422 | liquid | -1.011 |
| | | vapor | 5.309 |
| 210 | 5.456 | liquid | -.818 |
| | | vapor | 5.497 |
| 211 | 5.490 | liquid | -.625 |
| | | vapor | 5.685 |
| 212 | 5.525 | liquid | -.434 |
| | | vapor | 5.871 |
| 213 | 5.559 | liquid | -.245 |
| | | vapor | 6.056 |

Reference: RFL - V1.0 - 97

CONVERSION TABLE - 0/7 BAR R407C SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 214 | 5.593 | liquid | -.055 |
| | | vapor | 6.241 |
| 215 | 5.627 | liquid | .133 |
| | | vapor | 6.425 |
| 216 | 5.662 | liquid | .321 |
| | | vapor | 6.608 |
| 217 | 5.696 | liquid | .508 |
| | | vapor | 6.790 |
| 218 | 5.730 | liquid | .693 |
| | | vapor | 6.971 |
| 219 | 5.765 | liquid | .878 |
| | | vapor | 7.152 |
| 220 | 5.799 | liquid | 1.062 |
| | | vapor | 7.332 |
| 221 | 5.833 | liquid | 1.246 |
| | | vapor | 7.510 |
| 222 | 5.868 | liquid | 1.428 |
| | | vapor | 7.688 |
| 223 | 5.902 | liquid | 1.610 |
| | | vapor | 7.865 |
| 224 | 5.936 | liquid | 1.791 |
| | | vapor | 8.042 |
| 225 | 5.971 | liquid | 1.972 |
| | | vapor | 8.217 |
| 226 | 6.005 | liquid | 2.150 |
| | | vapor | 8.392 |
| 227 | 6.039 | liquid | 2.329 |
| | | vapor | 8.566 |
| 228 | 6.074 | liquid | 2.507 |
| | | vapor | 8.739 |
| 229 | 6.108 | liquid | 2.684 |
| | | vapor | 8.912 |
| 230 | 6.142 | liquid | 2.860 |
| | | vapor | 9.084 |
| 231 | 6.176 | liquid | 3.036 |
| | | vapor | 9.255 |
| 232 | 6.211 | liquid | 3.210 |
| | | vapor | 9.425 |
| 233 | 6.245 | liquid | 3.385 |
| | | vapor | 9.595 |
| 234 | 6.279 | liquid | 3.558 |
| | | vapor | 9.764 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 235 | 6.314 | liquid | 3.731 |
| | | vapor | 9.932 |
| 236 | 6.348 | liquid | 3.902 |
| | | vapor | 10.099 |
| 237 | 6.382 | liquid | 4.074 |
| | | vapor | 10.266 |
| 238 | 6.417 | liquid | 4.244 |
| | | vapor | 10.432 |
| 239 | 6.451 | liquid | 4.415 |
| | | vapor | 10.597 |
| 240 | 6.485 | liquid | 4.584 |
| | | vapor | 10.762 |
| 241 | 6.520 | liquid | 4.753 |
| | | vapor | 10.927 |
| 242 | 6.554 | liquid | 4.920 |
| | | vapor | 11.090 |
| 243 | 6.588 | liquid | 5.087 |
| | | vapor | 11.253 |
| 244 | 6.623 | liquid | 5.254 |
| | | vapor | 11.415 |
| 245 | 6.657 | liquid | 5.420 |
| | | vapor | 11.576 |
| 246 | 6.691 | liquid | 5.585 |
| | | vapor | 11.737 |
| 247 | 6.726 | liquid | 5.750 |
| | | vapor | 11.898 |
| 248 | 6.760 | liquid | 5.913 |
| | | vapor | 12.057 |
| 249 | 6.794 | liquid | 6.076 |
| | | vapor | 12.216 |
| 250 | 6.829 | liquid | 6.240 |
| | | vapor | 12.374 |
| 251 | 6.863 | liquid | 6.402 |
| | | vapor | 12.532 |
| 252 | 6.897 | liquid | 6.562 |
| | | vapor | 12.689 |
| 253 | 6.931 | liquid | 6.724 |
| | | vapor | 12.846 |
| 254 | 6.966 | liquid | 6.884 |
| | | vapor | 13.002 |
| 255 | 7.000 | liquid | 7.044 |
| | | vapor | 13.157 |

CONVERSION TABLE - 0/25 BAR R407C SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 53 | 0.245 | liquid | -70.144 |
| | | vapor | -62.256 |
| 54 | 0.368 | liquid | -62.915 |
| | | vapor | -55.565 |
| 55 | 0.490 | liquid | -57.740 |
| | | vapor | -50.506 |
| 56 | 0.613 | liquid | -53.582 |
| | | vapor | -46.392 |
| 57 | 0.735 | liquid | -50.056 |
| | | vapor | -42.901 |
| 58 | 0.858 | liquid | -46.974 |
| | | vapor | -39.852 |
| 59 | 0.980 | liquid | -44.249 |
| | | vapor | -37.105 |
| 60 | 1.103 | liquid | -41.761 |
| | | vapor | -34.653 |
| 61 | 1.226 | liquid | -39.481 |
| | | vapor | -32.409 |
| 62 | 1.348 | liquid | -37.377 |
| | | vapor | -30.335 |
| 63 | 1.471 | liquid | -35.419 |
| | | vapor | -28.407 |
| 64 | 1.593 | liquid | -33.582 |
| | | vapor | -26.602 |
| 65 | 1.716 | liquid | -31.851 |
| | | vapor | -24.905 |
| 66 | 1.838 | liquid | -30.214 |
| | | vapor | -23.301 |
| 67 | 1.961 | liquid | -28.662 |
| | | vapor | -21.777 |
| 68 | 2.083 | liquid | -27.183 |
| | | vapor | -20.327 |
| 69 | 2.206 | liquid | -25.774 |
| | | vapor | -18.942 |
| 70 | 2.329 | liquid | -24.424 |
| | | vapor | -17.617 |
| 71 | 2.451 | liquid | -23.131 |
| | | vapor | -16.344 |
| 72 | 2.574 | liquid | -21.884 |
| | | vapor | -15.122 |
| 73 | 2.696 | liquid | -20.684 |
| | | vapor | -13.943 |
| 74 | 2.819 | liquid | -19.525 |
| | | vapor | -12.805 |
| 75 | 2.941 | liquid | -18.404 |
| | | vapor | -11.705 |
| 76 | 3.064 | liquid | -17.319 |
| | | vapor | -10.641 |
| 77 | 3.186 | liquid | -16.266 |
| | | vapor | -9.609 |
| 78 | 3.309 | liquid | -15.244 |
| | | vapor | -8.608 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 79 | 3.431 | liquid | -14.251 |
| | | vapor | -7.636 |
| 80 | 3.554 | liquid | -13.284 |
| | | vapor | -6.690 |
| 81 | 3.677 | liquid | -12.344 |
| | | vapor | -5.768 |
| 82 | 3.799 | liquid | -11.426 |
| | | vapor | -4.872 |
| 83 | 3.922 | liquid | -10.532 |
| | | vapor | -3.995 |
| 84 | 4.044 | liquid | -9.659 |
| | | vapor | -3.141 |
| 85 | 4.167 | liquid | -8.805 |
| | | vapor | -2.306 |
| 86 | 4.289 | liquid | -7.971 |
| | | vapor | -1.490 |
| 87 | 4.412 | liquid | -7.154 |
| | | vapor | -.691 |
| 88 | 4.534 | liquid | -6.355 |
| | | vapor | .090 |
| 89 | 4.657 | liquid | -5.572 |
| | | vapor | .855 |
| 90 | 4.779 | liquid | -4.804 |
| | | vapor | 1.605 |
| 91 | 4.902 | liquid | -4.052 |
| | | vapor | 2.340 |
| 92 | 5.025 | liquid | -3.313 |
| | | vapor | 3.062 |
| 93 | 5.147 | liquid | -2.588 |
| | | vapor | 3.769 |
| 94 | 5.270 | liquid | -1.876 |
| | | vapor | 4.464 |
| 95 | 5.392 | liquid | -1.177 |
| | | vapor | 5.147 |
| 96 | 5.515 | liquid | -.489 |
| | | vapor | 5.818 |
| 97 | 5.637 | liquid | .187 |
| | | vapor | 6.477 |
| 98 | 5.760 | liquid | .852 |
| | | vapor | 7.126 |
| 99 | 5.882 | liquid | 1.506 |
| | | vapor | 7.764 |
| 100 | 6.005 | liquid | 2.150 |
| | | vapor | 8.392 |
| 101 | 6.127 | liquid | 2.785 |
| | | vapor | 9.010 |
| 102 | 6.250 | liquid | 3.409 |
| | | vapor | 9.619 |
| 103 | 6.372 | liquid | 4.025 |
| | | vapor | 10.218 |
| 104 | 6.495 | liquid | 4.632 |
| | | vapor | 10.809 |

CONVERSION TABLE - 0/25 BAR R407C SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 105 | 6.618 | liquid | 5.230 |
| | | vapor | 11.392 |
| 106 | 6.740 | liquid | 5.820 |
| | | vapor | 11.966 |
| 107 | 6.863 | liquid | 6.402 |
| | | vapor | 12.532 |
| 108 | 6.985 | liquid | 6.976 |
| | | vapor | 13.091 |
| 109 | 7.108 | liquid | 7.542 |
| | | vapor | 13.642 |
| 110 | 7.230 | liquid | 8.101 |
| | | vapor | 14.186 |
| 111 | 7.353 | liquid | 8.653 |
| | | vapor | 14.723 |
| 112 | 7.476 | liquid | 9.199 |
| | | vapor | 15.253 |
| 113 | 7.598 | liquid | 9.739 |
| | | vapor | 15.777 |
| 114 | 7.721 | liquid | 10.271 |
| | | vapor | 16.294 |
| 115 | 7.843 | liquid | 10.797 |
| | | vapor | 16.805 |
| 116 | 7.966 | liquid | 11.316 |
| | | vapor | 17.309 |
| 117 | 8.088 | liquid | 11.830 |
| | | vapor | 17.808 |
| 118 | 8.211 | liquid | 12.338 |
| | | vapor | 18.301 |
| 119 | 8.333 | liquid | 12.840 |
| | | vapor | 18.788 |
| 120 | 8.456 | liquid | 13.337 |
| | | vapor | 19.270 |
| 121 | 8.578 | liquid | 13.828 |
| | | vapor | 19.747 |
| 122 | 8.701 | liquid | 14.314 |
| | | vapor | 20.219 |
| 123 | 8.823 | liquid | 14.795 |
| | | vapor | 20.685 |
| 124 | 8.946 | liquid | 15.271 |
| | | vapor | 21.147 |
| 125 | 9.069 | liquid | 15.742 |
| | | vapor | 21.603 |
| 126 | 9.191 | liquid | 16.208 |
| | | vapor | 22.056 |
| 127 | 9.314 | liquid | 16.670 |
| | | vapor | 22.503 |
| 128 | 9.436 | liquid | 17.127 |
| | | vapor | 22.946 |
| 129 | 9.559 | liquid | 17.580 |
| | | vapor | 23.385 |
| 130 | 9.681 | liquid | 18.029 |
| | | vapor | 23.819 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 131 | 9.804 | liquid | 18.473 |
| | | vapor | 24.249 |
| 132 | 9.926 | liquid | 18.913 |
| | | vapor | 24.676 |
| 133 | 10.049 | liquid | 19.349 |
| | | vapor | 25.098 |
| 134 | 10.171 | liquid | 19.781 |
| | | vapor | 25.516 |
| 135 | 10.294 | liquid | 20.210 |
| | | vapor | 25.930 |
| 136 | 10.417 | liquid | 20.635 |
| | | vapor | 26.341 |
| 137 | 10.539 | liquid | 21.055 |
| | | vapor | 26.748 |
| 138 | 10.662 | liquid | 21.472 |
| | | vapor | 27.151 |
| 139 | 10.784 | liquid | 21.886 |
| | | vapor | 27.551 |
| 140 | 10.907 | liquid | 22.296 |
| | | vapor | 27.947 |
| 141 | 11.029 | liquid | 22.703 |
| | | vapor | 28.340 |
| 142 | 11.152 | liquid | 23.106 |
| | | vapor | 28.730 |
| 143 | 11.274 | liquid | 23.506 |
| | | vapor | 29.116 |
| 144 | 11.397 | liquid | 23.903 |
| | | vapor | 29.500 |
| 145 | 11.520 | liquid | 24.296 |
| | | vapor | 29.880 |
| 146 | 11.642 | liquid | 24.687 |
| | | vapor | 30.257 |
| 147 | 11.765 | liquid | 25.075 |
| | | vapor | 30.631 |
| 148 | 11.887 | liquid | 25.460 |
| | | vapor | 31.002 |
| 149 | 12.010 | liquid | 25.841 |
| | | vapor | 31.370 |
| 150 | 12.132 | liquid | 26.220 |
| | | vapor | 31.735 |
| 151 | 12.255 | liquid | 26.596 |
| | | vapor | 32.097 |
| 152 | 12.377 | liquid | 26.969 |
| | | vapor | 32.457 |
| 153 | 12.500 | liquid | 27.339 |
| | | vapor | 32.814 |
| 154 | 12.623 | liquid | 27.707 |
| | | vapor | 33.169 |
| 155 | 12.745 | liquid | 28.072 |
| | | vapor | 33.520 |
| 156 | 12.868 | liquid | 28.435 |
| | | vapor | 33.869 |

CONVERSION TABLE - 0/25 BAR R407C SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 157 | 12.990 | liquid | 28.795 |
| | | vapor | 34.216 |
| 158 | 13.113 | liquid | 29.152 |
| | | vapor | 34.560 |
| 159 | 13.235 | liquid | 29.507 |
| | | vapor | 34.902 |
| 160 | 13.358 | liquid | 29.860 |
| | | vapor | 35.241 |
| 161 | 13.480 | liquid | 30.210 |
| | | vapor | 35.577 |
| 162 | 13.603 | liquid | 30.558 |
| | | vapor | 35.912 |
| 163 | 13.726 | liquid | 30.903 |
| | | vapor | 36.244 |
| 164 | 13.848 | liquid | 31.246 |
| | | vapor | 36.574 |
| 165 | 13.971 | liquid | 31.587 |
| | | vapor | 36.902 |
| 166 | 14.093 | liquid | 31.926 |
| | | vapor | 37.227 |
| 167 | 14.216 | liquid | 32.263 |
| | | vapor | 37.551 |
| 168 | 14.338 | liquid | 32.597 |
| | | vapor | 37.872 |
| 169 | 14.461 | liquid | 32.930 |
| | | vapor | 38.191 |
| 170 | 14.583 | liquid | 33.260 |
| | | vapor | 38.509 |
| 171 | 14.706 | liquid | 33.588 |
| | | vapor | 38.824 |
| 172 | 14.828 | liquid | 33.914 |
| | | vapor | 39.137 |
| 173 | 14.951 | liquid | 34.238 |
| | | vapor | 39.448 |
| 174 | 15.074 | liquid | 34.561 |
| | | vapor | 39.757 |
| 175 | 15.196 | liquid | 34.881 |
| | | vapor | 40.064 |
| 176 | 15.319 | liquid | 35.200 |
| | | vapor | 40.369 |
| 177 | 15.441 | liquid | 35.516 |
| | | vapor | 40.673 |
| 178 | 15.564 | liquid | 35.831 |
| | | vapor | 40.974 |
| 179 | 15.686 | liquid | 36.144 |
| | | vapor | 41.274 |
| 180 | 15.809 | liquid | 36.455 |
| | | vapor | 41.572 |
| 181 | 15.931 | liquid | 36.765 |
| | | vapor | 41.869 |
| 182 | 16.054 | liquid | 37.072 |
| | | vapor | 42.163 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 183 | 16.176 | liquid | 37.378 |
| | | vapor | 42.456 |
| 184 | 16.299 | liquid | 37.682 |
| | | vapor | 42.747 |
| 185 | 16.422 | liquid | 37.985 |
| | | vapor | 43.036 |
| 186 | 16.544 | liquid | 38.286 |
| | | vapor | 43.324 |
| 187 | 16.667 | liquid | 38.585 |
| | | vapor | 43.610 |
| 188 | 16.789 | liquid | 38.883 |
| | | vapor | 43.895 |
| 189 | 16.912 | liquid | 39.179 |
| | | vapor | 44.178 |
| 190 | 17.034 | liquid | 39.473 |
| | | vapor | 44.459 |
| 191 | 17.157 | liquid | 39.766 |
| | | vapor | 44.739 |
| 192 | 17.279 | liquid | 40.057 |
| | | vapor | 45.017 |
| 193 | 17.402 | liquid | 40.347 |
| | | vapor | 45.294 |
| 194 | 17.524 | liquid | 40.635 |
| | | vapor | 45.569 |
| 195 | 17.647 | liquid | 40.922 |
| | | vapor | 45.843 |
| 196 | 17.770 | liquid | 41.208 |
| | | vapor | 46.116 |
| 197 | 17.892 | liquid | 41.491 |
| | | vapor | 46.387 |
| 198 | 18.015 | liquid | 41.774 |
| | | vapor | 46.656 |
| 199 | 18.137 | liquid | 42.055 |
| | | vapor | 46.924 |
| 200 | 18.260 | liquid | 42.335 |
| | | vapor | 47.191 |
| 201 | 18.382 | liquid | 42.613 |
| | | vapor | 47.456 |
| 202 | 18.505 | liquid | 42.891 |
| | | vapor | 47.720 |
| 203 | 18.627 | liquid | 43.166 |
| | | vapor | 47.983 |
| 204 | 18.750 | liquid | 43.441 |
| | | vapor | 48.244 |
| 205 | 18.872 | liquid | 43.713 |
| | | vapor | 48.504 |
| 206 | 18.995 | liquid | 43.985 |
| | | vapor | 48.763 |
| 207 | 19.118 | liquid | 44.256 |
| | | vapor | 49.020 |
| 208 | 19.240 | liquid | 44.525 |
| | | vapor | 49.276 |

CONVERSION TABLE - 0/25 BAR R407C SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 209 | 19.363 | liquid | 44.793 |
| | | vapor | 49.531 |
| 210 | 19.485 | liquid | 45.060 |
| | | vapor | 49.785 |
| 211 | 19.608 | liquid | 45.325 |
| | | vapor | 50.037 |
| 212 | 19.730 | liquid | 45.590 |
| | | vapor | 50.288 |
| 213 | 19.853 | liquid | 45.853 |
| | | vapor | 50.538 |
| 214 | 19.976 | liquid | 46.115 |
| | | vapor | 50.787 |
| 215 | 20.098 | liquid | 46.375 |
| | | vapor | 51.035 |
| 216 | 20.221 | liquid | 46.635 |
| | | vapor | 51.281 |
| 217 | 20.343 | liquid | 46.893 |
| | | vapor | 51.526 |
| 218 | 20.466 | liquid | 47.151 |
| | | vapor | 51.771 |
| 219 | 20.588 | liquid | 47.407 |
| | | vapor | 52.014 |
| 220 | 20.711 | liquid | 47.662 |
| | | vapor | 52.256 |
| 221 | 20.833 | liquid | 47.916 |
| | | vapor | 52.496 |
| 222 | 20.956 | liquid | 48.169 |
| | | vapor | 52.736 |
| 223 | 21.078 | liquid | 48.421 |
| | | vapor | 52.975 |
| 224 | 21.201 | liquid | 48.671 |
| | | vapor | 53.212 |
| 225 | 21.323 | liquid | 48.921 |
| | | vapor | 53.449 |
| 226 | 21.446 | liquid | 49.170 |
| | | vapor | 53.684 |
| 227 | 21.569 | liquid | 49.417 |
| | | vapor | 53.919 |
| 228 | 21.691 | liquid | 49.664 |
| | | vapor | 54.152 |
| 229 | 21.814 | liquid | 49.910 |
| | | vapor | 54.384 |
| 230 | 21.936 | liquid | 50.154 |
| | | vapor | 54.616 |
| 231 | 22.059 | liquid | 50.398 |
| | | vapor | 54.846 |
| 232 | 22.181 | liquid | 50.640 |
| | | vapor | 55.075 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 233 | 22.304 | liquid | 50.882 |
| | | vapor | 55.304 |
| 234 | 22.426 | liquid | 51.123 |
| | | vapor | 55.531 |
| 235 | 22.549 | liquid | 51.363 |
| | | vapor | 55.758 |
| 236 | 22.672 | liquid | 51.601 |
| | | vapor | 55.983 |
| 237 | 22.794 | liquid | 51.839 |
| | | vapor | 56.207 |
| 238 | 22.917 | liquid | 52.076 |
| | | vapor | 56.431 |
| 239 | 23.039 | liquid | 52.312 |
| | | vapor | 56.654 |
| 240 | 23.162 | liquid | 52.547 |
| | | vapor | 56.875 |
| 241 | 23.284 | liquid | 52.782 |
| | | vapor | 57.096 |
| 242 | 23.407 | liquid | 53.015 |
| | | vapor | 57.316 |
| 243 | 23.529 | liquid | 53.247 |
| | | vapor | 57.535 |
| 244 | 23.652 | liquid | 53.479 |
| | | vapor | 57.753 |
| 245 | 23.775 | liquid | 53.710 |
| | | vapor | 57.970 |
| 246 | 23.897 | liquid | 53.939 |
| | | vapor | 58.187 |
| 247 | 24.020 | liquid | 54.168 |
| | | vapor | 58.402 |
| 248 | 24.142 | liquid | 54.397 |
| | | vapor | 58.617 |
| 249 | 24.265 | liquid | 54.624 |
| | | vapor | 58.831 |
| 250 | 24.387 | liquid | 54.851 |
| | | vapor | 59.044 |
| 251 | 24.510 | liquid | 55.076 |
| | | vapor | 59.256 |
| 252 | 24.632 | liquid | 55.301 |
| | | vapor | 59.467 |
| 253 | 24.755 | liquid | 55.525 |
| | | vapor | 59.677 |
| 254 | 24.877 | liquid | 55.748 |
| | | vapor | 59.887 |
| 255 | 25.000 | liquid | 55.970 |
| | | vapor | 60.096 |

CONVERSION TABLE - 0/7 BAR R404A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 54 | 0.103 | liquid | -84.901 |
| | | vapor | -83.974 |
| 55 | 0.137 | liquid | -80.909 |
| | | vapor | -80.001 |
| 56 | 0.171 | liquid | -77.673 |
| | | vapor | -76.784 |
| 57 | 0.206 | liquid | -74.930 |
| | | vapor | -74.059 |
| 58 | 0.240 | liquid | -72.536 |
| | | vapor | -71.685 |
| 59 | 0.275 | liquid | -70.408 |
| | | vapor | -69.575 |
| 60 | 0.309 | liquid | -68.497 |
| | | vapor | -67.664 |
| 61 | 0.343 | liquid | -66.737 |
| | | vapor | -65.923 |
| 62 | 0.377 | liquid | -65.129 |
| | | vapor | -64.315 |
| 63 | 0.412 | liquid | -63.625 |
| | | vapor | -62.820 |
| 64 | 0.446 | liquid | -62.224 |
| | | vapor | -61.420 |
| 65 | 0.480 | liquid | -60.900 |
| | | vapor | -60.110 |
| 66 | 0.515 | liquid | -59.656 |
| | | vapor | -58.871 |
| 67 | 0.549 | liquid | -58.478 |
| | | vapor | -57.698 |
| 68 | 0.583 | liquid | -57.352 |
| | | vapor | -56.577 |
| 69 | 0.618 | liquid | -56.283 |
| | | vapor | -55.512 |
| 70 | 0.652 | liquid | -55.257 |
| | | vapor | -54.495 |
| 71 | 0.686 | liquid | -54.278 |
| | | vapor | -53.516 |
| 72 | 0.720 | liquid | -53.332 |
| | | vapor | -52.575 |
| 73 | 0.755 | liquid | -52.423 |
| | | vapor | -51.671 |
| 74 | 0.789 | liquid | -51.544 |
| | | vapor | -50.801 |
| 75 | 0.824 | liquid | -50.697 |
| | | vapor | -49.954 |
| 76 | 0.858 | liquid | -49.879 |
| | | vapor | -49.141 |
| 77 | 0.892 | liquid | -49.084 |
| | | vapor | -48.351 |
| 78 | 0.927 | liquid | -48.313 |
| | | vapor | -47.584 |
| 79 | 0.961 | liquid | -47.565 |
| | | vapor | -46.842 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 80 | 0.995 | liquid | -46.837 |
| | | vapor | -46.116 |
| 81 | 1.029 | liquid | -46.132 |
| | | vapor | -45.413 |
| 82 | 1.064 | liquid | -45.442 |
| | | vapor | -44.727 |
| 83 | 1.098 | liquid | -44.770 |
| | | vapor | -44.056 |
| 84 | 1.132 | liquid | -44.112 |
| | | vapor | -43.403 |
| 85 | 1.167 | liquid | -43.474 |
| | | vapor | -42.767 |
| 86 | 1.201 | liquid | -42.847 |
| | | vapor | -42.145 |
| 87 | 1.235 | liquid | -42.234 |
| | | vapor | -41.534 |
| 88 | 1.270 | liquid | -41.638 |
| | | vapor | -40.938 |
| 89 | 1.304 | liquid | -41.052 |
| | | vapor | -40.357 |
| 90 | 1.338 | liquid | -40.477 |
| | | vapor | -39.784 |
| 91 | 1.372 | liquid | -39.914 |
| | | vapor | -39.224 |
| 92 | 1.407 | liquid | -39.363 |
| | | vapor | -38.675 |
| 93 | 1.441 | liquid | -38.819 |
| | | vapor | -38.136 |
| 94 | 1.476 | liquid | -38.289 |
| | | vapor | -37.606 |
| 95 | 1.510 | liquid | -37.767 |
| | | vapor | -37.088 |
| 96 | 1.544 | liquid | -37.254 |
| | | vapor | -36.577 |
| 97 | 1.578 | liquid | -36.750 |
| | | vapor | -36.076 |
| 98 | 1.613 | liquid | -36.255 |
| | | vapor | -35.581 |
| 99 | 1.647 | liquid | -35.768 |
| | | vapor | -35.094 |
| 100 | 1.681 | liquid | -35.286 |
| | | vapor | -34.616 |
| 101 | 1.716 | liquid | -34.813 |
| | | vapor | -34.146 |
| 102 | 1.750 | liquid | -34.347 |
| | | vapor | -33.682 |
| 103 | 1.784 | liquid | -33.888 |
| | | vapor | -33.226 |
| 104 | 1.819 | liquid | -33.436 |
| | | vapor | -32.774 |
| 105 | 1.853 | liquid | -32.992 |
| | | vapor | -32.332 |

CONVERSION TABLE - 0/7 BAR R404A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 106 | 1.887 | liquid | -32.552 |
| | | vapor | -31.894 |
| 107 | 1.922 | liquid | -32.119 |
| | | vapor | -31.464 |
| 108 | 1.956 | liquid | -31.693 |
| | | vapor | -31.038 |
| 109 | 1.990 | liquid | -31.272 |
| | | vapor | -30.619 |
| 110 | 2.024 | liquid | -30.856 |
| | | vapor | -30.203 |
| 111 | 2.059 | liquid | -30.444 |
| | | vapor | -29.792 |
| 112 | 2.093 | liquid | -30.035 |
| | | vapor | -29.387 |
| 113 | 2.127 | liquid | -29.633 |
| | | vapor | -28.988 |
| 114 | 2.162 | liquid | -29.237 |
| | | vapor | -28.593 |
| 115 | 2.196 | liquid | -28.846 |
| | | vapor | -28.202 |
| 116 | 2.230 | liquid | -28.458 |
| | | vapor | -27.817 |
| 117 | 2.265 | liquid | -28.075 |
| | | vapor | -27.434 |
| 118 | 2.299 | liquid | -27.696 |
| | | vapor | -27.058 |
| 119 | 2.333 | liquid | -27.321 |
| | | vapor | -26.686 |
| 120 | 2.368 | liquid | -26.951 |
| | | vapor | -26.317 |
| 121 | 2.402 | liquid | -26.585 |
| | | vapor | -25.953 |
| 122 | 2.436 | liquid | -26.223 |
| | | vapor | -25.594 |
| 123 | 2.471 | liquid | -25.866 |
| | | vapor | -25.236 |
| 124 | 2.505 | liquid | -25.511 |
| | | vapor | -24.884 |
| 125 | 2.539 | liquid | -25.161 |
| | | vapor | -24.536 |
| 126 | 2.574 | liquid | -24.815 |
| | | vapor | -24.191 |
| 127 | 2.608 | liquid | -24.471 |
| | | vapor | -23.850 |
| 128 | 2.642 | liquid | -24.132 |
| | | vapor | -23.512 |
| 129 | 2.676 | liquid | -23.796 |
| | | vapor | -23.176 |
| 130 | 2.711 | liquid | -23.463 |
| | | vapor | -22.845 |
| 131 | 2.745 | liquid | -23.131 |
| | | vapor | -22.517 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 132 | 2.779 | liquid | -22.805 |
| | | vapor | -22.193 |
| 133 | 2.814 | liquid | -22.482 |
| | | vapor | -21.871 |
| 134 | 2.848 | liquid | -22.162 |
| | | vapor | -21.552 |
| 135 | 2.882 | liquid | -21.845 |
| | | vapor | -21.235 |
| 136 | 2.917 | liquid | -21.529 |
| | | vapor | -20.922 |
| 137 | 2.951 | liquid | -21.218 |
| | | vapor | -20.611 |
| 138 | 2.985 | liquid | -20.908 |
| | | vapor | -20.304 |
| 139 | 3.020 | liquid | -20.602 |
| | | vapor | -19.999 |
| 140 | 3.054 | liquid | -20.298 |
| | | vapor | -19.697 |
| 141 | 3.088 | liquid | -19.998 |
| | | vapor | -19.397 |
| 142 | 3.123 | liquid | -19.699 |
| | | vapor | -19.099 |
| 143 | 3.157 | liquid | -19.403 |
| | | vapor | -18.806 |
| 144 | 3.191 | liquid | -19.108 |
| | | vapor | -18.512 |
| 145 | 3.225 | liquid | -18.818 |
| | | vapor | -18.224 |
| 146 | 3.260 | liquid | -18.529 |
| | | vapor | -17.935 |
| 147 | 3.294 | liquid | -18.243 |
| | | vapor | -17.650 |
| 148 | 3.328 | liquid | -17.959 |
| | | vapor | -17.368 |
| 149 | 3.363 | liquid | -17.676 |
| | | vapor | -17.087 |
| 150 | 3.397 | liquid | -17.396 |
| | | vapor | -16.808 |
| 151 | 3.431 | liquid | -17.119 |
| | | vapor | -16.533 |
| 152 | 3.466 | liquid | -16.844 |
| | | vapor | -16.258 |
| 153 | 3.500 | liquid | -16.571 |
| | | vapor | -15.986 |
| 154 | 3.534 | liquid | -16.299 |
| | | vapor | -15.716 |
| 155 | 3.569 | liquid | -16.029 |
| | | vapor | -15.447 |
| 156 | 3.603 | liquid | -15.762 |
| | | vapor | -15.182 |
| 157 | 3.637 | liquid | -15.497 |
| | | vapor | -14.917 |

CONVERSION TABLE - 0/7 BAR R404A SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 158 | 3.672 | liquid | -15.233 |
| | | vapor | -14.655 |
| 159 | 3.706 | liquid | -14.972 |
| | | vapor | -14.395 |
| 160 | 3.740 | liquid | -14.712 |
| | | vapor | -14.136 |
| 161 | 3.774 | liquid | -14.454 |
| | | vapor | -13.879 |
| 162 | 3.809 | liquid | -14.197 |
| | | vapor | -13.624 |
| 163 | 3.843 | liquid | -13.943 |
| | | vapor | -13.371 |
| 164 | 3.878 | liquid | -13.690 |
| | | vapor | -13.120 |
| 165 | 3.912 | liquid | -13.439 |
| | | vapor | -12.869 |
| 166 | 3.946 | liquid | -13.190 |
| | | vapor | -12.621 |
| 167 | 3.980 | liquid | -12.943 |
| | | vapor | -12.375 |
| 168 | 4.015 | liquid | -12.697 |
| | | vapor | -12.130 |
| 169 | 4.049 | liquid | -12.452 |
| | | vapor | -11.887 |
| 170 | 4.083 | liquid | -12.209 |
| | | vapor | -11.644 |
| 171 | 4.118 | liquid | -11.968 |
| | | vapor | -11.404 |
| 172 | 4.152 | liquid | -11.728 |
| | | vapor | -11.166 |
| 173 | 4.186 | liquid | -11.489 |
| | | vapor | -10.929 |
| 174 | 4.221 | liquid | -11.253 |
| | | vapor | -10.693 |
| 175 | 4.255 | liquid | -11.017 |
| | | vapor | -10.459 |
| 176 | 4.289 | liquid | -10.783 |
| | | vapor | -10.226 |
| 177 | 4.324 | liquid | -10.551 |
| | | vapor | -9.994 |
| 178 | 4.358 | liquid | -10.320 |
| | | vapor | -9.764 |
| 179 | 4.392 | liquid | -10.090 |
| | | vapor | -9.536 |
| 180 | 4.426 | liquid | -9.862 |
| | | vapor | -9.309 |
| 181 | 4.461 | liquid | -9.635 |
| | | vapor | -9.083 |
| 182 | 4.495 | liquid | -9.409 |
| | | vapor | -8.858 |
| 183 | 4.529 | liquid | -9.184 |
| | | vapor | -8.635 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 184 | 4.564 | liquid | -8.962 |
| | | vapor | -8.412 |
| 185 | 4.598 | liquid | -8.740 |
| | | vapor | -8.191 |
| 186 | 4.632 | liquid | -8.520 |
| | | vapor | -7.972 |
| 187 | 4.667 | liquid | -8.300 |
| | | vapor | -7.754 |
| 188 | 4.701 | liquid | -8.082 |
| | | vapor | -7.537 |
| 189 | 4.735 | liquid | -7.865 |
| | | vapor | -7.321 |
| 190 | 4.770 | liquid | -7.649 |
| | | vapor | -7.107 |
| 191 | 4.804 | liquid | -7.435 |
| | | vapor | -6.893 |
| 192 | 4.838 | liquid | -7.221 |
| | | vapor | -6.680 |
| 193 | 4.873 | liquid | -7.010 |
| | | vapor | -6.469 |
| 194 | 4.907 | liquid | -6.798 |
| | | vapor | -6.259 |
| 195 | 4.941 | liquid | -6.589 |
| | | vapor | -6.049 |
| 196 | 4.975 | liquid | -6.379 |
| | | vapor | -5.843 |
| 197 | 5.010 | liquid | -6.172 |
| | | vapor | -5.636 |
| 198 | 5.044 | liquid | -5.966 |
| | | vapor | -5.430 |
| 199 | 5.078 | liquid | -5.760 |
| | | vapor | -5.225 |
| 200 | 5.113 | liquid | -5.555 |
| | | vapor | -5.021 |
| 201 | 5.147 | liquid | -5.352 |
| | | vapor | -4.818 |
| 202 | 5.181 | liquid | -5.150 |
| | | vapor | -4.617 |
| 203 | 5.216 | liquid | -4.947 |
| | | vapor | -4.416 |
| 204 | 5.250 | liquid | -4.747 |
| | | vapor | -4.216 |
| 205 | 5.284 | liquid | -4.548 |
| | | vapor | -4.018 |
| 206 | 5.319 | liquid | -4.349 |
| | | vapor | -3.820 |
| 207 | 5.353 | liquid | -4.151 |
| | | vapor | -3.624 |
| 208 | 5.387 | liquid | -3.955 |
| | | vapor | -3.428 |
| 209 | 5.422 | liquid | -3.759 |
| | | vapor | -3.234 |

CONVERSION TABLE - 0/7 BAR R404A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 210 | 5.456 | liquid | -3.565 |
| | | vapor | -3.040 |
| 211 | 5.490 | liquid | -3.371 |
| | | vapor | -2.847 |
| 212 | 5.525 | liquid | -3.178 |
| | | vapor | -2.654 |
| 213 | 5.559 | liquid | -2.987 |
| | | vapor | -2.464 |
| 214 | 5.593 | liquid | -2.795 |
| | | vapor | -2.274 |
| 215 | 5.627 | liquid | -2.605 |
| | | vapor | -2.084 |
| 216 | 5.662 | liquid | -2.415 |
| | | vapor | -1.896 |
| 217 | 5.696 | liquid | -2.227 |
| | | vapor | -1.708 |
| 218 | 5.730 | liquid | -2.039 |
| | | vapor | -1.521 |
| 219 | 5.765 | liquid | -1.853 |
| | | vapor | -1.336 |
| 220 | 5.799 | liquid | -1.667 |
| | | vapor | -1.150 |
| 221 | 5.833 | liquid | -1.482 |
| | | vapor | -0.967 |
| 222 | 5.868 | liquid | -1.298 |
| | | vapor | -0.783 |
| 223 | 5.902 | liquid | -1.115 |
| | | vapor | -0.600 |
| 224 | 5.936 | liquid | -0.931 |
| | | vapor | -0.418 |
| 225 | 5.971 | liquid | -0.750 |
| | | vapor | -0.237 |
| 226 | 6.005 | liquid | -0.569 |
| | | vapor | -0.057 |
| 227 | 6.039 | liquid | -0.389 |
| | | vapor | 0.122 |
| 228 | 6.074 | liquid | -0.209 |
| | | vapor | 0.301 |
| 229 | 6.108 | liquid | -0.030 |
| | | vapor | 0.478 |
| 230 | 6.142 | liquid | 0.147 |
| | | vapor | 0.656 |
| 231 | 6.176 | liquid | 0.325 |
| | | vapor | 0.832 |
| 232 | 6.211 | liquid | 0.501 |
| | | vapor | 1.008 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 233 | 6.245 | liquid | 0.677 |
| | | vapor | 1.183 |
| 234 | 6.279 | liquid | 0.852 |
| | | vapor | 1.357 |
| 235 | 6.314 | liquid | 1.026 |
| | | vapor | 1.531 |
| 236 | 6.348 | liquid | 1.200 |
| | | vapor | 1.703 |
| 237 | 6.382 | liquid | 1.372 |
| | | vapor | 1.875 |
| 238 | 6.417 | liquid | 1.544 |
| | | vapor | 2.046 |
| 239 | 6.451 | liquid | 1.716 |
| | | vapor | 2.218 |
| 240 | 6.485 | liquid | 1.887 |
| | | vapor | 2.387 |
| 241 | 6.520 | liquid | 2.057 |
| | | vapor | 2.557 |
| 242 | 6.554 | liquid | 2.226 |
| | | vapor | 2.725 |
| 243 | 6.588 | liquid | 2.395 |
| | | vapor | 2.893 |
| 244 | 6.623 | liquid | 2.563 |
| | | vapor | 3.061 |
| 245 | 6.657 | liquid | 2.730 |
| | | vapor | 3.228 |
| 246 | 6.691 | liquid | 2.897 |
| | | vapor | 3.393 |
| 247 | 6.726 | liquid | 3.063 |
| | | vapor | 3.559 |
| 248 | 6.760 | liquid | 3.229 |
| | | vapor | 3.723 |
| 249 | 6.794 | liquid | 3.393 |
| | | vapor | 3.888 |
| 250 | 6.829 | liquid | 3.558 |
| | | vapor | 4.051 |
| 251 | 6.863 | liquid | 3.721 |
| | | vapor | 4.214 |
| 252 | 6.897 | liquid | 3.884 |
| | | vapor | 4.376 |
| 253 | 6.931 | liquid | 4.047 |
| | | vapor | 4.538 |
| 254 | 6.966 | liquid | 4.208 |
| | | vapor | 4.699 |
| 255 | 7.000 | liquid | 4.370 |
| | | vapor | 4.860 |

CONVERSION TABLE - 0/25 BAR R404A SENSOR

TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 53 | 0.245 | liquid | -72.224 |
| | | vapor | -71.373 |
| 54 | 0.368 | liquid | -65.573 |
| | | vapor | -64.750 |
| 55 | 0.490 | liquid | -60.531 |
| | | vapor | -59.741 |
| 56 | 0.613 | liquid | -56.425 |
| | | vapor | -55.654 |
| 57 | 0.735 | liquid | -52.925 |
| | | vapor | -52.173 |
| 58 | 0.858 | liquid | -49.864 |
| | | vapor | -49.131 |
| 59 | 0.980 | liquid | -47.135 |
| | | vapor | -46.411 |
| 60 | 1.103 | liquid | -44.661 |
| | | vapor | -43.949 |
| 61 | 1.226 | liquid | -42.395 |
| | | vapor | -41.693 |
| 62 | 1.348 | liquid | -40.300 |
| | | vapor | -39.609 |
| 63 | 1.471 | liquid | -38.349 |
| | | vapor | -37.665 |
| 64 | 1.593 | liquid | -36.520 |
| | | vapor | -35.846 |
| 65 | 1.716 | liquid | -34.799 |
| | | vapor | -34.129 |
| 66 | 1.838 | liquid | -33.164 |
| | | vapor | -32.504 |
| 67 | 1.961 | liquid | -31.615 |
| | | vapor | -30.962 |
| 68 | 2.083 | liquid | -30.135 |
| | | vapor | -29.484 |
| 69 | 2.206 | liquid | -28.716 |
| | | vapor | -28.072 |
| 70 | 2.329 | liquid | -27.356 |
| | | vapor | -26.719 |
| 71 | 2.451 | liquid | -26.050 |
| | | vapor | -25.421 |
| 72 | 2.574 | liquid | -24.795 |
| | | vapor | -24.172 |
| 73 | 2.696 | liquid | -23.586 |
| | | vapor | -22.968 |
| 74 | 2.819 | liquid | -22.417 |
| | | vapor | -21.805 |
| 75 | 2.941 | liquid | -21.287 |
| | | vapor | -20.680 |
| 76 | 3.064 | liquid | -20.192 |
| | | vapor | -19.591 |
| 77 | 3.186 | liquid | -19.130 |
| | | vapor | -18.534 |
| 78 | 3.309 | liquid | -18.100 |
| | | vapor | -17.508 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 79 | 3.431 | liquid | -17.098 |
| | | vapor | -16.512 |
| 80 | 3.554 | liquid | -16.124 |
| | | vapor | -15.542 |
| 81 | 3.677 | liquid | -15.174 |
| | | vapor | -14.596 |
| 82 | 3.799 | liquid | -14.249 |
| | | vapor | -13.676 |
| 83 | 3.922 | liquid | -13.346 |
| | | vapor | -12.777 |
| 84 | 4.044 | liquid | -12.465 |
| | | vapor | -11.900 |
| 85 | 4.167 | liquid | -11.604 |
| | | vapor | -11.042 |
| 86 | 4.289 | liquid | -10.761 |
| | | vapor | -10.204 |
| 87 | 4.412 | liquid | -9.937 |
| | | vapor | -9.383 |
| 88 | 4.534 | liquid | -9.130 |
| | | vapor | -8.580 |
| 89 | 4.657 | liquid | -8.340 |
| | | vapor | -7.794 |
| 90 | 4.779 | liquid | -7.565 |
| | | vapor | -7.022 |
| 91 | 4.902 | liquid | -6.805 |
| | | vapor | -6.266 |
| 92 | 5.025 | liquid | -6.060 |
| | | vapor | -5.523 |
| 93 | 5.147 | liquid | -5.328 |
| | | vapor | -4.795 |
| 94 | 5.270 | liquid | -4.609 |
| | | vapor | -4.079 |
| 95 | 5.392 | liquid | -3.903 |
| | | vapor | -3.377 |
| 96 | 5.515 | liquid | -3.209 |
| | | vapor | -2.685 |
| 97 | 5.637 | liquid | -2.527 |
| | | vapor | -2.006 |
| 98 | 5.760 | liquid | -1.855 |
| | | vapor | -1.338 |
| 99 | 5.882 | liquid | -1.195 |
| | | vapor | -0.681 |
| 100 | 6.005 | liquid | -0.545 |
| | | vapor | -0.033 |
| 101 | 6.127 | liquid | 0.096 |
| | | vapor | 0.605 |
| 102 | 6.250 | liquid | 0.727 |
| | | vapor | 1.233 |
| 103 | 6.372 | liquid | 1.349 |
| | | vapor | 1.851 |
| 104 | 6.495 | liquid | 1.961 |
| | | vapor | 2.461 |

CONVERSION TABLE - 0/25 BAR R404A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 105 | 6.618 | liquid | 2.564 |
| | | vapor | 3.062 |
| 106 | 6.740 | liquid | 3.160 |
| | | vapor | 3.655 |
| 107 | 6.863 | liquid | 3.747 |
| | | vapor | 4.240 |
| 108 | 6.985 | liquid | 4.326 |
| | | vapor | 4.816 |
| 109 | 7.108 | liquid | 4.899 |
| | | vapor | 5.386 |
| 110 | 7.230 | liquid | 5.463 |
| | | vapor | 5.948 |
| 111 | 7.353 | liquid | 6.020 |
| | | vapor | 6.502 |
| 112 | 7.476 | liquid | 6.570 |
| | | vapor | 7.050 |
| 113 | 7.598 | liquid | 7.114 |
| | | vapor | 7.591 |
| 114 | 7.721 | liquid | 7.650 |
| | | vapor | 8.126 |
| 115 | 7.843 | liquid | 8.181 |
| | | vapor | 8.654 |
| 116 | 7.966 | liquid | 8.705 |
| | | vapor | 9.176 |
| 117 | 8.088 | liquid | 9.224 |
| | | vapor | 9.693 |
| 118 | 8.211 | liquid | 9.736 |
| | | vapor | 10.202 |
| 119 | 8.333 | liquid | 10.243 |
| | | vapor | 10.707 |
| 120 | 8.456 | liquid | 10.744 |
| | | vapor | 11.206 |
| 121 | 8.578 | liquid | 11.240 |
| | | vapor | 11.700 |
| 122 | 8.701 | liquid | 11.730 |
| | | vapor | 12.188 |
| 123 | 8.823 | liquid | 12.216 |
| | | vapor | 12.671 |
| 124 | 8.946 | liquid | 12.696 |
| | | vapor | 13.149 |
| 125 | 9.069 | liquid | 13.171 |
| | | vapor | 13.622 |
| 126 | 9.191 | liquid | 13.642 |
| | | vapor | 14.091 |
| 127 | 9.314 | liquid | 14.107 |
| | | vapor | 14.554 |
| 128 | 9.436 | liquid | 14.568 |
| | | vapor | 15.014 |
| 129 | 9.559 | liquid | 15.025 |
| | | vapor | 15.468 |
| 130 | 9.681 | liquid | 15.478 |
| | | vapor | 15.919 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 131 | 9.804 | liquid | 15.926 |
| | | vapor | 16.365 |
| 132 | 9.926 | liquid | 16.370 |
| | | vapor | 16.807 |
| 133 | 10.049 | liquid | 16.810 |
| | | vapor | 17.245 |
| 134 | 10.171 | liquid | 17.246 |
| | | vapor | 17.679 |
| 135 | 10.294 | liquid | 17.677 |
| | | vapor | 18.109 |
| 136 | 10.417 | liquid | 18.105 |
| | | vapor | 18.535 |
| 137 | 10.539 | liquid | 18.530 |
| | | vapor | 18.957 |
| 138 | 10.662 | liquid | 18.950 |
| | | vapor | 19.376 |
| 139 | 10.784 | liquid | 19.367 |
| | | vapor | 19.791 |
| 140 | 10.907 | liquid | 19.781 |
| | | vapor | 20.203 |
| 141 | 11.029 | liquid | 20.191 |
| | | vapor | 20.611 |
| 142 | 11.152 | liquid | 20.598 |
| | | vapor | 21.016 |
| 143 | 11.274 | liquid | 21.001 |
| | | vapor | 21.417 |
| 144 | 11.397 | liquid | 21.401 |
| | | vapor | 21.816 |
| 145 | 11.520 | liquid | 21.797 |
| | | vapor | 22.211 |
| 146 | 11.642 | liquid | 22.191 |
| | | vapor | 22.603 |
| 147 | 11.765 | liquid | 22.582 |
| | | vapor | 22.991 |
| 148 | 11.887 | liquid | 22.969 |
| | | vapor | 23.377 |
| 149 | 12.010 | liquid | 23.354 |
| | | vapor | 23.760 |
| 150 | 12.132 | liquid | 23.736 |
| | | vapor | 24.140 |
| 151 | 12.255 | liquid | 24.115 |
| | | vapor | 24.517 |
| 152 | 12.377 | liquid | 24.490 |
| | | vapor | 24.891 |
| 153 | 12.500 | liquid | 24.863 |
| | | vapor | 25.262 |
| 154 | 12.623 | liquid | 25.234 |
| | | vapor | 25.631 |
| 155 | 12.745 | liquid | 25.602 |
| | | vapor | 25.997 |
| 156 | 12.868 | liquid | 25.966 |
| | | vapor | 26.361 |

CONVERSION TABLE - 0/25 BAR R404A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 157 | 12.990 | liquid | 26.329 |
| | | vapor | 26.722 |
| 158 | 13.113 | liquid | 26.689 |
| | | vapor | 27.080 |
| 159 | 13.235 | liquid | 27.047 |
| | | vapor | 27.436 |
| 160 | 13.358 | liquid | 27.402 |
| | | vapor | 27.789 |
| 161 | 13.480 | liquid | 27.754 |
| | | vapor | 28.140 |
| 162 | 13.603 | liquid | 28.104 |
| | | vapor | 28.488 |
| 163 | 13.726 | liquid | 28.452 |
| | | vapor | 28.835 |
| 164 | 13.848 | liquid | 28.798 |
| | | vapor | 29.178 |
| 165 | 13.971 | liquid | 29.141 |
| | | vapor | 29.520 |
| 166 | 14.093 | liquid | 29.482 |
| | | vapor | 29.859 |
| 167 | 14.216 | liquid | 29.820 |
| | | vapor | 30.196 |
| 168 | 14.338 | liquid | 30.157 |
| | | vapor | 30.532 |
| 169 | 14.461 | liquid | 30.492 |
| | | vapor | 30.865 |
| 170 | 14.583 | liquid | 30.824 |
| | | vapor | 31.195 |
| 171 | 14.706 | liquid | 31.154 |
| | | vapor | 31.524 |
| 172 | 14.828 | liquid | 31.483 |
| | | vapor | 31.851 |
| 173 | 14.951 | liquid | 31.808 |
| | | vapor | 32.175 |
| 174 | 15.074 | liquid | 32.133 |
| | | vapor | 32.498 |
| 175 | 15.196 | liquid | 32.455 |
| | | vapor | 32.819 |
| 176 | 15.319 | liquid | 32.775 |
| | | vapor | 33.137 |
| 177 | 15.441 | liquid | 33.094 |
| | | vapor | 33.454 |
| 178 | 15.564 | liquid | 33.410 |
| | | vapor | 33.769 |
| 179 | 15.686 | liquid | 33.725 |
| | | vapor | 34.082 |
| 180 | 15.809 | liquid | 34.037 |
| | | vapor | 34.394 |
| 181 | 15.931 | liquid | 34.348 |
| | | vapor | 34.703 |
| 182 | 16.054 | liquid | 34.658 |
| | | vapor | 35.011 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 183 | 16.176 | liquid | 34.965 |
| | | vapor | 35.317 |
| 184 | 16.299 | liquid | 35.271 |
| | | vapor | 35.621 |
| 185 | 16.422 | liquid | 35.575 |
| | | vapor | 35.924 |
| 186 | 16.544 | liquid | 35.877 |
| | | vapor | 36.225 |
| 187 | 16.667 | liquid | 36.178 |
| | | vapor | 36.524 |
| 188 | 16.789 | liquid | 36.477 |
| | | vapor | 36.821 |
| 189 | 16.912 | liquid | 36.774 |
| | | vapor | 37.117 |
| 190 | 17.034 | liquid | 37.070 |
| | | vapor | 37.411 |
| 191 | 17.157 | liquid | 37.364 |
| | | vapor | 37.704 |
| 192 | 17.279 | liquid | 37.657 |
| | | vapor | 37.995 |
| 193 | 17.402 | liquid | 37.948 |
| | | vapor | 38.285 |
| 194 | 17.524 | liquid | 38.237 |
| | | vapor | 38.573 |
| 195 | 17.647 | liquid | 38.526 |
| | | vapor | 38.860 |
| 196 | 17.770 | liquid | 38.812 |
| | | vapor | 39.145 |
| 197 | 17.892 | liquid | 39.097 |
| | | vapor | 39.428 |
| 198 | 18.015 | liquid | 39.381 |
| | | vapor | 39.711 |
| 199 | 18.137 | liquid | 39.663 |
| | | vapor | 39.991 |
| 200 | 18.260 | liquid | 39.944 |
| | | vapor | 40.271 |
| 201 | 18.382 | liquid | 40.223 |
| | | vapor | 40.549 |
| 202 | 18.505 | liquid | 40.501 |
| | | vapor | 40.825 |
| 203 | 18.627 | liquid | 40.778 |
| | | vapor | 41.100 |
| 204 | 18.750 | liquid | 41.053 |
| | | vapor | 41.374 |
| 205 | 18.872 | liquid | 41.327 |
| | | vapor | 41.647 |
| 206 | 18.995 | liquid | 41.599 |
| | | vapor | 41.918 |
| 207 | 19.118 | liquid | 41.871 |
| | | vapor | 42.188 |
| 208 | 19.240 | liquid | 42.141 |
| | | vapor | 42.456 |

CONVERSION TABLE - 0/25 BAR R404A SENSOR TECHNICAL DATA SHEET

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 209 | 19.363 | liquid | 42.409 |
| | | vapor | 42.723 |
| 210 | 19.485 | liquid | 42.677 |
| | | vapor | 42.989 |
| 211 | 19.608 | liquid | 42.943 |
| | | vapor | 43.254 |
| 212 | 19.730 | liquid | 43.208 |
| | | vapor | 43.518 |
| 213 | 19.853 | liquid | 43.472 |
| | | vapor | 43.780 |
| 214 | 19.976 | liquid | 43.734 |
| | | vapor | 44.041 |
| 215 | 20.098 | liquid | 43.995 |
| | | vapor | 44.301 |
| 216 | 20.221 | liquid | 44.255 |
| | | vapor | 44.560 |
| 217 | 20.343 | liquid | 44.514 |
| | | vapor | 44.817 |
| 218 | 20.466 | liquid | 44.772 |
| | | vapor | 45.074 |
| 219 | 20.588 | liquid | 45.029 |
| | | vapor | 45.329 |
| 220 | 20.711 | liquid | 45.284 |
| | | vapor | 45.583 |
| 221 | 20.833 | liquid | 45.538 |
| | | vapor | 45.836 |
| 222 | 20.956 | liquid | 45.792 |
| | | vapor | 46.088 |
| 223 | 21.078 | liquid | 46.044 |
| | | vapor | 46.338 |
| 224 | 21.201 | liquid | 46.295 |
| | | vapor | 46.588 |
| 225 | 21.323 | liquid | 46.545 |
| | | vapor | 46.837 |
| 226 | 21.446 | liquid | 46.794 |
| | | vapor | 47.084 |
| 227 | 21.569 | liquid | 47.042 |
| | | vapor | 47.331 |
| 228 | 21.691 | liquid | 47.289 |
| | | vapor | 47.576 |
| 229 | 21.814 | liquid | 47.534 |
| | | vapor | 47.820 |
| 230 | 21.936 | liquid | 47.779 |
| | | vapor | 48.063 |
| 231 | 22.059 | liquid | 48.023 |
| | | vapor | 48.306 |
| 232 | 22.181 | liquid | 48.265 |
| | | vapor | 48.547 |

| U VALUE | PRESSURE in bars | PHASE | TEMP. °C |
|---------|---------------------|--------|----------|
| 233 | 22.304 | liquid | 48.507 |
| | | vapor | 48.787 |
| 234 | 22.426 | liquid | 48.748 |
| | | vapor | 49.027 |
| 235 | 22.549 | liquid | 48.987 |
| | | vapor | 49.265 |
| 236 | 22.672 | liquid | 49.226 |
| | | vapor | 49.502 |
| 237 | 22.794 | liquid | 49.464 |
| | | vapor | 49.739 |
| 238 | 22.917 | liquid | 49.701 |
| | | vapor | 49.974 |
| 239 | 23.039 | liquid | 49.937 |
| | | vapor | 50.209 |
| 240 | 23.162 | liquid | 50.172 |
| | | vapor | 50.442 |
| 241 | 23.284 | liquid | 50.406 |
| | | vapor | 50.675 |
| 242 | 23.407 | liquid | 50.639 |
| | | vapor | 50.906 |
| 243 | 23.529 | liquid | 50.871 |
| | | vapor | 51.137 |
| 244 | 23.652 | liquid | 51.102 |
| | | vapor | 51.367 |
| 245 | 23.775 | liquid | 51.333 |
| | | vapor | 51.596 |
| 246 | 23.897 | liquid | 51.562 |
| | | vapor | 51.824 |
| 247 | 24.020 | liquid | 51.791 |
| | | vapor | 52.051 |
| 248 | 24.142 | liquid | 52.018 |
| | | vapor | 52.278 |
| 249 | 24.265 | liquid | 52.246 |
| | | vapor | 52.503 |
| 250 | 24.387 | liquid | 52.471 |
| | | vapor | 52.728 |
| 251 | 24.510 | liquid | 52.697 |
| | | vapor | 52.952 |
| 252 | 24.632 | liquid | 52.921 |
| | | vapor | 53.174 |
| 253 | 24.755 | liquid | 53.145 |
| | | vapor | 53.396 |
| 254 | 24.877 | liquid | 53.367 |
| | | vapor | 53.618 |
| 255 | 25.000 | liquid | 53.571 |
| | | vapor | 53.820 |

The specifications and technical characteristics in this booklet are given for information purposes. The manufacturer reserves the right to modify them without prior notice or obligation to modify in a similar manner, the equipment previously supplied.

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