Hubbard Products Ltd
Hermetic R744 Condensing Units

Model Number:
HCU2040PXB1
ESIE21-03

Installation, Commissioning and Maintenance Manual

CONTENTS

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1. EC Declaration of Conformity

Model: HCU2040PXB1

Part Number: A10145-04L
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EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of the manufacturer.
Hubbard Products Ltd hereby declares that the products listed below are intended to be incorporated into a refrigeration system and should not be put into operation until the system has been declared as being in conformity with the requirements of the relevant EU Directives.

This declaration is based on the design and construction of the equipment in the form brought onto the market by Hubbard Products Ltd. Any alterations made to the machinery without prior consultation with Hubbard Products Ltd render this declaration invalid.

Relevant EC Directives:
Machinery Directive (2006/42/EC)
LV Directive (2014/35/EU)
Pressure Equipment Directive (2014/68/EU) and Conformity Assessment Module

Category III: Module H1

Notified Body Module H1 Certificate Reference: 0343/PED/PRJ1109993242/2
Notified Body:
Lloyd's Register Nederland B.V
Address:
K.P. Van Der Mandelelaan 41A,
3062 MB, Rotterdam
Netherlands.

Applied harmonised standards:

BS EN 378-1:2016	Specification for refrigerating systems and heat pumps. Safety and environmental requirements. Basic requirements, definitions, classification and selection criteria
BS EN 378-2:2016	Specification for refrigerating systems and heat pumps. Safety and environmental requirements. Design, construction, testing, marking and documentation
BS EN ISO 12100:2010	Safety of Machinery – General principles for design – Risk assessment and risk reduction.
BS EN 60204-1:2006+A1:2009	Safety of Machinery. Electrical equipment of machines. General requirements

Model name	**4HP LT CO2 CONDENSING UNIT**
Model Part No	**HCU2040PXB1 – A10145-04L**
Description	4HP LT 1INV condensing unit operating on R744. High side PRV is rated at 120bar and Receiver is rated at 90bar.
Serial No	**See Serial Plate fitted to unit**

Signature of HPL designated "responsible person"	
Position of signatory	DIRECTOR
Date of Issue:	22/03/2021

Hubbard Hermetic Rotary R744 Units

Installation, Commissioning and Maintenance Manual

Model No.: HCU2040PXB1

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Contents

These pages contain important safety information. Please read carefully before commencing any work on the equipment to which the instructions refer.

It is assumed that installation, commissioning, service and maintenance activities must only be undertaken only by competent personnel who have been trained for the activity. They should be familiar with this type of equipment and the handling of refrigerants and their disposal.

1. *Safety recommendations*

When installing and using the unit please follow the recommendations listed here below.

- Installation shall be carried out in strict compliance with the diagrams and instructions supplied by the manufacturer.
- Damages due to improper connections are excluded.
- The electric system available where the unit is installed shall meet the relevant standards in force.
- Maintenance shall be effected by trained personnel or by the manufacturer according to the provisions as per EN378.

WARNING
Use safety gloves to protect your hands from possible cuts.

The user is strongly recommended to contact the manufacturer before attempting any intervention on the unit and any use not corresponding to the manufacturer's indications (in particular as for the field of application) and to enquire about the possible dangers and contra-indications connected with an improper use of the machine.

- The unit shall be used following these instructions and sticking to the destination of use indicated by the supplier. Any incorrect use can result in damages to the unit and represents a serious danger for people's health.

ATTENTION
The unit is not suitable for working in explosive environments.
Therefore the use of the unit in an explosion-dangerous atmosphere is absolutely forbidden.

When maintenance requires operations on the cooling circuit, drain the system and let it reach the atmospheric pressure. Oil residuals left in the refrigerant receiver should be recovered and disposed of by specialized firms, specially authorized by the national regulations in force.

ATTENTION
The unit is not suitable for working in salty environments. In such a case protect condenser and evaporator with appropriate means.

- Only use refrigerant and oil as specified on the serial plate and this manual.
- No modifications or changes in circuit or components (such as: welding on compressor body, on refrigerant receiver wall or on refrigerant separator wall) are allowed.
- Sight glasses, minimum level indicators and flanged couplings are secured to the receiver or the separator by means of demountable fixing elements. As a rule, gaskets resist pressure, temperature and fluid stresses. When fixing elements include gaskets (for example glass windows and flanges) however, reduced tightness and bedding of gaskets can not be excluded due to their features; for this reason tighten them before and possibly after starting. Driving torques can be different. On sight glasses (mounted on refrigerant receiver) use a dynamometric wrench, otherwise the steel edge could be excessively loaded and cause glass breakage.
- Any official registration necessary for pressure appliances and repeated tests shall by governed by the laws and regulations in force in the Country where the unit is installed. Compliance with laws, regulations and with the technical instructions specified above falls within the manager's responsibility.
- The final user shall protect the unit from external fire dangers.

2. Storage

Equipment should be stored, prior to installation, in warm, dry conditions, free from dust, vibration and extremes of temperature and humidity.

3. Description of the unit

Hubbard CO2 hermetic rotary series includes air-cooled condensing units. They consist of:

1. Condensing unit placed outside the cold room;
2. Electric control panel placed on the condensing unit.

4. Application

Under no circumstances must the equipment be used for any purpose other than that for which it was specifically designed.

The equipment must be located on, and secured to a solid level base or framework designed for the purpose. Anti-vibration pads/feet are strongly recommended.

Access must be provided to allow safe working for both installation and servicing of all electrical and refrigeration components. A safe exit path must be provided in the event of a mishap. During installation, the space must be adequately ventilated to remove any potentially toxic/asphyxiating/explosive gases that may otherwise build up.

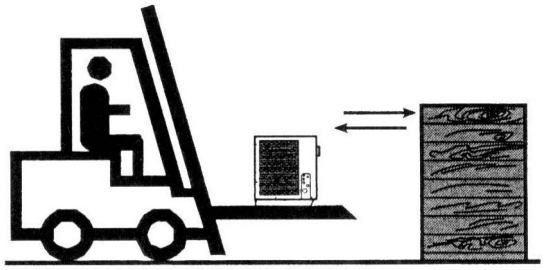
All pipework connected to the equipment must be adequately supported and all electrical components and supplies connected to the equipment must conform to IEE regulations.

Refer to the individual electrical drawings supplied width the equipment for details of the electrical circuitry.

Extreme care should be exercised when opening any part of the refrigerant pipework to atmosphere for the purpose of connecting pipework etc. The systems contain a positive pressure of inert gas, when despatched, which will be released upon any breach of the equipment's pipework or pressure vessels.

5. Handling

The unit shall be handled by appropriate lifting and transport means. An appropriate risk assessment should be undertaken by a suitably qualified person before attempting to move or lift the equipment.



Make sure that no one is in transit in the operating area of the lifting/transport means to prevent any possible accidents to people.

If the unit is in a wooden case or crate, sling the packing properly before handling it.

Lifting speed shall be such as not to make the packed unit oscillate dangerously and possibly fall.

6. Post Transport Checks

On siting the unit, we recommend the security of all electrical connections is checked, and system flanges, rotalock valves, and flexible connections are secure. Where flexible hose lines are used please ensure that the outer material is not subject to rupture due to contact with other surfaces.

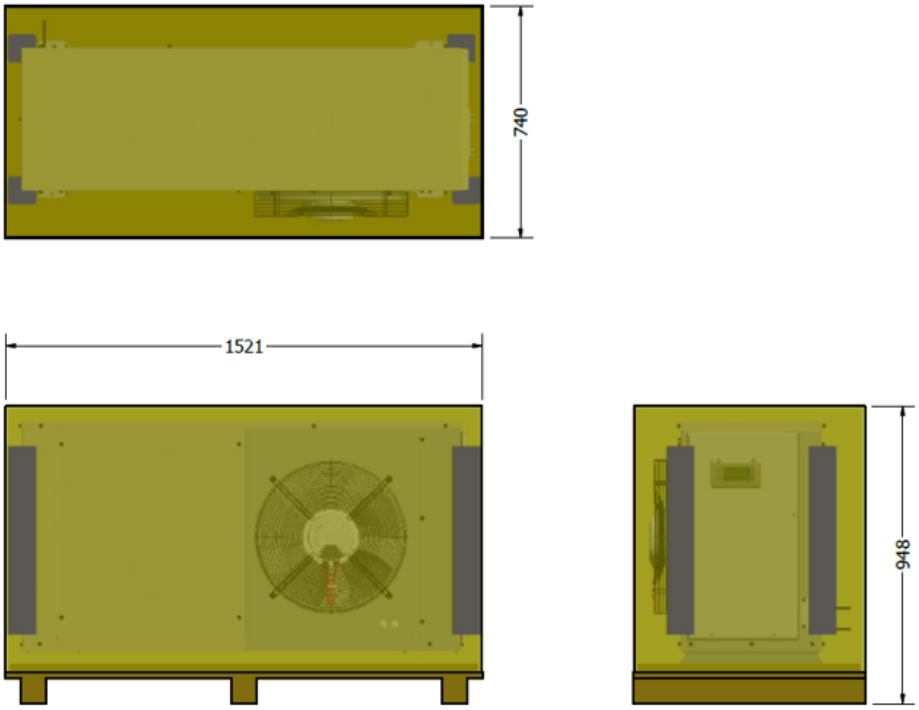
Before initial operation we recommend that crankcase heaters are operated for 24 hours prior to compressor operation to ensure correct lubrication properties are provided.

The units are factory tested including leak, pressure and electrical test – not running test. Anyway, is highly recommend a further pressure test after transport and positioning to help prevent leakage in operation. Pressure testing should be carried out according to your companies test procedures and where applicable in accordance current P.E.D. recommendations, F-gas regulations and your customers requirements.

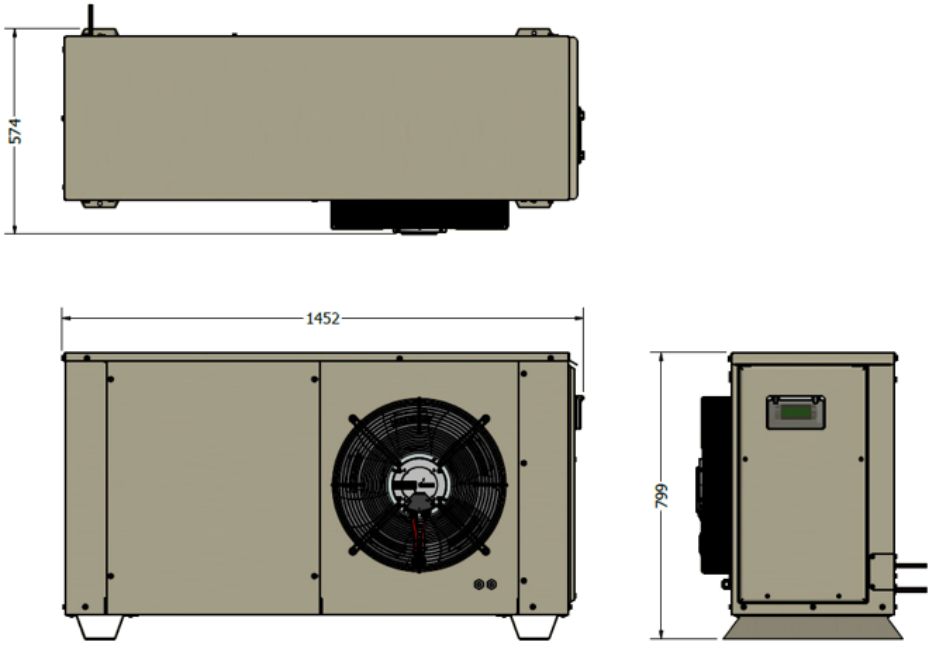
7. Dimensions and weights:

Models: HCU2040PXB1

7.1 Packaged Unit



7.2. Unit Dimensions



7.3. Weights

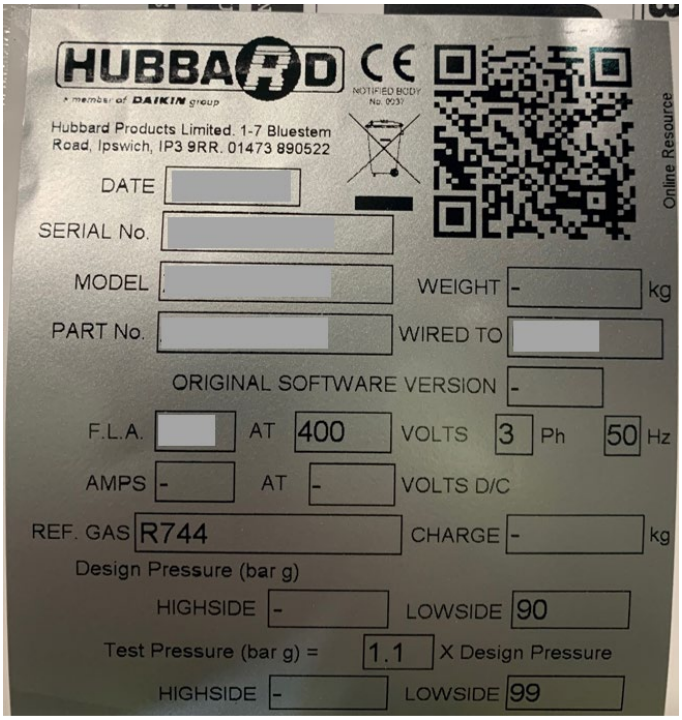
Models: HCU2040PXB1

Packaged weight: 180 kg

Unit Dry weight: 155 kg

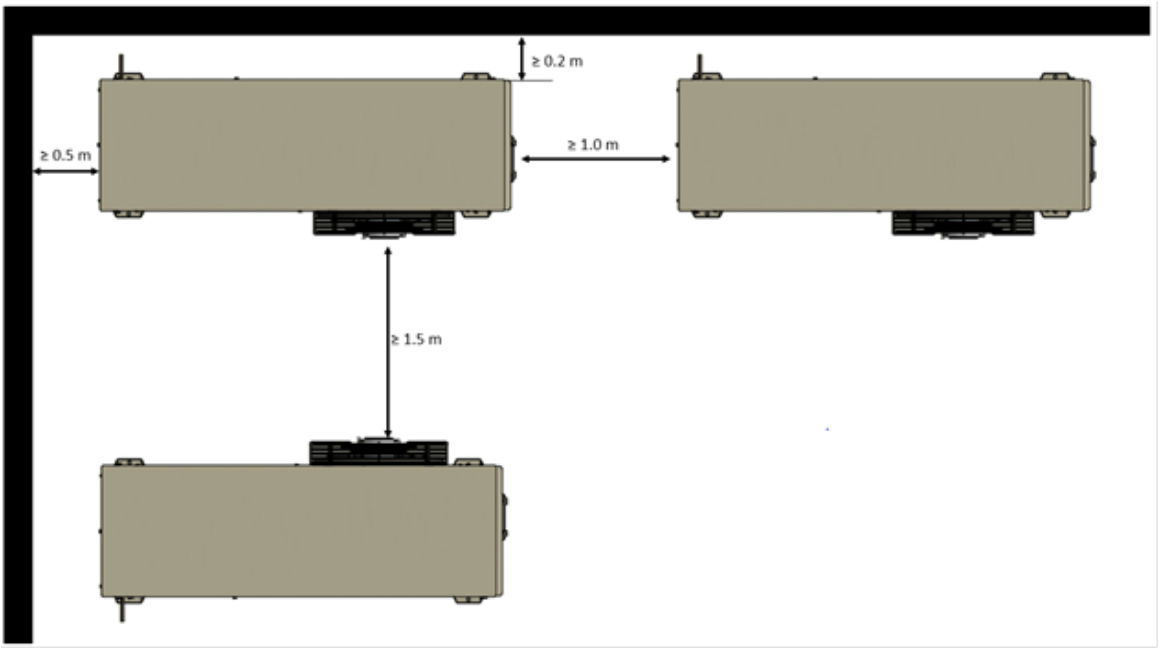
8. Serial Plate Information

The unit is supplied with necessary warning and attention plates. Serial plate is supplied with the weight of the unit and other information as showing below.



9. Installation spacing

Below picture shows the recommended spacing aroung the unit for operational, service and maintainence purposes. Respect minimum spacing from walls as showing below.



ATTENTION
Before connecting the unit make sure that mains voltage and frequency correspond to the values shown in the data plate. Voltage tolerance: +/- 10% compared to nominal value.

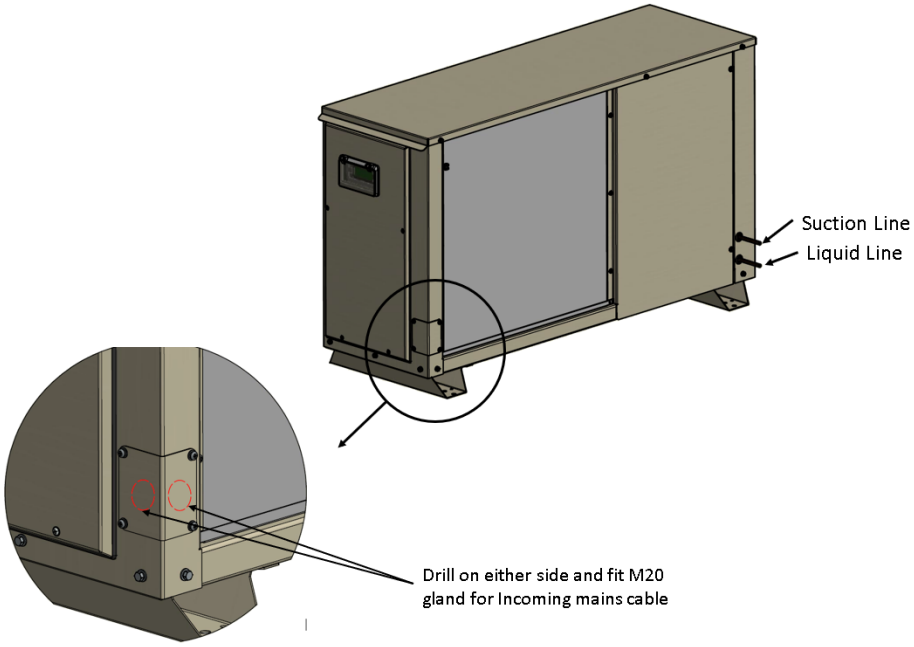
10. External Pipe and Electrical connections

Liquid and Suction Line positions are shown as below. Both liquid and suction line are sealed to avoid any moister entering the pipes. The unit is delivered with positive pressure, please make sure that you release pressure before cutting the pipes.

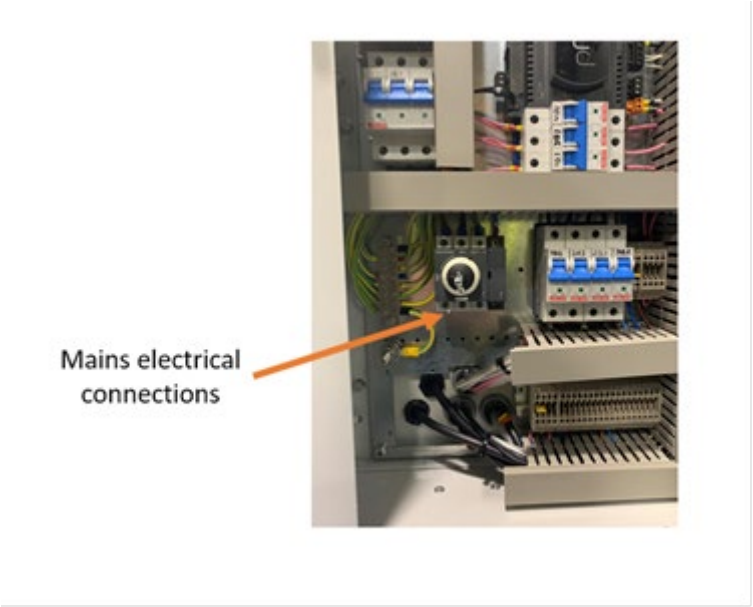
Pipe Sizes:

HCU2040PXB1 :
Suction Line: 1/2'' Liquid Line: 3/8''

Mains electrical supply should be connected by drilling the cover plate as shown below. Secure main cable and avoid scratches on mains cable. Fit M20 gland is recommended.



The incoming three phase is connected to the main isolator as shown below.

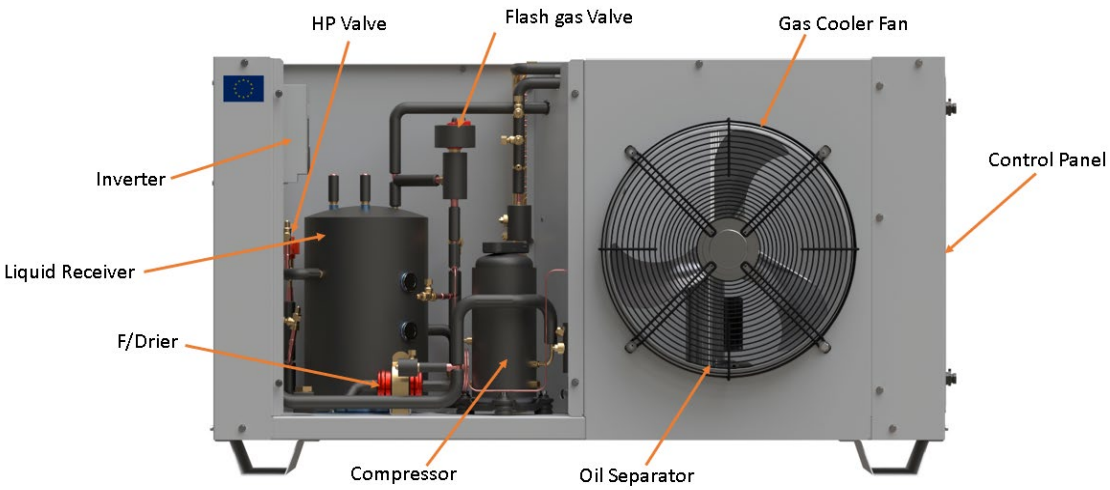


For HCU2040PXB1 unit an incoming cable size of not less than 2.5 mm^2 is recommended. However, cable run and voltage drop need to be consinder.

10.1 Recommends for liquid & suction pipework

It is really important to ensure a good oil return on the compressor. Suggested connections for suction and liquid line are shown below.
Industry recognised design standards for pipework sizing are to be followed. Horizontal and vertical (riser) suction pipework sizing during full and part load conditions require design to ensure sufficient oil recovery and return to unit

11. Basic component layout



12. Mechanical Safety of the system

Pressure relief valves and pressure switches are installed on the unit accordingly to EN 378. Pressure relief valves are rated as below:

Max Allowable Pressures (PS):

- High Side (Compressor discharge)..... Rated 120 bar
- Intermediate Pressure (Liquid receiver)..... Rated 90 bar

Max Allowable Temperatures (TS): -45°C to +130°C

All the safety valve discharge vents on the condensing units are facing downwards in the compartment behind the gas cooler fan.

- Pressure relief valves are preset to discharge at a set pressure. No attempt should be made to adjust this setting or to check the setting by discharging the valve. Valves should be removed before testing to a value in excess of 80% of the valve setting.

- Should the need to replace a valve arise, this can be achieved by shutting off the faulty valve by either removing the system charge on assemblies fitted with single relief valves or via a dual shut off valve assembly in which the pressure relief valve is mounted.

- Relief valves that have been found to have discharged refrigerant should be replaced as positive sealing after discharge is not guaranteed.

- After maintenance a leak test is recommended to avoid any unexpected leaks occur during maintenance process.

- Inspect the valves and replace according to PED and relevant regulations.

13. Commissioning and Maintenance of Hubbard Hermetic CCUs

These instructions, recommendations are provided as a guide for the commissioning and maintenance of units supplied by Hubbard Products Limited. These should be used in conjunction with your company's health and safety regulations, written work instructions and working practises to ensure that equipment is installed in a safe working manner. Further requirements may be specified by the end user or local legislation. Risk assessments should be carried out to ensure the safety of those conducting the work and anybody who may come into contact with the equipment during any of these procedures. Please ensure you are equipped with the correct and appropriate PPE, personnel protection equipment before commencing any work. Any work carried out should be completed by competent qualified personnel.

Commissioning Index;

13.1 Leak testing by Pressure Testing

Before pressure test it is necessary to identify the refrigerant for operation, positions of all pressure relief valves fitted and values, devices with restrictive pressure values (e.g. LP switches) , and the system design maximum operating pressures. The maximum operating pressures of the high and low side of the system will be stated on the serial plate, note however that safety switches should be set 10% below these values to prevent pressure relief valves discharging.

If you intend to pressure test with the pressure relief valves fitted the maximum values for test should be:

If high side pressure relief valves are fitted only:

High side: 80% of high PRV valve rating.

Low side: 80% of high PRV valve rating*

Before testing ensure with supplier that the equipment has been designed to operate at these conditions, as pipe-work gauges may be incorrect. The Serial Plate will specify the maximum low side design pressure, if low side is stated lower than high then a low side pressure relief valve must be fitted.

If high side and low side pressure relief valves are fitted:

High side: 80% of high PRV valve rating.

Low side: 80% of low PRV valve rating

If you intend to test to higher pressures or strength test the system please remove the pressure relief valves before commencing to retain there integrity. The maximum operating pressures of the high and low side of the system will be stated on the serial plate, note however that safety switches should be set 10% below these values to prevent pressure relief valves discharging.

Procedure:

Testing by visual examination, and a proprietary bubble solution. Ensure your supply cylinder of Oxygen Free Nitrogen (OFN) is fitted with a pressure limiting device set at just above your maximum test pressure value. Never move a cylinder with a regulator fitted.

At this stage the refrigeration compressors must remain electrically isolated from the system.

Open all liquid and suction valves and ensure that no system circuits are isolated by closed solenoid valves or non-return valves etc. First introduce dry oxygen free nitrogen (OFN) at a pressure of 3 barg to the system and check for audible leaks. If all components and pipe-work is sound, before proceeding to the second stage it is necessary that the following components are isolated:

1. Compressors
2. Pressure Switches
3. Transducers

The test pressure should now be increased to 10 barg using dry oxygen free nitrogen in stages of no more than 3 bar at a time. Listen for audible leaks and watch the gauge for pressure loss at each increment. Use leak detection soapy water at each joint to identify any small leaks. Leaks encountered should be repaired with the system de-pressurised.

When the test pressure has reached 10 bar, thoroughly test all joints and components etc. for leaks. The pressure should then be increased to no more than the maximum leak test pressure allowed for the particular section of the system, isolating any PRV's or controls etc. which may be susceptible to the test pressure, and all components should again be checked for leaks.

Strength Test

Follow the above procedure then prove the system. The system should be held at test pressure for at least 15 minutes. If the pressure has not significantly reduced then the system can be slowly vented to the leak test pressure value. At which point the system should be checked again for leaks.

After all tests are completed the system should be de-pressurised gradually.

13.2 Electrical Testing

BEFORE commencing any testing procedure, a check must be made to ensure that NO electronic or extra low voltage devices are connected. COMPLETE isolation of these items must be achieved prior to testing.

1. Test for earth continuity. This test is to verify that in no instance should the resistance between the earth conductor (or control panel main earth terminals) and the metal parts exceed 0.1 ohm.

The electrician MUST ensure that the resistance in the earth conductor between the mains incoming supply and our control panel earth terminal does NOT exceed the figure quoted above. It is also the responsibility of the electrician to ensure that the earth conductor into our control panel is sized in accordance with the latest edition of I.E.E. regulations.

A current of 25 amps should be passed between the control panel main earth terminal and all exposed metal parts in turn. The test shall be made at a voltage not exceeding 6v ac.

Small isolated metal parts on, in or through non-conducting material, and separated by such material from current carrying parts in such a way they cannot become live, should not be included in the test.

2. A test of polarity should be made and it should be verified that all fuses and single pole control devices are connected in the phase conductor only.

13.3 Evacuation

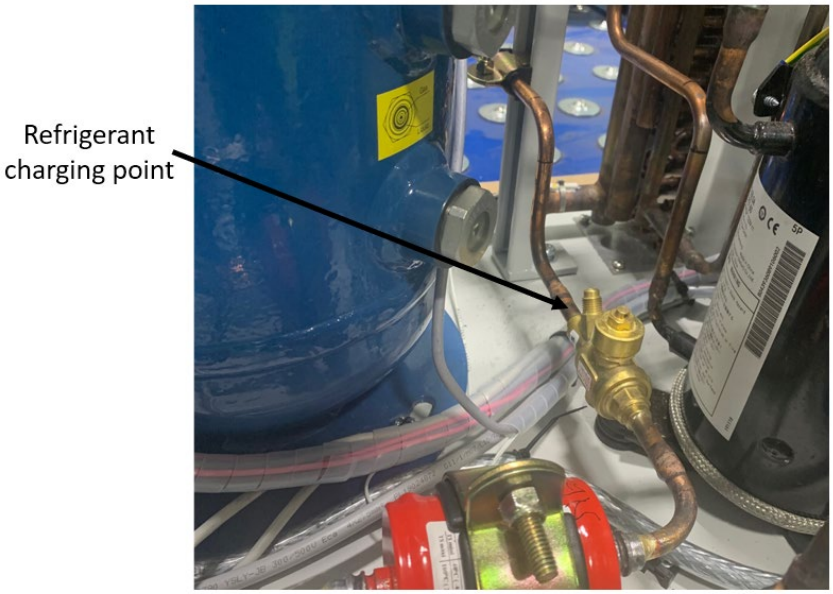
Before startarting the vacuum procedure it is necessary to open by hand the high pressure valve (HPV), see section 11 above. Also you can refer to P&ID attached in this maunal. For this operation the magnetic tool shown below needs to be used.

CAREL Product Reference & name: EEVMAG000 – Valve actuator

The operator can stop the vacuum procedure when the standing vacuum pressure (SVP) reaches 0.5 Torr.

13.4 Charging Refrigerant into the System

Initial charging should only be completed once the system has been proven to be leak free and after proper vacuum. The charging point is located on the liquid line adjacent to the drier assembly. Liquid or gas should not be added through the low pressure side of the system. Break vaccum with ONLY CO2 vapour (vapour off take cylinder) up to 8 to 10 bar pressure. By using vapour CO2 up to that pressure you can avoid any dry-ice formation. Make sure that compressor is off during this operation.
Maximum amount of refrigerant can be found in section 16.



13.5 Commissioning

Commissioning Step One

1. Remove the main fuses or switch off the circuit breakers for the compressor.
2. Switch on the main isolator on the unit.
3. Switch on each system, individually; checking as the systems are brought on that fans, lights etc. are operating properly. Check liquid solenoid valves operation and rotation of condenser fans (when fitted). When satisfied that all systems are functioning, switch off main supply.
4. Replace compressor fuses or switch on circuit breaker for the lead compressor only to ensure all systems are refrigerating during commissioning.
5. If additional oil is needed, please add through the valve in 1st stage suction line.
6. Switch on the main isolator. Providing enough refrigerant is in the system, the lead compressor will start up and adding more refrigerant to the plant can commence.

Commissioning Step Two

Charging of the system should continue until the receiver is approximately 25% full, and the discharge pressure approaching design value. When this condition has been reached, shut off all charging cylinders and allow the compressor to run normally.

Check now that all the systems/stubs are refrigerating satisfactorily, evaporators fully frosted etc.

Commissioning Step Three

Now replace remaining compressor fuse circuit breakers and allow electronic compressor controller to stage in compressors as required.

Commissioning Step Four

During the general commissioning the following electrical items should be checked:

1. Sub fuses, circuit breakers correct.
2. Main fuses, circuit breakers are correct and balanced.
3. Main compressor fuses and circuit breakers are correct.
4. All cable connections are tight.
5. Motor starter controls/contactor overloads are set correctly.
6. Check all contactors operate correctly.

13.6 Operational Checkout

When the system has been charged and has operated for at least 2 hours at normal operating conditions without any indication of malfunction, it should be allowed to operate overnight on automatic controls. Then a thorough re-check of the entire system operation should be made as follows:

1. Check the unit head and suction pressures. If the pressures are not within the system design limits, determine why and take corrective action.

2. Check the liquid line sight-glass and expansion valves operation. If there are indications that more refrigerant is required, leak test all connections and system components and repair any leaks before adding refrigerant.

3. Expansion valves must be checked for proper superheat settings.

Expansion valve probes must be in positive thermal contact with suction lines.

Valves with high superheat settings produce little refrigeration and poor oil return.

Too little superheat causes low refrigerant capacity and promotes liquid slugging and compressor oil removal. LIQUID REFRIGERANT MUST BE PREVENTED FROM REACHING THE COMPRESSOR.

4. Using suitable instruments carefully check line voltage and amperages at the compressor terminals. Voltage should be within 10% of the nameplate voltage.

The current should not exceed that on the nameplate rating. If amperage draw is excessive, immediately determine the cause and take corrective action. On three phase motor-compressor, check to see that a balanced load is drawn by each phase. Check all fan motors on air-cooled condensers and in fixture evaporator coils for correct rotation. Fan motor mounts and fan blades should be carefully checked for tightness and proper alignment.

All motors requiring lubrication should be oiled or greased as per manufacturer's recommendations. Check all electrical load bearing terminals for tightness.

5. When this stage is reached, the unit can now be left running on full automatic operation, commissioning sheets checked and completed (Section 9). The plant should be allowed to run for a further few days and then a further check made of all controls and any minor adjustments made.

6. The hints and procedures on commissioning are based on experience to date and checks made of units running during both winter and summer periods. Do ensure that the settings of the components are correct before making any adjustments.

7. DO NOT adjust components without satisfying yourself that there is good reason to do so. If adjustments are carried out, record the final setting on the commissioning report.

13.5.1 Compressor bypass valve

Please refer to P&ID for compressor bypass valve position. The role of bypass valve is very critical for the rotary compressor operation especially when the compressor is getting the signal to run. The valve is fully open when the unit is switched off. This valve ensures the pressure balance between interstage and first-stage suction of the compressor. That helps the compressor to start smothly.

13.7Lubrication Oil Condition (guide)

Complete system oil change is not needed. Additional oil charge and more information can be found in oil charge section.

14. Service and Maintenance

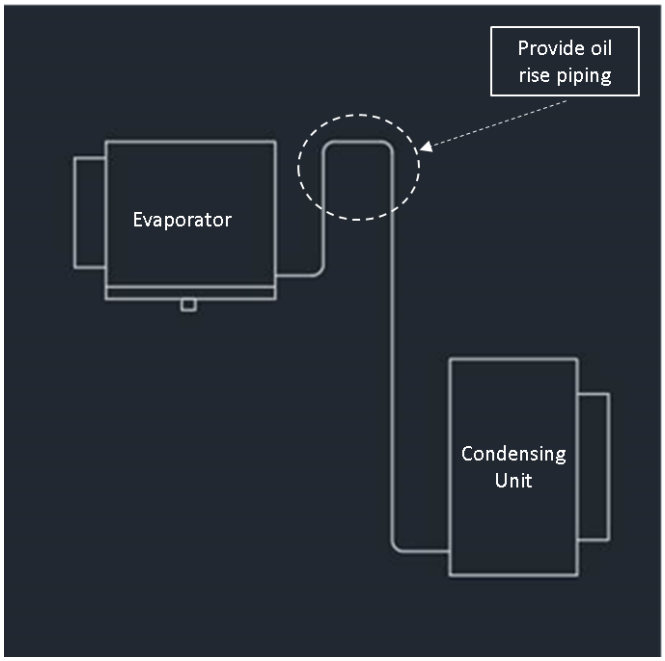
The following notes are not designed as a definitive guide, the maintenance procedures should be applied in conjunction with your companies work instructions and working practises. Any further information not covered by this section may be obtained from Hubbard Products Ltd on request.

14.1 Oil Management System

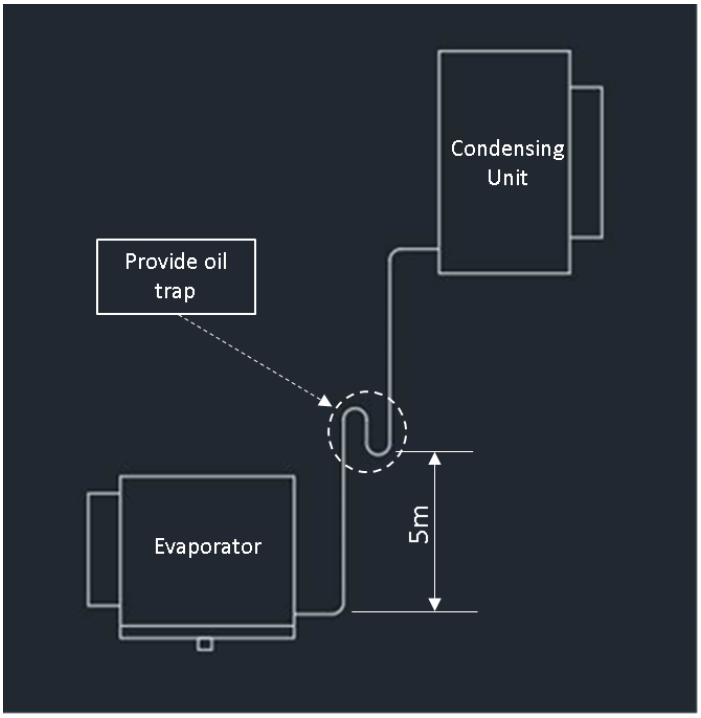
Oil management system fitted on unit HCU2040PXB1 is high pressure system.
The unit is fitted with a suitable sized coalescent oil separator/reservoir. The suction line has to be properly sized to provide good oil return. Standard practice for oil traps must be followed when condensing unit or evaporator are installed at diffeferent heights.

To assist with service/maintenance operations, shut-off valve is fitted to enable isolation.

The maximum high difference alloawance between condensing unit and evaporator should be no more than 15 meters. In case install outdoor unit under indoor unit, provide riser piping is close to indoor unit as shown below.



In case install outdoor unit above indoor unit provide oil trap as shown below (recommended 2 oil traps at 5m and 10m)



14.2 Operation

The oil is separated from the discharge gas in the oil separator. The oil then passes into the separator oil reservoir section. The oil reservoir section retains enough oil to supply the compressor oil/level regulators under all conditions. From the oil reservoir section the oil is supplied to the compressor where it is fed to the compresso through the capillary line.

14.3 Changing the Compressor Oil

Refrigeration oil is of bright, transparent appearance even after extended operation. However, various conditions of the system can affect the oil such as insufficient evacuation of the system on start up, dirt from the pipework on installation and excessive discharge temperatures. Initial Oil type is stated on the serial plate, for alternatives refer to Hubbard Technical.

When the oil is seen to be in an unclean condition it should be changed to avoid consequential compressor damage.

14.4 Changing a Compressor.

These instructions may be supplemented by additional reference material provided.

ATTENTION
Please ensure all work carried out is in accordance with your companies working practices and that the required equipment/PPE is available and used.

WARNING
Pipework associated with the condenser will be at extreme temperatures.

WARNING
Ensure condenser electrical supply is fully isolated and locked off prior to working on unit.

Should the need arise to change a compressor the following sequence should be followed:

Electrical

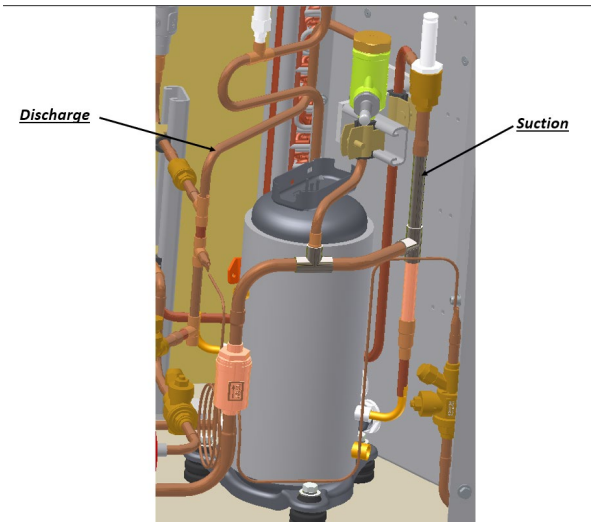
1. Turn off the power and control circuit of the compressor to be removed and attach a notice to the panel stating that work is being carried out on the equipment.
2. Disconnect the wires from the compressor terminals taking note of the position of each cable.
3. Remove the conduits and cable from the terminal box.

Mechanically Isolate the Compressor

4. Undo any pipe clamps of pipework running to the compressor.

5. Unsweat/Debraze pipe connections below.

For Model HCU2040PXB1 :



6. Undo 3 off M8 screws using 13mm socket.
7. Rotate compressor so connections are clear of pipework and lift out, when fitting new compressor ensure metal sleeves are fitted in the rubber compressor feet prior to bolting the compressor down to the base plate.
8. Rebraze pipe lines to the compressor ports then ensure pipe brackets are tightened.

14.5 Pressure Relief Valve/s

1. Pressure relief valves are preset to discharge at a set pressure dependant on placement within the circuit. No attempt should be made to adjust this setting or to check the setting by discharging the valve. Valves should be removed before testing to a value in excess of 80% of the valve setting.

2. Should the need to replace a valve arise, this can be achieved by shutting off the faulty valve by either removing the system charge on assemblies fitted with single relief valves or via a dual shut off valve assembly in which the pressure relief valve is mounted.

3. During installation of the pack the pipework from the pressure relief valves should be run out of the building and vented safely into the atmosphere. No restriction such as pipe caps Etc. should be left in or on the pipework leading from the pressure relief valves to the outside as any back pressure will change the relief set point of the valves. Pipe-work should be sized to provide correct discharge flow rate for system design.

4. Relief valves that have been found to have discharged refrigerant should be replaced as positive sealing after discharge is not guaranteed.

5. During maintenance checks a leak test should be carried out in case of seeping occurring.

Pressure Relief Valve Testing and Replacement

Inspect the valves and Replace regularly as per the PED and relevant regulations

14.6 Pressure switches and transducers

Transducers

Transducers that incorporate Schrader depressors will be supplied fitted directly to a port, those without will include a valve for isolation purposes to allow for maintenance.

Pressure switches – Safety.

Pressure switches fitted to compressor bodies are pre-set cartridge type will NOT be fitted with Schrader valves; this is to ensure that these safety switches are reacting to a definite pressure that cannot be influenced by mechanical tolerances.

High Pressure switch testing

Periodically, as deemed by customer requirements, remove the high pressure switch from the system and apply dry nitrogen pressure using a calibrated gauge of a suitable range and ensure that the switch breaks and resets in line with the settings shown on the switch data sheet. Refit the switch, leak test and set the system back in operation.

15 Maximum refrigerant charge

When the unit is pumped down, the receiver must be capable to accommodate all the refrigerant charge (kg) holding in the system. Also, it is really important to avoid to overcharge the system which can cause issues in compressor operation and efficiency.
Considering the above, the estimation of maximum refrigerant charge values are based on 80% capacity of the receiver (assuming that the unit is pumped down from the receiver).

The maximum amount of refrigerant can be charged into the system is 9.27 kg (at 80% receiver capacity).

16 Estimation of refrigerant and oil charge

The refrigerant charge shown below based on estimation that the receiver is fiilled up to 1st sight glass, different pipework lengths and evaporator.

If the evaporator volume is not known, the following estimation can be used:

For HCU2040PXB1 unit: 2.2 kg refrigerant at evaporator (estimation based on full capacity load of the condensing unit.

The following table is presententing the amount of refrigerant charge estimated for:

- Different pipe lengths
- Receiver up to 1st sight glass full
- Evaporator to match the capacity of unit

Recommended values – Those may change from installation to installation.

The amount of oil in the system is a proportional of refrigerant charge:

Oil / Refrigerant ≥ 35 (wt %)

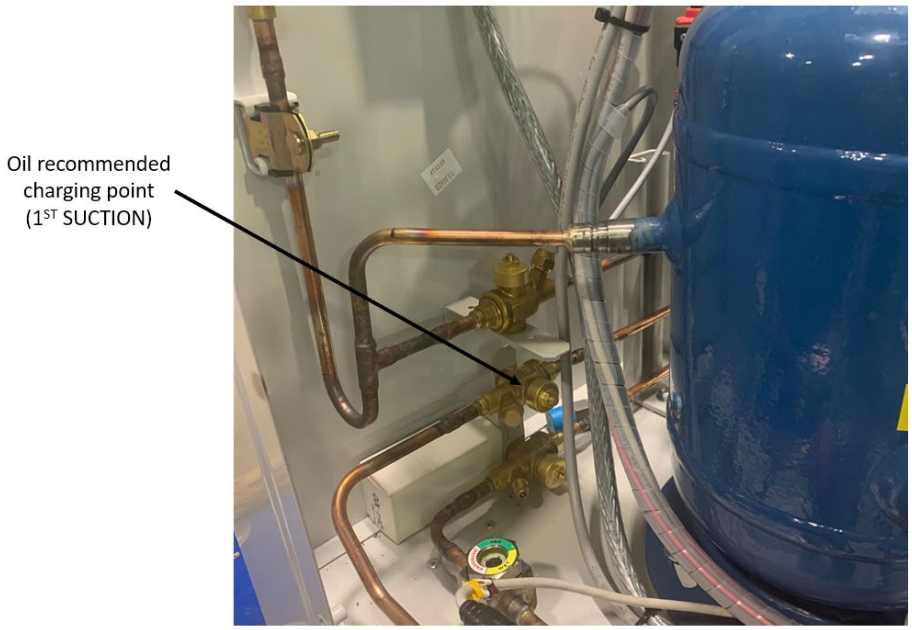
Example of oil charge:

- If the system is charged with 10 kg of CO2, then the recommended amount of oil is 3.5 kg.

Pipe length (to evaporator m)	5	8	11	14	17	20	23	26	29	32	35
Refrigerant amount in all pipework (kg)	0.6	0.81	1.01	1.21	1.41	1.61	1.81	2.01	2.21	2.41	2.61
Refrigearnt amount in evaporator (kg)	2.20										
Refrigerant left in receiver (kg)	3.48										
Total (kg)	6.28	6.49	6.69	6.89	7.09	7.29	7.49	7.69	7.89	8.09	8.29
Oil charge (kg)	2.20	2.27	2.34	2.41	2.48	2.55	2.62	2.69	2.76	2.83	2.90
Initial charge (kg)	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Oil charge (kg)	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.61	1.68	1.75

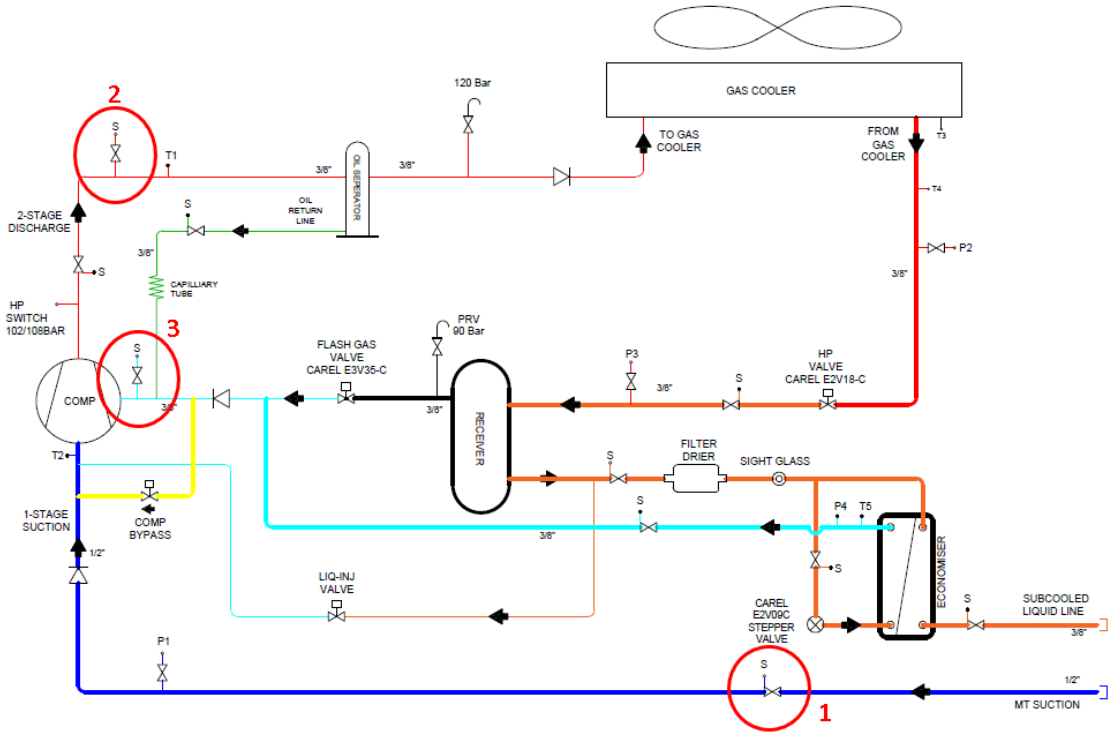
The correct amount of oil into the system ensures the compressor reliability and increase the lifetime of the system.

The HCU2040PXB1 unit is delivered with 1.15 kg of oil. The additional oil required for varies pipe length is shown in table above. The additional oil can be added in the system from the valve showing below.



It is recommended that the oil charge should take place before the refrigerant charge. The above estimations of oil charge can be used as guidelines. In case more oil need to be charged into the system after we have charge the refrigerant a number of steps should be follow as shown below.

1 Stop the unit (switch off on controller)
2 Close valve 1 at the suction line
3 Vent gas from service ports S n. 2 and n. 3 (1/4 SAE) until suction pressure drops near to 0 barg (check on controller display)
4 Charge required amount of oil at valve 1 – use a manual stirrup pump
5 Evacuate from valve 2 and 3 & isolate gauge manifold
6 Slowly open valve 1 & remove gauge manifold when pressure is above 10 barg
7 Wait for 5 min
8 Restart the unit and check R744 level in the receiver
9 Top up R744 if necessary



Materials in the System

Refrigerant R744

R-744 is odourless, heavier than air and is an asphyxiate. The refrigerant concentration limit of R-744 is lower than HFCs because of its potential for high toxicity

The table below summarises the effect of CO2 at various concentrations in air.

PPM of R744	Effect
400	Concentration in atmosphere
5,000	Long-term exposure limit (8 hours)
15,000	Short-term exposure limit (10 min)
30,000	Discomfort, breathing difficulties, headache, dizziness, etc
100,000	Loss of consciousness, death
300,000	Quick death

Please refer to the material safety datasheet provided for R744 for additional information

Lubricant Oil

Oil type used in these Condensing units is Daphne PZ68S (Idemitsu PAG)

Please refer to the material safety datasheet provided for the above oils for additional information

NATIONAL REFRIGERANTS, INC.

R-744

Material Safety Data Sheet

R-744

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: R-744
OTHER NAME: Carbon Dioxide
USE: Refrigerant gas
DISTRIBUTOR: National Refrigerants, Inc.
661 Kenyon Avenue
Bridgeton, New Jersey 08302

FOR MORE INFORMATION CALL:
(Monday-Friday, 8:00am-5:00pm)
1-800-262-0012

IN CASE OF EMERGENCY CALL:
CHEMTREC: 1-800-424-9300

2. HAZARDS IDENTIFICATION

CLASSIFICATION: **Gases under pressure, Liquefied Gas**
SIGNAL WORD: **WARNING**
HAZARD STATEMENT: **Contains gas under pressure, may explode if heated**
SYMBOL: **Gas Cylinder**
PRECAUTIONARY STATEMENT: **STORAGE: Protect from sunlight, store in a well ventilated place**

EMERGENCY OVERVIEW: Cold liquid and gas under pressure. Can cause rapid suffocation. Can increase respiration and heart rate. May cause nervous system damage. May cause frostbite. May cause dizziness and drowsiness. Self contained breathing apparatus and protective clothing may be required by rescue workers. This product is a colorless, odorless liquid that transforms to white crystalline particles when discharged from its container. The gas is slightly acidic and may be felt to have a slight, pungent odor and biting taste.

POTENTIAL HEALTH HAZARDS

EFFECTS OF A SINGLE ACUTE OVEREXPOSURE

SKIN: No harm expected from vapor. Prolonged contact with carbon dioxide could cause frostbite. Cold gas or liquid may cause severe frostbite.

EYES: No harm expected from vapor. Prolonged contact with carbon dioxide could cause frostbite. Cold gas or liquid may cause severe frostbite.

INHALATION: Carbon Dioxide is an asphyxiant with effect due to lack of oxygen. It is also physiologically active, affecting circulation and breathing. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing and heart rate, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

INGESTION: An unlikely route of exposure. This product is a gas at normal temperature and pressure, but may cause severe frostbite.

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DELAYED EFFECTS: No harm expected to healthy individuals. Where competent medical authority deems that such illness would be aggravated by exposure to carbon dioxide, persons in ill health should be restricted from working with or handling.

OTHER EFFECTS OF OVEREXPOSURE: Damage to retinal or ganglion cells and central nervous system may occur.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The toxicology and the physical and chemical properties of carbon dioxide suggest that overexposure is unlikely to aggravate existing medical conditions.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST
No ingredients listed in this section			

3. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	WEIGHT %
Carbon Dioxide	124-38-9	100%

There are no impurities or stabilizers that contribute to the classification of the material identified in Section 2

4. FIRST AID MEASURES

SKIN: Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not to exceed 105˚F (41˚C)) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.

EYES: Immediately flush eyes with large amounts of warm water for at least 15 minutes (in case of frostbite, water should be lukewarm, (not to exceed 105˚F (41˚C)) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

INHALATION: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention immediately.

INGESTION: Ingestion is an unlikely route of exposure. This product is a gas at normal temperature and pressure.

ADVICE TO PHYSICIAN: Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT:	None
FLASH POINT METHOD:	Not applicable
AUTOIGNITION TEMPERATURE:	Unknown
UPPER FLAME LIMIT (volume % in air):	None
LOWER FLAME LIMIT (volume % in air):	None
FLAME PROPAGATION RATE (solids):	Not applicable
OSHA FLAMMABILITY CLASS:	Not applicable

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EXTINGUISHING MEDIA:

Use any standard agent – choose the one most appropriate for type of surrounding fire (material itself is not flammable)

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Carbon Dioxide cannot catch fire. Heat of fire can build pressure in cylinder and cause it to rupture. No part of the container should be exposed to a temperature higher than 125˚F. Liquid carbon dioxide containers are equipped with pressure relief devices.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:

WARNING: High-pressure liquid and gas. Firefighters should wear appropriate gear for surrounding fire. Evacuate all personnel from impacted area. Immediately spray containers with water from maximum distance until cool, taking care not to spray water on to vents on top of container. Do not discharge sprays in to liquid carbon dioxide, which will freeze water rapidly. When containers have cooled, move them away from fire area if it can be done without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

6. ACCIDENTAL RELEASE MEASURES

WARNING! Cold liquid and gas under pressure

Carbon dioxide is an asphyxiant. Lack of oxygen can kill. Evacuate all personnel from release area. Use self contained breathing apparatus and protective clothing where needed. Liquid carbon dioxide will not “spill”. Flakes of carbon dioxide will form at pressures below 67 psig (461.95 kPa) and fall as snow. Shut off leak if you can do so without risk. Ventilate area or move container to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing entry.

Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations

7. HANDLING AND STORAGE

NORMAL HANDLING:

Never allow any unprotected part of your body to touch un-insulated pipes or vessels containing refrigerated liquid. Flesh will stick to the extremely cold metal and tears when you try to pull it free. Use suitable hand truck to move containers. Containers must be handles and stored in an upright position. Do not drop or tip containers, or roll them on their sides. If valve is hard to open discontinue use and contact your supplier.

STORAGE RECOMMENDATIONS:

Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Do not store in a confined space. Carbon dioxide is heavier than air. It tends to accumulate near the floor of an enclosed space, displacing air and pushing it upward. This creates an oxygen deficient atmosphere near the floor. Ventilate the space before entry. Verify sufficient oxygen concentration. Close container valve after each use; keep closed even when empty. Use adequate pressure relief devices in systems and piping to prevent pressure build up.

INCOMPATIBLITIES:

Alkali metals, alkaline earth metals, metal acetylides, chromium, titanium above 1022˚F (550˚C), uranium above ˚F (750˚C), magnesium above 1427˚F (775˚C).

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:

Use local exhaust system, if necessary, to keep the concentration of carbon dioxide below all applicable exposure limits. Under certain conditions, general exhaust ventilation may be acceptable to keep carbon dioxide below the exposure limit

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION:

Wear insulated neoprene gloves and safety shoes for handling cylinders. Select PPE in accordance with OSHA 29 CFR 1910.132 and 1910.133

EYE PROTECTION:

For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

RESPIRATORY PROTECTION:

None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the PEL, use a self-contained NIOSH approved breathing apparatus or supplied air respirator. For escape: use the former or a NIOSH approved gas mask with organic vapor canister.

EXPOSURE GUIDELINES

INGREDIENT NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
Carbon Dioxide	5000 ppm TWA (8hr)	5000 ppm TWA (8hr)	None

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS:

IDLH = 40,000ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Colorless liquid
PHYSICAL STATE:	Can be present as a liquid or a gas
MOLECULAR WEIGHT:	44.01
CHEMICAL FORMULA:	CO2
ODOR:	Slight pungent odor
SPECIFIC GRAVITY (water = 1.0):	1.22 @ 19.4˚F (-7˚C)
SOLUBILITY IN WATER (vol/vol at 68 F):	0.90
pH:	3.7 (for carbonic acid)
LIQUID DENSITY:	47.6 lb/cu.ft. (762 kg/cu.meter) (saturated at 21.1°C (70°F) at 1 atm
SUBLIMATION POINT (at 1 atm):	-78.5°C (-109.3°F)
VAPOR PRESSURE:	838 psig @ 70°F
VAPOR DENSITY (air = 1.0):	1.52 @ 70˚F (21.˚1C)
EVAPORATION RATE:	High
% VOLATILES:	100
ODOR THRESHOLD:	Not applicable
FLAMMABILITY:	Nonflammable
LEL/UEL:	None/None
PARTITIION COEFF(n-octanol/water)	Not available
AUTO IGNITION TEMP:	Not applicable

DECOMPOSITION TEMPERATURE Not available
VISCOSITY: Not applicable
FLASH POINT: Not applicable
(Flash point method and additional flammability data are found in Section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE: The product is stable.

CONDITIONS TO AVOID: Contact with incompatible materials, exposure to electrical discharges and or high temperatures listed below.

INCOMPATIBLE MATERIALS: Alkali metals, alkaline earth metals, metal acetylides, chromium, titanium above 1022˚F (550˚C), uranium above 1382˚F (750˚C), magnesium above 1427˚F (775˚C).

DECOMPOSITION PRODUCTS: Electrical discharges and high temperatures decompose carbon dioxide in to carbon monoxide and oxygen. Decomposition in to toxic, flammable, and/or oxidizing materials under above stated conditions

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS: Carbon Dioxide is an asphyxiant. It initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis. Symptoms in humans are as follows:

CONCENTRATION	EFFECT
1%	Breathing rate increases slightly
2%	Breathing rate increases to 50% above the normal level. Prolonged exposure can cause headache, tiredness.
3%	Breathing increases to twice the normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increased blood pressure and heart rate.
4-5%	Breathing increases to approximately four times normal rate, symptoms of intoxification become evident, and slight choking may be felt.
5-10%	Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment, and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness.
10-100%	Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.

DELAYED (CHRONIC) EFFECTS: A single study has shown an increase in heart defects in rats exposed to 6% carbon dioxide in air for 24 hours at different times during gestation. There is no evidence that carbon dioxide is teratogenic in humans.

POTENTIAL HEALTH HAZARDS

EFFECTS OF A SINGLE ACUTE OVEREXPOSURE

NATIONAL REFRIGERANTS, INC.

R-744

SKIN: No harm expected from vapor. Prolonged contact with carbon dioxide could cause frostbite. Cold gas or liquid may cause severe frostbite.

EYES: No harm expected from vapor. Prolonged contact with carbon dioxide could cause frostbite. Cold gas or liquid may cause severe frostbite.

INHALATION: Carbon Dioxide is an asphyxiant with effect due to lack of oxygen. It is also physiologically active, affecting circulation and breathing. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing and heart rate, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

INGESTION: An unlikely route of exposure. This product is a gas at normal temperature and pressure. But may cause severe frostbite.

DELAYED EFFECTS: No harm expected to healthy individuals. Where competent medical authority deems that such illness would be aggravated by exposure to carbon dioxide, persons in ill health should be restricted from working with or handling.

OTHER EFFECTS OF OVEREXPOSURE: Damage to retinal or ganglion cells and central nervous system may occur.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The toxicology and the physical and chemical properties of carbon dioxide suggest that overexposure is unlikely to aggravate existing medical conditions.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST
No ingredients listed in this section			

12. ECOLOGICAL INFORMATION

ECOTOXICITY: No adverse ecological effects expected

OTHER ADVERS EFFECTS: Carbon Dioxide does not contain any Class I or Class II ozone-depleting chemicals.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. TRANSPORT INFORMATION

US DOT ID NUMBER: UN1013
US DOT PROPER SHIPPING NAME: Carbon Dioxide
US DOT HAZARD CLASS: 2.2
US DOT PACKING GROUP: Not applicable
US DOT RQ: None

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

NATIONAL REFRIGERANTS, INC.

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15. REGULATORY INFORMATION

Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: Listed on the TSCA inventory

SARA TITLE III / CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA / CERCLA RQ (lb.)	SARA EHS TPQ (lb.)
Carbon Dioxide	None	None

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS:

IMMEDIATE : Yes
DELAYED: No
FIRE: No
PRESSURE: Yes
REACTIVITY: No

SARA 313 TOXIC CHEMICALS:

Carbon Dioxide is not subject to reporting under Section 313

STATE RIGHT-TO-KNOW

CALIFORNIA: Carbon Dioxide is not listed by California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)

PENNSYLVANIA: Carbon Dioxide is subject to the Pennsylvania Worker and Community Right to Know Act.

16. OTHER INFORMATION

CURRENT ISSUE DATE: May, 2015
PREVIOUS ISSUE DATE: April 2014
OTHER INFORMATION: HMIS Classification: Health – 3, Flammability – 0, Reactivity – 0
NFPA Classification: Health – 3, Flammability – 0, Reactivity – 0
Regulatory Standards:

1. OSHA regulations for compressed gases: 29 CFR 1910.101
2. DOT classification per 49 CFR 172.101

DISCLAIMER:

National Refrigerants, Inc. believes that the information and recommendations contained herein (including data and statements are accurate as of the date hereof. NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be valid where such product is used in combination with any other methods of use of the product and of the information referred to herein are beyond the control of National Refrigerants. National Refrigerants expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information.

IDEMITSU

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SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

DAPHNE HERMETIC OIL PZ68S

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	15.03.2017	100000003198	Date of first issue: 15.03.2017

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name : DAPHNE HERMETIC OIL PZ68S

Product code : 32450621

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture : Lubricant

Recommended restrictions on use :
None known.

1.3 Details of the supplier of the safety data sheet

Company : Idemitsu Kosan Co., Ltd.

Address : 1-1 3-Chome Marunouchi Chiyoda-ku Tokyo, 100-8321, Japan

Telephone : +81-3-3213-3143

Telefax : +81-3-3211-5343

1.4 Emergency telephone number

+44(0)1235 239 670

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Skin sensitisation, Category 1	H317: May cause an allergic skin reaction.
Chronic aquatic toxicity, Category 3	H412: Harmful to aquatic life with long lasting effects.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Warning

Hazard statements : H317 May cause an allergic skin reaction.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements : **Prevention:**

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P280	Wear protective gloves.
Response:	
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P362 + P364	Take off contaminated clothing and wash it before reuse.
Disposal:	
P501	Dispose of contents/ container to an approved waste disposal plant.

Hazardous components which must be listed on the label:
GLYCOLS,POLYPROPYLENE, DIMETHYL ETHER

[[(2-ethylhexyl)oxy]methyl]oxirane

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Hazardous components

Chemical name	CAS-No. EC-No. Registration number	Classification	Concentration (% w/w)
GLYCOLS,POLYPROPYLENE, DIMETHYL ETHER	24991-61-5	Skin Sens. 1; H317	>= 90 - <= 100
tris(methylphenyl) phosphate	1330-78-5 215-548-8	Repr. 2; H361 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	>= 1 - < 2.5
2,6-di-tert-butyl-p-cresol	128-37-0 204-881-4	Aquatic Acute 1; H400 Aquatic Chronic 1; H410	>= 0.25 - < 1
[[(2-ethylhexyl)oxy]methyl]oxirane	2461-15-6 219-553-6	Skin Irrit. 2; H315 Skin Sens. 1A; H317	>= 0.1 - < 1

No hazardous ingredients

Chemical name	CAS-No. EC-No. Registration number	Classification	Concentration (% w/w)
Lubricating oil additive	-	-	< 0.1

For explanation of abbreviations see section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : No hazards which require special first aid measures.

If inhaled : Move to fresh air in case of accidental inhalation of dust or

fumes from overheating or combustion.
If symptoms persist, call a physician.

In case of skin contact	:	Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water.
In case of eye contact	:	Flush eyes with water as a precaution. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing.
If swallowed	:	Clean mouth with water and drink afterwards plenty of water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Risks	:	May cause an allergic skin reaction.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment	:	The first aid procedure should be established in consultation with the doctor responsible for industrial medicine.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products	:	No hazardous combustion products are known

5.3 Advice for firefighters

Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.
Further information	:	Standard procedure for chemical fires.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

6.2 Environmental precautions

Environmental precautions	:	No special environmental precautions required.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up	:	Wipe up with absorbent material (e.g. cloth, fleece). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For personal protection see section 8., For disposal considerations see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling	:	For personal protection see section 8. No special handling advice required.
Advice on protection against fire and explosion	:	Normal measures for preventive fire protection.
Hygiene measures	:	General industrial hygiene practice.

7.2 Conditions for safe storage, including any incompatibilities

Advice on common storage	:	No special restrictions on storage with other products.

7.3 Specific end use(s)

Specific use(s)	:	Consult the technical guidelines for the use of this substance/mixture.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
2,6-di-tert-butyl-p-cresol	128-37-0	TWA	10 mg/m3	GB EH40
Further information	Where no specific short-term exposure limit is listed, a figure three times the long-term exposure should be used			

8.2 Exposure controls

Personal protective equipment

Eye protection	:	Safety glasses
Hand protection		
Glove thickness	:	>= 0.3 mm
Remarks	:	For prolonged or repeated contact use protective gloves.
Skin and body protection	:	Protective suit
Respiratory protection	:	No personal respiratory protective equipment normally required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	transparent
Physical state	:	liquid
Colour	:	light yellow
Odour	:	characteristic
Odour Threshold	:	No data available
pH	:	No data available
Freezing point	:	No data available

Melting point	:	No data available
Drop point	:	No data available
Pour point	:	-50.0 °C
Boiling point	:	No data available
Flash point	:	216 °C Method: Cleveland open cup
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	0.9973 g/cm3 (15 °C)
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity		
Viscosity, kinematic	:	68.73 mm2/s (40 °C)
Oxidizing properties	:	No data available

9.2 Other information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Stable under recommended storage conditions.

10.2 Chemical stability

No decomposition if stored and applied as directed.

10.3 Possibility of hazardous reactions

Hazardous reactions : No hazards to be specially mentioned.

10.4 Conditions to avoid

Conditions to avoid : No data available

10.5 Incompatible materials

Materials to avoid : Strong bases

10.6 Hazardous decomposition products

No hazardous decomposition products are known.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Not classified based on available information.

Skin corrosion/irritation

Not classified based on available information.

Product:

Remarks: According to the classification criteria of the European Union, the product is not considered as being a skin irritant.

Serious eye damage/eye irritation

Not classified based on available information.

Product:

Remarks: According to the classification criteria of the European Union, the product is not considered as being an eye irritant.

Respiratory or skin sensitisation

Skin sensitisation: May cause an allergic skin reaction.
Respiratory sensitisation: Not classified based on available information.

Product:

Remarks: No data available

Germ cell mutagenicity

Not classified based on available information.

Carcinogenicity

Not classified based on available information.

Reproductive toxicity

Not classified based on available information.

STOT - single exposure

Not classified based on available information.

STOT - repeated exposure

Not classified based on available information.

Aspiration toxicity

Not classified based on available information.

Further information

Product:

Remarks: No data available

SECTION 12: Ecological information

12.1 Toxicity

Components:

tris(methylphenyl) phosphate:

M-Factor (Acute aquatic toxicity) : 1

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

Product:

Assessment : This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher..

12.6 Other adverse effects

Product:

Additional ecological information : There is no data available for this product.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging : Empty remaining contents.
Empty containers should be taken to an approved waste handling site for recycling or disposal.

SECTION 14: Transport information

14.1 UN number

Not regulated as a dangerous good

14.2 UN proper shipping name

Not regulated as a dangerous good

14.3 Transport hazard class(es)

Not regulated as a dangerous good

14.4 Packing group

Not regulated as a dangerous good

14.5 Environmental hazards

Not regulated as a dangerous good

14.6 Special precautions for user

Not applicable

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59). : Not applicable

Regulation (EC) No 1005/2009 on substances that deplete the ozone layer : Not applicable

Regulation (EC) No 850/2004 on persistent organic pollutants : Not applicable

Regulation (EC) No 649/2012 of the European Parliament and the Council concerning the export and import of dangerous chemicals : Not applicable

Seveso II - Directive 2003/105/EC amending Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances

Not applicable

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

Not applicable

Other regulations : Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

The components of this product are reported in the following inventories:

ENCS : Listed

TSCA : Listed

EINECS : Listed

REACH : For further information, please contact

DSL : Listed

AICS : Not listed

KECI : Listed

PICCS : Listed

IECSC : Listed

TCSI : Listed

15.2 Chemical safety assessment

A Chemical Safety Assessment is not required for this substance.

SECTION 16: Other information

Full text of H-Statements

H315	:	Causes skin irritation.
H317	:	May cause an allergic skin reaction.
H361	:	Suspected of damaging fertility or the unborn child.
H400	:	Very toxic to aquatic life.
H410	:	Very toxic to aquatic life with long lasting effects.

Full text of other abbreviations

Aquatic Acute	:	Acute aquatic toxicity
Aquatic Chronic	:	Chronic aquatic toxicity
Repr.	:	Reproductive toxicity
Skin Irrit.	:	Skin irritation
Skin Sens.	:	Skin sensitisation

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

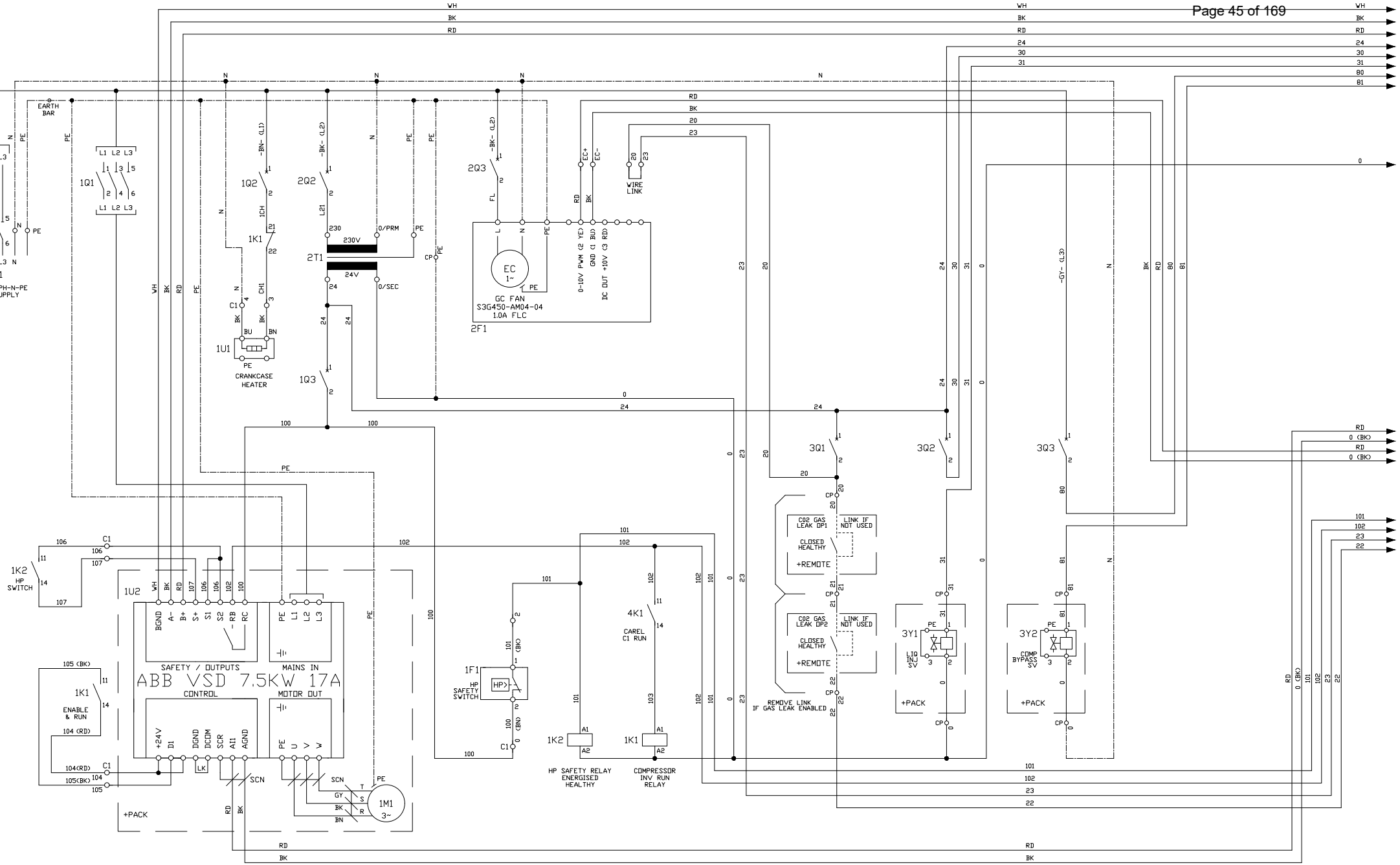
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

GB / EN

4. Wiring Schematics

Model: HCU2040PXB1

Part Number: D4155S-LT



Rev No	Date	PCO
03	14/02/20	21193-01
02	13/05/19	21178-01
01	01/03/19	20958-01

Title: 4HP LT CCU WIRING DIAGRAM (SHORT FORM)

Drawing No.	Sheet:	Drawn By:	Checked By:	Date:
D4155S-LT / 03	1/2	AN		23/04/2020

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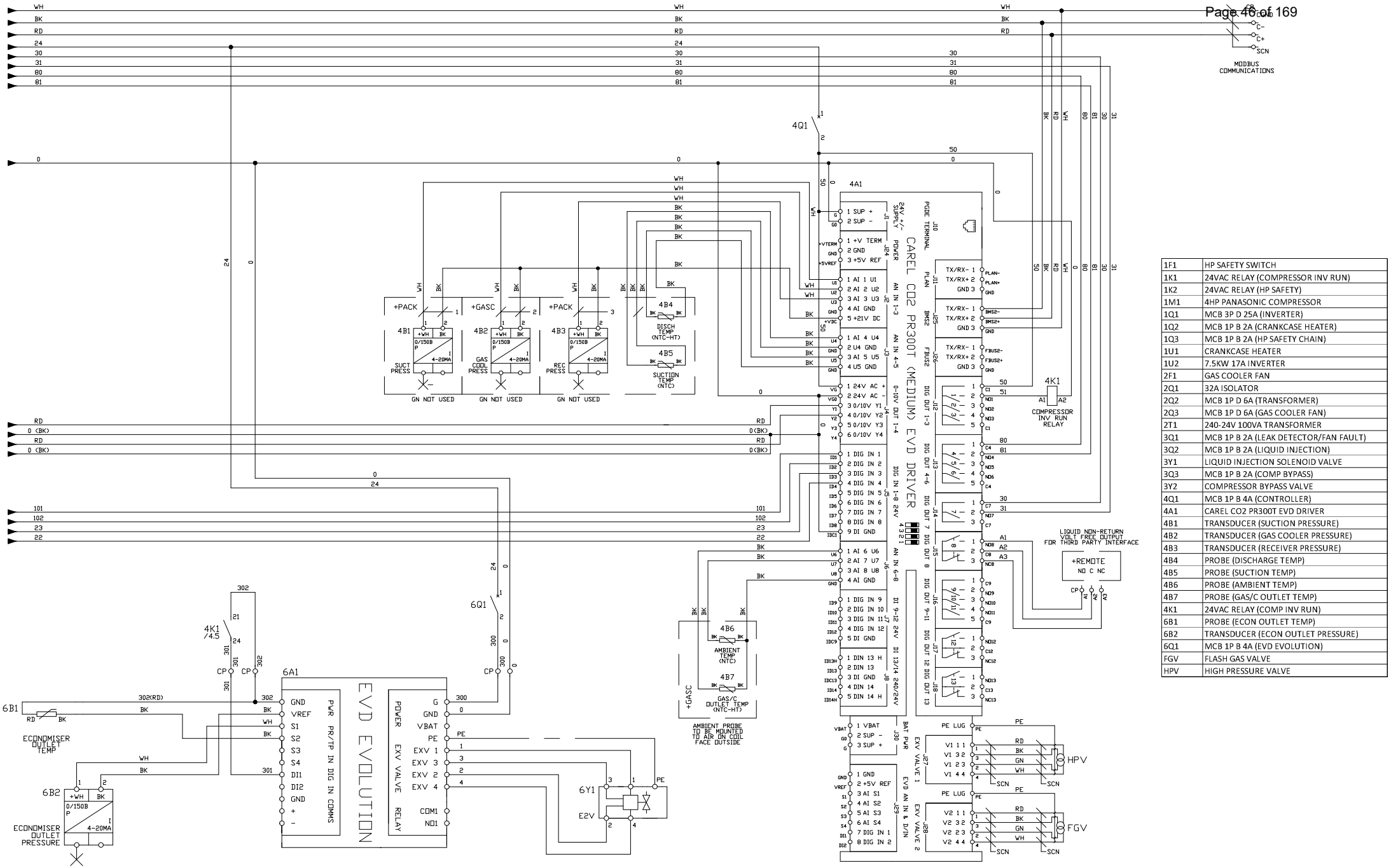
P4367 Rev 01



1F1	HP SAFETY SWITCH
1K1	24VAC RELAY (COMPRESSOR INV RUN)
1K2	24VAC RELAY (HP SAFETY)
1M1	4HP PANASONIC COMPRESSOR
1Q1	MCB 3P D 25A (INVERTER)
1Q2	MCB 1P B 2A (CRANKCASE HEATER)
1Q3	MCB 1P B 2A (HP SAFETY CHAIN)
1U1	CRANKCASE HEATER
1U2	7.5KW 17A INVERTER
2F1	GAS COOLER FAN
2Q1	32A ISOLATOR
2Q2	MCB 1P D 6A (TRANSFORMER)
2Q3	MCB 1P D 6A (GAS COOLER FAN)
2T1	240-24V 100VA TRANSFORMER
3Q1	MCB 1P B 2A (LEAK DETECTOR/FAN FAULT)
3Q2	MCB 1P B 2A (LIQUID INJECTION)
3Y1	LIQUID INJECTION SOLENOID VALVE
3Q3	MCB 1P B 2A (COMP BYPASS)
3Y2	COMPRESSOR BYPASS VALVE
4Q1	MCB 1P B 4A (CONTROLLER)
4A1	CAREL CO2 PR300T EVD DRIVER
4B1	TRANSDUCER (SUCTION PRESSURE)
4B2	TRANSDUCER (GAS COOLER PRESSURE)
4B3	TRANSDUCER (RECEIVER PRESSURE)
4B4	PROBE (DISCHARGE TEMP)
4B5	PROBE (SUCTION TEMP)
4B6	PROBE (AMBIENT TEMP)
4B7	PROBE (GAS/C OUTLET TEMP)
4K1	24VAC RELAY (COMP INV RUN)
6B1	PROBE (ECON OUTLET TEMP)
6B2	TRANSDUCER (ECON OUTLET PRESSURE)
6Q1	MCB 1P B 4A (EVD EVOLUTION)
FGV	FLASH GAS VALVE
HPV	HIGH PRESSURE VALVE

Rev No	Date	PCO
03	14/02/20	21193-01
02	13/05/19	21178-01
01	01/03/19	20958-01

Title: 4HP LT CCU WIRING DIAGRAM (SHORT FORM)

Drawing No.	Sheet:	Drawn By:	Checked By:	Date:
D4155S-LT / 03	2/2	AN		23/04/2020

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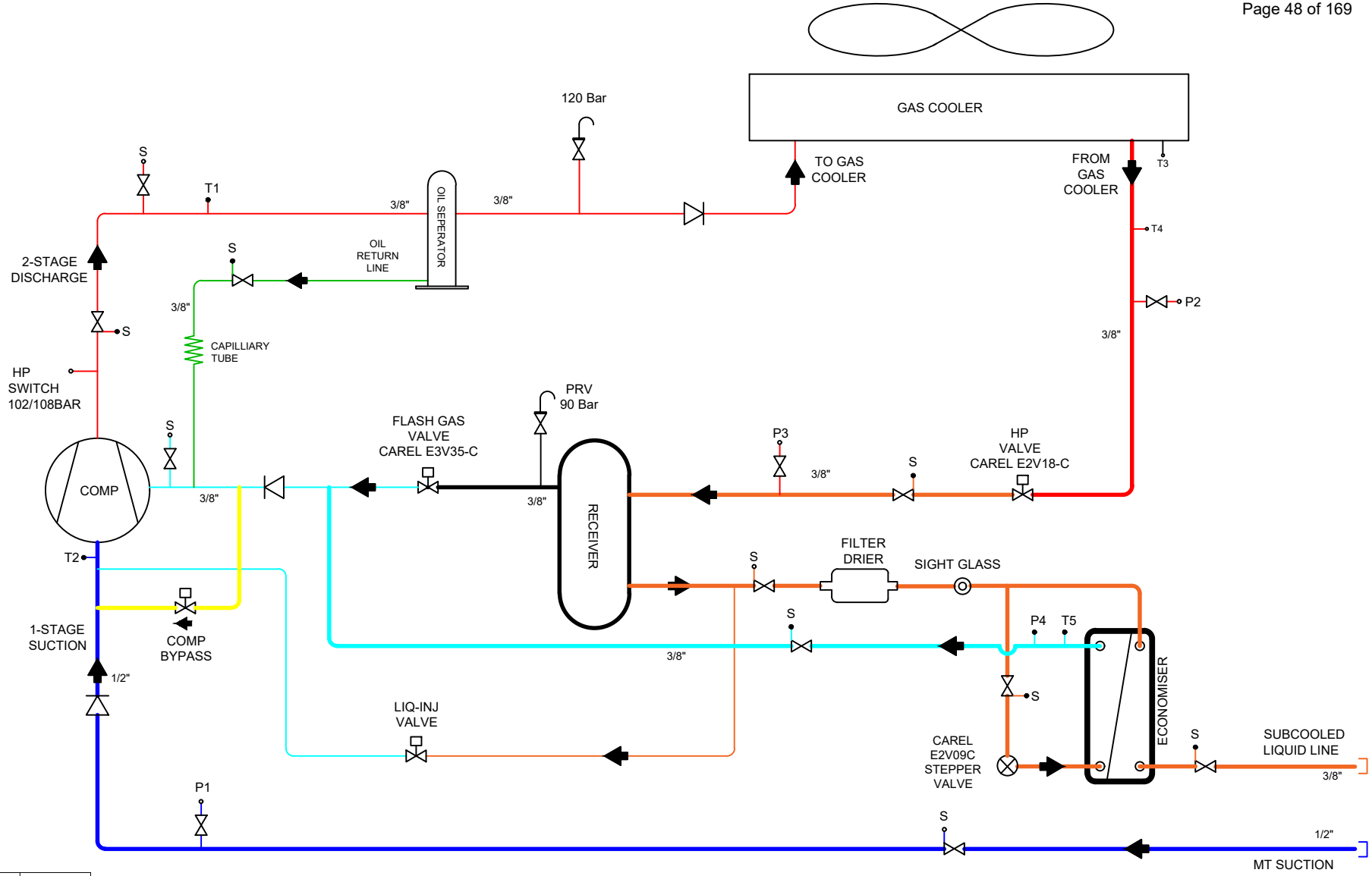
P4367 Rev 01

5. Pipework Schematics (P&ID)

Model: HCU2040PXB1
Part Number: D4129-LT



Item	Description	Wiring ref
T1	Discharge Temperature	4B4
T2	Suction Temperature	4B5
T3	Ambient Temperature	4B6
T4	Gas Cooler Outlet Temperature	4B7
T5	Economiser Outlet Temperature	6B1
P1	Suction Pressure	4B1
P2	Gas Cooler Pressure	4B2
P3	Receiver Pressure	4B3
P4	Economiser Outlet Pressure	6B2

BALL VALVE
PRV
ACCESS VALVE
CHECK VALVE

Rev No	Date	PCO	Title
			4HP LT CCU PIPING SCHEMATIC

Drawing No.	Drawn By:	Checked By:	Date:
D4129-LT/00	IAM		22/03/2018

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6. Carel PR300T CO2 Controller manual

pRack pR300T

CAREL

ENG

pRack pR300T user manual for the management of CO_2 systems in transcritical conditions

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

NO POWER & SIGNAL CABLES TOGETHER

READ CAREFULLY IN THE TEXT!

High Efficiency Solutions

IMPORTANT

CAREL bases the development of its products on decades of experience in HVAC, on the continuous investments in technological innovations to products, procedures and strict quality processes with in-circuit and functional testing on 100% of its products, and on the most innovative production technology available on the market. CAREL and its subsidiaries nonetheless cannot guarantee that all the aspects of the product and the software included with the product respond to the requirements of the final application, despite the product being developed according to start-of-the-art techniques. The customer (manufacturer, developer or installer of the final equipment) accepts all liability and risk relating to the configuration of the product in order to reach the expected results in relation to the specific final installation and/or equipment. CAREL may, based on specific agreements, act as a consultant for the positive commissioning of the final unit/application, however in no case does it accept liability for the correct operation of the final equipment/system.

The CAREL product is a state-of-the-art product, whose operation is specified in the technical documentation supplied with the product or can be downloaded, even prior to purchase, from the website www.CAREL.com. Each CAREL product, in relation to its advanced level of technology, requires setup / configuration / programming / commissioning to be able to operate in the best possible way for the specific application. The failure to complete such operations, which are required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases.
Only qualified personnel may install or carry out technical service on the product.
The customer must only use the product in the manner described in the documentation relating to the product.

In addition to observing any further warnings described in this manual, the following warnings must be heeded for all CAREL products:

- Prevent the electronic circuits from getting wet. Rain, humidity and all types of liquids or condensate contain corrosive minerals that may damage the electronic circuits. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not install the device in particularly hot environments. Too high temperatures may reduce the life of electronic devices, damage them and deform or melt the plastic parts. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not attempt to open the device in any way other than described in the manual.
- Do not drop, hit or shake the device, as the internal circuits and mechanisms may be irreparably damaged.
- Do not use corrosive chemicals, solvents or aggressive detergents to clean the device.
- Do not use the product for applications other than those specified in the technical manual.

All of the above suggestions likewise apply to the controllers, serial boards, programming keys or any other accessory in the CAREL product portfolio.
CAREL adopts a policy of continual development. Consequently, CAREL reserves the right to make changes and improvements to any product described in this document without prior warning.

The technical specifications shown in the manual may be changed without prior warning.

The liability of CAREL in relation to its products is specified in the CAREL general contract conditions, available on the website www.CAREL.com and/or by specific agreements with customers; specifically, to the extent where allowed by applicable legislation, in no case will CAREL, its employees or subsidiaries be liable for any lost earnings or sales, losses of data and information, costs of replacement goods or services, damage to things or people, downtime or any direct, indirect, incidental, actual, punitive, exemplary, special or consequential damage of any kind whatsoever, whether contractual, extra-contractual or due to negligence, or any other liabilities deriving from the installation, use or impossibility to use the product, even if CAREL or its subsidiaries are warned of the possibility of such damage.

DISPOSAL

INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

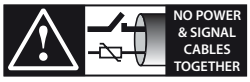
In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

- WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
- the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment;
- the equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
- the symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
- in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

Warranty on the materials: 2 years (from the date of production, excluding consumables).

Approval: the quality and safety of CAREL INDUSTRIES Hqs products are guaranteed by the ISO 9001 certified design and production system.

WARNING:



READ CAREFULLY IN THE TEXT!

separate as much as possible the probe and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance.
Never run power cables (including the electrical panel wiring) and signal cables in the same conduits.

Key icone

	NOTE:	to bring attention to a very important subject; in particular, regarding the practical use of the various functions of the product.
	IMPORTANT:	to bring critical issues regarding the use of the pRack PR300 to the attention of the user.
	TUTORIAL:	some simple examples to accompany the user in configuring the most common settings.

CAREL reserves the right to modify the features of its products without prior notice.

Content

1. INTRODUCTION

1.1 Main features

pRack pR300T is the integrated CAREL solution for control and management of CO_2 compressor racks.

The main features and compressor management characteristics of pRack pR300T are listed below.

1.1.1 pR300T functionality list

Main features	Possibility of management integrated in a single control for the medium temperature and low temperature line and the high pressure stage.
	Management of the high pressure valve (HPV)
	Management of the receiver pressure regulating valve (RPRV)
	Valves management via external or built-in (PRK30TD*) driver through fieldbus communication port or via external driver in position mode in 0…10V
	Integration between HPV and receiver pressure
	Accessory functions (pre-positioning, minimum and maximum values differentiated by machine ON and OFF, maximum distance from the setpoint, ...)
	Oil cooler
	Oil receiver and oil injection
	Heat Reclaim
	Integration between heat reclaim and HPV and RPRV valve management
	Double suction line and one high pressure stage
	Up to 16 fans for condensing line
	Inverter regulation on the first compressor and on the first fan
	Generic functions easily configurable (ON/OFF, modulations, alarms, scheduler)
Hardware	S, M, D, L version (based on pCO5+ hardware) External display (pGDE) or built-in display
Compressors	Scroll, reciprocating, digital scroll compressors management
	Up to 12 piston compressors per line, a maximum of 4 different sizes
	Up to 4 alarms per compressor
	Inverter management, even with modulation inside the dead zone
	Pump down
	Control of overheating in suction
Lingue	Italian, English, German, French, Spanish, Russian, Portoguese, Swedish
Unit of measure	Temperature: °C, °F Pressure: barg, psig (all pressure values are also converted to temperature) Date format settable between: dd/mm/yy, mm/dd/yy, yy.mm.dd
Control	Proportional band (P, PI) available for compressors and fans Neutral zone available for compressors and fans
Compressor rotation	FIFO LIFO Timed Fixed (the ON/OFF order can be set as required)
Scheduling by calendar	Scheduling available: heating/cooling, 4 daily time bands, 5 special periods (e.g.: closing period), 10 special days (e.g.: holidays) Schedulable functions: set point compensation for compressors and fans, split condenser (heating/cooling only), anti noise, heat recovery, generic functions
Setpoint	Compensation from digital input, from scheduling, floating based on supervisor parameter (compressors) or outside temperature (fans)
Prevent	High pressure, including activation of heat recovery or ChillBooster
Alarms	Automatic and manual management Configurable compressor alarms Double Signal on digital outputs for high or low priority alarms Log from application
Supervisor protocol	Carel Modbus®

Tab. 1.a

1.2 Components and accessories

The pRack pR300T is available in 4 hardware sizes listed in the table (for the detailed description of each size, electrical characteristics and installation, refer to Chapter 2):

Hardware sizes:

Size	Available analog inputs	Available digital inputs	Available analog outputs	Available digital outputs
Small	5 (*)	8	4	8
Medium	8 (*)	14	4	13
Medium + Driver	8(*) + 4	14+2	4	13
Large	10 (*)	18	6	18

Tab. 1.b

(*) can also be used as digital inputs

For each size the following versions are available:
- with built-in terminal, without terminal

All pRack pR300T models are equipped with:
- integrated RS485 serial interface
- anthracite gray plastic cover
- connector kit
- USB.

pRack pR300T models

Size	Code	Description
small	PRK30TS0E0	pRack PR300T small, USB, no display, BMS/FBUS OPTO, 2 SSR, connector kit
	PRK30TS3E0	pRack PR300T small, USB, display built-in, BMS/FBUS OPTO, 2 SSR, connector kit
	PRK30TS0F0	pRack PR300T small, USB, no display, BMS/FBUS opto, connector kit
	PRK30TS3F0	pRack PR300T small, USB, display built-in, BMS/FBUS opto, connector kit
	PRK30TS3FK	pRack PR300T small, USB, external display, BMS/FBUS opto, connector kit
medium	PRK30TM0E0	pRack PR300T medium, USB, no display, BMS/FBUS OPTO, 2 SSR, connector kit
	PRK30TM3E0	pRack PR300T medium, USB, display built-in, BMS/FBUS opto, 2 SSR, connector kit
	PRK30TM0F0	pRack PR300T medium, USB, no display, BMS/FBUS opto, connector kit
	PRK30TM3F0	pRack pR300T medium, USB, display built-in, BMS/FBUS opto, kit connettori
	PRK30TM3FK	pRack pR300T medium, USB, external display, BMS/FBUS opto, kit connettori
driver	PRK30TD0E0	pRack PR300T medium, EVD EVO embedded for 2 UNIV. EXV, USB, no display, BMS/FBUS opto, 2 SSR, connector kit
	PRK30TD3E0	pRack PR300T medium, EVD EVO Eembedded for 2 UNIV. EXV, USB, display built-in, BMS/FBUS opto, 2 SSR, connector kit
	PRK30TD0F0	pRack PR300T medium, evd evo embedded for 2 univ. EXV, USB, no display, BMS/FBUS opto, connector kit
	PRK30TD3F0	pRack PR300T medium, evd evo embedded for 2 univ. EXV, USB, display built-in, BMS/FBUS opto, connector kit
	PRK30TD3FK	pRack PR300T medium, evd evo embedded for 2 univ. EXV, USB, external display, BMS/FBUS opto, connector kit
large	PRK30TL0E0	pRack PR300T large, USB, no display, BMS/FBUS OPTO, 6 SSR, connector kit
	PRK30TL3E0	pRack PR300T large, USB, display built-in, BMS/FBUS opto, 6 SSR, connector kit
	PRK30TL0F0	pRack PR300T large, USB, no display, BMS/FBUS opto, connector kit
	PRK30TL3F0	pRack pR300T large, USB, display built-in, BMS/FBUS opto, connector kit
	PRK30TL3FK	pRack pR300T large, USB, external display, BMS/FBUS opto, connector kit

Tab. 1.c

Accessories:

Code	Description
PGDERK1FX0	pGD evolution user terminal for pRack pR300T
CONVONOFF0	Module to convert a 0...10V analog output to an SPDT digital output
CVSTDUTLF0	USB/RS485 serial convertor with telephone connector
CVSTDUMOR0	USB/RS485 serial converter with 3-way terminal
PCOSO0AKY0	Smart Key programming key
S90CONN002	Connection cable for terminal 1=0.8m
S90CONN000	Connection cable for terminal 1=1.5m
S90CONN001	Connection cable for terminal 1=3 m
SPKT*R* and SPKC00*	Ratiometric pressure probes 0…5 Vdc
SPK*C*, SPK1*, SPK2*, SPK3*	Active pressure probes 4…20 mA
NTC*	Pressure probe NTC -50T90°C
NTC*HT*	Pressure probe NTC -0T150°C
EVD0000E50	EVD EVO universal driver for Carel valves, RS485/Modbus™
EVDIS00D*0	Display for EVD EVO
E2VCABS*00	EVD-valve connection cable

Tab. 1.d

1.3 Configuration of the system and configuration of the inputs and outputs

pRack pR300T has the same system configuration management and input and output configuration management as the standard pRack.

Note: each input/output is completely configurable with the only requirements being those set by the system configuration. For example, the suction pressure probe on line 1 can be arbitrarily configured to any one of the analog inputs in the pLAN control board with address 1 compatible with the type of probe.

1.3.1 System configurations available

pRack pR300T can manage system configurations with up to 2 suction lines (maximum 12 scroll or piston compressors for lines 1 and 2) and up to 1 high pressure line (maximum 16 fans per line). When there are two suction lines, the lines can be managed by the same pRack board or by separate boards. The condenser line can be managed by the board that manages the suction line, or by a separate board, in accordance with the number of inputs/outputs available.

For each line, both suction and condensing, pRack pR300T can manage a modulating device (inverter, Digital Scroll® compressor or compressor with continuous control).

Example 1: 1 suction line with scroll or piston compressors, 1 high pressure line:

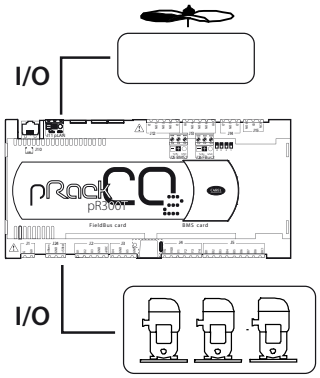


Fig. 1.a

Example 2: 2 suction lines on the same board with scroll or piston compressors, 1 high pressure line:

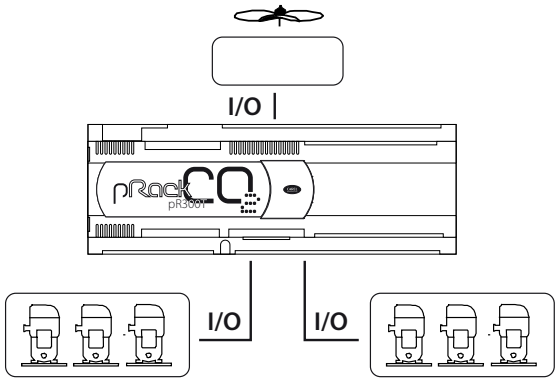


Fig. 1.b

Example 3: 2 suction lines on separate boards (scroll or piston compressors), 1 high pressure line (on the first suction line board):

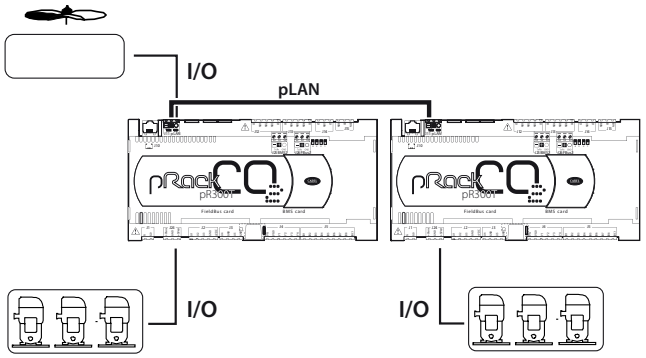


Fig. 1.c

Example 4: 2 suction lines on separate boards with scroll or piston compressors, 1 high pressure line on separate board:

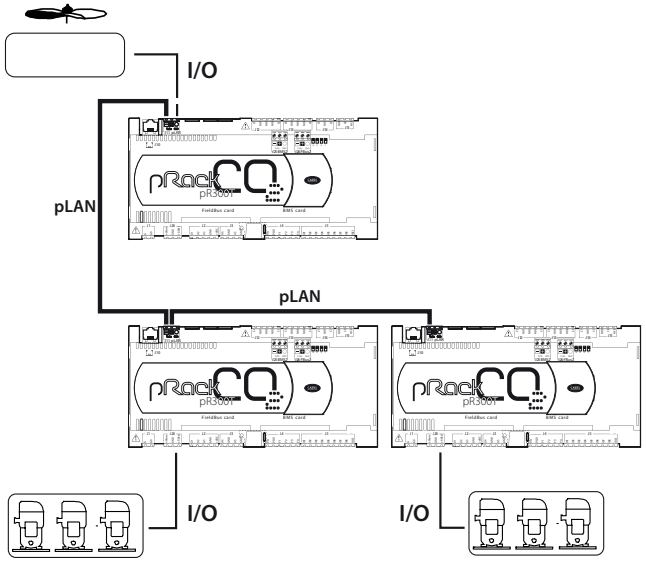


Fig. 1.d

Note: if connecting more than one pRack pR300 board in a pLAN, mixed networks cannot be created combining Compact boards and S, M, L boards, while mixed networks are possible using combinations of the latter models only.

Important: all the boards connected to the pLAN must have the same software revision.

2. HARDWARE CHARACTERISTICS AND INSTALLATION

2.1 pRack 300 S, M, D, L board description

pRack pR300T S

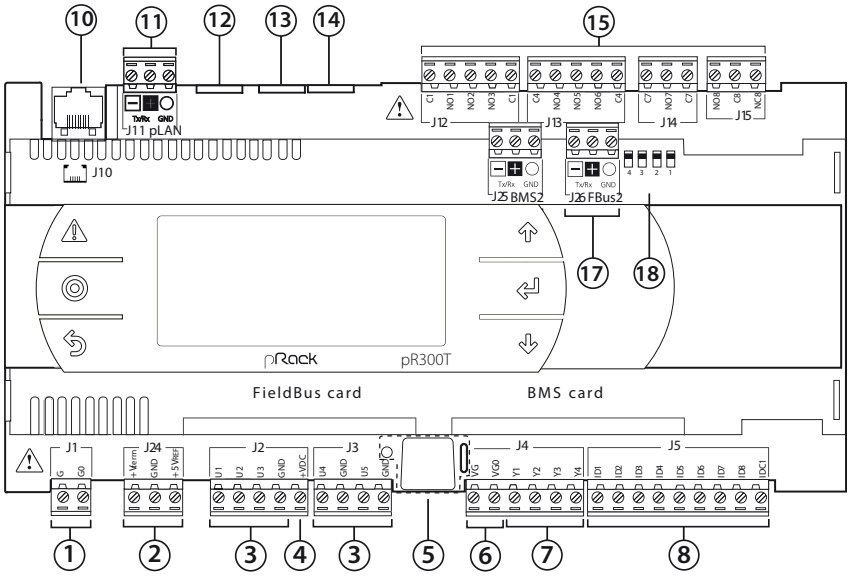


Fig. 2.a

pRack pR300T M

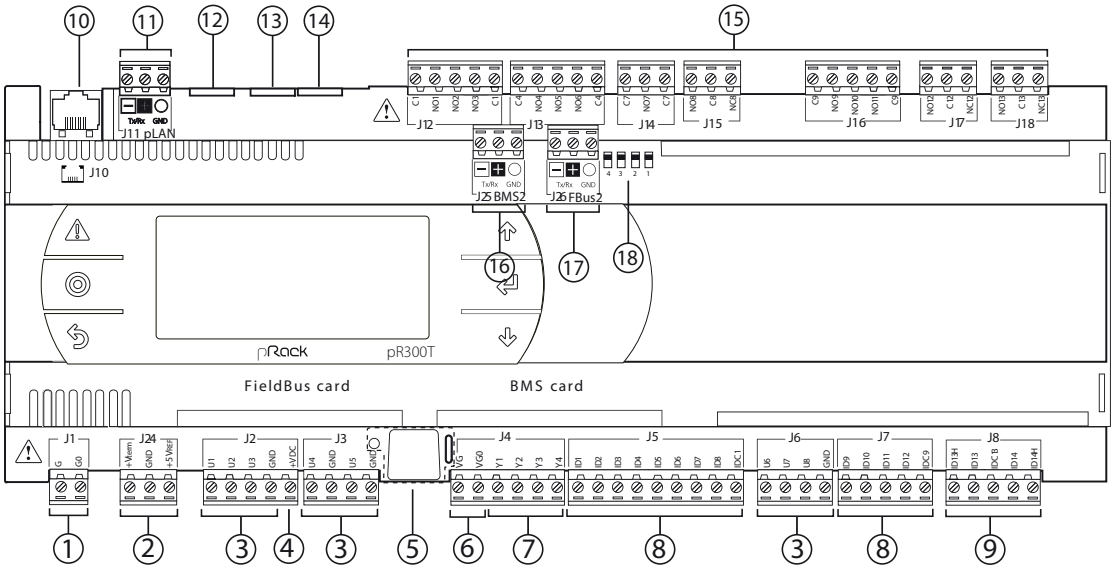


Fig. 2.b

Key:

Ref.	Description
1	Power supply connector [G(+), G0(-)]
2	+Vterm: power supply for additional terminal+5 VREF power supply for ratiometric probes
3	Universal inputs/outputs
4	+VDC: power supply for active probes
5	Button for setting pLAN address, second display, LED
6	VG: power supply at voltage A(*) for opto-isolated analogue output VG0: power to opto-isolated analogue output, 0 Vac/Vdc
7	Analogue outputs
8	ID: digital inputs for voltage A (*)
9	ID..: digital inputs for voltage A (*) IDH..: digital inputs for voltage B (**)
10	pLAN telephone connector for terminal/downloading application

(*) Voltage A: 24 Vac or 28 to 36 Vdc; (**) Voltage B: 230 Vac - 50/60 Hz.

Ref.	Description
11	pLAN plug-in connector
12	Reserved
13	Reserved
14	Reserved
15	Relay digital outputs
16	BMS2 connector
17	FieldBus2 connector
18	Jumpers for selecting FieldBus/ BMS

Tab. 2.a

pRack pR300T D

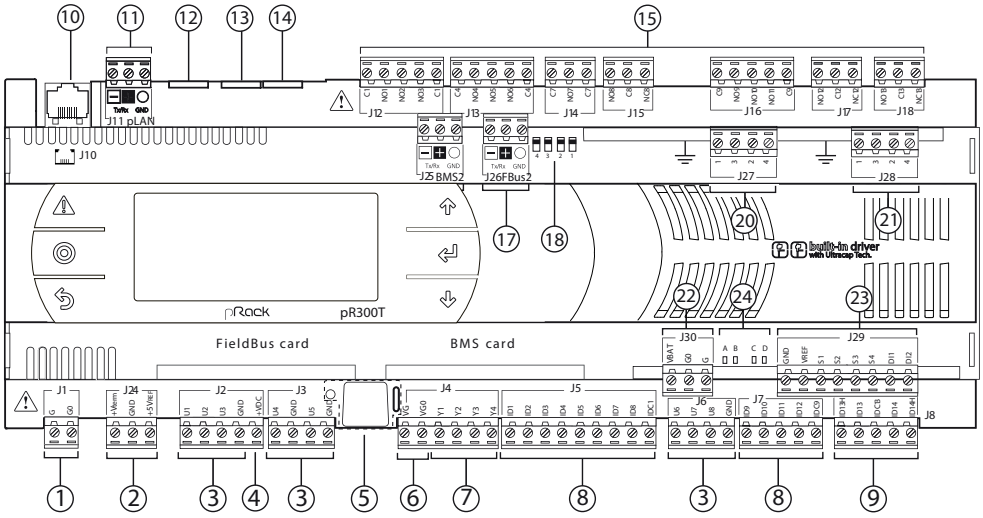


Fig. 2.c

Key:

Ref.	Description	Ref.	Description
1	Power supply connector [G(+), G0(-)]	13	Reserved
2	+Vterm: power supply for additional terminal +5 VREF power supply for ratiometric probes	14	Reserved
3	Universal inputs/outputs	15	Relay digital outputs
4	+VDC: power supply for active probes	16	BMS2 connector
5	Button for setting pLAN address, second display, LED	17	FieldBus2 connector
6	VG: power supply at voltage A(*) for opto-isolated analogue output VG0: power to opto-isolated analogue output, 0 Vac/Vdc	18	Jumpers for selecting FieldBus/ BMS
7	Analogue outputs	20	Electronic valve A connector
8	ID: digital inputs for voltage A (*)	21	Electronic valve B connector
9	ID..: digital inputs for voltage A (*); IDH..: digital inputs for voltage B (**)	22	Connector for external Ultracap module (accessory)
10	pLAN telephone connector for terminal/downloading application	23	Valve driver analogue and digital inputs
11	pLAN plug-in connector	24	Valve status signal LED
12	Reserved		
(*) Voltage A: 24 Vac or 28 to 36 Vdc; (**) Voltage B: 230 Vac - 50/60 Hz.			Tab. 2.b

pRack pR300T L

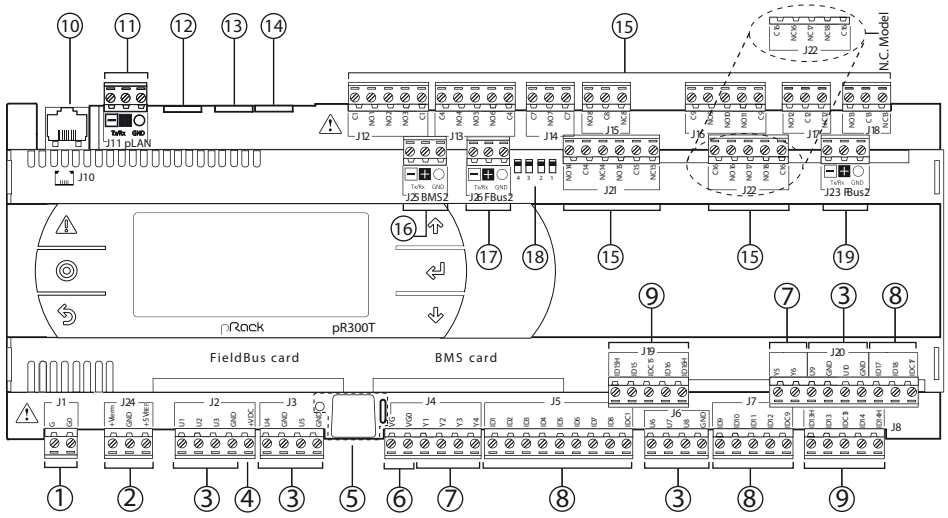


Fig. 2.d

Key:

Ref.	Description
1	Power supply connector [G(+), G0(-)]
2	+Vterm: power supply for additional terminal +5 VREF power supply for ratiometric probes
5	Button for setting pLAN address, second display, LED
6	VG: power supply at voltage A(*) for opto-isolated analogue output VG0: power to opto-isolated analogue output, 0 Vac/Vdc
7	Analogue outputs
8	ID: digital inputs for voltage A (*)
9	ID..: digital inputs for voltage A (*); IDH..: digital inputs for voltage B (**)
10	pLAN telephone connector for terminal/downloading application

Ref.	Description
11	pLAN plug-in connector
12, 13, 14	Reserved
15	Relay digital outputs
16	BMS2 connector
17	FieldBus2 connector
18	Jumpers for selecting FieldBus/ BMS
19	FieldBus2 connector

(*) Voltage A: 24 Vac or 28 to 36 Vdc; (**) Voltage B: 230 Vac - 50/60 Hz. Tab. 2.c

2.2 Technical specifications

2.2.1 Physical specifications

Dimensions	SMALL	13 DIN modules	110 X 227,5 X 60 mm
	MEDIUM, LARGE	18 DIN modules	110 X 315 X 60 mm
	BUILT-IN DRIVER	18 DIN modules	110 X 315 X 75 mm
Plastic case	Assembly	fitted on DIN rail in accordance with DIN 43880 CEI EN 50022	
	Material	technopolymer	
	Flammability	V2 (UL94) and 850 °C (in accordance with IEC 60695)	
	Ball pressure test	125 °C	
	Resistance to creeping current	≥ 250 V	
	Colour	Antrancite	
Built-in terminal	PGDE (132x64 pixel) with backlit keypad		
Other features	Operating conditions	PRK300T*3**, PRK300T*0**(w/o built-in terminal): -40T70 °C, 90% RH non-condensing(*)	
		PRK300T*3*0 (with built-in terminal): -20T60 °C, 90% RH non-condensing	
		(*) with Ultracap module fitted: -40T60°C	
	Storage conditions	PRK300TD*** (w/o built-in terminal): -40T70 °C, 90% RH non-condensing	
		PRK300TD*** (with built-in terminal): -30T70 °C, 90% RH non-condensing	
	Ingress protection	Models with USB port and/or with Ultracap module: IP20 on the front panel only	
		Models without USB port and without Ultracap module: IP40 on the front panel only	
	Environmental pollution	2	
	Class according to protection against electric shock	to be integrated into Class I and/or II appliances in the versions without valve driver, class I in the versions with valve driver	
	PTI of the insulating materials	PCB: PTI 250 V; insulating material: PTI 175	
	Period of stress across the insulating parts	long	
	Type of action	1C; 1Y for SSR versions	
	Type of disconnection or microswitching	microswitching	
	Heat and fire resistance category	Category D (UL94-V2)	
	Ageing characteristics (operating hours)	80,000	
	Number of automatic operating cycles	100,000 (EN 60730-1); 30,000 (UL 873)	
	Overvoltage category	category II	

Tab. 2.d

2.2.2 Electrical specifications

Power supply	SMALL, MEDIUM, LARGE: use a dedicated 50 class II safety transformer VA.				
	BUILT IN DRIVER: use a dedicated 100 VA class II safety transformer.				
		Vac	P (Vac)	Vdc	P (Vdc)
	SMALL	24 Vac (+10/-15%), 50/60 Hz protected by an external 2.5 A type T fuse	45 VA	28 to 36 Vdc (-20/+10%) protected by an external 2.5 A type T fuse	30 W
	MEDIUM				
	LARGE				
	BUILT-IN DRIVER		90 VA	Not allowed	

Important: only power "PRK300TD***" with alternating current. The power transformer secondary **must** be earthed.

Terminal block	with male/female plug-in connectors
Cable cross-section	min 0.5 mm^2 - max 2.5 mm^2
CPU	32 bit, 100 MHz
Non-volatile memory (FLASH)	2 M byte Bios + 11 Mbyte application program
Data memory (RAM)	3.2 Mbyte (1.76 Mbyte Bios + 1.44 Mbyte application program)
T buffer memory (EEPROM)	13 kbyte
P parameter memory(EEPROM)	32 kbyte (not available to the pLAN)
Clock with battery	standard, precision 100 ppm
Battery	CR2430 3 Vdc lithium button battery (size 24x3 mm)
Software class and structure	Class A
Category of immunity to voltage surges (EN 61000-4-5)	Category III

Device not designed to be hand-held when powered

Tab. 2.e

2.2.3 Universal inputs/outputs U...

Analogue inputs, Lmax = 30 m (maximum number)		SMALL		MEDIUM/ BUILT-IN DRIVER		LARGE		
	- CAREL NTC probes (-50T90°C; R/T 10 kΩ±1% at 25°C); - HT NTC (0T150°C); - PTC (600Ω to 2200Ω) - PT500 (-100T400°C) - PT1000 (-100T400°C)	5		8		10		
	- PT100 probes (-100T200°C)	2		3 (2 on U1...U5, 1 on U6...U8)		4 (2 on U1...U5, 1 on U6...U8, 1 on U9...U10)		
	- 0 to 1 Vdc/0 to 10 Vdc signals from probes powered by controller	max tot 5	5	max tot 8	6	max tot 10	6	
	- 0 to 1 Vdc/0 to 10 Vdc signals powered externally		5		8		10	
	- 0 to 20 mA /4 to 20 mA inputs from probes powered by the controller	max tot 4	4	max tot 7	6 (max 4 on U1...U5, 3 on U6...U8)	max tot 9	6 (max 4 on U1...U5, 3 on U6...U8, 2 on U9...U10)	
	- 0 to 20 mA /4 to 20 mA inputs powered externally		4		7 (max 4 on U1...U5, 3 on U6...U8)		9 (max 4 on U1...U5, 3 on U6...U8, 2 on U9...U10)	
	- 0 to 5 V signals from ratiometric probes powered by controller	5		6		6		
	Input precision: ± 0.3 % f.s.							
	Time constant for each input: 0.5 s							
	Classification of measuring circuits (CEI EN 61010-1): category I							
Digital inputs w/o optical isolation, Lmax = 30 m (maximum number)		SMALL		MEDIUM/ BUILT-IN DRIVER		LARGE		
	- voltage-free contacts	5		8		10		
	- fast digital inputs type: voltage-free contact max current: 10 mA max frequency 2kHz and resolution ±1 Hz	max 2		4 (max 2 on U1...U5, max 2 on U6...U8)		6 (max 2 on U1...U5, max 2 on U6...U8, 2 on U9...U10)		

Important:
- for active probes powered externally (0 to 1 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA), to avoid irreparably damaging the controller, implement adequate current protection measures that must ensure < 100 mA;
- the ratiometric probes can only be powered by the controller;
- on power-up, the universal inputs/outputs remain shorted to GND for around 500 ms until the end of the configuration procedure.

Analogue outputs w/o optical isolation (maximum number), Lmax = 30 m		SMALL	MEDIUM/ BUILT-IN DRIVER	LARGE
	0 to 10 Vdc (maximum current 2 mA)	5	8	10
	PWM (output 0/3.3 Vdc, maximum current 2 mA, frequency: 2kHz asynchronous)	5	8	10

Tab. 2.f

2.2.4 Power supply to probes and terminals

+Vdc	can be used to power any active probes using the 24/21 Vdc ± 10% (P+5*/P+3*) available at terminal +VDC (J2). The maximum current available is 150 mA, protected against short-circuits.
+5Vref	to power the 0 to 5V ratiometric probes, use the 5 Vdc (± 5%) available at terminal +5VREF(J24). The maximum current available is 60 mA.
Vterm	P+3**********: 21 Vdc ± 10%; P+5**********: 24 Vdc ± 10% Used to power an external terminal as an alternative to the one connected to J10, Pmax = 1.5 W
Important: if the length exceeds 10 m, use shielded cable with the shield connected to earth. In any case, the max length allowed is 30 m.	

Tab. 2.g

2.2.5 Digital inputs ID... IDH...

Type	Optically-isolated		
Lmax	30 m		
		no. of optically-isolated inputs, 24 Vac or 24 Vdc	no. of optically-isolated inputs, 24 Vac/Vdc or 230 Vac - 50/60 Hz
Maximum number	SMALL	8	None
	MEDIUM/ BUILT-IN DRIVER	12	2
	LARGE	14	4
Minimum digital input pulse detection time	Normally open (open-closed-open)	200 ms	
	Normally closed (closed-open-closed)	400 ms	
Power supply to the inputs	External	IDH...: 230 Vac (+10/-15%) 50/60 Hz	
Classification of measuring circuits (CEI EN 61010-1)	Category I: 24 Vac/Vdc (J5, J7, J20) Category III: 230 Vac (J8, J19)		
Digital input current draw at 24 Vac/Vdc		5 mA	
Digital input current draw at 230 Vac		5 mA	

Tab. 2.h

Note:
- separate as much as possible the probe and digital input cables from cables to inductive loads and power cables, so as to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel cables) and signal cables in the same conduits;
- the two 230 Vac or 24 Vac/Vdc inputs on terminals J8 (ID13, ID14) or J19 (ID15, ID16) have the same common pole and therefore both will operate at 230 Vac or 24 Vac/Vdc. There is basic insulation between the two inputs; there is reinforced insulation between the inputs and the rest of the controller;
- ID1...ID8, ID9 to ID12, ID17, ID18 have functional insulation from the rest of the controller;
- for DC voltage inputs (24 Vdc) either the + or the - can be connected to common terminal;
- the rating of the external contact connected to the digital inputs must be at least 5 mA.

2.2.6 Analogue outputs Y...

Type	0 to 10 V optically-isolated on Y1...Y6		
Lmax	30 m		
Maximum number	SMALL, MEDIUM/ BUILT-IN DRIVER	4	Y1...Y4, 0 to 10 V
	LARGE	6	Y1...Y6, 0 to 10 V
Power supply	external	24 Vac (+10/-15%) or 28 to 36 Vdc on VG(+), VG0(-)	
Precision	Y1...Y6	± 2% full scale	
Resolution	8 bit		
Settling time	Y1...Y6	from 1 s (slew rate 10 V/s) to 20 s (slew rate 0.5 V/s) selectable via SW	
Maximum load	1 kΩ (10 mA)		

Tab. 2.i

Warnings:
- for lengths > 10 m, only use shielded cable, with the shield connected to earth;
- a 0 to 10 Vdc analogue output can be connected in parallel to other outputs of the same type, or alternatively to an external source of voltage. The higher voltage will be considered. Correct operation is not guaranteed if actuators with voltage inputs are connected;
- power the VG-VG0 analogue outputs at the same voltage on G-G0: Connect G0 to VG0 and G to VG. This is valid for both alternating and direct current power supplies.

2.2.7 Digital outputs NO..., NC...

Type	Relay. Minimum contact current: 50 mA.											
Maximum no	8: SMALL; 13: MEDIUM/ BUILT-IN DRIVER; 18: LARGE;											
Insulation distance	The relay outputs have different features depending on the model of controller. The outputs can be divided into groups. The relays belonging to the same group (individual cell in the table) have basic insulation and therefore must have the same voltage. Between groups (cells in the table) there is double insulation and consequently these may have different voltages. There is also double insulation between each terminal of the digital outputs and the rest of the controller.											
	Relays with the same insulation											
		Group										
Makeup of the groups	Model	1	2	3	4	5	6	7	8	9	10	11
	SMALL	1-3	4-6	7	8	-	-	-	-	-	-	-
	Type of relay	Type A	Type A	Type A	Type A	-	-	-	-	-	-	-
	MEDIUM/ BUILT-IN DRIVER	1-3	4-6	7	8	9-11	12	13	-	-	-	-
	Type of relay	Type A	Type A	Type A	Type A	Type A	Type A	Type A	-	-	-	-
	LARGE NO	1-3	4-6	7	8	9-11	12	13	14-15	16-18	-	-
	Type of relay	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type A	-	-
	LARGE NC	1-3	4-6	7	8	9-11	12	13	14-15	16-18	-	-
	Type of relay	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type C	-	-
	EXTRALARGE	1-3	4-6	7	8	9-11	12	13	14-16	17-20	21-24	25-29
	Type of relay	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type B	Type B	Type B	Type B
Number of changeover contacts	1: SMALL (relay 8) 3: MEDIUM (relay 8, 12, 13) 5: LARGE NO/NC (relay 8, 12, 13, 14 e 15)											

Note: the output relays have different features, depending on the model of controller.

Switchable power	Relay type A	Rated data	SPDT, 2000 VA, 250 Vac, 8A resistive	
		Approval	UL 873	2 A 250 Vac resistive, 2A FLA, 12 LRA, 250 Vac, C300 pilot duty (30,000 cycles)
			EN 60730-1	2 A resistive, 2A inductive, cosφ=0.6, 2(2)A (100,000 cycles)
	Relay type B	Relay rated data	SPST, 1250 VA, 250 Vac, 5A resistive	
		Approval	UL 873	1 A 250 Vac resistive, 1A FLA, 6 LRA, 250 Vac, C300 pilot duty (30,000 cycles)
			EN 60730-1	1 A resistive, 1A inductive, cosφ=0.6, 1(1)A (100,000 cycles)
	Relay type C	Relay rated data	SPDT, 1250 VA, 250 Vac, 5A resistive	
		Approval	UL 873	1 A 250 Vac resistive, 1A FLA, 6 LRA, 250 Vac, C300 pilot duty (30,000 cycles)
			EN 60730-1	1 A resistive, 1A inductive, cosφ=0.6, 1(1)A (100,000 cycles)

Tab. 2.j

2.2.8 SSR outputs (in models where featured)

Maximum number	2: SMALL (outputs 7, 8); 2: MEDIUM (outputs 7, 12); 6: LARGE (outputs 7, 8, 12, 13, 14, 15)
Working voltage	24 Vac/Vdc
Load current (MAX)	1 A
Impulsive load current (MAX)	1.2 A

Tab. 2.k

Warnings:
- if the load requires higher current, use an external SSR;
- to power external loads, use the same power supply as the pCO (connected to terminals G/G0); this must always be dedicated and not in common with the power supply to other devices on the electrical panel (such as contactors, coils, etc...);
- the groups that the digital outputs are divided into have two common pole terminals to simplify wiring;
- make sure that the current running through the common terminals does not exceed the rated current of an individual terminal, that is, 8 A.

2.2.9 Serial port

Use AWG 20-22 twisted pair shielded cable for the +/-

Serial	Type/connectors	Features
Serial ZERO	pLAN/J10, J11	• Integrated on main board • HW driver: asynchronous half duplex RS485 pLAN • Not optically-isolated • Connectors: 6-pin telephone jack + 3-pin plug-in p. 5.08 • Maximum length: 500 m • Max data rate: 115200 bit/s • Maximum number of connectable devices: 3
Serial ONE	BMS 1 Serial Card	• Not integrated on main board • HW driver: not featured • Can be used with all pCO family optional BMS cards
Serial TWO	FieldBus 1 Serial Card	• Not integrated on main board • HW driver: not present • Can be used with all pCO family optional FieldBus cards
Serial THREE	BMS 2 / J25	• Integrated on main board • HW driver: asynchronous half duplex RS485 Slave • Optically-isolated • 3-pin plug-in connector p. 5.08 • Maximum length: 1000 m • Max data rate: 384000 bit/s
Serial FOUR	FFieldBus 2 / J26 (and J23 on Large and Extralarge version)	• Integrated on main board • J23: not optically-isolated • J26: optically-isolated • 3-pin plug-in connector p. 5.08 • J23 and J26 are independent.

Tab. 2.l

Note: in industrial/residential environments, for distances > 10 m, shielded cable is required, with the shield connected to earth. In residential environments (EN 55014), irrespective of the cable length, on versions without valve driver, the connection cable between the controller and the terminal and the serial cable must be shielded and connected to earth at both ends.

2.2.10 Model with electronic expansion valve driver

Valve compatibility	CAREL: E*V****			
	ALCO: EX4; EX5; EX6; EX7; EX8 330 Hz (recommended by CAREL); EX8 500 Hz (from ALCO specifications)			
	SPORLAN: SEI 0.5-11; SER 1.5-20; SEI 30; SEI 50; SEH 100; SEH175			
	Danfoss: ETS 12.5-25B; ETS 50B; ETS 100B; ETS 250; ETS 400 CCM 40, CCM 10-20-30, CCMT 2-4-8			
	CAREL: two CAREL EXV as for EVD EVOLUTION TWIN			
	SPORLAN: SER(I) G, J, K			
Motor connection	Shielded 4-wire cable CAREL P/N E2VCABS*00, or AWG22 shielded 4-wire cable Lmax =10 m, or AWG14 shielded 4-wire cable Lmax 50 m			
Digital input connection	Digital input to be activated with voltage-free contact or transistor to GND. Closing current 5mA; maximum length < 10 m			
Probes	Maximum length 10 m or less than 30 m with shielded cable			
	S1	ratiometric pressure probe (0 to 5 V)	resolution 0.1 % fs	measurement error: 2% fs massimo; 1% typical
		electronic pressure sensor (4 to 20 mA)	resolution 0.5 % fs	measurement error: 8% fs massimo; 7% typical
		combined ratiometric pressure probe (0 to 5 V)	resolution 0.1 % fs	measurement error: 2 % fs massimo; 1 % typical
		4 to 20 mA input (max. 24 mA)	resolution 0.5 % fs	measurement error: 8 % fs massimo; 7 % typical
	S2	low temperature NTC	10 kΩ at 25 °C, -50T90 °C	measurement error: 1°C in the range -50T50 °C; 3°C in the range +50T90 °C
		high temperature NTC	50 kΩ at 25 °C,-40T150 °C	measurement error: 1.5 °C in the range -20T115°C, 4 °C in range outside of -20T115 °C
		combined NTC	10 kΩ at 25 °C,-40T120 °C	measurement error: 1°C in the range -40T50 °C; 3°C in the range +50T90 °C
		0 to 10 V input (max 12 V)	resolution 0.1 % fs	measurement error: 9% fs massimo; 8% typical
	S3	ratiometric pressure probe (0 to 5 V):	resolution 0.1 % fs	measurement error: 2% fs massimo; 1% typical
		electronic pressure sensor (4 to 20 mA)	resolution 0.5 % fs	measurement error: 8% fs massimo; 7% typical
		combined ratiometric pressure probe (0 to 5 V)	resolution 0.1 % fs	measurement error: 2 % fs massimo; 1 % typical
		4 to 20 mA input (max. 24 mA)	resolution 0.5 % fs	measurement error: 8 % fs massimo; 7 % typical
	S4	low temperature NTC	10 kΩ at 25 °C,-50T105 °C	measurement error: 1 °C in the range -50T50 °C; 3°C in the range 50T90 °C
		high temperature NTC	10 kΩ at 25 °C,-40T150 °C	measurement error: 1.5 °C in the range -20T115 °C; 4 °C in range outside of -20T115 °C
		combined NTC	10 kΩ at 25 °C, -40T120 °C	measurement error 1 °C in the range -40T50 °C; 3°C in the range +50T90 °C
Power to active probes (VREF)	programmable output: +5 Vdc ±2% or 12 Vdc ±10%, Imax = 50 mA			
Emergency power supply	optional Ultracapacitor module (PCOS00UC20 or EVD0000UC0). If the controller operates constantly at temperatures near the upper limit of 60°C it's recommended to use the external module EVD0000UC0, where possible located in the coolest point of the panel. The PCOS00UC20 and EVD0000UC0 modules can be connected at the same time to the same controller, thus doubling the energy available to close the valves. Important: The module only powers the valve driver and not the controller.			

Tab. 2.m

2.2.11 Meaning of the inputs/outputs on the pRack pR300T S, M, L boards

Version	Connector	Signal	Description
S, M, L	J1-1	G	+24 Vdc or 24 Vac power supply
	J1-2	G0	power supply reference
	J2-1	B1	universal analogue input 1 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0…10 V, 0…20 mA, 4…20 mA)
	J2-2	B2	universal analogue input 2 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0…10 V, 0…20 mA, 4…20 mA)
	J2-3	B3	universal analogue input 3 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0…10 V, 0…20 mA, 4…20 mA)
	J2-4	GND	common for analogue inputs
	J2-5	+VDC	21 Vdc power supply for active probes (maximum current 200 mA)
	J3-1	B4	passive analogue input 4 (NTC, PT1000, ON/OFF)
	J3-2	BC4	common for analogue input 4
	J3-3	B5	passive analogue input 5 (NTC, PT1000, ON/OFF)
	J3-4	BC5	common for analogue input 5
	J4-1	VG	power to optically-isolated analogue output, 24 Vac/Vdc
	J4-2	VG0	power to optically-isolated analogue output, 0 Vac/Vdc
	J4-3	Y1	analogue output no. 1, 0…10 V
	J4-4	Y2	analogue output no. 2, 0…10 V
	J4-5	Y3	analogue output no. 3, 0…10 V
	J4-6	Y4	analogue output no. 4, 0…10 V
	J5-1	ID1	digital input no. 1, 24 Vac/Vdc
	J5-2	ID2	digital input no. 2, 24 Vac/Vdc
	J5-3	ID3	digital input no. 3, 24 Vac/Vdc
	J5-4	ID4	digital input no. 4, 24 Vac/Vdc
	J5-5	ID5	digital input no. 5, 24 Vac/Vdc
	J5-6	ID6	digital input no. 6, 24 Vac/Vdc
	J5-7	ID7	digital input no. 7, 24 Vac/Vdc
	J5-8	ID8	digital input no. 8, 24 Vac/Vdc
	J5-9	IDC1	common for digital inputs from 1 to 8 (negative pole for DC power supply)
M, L	J6-1	B6	universal analogue input 6 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0…10 V, 0…20 mA, 4…20 mA)
	J6-2	B7	universal analogue input 7 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0…10 V, 0…20 mA, 4…20 mA)
	J6-3	B8	universal analogue input 8 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0…10 V, 0…20 mA, 4…20 mA)
	J6-4	GND	common for analogue inputs
	J7-1	ID9	digital input no. 9, 24 Vac/Vdc
	J7-2	ID10	digital input no. 10, 24 Vac/Vdc
	J7-3	ID11	digital input no. 11, 24 Vac/Vdc
	J7-4	ID12	digital input no. 12, 24 Vac/Vdc
	J7-5	IDC9	common for digital inputs from 9 to 12 (negative pole for DC power supply)
	J8-1	ID13H	digital input no. 13, 230 Vac
	J8-2	ID13	digital input no. 13, 24 Vac/Vdc
	J8-3	IDC13	common for digital inputs 13 and 14 (negative pole for DC power supply)
	J8-4	ID14	digital input no. 14, 24 Vac/Vdc
	J8-5	ID14H	digital input no. 14, 230 Vac
S, M, L	J9		8-pin telephone connector for connecting a display terminal (not used)
	J10		6-pin telephone connector for connecting the standard pGDE user terminal
	J11-1	RX-/TX-	RX-/TX- connector for RS485 connection to the pLAN network
	J11-2	RX+/TX+	RX+/TX+ connector for RS485 connection to the pLAN network
	J11-3	GND	GND connector for RS485 connection to the pLAN network
	J12-1	C1	common for relays: 1, 2, 3
	J12-2	NO1	normally open contact, relay no. 1
	J12-3	NO2	normally open contact, relay no. 2
	J12-4	NO3	normally open contact, relay no. 3
	J12-5	C1	common for relays: 1, 2, 3
	J13-1	C4	common for relays: 4, 5, 6
	J13-2	NO4	normally open contact, relay no. 4
	J13-3	NO5	normally open contact, relay no. 5
	J13-4	NO6	normally open contact, relay no. 6
	J13-5	C4	common for relays: 4, 5, 6
	J14-1	C7	common for relay no. 7
	J14-2	NO7	normally open contact, relay no. 7/ normally open contact, relay no. 7 SSR 24 Vac/Vdc (*)
	J14-3	C7	common for relay no. 7
	J15-1	NO8	normally open contact, relay no. 8/ only S-board: normally open contact, relay no. 8 SSR 24 Vac/Vdc, S board only (*)
	J15-2	C8	common for relay no. 8
	J15-3	NC8/---	normally closed contact relay no. 8/ only S-board: not used, S board only (*)
M, L	J16-1	C9	common for relay: 9, 10, 11
	J16-2	NO9	normally open contact, relay no. 9
	J16-3	NO10	normally open contact, relay no. 10
	J16-4	NO11	normally open contact, relay no. 11
	J16-5	C9	common for relay: 9, 10, 11
	J17-1	NO12	normally open contact, relay no. 12/ normally open contact, relay no. 12 SSR 24 Vac/Vdc (*)
	J17-2	C12	common for relay no. 12
	J17-3	NC12/---	normally closed contact relay no. 12/ not used (*)
	J18-1	NO13	normally open contact, relay no. 13
	J18-2	C13	common for relay no. 13
	J18-3	NC13	normally closed contact relay no. 13
L	J19-1	ID15H	digital input no. 15, 230 Vac
	J19-2	ID15	digital input no. 15, 24 Vac/Vdc
	J19-3	IDC15	common for digital inputs 15 and 16 (negative pole for DC power supply)
	J19-4	ID16	digital input no. 16, 24 Vac/Vdc
	J19-5	ID16H	digital input no. 16, 230 Vac
	J20-1	Y5	digital input no. 5 0…10 V
	J20-2	Y6	digital input no. 6 0…10 V
	J20-3	B9	passive analogue input 9 (NTC, PT1000, ON/OFF)
	J20-4	BC9	common for analogue input 9
	J20-5	B10	passive analogue input 10 (NTC, PT1000, ON/OFF)

Version	Connector	Signal	Description
L	J20-6	BC10	common for analogue input 10
	J20-7	ID17	digital input no. 17, 24 Vac/Vdc
	J20-8	ID18	digital input no. 18, 24 Vac/Vdc
	J20-9	IDC17	common for digital inputs 17 and 18 (negative pole for DC power supply)
	J21-1	NO14	normally open contact, relay no. 14/ normally open contact, relay no. 14 SSR 24 Vac/Vdc (*)
	J21-2	C14	common for relay no. 14
	J21-3	NC14/---	normally closed contact relay no. 14/ not used (*)
	J21-4	NO15	normally open contact, relay no. 15/ normally open contact, relay no. 15 SSR 24 Vac/Vdc (*)
	J21-5	C15	common for relay no. 15
	J21-6	NC15/---	normally closed contact relay no. 15/ not used (*)
	J22-1	C16	common for relay: no. 16, 17, 18
	J22-2	NO16	normally open contact, relay no. 16
	J22-3	NO17	normally open contact, relay no. 17
	J22-4	NO18	normally open contact, relay no.18
	J22-5	C16	common for relay: no. 16, 17, 18
	J23-1	E-	E- terminal for RS485 connection to the I/O expansion modules (not used)
	J23-2	E+	E+ terminal for RS485 connection to the I/O expansion modules (not used)
	J23-3	GND	GND terminal for RS485 connection to the I/O expansion modules (not used)
S, M, D, L	J24-1	+V term	additional power supply terminal Aria (not used)
	J24-2	GND	power supply common
	J24-3	+5 Vref	power supply for 0/5 V ratiometric probes
	J25-1	E-	E- terminal for RS485 connection, BMS2
	J25-2	E+	E+ terminal for RS485 connection, BMS2
	J25-3	GND	GND terminal for RS485 connection, BMS2
	J26-1	E-	E- terminal for RS485 connection, FIELDBUS 2
	J26-2	E+	E+ terminal for RS485 connection, FIELDBUS 2
	J26-3	GND	GND terminal for RS485 connection, FIELDBUS 2
D	J27-1	1	ExV connection, power stepper-motor
	J27-2	2	ExV connection, power stepper-motor
	J27-3	3	ExV connection, power stepper-motor
	J27-4	4	ExV connection, power stepper-motor
	J28-1	1	ExV connection, power stepper-motor
	J28-2	2	ExV connection, power stepper-motor
	J28-3	3	ExV connection, power stepper-motor
	J28-4	4	ExV connection, power stepper-motor
	J29-1	GND	Signals-ground
	J29-2	VREF	Active probe power supply
	J29-3	S1	Probe 1 (pressure) or external-signal 4…20mA
	J29-4	S2	Probe 2 (temperature) or external-signal 0…10V
	J29-5	S3	Probe 3 (pressure) or external-signal 4…20mA
	J29-6	S4	Probe 4 (temperature)
	J29-7	DI1	Digital input 1
	J29-8	DI2	Digital input 2
	J30-1	VBAT	Emergency power supply
	J30-2	G0	Power supply
	J30-3	G	Power supply

(*) depending on model

Tab. 2.n

2.3 pRack pR300T S, M, D, L board dimensions

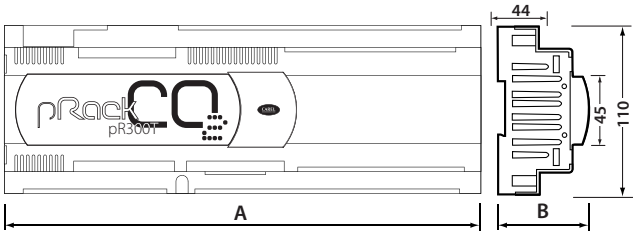


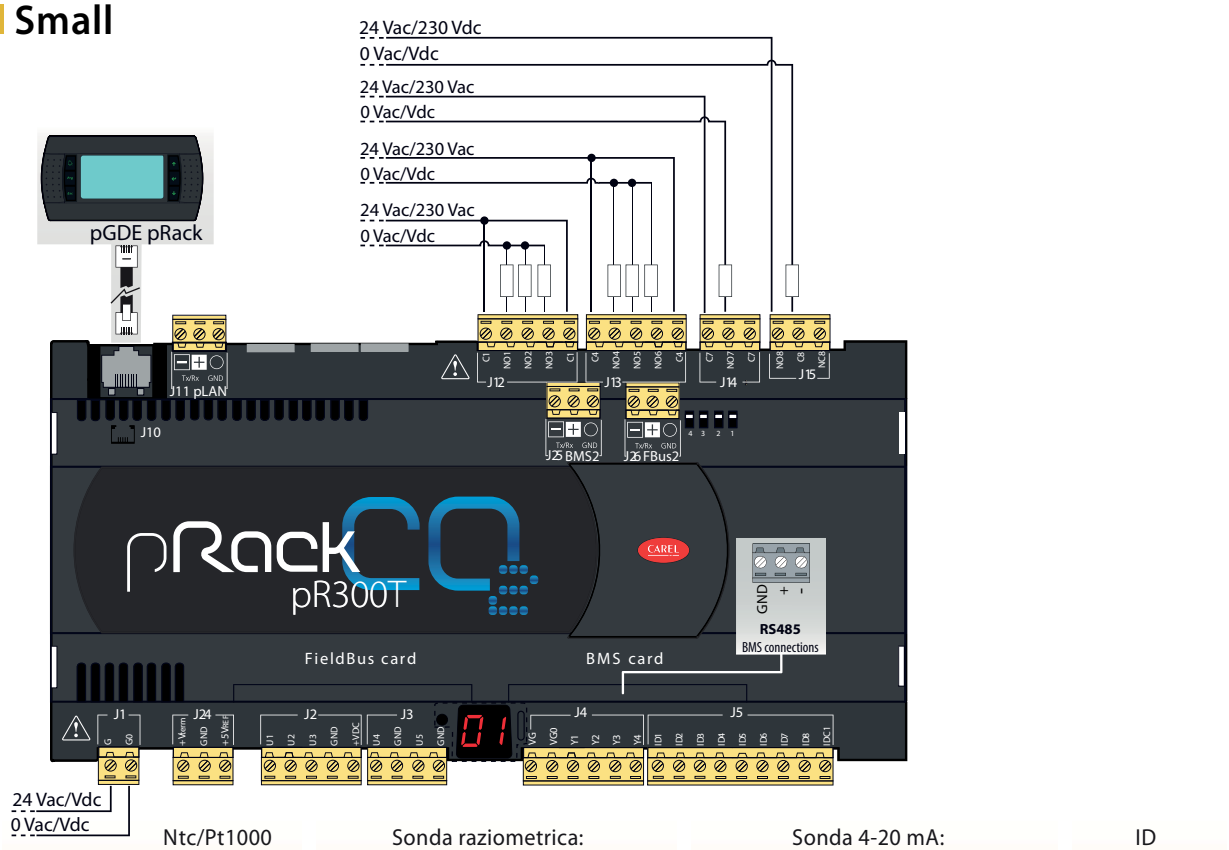
Fig. 2.e

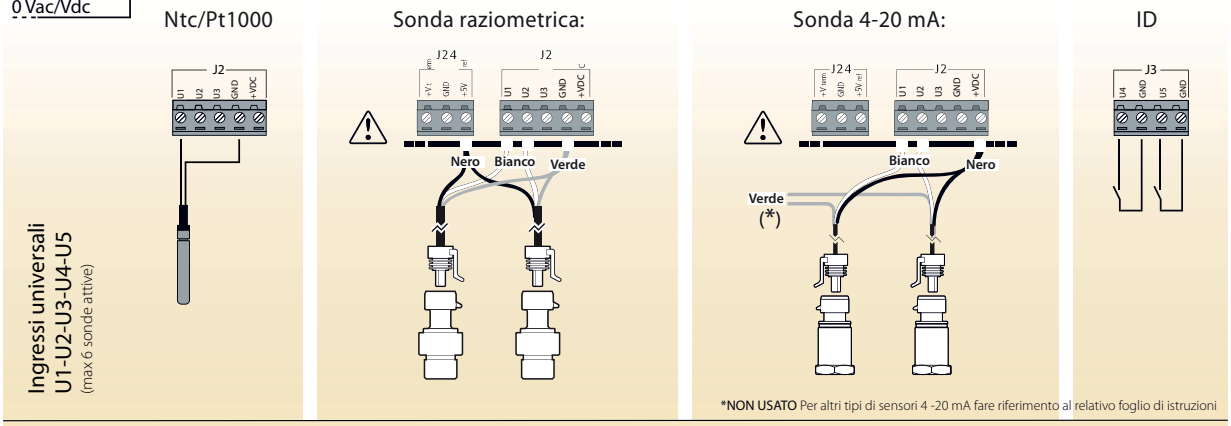
	Small	Medium	Buit-in driver	Large
A	227,5	315	315	315
B	60	60	60	60
B - with USB port and/or built-in terminal	70	70	70	70
B - with Ultracap module	-	-	75	-

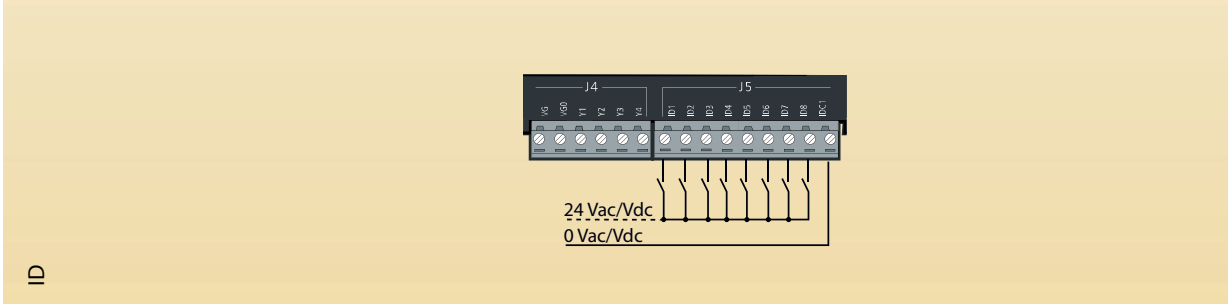
Tab. 2.o

2.4 pRack pR300T general connection diagram

Small







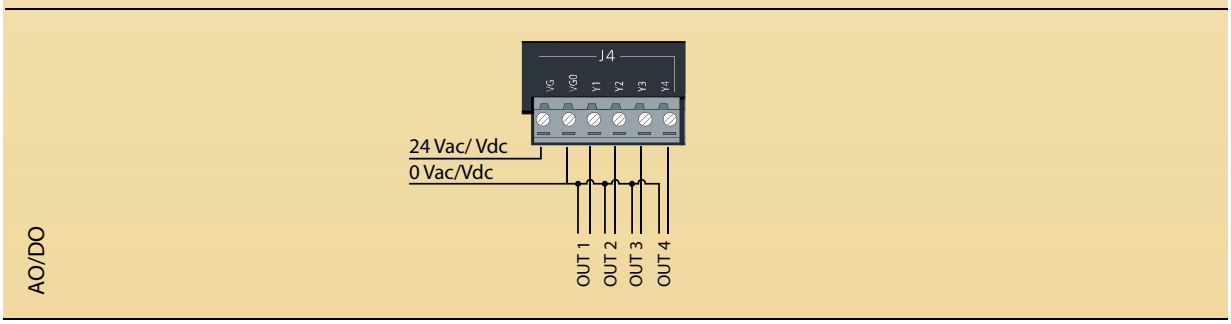
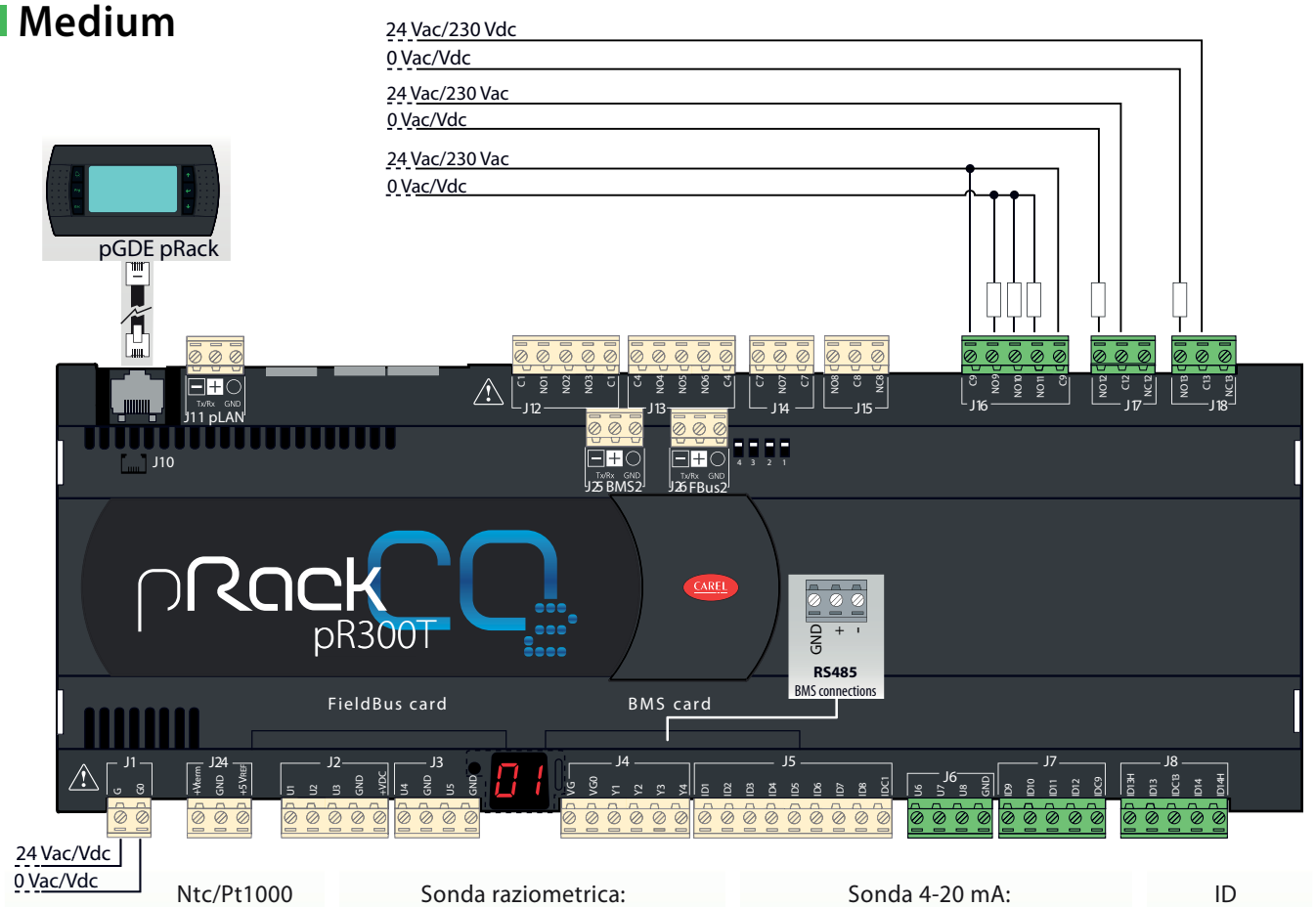


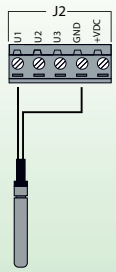
Fig. 2.f

Medium

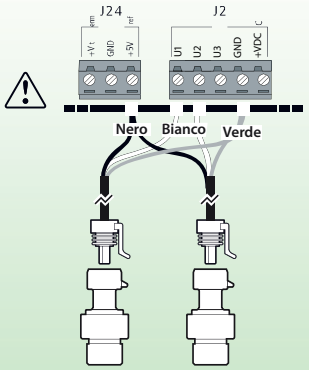


Ingressi universali
U1-U2-U3-U4-U5-U6-U7-U8
(max 6 sonde attive)

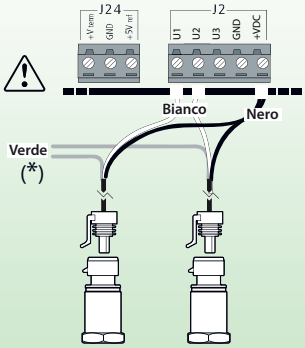
Ntc/Pt1000



Sonda raziometrica:

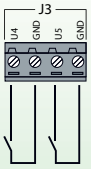


Sonda 4-20 mA:



*NON USATO Per altri tipi di sensori 4 -20 mA fare riferimento al relativo foglio di istruzioni

ID



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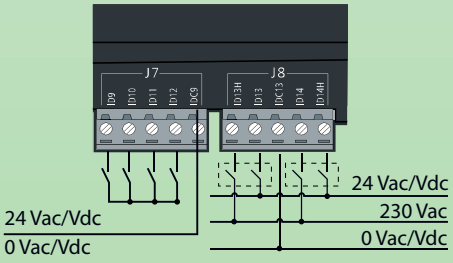


Fig. 2.g

Large

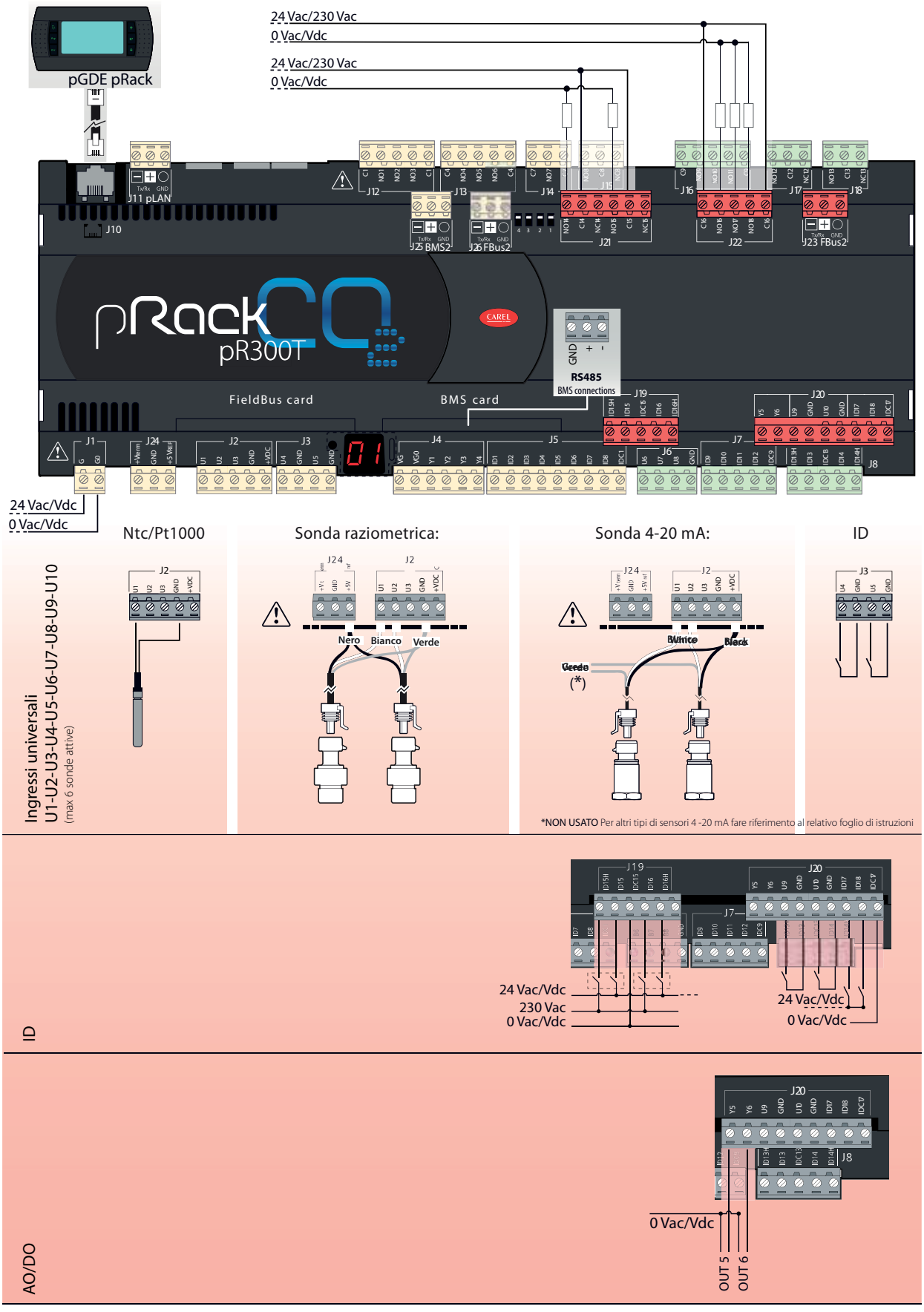


Fig. 2.h

Driver integrato

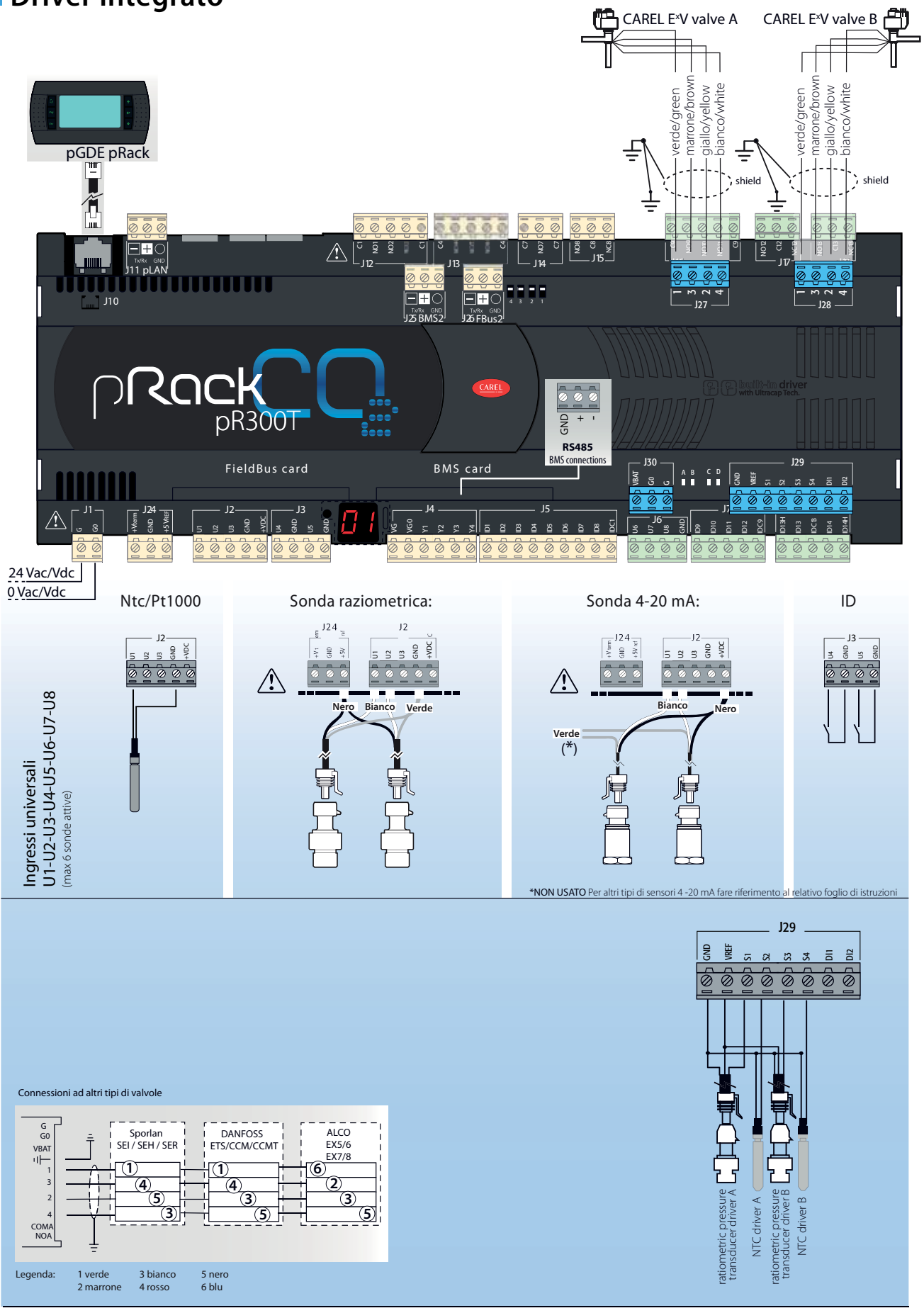


Fig. 2.i

Driver esterno (applicabile a S/M/L/D)

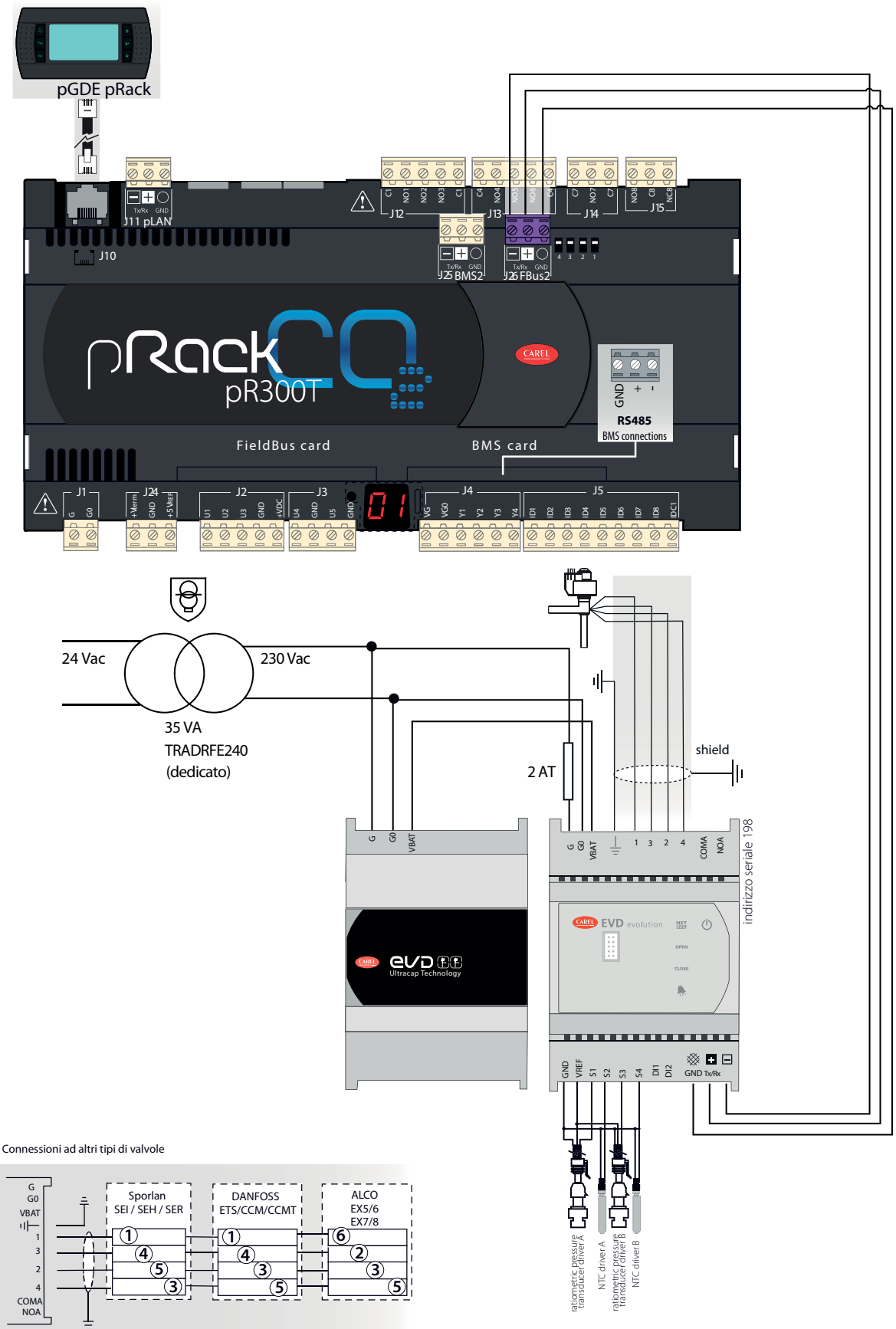


Fig. 2.j

2.5 Expansion card

From version 3.3.0, an I/O expansion card can be used to provide additional analogue and digital channels, ideal when there is a high number of compressors and corresponding alarms, or with complex heat recovery systems that require of numerous temperature sensors in the water and CO2 circuits (see technical leaflet +0500059IE for the product's electrical and physical specifications). The universal inputs/outputs (marked U on the connection diagram) can be configured by pRack pR300T to connect active and passive probes, digital inputs, analogue and PWM outputs, up to a total of 10. A further 6 digital outputs are also available.

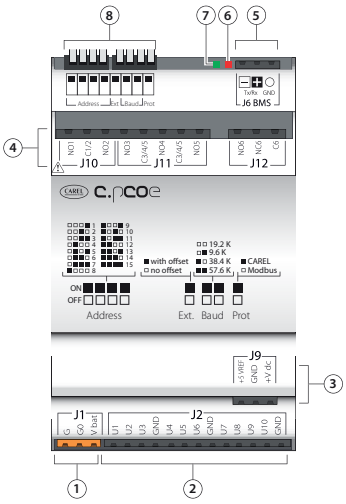


Fig. 2.a

Key:

1	Power connector [G(+), G0(-), Vbat]
2	Universal inputs/outputs
3	+Vdc power supply for active probes
4	+5V power supply for ratiometric probes
5	Relay digital outputs
6	BMS connector
7	Communication indicator LED
8	Configuration indicator LED
	Configuration dipswitches

For correct communication with pRack pR300T, the dipswitches on the expansion card should be configured as follows:

- Address: 15
- Ext: no off set
- Baud: 19.2 K
- Prot: CAREL

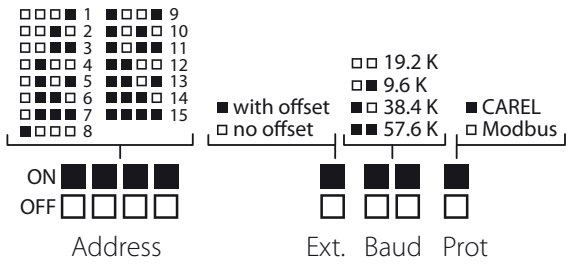


Fig. 2.k

The pRack pR300T software (version 3.3.0 and higher) offers the possibility to extend the number of I/Os by expansion card directly from the Wizard, in screen Ib1f:

```
Wizard                Ib1f

Enable I/O expansion
board management:
                        NO
```

Additional configuration of the expansion card is possible on Fda01, under PROGRAMMING→ F.Settings →d.FIELDBUS:

```
L1-Fieldbus          Fda01
Enable cpCOe:          NO

Offline pattern:      DIS
Digital output pattern
1:OFF   2:OFF   3:OFF
4:OFF   5:OFF   6:OFF
```

When enabling "Offline pattern", the status of the outputs can be configured if the card is offline from the pRack.
Both the digital (Fda01) that analogue outputs (Fda02) can be configured

```
L1-Fieldbus          Fda02
Univers.input pattern

UI01:--0%  UI02:--0%
UI03:--0%  UI04:--0%
UI05:--0%  UI06:--0%
UI07:--0%  UI08:--0%
UI09:--0%  UI10:--0%
```

Note: the expansion card cannot be used to configure the suction pressure probes (including the backup probes)

The expansion card is connected to the pRack pR300T via port J26 FBus on the pRack, the same used for connecting an external driver, and port J6BMS on the expansion card via RS485

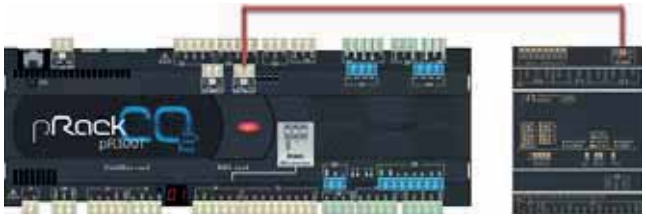


Fig. 2.l

Only one expansion card can be used for each compressor rack and the expansion card can only be connected to the board with pLAN address 1:

Fig. 2.m

3. INSTALLATION

3.1 General installation instructions

3.1.1 Installation procedure

Environmental conditions

Avoid assembling the pRack PR300T and the terminal in environments with the following characteristics:

- temperature and humidity that do not conform to the rated operating data of the product;
- strong vibrations or knocks;
- exposure to aggressive and polluting atmospheres(e.g.: sulphur and ammonia fumes, saline mist, smoke) so as to avoid corrosion and/or oxidation;
- strong magnetic and/or radio frequency interference (therefore avoid installing the units near transmitting antennae);
- exposure of the pRack PR300T to direct sunlight and to the elements in general;
- large and rapid fluctuations in the room temperature;
- environments containing explosives or mixes of flammable gases;
- exposure to dust (formation of corrosive patina with possible oxidation and reduction of insulation).

Positioning the instrument inside the panel

The position of the instrument in the electrical cabinet must be chosen so as to guarantee correct physical separation of the instrument from the power components (solenoids, contactors, actuators, inverters, …) and the connected cables. Proximity to such devices/cables may create random malfunctions that are not immediately evident.

The structure of the panel must allow the correct flow of cooling air.

3.1.2 Wiring procedure

When laying the wiring, "physically " separate the power part from the control part. The proximity of these two sets of wires will, in most cases, cause problems of induced disturbance or, over time, malfunctions or damage to the components. The ideal solution is to house these two circuits in two separate cabinets. Sometimes this is not possible, and therefore the power part and the control part must be installed inside the same panel. For the control Signals, it is recommended to use shielded cables with twisted wires.

If the control cables have to cross over the power cables, the intersections must be as near as possible to 90 degrees, always avoiding running the control cables parallel to the power cables.

- Use cable ends suitable for the corresponding terminals. Loosen each screw and insert the cable ends, then tighten the screws. When the operation is completed, slightly tug the cables to check they are sufficiently tight;
- separate as much as possible the sensor Signal, digital input and serial line cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never insert power cables (including the electrical cables) and probe Signal cables in the same conduits. Do not install the sensor cables in the immediate vicinity of power devices (contactors, circuit breakers or similar);
- reduce the path of the sensor cables as much as possible, and avoid spiral paths that enclose power devices;
- avoid touching or nearly touching the electronic components fitted on the boards to avoid electrostatic discharges (extremely damaging) from the operator to the components;
- if the power transformer secondary is earthed, check that the earth wire corresponds to the wire that runs to the controller and enters terminal G0; this applies to all the devices connected to the pRack PR300T;
- do not secure the cables to the terminals by pressing the screwdriver with excessive force, to avoid damaging the pRack PR300T;
- for applications subject to considerable vibrations (1.5 mm pk-pk 10/55 Hz), secure the cables connected to the pRack PR300 around 3 cm from the connectors using clamps;
- if the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m;
- all the very low voltage connections (analogue and 24 Vac/Vdc digital inputs, analogue outputs, serial bus connections, power supplies) must have reinforced or double insulation from the mains network;
- in residential environments, the connection cable between the pRack PR300T and the terminal must be shielded;
- there is no limit to the number of cables that can be connected to an individual terminal. The only limitation concerns the maximum current crossing each terminal: this must not exceed 8 A;
- the maximum cross-section of the cable that connected to a terminal is 2.5 mm^2 (12 AWG);
- the maximum value of the twisting torque to tighten the screw on the terminal (torque tightening) is 0.6 Nm;

Important:

- Installation must be performed according to the standards and legislation in force in the country where the device is used;
- for safety reasons the equipment must be housed inside an electrical panel, so that the only accessible part is the display and the keypad;
- in the event of malfunctions, do not attempt to repair the device, but rather contact the CAREL service centre;
- the connector kit also contains the stick-on labels.

3.1.3 Anchoring the pRack PR300T

The pRack PR300T is installed on a DIN rail. To fasten the unit to the DIN rail, press it lightly against the rail. The rear tabs will click into place, locking the unit to the rail. Removing the unit is just as Simple, using a screwdriver through the release slot to lever and lift the tabs. The tabs are kept in the locked position by springs.

3.2 Power supply

Power supply to the pRack PR300T S, M, D, L (controller with terminal connected)	28…36 Vdc +10/-20% or24 Vac +10/-15% 50…60 Hz; Maximum current P= 15 W (power supply Vdc) P=40 VA (Vac)

Tab. 3.a

Important:

- power supplies other than those specified seriously damage the system;
- a Class II safety transformer, must be used in the installation to supply just one pRack PR300T controller, rating 30 VA for pRack Compact and 50 VA for pRack S, M, L;
- the power supply to the pRack PR300T controller and terminal (or pRack PR300T controllers and terminals) should be separated from the power supply to the other electrical devices (contactors and other electromechanical components) inside the electrical panel;
- if the power transformer secondary is earthed, check that the earth wire corresponds to the wire that runs to the controller and enters terminal G0. This applies to all the devices connected to the pRack PR300T;
- a yellow LED indicates that power is connected to the pRack PR300T.

3.3 Connecting the analogue inputs

The analogue inputs on the pRack PR300T can be configured for the most common sensors on the market: 0 to 1 V, 0…10 V, 0…20 mA, 4…20 mA. The different types of sensors for each input can be selected by setting a parameter on the user terminal.

3.3.1 Connecting universal NTC temperature sensors

The analogue inputs are compatible with 2-wire NTC sensors.
The inputs must be set for NTC Signals from the user terminal or using the default value installation procedure. The connection diagram is shown below:

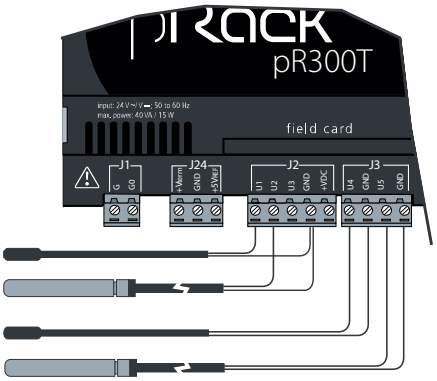


Fig. 3.a

Hardware Version	Terminals	NTC probe cable
S	GND, U4, U5	1
	U1, U2, U3, U4, U5	2
M, D	GND, U4, U5	1
	U1, U2, U3, U4, U5, U6, U7, U8, S2, S4	2
L	GND, U4, U5, U9, U10	1
	U1, U2, U3, U4, U5, U6, U7, U8, U9, U10	2

Tab. 3.b

Note: the two wires of the NTC sensors are equivalent, as they have no polarity, therefore it is not necessary to follow any specific order when connecting to the terminal block.

3.3.2 Connecting PT1000 temperature sensors

The pRack PR300T can be connected to 2-wire PT1000 sensors for all high temperature applications; the operating range is: -100 to 200 °C.
The inputs must be pre-configured for PT1000 Signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

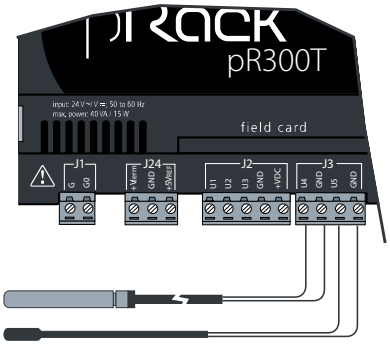


Fig. 3.b

Hardware Version	Terminals	PT1000 probe cable
S, M	U4, U5, GND	1
	U4, U5	2
L	U4, U5, U9, U10	1
	U4, U5, U9, U10	2

Tab. 3.c

Important: for correct measurement by the PT1000 sensor, each sensor wire needs to be connected to a dedicated terminal, as shown in Fig. 3.b.

Note: the two wires of the PT1000 sensors are equivalent, as they have no polarity, therefore it is not necessary to follow any specific order when connecting to the terminal block.

3.3.3 Connecting current pressure probes

pRack PR300T can be connected to all CAREL SPK* series active pressure probes or any other pressure sensors available on the market with 0…20 mA or 4…20 mA Signal.
The inputs must be set for 0…20 mA or 4…20 mA Signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

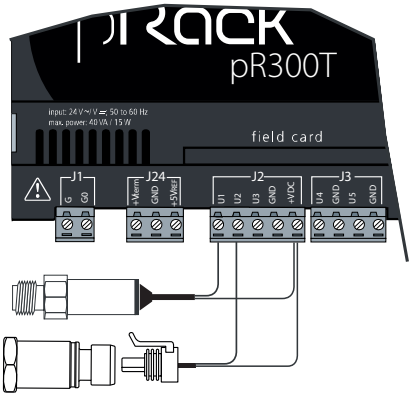


Fig. 3.c

Hardware Version	Terminals	Probe wire colour	Description
S, M, L, D	+VDC	brown	power supply
	U1, U2, U3, B6, B7, B8, S1, S3	white	Signal

Tab. 3.d

Important: do not connect the green wire.

3.3.4 Connecting 0 to 5 V ratiometric pressure probes

pRack PR300T can be connected to any other pressure probes available on the market with 0 to 5 V ratiometric sensor.
The inputs must be set for 0 to 5 V Signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

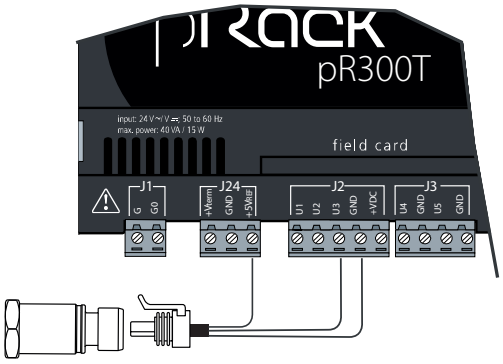


Fig. 3.d

Hardware Version	Terminals	Probe wire colour	Description
S, M, L, D	+5 Vref	black	power supply
	GND	green	power supply reference
	U1, U2, U3, U6, U7, U8, S1, S3	white	Signal

Tab. 3.e

3.3.5 Connecting 0…10 V active probes

PRack PR300T can be connected to 0…10 V sensors.
The inputs must be set for 0…10 V Signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

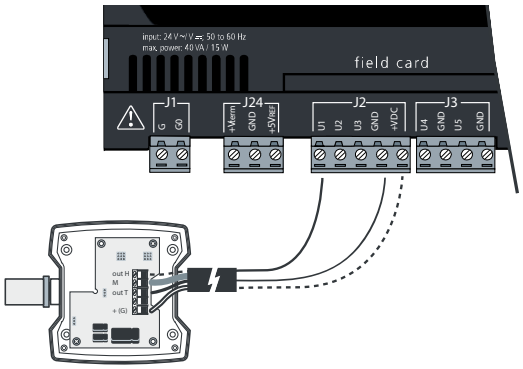


Fig. 3.e

Hardware Version	Terminals	Description
S, M, L, D	+VDC	power supply (any)
	GND	reference
	U1, U2, U3, U6, U7, U8,	Signal

Tab. 3.f

3.3.6 Connecting the analogue inputs selected as ON/OFF

The pRack PR300T allows some analogue inputs to be configured as voltage-free digital inputs, not optically-isolated.
The inputs must be pre-configured as voltage-free digital inputs from the user terminal or using the default value installation procedure.

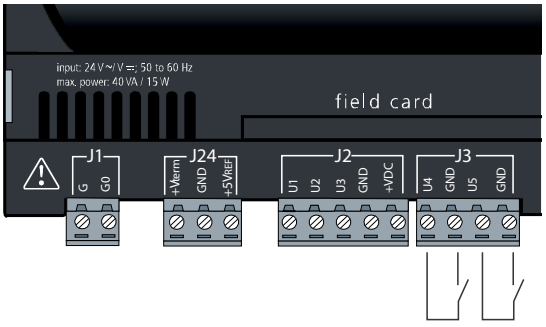


Fig. 3.f

Hardware Version	Terminals	Digital input cable
S, M	BC4, BC5	1
	U4, U5	2
S, M, L	U4, U5, U9, U10	1
	U4, U5, U9, U10	2

Tab. 3.g

Important: the maximum current available at the digital input is 5 mA (thus the rating of the external contact must be at least 5 mA). These inputs are not optically-isolated.

3.3.7 Remote connection of the analogue inputs

The Sizes of the cables for the remote connection of the analogue inputs are shown in the following table:

Type of input	Size [mm²] for length up to 50 m	Size [mm²] for length up to 100 m
NTC	0.5	1.0
PT1000	0.75	1.5
current	0.25	0.5
voltage	0.25	0.5

Tab. 3.h

If the product is installed in industrial enviroment (in compliance for the EN 61000-6-2 standard) the length of the connections must be less than 30m. In any case you should never exceed this length to have no measurement errors.

3.4 Connecting the digital inputs

The pRack PR300T features digital inputs for connecting safety devices, alarms, device status and remote switches. These inputs are all optically isolated from the other terminals. They can work at 24 Vac, 24 Vdc and some at 230 Vac for S, M, L models.

Note: separate the sensor Signal and digital input cables as much as possible from the inductive load and power cables, to avoid possible electromagnetic disturbance.

Important:

- if the control voltage is drawn in parallel with a coil, fit a dedicated RC filter in parallel with the coil (the typical ratings are 100 Ω, 0.5 µF, 630 V).
- If connecting the digital inputs to safety systems (alarms), remember that: the presence of voltage across the contact must be the normal operating condition, while no voltage must represent an alarm situation. This will ensure that any interruption (or disconnection) of the input will also be Signalled. Do not connect the neutral in place of an open digital input. Always interrupt the phase. The 24 Vac/Vdc digital inputs have a Resistance of around 5 kΩ.

All pRack digital inputs can be powered at 24 Vac and 24 Vdc, while for models M, L only 230 Vac inouts are also available.
To maintain the optical isolation of the digital inputs, a separate power supply must be used just for the digital inputs.
The connection diagrams shown in these figures, which while being the more common and the more convenient, do not exclude the possibility of powering the digital inputs independently from the power supply to the pRack PR300T.
In any case, the inputs only have functional insulation from the rest of the controller.

24 Vac digital inputs

The following figure represents an example for connecting the 24 Vac digital inputs on pRack models S, M, L.

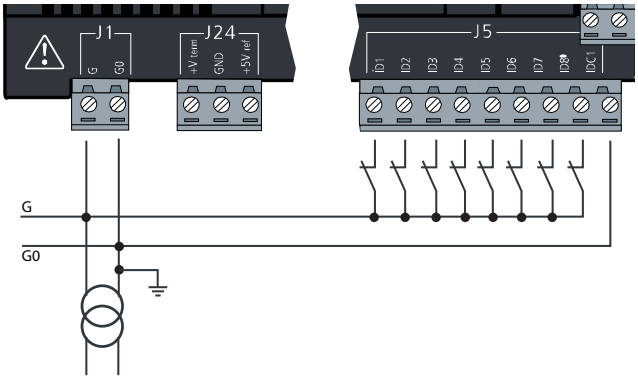


Fig. 3.g

24 Vdc digital inputs

The following figure represents an example for connecting the 24 Vdc digital inputs on pRack models S, M, L.

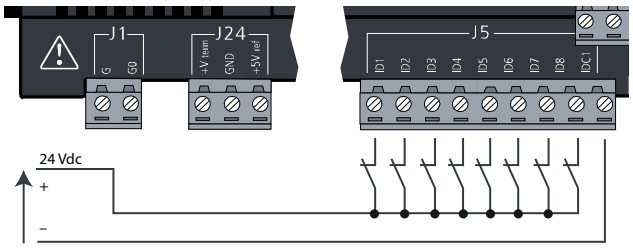


Fig. 3.h

230 Vac digital inputs

pRack M, L models have up to two groups of inputs powered at 230 Vac 50/60 Hz +10/-15%; each group features two inputs (see paragraph 2.2.1 for details). The groups have double insulation between them and can have different voltages.

Important: within each group the inputs must be powered at the same voltage to avoid short-circuits or powering lower voltage inputs at 230 Vac.

The following figure represents an example for connecting the 230 Vac digital inputs on pRack models S, M, L.

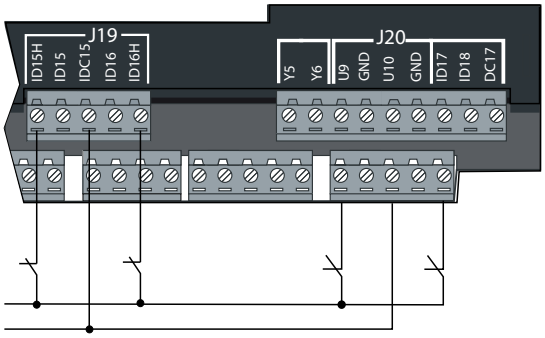


Fig. 3.i

3.4.1 Remote connection of the digital inputs

Important note: do not connect other devices to the digital inputs IDn inputs.

The Sizes of the cables for the remote connection of the digital inputs are shown in the following table:

Size (mm^2) for length up to 50 m	Size (mm^2) for length until 100 m
0,25	0,5

If the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.5 Connecting the analogue outputs

3.5.1 Connecting 0…10 V analogue outputs

The pRack PR300T provides 0…10 V optically-isolated analogue outputs, powered externally at 24 Vac/Vdc. The figure below shows the electrical connection diagram; the 0V (zero) of the power supply is also the reference for the output voltage:

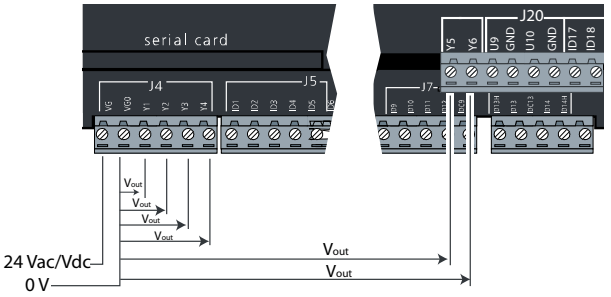


Fig. 3.j

Hardware Version	Terminals	Reference
S, M	Y1, Y2, Y3, Y4	VG0
L	Y1, Y2, Y3, Y4, Y5, Y6	VG0

Tab. 3.i

3.5.2 Optional modules

Module for converting a PWM analogue output to a liner 0…10 V and 4…20 mA analogue output (code CONV0/10A0)

The module is used to convert a PWM output (5 V pulses) to a liner 0…10 V and 4…20 mA analogue output (code CONV0/10A0). The control Signal (at the input terminals optically-isolated from the rest of the module) must have a maximum amplitude of 5V and a period between 8 ms and 200 ms. The 0…10 V output voltage can be connected to a maximum load of 2 kΩ, with a maximum ripple of 100 mV.
The 4…20 mA current output can be connected to a maximum load of 280 Ω, with maximum overshoot of 0.3 mA.
The mechanical dimensions of the module are 87x36x60 mm (2 DIN modules) with IP20 index of protection.

Module for converting a 0…10 V analogue output to an SPDT digital output (code CONVONOFF0)

The module is used to convert a 0…10 V analogue output to an ON/OFF relay output. The control Signal (at the input terminals, optically-isolated from the rest of the module), to ensure the switching of the relay from OFF to ON, must have a maximum amplitude of 3.3 V. The relay is SPDT, with max current of 10 A and max inductive load of 1/3 HP. The mechanical dimensions of the module are 87x36x60 mm (2 DIN modules) with IP20 index of protection.

3.6 Connecting the digital outputs

3.6.1 Electromechanical relay digital outputs

The pRack PR300T features digital outputs with electromechanical relays. For ease of installation, the common terminals of some of the relays have been grouped together. The following figure illustrates a connection example. If the following this diagram is used, the current at the common terminals must not exceed the rating (nominal current) of a single terminal (8 A).

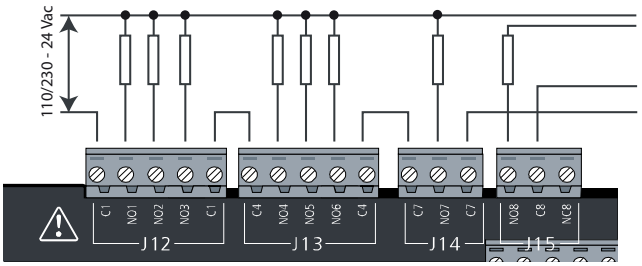


Fig. 3.k

The relays are divided into groups, according to the degree of insulation. Inside each group, the relays have just basic insulation and thus must have the same voltage (generally 24V ac or 110 to 230 Vac).
Between the groups there is double insulation and thus the groups can have different voltages. There is also double insulation from the rest of the controller.

Changeover outputs

Some relays feature changeover outputs, the number of changeover outputs depends on whether or not there are solid state relays (SSR) and consequently varies depending on the models.

Hardware Version	Changeover relay reference, without SSR model	Terminal
PRK30T**F* models		
S	8	J15
M	8, 12, 13	J15, J17, J18
L	8, 12, 13, 14, 15	J15, J17, J18, J21
PRK30T**E* models		
S	-	-
M	8, 13	
D	8, 13	J15, J18
L	6	

Tab. 3.j

3.6.2 Solid state relay (SSR) digital outputs

The pRack PR300T also features a Version with solid state relays (SSR) on some models for controlling devices that require an unlimited number of switching cycles and thus would not be supported by electromechanical relays.

Important: the SSRs can control resistive loads powered at 24 Vac/Vdc, maximum power Pmax= 10 W. For details see paragraph 2.2.2. The figure shows a connection example for resistive loads.

An example of resistive loads is illustrated in the the following figure:

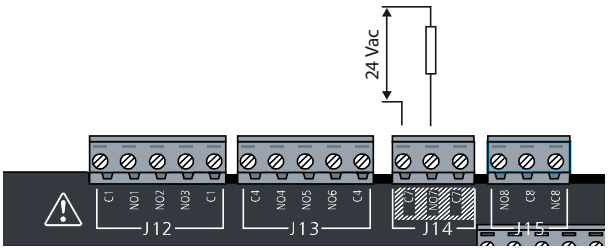


Fig. 3.l

The following figure illustrates correct applications for inductive loads.

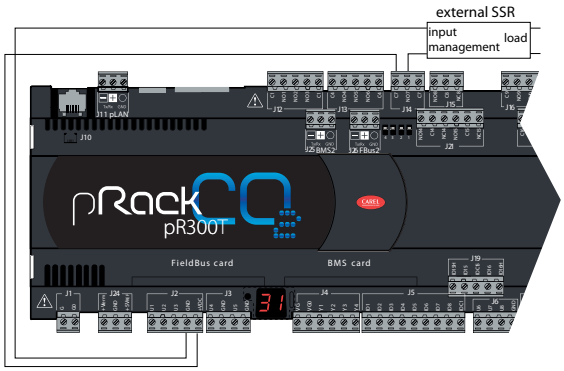


Fig. 3.m

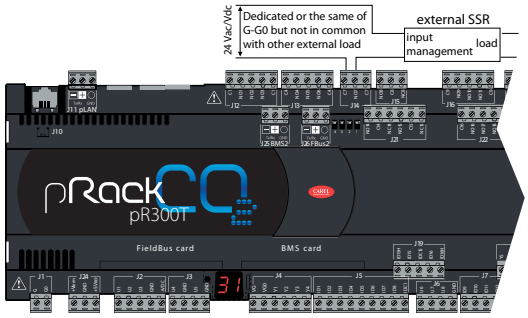


Fig. 3.n

The table below shows the reference outputs for pRack models fitted with SSR outputs.

Hardware Version	Reference Relay SSR	Terminal
S	7, 8	J14, J15
M	7, 8, 12, 13	J14, J15, J17, J18
L	7, 8, 12, 13, 14, 15	J14, J15, J17, J18, J21

Tab. 3.k

Important: the SSR relay load is powered at 24 Vac/Vdc, thus all the other terminals in the group must be powered at 24 Vac/Vdc due to the absence of double insulation within the group.

3.6.3 Summary table of digital outputs according to the Versions available

Hardware Version	NO contacts	NC contacts	changeover contacts	total no. of outputs	SSR relays
Models PRK100**A* and PRK100**B*					
Compact	5	-	-	7	2 (1, 2)
S	6	-	-	8	2 (7, 8)
M	9	-	2 (8, 13)	13	2 (7, 12)
L	12	-	2 (8, 13)	18	4 (7, 12, 14, 15)
Models PRK100**C* and PRK100**D*					
Compact	6	-	1 (1)	7	-
S	7	-	1 (8)	8	-
M	10	-	3 (8, 12, 13)	13	-
L	13	-	5 (8, 12, 13, 14, 15)	18	-

Tab. 3.l

3.6.4 Remote connection of the digital outputs

The Sizes of the cables for the remote connection of the digital outputs are shown in the following table:

AWG	Size [mm²]	Current [A]
20	0,5	2 A
15	1,5	6 A
14	2,5	8 A

Tab. 3.m

If the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.7 pLAN electrical connections

If the selected system configuration involves the connection of more than one pRack PR300T board in a pLAN, AWG20/22 twisted pair shielded cable must be used, with capacitance between the wires less than 90 PF/m.
The maximum length of the pLAN network is 500 m with AWG22 twisted pair shielded cable.
The boards should be connected in parallel with reference to plug-in connector J5 (pRack Compact) or J11 (Versions S, M, L).

Important: follow the network polarity: RX/TX+ on one board must be connected to RX/TX+ on the other boards; the same applies to RX/TX-.

The figure shows the diagram for more than one board connected in a pLAN network powered by the same transformer; this is a typical application with more than one board connected inside the same electrical panel.

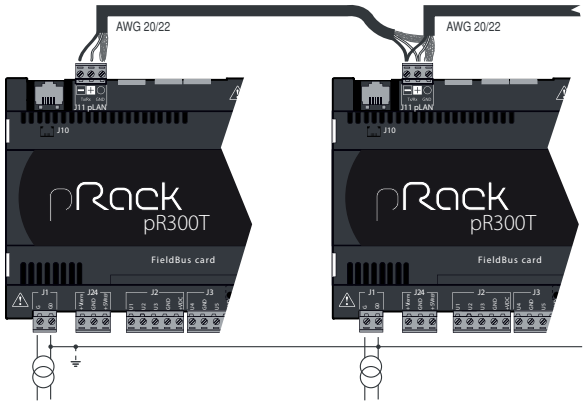


Fig. 3.o

Important: pLAN connections are also possible with multiple boards powered by different transformers, for further details see the pCO Sistema manual, code: +030220335.

3.7.1 Connecting the terminals

pRack PR300T features PGDE terminals, both built-in and external connected via pLAN. Up to two external terminals can be connected, with pLAN addresses 31 and 32. The connection can be made using 6-wire telephone cables (connector J10 for S, M, L models) or shielded pair cables with 3-pin plug-in connectors (J11 for S, M, L models), as shown in the table:

Type of cable	Power supply distance	Power supply
6-wire telephone (J10)	10 m	Taken from pRack (150 mA)
AWG24	200 m	Taken from pRack (150 mA)
AWG20/22	500 m	Separate, from TCONN6J000

Tab. 3.n

4. START UP

4.1 Starting the first time

After having correctly installed pRack, a number of preliminary operations are required to configure the installation.

Tutorial: the pRack PR300 configuration procedure varies according to the complexity of the installation:

A. **systems with only one board and maximum one external terminal.** In this case, simply connect the terminal (if not built-in), power up the board and select one of the configuration solutions described below.
B. **systems with more than one board in pLAN or two external terminals**. IIn this case, the additional operations described in Appendix A. 2 need to be completed before proceeding with configuration.

The procedure for configuring an installation described below is the same for all system configurations that feature just one pRack PR300 board, and for system configurations with more than one board connected in a pLAN.

When first starting the pRack PR300 board, after waiting around 1 minute, a screen is shown for choosing the language used to display the program (English or Italian).
Press ENTER (↵) to change the language displayed, while pressing ESC displays the following screen.

Note: If no option is chosen within a time set by parameter and visible on the screen, the current language remains selected.

After having selected the user interface language, the pRack PR300 software shows a screen for choosing between three possible system configuration solutions, as follows:

- Wizard
- Advanced configuration.

Important: after having configured the system, the configuration can be modified, it can be modified by repeating the same procedure, making sure the Carel default values have been reset.
After having restored the defaults, the 7 segment display will show the number 88, the same as when first starting the controller. This means that the DEFAULT values have been restored correctly.

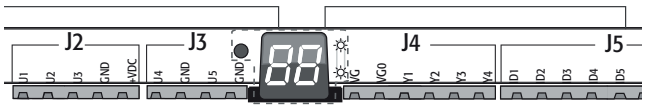


Fig. 4.a

Important: after having configured the system, power down the controller and power up again.

4.2 Wizard

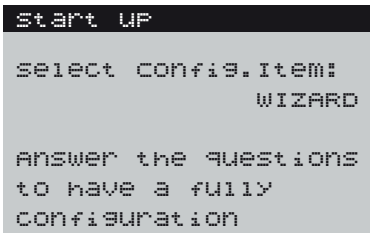


Fig. 4.b

This solution is for obtaining the recommended configuration for the system. By responding to a series of questions, from screen to screen, the user is guided in choosing the devices that are present. Once the guided procedure is finished, the final obtainable results can be viewed (report) and, if the configuration is correct, direct installation can be performed of the parameters for pRack pR300T operation, including those associated with the inputs and outputs as described in paragraph 4.4.

Note: after having configured the parameters using the Wizard, the configuration can be modified manually, within the context of the selected system configuration.

Important: before starting the pRack PR300T, carefully check the settings made automatically by the software.

Tutorial: the following paragraph shows a configuration example using the Wizard for an installation with two suction lines.

4.3 Example of system configuration using the Wizard

This describes a possible example of Wizard-led configuration for a type of system like the one shown in the figure, with 2 suction lines and part in high pressure (gas cooler and HPV, RPRV valves) on 3 different control boards:

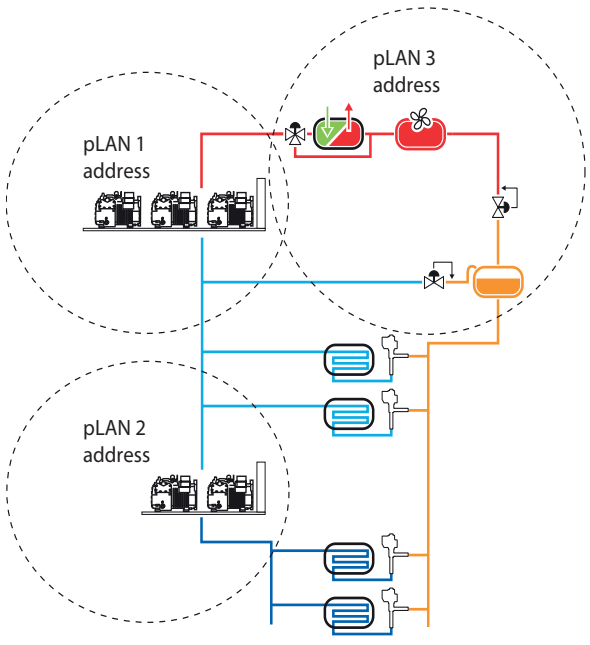


Fig. 4.c

The preliminary operations to be performed before configuration are:
1. with the boards not connect to the pLAN, power up the second and third pRack board and set the pLAN address to 2 and 3 (for details, refer to Appendix A.1)
2. remove power and connect the boards and any terminal to the pLAN as described in paragraph 3.7.
3. power the board and wait for the Wizard selection to appear

At this point, select the type of installation as SUCTION+CONDENSER:

```
Wizard          Ib01
Type of Installation:

 SUCTION & CONDENSER
```

Fig. 4.d

Set the type of compressors and regulation of suction line 1 by answering the questions asked by the pRack pR300T software, for example:

```
Wizard          Ib03
Compressor config.

Compressor type:
       RECIPROCATING

Compressor number:  3
```

Fig. 4.e

```
Wizard          Ib40
Compressor config.
Regulation by:
             PRESSURE
Measure unit:    barg

Refrigerant:     R744
```

Fig. 4.f

```
Wizard          Ib41
Compressor config.
Regulation type:
   PROPORTIONAL BAND

Enable integral time
action:          YES
```

Fig. 4.g

After having configured suction line 1, the unit asks if another suction line needs to be configured, which must be answered YES:

```
Wizard          Ib43
Compressor config.

Configure another
suction line:
                 YES
```

Fig. 4.h

Answer YES to the next question which asks if a dedicated pRack board is present; this way the pRack pR300T software is ready to configure the board with address 2 in pLAN:

```
Wizard          Ib45
Compressor config.

Dedicated pRack
board for
suction line:
                 YES
```

Fig. 4.i

After having answered the question to configure the second suction line, the software asks if there is a dedicated pLAN board for condensing line 1 In this example, answer YES.

```
Wizard          Ib90
Condenser config.

Dedicated pRack
board for
condensing line:
                 YES
```

Fig. 4.j

```
Wizard          Ib99
Gas cooler config.
EEVS Managemant
HPU valve:          ENABLE   (*)
RPRV valve:         ENABLE   (*)
Valves routing:
TWIN A->HPV,B->RPRV
Status:          Connected
```

Fig. 4.k

Note: (*) ENABLE, for valves driven directly by Carel driver, if you need 0-10V (as described in page 49, paragraph 6.15.1...), please set DISABLE

After having configured condensing line 1, the software asks if there is a condensing line 2; answer NO to this question:

```
Wizard          Ib98

Configure another
condensing line:
                   NO
```

Fig. 4.l

At this point, the software asks if you wish to view a report of the settings performed:

```
Wizard          Ib2a
Enable I/O config: YES
Visualize Wizard
report:
                   NO
(Push (DOWN)
to continue)
```

Fig. 4.m

If the settings are correct, you can proceed to install the set values:

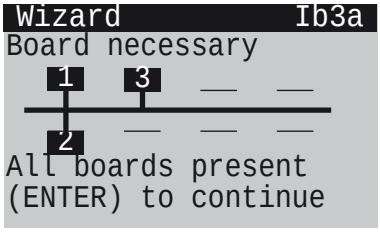


Fig. 4.n

After a few seconds, the unit can be started.

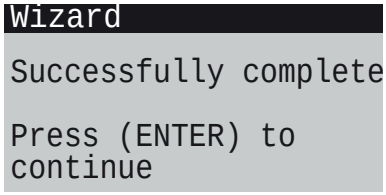


Fig. 4.o

Note: after having configured pRack pR300T, the power must be turned off and back on in order to confirm that the data is saved.

4.4 Advanced configuration

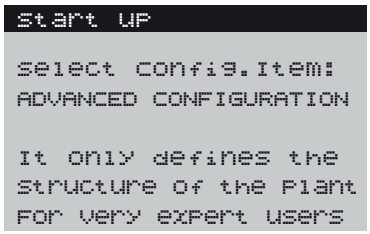


Fig. 4.p

This solution allows you to establish the configuration for the pLAN structure needed for correct operation of the system.
Once the procedure for choosing the various factors that influence the final configuration is completed, the pRack pR300T software verifies if the pLAN configuration is exact and shows the user interface for configuring the parameters that must be manually performed by the user.

Attention: this configuration method is recommended only for expert users, since all system parameters must be manually configured.

4.4.1 Associating the inputs and outputs

When using pre-configurations and the wizard, pRack PR300T can automatically associate the board's inputs and outputs with the various functions.

For the wizard only, after having configured the lines, automatic association can be chosen as an option. If choosing not to use this function, the I/Os need to be configured manually, according to requirements.

The criteria applied for automatic association are described below.

Digital outputs
pRack PR300T assigns in order:
- Compressor outputs
- Fan outputs
- Global alarm.

Digital inputs
pRack PR300T assigns in order:
- High and low pressure switches (HP and LP)
- Compressor alarms
- Fan alarms

Note: pRack PR300T can also use certain analogue inputs as digital inputs, nonetheless the common HP and LP pressure switches are always associated with actual digital inputs.

Analogue inputs
pRack PR300T assigns in order:
- Pressure or temperature control probes for 1 or 2 lines, according to the settings made. The types of probe asSigned as default are 4…20 mA or 0 to 5 V (first 4…20 mA, then 0 to 5 V if necessary) for the pressure probes, NTC for the suction temperature probes and HTNTC for the condensing temperature probes;
- Suction temperature probe on line 1: if possible this is associated with input U3, otherwise the first free input;
- Discharge temperature probe on line 1;
- Suction temperature probe on line 2;
- Discharge temperature probe on line 2.

Analogue outputs
pRack PR300T assigns in order:
- Compressor inverters for 1 or 2 lines;
- Fan modulating devices.

5. USER INTERFACE

5.1 Graphic terminal

The pRack PR300T user interface is represented by the pGDE terminal, panel or built-in versions. The functions associated with the 6 buttons on the pGDE terminal are the same on all the screens and are described in the table below.

Functions of the 6 buttons

Button		Function associated
⚠	(ALARM)	displays the list of active alarms and accesses the alarm log
⊙		used to enter the main menu tree
↩		returns to the higher level screen
↑	(UP)	scrolls a list upwards or increases the value highlighted by the cursor
↓	(DOWN)	scrolls a list downwards or decreases the value highlighted by the cursor
↵	(ENTER)	enters the selected submenu or confirms the set value.

Tab. 5.a

The LEDs associated with the buttons have the following meanings.

Meaning of LEDs

LED	Button	Meaning
Red	⚠	**Flashing:** active alarms present and not acknowledged **Steady:** alarms present and acknowledged
Yellow	⊙	pRack PR300T on
Green	↩	pRack PR300T powered

Tab. 5.b

5.2 Description of the display

There are three fundamental types of screens shown to the user:
- Main screen
- Menu screen
- Screen for displaying/setting the parameters

Main screen

The main screen is the screen that the software on board pRack PR300T automatically returns to 5 minutes after the last button was pressed.

An example of the main screen is shown in the figure, highlighting the fields and icons used:

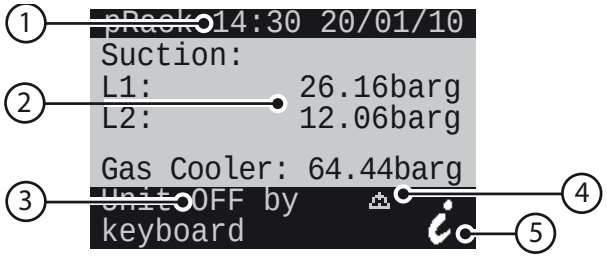


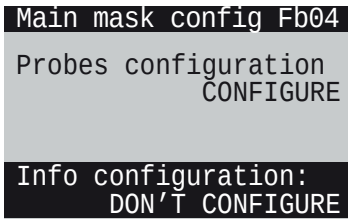
Fig. 5.a

1 Time and date
2 Main values.
3 Unit status (unit off) or compressor and fan status (unit on)
4 Active alarm Signal and manual operation
5 Access further information screens (menu branch A.a) by pressing button ↵.

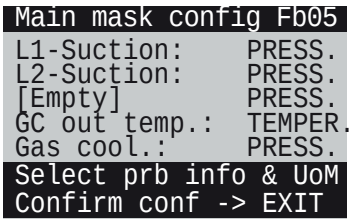
The information relating to the main values (Fig. 5.a) shown on the main screen when first starting vary according to the system configuration (one line, two lines, two lines with shared condenser) and the type of control value (pressure, temperature).

Note: The other information shown in menu branch A.a. varies according to the system configuration. For two line systems, pressing ↵ from the main screen accesses a different screen based on the starting point (line 1, line 2).

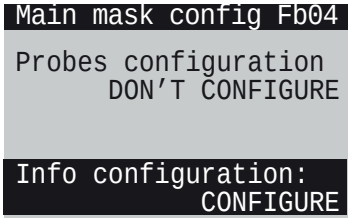
Starting in version 3.3.0, the main screen can be modified, both in terms of the probe displayed and the value used, from the menu at: F.SETTINGS →b.Language→ Fb04



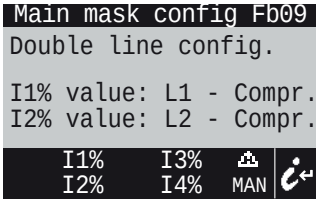
After having set the "probe configurations" (screen Fb04) under "CONFIGURE" and having pressed "ENTER" button, screen Fb05 can be accessed:

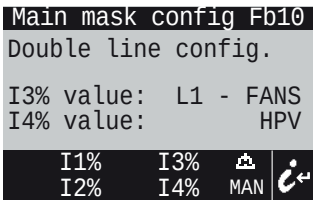


Here, for example, the receiver pressure can be entered (rather than the discharge or intercooler temperature), the order of the probes shown can be reversed, and the saturated values of the probe readings displayed.
In the same way, the positon of the compressor or fan status information in the unit status display (3, Fig.5.a) can be changed, accessing "CONFIGURE" for the "Info Configuration" field on screen Fb04:



Once again, pressing "ENTER" accesses screens Fb09 and Fb10:





In this way, for example, the backpressure or flash gas valve opening percentage can be entered

Menu screen
An example of a menu screen is shown in the figure below:

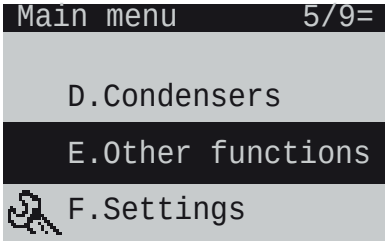


Fig. 5.b

The top right corner shows the selected item and the current password level (for details see the following paragraph). The ↑ and ↓ buttons are used to select the desired menu item, while ↵ accesses the selected item.

Screen for displaying/setting the parameters
An example of a screen for displaying/setting the parameters is shown in the figure, also highlighting the fields and icons used:

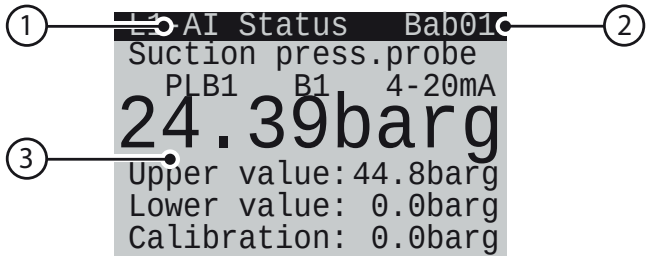


Fig. 5.c

1	Menu branch identifier
2	Screen identifier
3	Parameter

The screen identifier uniquely identifies the menu branch and the screen: the first characters indicate the menu branch, while the last two alphanumeric digits identify the order of the screen inside the menu, for example screen Bab01 is the first screen in menu B.a.b.

Note: The information on the screens may vary according to the password level used to access the menu.

5.3 Password

pRack PR300T manages three levels of password:
- User
- Maintenance
- Manufacturer

Each level includes the same rights as the lower levels, that is, the Manufacturer can access all the screens and parameters, the Maintenance can access the screens and parameters available in the Maintenance and User levels, while the User can only access the screens and parameters available in the User level.

Note: All levels display the main screens and the other information screens.

When pressing ⊙ a prompt is shown to enter the password, which remains active for 5 minutes after the last button is pressed.

The menu screens show their own password level using an icon at the top right: 1 line: user, 2 lines: maintenance, 3 lines: manufacturer.

The password level can be changed from menu branch F.c. at any time. The password can also be changed in the corresponding menu branch.

5.4 Menu description

- A.Unit status
  - a.Main info
  - b.Set point
  - c.On/Off
- B.In/Out
  - a.Status
    - a.Digital in
    - b.Analog in
    - c.Digital out
    - d.Analog out
  - b.Manual op.
    - a.Digital out
    - b.Analog out
  - c.Test
    - a.Digital out
    - b.Analog out
- C.Compressors
  - a.Line 1 (*)
    - a.I/O status
    - b.Control
    - c.Op. hours
    - d.Energy saving
    - e.Alarms
    - f.Konfig.
    - g.Advanced
  - b.Line 2 (*)
    - ….
- D.Fans
  - a.Line 1 (*)
    - a.I/O status
    - b.Control
    - c.EEV
    - d.Energy saving
    - e.Alarms
    - f.config.
    - g.Advanced
  - b.Line 2 (*)
    - ….
- E.Other func.
  - a.Oil
    - a.Line 1 (*)
      - a.I/O status
      - b.Settings
    - b.Line 2 (*)
      - ….
  - b.Subcool
    - a.Line 1 (*)
      - a.I/O status
      - b.Settings
      - c.EEV
    - b.Line 2 (*)
      - ….
  - c.Economiser
    - a.Line 1 (*)
      - a.I/O status
      - b.Settings
      - c.EEV
    - b.Line 2 (*)
      - ….
  - d.Liquid inj.
    - a.Line 1 (*)
      - a.I/O status
      - b.Settings
    - b.Line 2 (*)
      - ….
  - e.Heat recovery
    - a.Line 1 (*)
      - a.I/O status
      - b.Settings
    - b.Line 2 (*)
      - ….
  - f.Generic func.
    - a.Stages
    - b.Modulation
    - c.Alarms
    - d.Time bands
    - e.I/O status
  - g.ChillBooster
    - a.Line 1 (*)
      - a.I/O status
      - b.Settings.
    - b.Line 2 (*)
      - ….
  - h.DSS (*)
    - a.I/O status
    - b.Settings
- F.Settings.
  - a.Clock
    - aTime bands
    - b.Adjust
  - b.Languages
  - c.BMS
    - a.Line 1 (*)
    - b.Line 2 (*)
  - d.Password
- G.Safety
  - a.Log
  - b.Prevent
    - a.Line 1 (*)
    - b.Line 2 (*)
  - c.Alarm Konfig.
    - a.Line 1 (*)
    - b.Line 2 (*)
- H.Info
- I.Setup
  - a.Pre-configurations
  - b.Wizard
  - c.Advanced config.
  - d.Default
    - b.Wizard
    - c.Advanced config.
    - d.Default

(*) this menu level is only visible for system configurations with two lines.

Note:

- The figure illustrates the maximum menu configuration visible with the Manufacturer password. If accessing with the User or Maintenance password, only the menu items available are visible
- For some menu items, access is possible with different password levels (e.g. I/O status), but the information available on the screens changes.

6. FUNCTIONS

6.1 Schematic diagram and system configurations used

The schematic diagram of a transcritical system is shown in the figure:

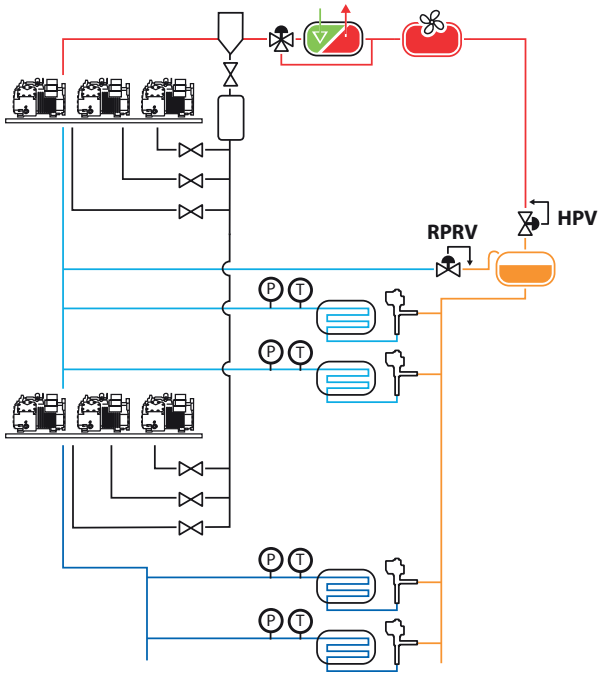


Fig. 6.a

This shows the two medium and low temperature lines, the HPV valve, which separates the high pressure part of the circuit from the medium pressure part, and the RPRV valve which regulates the pressure in the receiver. Both valves can be managed directly by the controller with built-in driver (PRK30TD*).

Management of the system can be performed using one of the system configurations described hereafter.

Configuration 1: a pRack pR300T board for managing both suction lines and control of the high pressure part (this configuration can be used also as a backup controller):

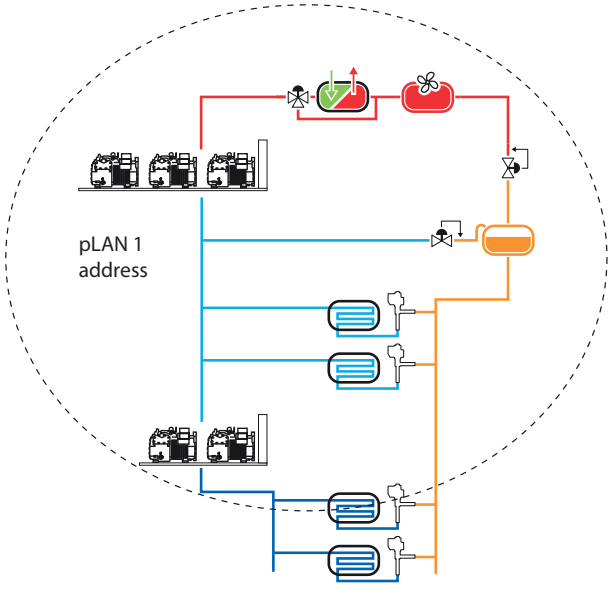


Fig. 6.b

Configuration 2: 1 a pRack pR300T board for each suction line and 1 pRack pR300T board for control of the high pressure part (gas cooler and HPV, RPRV valves):

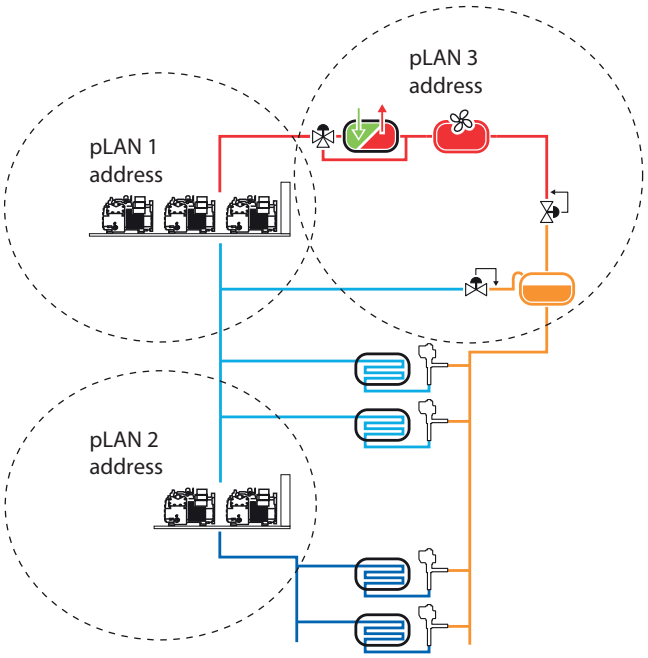


Fig. 6.c

Configuration 3: a pRack pR300T board to manage the medium temperature suction line and control of the high pressure part and a board for managing the low temperature suction line:

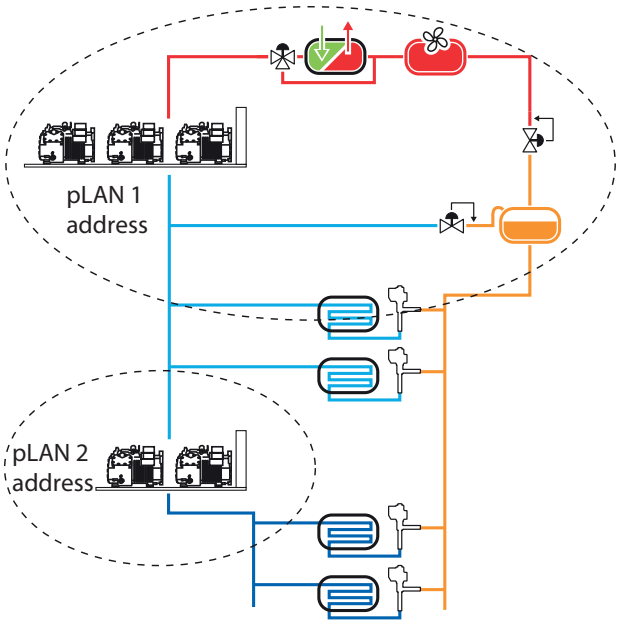


Fig. 6.d

Configuration 4: a pRack pR300T board for managing the two suction lines and a board for control of the high pressure part:

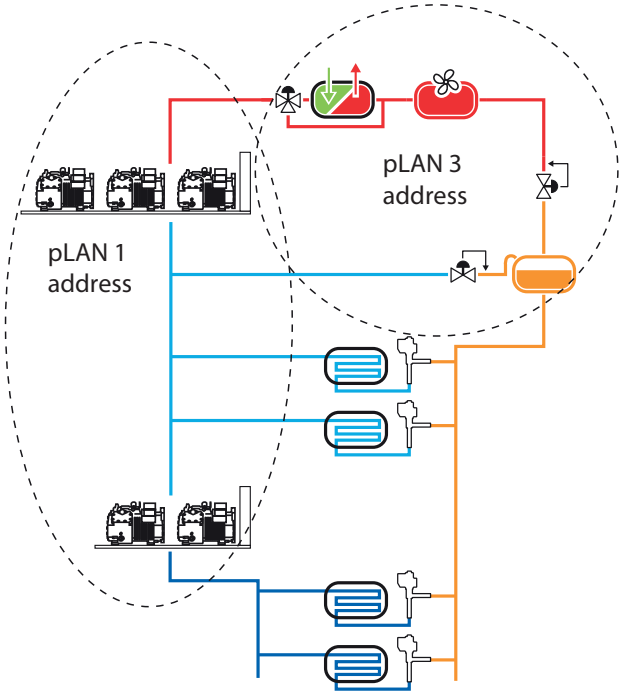


Fig. 6.e

6.2 Unit On-Off

The unit can be switched on and off from:
- User terminal
- Supervisor
- Digital input

On-off from the user terminal and the configuration parameters are available under the main menu, branch A.c, and are differentiated based on the access level; the User password allows display only.

On-off from the supervisor and from the digital input and start-up after a blackout (with specific delay, to avoid continuous starts and stops in the event of instability in the power supply) must be enabled using the parameters visible only with the Manufacturer password.

On-off from the digital input is equivalent to an enabling Signal, that is, if the digital input is Off the unit cannot be switched on in any other way, while if is On, the unit can be switched on or off in any other way, with the same priority (the most recent control has precedence, whatever the origin), as shown in the figure:

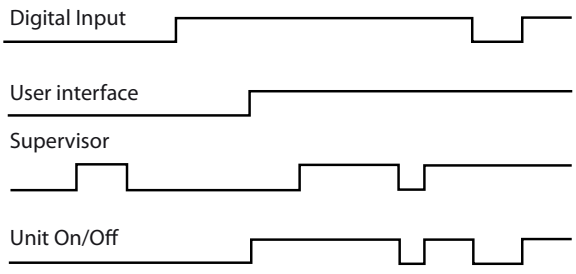


Fig. 6.f

When there are two suction and condenser lines, on-off is independent for each line, while when there are two suction lines and one condenser line, it is independent for the suction lines, while the condenser line stops when both suction lines are off, and starts when at least one suction line is ON.

Note: certain special conditions or functions in the pRack software cause the unit to shutdown:
- Configuration of some parameters: e.g. inputs/outputs, configuration of compressors, inverter parameters.
- Installation of default parameters
- Manual management

6.3 Control

pRack PR300T can manage two types of control:
- Proportional band (P, P+I);
- Neutral zone (fixed times, variable times).

Both types of control can be applied to both compressors and condensers, according to the settings defined during start-up or in main menu branches C.a.b/C.b.b and D.a.b/D.b.b.

The type of control chosen is independent for each line present, either suction or condenser. In addition, pRack PR300T can use as the reference for control either the pressure or the converted temperature, or the temperature read by probe if there is no pressure probe, even if reference is only made to pressure below.

The control set point can be compensated by an offset linked to digital inputs, probes, supervisor or time bands, for details see paragraph 6.5 relating to compressor and fan energy saving. Both types of control are described below, and are valid for both control of suction pressure and condensing pressure, and operation with backup probes and/or probes not working.

6.3.1 Proportional band

The operating principle is normal proportional or proportional + integral control (P, P+I).

The control set point is central, consequently - for proportional control only - operation is schematised in the following figure:

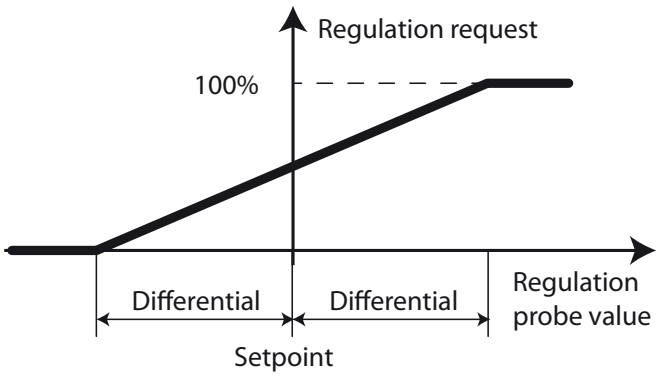


Fig. 6.g

For example, for 4 devices with the same capacity and proportional only control, start-up occurs as shown in the figure:

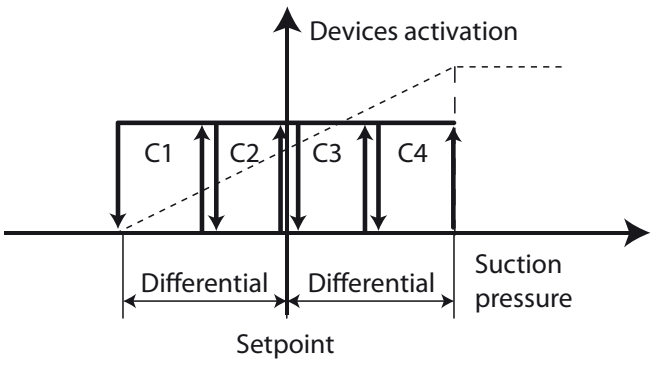


Fig. 6.h

With P+I control, added to the effect of the proportional action described above is the integral action, used to achieve a null control error in steady operation, as shown in the figure:

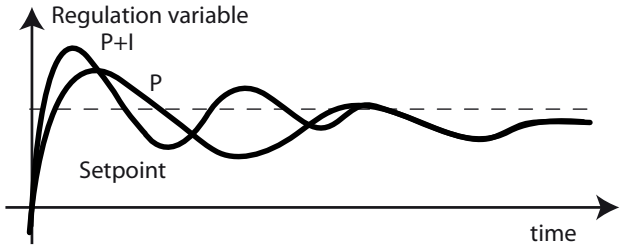


Fig. 6.i

The integral action depends on the time and the deviation from the set point. This modifies the request if the control value does not approach the set point for some time.
The integral time setting represents how fast integral control is implemented:
- low values determine fast and intense control action
- high values determine slower and more stable control action

It is recommended to not set a value that is too low for the integral time, to avoid instability.

Note: the set point is in the centre of the activation band, therefore when reaching the set point some devices are on, even with purely proportional control.

6.3.2 Neutral zone

The operating principle is schematised in the following figure:

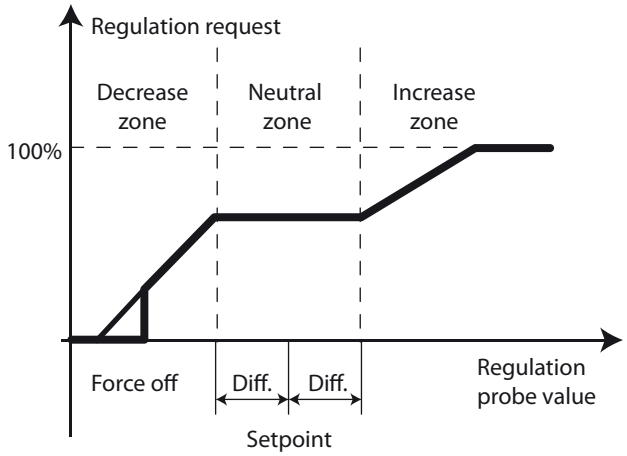


Fig. 6.j

Inside the neutral zone the capacity request sent by the controller is constant (except when there is a modulation device and modulation is enabled inside the neutral zone, as described in the following paragraph) and the value satisfies the temperature control request in those specific operating conditions, therefore within this zone no device is stopped or started.

In the decrease zone, the request also decreases at a rate that depends on the deviation from the set point, and vice-versa in the increase zone the request increases proportionally to the deviation.

For the increase and decrease zones, the following can be used:
- Fixed times: the request decreases or increases constantly as time elapses.
- Variable times: the request decreases or increases more quickly (according to the settings) as the deviation from the set point increases.

Note: The previous figure shows the increase and decrease with fixed times.

For control in Neutral zone, the parameters shown in the figure must be set:

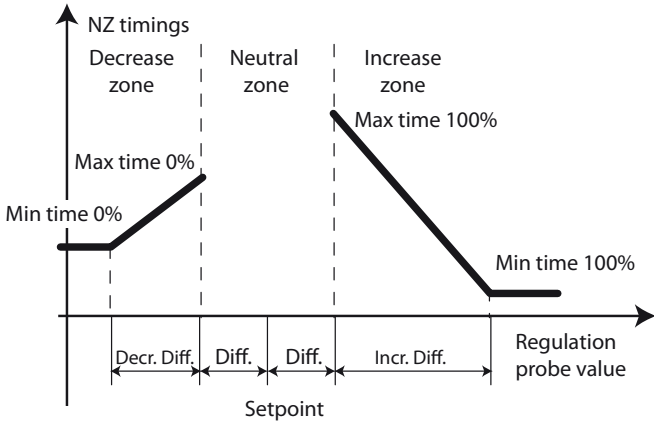


Fig. 6.k

As well as the decrease and increase differentials, 4 times need to be set, two for each zone, which represent the maximum and minimum time to reach the request, equal to 0% or 100%, for the decrease and increase respectively.

Tutorial: the decrease/increase times (minimum and maximum) represent the time needed to change from maximum to minimum capacity and vice-versa, and not the time between the deactivation/activation of the individual device. For example, in the case of 4 devices with the same capacity, an increase time of 180 s means that one device is activated every 45 s.

In the situation shown in the figure, the request sent by the controller decreases/increases slowly as soon as the controlled value is outside of the Neutral zone, while it decreases/increases quickly the further the controlled value moves away from the Neutral zone; in this way the response of the system is faster when further from steady conditions.

Note: When using fixed times, the maximum and minimum must be set to the same value. In this case, the request sent by the controller decreases/increases constantly inside the deactivation/activation differential.

6.3.3 Modulation in Neutral zone

pRack PR300T can activate a specific function inside the Neutral zone if modulating devices are used (e.g.: inverters). This function can be enabled in main menu branch C.a.g/C.b.g or D.a.g/D.b.g.

Modulation in Neutral zone is used to vary the request sent by the controller inside the Neutral zone proportionally so as to enter the decrease zone with the minimum request and the increase zone with the maximum request, meaning a device can be immediately deactivated/activated when exiting the Neutral zone.
This makes it possible to remain longer inside the neutral zone without starting or stopping any device.
An example of this operation is shown in the figure:

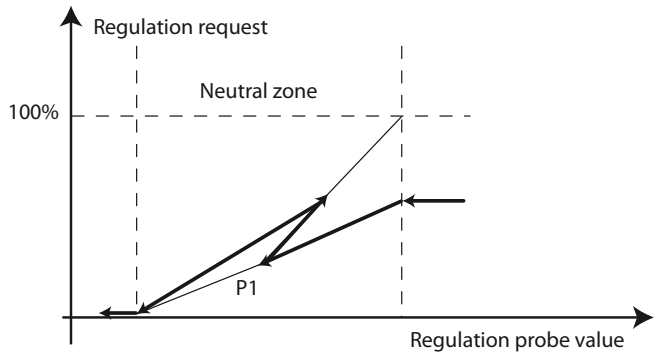


Fig. 6.l

When entering the Neutral zone, the pRack PR300T software calculates how the request needs to change in order to exit the Neutral zone at minimum or maximum output, and applies one of the two values according to the trend in variation in the control variable. For example, at point P1 in the figure, the trend of the two requests is represented by the segments with thin lines, and the request 'reverses' because at that point the control variable has started increasing in value again.

Note: When exiting the Neutral zone, it is possible that the request is not at the minimum or maximum value, where limitation is enabled for of the modulating device variation speed.

6.3.4 Control with backup probes and/or probes not working

pRack PR300T can use backup control probes that are activated when the normal control probes are not working.

The backup probes must be enabled in main menu branch C.a.g/C.b.g or D.a.g/D.b.g.

When different pRack boards are used to manage the suction and condenser lines, the backup suction pressure probe must be connected to the board that manages the suction line, while the backup condensing pressure probe can be connected either to the board that manages the suction line or the board that manages the condenser line.

If the main control probes are not working and no backup probes are fitted, or the backup probes are also not working, or the corresponding temperature probes are also not working, fixed values are used for the control request, set in main menu branch C.a.g/C.b.g or D.a.g/D.b.g.

6.4 Compressors

pRack PR300T can manage up to 2 suction lines with different types of compressors and capacity modulation devices, applying common types of device rotation and controlling both the start mode and the safety times for each type of compressor, as well as a number of accessory functions. The compressor functions and related parameter settings are enabled from main menu branch C.a/C.b. These features and functions are described in detail in the following paragraphs.

6.4.1 Possible compressor configurations

pRack PR300T can manage different types of compressors:
- Reciprocating
- Scroll

Moreover, a capacity modulation device is allowed for each suction line, which may be one of the following, according to the type of compressor:

Compressors and modulation devices

Compressors	modulation devices
Reciprocating	Inverter
Scroll	Inverter Digital Scroll™

Tab. 6.a

Note: The same modulation device is used on each line.

The maximum number of compressors and load stages per line varied according to the type of compressor:

Compressors and modulation devices

Compressors	Maximum No.	Load stages
Reciprocating	12	24 total
Scroll	12	24 total

Tab. 6.b

The compressor size refers to its capacity and number of load stages or to the inverter presence, therefore different sizes need to be defined for compressors with the same capacity yet a different number of load stages. The inverter is always associated to size 1.

Tutorial: below is one example of some possible configurations:
- One line, 4 reciprocating compressors with the same capacity, the first with inverter (2 sizes).
- One line, 4 scroll compressors with the same capacity, the first Digital Scroll™ (1 sizes).
- One line, 4 reciprocating compressors with the same capacity, the first two with 4 load stages, the other two not capacity-controlled (2 sizes).
- One line, 4 reciprocating compressors with the same capacity and 4 load stages each (1 size).
- Two lines, line 1 with 4 scroll compressors, the first Digital Scroll™, line 2 with 4 reciprocating compressors, the first with inverter (1 size line 1, 2 sizes line 2).

6.4.2 Rotation

pRack PR300T can manage 4 different types of device rotation:
- FIFO (First In First Out): the first device to start is also the first to stop
- LIFO (Last In First Out): the last device to start is the first to stop
- By time: the device with the least number of operating hours starts and the device with highest number of operating hours stops
- Custom: the on/off sequences are defined by the user

NB: Different Sizes of compressors can only be managed with Custom rotation.

The type of rotation is selected and the corresponding parameters set during the start-up procedure or in main menu branch C.a.f/C.b.f.
The activation thresholds are calculated differently depending on whether FIFO, LIFO, time or Custom rotation is used:

Device activation threshold calculation

Rotation	Threshold calculation
FIFO LIFO By time	Static: the range of variation of the control request is divided equally between the number of stages available
Custom	Dynamic: the thresholds are calculated depending on the capacity effectively available

Tab. 6.c

Example 1: FIFO rotation, 4 compressors of the same capacity without load stages.

The activation thresholds are 25, 50, 75 and 100 %.

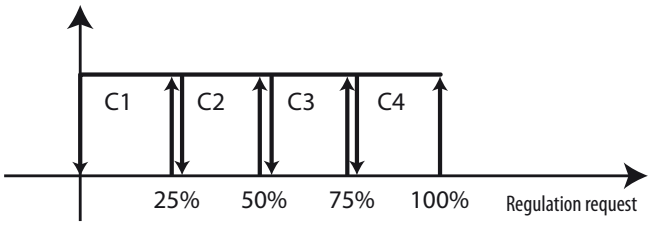


Fig. 6.m

Example 2: Custom rotation, 4 compressors with capacities of 10, 20, 30 and 40 kW. The activation thresholds with all the compressors available are 10, 30, 60, 100 %.

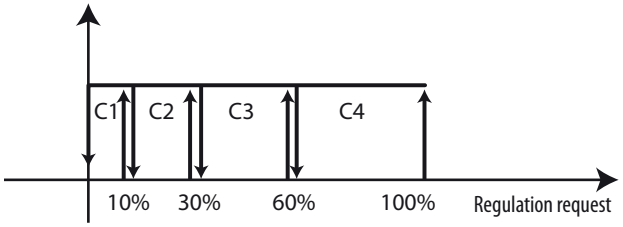


Fig. 6.n

If an alarm is active on compressor 3, the recalculated activation thresholds are 10, 30, 70 %.

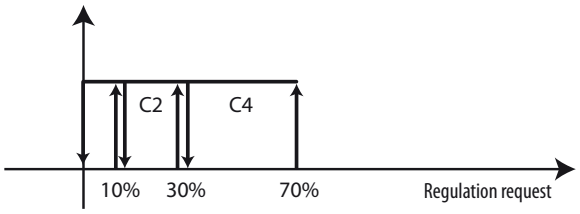


Fig. 6.o

Activation of the compressors and load stages may be:
- Grouped (CpppCppp): first all the load stages are activated on one compressor before starting the next one
- Balanced (CCppppppp): first all the compressors are started at minimum capacity and then the corresponding load stages are activated, one for each compressor, in sequence.

6.4.3 Rotation with modulation devices

pRack PR300T can also manage compressor rotation when a capacity modulation device is fitted (inverter, Digital Scroll™ or continuous control). The type of modulating device is selected and the corresponding parameters set during the start-up procedure or in main menu branch C.a.f/C.b.f and C.a.g/C.b.g

The modulating device is always the first to start and the last to stop irrespective of the type of rotation, the other devices start or stop according to the type of rotation selected.

Note: The compressor with modulation device is also assumed to be the first.

The trend in capacity delivered by the modulation device depends on the capacity of the compressor with the modulating device compared to the other compressors available.

Three cases can be identified:
- compressors all with the same capacity and range of capacity variation of the modulating device greater than or equal to the capacity of the compressors
- compressors all with the same capacity and range of capacity variation of the modulating device less than the capacity of the compressors
- compressors with different capacities

In the first case, the modulating device manages to continuously cover the range of variation of the control request, while in the second case some discontinuous variations remain. The behaviour in the third case varies according to the capacities involved, and in any case reflects one of the two previous cases.
To configure the compressor capacity when an inverter is used, the minimum and maximum operating frequencies need to be set relating to the minimum and maximum value of the analogue output and the rated capacity delivered at rated frequency (50 Hz), so that the pRack PR300T software can calculate the capacity the compressor can deliver with the inverter and use this value for control. In addition, for inverters the variation in capacity delivered can be limited by setting the increase and decrease times. If these times have already been configured on the inverter, the higher time set has priority.

Example 1: range of modulating device capacity variation higher than the capacity of the compressors:
Two compressors without capacity control, with the same capacity, 20 kW each, modulating device with variable capacity between 30 and 60 kW. The figure shows the trend when the request sent by the controller increases and then decreases continuously between 0 and 100 %.

It can be seen that the capacity delivered exactly follows the required capacity, except when below the minimum capacity of the modulating device.

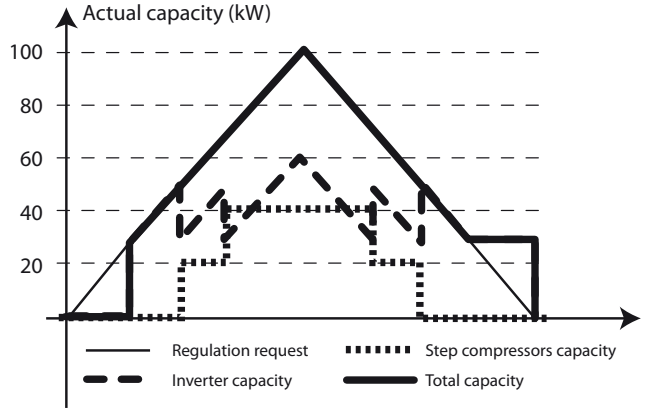


Fig. 6.p

Example 2: range of modulating device capacity variation lower than the capacity of the compressors: two compressors without capacity control, with the same capacity, 30 kW each, modulating device with variable capacity between 20 and 40 kW.
It can be seen that the capacity delivered does not exactly follow the required capacity, rather acts in steps, so as to avoid swings.

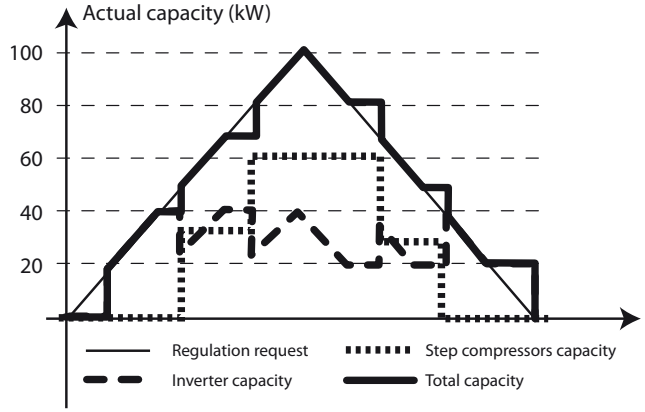


Fig. 6.q

Example 3: range of modulating device capacity variation in between the capacity of the compressors, all different sizes: two compressors without capacity control, capacities 15 kW and 25 kW, modulating device with variable capacity between 10 and 30 kW.

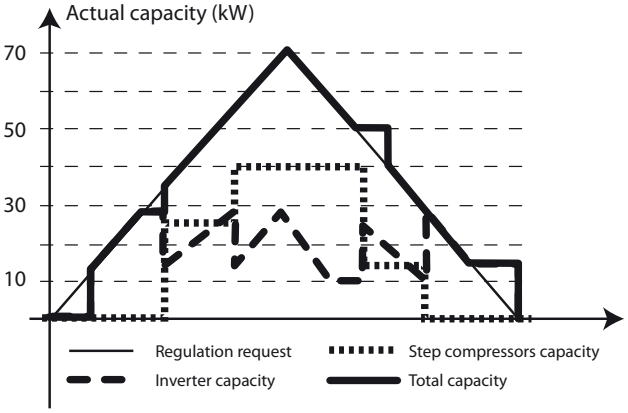


Fig. 6.r

6.4.4 Starting

pRack PR300T can manage different types of compressor starting:
- Direct
- Part-winding
- Star/delta

The type of starting can be selected and the related parameters set in main menu branch C.a.f/C.b.f.

For part-winding starting, the delay in activating the digital output that controls the second winding needs to be set:

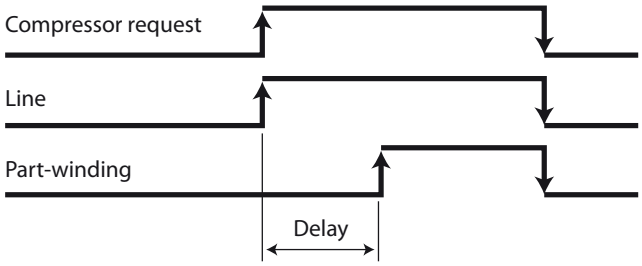


Fig. 6.s

For star/delta starting, the star time, the delay between the activation of the line and star digital input, and between the delta and star digital input all need to be set, as shown in the figure:

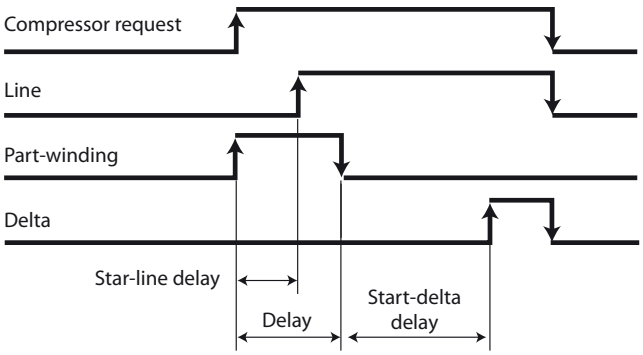


Fig. 6.t

6.4.5 Safety times

pRack PR300T can manage common safety times for each compressor:
- Minimum on time
- Minimum off time
- Minimum time between consecutive starts

The related parameters can be set in main menu branch C.a.f/C.b.f.

Note: for two lines, a further delay can be set between starts of the compressors on different lines, so as to avoid Simultaneous starts. See paragraph 6.6.6 for the detailed description of the synchronisation function for two lines (DSS).

6.4.6 Balancing

pRack PR300T can control any balance valves in parallel with the compressors.
This function can be used to activate a communicating solenoid valve between compressor suction and discharge, for a set time, before each individual compressor starts. In this way, the suction and discharge pressure can be balanced and the compressor can be started in more favourable conditions.

The balancing function can be enabled and the related activation time set in main menu branch C.a.f/C.b.f.

6.4.7 Economizer

pRack PR300T can activate the economizer function to boost compressor efficiency by injecting vapour. Some of the liquid is taken from the condenser, expanded through a valve and then sent to a heat exchanger to cool the liquid leaving the condenser. The resulting superheated vapour is injected into a special section of the compressor.

The function can be enabled and the related parameters set in main menu branch E.c.a.b.

The economizer is only efficient for high compressor activation capacities, typically over 75 %, therefore the economizer function control valve is only activated when exceeding a set threshold.
As the economizer tends to increase the condensing pressure, this needs to be controlled to ensure the high condensing pressure alarm is not generated. In addition, the injection of vapour decreases the discharge temperature and so this value also needs to be monitored.
Consequently, the three conditions for activation of the economizer function are:
- Capacity above a set threshold
- Condensing pressure below a set threshold (with reset differential)
- Discharge temperature above a set threshold (with reset differential)

Note: the function can be activated on a maximum of 6 compressors.

6.4.8 Liquid injection

As an alternative to the economizer, pRack PR300T can manage the injection of liquid into the compressors (the two functions are alternative, as the point of vapour injection into the compressor is the same).

The function can be enabled and the related parameters set in main menu branch E.d.a.b/E.d.b.b.

Liquid injection is used to protect the compressor, and in fact decreases the discharge temperature. Operation is Similar to the economizer function, with the difference that the expanded liquid is not sent to a heat exchanger, but rather directly into the compressor. The function is only activated when the compressor is on and the discharge temperature exceeds a set threshold (with differential).

Note: the function can be activated on a maximum of 6 compressors.

6.4.9 Manual operation

pRack PR300T can manage 3 different compressor manual operating modes:
- Enabling / disabling
- Manual management
- Output test

Enabling / disabling is managed in main menu branch C.a.f/C.b.f., while manual management and the output test can be activated in main menu branch B.b or B.c.

Enabling / disabling is used to temporarily exclude the compressors from operation, to allow, for example, repair or replacement. The disabled compressors are also excluded from rotation.

Note: enabling is the only compressor manual operating mode that can be activated when the unit is on.

Both manual management and the output test are enabled by parameter and remain active for a set time after the last button is pressed, after which the unit returns to normal operating mode.

Manual management is used to switch the compressors on or off without observing the control needs, however still considering any safety devices (alarms, safety times, starting procedures) and respecting the set configuration of the inputs/outputs.

The activation screen resembles the one shown in the figure and is used to override the outputs relating to the operation of the selected device, e.g. compressor 1:

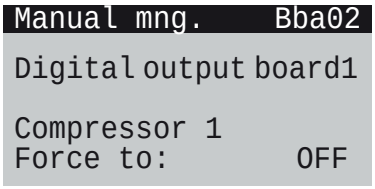


Fig. 6.u

The output test is used to activate or deactivate the outputs (where necessary setting an output percentage for the analogue outputs), without observing any type of safety feature.
The activation screen resembles the one shown in the figure and is used to override the outputs on the pRack boards, in the order they physically appear on the board (without links to the devices):

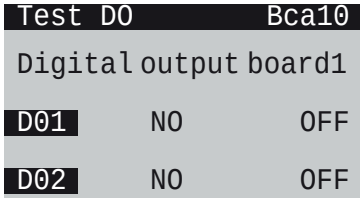


Fig. 6.v

Important: manual mode and the output test can only be activated with the unit off.
Both manual mode and above all the output test must be used with special care and by expert personnel to avoid damage to the devices.

Digital Scroll™ compressors

pRack PR300T can use a Digital Scroll™ compressorä as the modulating device for suction lines (one for each line). This type of compressor features special operation, and is controlled by pRack PR300T as follows.

The related parameters can be set in main menu branch C.a.f/C.b.f. The capacity is modulated by opening/closing a valve with PWM; when the valve is ON the compressor delivers minimum capacity, while when the valve is off the compressor delivers maximum capacity. In the following description and figure, ON and OFF refer to the status of the compressor, while operation of the valve is the exact opposite:

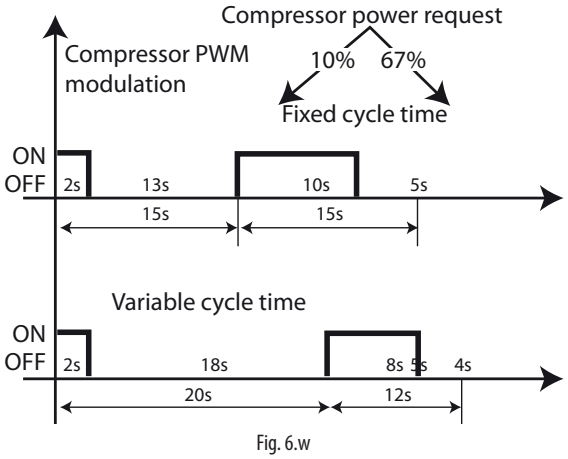


Fig. 6.w

The following data are provided by the manufacturer of the compressor:
- minimum ON time 2 s
- maximum cycle time 20 s
- optimum cycle time 12 s

There are three possible operating modes:
- Fixed cycle time
- Variable cycle time
- Optimised cycle time

Based on the operating mode selected, pRack PR300T calculates the valve activation percentage that satisfies the required capacity.

Fixed cycle time

The compressor ON time is calculated as the percentage of the cycle time corresponding to the required capacity:

T_{ON} = % Richiesta * Tempo di ciclo

The cycle time can be set to the optimum value suggested by the manufacturer to achieve maximum COP, or to a higher value to increase resolution of the capacity delivered (a higher cycle time implies greater continuity in the effective capacity that can be delivered).

Variable cycle time

The compressor ON time is set to 2 s and the cycle time is calculated based on the required capacity:

$T_{CICLO} = T_{ON}$ /% Richiesta

Optimised cycle time

The compressor ON time is set to 2 s and the cycle time is calculated based on the required capacity for capacities less than 17 %, after which the cycle time is set to 12 s and the ON time varies. In essence, this mode is a combination of the previous two. This guarantees the maximum possible COP and control rate (obtained with the 12 s cycle time) and the maximum control range (starting from 10 %).

Note: the minimum capacity that can be delivered by Digital Scroll™ compressors is Minimum ON time/Maximum cycle time = 2/30 = 6.7 %, which also depends on the selected control mode (for example, in the first case shown in the figure the minimum capacity delivered is Minimum ON time/Cycle time = 2/15 = 13%).

Note: if high pressure prevention is enabled with activation/deactivation of the devices, the Digital Scroll™ compressor delivers the minimum possible capacity.

Starting procedure

pRack PR300T can manage the specific starting procedure for Digital Scroll™ compressors, as represented as in the following figure:

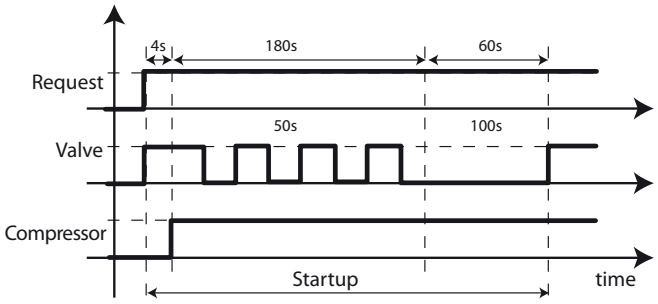


Fig. 6.x

There are three stages:
1. balance: the PWM valve is activated for 4 s, so that the compressor delivers minimum capacity;
2. compressor activation with 50 % capacity for 3 minutes;
3. forced operation at 100 % for 1 minute.

During the starting procedure, the request sent by the controller is ignored and only at the end of the procedure does the capacity delivered start reflecting the request. If the request is cancelled during the starting procedure, the compressor stops at the end, then the minimum ON time for these types of compressors is set to 244 s.

The starting procedure is performed when the compressor is started, while it can be disabled for a set time by parameter for subsequent starts, if the compressor has not remained off for a minimum set time. After this time has elapsed the procedure is performed again during the following start.

Note: the safety times for Digital Scroll™ compressors are established by the manufacturer, and are as follows:
- Minimum ON time: 244 s (starting procedure)
- Minimum OFF time: 180 s
- Minimum time between restarts: 360 s

Alarms

pRack PR300T can manage, in addition to the common alarms for all types of compressors (see chapter 8 for details), some specific alarms for Digital Scroll™ compressors:

- high oil temperature
- oil dilution
- high discharge temperature

These alarms are managed as specified by the manufacturer of the compressor, and therefore pRack PR300T can only enable or disable them. Activation of these alarms requires an oil temperature probe, which can also be the common probe (see the paragraph relating to oil management) and the compressor discharge temperature probe.

Note: pRack PR300T does not manages the envelope for Digital Scroll™ compressors and consequently there is no corresponding alarm when operating outside the envelope.

6.5 Gas cooler

pRack pR300T manages the gas cooler in a manner that is completely similar to the pRack PR300T for the condensers, with the only difference being that in transcritical condition, since correspondence between the pressure and saturated temperature is lost, the regulation is always in temperature di default ma è possibile a partire dalla versione 3.1.5 regolare i ventilatori anche in pressure. The regulation variable, therefore, is the output temperature from the gas cooler.

Up to 16 fans can be managed, also with inverter modulation. In the event of modulation, the modulating output 0...10 V is unique while an input can be managed for each fan for signalling the alarms.

The functionalities can be enabled and the relative parameters can be set from main menu branch D.a.

6.5.1 Control

pRack PR300T can manage proportional band and Neutral zone control, by pressure or temperature.

For details on the control modes, see the corresponding paragraph, while below is the description only of the features relating to the fans.

Fan operation depending on the compressors

The operation of the fans can be bound to the operation of the compressors by setting a parameter in main menu branch D.a.b/D.b.b, in this case the fans only start if at least one compressor is on. This setting is ignored if the fans are controlled by a dedicated pRack PR300T board and the pLAN network is disconnected.

Fan operation with modulating device

If the fans are controlled by a modulating device, the meaning of the parameters that associate the minimum and maximum values of the device's modulating output and the minimum and maximum capacity of the modulating device on screens Dag02 and Dbg02 is illustrated in the following examples.

Example 1: minimum modulating output value 0 V, maximum value 10 V, minimum modulating device capacity 0 %, maximum 100 %.

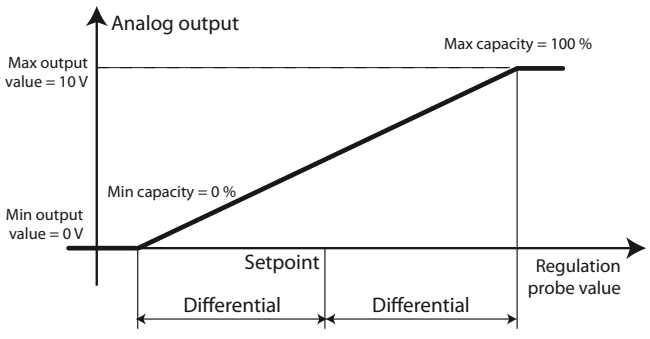


Fig. 6.y

Example 2: minimum modulating output value 0 V, maximum value 10 V, minimum modulating device capacity 60 %, maximum 100 %.

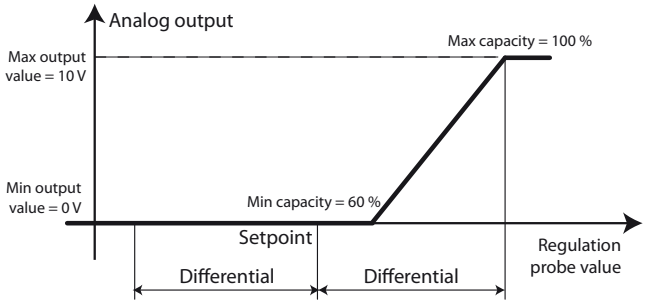


Fig. 6.z

Example 3: minimum modulating output value 2 V, maximum value 10 V, minimum modulating device capacity 60 %, maximum 100 %.

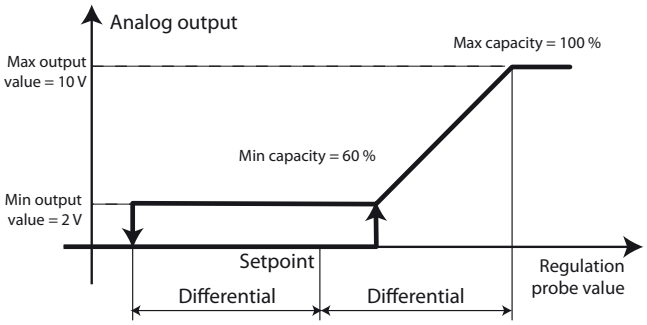


Fig. 6.aa

Cut-off

pRack PR300T manages a control cut-off for the fans; functions and related parameter settings can be enabled from main menu branch D.a.b/D.b.b. The operating principle of the cut-off function is shown in the figure:

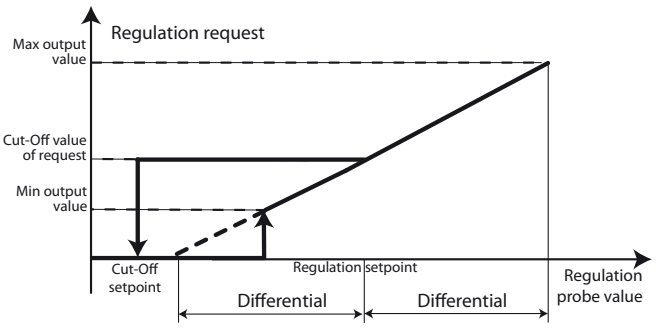


Fig. 6.ab

A percentage of the control request and a cut-off set point can be set. When the control request reaches the set cut-off value, this value is kept constant until the control value falls below the cut-off set point, after which it falls to 0 % and remains there until the request exceeds the cut-off value again.

6.5.2 Rotation

pRack PR300T can manage rotation of the fans, much in the same way as described for the compressors, therefore:
- LIFO, FIFO, time, Custom rotation
- Management of a modulation device on each line

The substantial difference compared to the compressors concerns the possibility to manage different capacities and load stages, which are obviously not featured for the fans. In addition, pRack PR300T can specially manage inverter driven fans. In fact, a multiple number of inverter driven fans can be set.
If there is more than one fan, however the number of inverter driven fans is set to 1, the fans are started and stopped at the same time, and the fans will always all be at the same power.

If there is more than one inverter driven fan, as well as being able to use an alarm digital input for each, it is assumed that the weight of the modulating device is proportional to the number of fans, therefore the first case is applied, as described previously: fans all with the same power and modulating device power variation range greater than or equal to the capacity of the other devices.

Example 1: 4 fans all controlled by the same inverter correspond to 1 fan with four times the power.

Note: some fans can be excluded from the rotation, for example in the winter; to do this use the split condenser function.

6.5.3 Fast start (speed up)

pRack PR300T can manage the fast start function (speed up), used to overcome the initial inertia of the fans. The function can be enabled and the related parameters set in main menu branch D.a.g If speed up is enabled, a start time can be set in which the fan speed is forced to 100%. If the outside temperature sensor is used, moreover, a threshold can be set (with reset differential) below which speed up is disabled, so as to not drastically lower the condensing pressure at start-up.

Note: speed up has lower priority than the Silencer function (see the following paragraph for the details), therefore if the Silencer function is active, this is disabled.

6.5.4 Silencer

pRack PR300T can manage the Silencer function, used to limit fan speed at certain times of the day or in specific conditions, enabled by digital input.

The function can be enabled and the related parameters set in main menu branch D.a.g.

Enabling fan speed limitation from the digital input or based on time bands is independent, consequently the speed is limited to the set value when at least one of the two conditions is active.
Up to 4 activation bands can be set for each day of the week.

6.5.5 Split condenser

pRack PR300T can manage the possibility to exclude some fans from operation, for example to reduce gas cooler operation in winter, using the split condenser function.

The function can be enabled and the related parameters set in main menu branch D.a.g.

Split condenser can be used to exclude from rotation fans whose index is:
- even
- odd
- higher than a settable value
- lower than a settable value

The function can be activated by:
- time bands (winter/summer seasons)
- digital input
- supervisor
- outside temperature (set threshold and differential)

Note:
- the split condenser function can be disabled by parameter if the high pressure prevention function is activated. If split condenser is disabled due to activation of the high pressure prevention function, it remains disabled for a set time, after which it is reactivated.
- split condenser cannot be enabled if there is a speed modulation device that controls all the fans.

6.5.6 Manual operation

pRack PR300T can also manage the same three manual operating modes for the fans as described for the compressors:
- Enabling
- Manual management
- Output test

Enabling is managed in main menu branch D.a.f/D.b.f., while manual management and the output test can be activated in main menu branch B.b or B.c. For the detailed description of the three modes, see paragr. 6.3.9.

6.5.7 Alarms

pRack PR300T can manage both a common alarm for the fans and separate alarms for each fan.
When the common alarm is active the alarm is signalled, but no fan is stopped, while for separate alarms the fan that the alarm refers to is stopped.

6.6 HPV valve management

Management of the HPV valves, which separates the high pressure part of the system from the medium pressure part, determines the transcritical and subcritical operation mode of the unit. In transcritical mode, valve regulation is done to obtain maximum yield while in subcritical mode, regulation controls the subcooling. The HPV valve has a proportional + integral (PI) type of regulation which uses an optimal pressure value of the gas cooler calculated on the basis of the gas cooler pressure and temperature as a regulation setpoint, as described hereafter.
Enabling HPV valve management coincides with enabling the transcritical system management mode.
The HPV valve can be managed directly by pRack pR300T with built-in driver (PRK30TD***) or with external EVD EVO driver. Both solutions are compatible with the majority of valves available on the market. Direct control via serial connection is enabled under EEVS (electronic expansion valve settings), accessible from the main menu, branch E.i.c. The configuration parameters, on the other hand, are accessible from the main menu, branch E.i. The algorithm for calculating the regulation setpoint of the HPV valve can be optimized or customized by the user according to what was set by the parameter.

Calculation of the optimized setpoint
The calculation of the optimized setpoint is illustrated in the figure.

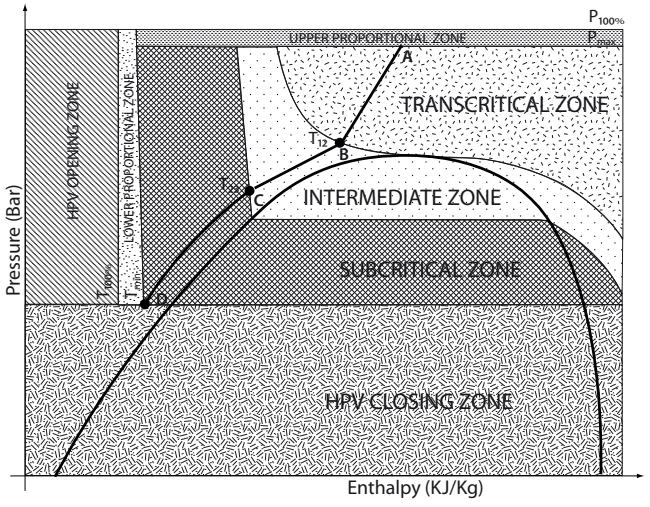


Fig. 6.ac

The HPV valve is managed according to the zone identified based on the output temperature and gas cooler pressure.

In order to define the zones, it is necessary to set the two pressure values $P_{100\%}$ and P_{max}, the two temperatures T_{12}, T_{23} related to points B and C in the figure and the two temperatures T_{min} and $T_{100\%}$.

In the following, with T_{gc} and P_{gc}, the temperature and pressure of the gas cooler will be indicated.

The behaviour of the HPV valve in the various zones is as follows:

- **Transcritical zone**, identified by $T_{gc} \geq T_{12}$ and $P_{gc} \leq P_{max}$: the valve works with proportional + integral (PI) type integration in order to maintain the maximum COP given by the optimal pressure P_{opt} calculated as a function of the output temperature from the gas cooler T_{ogc}.
- **Subcritical zone**, identified by $T_{min} \leq T_{gc} \leq T_{23}$: the valve works with PI regulation in order to maintain constant subcooling.
- **Transition zone**, identified by $T_{23} \leq T_{gc} \leq T_{12}$: the valve works with PI regulation with a pressure setpoint identified as the conjunction of points B and C in the figure, obtained by calculating the optimal pressure at the limit of the transcritical and subcritical zones. The purpose of this zone is to avoid discontinuity in passing between the two zones.
- **Upper proportional zone**, defined by $P_{max} < P_{gc} < P_{100\%}$: the valve works with only proportional regulation between the opening value reached at pressure P_{max} and the maximum opening value at pressure $P_{100\%}$. If the pressure decreases, the opening value of the HPV valve remains constant until it enters the transcritical zone, in which the regulation restarts as previously described.
- **Lower proportional zone**, defined by $T_{100\%} < T_{gc} < T_{min}$: the valve works with only proportional regulation between the opening value reached at temperature T_{min} and the maximum opening value at temperature $T_{100\%}$. If the pressure increases, the opening value of the HPV valve remains constant until it enters the subcritical zone, in which the regulation restarts as previously described. It is possible to disable operation according to this mode by parameter.

Calculation of the customized setpoint (custom)

The customized calculation differs from the optimized control due to the fact that the curve in the subcritical phase is rectilinear and defined by the user, therefore the definition of the bands and the calculation of the setpoint can be customized by the user. Behaviour in the remaining bands is as described for the optimized algorithm.

HPV valve accessory functions

HPV valve management includes some accessory functions:

- **Pre-positioning**: entering the unit ON status, the HPV valve remains at a fixed position that can be set by a parameter for a fixed time, which is also settable by a parameter, in order to be able to quickly raise the pressure in the tank. This procedure is reactivated whenever the unit goes into the OFF status or the HPV valve moves into the minimum position due to all of the compressors being turned off (optional).
- **Valve closure with compressors off**: if all compressors in the medium temperature unit are turned off, the HPV valve can be positioned at the minimum opening value in the OFF status, which can be set by a parameter. When a compressor is restarted, the valve restarts the regulation with the pre-positioning procedure described in the previous point.
- **Minimum and maximum opening values**: the minimum opening value in Off status and in ON status can be differentiated (by keypad, digital input or supervisor) which the maximum opening value is unique.
- **Maximum percentage variation**: the movement of the valve cannot exceed the maximum set percentage variation per second.
- **Filter on setpoint**: the calculation of the regulation setpoint of the HPV valve can be done by taking into account the averages of the last ***n*** samples (maximum 99) to avoid sudden variations due to high variability of the output temperature of the gas cooler.
- **Minimum setpoint**: a minimum value can be set for the HPV valve setpoint, below which the setpoint can never go regardless of the parameters entered, in order to preserve the operation of the compressors.
- **Setpoint distance alarm**: if the gas cooler pressure is too far from the calculated setpoint for too long (threshold and delay can be set), an alarm can be triggered.

6.6.8 Control of the receiver pressure through the HPV valve

If the pressure in the receiver goes below the minimum work pressure set, the dynamic calculated setpoint for the HPV valve can be changed in order to increase the pressure in the receiver.

An offset in proportion to the distance from the minimum threshold is subtracted from the calculated setpoint so that the greater opening of the HPV valve contributes to increasing the pressure in the receiver.

The offset is directly proportional to the distance from the minimum work threshold, as illustrated in the figure:

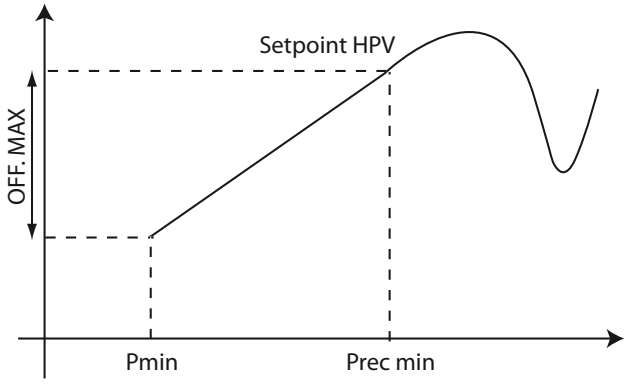


Fig. 6.ad

On the other hand, if the pressure in the receiver goes above the maximum work pressure set, the dynamic calculated setpoint for the HPV valve can be changed in order to decrease the pressure in the receiver.

An offset in proportion to the distance from the maximum threshold is added to the calculated setpoint so that the lesser opening of the HPV valve contributes to decreasing the pressure in the receiver.

The offset is directly proportional to the distance from the maximum work threshold, as illustrated in the figure:

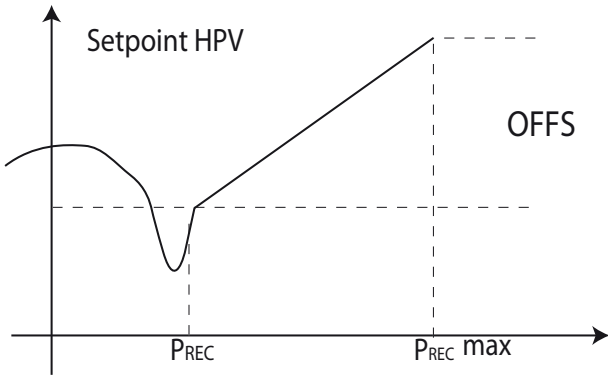


Fig. 6.ae

6.6.9 Summary of inputs, outputs and HPV valve par.

The following is a summary table of the inputs/outputs used and the parameters with indications of the related configuration screens. For details, refer to Appendix A.1.

Summary of inputs/outputs and HPV valve parameters

	Mask	Description
Analog inputs	Bab04, Daa39	Gas cooler pressure
	Bab61, Daa43	Gas cooler output temperature
	Bab09, Daa40	Gas cooler backup pressure
	Bab62, Daa44	Gas cooler output backup temperature
Digital inputs	Baade, Eia04	HPV valve alarm
Analog outputs	Bad14, Eia06	HPV valve output
Digital outputs	---	---

Parameters		
Settings	Eib01	HPV valve management enabled, or transcritical operation mode enabled
		Selecting the type of algorithm to apply to the calculation of the pressure setpoint
Zone definition	Eib05	$P_{100\%}$ upper pressure limit
		P_{max} pressure for defining the upper proportional zone
		P_{critic} optimal pressure calculated at the passage temperature between the intermediate zone and transcritical zone
		T_{12} temperature limit between the transcritical zone and intermediate zone
		T_{23} temperature limit between the intermediate zone and subcritical zone
		T_{min} temperature for defining the lower proportional zone
	Eib06	$T_{100\%}$ temperature for defining the complete opening zone of the valve
		Subcooling delta for optimized regulation
		Coefficient for determining the customized line
Regulation	Eib07	Proportional gain for the proportional + integral regulation of the HPV valve
		Integral time for the proportional + integral regulation of the HPV valve
		Proportional gain for the proportional + integral regulation of the HPV valve with heat recovery
		Integral time for the proportional + integral regulation of the HPV valve with heat recovery
	Eib16	Enabling the regulation of the gas cooler in the subcritical zone
Safeties	Eib02	Min. opening of the HPV valve with the unit OFF
		Min. opening of the HPV valve with the unit ON
	Eib03	Opening of the HPV valve at start-up during pre-positioning
		Pre-positioning duration
	Eib08	Enabling of the filter action on the HPV valve setpoint
		Number of samples
	Eib09	Enabling of different management of the HPV valve during heat recovery activation
		Setpoint regulation of the HPV valve during heat recovery
		Time scale for the setpoint reset procedure after heat recovery
		Pressure scale for the setpoint reset procedure after heat recovery
	Eib10	HPV valve safety position
	Eib11	Offset to be applied to the external temperature in the event of gas cooler temperature probe error
Safeties	Eib12	HPV valve safety procedure enabling
	Eib13	Receiver high pressure threshold
		Maximum allowed receiver pressure
		Maximum offset to add to the HPV setpoint when the receiver pressure exceeds the high pressure threshold
	Eib14	Receiver low pressure threshold
		Minimum allowed receiver pressure
		Maximum offset to subtract from the HPV setpoint when the receiver pressure goes below the low pressure threshold
	Eib15	Enable HPV valve closure when all compressors on line 1 are off
		Delay HPV valve closure when all compressors on line 1 are off
	Eib17	Enable warning function when the gas cooler pressure is too far from the setpoint for the set time
		Difference between the gas cooler pressure and the setpoint which generates the warning
		Delay time before generating the warning
	Eib32	Maximum opening of the HPV valve
		Maximum variation per second allowed for the HPV valve output
	Eib28	Minimum HPV valve regulation setpoint
		Enable low temp. control (lower proportional zone)

6.7 RPRV valve management

Management of the RPRV valve, which is a PI regulation, is to maintain the pressure inside the CO_2 receiver equal to the setpoint. The RPRV valve can be managed directly by pRack pR300T with built-in driver (PRK30TD***) or with external EVD EVO driver. Both solutions are compatible with the majority of valves available on the market. Direct control via serial connection is enabled under EEVS (electronic expansion valve settings), accessible from the main menu, branch E.i.c. The configuration parameters, on the other hand, are accessible from the main menu, branch E.i.

6.7.1 RPRV valve accessory functions

RPRV valve management includes some accessory functions:

- **Pre-positioning**: entering the unit ON status, the RPRV valve remains at a fixed position that can be set by a parameter for a fixed time, also settable by a parameter, in order to be able to quickly raise the pressure in the tank. This procedure is reactivated whenever the unit goes into the OFF status or the RPRV valve moves into the minimum position due to all of the compressors being turned off (optional).
- **Valve closure with compressors off**: if all compressors in the medium temperature unit are turned off, the RPRV valve can be positioned at the minimum opening value in the OFF status, which can be set by a parameter. When a compressor is restarted, the valve restarts the regulation with the pre-positioning procedure described in the previous point.
- **Minimum and maximum opening values**: the minimum opening value in Off status and in ON status can be differentiated (by keypad, digital input or supervisor) while the maximum opening value is unique.
- **Maximum percentage variation**: the movement of the valve cannot exceed the maximum set percentage variation per second.
- **Maximum receiver pressure**: a maximum value can be set for the receiver pressure, above which an alarm is triggered and unit operation can be blocked. The block is optional and can be enabled by a parameter.

6.7.2 Summary of inputs, outputs and RPRV valve parameters

The following is a summary table of the inputs/outputs used and the parameters with indications of the related configuration screens. For details, refer to Chapter 6 and Appendix A.1.

Summary of inputs/outputs and RPRV valve parameters

	Mask	Description
Analog inputs	Bab66, Eia01	RPRV receiver pressure probe
Digital inputs	Baadf, Eia05	RPRV valve alarm
Analog outputs	Bad15, Eia07	RPRV valve output
Digital outputs	---	---
Parameters		
Settings	Eib18	Enable RPRV valve management
Regulation	Eib22	Regulation setpoint for the CO2 receiver pressure
		Proportional gain for the proportional + integral regulation of the RPRV valve
		Integral time for the proportional + integral regulation of the RPRV valve
Safeties	Eib19	Minimum opening of the RPRV valve with the unit OFF
		Minimum opening of the RPRV valve with the unit ON
	Eib20	Opening of the RPRV valve at start-up during pre-positioning
		Pre-positioning duration
	Eib21	Maximum opening of the RPRV valve
		Maximum variation per second allowed for the RPRV valve output
	Eib23	HPV valve safety position
	Eib24	Enable RPRV valve closure when all compressors on line 1 are off
		RPRV valve closure delay when all compressors on line 1 are off
	Eib25	Receiver high pressure threshold alarm
		Receiver high pressure differential alarm
		Receiver high pressure alarm delay
		Receiver high pressure alarm reset type
		Enable compressor shutoff with receiver high pressure alarm

Tab. 6.d

6.8 Intercooler

pRack pR300T manages the gas cooler much the same way as pRack PR300 does for the condensers on a second condenser line, and activation is only available via the Wizard:

```
Wizard                Ib98
Configure intercooler
between the suction
lines?
                        NO
```

Only temperature control is available. The control variable is therefore the intercooler outlet temperature (measured by the probe, and not a converted pressure value).

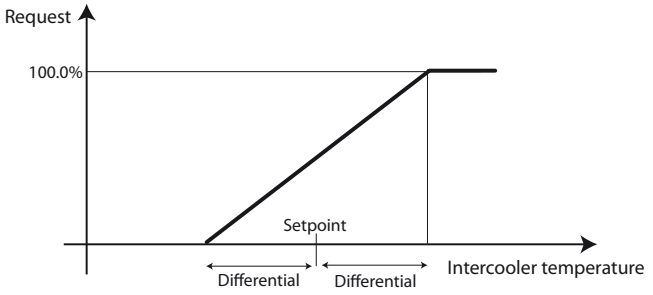


Fig. 6.af

If the intercooler temperature probe is faulty or not fitted, the compressor discharge temperature on the low temperature line (L2) can be used, where configured.

If, on the other hand, the low temperature compressor discharge temperature probe (L2) is not fitted or has an alarm, the controller can use the value converted from the suction pressure on the medium temperature line (L1).

The fans can also be managed with modulating operation by inverter; in this case, there is only one 0 to 10 V modulating output, while a different input can be used for each fan as regards the alarm signal. The function can be enabled and the related parameters set from main menu branch D.b.

The intercooler can be configured only if the second suction line is available (therefore on the pLAN 1 boards, if the double suction line is managed using one board, or pLAN 2 boards if the double suction line is managed using two boards).

The following functions are not available for the second line of fans (intercooler)::
- floating condensing;
- set point compensation;
- chillbooster;
- heat recovery;
- backup pressure probes;
- split condenser.

The pressure prevent function will be managed as configured on screen Gbb07:

```
L2-Prevent          Gbb07
Booster system
Use L1 suct.probe for
condensing line 2:
                        NO
(Prevent disabled:
disch.press.needed)
```

Selecting NO means the low temperature line discharge pressure (L2) needs to be configured for managing the PREVENT function, otherwise PREVENT will not be activated.
If the field is set to YES, the PREVENT function will work using the medium temperature line suction pressure (L1).

6.9 Energy saving

pRack PR300T can activate energy saving functions by adjusting the suction and condensing pressure set points. The suction and condensing pressure set points can be applied with two different offsets, one for the closing period and one for the winter period, activated by:
- Digital input
- Time band
- Supervisor

In addition, the suction pressure set point can be modified from analogue input, applying a linearly variable offset based on the value read by a probe. As well as set point compensation from digital input, scheduler, supervisor or analogue input, two further energy saving functions are available, floating suction and condensing pressure set point. The functions can be enabled and the related parameters set in main menu branch C.a.d/C.b.d and D.a.d/D.b.d.

6.9.1 Set point compensation

Compensation from digital input, scheduler or supervisor is similar for suction and condensing pressure set points, consequently the following description applies to both. Two different offsets can be defined, which apply to:
- Closing periods, defined by the scheduler, activation of a digital input or supervisor
- Winter period, defined by the scheduler

The two offsets add to the set point defined by the user when the corresponding condition is active.

Example 1: closing offset 0.3 barg, winter offset 0.2 barg, suction pressure compensation from scheduler and from digital input activated. When the digital input is activated, for example with a day/night function, 0.3 barg is added to the operating set point, and when the winter period is in progress a further 0.2 barg is added. The operation can be schematised in the following figure:

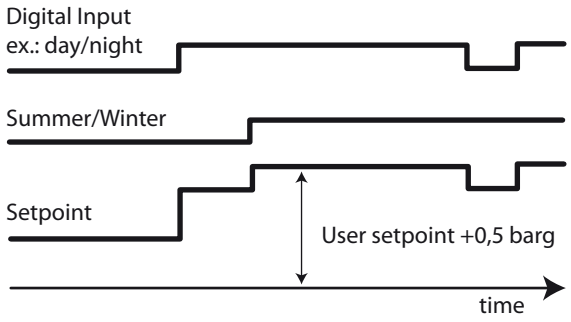


Fig. 6.ag

Note: the same digital input is used for set point compensation on each line, so if suction and condensing pressure set point compensation is activated by digital input, both compensation functions are active at the same time.

If compensation from analogue input is enabled, a offset that is linearly variable to the value read by a dedicated probe can be applied to the suction pressure set point, as shown in the figure.

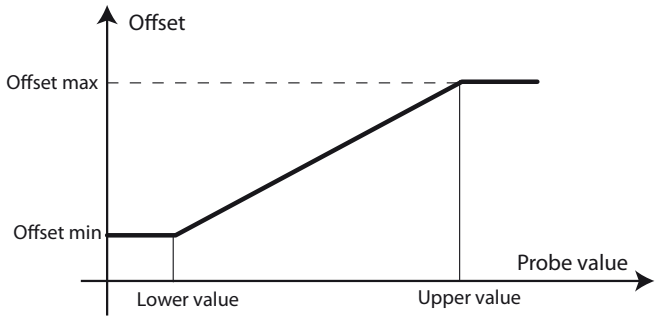


Fig. 6.ah

Compensation from analogue input applies to setpoint:
- suction
- gas cooler
- HPV minimum.

These compensations can be enabled separately.

6.9.2 Floating suction set point

For the suction line, the floating set point is managed by the supervisor. The suction pressure set point set by the user is changed by the supervisor in range between a settable minimum and maximum. The operation is illustrated in the following figure:

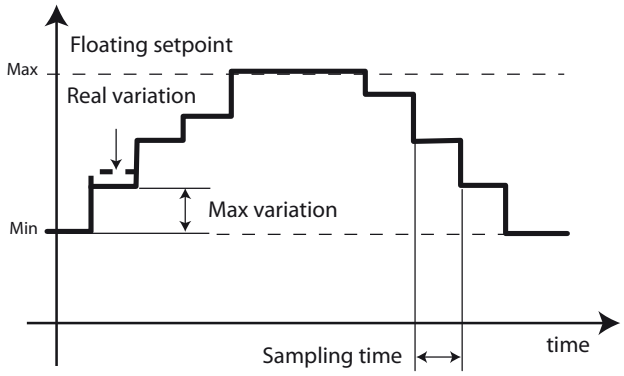


Fig. 6.ai

The set point is calculated by the supervisor and acquired by the pRack PR300T controller at set intervals, the maximum variation allowed for the set point in each sampling period can also be set; if the value acquired differs from the previous value by more than the maximum variation allowed, the variation is limited to the maximum value. If the supervisor is disconnected, after 10 minutes (fixed) the pRack PR300T controller starts decreasing the set point with variations equal to the maximum variation allowed each sampling period, until reaching the minimum set point allowed with floating suction pressure.

Note: if set point compensation from scheduler, digital input or supervisor is also active, the offset is added to the minimum and maximum limits for the floating set point.

6.9.3 Floating condensing set point

For the condenser line, the floating set point is based on the outside temperature. The floating condensing pressure set point is achieved by adding a constant programmable value to the outside temperature and limiting the resulting value between a settable minimum and maximum, as shown in the figure:

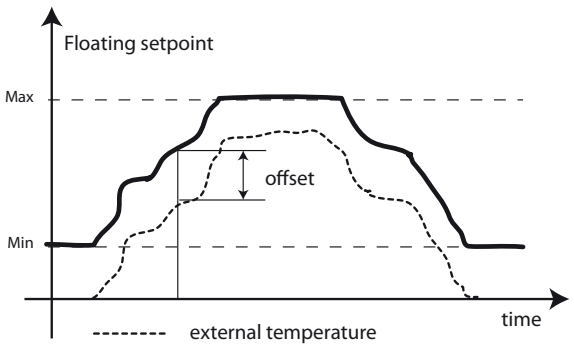


Fig. 6.aj

Note: if set point compensation from scheduler, digital input or supervisor is also active, the offset is added to the minimum and maximum limits for the floating set point.

6.10 Accessory functions

pRack PR300T can manage several accessory functions. Of these, the economizer and liquid injection have already been described in paragraph 6.3 on compressor operation, while the others are described below.

6.11 Oil management

pRack pR300T allows some additional functionalities for oil management, per individual compressor or per line:

- Individual compressor: oil cooling, oil injection.
- Line: common oil receiver

The functionalities can be enabled and the relative parameters can be set from main menu branch E.a.a/E.a.b.

6.11.1 Individual compressor oil management

Oil cooler

An oil cooler can be managed for the first 6 compressors in line 1, in order to keep the oil temperature under constant control. For each compressor, based on the value read by the oil temperature probe, an oil cooler digital output can be activated with a settable threshold and differential, as shown in the figure.

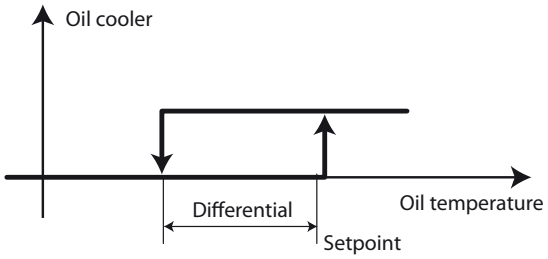


Fig. 6.ak

For each compressor, two alarms can also be managed for high or low oil temperature, setting the threshold, differential and delay.

Oil injection

An oil injection valve can be managed for each of the first 6 compressors in each line as shown schematically for three compressors in Fig. 6.ah. Valve activation is performed when the corresponding oil level digital input is active. The valve is opened in intermittent mode with settable opening and closing times, for a total time that is also settable. Once exceeded, if the digital input is still active a low oil alarm is generated. When the oil level digital input is not active, the valve is activated with opening and closing times which can be set at a different value, in order to allow the passage of a certain quantity of oil.

6.11.2 Oil management per line

A solenoid valve can be managed which connects the oil separator to the receiver based on the digital input reading of the oil level, which can be only minimum level or minimum and maximum level. Separator, receiver and valve are illustrated schematically in Fig. 5.a. If no oil level input is present, the solenoid valve can still be activated by connecting its operation to the status of the compressors. If only the minimum level is present, activation of the solenoid valve occurs intermittently for the entire time in which the minimum level is not active. The opening and closing times of the valve during activation can be set by a parameter. If the minimum level signal deactivates again, the valve remains deactivated for at least a minimum set closure time, as shown in the figure:

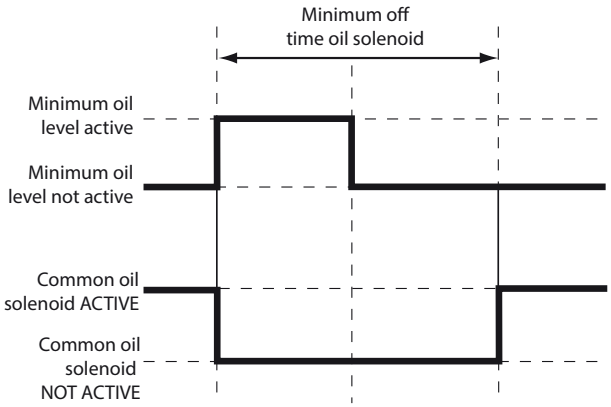


Fig. 6.al

Gestione olio comune
da livello minimo

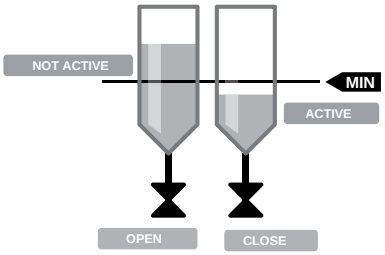


Fig. 6.am

If two levels are present, activation of the solenoid valve occurs when the maximum level is activated and remains activated in intermittent mode, with settable opening and closing times, for the entire time in which the minimum level is not active. If the minimum level signal is activated, the valve remains deactivated until the maximum level is reactivated again, as shown in the figure:

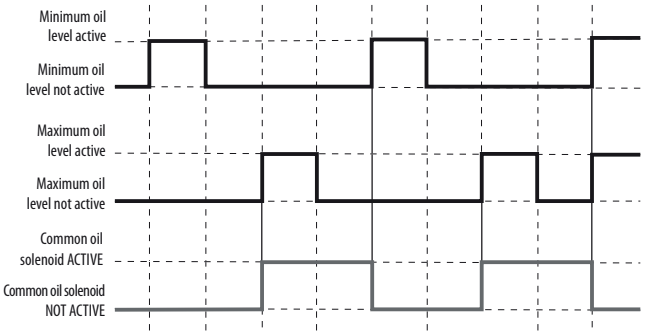


Fig. 6.az

Gestione olio comune
da livello minimo e massimo

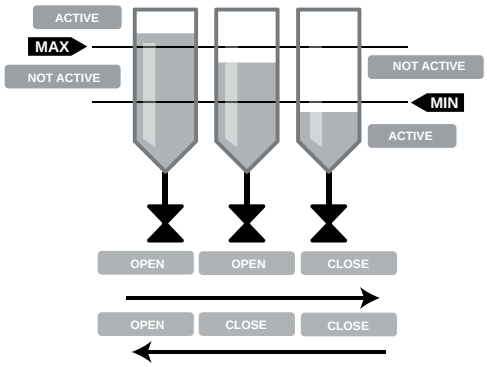


Fig. 6.ba

If no oil level input is present, activation of the solenoid valve occurs intermittently for the entire time in which at least one compressor is active. The opening and closing times of the valve during activation can be set by a parameter. In any case, if the pressure difference between the oil receiver and suction is less than a settable threshold for at least a settable time, the solenoid can be forced in intermittent mode with settable times. It is also possible to set different delay times, to be applied during normal operation, or when the pressure difference exceeds the threshold, in order to ensure pressurization of the receiver.

Common oil management based on differential pressure

pR300T also offers the possibility to configure an oil receiver pressure probe, directly from the "Inputs/Outputs" menu:
Inputs/Outputs → Status → Analog Inputs → Screen Bab63

as well as a digital output for the oil reservoir, again at the same path:
Inputs/Outputs →Status → Digital Outputs → Screen Bac71

This will manage the solenoid valve placed between the oil separator and receiver. Once these two I/Os have been enabled, a pressure differential threshold can be set between the oil receiver pressure and the suction line pressure, from the "Other functions" menu:
Other functions → Oil → Settings → Screen Eaab14

If the difference between the two pressure values is less than the threshold, the pR300T will open the pressurising solenoid valve between the separator and receiver. This activation may be delayed by a settable value in seconds. The valve will be closed immediately once the correct difference between the two pressure values has been restored.

6.11.3 Summary of inputs, outputs and oil parameters

The following are summary tables of the inputs/outputs used and the parameters with indications of the related configuration screens. For details, refer to Appendix A.1.

Summary of inputs/outputs and oil cooling parameters

	Mask	Description
Analog inputs	Bab41, Eaaa05	Oil temperature probe compressor 1 line 1
	Bab42, Eaaa06	Oil temperature probe compressor 2 line 1
	Bab43, Eaaa07	Oil temperature probe compressor 3 line 1
	Bab44, Eaaa08	Oil temperature probe compressor 4 line 1
	Bab45, Eaaa09	Oil temperature probe compressor 5 line 1
	Bab46, Eaaa10	Oil temperature probe compressor 6 line 1
Digital inputs	---	---
Analog outputs	---	---
Digital outputs	Eaaa16	Oil cooling compressor 1 line 1
	Eaaa19	Oil cooling compressor 2 line 1
	Eaaa22	Oil cooling compressor 3 line 1
	Eaaa25	Oil cooling compressor 4 line 1
	Eaaa28	Oil cooling compressor 5 line 1
	Eaaa31	Oil cooling compressor 6 line 1
Parameters	Eaab15	Enable oil cooling compressors (line 1)
		Oil cooling functioning only when compressor functioning
	Eaab08	Oil temperature setpoint (line 1)
		Oil temperature differential (line 1)
		Fan startup time in case of oil probe error (line 1)
		Fan shutdown time in case of oil probe error (line 1)
	Eaab16	Oil cooler high temperature alarm threshold (line 1)
		Oil cooler high temperature alarm differential (line 1)
		Oil cooler high temperature alarm delay (line 1)
	Eaab20	Oil cooler low temperature alarm threshold (line 1)
		Oil cooler low temperat. alarm differential (line 1)
		Oil cooler low temperature alarm delay (line 1)

Tab. 6.e

Summary of inputs/outputs and oil injection parameters

	Mask	Description
Analog inputs	Bab62	Oil differential pressure probe 1 line 1
	Bab66	Oil differential pressure probe 1 line 2
Digital inputs	Eaaa57	Oil level compressor 1 line 1
	Eaaa58	Oil level compressor 2 line 1
	Eaaa59	Oil level compressor 3 line 1
	Eaaa60	Oil level compressor 4 line 1
	Eaaa61	Oil level compressor 5 line 1
	Eaaa62	Oil level compressor 6 line 1
	Eaba17	Oil level compressor 1 line 2
	Eaba18	Oil level compressor 2 line 2
	Eaba19	Oil level compressor 3 line 2
	Eaba20	Oil level compressor 4 line 2
	Eaba21	Oil level compressor 5 line 2
	Eaba22	Oil level compressor 6 line 2
Analog outputs	---	---
Digital outputs	Eaaa40	Oil level valve compressor 1 line 1
	Eaaa41	Oil level valve compressor 2 line 1
	Eaaa42	Oil level valve compressor 3 line 1
	Eaaa43	Oil level valve compressor 4 line 1
	Eaaa44	Oil level valve compressor 5 line 1
	Eaaa45	Oil level valve compressor 6 line 1
	Eaba40	Oil level valve compressor 1 line 2
	Eaba41	Oil level valve compressor 2 line 2
	Eaba42	Oil level valve compressor 3 line 2
	Eaba43	Oil level valve compressor 4 line 2
	Eaba44	Oil level valve compressor 5 line 2
	Eaba45	Oil level valve compressor 6 line 2
Parameters	Eaab10	Enable oil level management (line 1)
		Number of compressor alarms associated with the oil level (line 1)
	Eaab11	Oil level valve opening time (line 1)
		Oil level valve closing time (line 1)
		Delay for oil level valve pulsing at startup (line 1)
		Maximum pulsing time for the oil level valve (line 1)
	Eabb10	Enable oil level management (line 2)
		Number of compressor alarms associated to the oil level (line 2)
		Oil level valve opening time (line 2)
		Oil level valve closing time (line 2)
	Eabb11	Delay for oil level valve pulsing at startup (line 2)
		Maximum pulsing time for the oil level valve (line 2)

Tab. 6.f

Summary of inputs/outputs and oil receiver level parameters

	Mask	Description
Analog inputs	Bab63	Oil separator differential pressure probe line 1
	Bab65	Oil separator differential pressure probe line 2
Digital inputs	---	---
Analog outputs	---	---
Digital outputs	Bac71	Oil separator line 1
	Baceo	Oil separator line 2
Parameters	Eaab12	Type of oil level separator control: with minimum level only, with minimum and maximum level and with compressor status (line 1)
		Minimum separator valve closing time (line 1)
		Minimum oil level detection delay (line 1)
	Eaab13	Valve opening time during oil level reset (line 1)
		Valve closing time during oil level reset (line 1)
		Valve opening time with correct oil level (line 1)
		Valve closing time with correct oil level (line 1)
	Eaab15	Oil receiver differential pressure threshold (line 1)
		Oil receiver differential pressure (line 1)
		Oil receiver differential pressure delay (line 1)

Tab. 6.g

6.12 Subcooling

pRack PR300T can control subcooling in two different ways:
- with the condensing temperature and the liquid temperature
- with the liquid temperature only

In the first case, subcooling is calculated as the difference between the condensing temperature (obtained by converting the condensing pressure) and the liquid temperature measured after the exchanger.
The corresponding output is activated below a set threshold, with fixed differential.

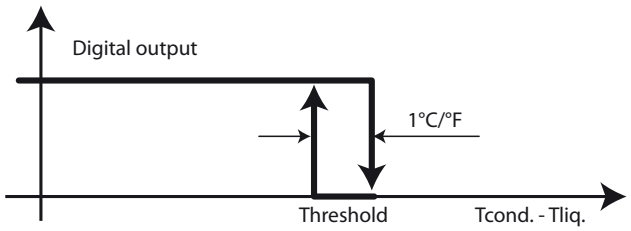


Fig. 6.an

In the second case, the output is active for liquid temperature values greater than a threshold, with fixed differential.

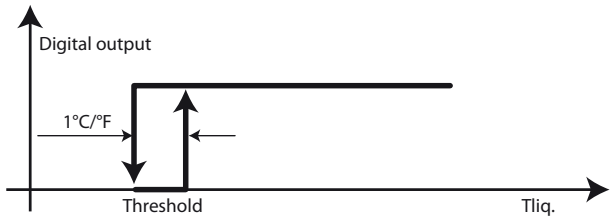


Fig. 6.ao

The subcooling function can be enabled and the related parameters set in main menu branch E.b.a/E.b.b.

Note: the subcooling function is active when at least one compressor is on.

6.13 Heat recovery

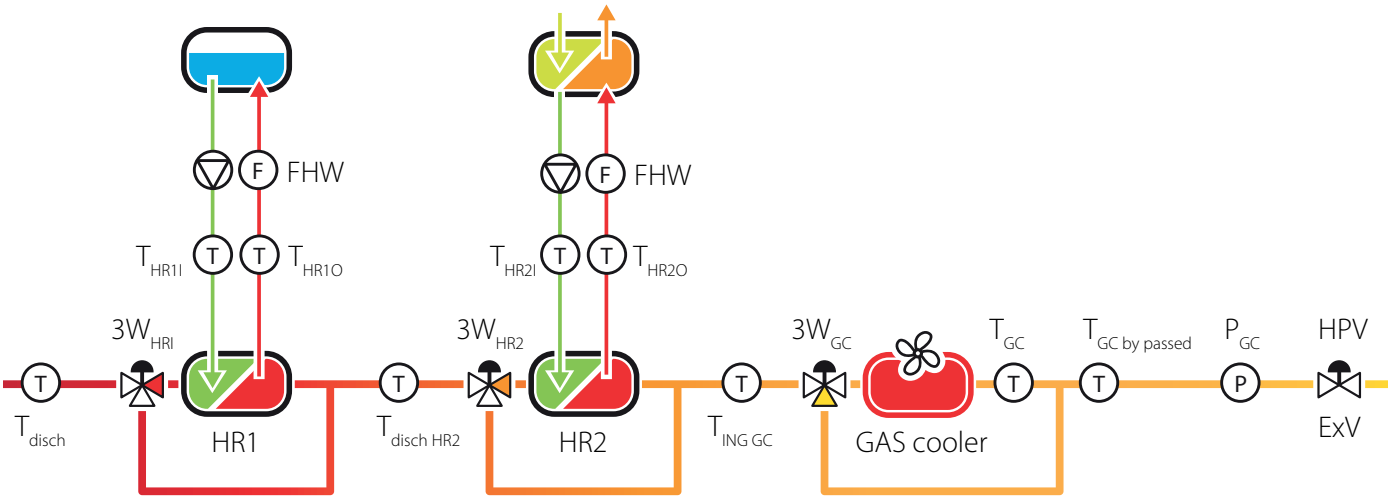


Fig. 6.ap

pRack pR300T manages up to two heat recovery functions at the same time. The related parameters can be set from the main menu, branch E.e.a.b.01.

Activation and control of each heat recovery function will reflect the percentage of heat demand calculated based on one of the following:
- digital input
- temperature probe
- external analogue signal

In the last two cases, a digital input can still be used to enable the function.

Once active, heat recovery control can act on the HPV valve set point and on the effective Gas Cooler set point, in both simultaneous mode (acting on both at the same time) and in sequential mode, based on thresholds (first acting on the HPV and then the Gas Cooler, when exceeding a certain heat demand threshold):
- action on HPV set point (in barg/psig)
- action on GC set point °C/°F)

When acting on the HPV valve set point, the heat recovery function modifies the "Minimum HPV valve control set point" parameter (screen Eib28), whose default value is 40.0 barg and used as a lower limit for calculating the dynamic pressure set point for controlling the high pressure valve.

Increasing this minimum set point from its default value (40.0 barg) to a new minimum set point (e.g. 75.0 barg) causes the system to operate in transcritical conditions, even when the Gas Cooler outlet temperature is between Tmin and T23 (see the control parameters, screen Eib05); in this zone, defined as subcritical, the HPV set point would be calculated based on subcooling.

This minimum set point can be increased further (screen Eeab28) in proportion to the heat recovery demand, up to a settable maximum limit value (e.g. 85.0 barg).

If the HPV valve set point calculated based on the Gas Cooler temperature exceeds the minimum set point modified by the heat recovery function, the controller will use the calculated set point.

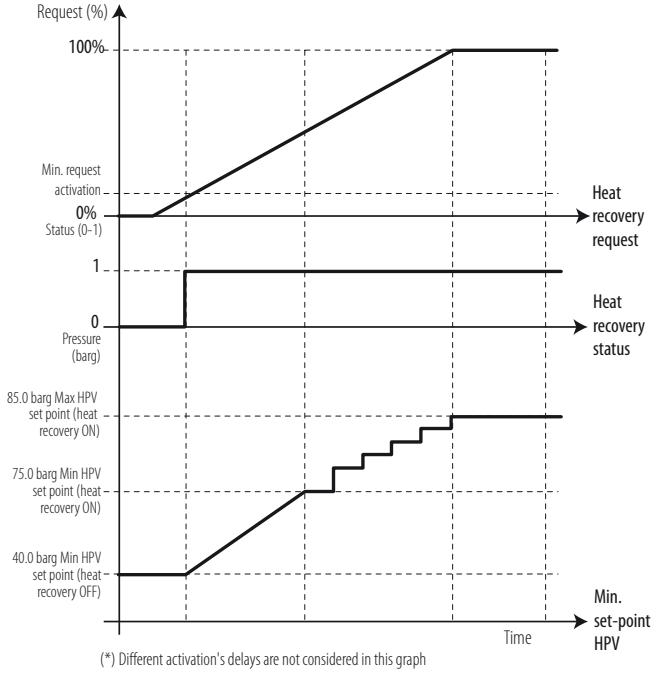


Fig. 6.aq

When acting on the on the Gas Cooler set point, the Gas Cooler fan temperature set point can be increased gradually to the maximum limit.

This limit is equal to the maximum allowable set point (screen Dab06) when operating in simultaneous mode, or the value set on screen Eeab29 in sequential mode.

In simultaneous mode, the increase will start at the same time as the action on the HPV valve set point, while in sequential mode the increase will start after having exceeded a settable heat demand percentage limit threshold (Eeab29).

If the floating condensing function is active (branch D.a.d), this can be disabled when heat recovery is active (Eeab04), however if it is enabled while heat recovery is active, the Gas Cooler set point increase can be added directly to the outside temperature.

- CFloating condensing without heat recovery: SP=Tout+ΔT (screen Dad06)
- Floating condensing during heat recovery (acting on GC): SP=Tout+OffsetGC; where OffsetGC> ΔT
- As the last step of the heat recovery function, the Gas Cooler can be bypassed when the following conditions are true:
- bypass is enabled (screen Eeab)
- the heat demand percentage exceeds a settable limit value (e.g. 90%)
- the bypassed gas temperature cooler is lower than a certain settable limit value (e.g. 20°C)

When these conditions are true, the bypass valve will start modulating, with its set point being calculated based on the bypassed Gas Cooler temperature, until the Gas Cooler is completely bypassed when the temperature allows.

When heat recovery is deactivated, the HPV valve set point gradually returns to the calculated value, over a settable time. The same is also true for the condenser control set point.

6.14 Generic functions

pRack pR300T allows the use of free inputs/outputs and some internal variables for generic functions.

Attention: generic functions are available on the pRack pR300T boards with pLAN address from 1 to 4, or on all boards that manage a suction or condensing line, however only the parameters related to the functions managed by boards 1 and 2 are sent to the supervisor system.

The generic functions available for each board are:
- 5 stages
- 2 modulations
- 2 alarms
- 1 scheduler

Each function can be enabled/disabled by digital input or user interface.

The functionalities can be enabled and the relative parameters can be set from main menu branch E.f.

To be able to use the free inputs they must be configured as generic probes from A to E (analog inputs) and generic inputs from F to J (digital inputs), so a maximum of 5 analog and 5 digital inputs can be used. After having configured the generic probes, the variables associated with them can be used as regulation variables and the digital inputs as enabling variables. Besides the probes and generic inputs, internal variables in the pRack pR300T software can be used, which depend upon the configuration of the system. Some examples, for analog variables, are:
- Suction pressure
- Gas cooler pressure
- Saturated suction temperature
- Gas cooler temperature
- Suction temperature
- Discharge temperature
- % of compressors active
- % of fans active
- Superheating
- Subcooling
- Liquid temperature
- % requested compressors
- % requested fans

for digital variables:
- High suction pressure alarm
- Low suction pressure alarm
- High gas cooler pressure alarm
- Low gas cooler pressure alarm
- Sign of life
- Prevent active

A unit of measure and description can be associated to each generic function. The following shows the operation of 4 types of generic functions.

Stages

pRack pR300T can manage up to 5 stage functions, with either direct or reverse operation.
In both cases a setpoint and differential can be set and the operation of the related output is illustrated in the figure for both cases:

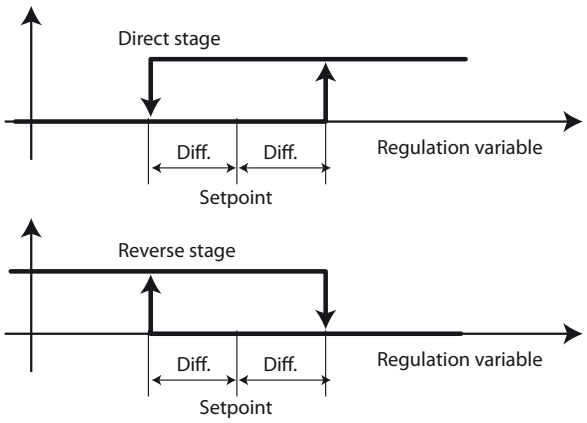


Fig. 6.ar

If an enabling value is set, the output connected to the stage is active if the enabling is also active. For each stage, a high alarm and low alarm threshold can be enabled and they are absolute. For each alarm, the activation delay and priority can be set. See Chapter 8 for details on the alarms. An example of using the generic stage functions may be the activation of the fans on the room units based on the temperature.

Modulation

pRack pR300T can manage up to 2 modulation functions, with either direct or reverse operation. In both cases a setpoint and differential can be set and the operation of the related output is illustrated in the figure for the direct mode, where the cut-off function is also enabled:

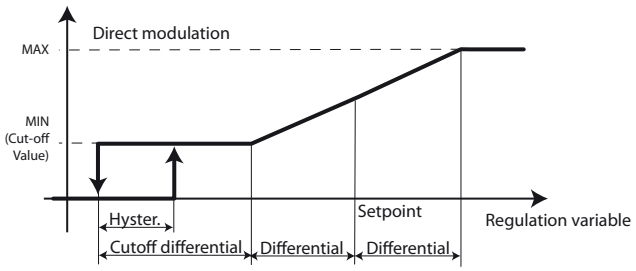


Fig. 6.as

If an enabling value is set, the output connected to the stage is active if the enabling is also active. For each modulation, a high alarm and low alarm threshold can be enabled and they are absolute. For each alarm, the activation delay and priority can be set. See Chapter 8 for details on the alarms. For modulation, a minimum and maximum value can also be set for the output and the cut-off function can be enabled, which operates as shown in the previous figure.

Alarms

pRack pR300T can manage up to 2 alarm functions, for which a digital variable to be monitored, activation delay, priority and any description can be set. A digital output can be associated to each general alarm function for the activation of external devices when the alarm is triggered. One example of use of the generic alarm functions is the detection of gas leaks.

Scheduler

pRack pR300T can manage a generic scheduler which activates a digital output in certain time bands. Up to 4 daily time bands can be set for each day of the week. Operation of the generic scheduler can also be linked to the common scheduler and the output activated based on:
- summer/winter
- up to 5 closing periods
- up to 10 special days

See Paragraph 6.7.2 in the pRack PR300T manual code +0300011EN for details on the time bands.

6.14.1 ChillBooster

pRack PR300T can control the Carel ChillBooster, device used for evaporative cooling of the air that flows through the condenser.

ChillBooster can be enabled and the related parameters set in main menu branch E.g.

ChillBooster is activated when two conditions exist:
- the outside temperature exceeds a set threshold
- the fan control request is at the maximum for at least a settable number of minutes

The maximum request time starts counting again whenever the request decreases, therefore the request must remain at the maximum for at least the set time. Activation ends when the request falls below a set threshold.

pRack PR300T can manage an alarm digital input from ChillBooster, the effect of which is to deactivate the device.

As the number of operating hours of ChillBooster is critical as regards formation of scale on the condenser, pRack PR300T can manage the operating hour threshold, which should be set to 200 hours.

Hygiene procedure

To avoid water stagnation in the pipes, a hygiene procedure can be enabled that activates ChillBooster every day for a set time, if the outside temperature is greater than a threshold.

Note: if the outside temperature probe is not configured or is configured but is not working, ChillBooster operates based solely on the control request, and the hygiene procedure can still be activated.

The only difference between probe not configured and probe not working concerns the ChillBooster operating without temperature probe alarm, which is only generated when the probe is configured but not working.

ChillBooster as the first stage in high pressure prevention

ChillBooster can be used to prevent high condensing pressure. The parameters relating to this function can be set in branch G.b.a/G.b.b in the main menu, after having enabled the ChillBooster function. For details on the prevent function see paragraph 8.3.3. Operation of ChillBooster as the first stage in high pressure prevention is Similar to the heat recovery function described in paragraph 6.6.3. The function must be enabled and an offset must be set in relation to the prevent.

6.15 Double line synchronization (DSS)

pRack pR300T can manage some synchronization functions between the two lines:
- Inhibition of contemporary compressor starts
- Forcing the medium temperature line if the low temperature line is activated
- Turning off the low temperature line if the medium temperature line is in a serious alarm condition

The three DSS functions can be enabled independently

Attention: in the pRack pR300T software, it is assumed that the medium temperature line is line L1 while the low temperature line is L2.

DSS can be enabled and the relative parameters can be set from main menu branch E.f.

Inhibition of the contemporary starts

The inhibition of contemporary starts of the compressor can be useful for all system configurations with two separate lines and in cascading system configurations. The function that prevents contemporary starts can be enabled and a delay time can be set for compressor starts belonging to different lines.

Forcing the medium temperature line

Forcing the medium temperature line can be useful for cascading system configuration and, once enabled, can force the startup at minimum power of at least one compressor in the medium temperature L1 line if at least one compressor in the low temperature L2 line is on.

This means that before turning on the low temperature line, the DSS forces at least one of the compressors in the medium temperature L1 line to turn on at minimum power. The low temperature L2 line thus has greater priority in relation to the request coming from the regulation for the medium temperature L1 line.

Turning off the low temperature line

Turning off the low temperature line is forced by the DSS if a serious alarm occurs which turns off all of the alarms in the medium temperature line or, in general, if the medium temperature line is OFF.

Enable pump-down on medium temperature line

During normal compressor rack operation, when at least one compressor on the low temperature line is running, the medium temperature compressor control will enable pump-down. If there is demand, the minimum capacity step will be guaranteed, only if the medium temperature line suction pressure is below a set threshold.

Note: in the event of failure of the pLAN network, the DSS is disabled

6.16 EEVS: Electronic Expansion Valve Synchronization

The new software for managing transcritical systems features the possibility to manage the 2 stepper valves for high pressure and flash gas control directly from the pRack controller. The built-in driver on PRK30TD*** controllers or the external driver (EVD) is controlled via fieldbus. Direct communication between controller and driver is used to synchronise compressor rack operation and electronic expansion valve control.
Communication is managed inside the controller (on PRK30TD*** codes) or via RS485 serial for external drivers. One single interface (pRack) can thus be used to monitor / set the main parameters for the EVDEVO and view them via the supervisor (Modbus communication). The FIELDBUS DRIVER offers the possibility to use 4 additional analogue inputs (S1, S2, S3 and S4) directly from pRack.
Where:
S1 Probe 1 (pressure) or external 4 to 20 mA signal
S2 Probe 2 (temperature) or external 0 to 10 V signal (*)
S3 Probe 3 (pressure)
S4 Probe 4 (temperature)

6.16.1 HPV and RPRV valve connection

The HPV and RPRV valves can be connected:
- directly, controlling the valves using a 0-10 V output on pRack pR300T

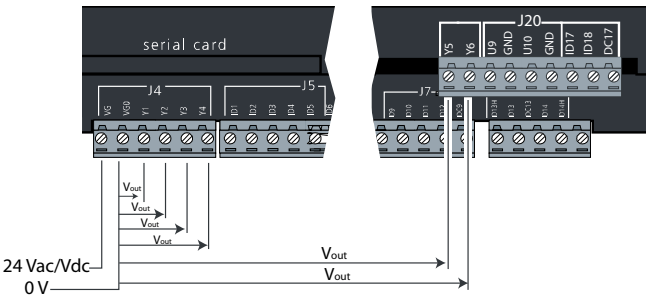


Fig. 6.at

(*): If one of the two valves is controlled by the driver Carel, while the other, just is controlled by a signal 0...10V, remember to disable the last one from the driver with mask Ib99 during Wizard operation or mask Eic01 if Wizard is completed.

- via an EVD EVO driver configured as 0 to 10 V positioner to control Carel stepper valves (pressure less than 45 barg) or third party valves (fig. 2.f)

EVD + pRack pR300T connections:

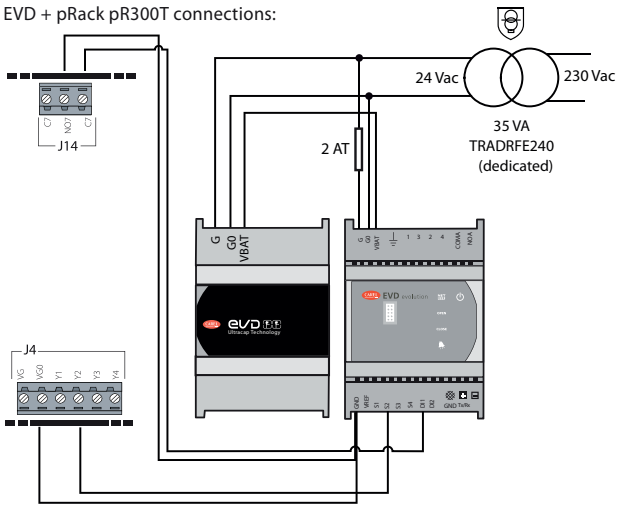


Fig. 6.au

- via a EVD EVO external driver (fig. 2.g) or integrated in PRK30TD*** models, in both cases using fieldbus serial.

EVD + pRack pR300T connections: via filedbus

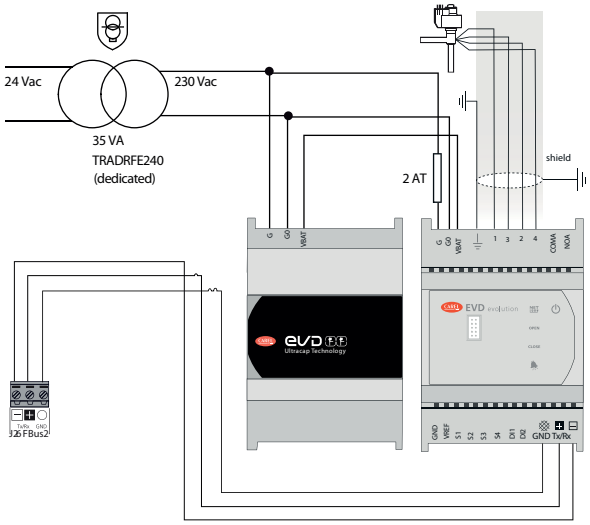


Fig. 6.av

6.16.2 Unit of measure

pRack PR300T can manage two units of measure, the international system and Imperial.

Note: the temperature and pressure units of measure can be changed from °C, barg to °F, psig only during start-up; mixed configurations are not allowed, for example °F and barg.

6.16.3 Sign of life

pRack PR300T can manage a digital output acting as a sign of life, activated when pRack PR300T is powered up. This output remains active while the controller is working correctly and highlights any hardware faults. The Signal can be configured in main menu branch B.a.c.

6.16.4 Liquid non-return

pRack PR300T can manage a digital output with the meaning of liquid non-return. This normally active output is deactivated when all the compressors are off and no compressor can be started due to alarms or time settings, despite the control request, or when the unit is OFF. As soon as at least one compressor is enabled to start, the output is deactivated, allowing management of a liquid non-return valve. The function can be configured in main menu branch C.a.g/C.b.g.

6.16.5 Parallel compressor

pRack pR300T can enable a line of compressors in parallel to the medium temperature suction line upstream of the RPRV valve using a dedicated board, and starting from version 3.3.0 this board can be enabled via pLAN. If managing a single parallel compressor (again starting from version 3.3.0), the main control board can be used, i.e. without requiring a dedicated board.

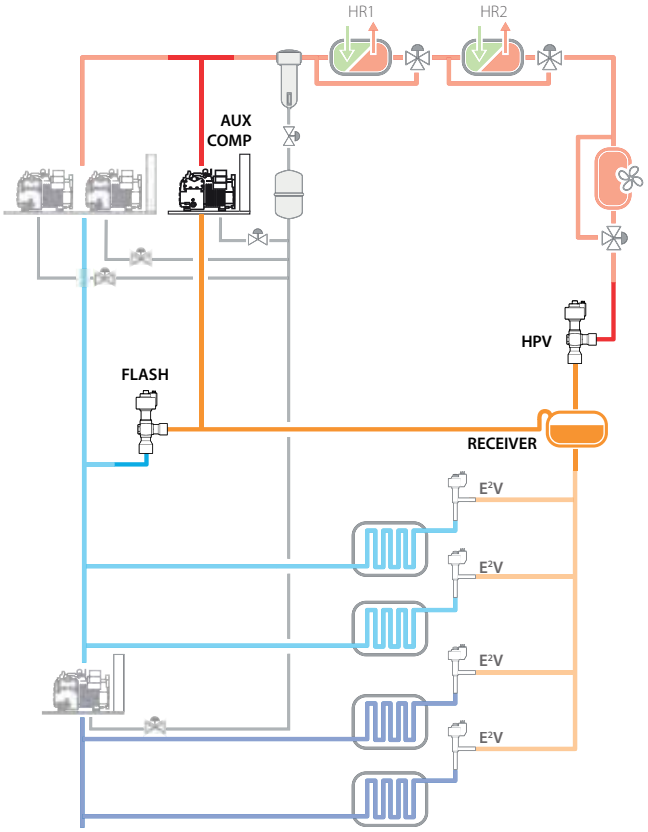


Fig. 6.aw

This function is configured in branch COMPRESSORS →c.Parallel compress.

```
Compressors          3/3
a. Line 1
b. Line 2
c. Parallel compression
```

If the parallel compressor line is managed using an additional board (via pLAN or connected via DI/DO):

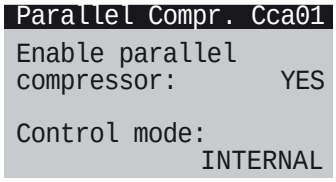
```
Parallel Compr. Cca01
Enable parallel
compressor:        YES
Control mode:
          EXTERNAL PLAN
```

```
Parallel Compr. Cca01
Enable parallel
compressor:        YES
Control mode:
          EXTERNAL I/O
```

in both cases, the board follows the configuration and relative restrictions described in the paragraphs on control 6.3 and compressors 6.4.

Consequently, the first compressor in the parallel line can be controlled by inverter. It is recommended to use a suction pressure set point value for the parallel line that is the same as the receiver pressure set point for proportional control, while the set point should be slightly lower than the latter for neutral zone control (1 barg difference between the two set points should be sufficient).

If on the other hand there is a single parallel compressor managed directly by the main board:



Compressor control is proportional with integration error, P+I, and the various settings, relating to:
- times;
- control;
- inverter modulation;
- alarms;
- analogue output configuration;

can all be found inside the same menu: C.Compressors → c.Parallel compression → Ccaxy (see the parameter table)

The main variables used to manage activation and control of the parallel compressor are:
- gas cooler outlet temperature;
- RPRV valve opening percentage;
- receiver pressure set point.

The parallel compressor is activated when the following conditions are true:
- gas cooler outlet temperature above a settable threshold;
- RPRV valve opening percentage above a settable threshold.

At the same time as the parallel compressor is activated, the receiver pressure set point will be increased by a settable offset in a settable time.

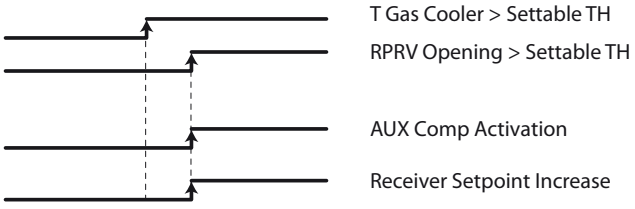


Fig. 6.ax

Increasing the receiver set point results in the flash gas valve (RPRV) closing. The parallel compressor is not affected by a decrease in the opening of the RPRV valve, however remains active until parallel compressor control reaches the set point (depending on how the controller is configured)

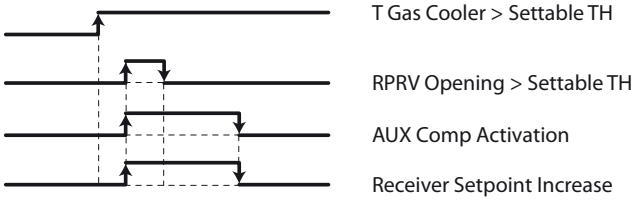


Fig. 6.ay

If, on the other hand, the Gas Cooler outlet temperature falls below the activation threshold, the card that manages the parallel compressor no longer receives the enabling signal and thus switches off the parallel compressor:

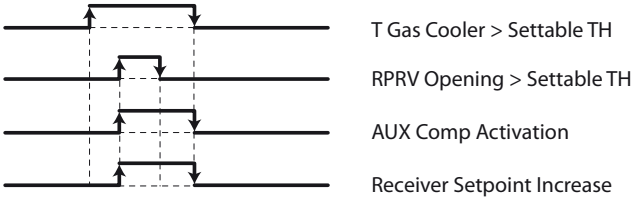
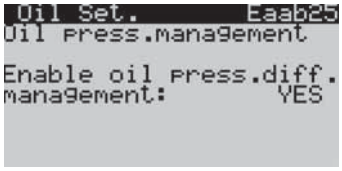
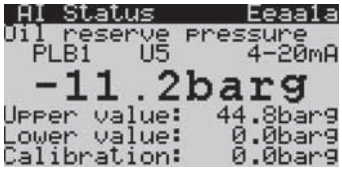


Fig. 6.az

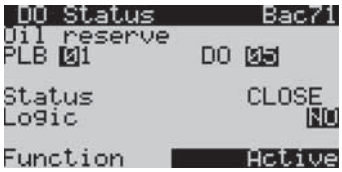
Oil differential management with parallel compression
The parallel compression function, either integrated (single compressor) or via pLAN, can also be included in the common oil management by differential pressure (also see paragraph 6.10.2), and is enabled on screen Eaab25:



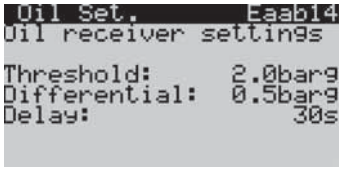
Differential oil pressure control by dedicated pressure probe, screen Eeaa1a:



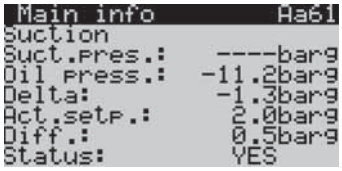
This manages the opening of the solenoid valve, screen Bac71.



This digital output is dedicated to the common solenoid valve installed between the oil separator and oil receiver.
When the oil reservoir pressure approaches the threshold (delta) set on screen Eaab14:



This will trigger the opening of the valve so as to pressurise the oil reservoir and ensure correct oil flow to the compressors.
The delta is calculated based on the difference between the medium temperature compressor suction pressure and the oil receiver pressure.
The status of the function can be checked on screen Aa61:



For integrated parallel compression (single compressor), when the parallel compressor is active, the reference for calculating the delta will no longer be more the medium temperature line compressor suction pressure, but rather the (liquid) receiver pressure, which coincides with the parallel compressor suction pressure
The changeover in reference from suction to receiver pressure is automatic, and does not need to be enabled.

For parallel compression enabled via pLAN, the same I/Os (oil receiver pressure probe and solenoid valve digital output) and the same settings (delta and differential) can be used as seen above, or new I/Os and new parameters can be set on the parallel compressor board (always on screen Eaab25)

6.17 Settings

6.17.1 Clock

pRack PR300T features an internal clock with backup battery that keeps the time and date for all related functions (see Chapter 2 for details relating to the hardware).

The date on pRack PR300T can be set as follows:
- day, month, year (dd/mm/yy)
- month, day, year (mm/dd/yy)
- year, month, day (yy/mm/dd)

The current date and time can be set, the day of the week corresponding to set date displayed, plus changeover to daylight saving can be enabled by setting the changeover date and the deviation.

The related parameters can be set during start-up or in main menu branch F.a.

Note: the date and time are managed on pRack boards with addresses 1 and 2; on power-up and whenever the pLAN network is reconnected, the software on pRack synchronises the settings on board 2, sending the date and time set on board 1.

If the clock card is not operating, an alarm is generated and the functions relating to the time bands described in the following paragraph are not available.

6.17.2 Time bands

pRack PR300T allows the operating seasons, the closing periods and weekends to only be set once, and consequently these are common to all the system functions.

As well as these settings, each function can be associated with a weekly scheduler, setting up to 4 different daily activation bands for each day of the week. For each time band, the start and end time can be set and settings made can be copied to the others days of the week.

The priority of the schedulers, from lowest to highest, is:
- weekly scheduler
- closing periods
- special days

For example, if the weekly scheduler requires activation of a function, yet a closing period is in progress, and requires deactivation of the same function, then the function is deactivated.
The following functions allow the setting of time bands:
- Split-condenser: the function is active only based on the operating seasons, and consequently special days, closing periods and daily time bands are ignored.
- Silencer: the function is only active with daily time bands, there is no link to operating seasons, special days and closing periods
- Heat recovery: the function is active with daily time bands, special days and closing periods, no link to operating seasons. The link to the general scheduler can be disabilitato, considering the time bands only.
- Set point compensation: active with operating seasons, special days, closing periods and daily time bands (two different offsets).
- Generic functions: the generic scheduling function is active with the operating seasons, special days, closing periods and daily time bands. Operation of the generic functions can be separated from the generic scheduler, considering the daily time bands only.

For details on the functions that use time bands, see the corresponding paragraphs.

6.18 Managing the default values

pRack PR300T can manage two different sets of default values:
- user defaults
- Carel defaults

The two functions can be activated in main menu branch I.d.

Important: after having reset the default values, the pRack PR300T board need to be switched off and on again.

6.18.1 Saving and resetting the user default values

pRack PR300T can save the exact configuration set by the user inside the instrument, allowing it to be recalled at any time.

All the set values are saved, therefore loading user defaults restores the exact same conditions that the pRack PR300T controller was in when the data were saved.

Note: only one user default configuration can be saved, therefore when the data is next saved, this overwrites the previous data.

Important:
- the Carel default reset procedure totally deletes the pRack PR300T permanent memory, and consequently is an irreversible operation;
- the user values cannot be reset after updating the software on the pRack PR300T (see Chapter 10).

6.18.2 Resetting the Carel default values

The Carel default values are shown in the Parameters table.

The values pre-set by Carel can be installed at any time, restoring the pRack PR300T default settings, and requiring the startup procedure described in Chapter 4 to be repeated.

Important: the Carel default reset procedure totally deletes the pRack PR300T permanent memory, and consequently is an irreversible operation; nonetheless, the user settings can still be restored if these have already been saved. Given that pRack PR300T, following the installation of the Carel default values requires the startup procedure to be repeated, select the first pre-configuration and then restore the user defaults.

Note: to complete a new configuration procedure (reffer to Chapter 4), first restore the Carel default values.

7. PARAMETERS AND ALARMS TABLE

7.1 Parameter table

"Mask index": indicates the unique address of each screen and therefore the path for reaching the parameters in that screen. For example, to reach the parameters related to the suction pressure probe with mask index Bab01, proceed as follows:

 Main Menù I/O B.In./Out.➔a.Status➔b.Analog.in.

Below is the table of parameters that can be displayed on the terminal.
The values indicated with '---' are not significant or are not set, while the values indicated with '...' may vary according to the configuration and the possible options are visible on the user terminal. A line of '..' means that there are a series of parameters similar to the previous ones.

Note: not all of the screens and parameters in the table are always visible/settable, the visible/settable screens and parameters depend upon the configuration and access level.

Mask index	Display description	Description	Def.	U. of M.	Values
Main Mask					
	---	Hour and minutes	---	...	...
	---	Date	---	...	...
	Suction	Suction pressure or temperature	---	...	...(**)
	Gas cool.	Gas cooler pressure or temperature	---	...	...(**)
	Superheat	Superheating	---	...	...(**)
	Suc.Temp.	Suction temperature	---	...	...(**)
	Disch.Temp.	Discharge temperature	---	...	...(**)
Main mask for individual suction line and individual condensing line (display only)	---	Unit status (with unit OFF)	---	---	Unit OFF due to Alarms Unit OFF due to black out Unit OFF from supervisor Unit OFF from default Unit OFF from digital input Unit OFF from keypad Unit OFF from manual mode
	---	Number compressors on (with unit ON)	---	---	0...12
	---	Compressor activation percentage (with unit ON)	---	%	0...100
	---	Number of fans on (with unit ON)	---	---	0...16
	---	Fan activation percentage (with unit ON)	---	%	0...100
	---	Hour and minutes	---	...	...
	---	Date	---	...	...
	L1-Suction	Suction pressure or temperature (line 1)	---	...	...(**)
	L1-Gas cool.	Gas cooler pressure or temperature (line 1)	---	...	...(**)
	L1-Superheat	Superheating (line 1)	---	...	...(**)
	L1-Suc.Temp.	Suction temperature (line 1)	---	...	...(**)
	L1-Disch.Temp.	Discharge temperature (line 1)	---	...	...(**)
Main mask for double suction line and double condensing line, masks separated per each line (display only)	---	Unit status (with unit OFF)	---	---	See individual line mask values
	---	Number compressors on (with unit ON, line 1)	---	---	0...12
	---	Compressor activation percentage (with unit ON, line 1)	---	%	0...100
	---	Number of fans on (with unit ON, line 1)	---	---	0...16
	---	Fan activation percentage (with unit ON, line 1)	---	%	0...100
	L2-Suction	Suction pressure or temperature (line 2)	---	...	...(**)
	L2-Condens.	Condensing pressure or temperature (line 2)	---	...	...(**)
	L2-Superheat	Superheating (line 2)	---	...	...(**)
	L2-Suc.Temp.	Suction temperature (line 2)	---	...	...(**)
	L2-Disch.Temp.	Discharge temperature (line 2)	---	...	...(**)
	---	Unit status (with unit OFF)	---	---	See individual line mask values
	---	Number compressors on (with unit ON, line 2)	---	---	0...12
	---	Compressor activation percentage (with unit ON, line 2)	---	%	0...100
	---	Number of fans on (with unit ON, line 2)	---	---	0...16
	---	Fan activation percentage (with unit ON, line 2)	---	%	0...100
	---	Hour and minutes	---	...	...
	---	Date	---	...	...
	L1-Suction	Suction pressure or temperature (line 1)	---	...	...(**)
	L1-Gas cool.	Gas cooler pressure or temperature (line 1)	---	...	...(**)
	L2-Suction	Suction pressure or temperature (line 2)	---	...	...(**)
Main mask for double suction line and double condensing line, one mask for both lines (display only)	L2-Condens.	Condensing pressure or temperature (line 2)	---	...	...(**)
	L1-Suc.Temp.	Suction temperature (line 1)	---	...	...(**)
	L1-Superheat	Superheating (line 1)	---	...	...(**)
	L2-Suc.Temp.	Suction temperature (line 2)	---	...	...(**)
	L2-Superheat	Superheating (line 2)	---	...	...(**)
	L1-Disch.Temp.	Discharge temperature (line 1)	---	...	...(**)
	L2-Disch.Temp.	Discharge temperature (line 2)	---	...	...(**)
	---	Unit status (with unit OFF)	---	---	See individual line mask values
	---	Compressor activation percentage (with unit ON, line 1)	---	%	0...100
	---	Compressor activation percentage (with unit ON, line 2)	---	%	0...100
	---	Fan activation percentage (with unit ON, line 1)	---	%	0 to 100
	---	Fan activation percentage (with unit ON, line 2)	---	%	0...100
	---	Hour and minutes	---	...	...
	---	Date	---	...	...
	Suction: L1	Suction pressure or temperature (line 1)	---	...	...(**)
	L2	Suction pressure or temperature (line 2)	---	...	...(**)
	Gas cooler	Gas cooler pressure or temperature	---	...	...(**)
Main mask for double suction line and individual condensing line, (display only)	L1-Suc.Temp.	Suction temperature (line 1)	---	...	...(**)
	L1-Disch.Temp.	Discharge temperature (line 1)	---	...	...(**)
	L1-Superheat	Superheating (line 1)	---	...	...(**)
	L2-Suc.Temp.	Suction temperature (line 2)	---	...	...(**)
	L2-Disch.Temp.	Discharge temperature (line 2)	---	...	...(**)
	L2-Superheat	Superheating (line 2)	---	...	...(**)
	---	Unit status (with unit OFF)	---	---	See individual line mask values
	---	Compressor activation percentage (with unit ON, line 1)	---	%	0...100
	---	Compressor activation percentage (with unit ON, line 2)	---	%	0...100
	---	Fan activation percentage (with unit ON, line 1)	---	%	0...100

Tab. 7.a

Mask index	Display description	Description	Def.	U. of M.	Values
	A. Unit status				
Aa01 (display only)	Pressure	Suction pressure (line 1)	---	…	…(**)
	Sat.Temp.	Suction saturated temperature (line 1)	---	…	…(**)
	ActualSet	Actual setpoint for pressure regulation (with compensations applied, line 1)	---	…	…(**)
	Differen.	Regulation differential for pressure regulation (line 1)	---	…	…(**)
Aa02 (display only)	Pressure	Suction pressure (line 1)	---	…	…(**)
	Sat.Temp.	Suction saturated temperature (line 1)	---	…	…(**)
	ActualSet	Actual setpoint for temperature regulation (with compensations applied, line 1)	---	…	…(**)
	Differen.	Regulation differential for temperature regulation (line 1)	---	…	…(**)
Aa03 (display only)	Act/Req.	Power delivered/Power requested per suction line (line 1)	---	%	0 | 0 …100 | 100
	Reg. Status	Regulation status (according to the type of regulation set, line 1)	---	---	Stop | Increase Decrease Stand-by Functioning Timings | Alarms
	Reg. Type	Compressor regulation type (line 1)	---	---	Proportional Band Dead Zone
	Setpoint	Actual suction setpoint (with compensations applied, line 1)	---	…	…(**)
Aa04 (display only)	C01, C02, …C12	Time remaining for next compressor startup (line 1)	---	s	0…32000
	C01	Power delivered from compressor 1 of line 1 (a "!" to the right of the value means that some form of compressor power forcing is active, e.g., safety times, alarms, startup procedure)	---	%	0…100
	…	…	…	…	…
	C12	Power delivered from compressor 12 (line 1)	---	%	0…100
Aa05 (display only)	Temperature	Suction temperature (line 1)	---	…	…(**)
	Superheat.	Superheating (line 1)	---	…	…(**)
Aa11 (display only)	Disch. 1	Discharge temperature compressor 1 (line 1)	---	…	…(**)
	…	…	…	…	…
	Disch. 6	Discharge temperature compressor 6 (line 1)	---	…	…(**)
Aa12 (display only)	Oil Temp 1	Oil temperature compressor 1 (line 1)	---	…	…(**)
	…	…	…	…	…
	Oil Temp 6	Oil temperature compressor 6 (line 1)	---	…	…(**)
Aa13 (display only)	In.liq.1: DO	Digital output number associated and liquid injection/economizer (*) status compressor 1 (line 1)	---	…	0…29
	…	…	…	…	…
	In.liq.6: DO	Digital output number associated and liquid injection/economizer (*) status compressor 6 (line 1)	---	…	0…29
Aa15 (display only)	Discharge temperature	Discharge temperature Digital Scroll ™ compressor (line 1)	---	…	…(**)
	Cap.Reduction	Capacity reduction Digital Scroll ™ compressor (line 1) in progress			NO | YES
	Oil sump T.	Oil sump temperature Digital Scroll ™ compressor (line 1)	---	…	…(**)
	Oil status	Oil dilution status Digital Scroll ™ compressor (line 1)			OK | Diluted
Aa16 (display only)	Status	Operational status Digital Scroll ™ compressor (line 1)	---	---	OFF | Start ON | Alarm
	Count	Safety time count Digital Scroll ™ compressor (line 1)	---	s	0…999
	Compr.	Status Digital Scroll ™ compressor (line 1)	---	---	ON | OFF
	Valve	Status Digital Scroll ™ valve (line 1)	---	---	ON | OFF
	Cap.Req.	Capacity requested Digital Scroll ™ compressor (line 1)	---	%	0…100
	ActualCapac.	Actual capacity Digital Scroll ™ compressor (line 1)	---	%	0…100
Aa20 (display only)	Pressure	Condensing pressure (line 1)	---	…	…(**)
	Sat.Temp.	Condensing saturated temperature (line 1)	---	…	…(**)
	ActualSet	Actual setpoint for pressure regulation (with compensations applied, line 1)	---	…	…(**)
	Differen	Regulation differential for pressure regulation (line 1)	---	…	…(**)
Aa21 (display only)	Pressure	Condensing pressure (line 1)	---	…	…(**)
	Sat.Temp.	Condensing saturated temperature (line 1)	---	…	…(**)
	ActualSet	Actual setpoint for temperature regulation (with compensations applied, line 1)	---	…	…(**)
	Differen.	Regulation differential for temperature regulation (line 1)	---	…	…(**)
Aa22 (display only)	Act/Req	Power delivered/Power requested per condensing line (line 1)	---	%	0 | 0 …100 | 100
	Reg. Status	Regulation status (according to the type of regulation set, line 1)	---	---	Stop | Increase Decrease Stand-by Functioning Timings | Alarms
	Reg. Type	Gas cooler regulation type (line 1)	---	---	Proportional Band Dead Zone
	Setpoint	Actual setpoint gas cooler (line 1)	---	…	…(**)
Aa23 (display only)	F1	Power delivered from fan 1 of line 1 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
	…	…	…	…	…
	F8	Power delivered from fan 8 of line 1 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
Aa24 (display only)	F9	Power delivered from fan 9 of line 1 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
	…	…	…	…	…
	F16	Power delivered from fan 16 of line 1 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
Aa25 (display only)	Discharge temperature	Discharge temperature (line 1)	---	…	…(**)
	External temperature	External temperature (line 1)	---	…	…(**)
Aa31 (display only)	Pressure	Suction pressure (line 2)	---	…	…(**)
	Sat.Temp.	Suction saturated temperature (line 2)	---	…	…(**)
	ActualSet	Actual setpoint for pressure regulation (with compensations applied, line 2)	---	…	…(**)
	Differen.	Regulation differential for pressure regulation (line 2)	---	…	…(**)
Aa32 (display only)	Pressure	Suction pressure (line 2)	---	…	…(**)
	Sat.Temp.	Suction saturated temperature (line 2)	---	…	…(**)
	ActualSet	Actual setpoint for temperature regulation (with compensations applied, line 2)	---	…	…(**)
	Differen.	Regulation differential for temperature regulation (line 2)	---	…	…(**)
Aa33 (display only)	Act/Req.	Power delivered/Power requested per suction line (line 2)	---	%	0 | 0 …100 | 100
	Reg. Status	Regulation status (according to the type of regulation set, line 2)	---	---	Stop | Increase Decrease Stand-by Functioning Timings | Alarms
	Reg. Type	Compressor regulation type (line 2)	---	---	Proportional Band Dead Zone
	Setpoint	Actual suction setpoint (with compensations applied, line 2)	---	…	…(**)

Mask index	Display description	Description	Def.	U. of M.	Values
Aa34 (display only)	C01, C02, …C12	Time remaining for next compressor startup (line 2)	---	s	0…32000
	C01	Power delivered from compressor 1 from line 2 (a "!" to the right of the value means that some form of compressor power forcing is active, e.g., safety times, alarms, startup procedure)	---	%	0…100
	…	…	…	…	…
	C12	Power delivered from compressor 12 (line 2)	---	%	0…100
Aa35 (display only)	Temperature	Suction temperature (line 2)	---	…	…(**)
	Superheat.	Superheating (line 2)	---	…	…(**)
Aa41 (display only)	Disch. 1	Discharge temperature compressor 1 (line 2)	---	…	…(**)
	…	…	…	…	…
	Disch. 6	Discharge temperature compressor 6 (line 2)	---	…	…(**)
Aa43 (display only)	In.liq.1: DO	Digital output number associated and liquid injection status compressor 1 (line 2)	---	…	0…29 | ON | OFF
	…	…	…	…	…
	In.liq.6: DO	Digital output number associated and liquid injection status compressor 6 (line 2)	---	…	0…29 | ON | OFF
Aa45 (display only)	Discharge temperature	Discharge temperature Digital Scroll ™ compressor (line 2)	---	…	…(**)
	Cap.Reduction	Capacity reduction Digital Scroll ™ compressor (line 2) in progress			NO | YES
	Oil sump T.	Oil sump temperature Digital Scroll ™ compressor (line 2)	---	…	…(**)
	Oil status	Oil dilution status Digital Scroll ™ compressor (line 2)			Ok | Diluted
Aa46 (display only)	Status	Operational status Digital Scroll ™ compressor (line 2)	---	---	OFF start ON Alarm OFF for time ON for time manual mode in pump down
	Count	Safety time count Digital Scroll ™ compressor (line 2)	---	s	0…999
	Compr.	Status Digital Scroll ™ compressor (line 2)	---	---	ON | OFF
	Valve	Status Digital Scroll ™ valve (line 2)	---	---	ON | OFF
	Cap.Req.	Capacity requested Digital Scroll ™ compressor (line 2)	---	%	0…100
	ActualCapac.	Actual capacity Digital Scroll ™ compressor (line 2)	---	%	0…100
Aa50 (display only)	Pressure	Condensing pressure (line 2)	---	…	…(**)
	Sat.Temp.	Condensing saturated temperature (line 2)	---	…	…(**)
	ActualSet	Actual setpoint for pressure regulation (with compensations applied, line 2)	---	…	…(**)
	Differen.	Regulation differential for pressure regulation (line 2)	---	…	…(**)
Aa51 (display only)	Pressure	Condensing pressure (line 2)	---	…	…(**)
	Sat.Temp.	Condensing saturated temperature (line 2)	---	…	…(**)
	ActualSet	Actual setpoint for temperature regulation (with compensations applied, line 2)	---	…	…(**)
	Differen.	Regulation differential for temperature regulation (line 2)	---	…	…(**)
Aa52 (display only)	Act/Req.	Power delivered/Power requested per condensing line (line 2)	---	%	0 | 0 …100 | 100
	Reg. Status	Regulation status (according to the type of regulation set, line 2)	---	---	stop increase decrease stand-by functioning timings alarms
	Reg. Type	Condenser regulation Type (line 2)	---	---	Proportional Band Dead zone
	Setpoint	Actual condensing setpoint (with compensations applied, line 2)	---	…	…(**)
Aa53 (display only)	F1	Power delivered from fan 1 of line 2 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
	…	…	…	…	…
	F8	Power delivered from fan 8 of line 2 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
Aa54 (display only)	F9	Power delivered from fan 9 of line 2 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
	…	…	…	…	…
	F16	Power delivered from fan 16 of line 2 (a "!" to the right of the value means that some form of power forcing is active)	---	%	0…100
Aa55 (display only)	Discharge temperature	Discharge temperature (line 2)	---	…	…(**)
	External temperature	External temperature (line 2)	---	…	…(**)
Aa61 (display only)	Suct Press	Suction pressure value in the medium temperature compressor line	---	…	…(**)
	Oil Press	Oil receiver pressure value	---	…	…(**)
	Delta	Difference between receiver oil pressure and suction pressure (medium temperature compressors or liquid receiver when integrated parallel compressor activated or in pLAN when using the same I/Os)	---	…	…(**)
	Actual Setp	Pressure differential set point (receiver - suction)	1.0	barg/psig	…
	Differential	Return differential for deactivation of the oil differential function	0.5	barg/psig	…
	State	Oil differential function status (YES→ ACTIVE, NO→ INACTIVE)	NO	---	YES | NO
Aa65	S1 probe	Driver pressure probe S1 (driver connected in Fieldbus)	---	bar	-290…2900
	S2 probe	Driver pressure probe S2 (driver connected in Fieldbus)	---	°C	-870…2900
	S3 probe	Driver pressure probe S3 (driver connected in Fieldbus)	---	bar	-290…2900
	S4 probe	Driver pressure probe S4 (driver connected in Fieldbus)	---	°C	-870…2900
Aa66	Digital input staus 1	Driver digital input 1 (driver connected in Fieldbus)	---	---	Open | Closed
	Digital input staus 2	Driver digital input 2 (driver connected in Fieldbus)	---	---	Open | Closed
Aa77 (display only)	Parallel compressor status:	Parallel compressor status	ON/OFF		ON | OFF | not active
	GC out.temp.:	Gas Cooler Outlet temperature		°C/°F	
	RPRV opening:	RPRV valve opening		%	
	RPRV setp.:	RPRV Setpoint		barg	
Aaa76 (display only)	HR Total Request:	Percentage of heat reclaim used to activate different actions. It can refer to HR1 or HR2 or HR1+HR2		%	
	Status:	Detailed description of current running action			
	Run actions:	Run actions presence			YES | No
	Min HPV set.:	Current minimum HPV setpoint	40	barg	
	Offset GC:	Current temperature GC offset (to increase GC setpoint)		°C/°F	
	HR prevent:	HR configured as prevent and active			ON | OFF
Aaa77 (display only)	HR Total Request:	Percentage of heat reclaim used to activate different actions. It can refer to HR1 or HR2 or HR1+HR2		%	
	Bypass Allowed	Status of bypass allowed			
	GC out. Temp:	Current GC out temperature		°C/°F	
	GC byp. Temp:	Current GC baypassed temperature		°C/°F	
	GC reg. temp:	Current regulation temperature: Tgc out if bypass off, Tgc byp if bypass on		°C/°F	
	Gas Cooler byp:	Opening percentage of bypass valve		%	

Mask index	Display description	Description	Def.	U. of M.	Values
Aaan (display only)	Reg.var.	Value of the regulation variable for the generic function in stage 1	---	…	…(**)
	Enable	Status of the enabling variable for the generic function in stage 1	---	---	Not active | Active
	Setpoint	Regulation setpoint for the generic function in stage 1	---	…	…(**)
	Differen.	Regulation differential for the generic function in stage 1	---	…	…(**)
	Mode	Regulation mode for the generic function in stage 1 (direct or reverse)	---	---	D, R
	Status	Status of the generic function in stage 1	---	---	Not active | Active
…	…	…	…	…	…
Aaar (display only)	Reg.var.	Value of the regulation variable for the generic function in stage 5	---	…	…(**)
	Enable	Status of the enabling variable for the generic function in stage 5	---	---	Not active | Active
	Setpoint	Regulation setpoint for the generic function in stage 5	---	…	…(**)
	Differen.	Regulation differential for the generic function in stage 5	---	…	…(**)
	Mode	Regulation mode for the generic function in stage 5 (direct or reverse)	---	---	D, R
	Status	Status of the generic function in stage 5	---	---	Not active | Active
Aaas (display only)	Reg.variab.	Value of the regulation variable for generic modulating function 1	---	…	…(**)
	Enable	Status of the enabling variable for generic modulating function 1	---	---	Not active | Active
	Setpoint	Regulation setpoint for generic modulating function 1	---	…	…(**)
	Differen.	Regulation differential for generic modulating function 1	---	…	…(**)
	Mode	Regulation mode for generic modulating function 1 (direct or reverse)	---	---	D, R
	Status	Status of generic modulating function 1	---	%	0.0…100.0
Aaat (display only)	Reg.variab.	Value of the regulation variable for generic modulating function 2	---	…	…(**)
	Enable	Status of the enabling variable for generic modulating function 2	---	---	Not active | Active
	Setpoint	Regulation setpoint for generic modulating function 2	---	…	…(**)
	Differen.	Regulation differential for generic modulating function 2	---	…	…(**)
	Mode	Regulation mode for generic modulating function 2 (direct or reverse)	---	---	D, R
	Status	Status of generic modulating function 2	---	%	0.0…100.0
Aaau (display only)	Reg.variab.	Value of the regulation variable for generic alarm function 1	---	---	Not active | Active
	Enable	Status of the enabling variable for generic alarm function 1	---	---	Not active | Active
	Type	Type of alarm for generic alarm function 1	---	---	Normal | Serious
	Delay	Regulation differential for generic alarm function 1	---	s	0…9999
	Status	Status of generic alarm function 1	---	---	Not active | Active
Aaav (display only)	Reg.variab.	Value of the regulation variable for generic alarm function 2	---	---	Not active | Active
	Enable	Status of the enabling variable for generic alarm function 2	---	---	Not active | Active
	Type	Type of alarm for generic alarm function 2	---	---	Normal | Serious
	Delay	Regulation differential for generic alarm function 2	---	s	0…9999
	Status	Status of generic alarm function 2	---	---	Not active | Active
Aaaw (display only)	Day	Day of the week	---	---	Monday, ..., Sunday
	F1: --:-- -> --:--	Enabling and definition of time band 1: start hour and minute, end hour and minute for the generic scheduling function	---	…	…
	…	…	…	…	…
	F4: --:-- -> --:--	Enabling and definition of time band 4: start hour and minute, end hour and minute for the generic scheduling function	---	…	…
	Status	Status of the general scheduling function	---	---	Not active | Active
Aaax (display only)	HR 1 Request:	Percentage of first heat reclaim request		%	
	HR 1 Status:	Status of first heat reclaim request			ON | OFF
	Water temp.:	Water temperature with HR1 regulated by temperature		°C/°F	
	Valve:	Status of first heat reclaim valve			Open | Closed
	Pump:	Status of first heat reclaim pump			ON | OFF
	Pump An. Out:	Running percentage of first heat reclaim pump		%	
Aaay (display only)	HR 2 Request:	Percentage of second heat reclaim request		%	
	HR 2 Status:	Status of second heat reclaim request			ON | OFF
	Water temp.:	Water temperature with HR2 regulated by temperature		°C/°F	
	Valve:	Status of second heat reclaim valve			Open | Closed
	Pump:	Status of second heat reclaim pump			ON | OFF
	Pump An. Out:	Running Percentage of second heat reclaim pump		%	
Aaaz (display only)	Status	Status of the ChillBooster device (line 1)	---	---	ON | OFF
	Ext.Temp.	External temperature (line 1)	---	…	…(**)
	Thresh.est.t.	Threshold for activating the ChillBooster device (line 1)	---	…	…(**)
	F.Time100%	Number of minutes passed with fan at 100/number of minutes allowed (line 1)	---	min	0…999 | 0…999
Aaba (display only)	Status	Status of the ChillBooster device (line 2)	---	---	ON | OFF
	Ext.Temp.	External temperature (line 2)	---	…	…(**)
	Thresh.est.t.	Threshold for activating the ChillBooster device (line 2)	---	…	…(**)
	F.Time100%	Number of minutes passed with fan at 100/number of minutes allowed (line 2)	---	min	0…999 | 0…999
Aabb (display only)	Cond.Temp.	Condensing saturated temperature (line 1)	---	…	…(**)
	LiquidTemp	Liquid temperature (line 1)	---	…	…(**)
	Subcool	Subcooling (line 1)	---	…	…(**)
	Status	Status of the subcooling function (line 1)	---	---	Open | Closed
Aabc (display only)	Cond.Temp.	Condensing saturated temperature (line 2)	---	…	…(**)
	LiquidTemp	Liquid temperature (line 2)	---	…	…(**)
	Subcool	Subcooling (line 2)	---	…	…(**)
	Status	Status of the subcooling function (line 2)	---	---	Open | Closed
Ab01 (display only)	UserSetp.	Setpoint set by the user for suction regulation under pressure, proportional regulation (line 1)	---	…	…(**)
	ActualSetp.	Actual setpoint for suction regulation under pressure, proportional regulation (with compensations applied, line 1)	---	…	…(**)
	Diff.	Suction regulation under pressure differential, proportional regulation (line 1)	---	…	…(**)
Ab02 (display only)	UserSetp.	Setpoint set by the user for suction regulation under pressure, proportional regulation (line 1)	---	…	…(**)
	ActualSetp.	Actual setpoint for suction regulation under pressure, proportional regulation (with compensations applied, line 1)	---	…	…(**)
	Dead zone	Dead zone for suction regulation under pressure (line 1)	---	…	…(**)
	Incr.Diff.	Increase differential for suction regulation under pressure, regulation in dead zone (line 1)	---	…	…(**)
	Decr.Diff.	Decrease differential for suction regulation under pressure, regulation in dead zone (line 1)	---	…	…(**)
Ab03 (display only)	UserSetp.	Setpoint set by the user for suction regulation under pressure, proportional regulation (line 2)	---	…	…(**)
	ActualSetp.	Actual setpoint for suction regulation under pressure, proportional regulation (with compensations applied, line 2)	---	…	…(**)
	Diff.	Suction regulation under pressure differential, proportional regulation (line 2)	---	…	…(**)
Ab04 (display only)	UserSetp.	Setpoint set by the user for suction regulation under pressure, proportional regulation (line 2)	---	…	…(**)
	ActualSetp.	Actual setpoint for suction regulation under pressure, proportional regulation (with compensations applied, line 2)	---	…	…(**)
	Dead zone	Dead zone for suction regulation under pressure (line 2)	---	…	…(**)
	Incr.Diff.	Increase differential for suction regulation under pressure, regulation in dead zone (line 2)	---	…	…(**)
	Decr.Diff.	Decrease differential for suction regulation under pressure, regulation in dead zone (line 2)	---	…	…(**)

Mask index	Display description	Description	Def.	U. of M.	Values
Ab05 (display only)	UserSetp.	Setpoint set by the user for gas cooler regulation under pressure, proportional regulation (line 1)	---	…	…(**)
	ActualSetp.	Actual setpoint for gas cooler regulation under pressure, proportional regulation (with compensations applied, line 1)	---	…	…(**)
	Diff.	Gas cooler regulation under pressure differential, proportional regulation (line 1)	---	…	…(**)
Ab06 (display only)	UserSetp.	Setpoint set by the user for gas cooler regulation under pressure, proportional regulation (line 1)	---	…	…(**)
	ActualSetp.	Actual setpoint for gas cooler regulation under pressure, proportional regulation (with compensations applied, line 1)	---	…	…(**)
	Dead zone	Dead zone for gas cooler regulation under pressure (line 1)	---	…	…(**)
	Incr.Diff.	Increase differential for gas cooler regulation under pressure, regulation in dead zone (line 1)	---	…	…(**)
	Decr.Diff.	Decrease differential for gas cooler regulation under pressure, regulation in dead zone (line 1)	---	…	…(**)
Ab07 (display only)	UserSetp.	Setpoint set by the user for condensing regulation under pressure, proportional regulation (line 2)	---	…	…(**)
	ActualSetp.	Actual setpoint for condensing regulation under pressure, proportional regulation (with compensations applied, line 2)	---	…	…(**)
	Diff.	Condensing regulation under pressure differential, proportional regulation (line 2)	---	…	…(**)
Ab08 (display only)	UserSetp.	Setpoint set by the user for condensing regulation under pressure, proportional regulation (line 2)	---	…	…(**)
	ActualSetp.	Actual setpoint for condensing regulation under pressure, proportional regulation (with compensations applied, line 2)	---	…	…(**)
	Dead zone	Dead zone for condensing regulation under pressure (line 1)	---	…	…(**)
	Incr.Diff.	Increase differential for condensing regulation under pressure, regulation in dead zone (line 2)	---	…	…(**)
	Decr.Diff.	Decrease differential for condensing regulation under pressure, regulation in dead zone (line 2)	---	…	…(**)
Ab12	Setpoint	Setpoint without compensation (suction line 1)	26.0 barg	…	…(**)
Ab13	Setpoint	Setpoint without compensation (gas cooler line 1)	12.0 °C	…	…(**)
Ab14	Setpoint	Setpoint without compensation (suction line 2)	12.0 barg	…	…(**)
Ab15	Setpoint	Setpoint without compensation (condens. line 2)	12.0 barg	…	…(**)
Ac01	Status	Unit status (display only)	OFF from keypad	---	Wait… Unit ON OFF from Alarm OFF from blackout OFF from BMS OFF from default OFF from DIN OFF from keypad Manual Funct. work Prevent from HP
	---	On-off from keypad (line 1)	OFF	---	OFF | ON
Ac02	L1: L2:	Unit status (display only)	OFF da tastiera	---	… (see Ac01 above)
	---	On-off from keypad (line 1)	OFF	---	OFF | ON
	---	On-off from keypad (line 2)	OFF	---	OFF | ON
Ac03	Enable unit On/Off from digital input	Enable unit On/Off from digital input (line 1)	NO	---	NO | YES
	From supervisor	Enable on-off from supervisor (line 1)	NO	---	NO | YES
	Due to black out	Enable on-off due to black out (line 1)	NO	---	NO | YES
Ac04	Delay unit startup after blackout	Delay unit startup after blackout (line 1)	0	s	0…999
Ac06	Enable unit On/Off from digital input	Enable unit On/Off from digital input (line 2)	NO	---	NO | YES
	From supervisor	Enable on-off from supervisor (line 2)	NO	---	NO | YES
	Due to black out	Enable on-off due to black out (line 2)	NO	---	NO | YES
Ac07	Unit startup delay after blackout	Unit startup delay after blackout (line 2)	0	s	0…999

Tab. 7.b

Mask index	Display description	Description	Def.	U. of M.	Values
I/O B.Inp./Out.					
The I/Os depend on the configuration selected, the following are only examples. See Appendix A.1 for the complete list and position of available I/Os.					
Baa02	DI	Alarm 1 compressor 1 DI position(line 1)	03	---	---, 01…18, U1…U10 (****)
	Status (display only)	Status Alarm 1 compressor 1 DI (line 1)	---	---	Closed | Open
	Logic	Logic alarm 1 compressor 1 DI (line 1)	NC	---	NC | NO
	Function (display only)	Alarm 1 compressor 1 function status (line 1)	---	---	Not active | Active
…	…	…	…	…	…
Baacf	DI	Heat recovery from digital input DI position (line 1)	---	---	--- | 01…18 | U1…U10 (****)
	Status	Heat recovery from digital input DI status (line 1)	---	---	Closed | Open
	Logic	Heat recovery from digital input DI logic (line 1)	NC	---	NC | NO
	Function	Heat recovery from digital input function status (line 1)	---	---	Not active | Active
…	…	…	…	…	…
Bab01	---	Suction pressure probe position (Line 1)	B1	---	---, U1…U10 (****)
	---	Suction pressure probe type (Line 1)	4...20mA	---	--- 0-1V 0-10V 4...20mA 0-5V
	--- (display only)	Suction pressure value (line 1)	---	…	…(**)
	Max limit	Suction pressure maximum value (line 1)	44.8 barg	…	…(**)
	Min limit	Suction pressure minimum value (line 1)	0.0 barg	…	…(**)
	Calibrat.	Suction pressure probe calibration (Line 1)	0.0 barg	…	…(**)
Bab63	---	Common oil receiver pressure probe position (line 1)	---	---	U1…U10 (****)
	---	Common oil receiver pressure probe type (line 1)	4...20mA	---	---- | 0-1V | 0-10V 4...20mA | 0-5V
	--- (display only)	Common oil receiver pressure value (line 1)	---	…	…(**)
	Max limit	Maximum common oil receiver pressure value (line 1)	44.8 barg	…	…(**)
	Min limit	Minimum common oil receiver pressure value (line 1)	0.0 barg	…	…(**)
	Calibrat.	Common oil receiver pressure probe calibration (line 1)	0.0 barg	…	…(**)

Mask index	Display description	Description	Def.	U. of M.	Values
Bab65	---	Common oil receiver pressure probe position (line 2)	---	---	U1…U10 (****)
	---	Common oil receiver pressure probe type (line 2)	4...20mA	---	----, 0-1V 0-10V 4...20mA 0-5V
	--- (display only)	Common oil receiver pressure value (line 2)	---	…	…(**)
	Max limit	Maximum common oil receiver pressure value (line 2)	44.8 barg	…	…(**)
	Min limit	Minimum common oil receiver pressure value (line 2)	0.0 barg	…	…(**)
	Calibrat.	Common oil receiver pressure probe calibration (line 2)	0.0 barg	…	…(**)
Bab75	---	Discharge pressure probe position (line 1)	---	---	U1…U10 (****)
	---	Discharge pressure probe type (line 1)	4...20mA	---	----, 0-1V 0-10V 4...20mA 0-5V
	--- (display only)	Discharge pressure value (line 1)	---	…	…(**)
	Max limit	Maximum discharge pressure value (line 1)	44.8 barg	…	…(**)
	Min limit	Minimum discharge pressure value (line 1)	0.0 barg	…	…(**)
	Calibrat.	Discharge pressure probe calibration (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Bac02	Line relay DO	Compressor 1 line relay DO position and status (On/Off) display (line 1)	…	---	--- | 01…18 (****)
	Part winding DO/Star relay DO (*)	Compressor 1 part winding or star DO position and status (On/Off) display (line 1)	…	---	--- | 01…18 (****)
	---/Delta relay DO (*)	Compressor 1 delta DO position and status (On/Off) display (line 1)	…	---	---, 01…18 (****)
	Logic	Logic for compressor 1 power supply DO (line 1)	NO	---	NC | NO
Bac03	DO	Compressor 1 unloader 1 DO position (line 1)	…	---	---, 01…18 (****)
	Status (display only)	Status for compressor 1 unloader 1 DO (line 1)	---	---	Closed | Open
	Logic	Logic for compressor 1 unloader 1 DO (line 1)	NO	---	NC | NO
	Function (display only)	Compressor 1 unloader 1 function status (line 1)	---	---	Not active | Active
…	…	…	…	…	…
Bac71	DO	Solenoid valve DO position for managing common oil differential	---	---	---, 01…18 (****)
	Status (display only)	Solenoid valve DO status for managing common oil differential	---	---	Closed | Open
	Logic	Solenoid valve DO logic for managing common oil differential	NC	---	NC | NO
	Function	Status of the solenoid valve for managing common oil differential	---	---	Not active | Active
Bacef	DO Line relay	DO position and On/Off Status Parallel compressor consent	…	…	---, 01…18 (****)
	Logic:	Logic Parallel compressor consent DO:	NA	…	NC | NA
…	…	…	…	…	…
Bad01	AO	Compressor modulating device AO position (line 1)	0	---	---, 01…06 (****)
	Status (display only)	Modulating device output value (line 1)	0	%	0.0…100.0
…	…	…	…	…	…
Bb01	Suction L1	Suction line 1 in manual mode	Disabled	---	Disabled | abled
	Suction L2	Suction line 2 in manual mode	Disabled	---	Disabled | abled
	Condenser L1	Condenser line 1 in manual mode	Disabled	---	Disabled | abled
	Condenser L2	Condenser line 2 in manual mode	Disabled	---	Disabled | abled
	Timeout	Manual mode duration after last key pressed	10	min	0…500
Bba02	Compressor 1 Force to	Manual stages request for compressor 1 (line 1)	OFF	---	OFF | ON 2 STAGES (*) 3 STAGES (*) 4 STAGES (*)
…	…	…	…	…	…
Bba16	Compressor 12 Force to	Manual stages request for compressor 12 (line 1)	OFF	---	OFF | ON 2 STAGES (*) 3 STAGES (*) 4 STAGES (*)
Bba17	Oil Cool. pump 1 Force to	Manual operation status for oil cooling pump 1 (line 1)	OFF	---	OFF | ON
	Oil cool pump 2 Force to	Manual operation status for oil cooling pump 2 (line 1)	OFF	---	OFF | ON
Bba18	Oil cool fan 1 Force to	Manual operation status for oil cooling fan 1 (line 1)	OFF	---	OFF | ON
Bba20	Compressor 1 Force to	Manual stages request for compressor 1 (line 2)	OFF	---	OFF | ON 2 STAGES (*) 3 STAGES (*) 4 STAGES (*)
…	…	…	…	…	…
Bba34	Compressor 12 Force to	Manual stages request for compressor 12 (line 2)	OFF	---	OFF | ON 2 STAGES (*) 3 STAGES (*) 4 STAGES (*)
Bba35	Oil Cool. pump 1 Force to	Manual operation status for oil cooling pump 1 (line 2)	OFF	---	OFF | ON
	Oil Cool. pump 2 Force to	Manual operation status for oil cooling pump 2 (line 2)	OFF	---	OFF | ON
Bba37	Oil cool fan 1 Force to	Manual operation status for oil cooling fan (line 2)	OFF	---	OFF | ON
Bba38	Fan 1 Force to	Manual operation status for fan 1 (line 1)	OFF	---	OFF | ON
…	…	…	…	…	…
Bba53	Fan 16 Force to	Manual operation status for fan 16 (line 1)	OFF	---	OFF | ON
Bba54	Heat rec.pump Force to	Manual operation status for heat recovery pump (line 1)	OFF	---	OFF | ON
Bba55	ChillBooster Force to	Manual operation status for ChillBooster (line 1)	OFF	---	OFF | ON
Bba57	Fan 1 Force to	Manual operation status for fan 1 (line 2)	OFF	---	OFF | ON
…	…	…	…	…	…
Bba72	Fan 16 Force to	Manual operation status for fan 16 (line 2)	OFF	---	OFF | ON
Bba73	Heat rec.pump Force to	Manual operation status for heat recovery pump (line 2)	OFF	---	OFF | ON
Bba74	ChillBooster Force to	Manual operation status for ChillBooster (line 2)	OFF	---	OFF | ON
Bbb05	Compressor 1 Force to	Manual request for continuous capacity for compressor 1 (line 1)	0.0	%	0.0…100.0

Mask index	Display description	Description	Def.	U. of M.	Values
Bbb06	Oil cool. pump Force to	Manual request for oil cooling pump (line 1)	0.0	%	0.0…100.0
Bbb07	Compressor 1 Force to	Manual request for continuous capacity for compressor 1 (line 2)	0.0	%	0.0…100.0
Bbb08	Oil cool. pump Force to	Manual request for oil cooling pump (line 2)	0.0	%	0.0…100.0
Bbb09	Fan 1 Force to	Manual request for continuous capacity for fan 1 (line 1)	0.0	%	0.0…100.0
Bbb10	Heat recovery pump Force to	Manual request for heat recovery pump (line 1)	0.0	%	0.0…100.0
Bbb11	Fan 1 Force to	Manual request for continuous capacity for fan 1 (line 2)	0.0	%	0.0…100.0
Bbb12	Heat recovery pump Force to	Manual request for heat recovery pump (line 2)	0.0	%	0.0…100.0
Bbb75	---	Discharge pressure probe position (line 2)	---	---	U1…U10 (****)
	---	Discharge pressure probe type (line 2)	4...20mA	---	----, 0-1V 0-10V 4...20mA 0-5V
	--- (display only)	Discharge pressure value (line 2)	---	…	…(**)
	Max limit	Maximum discharge pressure value (line 2)	44.8 barg	…	…(**)
	Min limit	Minimum discharge pressure value (line 2)	0.0 barg	…	…(**)
	Calibrat.	Common oil receiver pressure probe calibration (line 2)	0.0 barg	…	…(**)
Bc01	Test DO	Enable DO test mode	NO	---	NO | YES
	Timeout	Duration of test mode after last key pressed	10	min	0…500
Bc02	Test AO	Enable AO test mode	NO	---	NO | YES
	Timeout	Duration of test mode after last key pressed	10	min	0…500
Bca10	DO1	DO 1 test logic	NO	---	NO | NC
	---	DO 1 test value	OFF	---	OFF | ON
…	…	…	…	…	…
Bca26	D29	DO 29 test logic	NO	---	NO | NC
	---	DO 29 test value	OFF	---	OFF | ON
Bcb10	AO1	AO 1 test value	0.0	---	0.0…100.0
…	…	…	…	…	…
Bcb12	AO6	AO 6 test value	0.0	---	0.0…100.0

Tab. 7.c

Mask index	Display description	Description	Def.	U. of M.	Values
	C.CompressorS				
The I/Os depend on the configuration selected, the following are only examples. See Appendix A.1 for the complete list and position of available I/Os.					
Caa01	DI	Alarm 1 compressor 1 DI position (line 1)	03	---	--- | 01…18 | U1…U10 (****)
	Status (display only)	Status Alarm 1 compressor 1 DI (line 1)	---	---	closed | open
	Logic	Logic alarm 1 compressor 1 DI (line 1)	NC	---	NC | NO
	Function (display only)	Alarm 1 compressor 1 function status (line 1)	---	---	not active | active
…	…	…	…	…	…
Caa08	Line relay DO	Compressor 1 line DO position and status (On/Off) display (line 1)	…	---	---, 01…18 (****)
	Part winding DO/Star relay DO (*)	Compressor 1 part winding/star DO position and status (On/Off) display (line 1)	…	---	---, 01…18 (****)
	---/Delta relay DO (*)	Compressor 1 DO position and status (On/Off) display (line 1)	…	---	---, 01…18 (****)
	Logic	Logic for compressor 1 power supply DO (line 1)	NC	---	NC | NO
Caa09	DO	Compressor 1 unloader 1 DO position (line 1)	…	---	---, 01…18 (****)
	Status (display only)	Status for compressor 1 unloader 1 DO (line 1)	---	---	closed | open
	Logic	Logic for compressor 1 unloader 1 DO (line 1)	NC	---	NC | NO
	Function (display only)	Compressor 1 unloader 1 function status (line 1)	---	---	not active | active
…	…	…	…	…	…
Caa14	AO	Compressor modulating device AO position (line 1)	0	---	---, 01…06 (****)
	Status (display only)	Modulating device output value (line 1)	0	%	0.0…100.0
…	…	…	…	…	…
Caaal	---	Suction pressure probe position (Line 1)	B1	---	--- |U1…U10 (****)
	---	Suction pressure probe type (Line 1)	4...20 mA	---	---- 0-1 V 0-10 V 4...20 mA 0-5 V
	--- (display only)	Suction pressure value (line 1)	---	…	…(**)
	Max limit	Suction pressure maximum value (line 1)	44.8 barg	…	…(**)
	Min limit	Suction pressure minimum value (line 1)	0.0 barg	…	…(**)
	Calibrat.	Suction pressure probe calibration (Line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Cab01	Regulation	Compressor control by temperature or pressure (line 1)	pressure	---	pressure temperature
	Reg. Type	Compressor regulation type (line 1)	dead zone	---	proportional Band dead Zone
Cab02	Minimum	Compressor setpoint lower limit (line 1)	0.0 barg	…	…(**)
	Maximum	Compressor setpoint upper limit (line 1)	40.0 barg	…	…(**)
Cab03	Setpoint	Compressor setpoint (line 1)	26.0 barg	…	…(**)
Cab04/Cab6 (**)	Reg. Type	Proportional regulation type (line 1)	proporz.	---	proportional / proport.+int.
	Integral time	Integral time for proportional regulation (line 1)	300	s	0…999
Cab05/Cab7 (**)	Differential	Differential for proportional regulation (line 1)	0.5 barg	…	…(**)
Cab08/Cab10 (**)	NZ diff.	Dead zone regulation differential (line 1)	0.5 barg	…	…(**)
	Activ.diff.	Dead zone regulation differential for device activation (line 1)	0.7 barg	…	…(**)
	Deact.diff.	Dead zone regulation differential for device deactivation (line 1)	0.7 barg	…	…(**)
Cab09/Cab11 (**)	En.force off	Enable capacity immediate decreasing to 0 (line 1)	NO	---	NO | YES
	Setp. force off	Threshold for capacity decreasing to 0 (line 1)	0.0 barg	…	…(**)
Cab12	Power to 100% min time	Minimum time to increase capacity request to 100%, dead zone regulation (suction line 1)	15	s	0…9999
	Power to 100% max time	Maximum time to increase capacity request to 100%, dead zone regulation (suction line 1)	90	s	0…9999

Mask index	Display description	Description	Def.	U. of M.	Values
Cab13	Power reduction to 0% min time	Minimum time to decrease capacity request to 0%, dead zone regulation (suction line 1)	30	s	0…9999
	Power reduction to 0% max time	Maximum time to decrease capacity request to 0%, dead zone regulation (suction line 1)	180	s	0…9999
Cac01	Compressor 1 operating hours	Compressor 1 operating hours (line 1)	---	h	0…999999
	(Check in...)	Compressor 1 remaining operating hours (line 1)	…	h	0…999999
	Compressor	Compressor 2 operating hours (line 1)	---	h	0…999999
	(Check in...)	Compressor 2 remaining operating hours (line 1)	…	h	0…999999
…	…	…	…	…	…
Cac11	Compress 11 operating hours	Compressor 11 operating hours (line 1)	---	h	0…999999
	(Check in...)	Compressor 11 remaining operating hours (line 1)	…	h	0…999999
	Compressor 12	Compressor 12 operating hours (line 1)	---	h	0…999999
	(Check in...)	Compressor 12 remaining operating hours (line 1)	…	h	0…999999
Cac13	Compressor threshold operating hours	Compressor maintenance threshold hours (line 1)	88000	h	0…999999
Cac14	Compressor hours reset	Reset compressor operating hours (line 1)	N	---	N | S
Cad01	Enable suction setpoint compensation	Enable setpoint compensation (suction line 1)	NO	---	NO | YES
Cad02	Winter offset	Offset applied for the Winter period	0.0	…	-999,9…999,9
	Closing offset	Offset applied for closing period	0.0	…	-999,9…999,9
Cad03	Enable setpoint compensation by scheduler	Enable scheduler setpoint compensation (suction line 1)	NO	---	NO | YES
Cad04	Day	Day of the week			MON, TUE, ...SUN
	TB1: --:-- -> --:--	Enabling and definition of time band 1: start hour and minute, end hour and minute (suction line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Enabling and definition of time band 4: start hour and minute, end hour and minute (suction line 1)	---	…	…
	Change	Time band change action	---	---	--- Save changes Load previous Clear all
	Copy to	Copy settings to other days	0	---	Monday...Sunday; Mon-Fri; Mon-Sat; Sat&Sun; All
Cad05	Change set by DI	Enable setpoint compensation by digital input (suct/cond line 1)	NO	---	NO | YES
Cad08	Enable floating suction setpoint	Enable floating setpoint (suction line 1)	NO	---	NO | YES
Cad09	Maximum floating setpoint	Max settable floating setpoint (line 1)	…(**)	…	…(**)
	Minimum floating setpoint	Minimum settable floating setpoint (line 1)	…(**)	…	…(**)
Cad10	Max setpoint variation accepted	Maximum variation allowed for floating setpoint (suction line 1)	…(**)	…	…(**)
	Offline decreasingtime	Reduction time when supervisor is offline for floating setpoint (suction line 1)	0	min	0…999
Cae01	Number of alarms for each compressor	Number of alarms for each compressor (line 1)	1/4 (*)	---	0…4 | 7 (*)
Cae02	Alarm 1 descr.	Selection of first compressor alarm description: Generic, Overload, High pressure, Low pressure, Oil (line 1)	…	---	☒(Not available) ☐(Not selected) ☑(Selected)
Cae03	Alarm 1 descr. (*)	Selection of first compressor alarm description: Rotation, Oil warning (line 1)	…	---	☒(Not available) ☐(Not selected) ☑(Selected)
Cae04	Activ. delay	Activation delay for alarm 1 during operation (line 1)	0	s	0…999
	Startup delay	Activation delay for alarm 1 at startup (line 1)	0	s	0…999
	Reset	Type of reset for compressor alarm 1 (line 1)	automatic	---	automatic manual
	Priority	Type of priority for compressor alarm 1 (line 1)	serious	---	Normal | Serious
…	…	…	…	…	…
Cae24	High suction pressure/ temperature alarm	Type of high suction pressure/temperature alarm threshold	absolute	---	absolute relative
	Threshold	High suction pressure/temperature alarm threshold	…(**)	…	…(**)
Cae25	Differen.	High suction pressure/temperature alarm differential	…(**)	…	…(**)
	Delay:	High suction pressure/temperature alarm delay	120	s	0…999
Cae26	Low suction pressure/ temperature alarm	Type of low suction pressure/temperature alarm	absolute	---	absolute relative
	Threshold	Low suction pressure/temperature alarm threshold	…(**)	…	…(**)
Cae27	Differen.	Low suction pressure/temperature alarm differential	…(**)	…	…(**)
	Delay	Low suction pressure/temperature alarm delay	30	s	0…999
Cae28	Enable oil temp alarm mgmt. (*)	Enable Digital Scroll™ oil temperature alarm (line 1)	NO	---	NO | YES
	Enable discharge temp alarm mgmt. (*)	Enable Digital Scroll™ discharge temperature alarm (line 1)	NO	---	NO | YES
Cae29	Low superheat alarm threshold	Threshold for low superheat alarm (line 1)	3.0	K	0.0…99,9
	Differen.	Low superheat alarm differential (line 1)	1.0	K	0.0…9,9
	Switch OFF comp.	Enable compressor shutdown for low superheat alarm (line 1)	NO	---	NO | YES
	Reset	Type of alarm reset for low superheat alarm (line 1)	manual	---	manual automatic
	Alarm delay	Low superheat alarm delay (line 1)	30	s	0…999
Cae31	Alarm setpoint	Discharge temperature alarm threshold	… (**)	…	… (**)
	Differential	Discharge temperature alarm differential	… (**)	…	… (**)
	Switch off compressor with alarm	Enable shutdown of compressors with discharge temperature alarm	disabled	---	Disabled abled
Cae40	Comp 1 off	Enable shutdown of compressor 1 for compressor warning inverter (line 1)	NO	---	NO | YES
	Reset	Type of reset for compressor warning inverter (line 1)	manual	---	manual automatic
	Alarm delay	Delay for compressor warning inverter (line 1)	0	s	0…999
Caf02	Compressor type	Type of compressors (line 1)	Recriproc.	---	Recriprocating | scroll
	Number of compressors	Number of compressors (line 1)	2/3 (*)	---	1…6 | 12 (*)
Caf03	Cmp1,…	Enable compressors (line 1)	abled	---	Disabled abled

Mask index	Display description	Description	Def.	U. of M.	Values
Caf04	Refrigerant type	Type of refrigerant (suction line 1)	R744	---	R22 | R134a R404A | R407C R410A | R507A R290 | R600 R600a | R717 R744 | R728 R1270 | R417A R422D | R413A R422A | R423A R407A | R427A R245Fa | R407F | R32
Caf05	Min.time on	Minimum compressor on time (line 1)	30	s	0…999
	Min.time off	Minimum compressor off time (line 1)	120	s	0…999
	Minimum time to start same comp.	Minimum time between starts of same compressor (line 1)	360	s	0…999
Caf06	Startup	Type of compressor startup	direct	---	Direct Part winding Star delta
Caf07	Star time	Star relay run time	0	ms	0…9999
	Star delay/line	Delaty betwen star and line relay	0	ms	0…9999
	Star delta delay	Delay between star and delta relay	0	ms	0…9999
Caf08	Partwinding delay	Partwinding delay	0	ms	0…9999
Caf09	Equalization	Enable compressor equalization at startup	NO	---	NO | YES
	Equal. time	Equalization duration	0	s	0…999
Caf10	Device rotation type	Type of rotation	FIFO	---	--- FIFO LIFO TIME CUSTOM
Caf11	Device sequence	Unloader sequence in relation to compressor activation (C=compressor, P=unloader)	CpppCppp	---	---- CCpppppp CpppCppp
Caf12	Load up time	Delay between different compressor starts	10	s	0…999
	Shutdown time	Delay between different compressor shutdowns	0	s	0…999
	Unloader delay	Delay between stages	0	s	0…999
Caf13	Custom rotation on order	Order of startup for compressor custom rotation	1	---	1…16
Caf14	Custom rotation off	Order of shutdown for compressor custom rotation	1	---	1…16
Caf15	Modulation device	Compressor modulating device type (line 1)	None	---	None Inverter Digital scroll
Caf16	Min frequency	Minimum inverter frequency	30	Hz	0…150
	Max frequency	Maximum inverter frequency	60	Hz	0…150
Caf17	Min.time on	Minimum time compressor controlled by inverter on (line 1)	30	s	0…999
	Min.time off	Minimum time compressor controlled by inverter off (line 1)	60	s	0…999
	Minimum time to start same comp.	Minimum time compressor controlled by inverter startup (line 1)	180	s	0…999
Caf18	Digital comp. valve regulation	Digital Scroll™ compressor valve control type (line 1)	Optimized regulation	---	Optimized regulat. Variable cycle time Fixed cycle time
	Cycle time	Cycle time (line 1)	13	s	12…20
Caf19	Oil dilution	Enable Digital Scroll™ oil temperature alarm (line 1)	enable	---	disable | enable
	Discharge temp	Enable Digital Scroll™ discharge temperature alarm (line 1)	enable	---	disable | enable
…	…	…	…	…	…
Caf90	Different sizes	Enable compressors of different sizes (line 1)	NO	---	NO | YES
	Different number of valves	Enable compressor partialization (line 1)	NO	---	NO | YES
Caf91	S1	Enable size and size for compressor group 1 (line 1)	YES' 10.0	--- kW	NO | YES 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO	--- --- kW	--- NO | YES 0.0…500.0
Caf92	S1	Enable stages and stages for compressor group 1 (line 1)	YES' 100	--- %	NO | YES 100 | 50 | 100 | 50 75 | 100 | 25 | 50 75 | 100 | 33 | 66 | 100
	…	…	…	…	…
	S4	Enable stages and stages for compressor group 4 (line 1)	NO ---	--- kW	NO | YES S1…S4
Caf93	C01	Size group for compressor 1 (line 1) or presence of inverter (line 1)	S1	---	S1…S4 | INV
…	…	…	…	…	…
	C12	Size group for compressor 6 (line 1)	S1	---	S1…S4
Caf95	Min.time on	Minimum time on for Digital Scroll™ compressor (line 1)	60	s	0…999
	Min.time off	Minimum time off for Digital Scroll™ compressor (line 1)	180	s	0…999
	Minimum time to start same comp.	Minimum time between startups for Digital Scroll™ compressor (line 1)	360	s	0…999
	Reactivate startup procedure after	Time for reactivation of startup procedure for Digital Scroll™ compressor (line 1)	480	min	0…9999
Cag01	Minimum voltage	Voltage corresponding to the minimum capacity of the inverter (line 1)	0.0	V	0.0…10.0
	Maximum voltage	Voltage corresponding to the maximum capacity of the inverter (line 1)	10.0	V	0.0…10.0
	Nominal freq.	Nominal frequency (frequency at nominal capacity) (line 1)	50	Hz	0…150
	Nominal power	Nominal capacity for compressor managed by inverter at nominal frequency (line 1)	10.0	kW	0.0…500.0
Cag02	Rising time	Time to pass from minimum to maximum capacity for modulating device (line 1)	90	s	0…600
	Falling time	Time to pass from maximum to minimum capacity for modulating device (line 1)	30	s	0…600
Cag03	Enable compressor modulat. in dead zone	Enable compressor 1 modulation inside dead zone (line 1)	AB	---	Disabled abled
Cag04	Enable suction press.backup probe	Enable screens for the configuration of the suction pressure backup probe (line 1)	NO	---	NO | YES
Cag05	Request in case of regulation probe fault	Compressor forcing value in case of suction probe fault (line 1)	50.0	%	0.0…100.0
	Pumpdown	Enable pumpdown function (line 1)	Disabled	---	disabled abled
	Threshold	Pumpdown end threshold (line 1)	1.5 barg	…	… (**)
Cag06	Enable anti return of liquid	Enable liquid non return function (line 1)	NO	---	NO | YES
	Delay	Delay liquid non return function (line 1)	0	min	0…15

Mask index	Display description	Description	Def.	U. of M.	Values
The following parameters refer to line 2, for details, see the corresponding parameters for line 1 above					
Cba01	DI	Alarm 1 compressor 1 DI position (line 2)	03	---	--- | 01…18 U1…U10 (****)
	Status (display only)	Status Alarm 1 compressor 1 DI (line 2)	---	---	closed | open
	Logic	Logic alarm 1 compressor 1 DI (line 2)	NC	---	NC | NO
	Function (display only)	Alarm 1 compressor 1 function status (line 2)	---	---	not active | active
…	…	…	…	…	…
Cbb01	Regulation	Compressor control by temperature or pressure (line 2)	pressure	---	pressure temperature
	Reg. Type	Compressor regulation type (line 2)	dead zone	---	Proportion. band dead zone
…	…	…	…	…	…
Cbc01	Compressor 1 operating hours	Compressor 1 operating hours (line 2)	---	---	0…999999
…	…	…	…	…	…
Cbd01	Enable suction setpoint compensation	Enable setpoint compensation (suction line 2)	NO	---	NO | YES
…	…	…	…	…	…
Cbe01	Number of alarms for each compressor	Number of alarms for each compressor (line 2)	1	---	0…4
…	…	…	…	…	…
Cbf02	Compressor type	Type of compressors (line 2)	Recriproc.	---	Recriprocating scroll
	Number of compressors	Number of compressors (line 2)	2/3 (*)	---	1…12
…	…	…	…	…	…
Cbg01	Minimum voltage	Voltage corresponding to the minimum capacity of the inverter (line 2)	0.0	Hz	0.0…10.0
	Maximum voltage	Voltage corresponding to the maximum capacity of the inverter (line 2)	10.0	Hz	0.0…10.0
	Nominal freq.	Nominal frequency (frequency at nominal capacity) (line 2)	50	Hz	0…150
	Nominal power	Nominal capacity for compressor managed by inverter at nominal frequency (line 2)	10.0	Kw	0.0…500.0
…	…	…	…	…	…
Cca02	RPRV opening	Flash gas valve opening percentage to enable parallel line activation	30	%	0…100
	Delay	Evaluation time for activation of parallel line from when reaching the set flash valve opening	10	s	…
	Min g.c. temp	Activation threshold relative to gas cooler outlet temperature	25°C	°C/°F	…
	Tgc off thr	Parallel compression or parallel compressor line deactivation threshold relative to gas cooler outlet temperature	15°C	°C/°F	…
Cca03	RPRV offset with par. comp. on	Offset applied to receiver pressure set point when at least one parallel compressor is active	2.0 barg	barg/psig	…
	Par. Comp. ON rising time RPRV	Time needed to add the offset to the receiver pressure set point	0	s	…
	Par. Comp. OFF falling time RPRV	Time needed to subtract the offset from the receiver pressure set point	20	s	…
Cca04	Setpoint	Set point for proportional control of integrated parallel compressor on the main board	35 barg	barg/psig	
	Prop gain	Proportional gain for proportional control of integrated parallel compressor on the main board	10	%	0…100
	Ti	Integral time for proportional control of integrated parallel compressor on the main board	30	s	…
	Td	Derivative time for proportional control of integrated parallel compressor on the main board	0	s	…
Cca05	Min.time on	Minimum integrated parallel compressor ON time	30	s	0…999
	Min.time off	Minimum integrated parallel compressor OFF time	120	s	0…999
	Min.time on same compr.	Minimum time between starts of same integrated parallel compressor	360	s	0…999
Cca06	Minimum voltage	Voltage corresponding to minimum power of the integrated parallel compressor inverter	0.0	V	0.0…10.0
	Maximum voltage	Voltage corresponding to maximum power of the integrated parallel compressor inverter	10.0	V	0.0…10.0
	Nominal freq.	Minimum integrated parallel compressor inverter frequency	30	Hz	0…150
	Nominal power	Maximum integrated parallel compressor inverter frequency	60	Hz	0…150
Cca07	Nominal freq.	Nominal frequency (frequency at nominal power) of the integrated parallel compressor	50	Hz	0…150
	Rising time	Time to move from integrated parallel compressor modulating device minimum to maximum power	20	s	0…600
	Falling time	Time to move from integrated parallel compressor modulating device maximum to minimum power	20	s	0…600
Cca11	Delay	Integrated parallel compressor generic alarm activation delay	0	s	0…999
	Delay at start	Integrated parallel compressor generic alarm activation delay at start-up	0	s	0…999
	Reset	Type of integrated parallel compressor generic alarm reset	automatic	…	automatic manual
	Priority		light	…	light | serious
Cca12	DI	Integrated parallel compressor generic alarm DI input position	---	---	01…18, U1…U10
	Status	Integrated parallel compressor generic alarm DI status	---	---	closed | open
	Logic	Integrated parallel compressor generic alarm DI logic	NC	---	NC | NO
	Function	Integrated parallel compressor generic alarm function status	---	---	not active | active
Eia14	Comp. Par. disch. Temp	Integrated parallel compressor discharge temperature	---	---	U1…U10
Cca08	Threshold	High discharge temperature alarm activation threshold for the integrated parallel compressor	120°C	°C/°F	---
	Different.	High discharge temperature alarm activation differential for the integrated parallel compressor	5°C	°C/°F	---
	Delay	High discharge temperature alarm activation delay for the integrated parallel compressor	5	s	---
Cca13	DO relay line	DO position and display status (ON/OFF) for integrated parallel compressor	---	---	DO1…DO18
	Logic	DO logic of integrated parallel compressor power supply	NC	---	NC | NO
Cca14	AO	Integrated parallel compressor modulating device AO position	---	---	01…06
	Status (display only)	Integrated parallel compressor modulating device AO value	0.0	%	0…100.0

Tab. 7.d

Mask index	Display description	Description	Def.	U. of M.	Values
D.Condensers					
The I/Os depend on the configuration selected, the following are only examples. See Appendix A.1 for the complete list and position of available I/Os.					
Daa01	DI	Fan 1 overload DI position (line 1)	…	---	---, 01…18, U1…U10 (****)
	Status (display only)	Fan 1 overload DI status (line 1)	---	---	closed | open
	Logic	Fan 1 overload DI logic (line 1)	NC	---	NC | NO
	Function (display only)	Fan 1 overload function status (line 1)	---	---	not active | active
…	…	…	…	…	…

Mask index	Display description	Description	Def.	U. of M.	Values
Daa18	---	Gas cooler backup probe position (line 1)	B1	---	---, U1…U10 (****)
	---	Gas cooler backup probe type (line 1)	4...20 mA	---	---- 0-1 V 0-10 V 4...20 mA 0-5 V
	--- (display only)	Gas cooler backup pressure value	---	…	…(**)
	Max limit	Gas cooler backup maximum pressure value (line 1)	30.0 barg	…	…(**)
	Min limit	Gas cooler backup pressure minimum value (line 1)	0.0 barg	…	…(**)
	Calibration	Gas cooler backup pressure probe calibration (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Daa21	DO	Fan 1 DO position (line 1)	03	---	--- | 01…18 (****)
	Status (display only)	Status of fan 1 DO (line 1)	---	---	closed | open
	Logic	Logic of fan 1 DO (line 1)	NC	---	NC | NO
	Function (display only)	Fan 1 function status (line 1)	---	---	not active | active
…	…	…	…	…	…
Daa38	AO	Inverter fan AO position (line 1)	0	---	---, 01…06 (****)
	Status (display only)	Inverter fan output value (line 1)	0	%	0.0…100.0
…	…	…	…	…	…
Dab01	Regulation	Condenser regulation by temperature or pressure (line 1) Note: with HPV valve management, only temperature regulation is enabled	temperat.	---	pressure temperature
	Regulation type	Condenser regulation Type (line 1)	proport. band	---	Proportion. band dead zone
Dab02	Minimum	Condenser setpoint lower limit (line 1)	…(**)	…	…(**)
	Maximum	Condenser setpoint upper limit (line 1)	…(**)	…	…(**)
Dab03	Setpoint	Condenser setpoint (line 1)	…(**)	…	…(**)
Dab04	*Fans work if at least one compressor works*	Enable fan operation linked to compressor operation	NO	---	NO | YES
Dab05	Cut-off enable	Enable fan cut-off	NO	---	NO | YES
	Cut-off request	Cut-off value	0.0	%	0.0…100.0
	Setpoint	Setpoint cut-off	…(**)	…	…(**)
	Diff.	Differential cut-off	…(**)	…	…(**)
	Hysteresis	Hysteresis cut-off	…(**)	…	…(**)
Dab6/ Dab8 (**)	Reg. Type	Proportional regulation type (condensing line 1)	proportion.	---	proportional proport.+integer
	Integral time	Integral time for proportional regulation (cond. line 1)	300	s	0…999
Dab7/ Dab9 (**)	Differential	Differential for proportional regulation (cond. line 1)	…(**)	…	…(**)
Dab10/Dab11(**)	DZ diff.	Dead zone regulation differential (line 1)	…(**)	…	…(**)
	Activ.diff.	Dead zone regulation differential for device activation (line 1)	…(**)	…	…(**)
	Deact.diff.	Dead zone regulation differential for device deactivation (line 1)	…(**)	…	…(**)
Dab12/Dab13 (**)	En.force off	Enable capacity immediate decreasing to 0 (line 1)	NO	---	NO | YES
	Setp. force off	Threshold for capacity decreasing to 0 (line 1)	…(**)	…	…(**)
Dab14	Power to 100% min time	Minimum time to increase capacity request to 100%, dead zone regulation (condensing line 1)	15	s	0…9999
	Power to 100% max time	Maximum time to increase capacity request to 100%, dead zone regulation (condensing line 1)	90	s	0…9999
Dab15	Power reduction to 0% min time	Minimum time to decrease capacity request to 0%, dead zone regulation (condensing line 1)	30	s	0…9999
	Power reduction to 0% max time	Maximum time to decrease capacity request to 0%, dead zone regulation (condensing line 1)	180	s	0…9999
Dac	--	Not available	---	---	---
Dad01	Enable condensing setpoint compensation	Enable setpoint compensation (condensing line 1)	NO	---	NO | YES
Dad02	Winter offset	Offset applied for the Winter period	0.0	…	-999,9…999,9
	Closing offset	Offset applied for closing period	0.0	…	-999,9…999,9
Dad03	Enable setpoint compensation by scheduler	Enable scheduler setpoint compensation (condensing line 1)	NO	---	NO | YES
Dad04	TB1: --:-- -> --:--	Enabling and definition of time band 1: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Enabling and definition of time band 4: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	Change	Time band change action	---	---	--- | Save changes Load previous | Clear all
	Copy to	Copy settings to other days	---	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL
Dad05	Enable floating gas cooler setpoint	Enable floating gas cooler setpoint (condensing line 1)	NO	---	NO | YES
Dad06	Offset for external temp.	Setpoint variation for floating gas cooler setpoint (condensing line 1)	0.0	…	-9,9…9,9
	Controlled by: -Dig. input	Enable floating gas cooler setpoint by digital input	NO	---	NO | YES
Dad07	Change setpoint by digital input	Enable setpoint compensation by digital input (suct/cond line 1)	NO	---	NO | YES
Dae01	Gas cooler high pressure alarm	Type of gas cooler high pressure alarm threshold (line 1)	absolute	---	absolute | relative
	Delay	Gas cooler high pressure alarm delay (line 1)	60	s	0…999
Dae02/Dae06	Gas cooler high pressure alarm	Gas cooler high pressure alarm threshold (line 1)	24.0 barg	…	…(**)
	Differen.	Gas cooler high pressure alarm differential (line 1)	1.0 barg	…	…(**)
Dae03	Gas cooler low pressure alarm	Type of gas cooler low pressure alarm threshold (line 1)	absolute	---	absolute | relative
	Delay	Gas cooler low pressure alarm delay (line 1)	30	s	0…999
Dae04/Dae07	Gas cooler low pressure alarm	Gas cooler low pressure alarm threshold (line 1)	7.0 barg	…	…(**)
	Differen.	Gas cooler low pressure alarm differential (line 1)	1.0 barg	…	…(**)
Dae05	Common fan overload	Enable common fan overload (line 1)	YES'	---	NO | YES
	Delay	Common fan alarm delay	0	s	0…500
	Reset	Common fan alarm reset type	automatic	---	automatic manual
Daf01	Number of fans	Number of fans (line 1)	3	---	0…16
Daf02	Fan1, Fan2, ...	Enable fan 1...12 (line 1)	AB	---	Disabled | abled
Daf03	Fan13, Fan14, ...	Enable fan 13...16 (line 1)	AB	---	Disabled | abled

Mask index	Display description	Description	Def.	U. of M.	Values
Daf04	Refrigerant type	Type of refrigerant (condensing line 1)	R744	---	R22 | R134a R404A | R407C R410A | R507A R290 | R600 R600a | R717 R744 | R728 R1270 | R417A R422D | R413A R422A | R423A R407A | R427A R245Fa | R407F | R32
Daf05	Device rotation type	Type of rotation devices (condensing line 1)	FIFO	---	------ FIFO LIFO TEMPO CUSTOM
Daf07, Daf08	Custom rotation on order	On order for devices for custom rotation (condensing line 1)	1	---	1…16
Daf09, Daf10	Custom rotation off	Off order for devices for custom rotation (condensing line 1)	1	---	1…16
Dag01	Speed modul. device	Modulating condenser device type (line 1)	None	---	None | Inverter Phase cut-off control
Dag02	Standby zone reg.	Fan modulation even in dead zone (line 1)	NO	---	NO | YES
	Min out value	Minimum voltage for compressor inverter (line 1)	0.0	V	0.0…9,9
	Max out value	Maximum voltage for compressor inverter (line 1)	10.0	V	0.0…99,9
	Min. power ref.	Minimum capacity of fan modulating device (line 1)	60	%	0…100
	Max. power ref.	Maximum capacity of fan modulating device (line 1)	100	%	0…999
Dag03	Rising time	Time to pass from minimum to maximum capacity for fan modulating device (line 1)	1200	s	0…32000
	Falling time	Time to pass from maximum to minimum capacity for fan modulating device (line 1)	1200	s	0…32000
	Num. control. fans	Number of fans under inverter (only for alarm enabling)	1	---	0…16
Dag04	Split Condenser	Enable split condenser (line 1)	NO	---	NO | YES
	Controlled by: -Digital input	Split condenser controlled by digital input (line 1)	---	---	NO | YES
	-External temp	Split condenser controlled by external temperature (line 1)	---	---	NO | YES
	-Scheduler	Split condenser controlled by scheduler (line 1)	---	---	NO | YES
Dag05	Ext.Temp.Set.	Split condenser setpoint by external temperature (line 1)	10.0 °C	…	-99,9…99,9
	Ext.Temp.Diff.	Split condenser differential by external temperature (line 1)	2,5 °C	…	-99,9…99,9
Dag06	Type	Fans enabled with split condenser (line 1)	custom	---	Custom Odd Even Greater than Less than
	---	Only when enabling is GREATER THAN or LESS THAN the number of fans to consider (line 1)	0	---	0…16
Dag09	Disable split condenser as first stage of HP pressure switch	Disable split condenser when high condensing pressure prevent occurs (line 1)	NO	---	NO | YES
	for	Duration of split condenser deactivation for high pressure prevent (line 1)	0	h	0…24
Dag10	Silencer	Enable silencer (line 1)	Disabled	---	Disabled Abled
	Max output	Maximum possible request when silencer is active (line 1)	75.0 %	%	0.0…100.0
	Controlled by: -Digital input	Silencer controlled by digital input (condensing line 1)	NO	---	NO | YES
	-Scheduler	Silencer controlled by scheduler (condensing line 1)	NO	---	NO | YES
Dag12	-	Day of the week	---	---	LUN, ..., DOM
	TB1: --:-- -> --:--	Enabling and definition of time band 1: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Enabling and definition of time band 4: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	Change	Time band change action	---	---	--- Save changes Load previous Clear all
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL
Dag13	Speed Up	Enable speed up (condensing line 1)	YES	---	NO | YES
	Speed up time	Speed up time (condensing line 1)	5	s	0…60
	Ext.Temp.Mgmt	Enable speed up management by external temperature (condensing line 1)	Disabled	---	Disabled | abled
	Ext.Temp.Set.	Speed up management by external temperature threshold (condensing line 1)	25.0 °C	…	-99,9…99,9
	Diff. Ext.Temp.	Speed up management by external temperature differential (condensing line 1)	2,5 °C	…	-99,9…99,9
Dag14	Enable gas cooler press. backup probe	Enable screens for the configuration of the gas cooler pressure backup probe (condensing line 1)	NO	---	NO | YES
Dag15	Request in case of regulation probe fault	Value of fan forcing in case of gas cooler probe error (line 1)	50.0	%	0.0…100.0
The following parameters refer to line 2, for details, see the corresponding parameters for line 1 above					
Dba01	DI	Fan 1 overload DI position (line 2)	…	---	--- | 01…18 | U1…U10 (****)
	Status (display only)	Fan 1 overload DI status (line 2)	---	---	closed | open
	Logic	Fan 1 overload DI logic (line 2)	NC	---	NC | NO
	Function (display only)	Fan 1 overload function status (line 2)	---	---	not active | active
Dba39	---	Intercooler pressure probe position (downstream)	---	---	U1…U10 (****)
	---	Intercooler pressure probe type (downstream)	4...20mA	---	---- | 0-1V | 0-10V 4...20mA | 0-5V
	--- (display only)	Intercooler pressure value (downstream)	---	…	…(**)
	Max limit	Maximum intercooler pressure value (downstream)	44.8 barg	…	…(**)
	Min limit	Minimum intercooler pressure value (downstream)	0.0 barg	…	…(**)
	Calibrat.	Intercooler pressure probe calibration (downstream)	0.0 barg	…	…(**)
…	…	…	…	…	…
Dbb01	Regulation	Condenser regulation by temperature or pressure (line 2)	pressure	---	pressure temperature
	Regulation type	Condenser regulation Type (line 2)	Proportion. band	---	proportional Band dead zone
…	…	…	…	…	…

Mask index	Display description	Description	Def.	U. of M.	Values
Dbd01	Enable condensing setpoint compensation	Enable setpoint compensation (condensing line 2)	NO	---	NO | YES
…	…	…	…	…	…
Dbe01	Cond.pressure high alarm	Condensing high pressure/temperature alarm threshold type (line 2)	absolute	---	absolute relative
	Delay	Condensing high pressure/temperature alarm delay (line 2)	60	s	0…999
…	…	…	…	…	…
Dbf01	Number of fans	Number of fans (line 2)	3	---	0…16
…	…	…	…	…	…
Dbg01	Modulate speed device	Modulating condenser device type (line 2)	None	---	None Inverter Phase cut-off control
…	…	…	…	…	…

Tab. 7.e

Mask index	Display description	Description	Def.	U. of M.	Values
	E.Other functions				
The I/Os depend on the configuration selected, the following are only examples. See Appendix A.1 for the complete list and position of available I/Os.					
Eaaa04	---	Oil temperature probe position (line 1)	B1	---	--- | U1…U10 (****)
	---	Oil temperature probe type (line 1)	4...20 mA	---	--- | NTC | PT1000 | 0...1 V | 0...10 V | 4...20 mA | 0...5 V | HT NTC
	--- (display only)	Oil temperature value (line 1)	---	…	…(**)
	Max limit	Maximum oil temperature value (line 1)	30.0 barg	…	…(**)
	Min limit	Minimum oil temperature value (line 1)	0.0 barg	…	…(**)
	Calibration	Oil temperature probe calibration (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Eaaa45	DO	Oil level valve compressor 6 DO position (line 1)	03	---	---, 01…18 (****)
	Status (display only)	Oil level valve compressor 6 DO status (line 1)	---	---	closed | open
	Logic	Oil level valve compressor 6 DO logic (line 1)	NC	---	NC | NO
	Function (display only)	Oil level valve compressor 6 function status (line 1)	---	---	not active | active
Eaab04	Enable com.cool.	Enable common oil cooling (line 1)	YES	---	NO | YES
	Number of oil pumps	Number of oil pumps for common oil cooler (ine 1)	0	---	0…1 (analog. output) 0…2 (digital output)
	Enable pump out.	Enable AO of common oil cooler pump (line 1)	YES	---	NO (digital output) YES (analog. output)
Eaab15	Enable cool.	Enable oil cooling compressors (line 1)	NO	---	NO | YES
	Oil cool. off with comp. off	Oil cooling functioning only when compressor functioning	NO	---	NO | YES
Eaab05	Setpoint	Common oil cooling setpoint (line 1)	0.0 °C	…	…(**)
	Differential	Common oil cooling differential (line 1)	0.0 °C	…	-9,9…9,9
Eaab06	Pump start delay	Pump 2 start delay after pump 1 startup (line 1)	0	s	0…999
Eaab07	Oil pump config	Oil pump output configuration: none, analog, digital	non conf.	---	not configurable analogic digital
Eaab08	Setpoint	Oil temperature setpoint (line 1)	0.0	°C/°F	…
	Differential	Oil temperature differential (line 1)	0.0	°C/°F	…
	Duty on time	Fan startup time in case of oil probe error (line 1)	0	s	0…9999
	Duty off time	Fan shutdown time in case of oil probe error (line 1)	0	s	0…9999
Eaab09	Threshold	Common oil high temperature alarm threshold (line 1)	100.0 °C	°C/°F	…
	Differential	Common oil high temperature alarm differential (line 1)	10.0 °C	°C/°F	…
	Delay	Common oil high temperature alarm delay (line 1)	0	s	0…32767
Eaab10	Enable oil lev.	Enable oil level management (line 1)	NO	---	NO | YES
	Num. oil level alarms	Number of compressor alarms associated with the oil level (line 1)	0	---	0…4 | 7 (*)
Eaab11	Open time	Oil level valve opening time (line 1)	0	s	0…999
	Closing time	Oil level valve closing time (line 1)	0	s	0…999
	Puls. start delay	Delay for oil level valve pulsation at startup (line 1)	0	s	0…999
	Max. puls. time	Maximum pulsing time of the oil level valve (line 1)	0	s	0…999
Eaab12	Oil level controlled by	Type of oil level separator control: with minimum level only, with minimum and maximum level and with compressor status (line 1)	livello min.	---	liv.min. | liv.min.&max comp. status
	Min.off valve	Minimum separator valve closing time (line 1)	0	s	0…999
	Min.lev. delay	Minimum oil level detection delay (line 1)	0	s	0…999
Eaab13	Ton Activ.	Valve opening time during oil level reset (line 1)	10	s	0…999
	Toff Activ.	Valve closing time during oil level reset (line 1)	0	s	0…999
	Ton Deact.	Valve opening time with correct oil level (line 1)	0	s	0…999
	Toff Deact.	Valve closing time with correct oil level (line 1)	10	min	0…999
Eaab14	Threshold	Oil separator differential pressure threshold (line 1)	1.0 barg	…	…(**)
	Differential	Oil separator differential pressure (line 1)	0,5 barg	…	…(**)
	Delay	Oil separator differential pressure delay (line 1)	0	s	0…99
Eaab16	Threshold	Oil cooler high temperature alarm threshold (line 1)	100.0 °C	°C/°F	…
	Differential	Oil cooler high temperature alarm differential (line 1)	10.0 °C	°C/°F	…
	Delay	Oil cooler high temperature alarm delay (line 1)	0	s	0 to 9999
Eaab20	Threshold	Oil cooler low temperature alarm threshold (line 1)	100.0 °C	°C/°F	…
	Differential	Oil cooler low temperature alarm differential (line 1)	10.0 °C	°C/°F	…
	Delay	Oil cooler low temperature alarm delay (line 1)	0	s	0 to 9999
Ebaa01	DO	Subcooling DO valve position (line 1)	…	---	---, 01…18 (****)
	Status (display only)	Subcooling DO valve status (line 1)	---	---	closed | open
	Logic	Subcooling DO valve logic (line 1)	NO	---	NC | NO
	Function (display only)	Status of the subcooling valve function (line 1)	---	---	not active | active
Ebab01	Subcooling contr.	Enable subcooling function (line 1)	NO	---	NO | YES
	---	Subcooling control type (line 1)	temp. Cond&Liqu.	---	Temp. Cond&Liquid Only Liquid Temp
	Threshold	Threshold for subcooling activation (line 1)	0.0 °C	…	-9999,9…9999,9
	Subcooling (display only)	Subcooling value (line 1)	0.0 °C	…	-999,9…999,9
Eeaab25	Enable Oil Pres.diff management	Enable common differential oil management	NO	---	YES | NO
	Manage oil press. with dedicated settings	With dedicated parallel compression board, select whether to use the same settings as the main board	NO	---	YES | NO
	Manage oil press. with dedicated I/O	With dedicated parallel compression board, select whether to use the same inputs and outputs as the main board	NO	---	YES | NO

Mask index	Display description	Description	Def.	U. of M.	Values
Eeaa1a	---	Common oil receiver pressure probe position (line 1)	---	---	U1…U10 (****)
	---	Common oil receiver pressure probe type (line 1)	4...20mA	---	----, 0-1V - 0-10V- 4...20mA- 0-5V
	--- (display only)	Common oil receiver pressure value (line 1)	---	…	…(**)
	Max limit	Maximum common oil receiver pressure value (line 1)	44.8 barg	…	…(**)
	Min limit	Minimum common oil receiver pressure value (line 1)	0.0 barg	…	…(**)
	Calibrat.	Common oil receiver pressure probe calibration (line 1)	0.0 barg	…	…(**)
Ecaa01	---	Discharge temperature probe position, compressor 1 (line 1)	B1	---	---, U1…U10 (****)
	---	Discharge temperature probe type, compressor 1 (line 1)	4...20mA	---	--- | NTC | PT1000 | 0...1 V | 0...10 V | 4...20 mA | 0...5 V | HTNTC
	--- (display only)	Discharge temperature value, compressor 1 (line 1)	---	…	…(**)
	Max limit	Maximum discharge temperature value, compressor 1 (line 1)	30.0 barg	…	…(**)
	Min limit	Minimum discharge temperature value, compressor 1 (line 1)	0.0 barg	…	…(**)
	Calibrat.	Discharge temperature probe calibration, compressor 1 (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Ecaa12	DO	Compressor 6 economizer valve DO position (line 1)	…	---	---, 01…18 (****)
	Status (display only)	Compressor 6 economizer valve DO status (line 1)	---	---	closed | open
	Logic	Compressor 6 economizer valve DO logic (line 1)	NO	---	NC | NO
	Function (display only)	Compressor 6 economizer valve function status (line 1)	---	---	not active | active
Ecab04 (*)	Economizer	Enable economizer function (line 1)	NO	---	NO | YES
	Comp.Power Thresh.	Capacity percentage threshold for economizer activation (line 1)	0	%	0…100
	Cond.Temp.Thresh.	Condensing temperature threshold for economizer activation (line 1)	0.0 °C	…	-999,9…999,9
	Discharge Temp.Thresh.	Discharge temperature threshold for economizer activation (line 1)	0.0 °C	…	-999,9…999,9
Edaa01	---	Discharge temperature probe position, compressor 1 (line 1)	B1	---	---, U1…U10 (****)
	---	Discharge temperature probe type, compressor 1 (line 1)	4...20mA	---	--- | NTC | PT1000 0...1 V | 0...10 V | 4...20 mA | 0...5 V | HTNTC
	--- (display only)	Discharge temperature value, compressor 1 (line 1)	---	…	…(**)
	Max limit	Discharge temperature maximum value, compressor 1 (line 1)	30.0 barg	…	…(**)
	Min limit	Discharge temperature minimum value, compressor 1 (line 1)	0.0 barg	…	…(**)
	Calibration	Discharge temperature probe calibration, compressor 1 (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Edaa12	DO	Compressor 6 liquid injection valve DO position (line 1)	…	---	---, 01…18 (****)
	Status (display only)	Compressor 6 injection valve DO status (line 1)	---	---	closed | open
	Logic	Compressor 6 injection valve DO logic (line 1)	NO	---	NC | NO
	Function (display only)	Compressor 6 injection valve function status (line 1)	---	---	not active | active
Edab01/Edab03 (*)	Liquid inj.	Enable liquid injection function (line 1)	Disabled	---	Disabled | abled
	Threshold	Liquid injection setpoint (line 1)	70.0 °C	…	… (**)
	Differential	Liquid injection differential (line 1)	5.0	…	… (**)
Eeaa02	DI HR Enable/Activation	Digital input to activate heat reclaim	…	…	---, 01…18, U1… U10 (****)
	Status	Status HR DI (display only)	…	…	Open | Closed
	Logic	Logic HR DI	No	…	NC | No
	Function (display only)	Function Status HR DI	…	…	Not active | Active
Eeaa05	AI HR ext. signal:	AI HR ext. Signal (HR request)	…	%	---, U1…U10 (****)
	Probe Type	Probe Type	0-10V	…	0-1V - 0-10V- 4...20mA- 0-5V
	Ext. Signal Value	Heat reclaim Ext. Signal Value	…	%	…(**)
	Upper Value:	Upper Value HR ext. Signal	100%	%	0.0…100.0
	Lower Value:	Lower Value HR ext. Signal	0%	%	0.0…100.0
	Calibration:	Calibration HR ext. Signal	0%	%	0.0…100.0
Eeaa06	DO Heat Reclaim out position:	DO Heat Reclaim out position	…	…	--- | 01…18 (****)
	Status (display only)	Status HR DO (display only)	…	…	Open | Closed
	Logic:	Logic HR DO:	NO	…	NC | NO
	Function (display only)	Function HR DO (display only)	Active	…	Not active | Active
Eeaa09	AO Heat Reclaim water pump:	AO Heat Reclaim water pump:	0	…	--- | 01…06 (****)
	Status:	Status HR AO (display only)	…	%	…
Eeab01	Enable heat reclaim 1:	Enable heat reclaim 1	No		YES | NO
	Enable heat reclaim 2:	Enable heat reclaim 2	No		YES | NO
	Consider contribution for tot. req.:	Composition of total request	HR1 only		None | Solo RC1 | Solo RC2 | RC!+RC2
Eeab02	Gas Cooler Pressure lower limit	Gas cooler lower limit admitted to activate heat reclaim	40.0	barg	
	Min toff betw. 2 activ. Heat reclaim 1:	Minimum time off between 2 activations Heat reclaim 1	30	min	
	Min toff betw. 2 activ. Heat reclaim 2:	Minimum time off between 2 activations Heat reclaim 2	30	min	
Eeab04	Disable floating cond. By heat reclaim:	Disable floating condensing by heat reclaim	No		YES | NO
Eeab05	Enable activation by scheduler:	Enable heat reclaim activation by scheduler	No		YES | NO
	Activation indipendent from the closing:	Activation indipendent from the closing	No		YES | NO
Eeab07	HR1 Regulation type:	Different type of regulation of first heat reclaim	Temperat.		External Signal Temperature Digital Input
	Setpoint	Setpoint if HR1 is regulated by temperature	55	°C/°F	
	Kp:	Kp if HR1 is regulated by temperature	1	%/°C	
	Integral time:	Integral time if HR1 is regulated by temperature	200	s	
Eeab08	HR1 Valve type:	Type of valve of first heat reclaim	ON/OFF		ON | OFF | 0 | 10V
	Activation thr:	Threshold to activate valve output HR1	10.0	%	
	De-activat thr:	Threshold to de-activate valve output HR1	5.0	%	
	Activation delay:	Delay to activate valve output HR1	30	s	
Eeab09	En. Pump:	Enable pump of first heat reclaim	No		YES | NO
	Pump type:	Selection of pump type of first heat reclaim			Modulating | ON | OFF
	Pump delay off:	Delay to switch off pump HR1	0	s	
Eeab10	Pump regulation type:	Different type of pump regulation of first heat reclaim	HR request		HR request | Diff temperature
	On threshold:	Threshold to activate pump output HR1	5.0	%	
	Off threshold:	Threshold to deactivate pump output HR1	0.0	%	

Mask index	Display description	Description	Def.	U. of M.	Values
Eeab11	Pump Management Setpoint:	Setpoint if HR1 pump is regulated by temperature	55	°C/°F	
	Kp:	Kp if HR1 pump is regulated by temperature	1	%/°C	
	Integral time:	Integral time if HR1 pump is regulated by temperature	120	s	
Eeab13	HR1 enable HR probe temp. Filter:	Enable multiple measurements of temperature probe	No		YES | NO
	Number of samples	Number of samples			1…200
Eeab14	Max. water temp. Alarm thresh:	Maximum water temperature Alarm threshold	85	°C/°F	
	Differential:	Differential for maximum water temperature Alarm threshold	5	°C/°F	
Eeab15	HR2 Regulation type:	Different type of regulation of first heat reclaim	Temperat.		External Signal Temperature Digital Input
	Setpoint	Setpoint if HR2 is regulated by temperature	40	°C/°F	
	Kp:	Kp if HR2 is regulated by temperature	1	%/°C	
	Integral time:	Integral time if HR2 is regulated by temperature	200	s	
Eeab16	HR2 Valve type:	Type of valve of first heat reclaim	ON/OFF		ON | OFF | 0 | 10V
	Activation thr:	Threshold to activate valve output HR2	10.0	%	
	De-activat thr:	Threshold to de-activate valve output HR2	5.0	%	
	Activation delay:	Delay to activate valve output HR2	30	s	
Eeab17	En. Pump:	Enable pump of first heat reclaim	No		YES | NO
	Pump type:	Selection of pump type of first heat reclaim			Modulating | ON | OFF
	Pump delay off:	Delay to switch off pump HR2	0	s	
Eeab18	Pump regulation type:	Different type of pump regulation of first heat reclaim	HR request		HR request | Diff temperature
	On threshold:	Threshold to activate pump output HR2	5.0	%	
	Off threshold:	Threshold to de-activate pump output HR2	0.0	%	
Eeab19	Pump Management Setpoint:	Setpoint if HR2 pump is regulated by temperature	55	°C/°F	
	Kp:	Kp if HR2 pump is regulated by temperature	1	%/°C	
	Integral time:	Integral time if HR2 pump is regulated by temperature	120	s	
Eeab20	HR2 enable HR probe temp. Filter:	Enable multiple measurements of temperature probe	No		YES | NO
	Number of sample	Number of samples			1…200
Eeab21	Maximum water temp. Alarm thresh:	Maximum water temperature Alarm threshold	85	°C/°F	
	Differential:	Differential for maximum water temperature Alarm threshold	5	°C/°F	
Eeab25	Actions on HPV valve and gas cooler fans setpoints done in:	Type of HPV setpoint increment	Simultan. Mode		Simultaneous Sequential mode with Threasold
	Wait. Time to act:	Delay to start HPV setpoint increment	120	s	
Eeab26	En. GasCool.bypass:	Enable Gas Cooler bypass	No		YES | NO
	Gas cooler bypass 3way valve type:	Gas cooler bypass 3way valve type	0/10	V	0 | 10 | ON | OFF
	Valve Mode	Bypass valve mode	ON/OFF		Modulating ON | OFF
	Eval. Time to byp:	Evaluation time to start GC bypass	30	s	
	Max receiver press. To allow byp:	Max receiver pressure to allow bypass	60.0	barg	
Eeab28	HPV valve modul. Setp.min%:	Min. HPV setpoint with heat reclaim total request upper setted threshold	75.0	barg	
	HPV valve modul. Setp.100%:	Max. HPV setpoint with heat reclaim total request equal to 100%	85.0	barg	
	Time to min setp.:	Time to reach minimum setpoint	60	s	
	Incr. Step:	Value of incremental step between setpoint min& e setpoint 100%	0.5	barg	
	Wait time:	Time each step	60	s	
Eeab29	Gas cool. Fans modulat. Incr. Step:	Value of GC incremental step	1.0	°C/°F	
	Gas cool. Fans modulat. Wait time:	Time each step	60	s	
	Gas cool. Fans modulat. Max offset:	GC maximum offset	5.0	°C/°F	
	Gas cool. Fans modulat. Min. HR request:	Minimum HR total request to start GC action	30.0	%	
	Gas cool. Fans modulat. Diff. OFF:	Differential to decrease GC action	5.0	%	
Eeab30	Max decrease time of HPV offset:	Time to decrease total HPV offset	240	s	
	Max decrease time of GC offset:	Time to decrease total GC offset	120	s	
	Max t.close byp.	Time to close bypass valve	120	s	
Efa05	Min.HR request:	Enable generic stage function 1	30.0	%	
	Diff.OFF:	…	5.0	%	
	JAN.funct.5	Enable generic stage function 5	disable	---	disable | enable
Efa06	Regulation variable	Regulation variable for stage 1 generic function	---	---	…
	Mode	Direct or reverse regulation	direct	---	direct | Reverse
Efa07	Enable	Enabling variable for stage 1 generic function	---	---	…
	Description	Enable description change	skip	---	skip | change
	----------	----------	---	---	…
Efa08	Setpoint	Setpoint stage 1 generic function	0.0 °C	…	… (**)
	Differential	Stage 1 generic function differential	0.0 °C	…	… (**)
Efa09	High alarm	High alarm enabling for stage 1 generic function	disable	---	disable | enable
	High alarm	High alarm threshold for stage 1 generic function	0.0 °C	…	… (**)
	Delay	High alarm delay for stage 1 generic function	0	s	0…9999
	Alarm type	High alarm type for stage 1 generic function	Normal	---	Normal | Serious
	Low alarm	Low alarm enabling for stage 1 generic function	disable	---	disable | enable
	Low alarm	Low alarm threshold for stage 1 generic function	0.0 °C	…	… (**)
	Delay	Low alarm delay for stage 1 generic function	0	s	0…9999
	Alarm type	Low alarm type for stage 1 generic function	Normal	---	Normal | Serious
…	…	…	…	…	…
Efb05	JAN.modulat.1	Enable generic modulating function 1 management	disable	---	disable | enable
	JAN.modulat.2	Enable generic modulating function 2 management	disable	---	disable | enable
Efb06	Regulation variable	Regulation variable for generic modulating function 1	---	---	…
	Mode	Direct or reverse regulation	direct	---	Direct | Reverse
Efb07	Enable	Enabling variable for generic modulating function 1	---	---	…
	Description	Enable description change	Skip	---	skip | change
	----------	----------	---	---	…
Efb08	Setpoint	Setpoint for generic modulating function 1	0.0 °C	…	… (**)
	Differential	Differential for generic modulating function 1	0.0 °C	…	… (**)

Mask index	Display description	Description	Def.	U. of M.	Values
Efb09	High alarm	High alarm enabling for generic modulating function 1	disable	---	disable | enable
	High alarm	High alarm threshold for generic modulating function 1	0.0 °C	…	… (**)
	Delay	High alarm delay for generic modulating function 1	0	s	0…9999
	Alarm type	Low alarm type for generic modulating function 1	Normal	---	Normal | Serious
Efb20	Low alarm	Low alarm enabling for stage 1 generic function	Disable	---	disable | Enable
	Low alarm	Low alarm threshold for stage 1 generic function	0.0 °C	…	… (**)
	Delay	Low alarm delay for stage 1 generic function	0	s	0…9999
	Alarm type	Low alarm type for stage 1 generic function	Normal	---	Normal | Serious
Efb10	Out upper limit	Output upper limit for generic modulating function 1	100.0	%	0…100
	Out lower limit	Output lower limit for generic modulating function 1	0.0	%	0…100
	Cut-off enable	Enable cut-off function for generic modulating function 1	NO	---	NO | YES
	Cutoff Diff	Cut-off differential for generic modulating function 1	0.0 °C	…	… (**)
	Cutoff hys.	Cut-off hysteresis for generic modulating function 1	0.0 °C	…	… (**)
…	…	…	…	…	…
Efb15	Out upper limit	Output upper limit for generic modulating function 1	100.0	%	0…100
	Out lower limit	Output lower limit for generic modulating function 1	0.0	%	0…100
	Cut-off enable	Enable cut-off function for generic modulating function 1	NO	---	NO | YES
	Cutoff Diff	Cut-off differential for generic modulating function 1	0.0 °C	…	… (**)
	Cutoff hys.	Cut-off hysteresis for generic modulating function 1	0.0 °C	…	… (**)
…	…	…	…	…	…
Efc05	JAN Alarm 1	Enable generic alarm function 1	disable	---	disable | Enable
	JAN Alarm 2	Enable generic alarm function 2	disable	---	disable | Enable
Efc06	Regulation variable	Monitored variable for generic alarm function 1	---	---	…
	Enable	Enabling variable for generic alarm function 1	---	---	…
	Description	Enable description change	Salta	---	Skip | Change
	----------	Description	---	---	…
Efc07	Alarm type	Priority type for generic alarm function 1	Normal	---	Normal | Serious
	Delay	Delay for generic alarm function 1	0	s	0…9999
…	…	…	…	…	…
Efd05	Enable generic scheduler funct.	Enable generic scheduler function	disable	---	disable | enable
	JAN. scheduling connected to common scheduler	Generic scheduler with the same days and special periods	NO	---	NO | YES
Efd06	Enable	Enabling variable for generic scheduler function	---	---	…
Efd07	TB1: --:-- -> --:--	Enabling and definition of time band 1: start hour and minute, end hour and minute (suction line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Enabling and definition of time band 4: start hour and minute, end hour and minute (suction line 1)	---	…	…
	Change	Time band change action	---	---	--- save changes load previous clear all
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL
Efe05	JAN. A measure	Generic analog input A unit of measure selection	°C	---	°C | °F | barg | psig | % | ppm
	…	…	…	…	…
Efe06/Efe07 (**)	---	Generic probe A position	B1	---	---, U1…U10 (****)
	---	Generic probe A type	4...20 mA	---	…(**)
	--- (display only)	Generic probe A value	---	…	…(**)
	Max limit	Generic probe A maximum limit	30.0 barg	…	…(**)
	Min limit	Generic probe A minimum limit	0.0 barg	…	…(**)
	Calibration	Generic probe A calibration	0.0 barg	…	…(**)
…	...	...	…	…	…
Efe21	DO	Generic stage 1 DO position	…	---	---, 01…18 (****)
	Status (display only)	Status of generic stage 1 DO	---	---	closed | open
	Logic	Logic of generic stage 1 DO	NO	---	NC | NO
	Function (display only)	Generic stage 1 function status	---	---	not active | active
…	…	…	…	…	…
Efe29	Modulating1	Generic modulating 1 AO position	0	---	---, 01…06 (****)
	Status (display only)	Generic modulating 1 function output value	0	%	0.0…100.0
…	…	…	…	…	…
Egaa01	DI	ChillBooster fault DI position (line 1)	---	---	---, 01…18, U1…U10 (****)
	Status	ChillBooster fault DI status (line 1)	---	---	closed | open
	Logic	ChillBooster fault DI logic (line 1)	NC	---	NC | NO
	Function	ChillBooster fault function status (line 1)	---	---	not active | active
Egaa02	DO	ChillBooster fault DO position (line 1)	…	---	---, 01…18 (****)
	Status (display only)	ChillBooster fault DO status (line 1)	---	---	closed | open
	Logic	ChillBooster fault DO logic (line 1)	NO	---	NC | NO
	Function (display only)	ChillBooster function status (line 1)	---	---	not active | active
Egab01	Device present	Enable ChillBooster function (line 1)	NO	---	NO | YES
	Deactivation when fan power less than	Fan capacity under which the ChillBooster is deactivated (line 1)	95	%	0…100
Egab02	Before activ. fans at max for	Min. time for fans at maximum capacity before ChillBooster activation (line 1)	5	min	0…300
	Ext.tempThresh	External temperature threshold for ChillBooster activation (line 1)	30.0 °C	…	…(**)
Egab03	Sanitary proc.	Enable sanitary procedure (line 1)	Disable	---	disable | Enable
	Start	Sanitary procedure starting time (line 1)	00:00	---	…
	Duration	Sanitary procedure duration (line 1)	0	min	0…30
	Ext.tempThresh	External temperature threshold for sanitary procedure activation (line 1)	5.0 °C	…	…(**)
Egab04	Maint. req. Chillb. after	Tempo massimo funzionamento ChillBooster (linea 1)	200	h	0…999
	Maint time reset	Reset tempo funzionamento ChilllBooster (linea 1)	NO	---	NO | YES
Ehb01	Avoid simultaneous pulse between lines	Abilitazione inibizione spunti contemporanei compressori	NO	---	NO | YES
	Delay	Ritardo tra partenze compressori linee diverse	0	s	0…999
Ehb03	Force3 off L2 comps for L1 fault	Abilitazione forzatura OFF compressori linea 2 per guasto compressori linea 1	NO	---	NO | YES
	Delay	Ritardo forzatura OFF compressori linea 2 per guasto compressori linea 1	0	s	0…999
Ehb04	Activ. L1 comps for L2 activ.	Abilitazione forzatura ON compressori linea 1 per accensione compres. linea 2	NO	---	NO | YES
	Delay	Ritardo forzatura ON compressori linea 1 per accensione compressori linea 2	30	s	0…999
	Force off L2 comps for L1 off	Abilitazione forzatura OFF compressori linea 2 per off linea 1	NO	---	NO | YES
Ehb05	Enable minimum threshold for act. of L1	Enable line 1 activation for DSS only when the suction pressure is greater than a minimum threshold	NO	---	NO | YES
	Threshold	Minimum threshold for line 1 activation for DSS	---	…	… (**)

Mask index	Display description	Description	Def.	U. of M.	Values
Ehb06	Enable pump down	Enable pump down with at least one LT compressor active	NO	---	NO | YES
	Threshold	Pump down threshold	1.5 barg	…	… (**)
Eia01	---	RPRV tank pressure probe position	---	---	---, U1…U10 (****)
	---	RPRV tank pressure probe type	4...20 mA	---	… (**)
	--- (display only)	RPRV tank pressure probe value	---	…	… (**)
	Max limit	RPRV tank pressure probe maximum value	60.0 barg	…	… (**)
	Min limit	RPRV tank pressure minimum value	0.0 barg	…	… (**)
	Calibration	RPRV tank pressure probe calibration	0.0 barg	…	… (**)
…	…	…	…	…	…
Eia04	DI	HPV alarm digital input position	---	---	---, 01…18, U1… U10 (****)
	Status	HPV alarm digital input status	---	---	closed | open
	Logic	HPV alarm digital input logic	NC	---	NC | NO
	Function	HPV alarm digital input status	---	---	not active | active
…	…	…	…	…	…
Eia06	---	HPV valve analog output position	0	---	---, 01…06 (****)
	Status (display only)	HPV valve analog output value	0	%	0.0…100.0
…	…	…	…	…	…
Eia08	DO Line relay	DO position and On/Off Status Parallel compressor	…	…	---, 01…18 (****)
	Logic:	Logic Parallel Compressor DO:	NA	…	NC | NA
…	…	…	…	…	…
Eia15	DI On/Off parall.compr.	Digital input on/off parallel compressor	…	…	---, 01…18, U1… U10 (****)
	Status	Status parallel compressor DI (display only)	…	…	Open | Closed
	Logic	Logic parallel compressor DI	NA	…	NC | NA
	Function (display only)	Function Status parallel compressor DI	…	…	Not active | Active
…	…	…	…	…	…
Eib01	Enable HPV valve management	HPV valve management enabled, or transcritical operation mode enabled	NO	---	NO | YES
	Algorithm selection	Selection of the algorithm-tyep to apply to the calculation of the pressure setpoint	optimiz.	---	optimiz. | custom
Eib02	Min HPV vale opening when OFF	Minimum opening of the HPV valve with the unit OFF	0	%	0.0…100.0
	During ON	Minimum opening of the HPV valve with the unit ON	0	%	0.0…100.0
	Max HPV valve opening	Maximum opening of the HPV valve	0	%	0.0…100.0
	Max delta	Maximum variation per second allowed for the HPV valve output	0	%	0.0…100.0
Eib03	Pre-positioning	Opening of the HPV valve at start-up during pre-positioning	0	%	0.0…100.0
	Prepos. time	Pre-positioning duration	0	s	0…9999
Eib04	---	Calculation algorithm graph	---	---	---
Eib05 (Definition of the points on the graph, see mask Eib04)	P100%	$P_{100\%}$ upper pressure limit	109.0 barg	…	… (**)
	Pmax	P_{max} pressure for defining the upper proportional zone	104.0 barg	…	… (**)
	Pcritic	P_{critic} optimal pressure calculated at the passage temperature between the intermediate zone and transcritical zone	76.8 barg	…	… (**)
	T12	T_{12} limit temperature between the transcritical zone and intermediate zone	31.0 °C	…	… (**)
	T23	T_{23} temperature limit between the intermediate zone and subcritical zone	20.0 °C	…	… (**)
	Tmin	T_{min} temperature for defining the lower proportional zone	6.0 °C	…	… (**)
Eib06 (Definition of the points on the graph, see mask Eib04)	T100%	$T_{100\%}$ temperature for defining the complete opening zone of the valve	-10.0 °C	…	… (**)
	Delta	Subcooling for optimized regulation	3.0 °C	…	… (**)
	Coeff.1	Coefficient for determining the customized line	2.5	…	-999.9…999.9
Eib07	P1	Proportional gain for the proportional + integral regulation of the HPV valve	5 %/ barg	%/barg	0…100
	I1	Integral time for the proportional + integral regulation of the HPV valve	60	s	0…9999
	PHR	Proportional gain for the proportional + integral regulation of the HPV valve with heat recovery	5 %/ barg	%/barg	0…100
	IHR	Integral time for the proportional + integral regulation of the HPV valve with heat recovery	60	s	0…9999
Eib08	Enable HPV setpoint filter	Enabling of the filter action on the HPV valve setpoint	NO	---	NO | YES
	Number of samples	Number of samples	5	---	0…99
Eib09	Enable mgmt of HPV with HR	Enabling of the various management of the HPV valve during heat recovery activation	NO	---	NO | YES
	HR setp.	Setpoint regulation of the HPV valve during heat recovery	90.0 barg	…	… (**)
	Post HR Dt	Time scale for the setpoint reset procedure after heat recovery	0.1	s	0…999
	Post HR DP	Pressure scale for the setpoint reset procedure after heat recovery	1.0 barg	…	… (**)
Eib10	HPV valve safety position	HPV valve safety position	50.0	%	0.0…100.0
Eib11	Gas cooler temp delta with probe error	Offset to be applied to the external temperature in the event of gas cooler pressure probe error	0.0 °C	…	… (**)
Eib12	Enable HPV safeties from tank pressure	HPV valve safety procedure enabling	NO	---	NO | YES
Eib13	High tank pressure threshold	High tank pressure threshold	40.0 barg	…	… (**)
	Max tank pressure	Maximum tank pressure allowed	45.0 barg	…	… (**)
	HPV set.incr.	Maximum offset to add to the HPV setpoint when the tank pressure exceeds the high pressure threshold	10.0 barg	…	… (**)
Eib14	Low tank pressure threshold	Low tank pressure threshold	32.0 barg	…	… (**)
	Min tank pressure	Minimum tank pressure allowed	27.0 barg	…	… (**)
	HPV set.decr.	Maximum offset to subtract from the HPV setpoint when the tank pressure goes below the low pressure threshold	10.0 barg	…	… (**)
Eib15	Force close with comp OFF	Enable HPV valve closure when all compressors on line 1 are off	NO	---	NO | YES
	Delay clos. with comp. OFF	HPV valve closure delay when all compressors on line 1 are off	10	s	0…999
Eib16	Regul. in subcritical zone	Enabling the regulation of the gas cooler in the subcritical zone	NO	---	NO | YES
Eib17	Enable	Enable warning function when the gas cooler pressure is too far from the setpoint for the set time	NO	---	NO | YES
	Delta	Difference between the gas cooler pressure and the setpoint which generates the warning	30.0 barg	…	… (**)
	Delay	Delay time before generating the warning	30	s	0…999
Eib18	Enable RPRV valve mgmt	Enable RPRV valve mgmt	NO	---	NO | YES
Eib19	Min RPRV vale opening when ON	Minimum opening of the RPRV valve with the unit ON	10.0	%	0.0…100.0
	During OFF	Minimum opening of the RPRV valve with the unit OFF	10.0	%	0.0…100.0
Eib20	Pre-positioning	Opening of the RPRV valve at start-up during pre-positioning	50.0	%	0.0…100.0
	Prepos. time	Pre-positioning duration	5	s	0…9999
Eib21	Max RPRV valve opening	Maximum opening of the RPRV valve	100.0	%	0.0…100.0
	Max delta	Maximum variation allowed for the HPV valve output	10.0	%	0.0…100.0
Eib22	CO2 rec. pressure setpoint	Regulation setpoint for the pressure for the CO2 receiver	35.0 barg	…	… (**)
	Gain	Proportional gain for the proportional + integral regulation of the RPRV valve	20 %/barg	%/barg	0…100
	Int time	Integral time for the proportional + integral regulation of the RPRV valve	60	s	0…9999
Eib23	RPRV valve safety position	RPRV valve safety position	50.0	%	0.0…100.0
Eib24	Force close with comp OFF	Enable RPRV valve closure when all compressors on line 1 are off	NO	---	NO | YES
	Delay clos. with comp. OFF	RPRV valve closure delay when all compressors on line 1 are off	10	s	0…999

Mask index	Display description	Description	Def.	U. of M.	Values
Eib25	Threshold	Receiver high pressure threshold alarm	45.0 barg	…	… (**)
	Diff.	Receiver high pressure differential alarm	5.0 barg	…	… (**)
	Delay	Receiver high pressure alarm delay	30	s	0…9999
	Reset	Receiver high pressure alarm reset type	manual	---	manual | auto
	Swith-off comp.	Enable compressor shutdown when high pressure receiver alarm occurs	NO	---	NO | YES
Eib27	Enable parallel compressor:	Enable parallel compressor	NO		YES | NO
Eib28	RPRV opening:	RPRV opening to allow parallel compressor	30	%	
	Delay:	Delay on parallel compressor activation	10	s	0…999
	Min g.c.temp.:	Minimum GC temperature to allow parallel compressor	15	°C/°F	
Eib31	Receiver pressure threshold	Threshold pressure for the gas cooler when the Heat Reclaim is ON	---	---	---
	Time	Time during which this threshold remains active	---	---	---
	Var. delta	Allowed variation	---	---	---
Eib32	Max. HPV valve opening percentage	HPV valve maximum opening	0	%	0.0…100.0
	Max. delta	HPV valve maximum variation per second	0	%	0.0…100.0
Eib35	Min on time:	Parallel compressor by inverter, timings. Min on time	30	s	
	Min off time:	Parallel compressor by inverter, timings. Min off time	30	s	
	Min time to start same compressor:	Parallel compressor by inverter, timings. Min time to start same compressor	60	s	
Eib40	RPRV offset with par. compr. On:	Increment of RPRV setpoint during parallel compressor regulation	2	barg	
	Par. Comp. ON Rising time RPRV:	Rising time of RPRV setpoint	0	s	
	Par. Comp. Off Falling time RPRV:	Falling time of RPRV setpoint	20	s	
Eic01	HPV Valve	Enable EVS management of HPV valve	enable	---	enable | disable
	RPPV Valve	Enable EVS management of HPV valve RPRV	enable	---	enable | disable
	EVD address	Driver address managed in FBUS from pRack	198	---	0..207
	Valves routing	Valve type driver association	---	---	Single A->HPV Single A->RPRV Twin A->RPRV B->HPV Twin A->HPV B->RPRV
	EVD Status	Driver connection to pRack status	---	---	connected not connected
Eic02	HPV Valve type	HPV valve type	CAREL EXV	---	CAREL EXV, CUSTOM, Danfoss CCMT, Danfoss ICMTS (0-10V)
	RPRV Valve type	RPRV valve type	CAREL EXV	---	CAREL EXV, CUSTOM, Danfoss ETS 400, Danfoss ETS 250, Danfoss ETS 100B, Danfoss ETS 50B, Danfoss ETS 12.5-25B, Danfoss CCM 40 Danfoss CCM 10-20-30 Danfoss ICMTS (0-10V)
Eic03 (Valvola HPV)	Min. steps	Minimum valve step number	50	step	0…9999
	Max. steps	Maximum valve step number	480	step	0…9999
	closing steps	Valve closing steps	500	step	0…9999
	Nom. step rate	Valve nominal speed	50	step/s	1…2000
	Move current	Nominal current	450	mA	0…800
	Holding current	Holding current	100	mA	0…250
Eic04 (Valvola HPV)	Duty Cycle	Valve duty cycle	30	%	0…100
	Opening sincre	Opening position synchronization	YES	-----	YES | NO
	Closing sincre	Closing position synchronization	YES	------	YES | NO
	Em. closing speed	Valve emergency closing speed	150	step/s	1…2000
Eic05 (Valvola RPRV)	Min. steps	Minimum valve step number	50	step	0…9999
	Max. steps	Maximum valve step number	480	step	0…9999
	closing steps	Valve closing steps	500	step	0…9999
	Nom. step rate	Valve nominal speed	50	step/s	1…2000
	Move current	Nominal current	450	mA	0…800
	Holding current	Holding current	100	mA	0…250
Eic06 (Valvola RPRV)	Duty Cycle	Valve duty cycle	30	%	0…100
	Opening sincre	Opening position synchronization	YES	-----	YES | NO
	Closing sincre	Closing position synchronization	YES	------	YES | NO
	Em. closing speed	Valve emergency closing speed	150	step/s	1…2000

The following parameters refer to line 2, for details, see the corresponding parameters for line 1 above

Eaba04	---	Oil temperature probe position (line 2)	B1	---	---, U1…U10 (****)
	---	Oil temperature probe type (line 2)	4...20 mA	---	--- | NTC | PT1000 | 0...1 V | 0...10 V | 4...20 mA | 0...5 V | HTNTC
	--- (display only)	Oil temperature value (line 2)	---	…	…(**)
	Max limit	Maximum oil temperature value (line 2)	30.0 barg	…	…(**)
	Min limit	Minimum oil temperature value (line 2)	0.0 barg	…	…(**)
	Calibration	Oil temperature probe calibration (line 2)	0.0 barg	…	…(**)
…	…	…	…	…	…
Eabb04	Enable com.cool.	Enable common oil cooling (line 2)	YES	---	NO | YES
	Number of oil pumps	Number of oil pumps for common oil cooler (line 2)	0	---	0…1 (analog. output) 0…2 (digital outputs)
	Enable pump out.	Enable AO of common oil cooler pump (line 2)	YES	---	NO (digital outputs) YES (analog. output)
…	…	…	…	…	…
Ebba01	DO	Subcooling DO valve position (line 2)	…	---	---, 01…18 (****)
	Status (display only)	Subcooling DO valve status (line 2)	---	---	closed | open
	Logic	Subcooling DO valve logic (line 2)	NO	---	NC | NO
	Function (display only)	Status of the subcooling valve function (line 2)	---	---	not active | active
…	…	…	…	…	…
Ebbb01	Subcooling contr.	Enable subcooling function (line 2)	NO	---	NO | YES
	---	Subcooling control type (line 2)	Temp. Cond&Liqu.	---	Temp. Cond&Liquid only Liquid Temp.
	Threshold	Threshold for subcooling activation (line 2)	0.0 °C	…	-9999,9…9999,9
	Subcooling (display only)	Subcooling value (line 2)	0.0 °C		-999,9…999,9

Mask index	Display description	Description	Def.	U. of M.	Values
…	…	…	…	…	…
Ecba01	---	Discharge temperature probe position, compressor 1 (line 2)	B1	---	--- | U1…U10 (****)
	---	Discharge temperature probe type, compressor 1 (line 2)	4...20 mA	---	--- | NTC | PT1000 0...1 V | 0...10 V | 4...20 mA | 0...5 V | HTNTC
	--- (display only)	Discharge temperature value, compressor 1 (line 2)	---	…	…(**)
	Max limit	Discharge temperature maximum value, compressor 1 (line 2)	30.0 barg	…	…(**)
	Min limit	Discharge temperature minimum value, compressor 1 (line 2)	0.0 barg	…	…(**)
	Calibration	Discharge temperature probe calibration, compressor 1 (line 2)	0.0 barg	…	…(**)
…	…	…	…	…	…
Ecbb04	Economizer	Enable economizer function (line 2)	NO	---	NO | YES
	Comp.Power Thresh.	Capacity percentage threshold for economizer activation (line 2)	0	%	0…100
	Cond.Temp.Thresh.	Condensing temperature threshold for economizer activation (line 2)	0.0 °C	…	-999,9…999,9
	Discharge Temp.Thresh.	Discharge temperature threshold for economizer activation (line 2)	0.0 °C	…	-999,9…999,9
…	…	…	…	…	…
Edba01	---	Discharge temperature probe position, compressor 1 (line 2)	B1	---	---, U1…U10 (****)
	---	Discharge temperature probe type, compressor 1 (line 2)	4...20mA	---	--- | NTC | PT1000 | 0...1 V | 0...10 V | 4...20 mA | 0...5 V | HTNTC
	--- (display only)	Discharge temperature value, compressor 1 (line 2)	---	…	…(**)
	Max limit	Discharge temperature maximum value, compressor 1 (line 2)	30.0 barg	…	…(**)
	Min limit	Discharge temperature minimum value, compressor 1 (line 2)	0.0 barg	…	…(**)
	Calibration	Discharge temperature probe calibration, compressor 1 (line 2)	0.0 barg	…	…(**)
…	…	…	…	…	…
Edbb01	Liquid inj.	Enable liquid injection function (line 2)	Disabled	---	Disabled | abled
	Threshold	Liquid injection setpoint (line 2)	70.0 °C	…	… (**)
	Differential	Liquid injection differential (line 2)	5.0	…	… (**)
…	…	…	…	…	…
Eeba02	DI	Heat recovery from digital input DI position (line 2)	…	---	---, 01…18, U1… U10 (****)
	Status	Heat recovery from digital input DI status (line 2)	---	---	closed | open
	Logic	Heat recovery from digital input DI logic (line 2)	NC	---	NC | NO
	Function	Heat recovery from digital input function status (line 2)	---	---	not active | active
Eebb01	Enable heat rec.	Enable heat recovery function (line 2)	NO	---	NO | YES
…	…	…	…	…	…
Egba01	DI	ChillBooster fault DI position (line 2)	---	---	--- | 01…18 U1…U10 (****)
	Status	ChillBooster fault DI status (line 2)	---	---	closed | open
	Logic	ChillBooster fault DI logic (line 2)	NC	---	NC | NO
	Function	ChillBooster fault function status (line 2)	---	---	not active | active
…	…	…	…	…	…
Egbb01	Device present	Enable ChillBooster function (line 2)	NO	---	NO | YES
	Deactivation when fan power less than	Fan capacity under which the ChillBooster is deactivated (line 2)	95	%	0…100
…	…	…	…	…	…

Tab. 7.f

Mask index	Display description	Description	Def.	U. of M.	Values
	F.settings				
Faaa01	Summer/Winter	Enable summer/winter management	NO	---	NO | YES
	Special days	Enable special days management	NO	---	NO | YES
	Closing per.	Enable closing period management	NO	---	NO | YES
Faaa02	Start	Summer start date	---	---	01 | JAN…31 | DEC
	End	Summer end date	---	---	01 | JAN…31 | DEC
Faaa03	Day 1	Special day 1 date	---	---	01 | JAN…31 | DEC
…	…	…	…	…	…
Faaa04	Day 10	Special day 10 date	---	---	01 | JAN…31 | DEC
Faaa05	P1	P1 closing period start date	---	---	01 | JAN…31 | DEC
	---	P1 closing period end date	---	---	01 | JAN…31 | DEC
	…	…	…	…	…
	P5	P5 closing period start date	---	---	01 | JAN…31 | DEC
	---	P5 closing period end date	---	---	01 | JAN…31 | DEC
Faab01	Date format	Date format	DD/MM/ YY	---	---- DD | MM | YY MM | DD | YY YY | MM | DD
Faab02	Hour	Hour and minutes	…	…	…
Faab03	Date	Date	…	…	…
Faab04	Day (display only)	Day of the week calculated from the date	…	…	Monday… Sunday
Faab05	Daylight savings time	Enable daylight savings time	disable	---	disable | enable
	Transition time	offset time	60	---	0…240
	Start	Daylight savings time starting week, day, month and time	…	…	…
	End	Daylight savings time ending week, day, month and time	…	…	…
Fb01	Language	Current language	english	---	…
Fb02	Disable language mask at startup	Disable the change language screen at startup	YES	---	NO | YES
	Countdown	Starting value for countdown, time change language screen active	60	s	0…60
Fb03	Main mask selection	Main screen selection	Linea 1	---	Line 1 | Line 2 Double suction | Double cond.
Fb04	Probes Configuration	Enable main screen configuration in terms of probes and values displayed	don't configure	---	configure | don't configure
	Info Configuration	Enable main screen configuration in terms of icons displayed	don't configure	---	configure | don't configure
Fb05* *refers to double lines and GC configuration at the start-up	L1 - Suction	Suction pressure L1	L1 - Suction	barg	main probes available
	L2 - Suction	Suction pressure L2	L2 - Suction	barg	main probes available
	[Empty]	Free to display new value	[Empty]	---	main probes available
	GC out temp	Gas cooler outlet temperature	GC OUT temp	°C/°F	main probes available
	Gas cool.	Gas cooler pressure	Gas cool.	barg	main probes available
Fb09	I1% value	Activation status of first control value	L1 - Compr	%	main status available
	I2% value	Activation status of second control value	L2 - Compr	%	main status available
Fb10	I3% value	Activation status of first control value	L1 - Fans	%	main status available
	I4% value	Activation status of second control value	HPV	%	main status available

Mask index	Display description	Description	Def.	U. of M.	Values
Fca01	Address	Address of the supervisory system (line 1)	196	---	0…207
	Protocol	Supervisor communication protocol (line 1)	Carel slave local	---	--, CAREL SLAVE LOCAL CAREL SLAVE REMOTE MODBUS SLAVE pRACK MANAGER CAREL SLAVE GSM
	Baudrate	Supervisor communication speed (line 1)	19200	---	1200…19200
Fd01	Insert password	Password	0000	---	0…9999
		Current password level	---	---	User | Service | Manufacturer
Fd02	Logout	Logout	NO	---	NO | YES
Fd03	User	User password	0000	---	0…9999
	Service	Service password	1234	---	0…9999
	Manufacturer	Manufacturer password	1234	---	0…9999
Fda01	Enable CpCOe	Enable expansion card	NO	---	YES | NO
	Offline pattern	Enable output configuration when offline	Disabled	---	Abled | Disabled
	Digital Output pattern 1: … 6:	Digital output status when expansion card offline	OFF	---	ON | OFF
Fda02	Universal Input pattern UI01..UI10	Analogue output status when expansion card offline	0	%	0…100
The following parameters refer to line 2, for details, see the corresponding parameters for line 1 above					
Fcb01	Address	Address of the supervisory system (line 2)	196	---	0…207
	Protocol	Supervisor communication protocol (line 2)	pRack manager	---	--, CAREL SLAVE LOCAL CAREL SLAVE REMOTE MODBUS SLAVE pRACK MANAGER CAREL SLAVE GSM
	Baudrate	Supervisor communication speed (line 2)	19200	---	1200…19200

Tab. 7.g

Mask index	Display description	Description	Def.	U. of M.	Values
	G.Safeties				
Gba01	Enable prevent	Enable high pressure condensing prevent (line 1)	NO	---	NO | YES
Gba02	Setpoint	High pressure condensing prevent threshold (line 1)	0.0 barg	…	… (**)
	Differential	High pressure condensing prevent differential (line 1)	0.0 barg	…	0.0…99,9
	Decrease compressor power time	Decreasing compressor capacity time (line 1)	0	s	0…999
Gba03	Enable heat recov. as first prevent step	Enabling heat recovery as first stage for condensing HP prevent (line 1)	NO	---	NO | YES
	Offset HeatRecov	Offset between heat recovery and prevent setpoint (line 1)	0.0 barg	…	0.0…99,9
Gba04	Enable ChillB. as first prevent step	Enable ChillBooster as first stage for condensing HP prevent (line 1)	NO	---	NO | YES
	Chill. offset	Offset between ChillBooster and prevent setpoint (line 1)	0.0 barg	…	0.0…99,9
Gba05	Max. num prevent	Max number of prevent before locking compressors (line 1)	3	---	1…5
	Prevent max number evaluation time	Prevent max number evaluation time	60	h	0…999
	Reset automatic prevent	Reset maximum number of prevent (line 1)	NO	---	NO | YES
Gca01	Common HP type	Type of reset for common HP alarm (line 1)	AUTO	---	AUTO | MAN
	Common HP delay	Common high pressure delay (line 1)	10	s	0…999
Gca02	Common LP start delay	Common low pressure delay at startup (line 1)	60	s	0…999
	Common LP delay	Common low pressure delay during operation (line 1)	20	s	0…999
Gca03	Time of semi-automatic alarm evaluation	Number of LP interventions evaluation time (line 1)	120	min	0…999
	Numer of retries before alarm becomes manual (line 1)	Number of LP interventions in the period after which the alarm becomes a manual reset (line 1)	5	---	0…999
Gca04	Liquid alarm delay	Liquid level alarm delay (line 1)	0	s	0…999
	Oil alarm delay	Common oil alarm delay (line 1)	0	s	0…999
Gca05	Output relay alarm activation with	Selection of output relay alarm activation with active alarms or alarms not reset	alarms attivi		alarms attivi alarms no reset
The following parameters refer to line 2, for details, see the corresponding parameters for line 1 above					
Gbb01	Enable prevent	Enable high pressure condensing prevent (line 2)	NO	---	NO | YES
…	…	…	…	…	…
Gcb01	Common HP type	Type of reset for common HP alarm (line 2)	AUTO	---	AUTO | MAN
	Common HP delay	Common high pressure delay (line 2)	10	s	0…999
…	…	…	…	…	…

Tab. 7.h

Mask index	Display description	Description	Def.	U. of M.	Values
	H.Info				
H01 (display only)	Ver.	Software version and date	…	---	…
	Bios	Bios version and date	…	---	…
	Boot	Boot version and date	…	---	…
H02 (display only)	Board type	Hardware type	…	---	…
	Size	Hardware size	…	---	…
	FLASH mem	Flash memory size	---	kB	…
	RAM	RAM memory size	---	kB	…
	Built-in type	Built-in display type	---	---	None | pGDE
	Cycle time	Number of cycles per second and cycle time software	---	cicli/s / ms	…

Tab. 7.i

Mask index	Display description	Description	Def.	U. of M.	Values
I.Setup					
Ib01	Type of system	Type of system	Aspiraz + Condens.	---	Suction Condenser Suction + Condenser
Ib02	Units of meas.	Units of measure	°C/barg	---	°C | barg | °F | psig
Ib03	Compressor type	Type of compressors (line 1)	Recriproc.	---	Recriprocating | Scroll
	Number of compressors	Number of compressors (line 1)	2/3 (*)	---	1…6 | 12 (*)
Ib04	Number of alarms for each compressor	Number of alarms for each compressor (line 1)	1	---	0…4 | 7 (*)
Ib05	Modulate speed device	Modulating device for first compressor (line 1)	None	---	None | Inverter --- | Digital scroll(*) --- | Continuous (*)
Ib30	Compress. size	Compressors sizes (line 1)	Same size& Same Partial.	---	Same size &Same Partial. Same size & different Partial. Define sizes
Ib34	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO | YES 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO | YES 0.0…500.0
Ib35	S1	Enable stages and stages for compressor group 1 (line 1)	YES 100	--- %	NO | YES 100 | 50/100 | 50/75/100 | 25/50/75/100 | 33/66/100
	…	…	…	…	…
	S4	Enable stages and stages for compressor group 4 (line 1)	NO ---	--- kW	NO | YES S1…S4
Ib36	C01	Size for compressor 1 or presence of inverter (line 1)	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size for compressor 12 (line 1)	S1	---	S1…S4
Ib11	Compress. size	Compressors sizes (line 1)	Same size	---	Same size Define sizes
Ib16	S1	Enable size and size for compressor group 1 (line 1)	YES ---	--- kW	NO | YES 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO | YES 0.0…500.0
---	---				
Ib17	C01	Size for compressor 1 or presence of inverter (line 1)	S1	---	S1…S4/INV
	…	…	…	…	…
	C06	Size for compressor 6 (line 1)	---	---	S1…S4
Ib20	Compress. size	Compressors sizes (line 1)	Same size	---	Same size Define sizes
Ib21	S1	Enable size and size for compressor group 1 (line 1)	YES ---	--- kW	NO | YES 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO | YES 0.0…500.0
Ib22	C01	Size for compressor 1 or presence of inverter (line 1)	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size for compressor 12 (line 1)	S1	---	S1…S4
Ib40	Regulation	Compressor control by temperature or pressure (line 1)	Pressure	---	Pressure | Temper.
	Units of measure	Units of measure (line 1)	barg	---	…
	Refrigerant	Type of refrigerant (suction line 1)	R744	---	R22 | R134a R404A | R407C R410A | R507A R290 | R600 R600a | R717 R744 | R728 R1270 | R417A R422D | R413A R422A | R423A R407A | R427A R245Fa | R407F | R32
Ib41	Regulation type	Compressor regulation type (line 1)	Dead zone	---	proportion. band Dead zone
	Enable integral time action	Enable integral time for proportional regulation of suction line (line 1)	NO	---	NO | YES
Ib42	Setpoint	Setpoint without compensation (suction line 1)	3,5 barg	…(**)	…(**)
	Differential	Differential (suction line 1)	0,3 barg	…(**)	…(**)
Ib43	Configure another suction line	Second line configuration	NO	---	NO | YES
Ib45	Dedicated pRack board for suction line	Suction lines in different boards	NO	---	NO | YES
Ib50	Compressor type	Type of compressors (line 2)	Recriproc.	---	Recriprocating | Scroll
	Number of compressors	Number of compressors (line 2)	3	---	1…12
Ib51	Number of alarms for each compressor	Number of alarms for each compressor (line 2)	1	---	0…4
Ib52	Modulate speed device	Modulating device for first compressor (line 2)	None	---	None | Inverter --- | Digital scroll(*)
Ib70	Compress. size	Compressors sizes (line 1)	Same size& Same Partial.	---	Same size &Same Partial. | Same size & different Partial. | Define sizes
Ib74	S1	Enable size and size for compressor group 1 (line 1)	YES ---	--- kW	NO | YES 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO | YES 0.0…500.0

Mask index	Display description	Description	Def.	U. of M.	Values
Ib75	S1	Enable stages and stages for compressor group 1 (line 1)	YES 100	--- %	NO | YES 100 | 50/100 | 50/75/100 | 25/50/75/100 | 33/66/100
	…	…	…	…	…
	S46	Enable stages and stages for compressor group 4 (line 1)	NO ---	--- kW	NO | YES S1…S4
Ib76	C01	Size for compressor 1 or presence of inverter (line 1)	S1	---	S1…S4 | INV
	…	…	…	…	…
	C12	Size for compressor 6 (line 1)	S1	---	S1…S4
Ib60	Compress. size	Compressors sizes (line 1)	Same size	---	Same size | Define sizes
Ib61	S1	Enable size and size for compressor group 1 (line 1)	YES' ---	--- kW	NO | YES 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO | YES 0.0…500.0
Ib62	C01	Size for compressor 1 or presence of inverter (line 1)	S1	---	S1…S4 | INV
	…	…	…	…	…
	C12	Size for compressor 6 (line 1)	S1	---	S1…S4
Ib80	Regulation	Compressor control by temperature or pressure (line 1)	Pressure	---	Pressure Temperature
	Units of measure	Units of measure (line 1)	barg	---	…
	Refrigerant	Type of refrigerant (suction line 1)	R744	---	R22 | R134a R404A | R407C R410A | R507A R290 | R600 R600a | R717 R744 | R728 R1270 | R417A R422D | R413A R422A | R423A R407A | R427A R245Fa | R407F | R32
Ib81	Regulation type	Compressor regulation type (line 1)	Dead zone	---	Proportion. band Dead zone
	Enable integral time action	Enable integral time for proportional regulation of suction line (line 2)	NO	---	NO | YES
Ib82	Setpoint	Setpoint without compensation (suction line 2)	3,5 barg	…(**)	…(**)
	Differential	Differential (suction line 2)	0,3 barg	…(**)	…(**)
Ib90	Dedicated pRack board for cond. line	Suction and condensing lines on different boards, that is condensing line on dedicated board	NO	---	NO | YES
Ib91	Number of fans	Number of fans (line 1)	3	---	0…16
Ib54	Modulate speed device	Fan modulating device (line 1)	None	---	None | Inverter Contr. taglio di fase
Ib93	Regulation	Fan regulation by pressure or temperature (line 1)	Pressure	---	Pressure | Temperature
	Units of measure	Units of measure (line 1)	barg	---	…
	Refrigerant	Type of refrigerant (condensing line 1)	R744	---	R22 | R134a R404A | R407C R410A | R507A R290 | R600 R600a | R717 R744 | R728 R1270 | R417A R422D | R413A R422A | R423A R407A | R427A R245Fa | R407F | R32
Ib94	Regulation type	Fan regulation type (line 1)	Banda proporz.	---	Banda proporz. | Dead zone
	Enable integral time action	Enable integral time for proportional regulation	NO	---	NO | YES
Ib95	Setpoint	Setpoint without compensation (condens. line 1)	12.0 barg	…(**)	…(**)
	Differential	Differential (condensing line 1)	2.0 barg	…(**)	…(**)
Ib96	Configure another condens. line	Configuration of a second condensing line	NO	---	NO | YES
Ib1a	Number of fans	Number of fans (line 2)	3	---	0…16
…	…	…	…	…	…
Ib1e	Differential	Differential (condensing line 2)	2.0 barg	…(**)	…(**)
Ic01	Type of system	Type of system	Aspiraz. + Conden.	---	Suction Condenser Aspiraz. + Conden.
Ic02	Units of measure	Unit of measure	°C/barg	---	°C/barg | °F/psig
Ic03	Number of suction lines	Number of suction lines	1	---	0…2
Ic04	Dedicated pRack board for suction line	Suction line in separate boards	NO	---	NO | YES
Ic05	Compressor type	Type of compressors (line 1)	Recriproc.	---	Recriprocating | Scroll
	Number of compressors	Number of compressors (line 1)	4	---	1…6/12 (*)
Ic06	Compressor type	Type of compressors (line 2)	Recriproc.	---	Recriprocating | Scroll
	Number of compressors	Number of compressors (line 2)	0	---	1…6
Ic07	Condenser line number	System condensing line number	1	---	0…2
Ic08	Line 1	Number of fans (line 1)	4	---	0…16
	Line 2	Number of fans (line 2)	0	---	0…16
Ic09	Dedicated pRack board for cond. line	Condensing lines in separate boards	NO	---	NO | YES
Ic10 (solo visual.)	Boards needed	pLAN boards needed for the selected configuration	---	---	---
Id01	Save configuration	Save Manufacturer configuration	NO	---	NO | YES
	Load configuration	Install Manufacturer configuration	NO	---	NO | YES
Id02	Reset Carel default	Install default Carel configuration	NO	---	NO | YES

Tab. 7.j

(*) According to compressor type
(**) According to unit of measure selected
(***) According to compressor manufacturer, refer to the related paragraph.
(****) According to hardware size

7.2 Alarm table

pRack pR300T can manage both alarms relating to the status of the digital inputs and to system operation, similar to the pRack pR300. For each alarm, the following are controlled:

- The actions on the devices, if necessary
- The output relays (one global and two with different priorities, if configured)
- The red LED on the terminal and the buzzer, where present
- The type of acknowledgement (automatic, manual, semiautomatic)
- Any activation delay

The complete list of alarms for the pRack pR300T with the related information as described above, is reported below.

Code	Description	Reset	Delay	Alarm relay	Action
ALA**	C.pCOe offline n° 001 Offline	Automatic	0s	R1	Outputs held in current status or according to pattern
ALA01	Discharge temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA02	Discharge temperature probe malfunction	Automatic	60 s	R1	Related functions disabled
ALA03	External temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA04	Generic probe malfunction A, PLB1	Automatic	60 s	R2	Related functions disabled
ALA05	Generic probe malfunction B, PLB1	Automatic	60 s	R2	Related functions disabled
ALA06	Generic probe malfunction C, PLB1	Automatic	60 s	R2	Related functions disabled
ALA07	Generic probe malfunction D, PLB1	Automatic	60 s	R2	Related functions disabled
ALA08	Generic probe malfunction E, PLB1	Automatic	60 s	R2	Related functions disabled
ALA09	Generic probe malfunction A, PLB2	Automatic	60 s	R2	Related functions disabled
ALA10	Generic probe malfunction B, PLB2	Automatic	60 s	R2	Related functions disabled
ALA11	Generic probe malfunction C, PLB2	Automatic	60 s	R2	Related functions disabled
ALA12	Generic probe malfunction D, PLB2	Automatic	60 s	R2	Related functions disabled
ALA13	Generic probe malfunction E, PLB2	Automatic	60 s	R2	Related functions disabled
ALA14	Generic probe malfunction A, PLB3	Automatic	60 s	R2	Related functions disabled
ALA15	Generic probe malfunction B, PLB3	Automatic	60 s	R2	Related functions disabled
ALA16	Generic probe malfunction C, PLB3	Automatic	60 s	R2	Related functions disabled
ALA17	Generic probe malfunction D, PLB3	Automatic	60 s	R2	Related functions disabled
ALA18	Generic probe malfunction E, PLB3	Automatic	60 s	R2	Related functions disabled
ALA19	Generic probe malfunction A, PLB4	Automatic	60 s	R2	Related functions disabled
ALA20	Generic probe malfunction B, PLB4	Automatic	60 s	R2	Related functions disabled
ALA21	Generic probe malfunction C, PLB4	Automatic	60 s	R2	Related functions disabled
ALA22	Generic probe malfunction D, PLB4	Automatic	60 s	R2	Related functions disabled
ALA23	Generic probe malfunction E, PLB4	Automatic	60 s	R2	Related functions disabled
ALA24	Suction pressure probe malfunction	Automatic	60 s	R1	Related functions disabled
ALA25	Suction temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA26	Room temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA27	Condensing pressure probe malfunction, line 2	Automatic	60 s	R1	Related functions disabled
ALA28	Discharge temperature probe malfunction, line 2	Automatic	60 s	R2	Related functions disabled
ALA29	Suction pressure probe malfunction, line 2	Automatic	60 s	R1	Related functions disabled
ALA30	Suction temperature probe malfunction, line 2	Automatic	60 s	R2	Related functions disabled
ALA31	Gall cooler backup pressure probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA32	Condensing pressure backup probe malfunction, line 2	Automatic	60 s	R2	Related functions disabled
ALA33	Suction pressure backup probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA34	Suction pressure backup probe malfunction, line 2	Automatic	60 s	R2	Related functions disabled
ALA35	Common oil temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA36	Common oil temperature probe malfunction, line 2	Automatic	60 s	R2	Related functions disabled
ALA39	Discharge temperature probe malfunction, compressors 1...6	Automatic	60 s	R2	Related functions disabled
ALA40	Discharge temperature probe malfunction, compressors 1...6, line 2	Automatic	60 s	R2	Related functions disabled
ALA41	Oil temperature probe malfunction, compressors 1...6, line 1	Automatic	60 s	R2	Related functions disabled
ALA42	Oil temperature probe malfunction, compressor 1, line 2	Automatic	60 s	R2	Related functions disabled
ALA43	Gas cooler output temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA44	CO2 receiver pressure probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA45	Gas cooler output backup temperature probe malfunction	Automatic	60 s	R2	Related functions disabled
ALA55	Discharge probe malfunction, line 1	Automatic	60 s	R2	Related functions disabled
ALA56	Discharge probe malfunction, line 2	Automatic	60 s	R2	Related functions disabled
ALA57	High/low discharge pressure, line 1	Automatic	Settable	R1	-
ALA58	High/low discharge pressure, line 2	Automatic	Settable	R1	-
ALB01	Low suction pressure from pressure switch	Semiautomatic	Config.	R1	Shutdown compressors
ALB02	High condensing pressure from pressure switch	Man./Autom.	Config.	R1	Shutdown compressors
ALB03	Low gas cooler output temperature from probe	Automatic	Settable	R1	Fan forcing at 0%
ALB04	High gas cooler output temperature from probe	Automatic	Settable	R1	Fan forcing at 100% and shutdown compres.
ALB05	Liquid level	Automatic	Config.	R2	-
ALB06	Common oil differential	Automatic	Config.	R2	-
ALB07	Common fan circuit breaker	Automatic	Config.	Config.	-
ALB08	Low suction pressure from pressure switch. line 2	Semiautomatic	Config.	R1	Shutdown compressors, line 2
ALB09	High condensing pressure from pressure switch. line 2	Man./Autom.	Config.	R1	Shutdown compressors, line 2
ALB10	Low condensing pressure from probe, line 2	Automatic	Config.	R1	-
ALB11	High condensing pressure from probe, line 2	Automatic	Config.	R1	-
ALB12	Liquid level, line 2	Automatic	Config.	R2	-
ALB13	Common oil differential, line 2	Automatic	Config.	R2	-
ALB14	Common fan circuit breaker, line 2	Automatic	Config.	Config.	-
ALB15	High suction pressure from probe	Automatic	Config.	R1	-
ALB16	Low suction pressure from probe	Automatic	Config.	R1	-
ALB17	High suction pressure from probe, line 2	Automatic	Config.	R1	-
ALB18	Low suction pressure from probe, line 2	Automatic	Config.	R1	-
ALB21	Shutdown to prevent high pressure	Manual	Config.	R1	Shutdown compressors
ALB22	Shutdown to prevent high pressure, line 2	Manual	Config.	R1	Shutdown compressors, line 2
ALC90	L1 – Generic alarm comp.	Man./Auto	config	config	Shutdown compressor with alarm
ALC91	L1 – Compressors overload alarm	Man./Auto	config	config	Shutdown compressor with alarm
ALC92	L1 – Compressors high pressure	Man./Auto	config	config	Shutdown compressor with alarm
ALC93	L1 – Compressors low pressure	Man./Auto	config	config	Shutdown compressor with alarm
ALC94	L1 – Compressors oil alarm	Man./Auto	config	config	Shutdown compressor with alarm
ALC96	L2 – Compressors generic alarm	Man./Auto	config	config	Shutdown compressor with alarm
ALC97	L2 – Compressors overload alarm	Man./Auto	config	config	Shutdown compressor with alarm
ALC98	L2 – Compressors high pressure	Man./Auto	config	config	Shutdown compressor with alarm
ALC99	L2 – Compressors low pressure	Man./Auto	config	config	Shutdown compressor with alarm
ALC9a	L2 – Compressors oil alarm	Man./Auto	config	config	Shutdown compressor with alarm

Code	Description	Reset	Delay	Alarm relay	Action
ALCad	High oil sump temperature, Digital Scroll™	Man./Autom.	Config.	R2	Shutdown compressor
ALCae	High discharge temperature, Digital Scroll™	Man./Autom.	Config.	R2	Shutdown compressor
ALCaf	High oil dilution, Digital Scroll™	Man./Autom.	Config.	R2	Shutdown compressor
ALCag	High oil sump temperature, Digital Scroll™, line 2	Man./Autom.	Config.	R2	Shutdown compressor
ALCah	High discharge temperature, Digital Scroll™, line 2	Man./Autom.	Config.	R2	Shutdown compressor
ALCai	High oil dilution, Digital Scroll™, line 2	Man./Autom.	Config.	R2	Shutdown compressor
ALCal	High discharge temperature, compressors 1...6	Automatic	60 s	R2	Related functions disabled
ALCam	High discharge temperature, compressors 1...6, line 2	Automatic	60 s	R2	Related functions disabled
AlCan	Compressor envelope	Manual	Config.	R1	Shutdown compressors
ALCao	High compressor oil temperature, line 1	Automatic	Config.	R2	-
AlCap	High compressor oil temperature, line 2	Automatic	Config.	R2	-
ALCaq	High compressor oil temperature, from 1 to 6	Automatic	-	R2	Related functions disabled
ALCar	Low compressor oil temperature, from 1 to 6	Automatic	-	R2	Related functions disabled
ALF01	Fan circuit breaker	Man./Autom.	Config.	R2	Shutdown fans
ALF02	Fan circuit breaker, line 2	Man./Autom.	Config.	R2	Shutdown fans
ALG01	Clock error	Automatic	-	R2	Related functions disabled
ALG02	Extended memory error	Automatic	-	R2	Related functions disabled
ALG11	Generic high temperature alarms 1...5, PLB1	Man./Autom.	Config.	Config.	-
ALG12	Generic high temperature alarms 1...5, PLB2	Man./Autom.	Config.	Config.	-
ALG13	Generic high temperature alarms 1...5, PLB3	Man./Autom.	Config.	Config.	-
ALG14	Generic high temperature alarms 1...5, PLB4	Man./Autom.	Config.	Config.	-
ALG15	Generic low temperature alarms 1...5, PLB1	Man./Autom.	Config.	Config.	-
ALG16	Generic low temperature alarms 1...5, PLB2	Man./Autom.	Config.	Config.	-
ALG17	Generic low temperature alarms 1...5, PLB3	Man./Autom.	Config.	Config.	-
ALG18	Generic low temperature alarms 1...5, PLB4	Man./Autom.	Config.	Config.	-
ALG19	Generic high modulation alarms 6 and 7, PLB1	Man./Autom.	Config.	Config.	-
ALG20	Generic high modulation alarms 6 and 7, PLB2	Man./Autom.	Config.	Config.	-
ALG21	Generic high modulation alarms 6 and 7, PLB3	Man./Autom.	Config.	Config.	-
ALG22	Generic high modulation alarms 6 and 7, PLB4	Man./Autom.	Config.	Config.	-
ALG23	Generic low modulation alarms 6 and 7, PLB1	Man./Autom.	Config.	Config.	-
ALG24	Generic low modulation alarms 6 and 7, PLB2	Man./Autom.	Config.	Config.	-
ALG25	Generic low modulation alarms 6 and 7, PLB3	Man./Autom.	Config.	Config.	-
ALG26	Generic low modulation alarms 6 and 7, PLB4	Man./Autom.	Config.	Config.	-
ALG27	Normal alarm generic functions 8/9, PLB1	Man./Autom.	Config.	Config.	-
ALG28	Serious alarm generic functions 8/9, PLB1	Man./Autom.	Config.	Config.	-
ALG29	Normal alarm generic functions 8/9, PLB2	Man./Autom.	Config.	Config.	-
ALG30	Serious alarm generic functions 8/9, PLB2	Man./Autom.	Config.	Config.	-
ALG31	Normal alarm generic functions 8/9, PLB3	Man./Autom.	Config.	Config.	-
ALG32	Serious alarm generic functions 8/9, PLB3	Man./Autom.	Config.	Config.	-
ALG33	Normal alarm generic functions 8/9, PLB4	Man./Autom.	Config.	Config.	-
ALG34	Serious alarm generic functions 8/9, PLB4	Man./Autom.	Config.	Config.	-
ALH01	ChillBooster fault	Automatic	Config.	R2	Disable ChillBooster
ALH02	ChillBooster fault, line 2	Automatic	Config.	R2	Disable ChillBooster
ALO02	pLan malfunction	Automatic	60 s	R1	Shutdown unit
ALT01	Compressor maintenance request	Manual	-	Not present	-
ALT02	Compressor maintenance request, line 2	Manual	-	Not present	-
ALT03	ChillBooster maintenance request	Manual	0 s	Not present	-
ALT04	ChillBooster maintenance request, line 2	Manual	0 s	Not present	-
ALT07	HPV valve alarm	Automatic	-	R2	Safety procedure activation
ALT08	RPRV valve alarm	Automatic	-	R2	Safety procedure activation
ALT09	Oil compressor alarm 1	Automatic	Settable	Not featured	Related functions disabled
ALT10	Oil compressor alarm 2	Automatic	Settable	Not featured	Related functions disabled
ALT11	Oil compressor alarm 3	Automatic	Settable	Not featured	Related functions disabled
ALT12	Oil compressor alarm 4	Automatic	Settable	Not featured	Related functions disabled
ALT13	Oil compressor alarm 5	Automatic	Settable	Not featured	Related functions disabled
ALT14	Oil compressor alarm 6	Automatic	Settable	Not featured	Related functions disabled
ALT15	Low superheat alarm	Settable	Settable	R1	Shutdown compressors, line 1
ALT16	Low superheat alarm, line 2	Settable	Settable	R1	Shutdown compressors, line 2
ALT17	HPV valve opening different from setpoint warning	Automatic	-	Not featured	-
ALT18	Receiver high pressure	Settable	Settable	R1	Shutdown compr., line 1 (can be enabled)
ALU01	Configuration not allowed	Automatic	Not present	Not present	Shutdown unit
ALU02	Control probes missing	Automatic	Not present	Not present	Shutdown unit
ALW01	High pressure prevent warning	Automatic	Config.	Not present	Shutdown compr., except min. load stage
ALW02	High pressure prevent warning, line 2	Automatic	Config.	Not present	Shutdown compr., line 2, except min. load stage
ALW03	Compressor inverter warning	Automatic	Not present	Not present	-
ALW04	Compressor inverter warning, line 2	Automatic	Not present	Not present	-
ALW05	Fan inverter warning	Automatic	Not present	Not present	-
ALW06	Fan inverter warning, line 2	Automatic	Not present	Not present	-
ALW07	Envelope warning: refrigerant not compatible with compressor series	Automatic	Not present	Not present	-
ALW08	Envelope warning: custom envelope not configured	Automatic	Not present	Not present	-
ALW09	Envelope warning: suction or condensing probes not configured	Automatic	Not present	Not present	-
ALW10	Low superheat warning	Automatic	Not present	Not present	-
ALW11	Low superheat warning, line 2	Automatic	Not present	Not present	-
ALW12	Warning, ChillBooster operating without external probe	Automatic	0 s	Not present	-
ALW13	Warning, ChillBooster operating without external probe, line 2	Automatic	0 s	Not present	-
ALW14	Warning, probe type configured not allowed	Automatic	Not present	Not present	-
ALW15	Warning, error during autoconfiguration	Automatic	Not present	Not present	-
ALW16	Warning oil receiver levels not configured correctly, line 1	Automatic	-	R2	-
ALW17	Warning oil receiver levels not configured correctly, line 2	Automatic	-	R2	-
ALW18	Probe SX fault	Automatic	Not present	Not present	Depends on the "Probe SX alarm management" parameter
ALW19	EEPROM damaged	Replace the driver/Contact service	Not present	Not present	Total shutdown
ALW20	Valve motor error	automatic	Not present	Not present	Interruption
ALW21	Driver OFFLINE	manual	5 s	Not present	Shutdown unit
ALW22	Battery discharged	Replace the battery	Not present	Not present	No effect

Tab. 7.a

7.3 I/O Table

The list of pRack pR300T inputs and outputs is reported below.

Digital inputs

Line 1

	Mask index	Description	Channel	Logic	Notes
Suction and Stage in high pressure	Ac05, Baack	ON/OFF unit, line 1			
	Baa56, Caaah	Common low pressure switch, line 1			
	Baada, Caa14	Compressor inverter warning, line 1			
	Baa02, Caa01	Alarm 1 compressor 1, line 1			
	Baa03, Caa02	Alarm 2, compressor 1, line 1			
	Baa04, Caa03	Alarm 3, compressor 1 line 1			
	Baa05, Caa04	Alarm 4, compressor 1 line 1			
	Baa06, Caa05	Alarm 5, compressor 1 line 1			
	Baa07, Caa06	Alarm 6, compressor 1 line 1			
	Baa08. Caa07	Alarm 7, compressor 1 line 1			
	Baa09, Caa15	Alarm 1, compressor 2, line 1			
	Baa10, Caa16	Alarm 2, compressor 2, line 1			
	Baa11, Caa17	Alarm 3, compressor 2, line 1			
	Baa12, Caa18	Alarm 4, compressor 2, line 1			
	Baa13, Caa19	Alarm 5, compressor 2, line 1			
	Baa14, Caa20	Alarm 6, compressor 2, line 1			
	Baa15, Caa21	Alarm 7, compressor 2, line 1			
	Baa17, Caa28	Alarm 1, compressor 3 line 1			
	Baa18, Caa29	Alarm 2, compressor 3, line 1			
	Baa19, Caa30	Alarm 3, compressor 3 line 1			
	Baa20, Caa31	Alarm 4, compressor 3 line 1			
	Baa21, Caa32	Alarm 5, compressor 3 line 1			
	Baa22, Caa33	Alarm 6, compressor 3 line 1			
	Baa23, Caa34	Alarm 7, compressor 3 line 1			
	Baa24, Caa40	Alarm 1, compressor 4 line 1			
	Baa25, Caa41	Alarm 2, compressor 4, line 1			
	Baa26, Caa42	Alarm 3, compressor 4 line 1			
	Baa27, Caa43	Alarm 4, compressor 4 line 1			
	Baa28, Caa44	Alarm 5, compressor 4 line 1			
	Baa29, Caa45	Alarm 6, compressor 4 line 1			
	Baa30, Caa46	Alarm 7, compressor 4 line 1			
	Baa32, Caa53	Alarm 1, compressor 5 line 1			
	Baa33, Caa54	Alarm 2, compressor 5, line 1			
	Baa34, Caa55	Alarm 3, compressor 5 line 1			
	Baa35, Caa56	Alarm 4, compressor 5 line 1			
	Baa36, Caa57	Alarm 5, compressor 5 line 1			
	Baa37, Caa58	Alarm 6, compressor 5 line 1			
	Baa38, Caa59	Alarm 7, compressor 5 line 1			
	Baa39, Caa65	Alarm 1, compressor 6 line 1			
	Baa40, Caa66	Alarm 2, compressor 6, line 1			
	Baa41, Caa67	Alarm 3, compressor 6 line 1			
	Baa42, Caa68	Alarm 4, compressor 6 line 1			
	Baa43, Caa69	Alarm 5, compressor 6 line 1			
	Baa44, Caa70	Alarm 6, compressor 6 line 1			
	Baa45, Caa71	Alarm 7, compressor 6 line 1			
	Baa47, Caa78	Alarm 1, compressor 7 line 1			
	Baa48, Caa79	Alarm 2, compressor 7 line 1			
	Baa49, Caa84	Alarm 1, compressor 8 line 1			
	Baa50, Caa85	Alarm 2, compressor 8 line 1			
	Baa51, Caa90	Alarm 1, compressor 9 line 1			
	Baa52, Caa91	Alarm 2, compressor 9 line 1			
	Baa53, Caa95	Alarm 1, compressor 10 line 1			
	Baa54, Caa99	Alarm 1, compressor 11 line 1			
	Baa55, Caaad	Alarm 1, compressor 12 line 1			
	Baa58, Caaaj	Common oil alarm, line 1			
	Baa59, Caaak	Liquid level alarm, line 1			
	Baadc	Fan inverter warning, line 1			
	Baa57, Daa50	Common high pressure switch, line 1			
	Baadf, Daa51	High pressure prevention, line 1			
	Baaau, Daa01	Fan circuit breaker 1, line 1			
	Baaav, Daa02	Fan circuit breaker 2, line 1			
	Baaaw, Daa03	Fan circuit breaker 3, line 1			
	Baaax, Daa04	Fan circuit breaker 4, line 1			
	Baaay, Daa05	Fan circuit breaker 5, line 1			
	Baaaz, Daa06	Fan circuit breaker 6, line 1			
	Baaba, Daa07	Fan circuit breaker 7, line 1			
	Baabb, Daa08	Fan circuit breaker 8, line 1			
Other functions	Baabc, Daa09	Fan circuit breaker 9, line 1			
	Baabd, Daa10	Fan circuit breaker 10, line 1			
	Baabe, Daa11	Fan circuit breaker 11, line 1			
	Baabf, Daa12	Fan circuit breaker 12, line 1			
	Baabg, Daa13	Fan circuit breaker 13, line 1			
	Baabh, Daa14	Fan circuit breaker 14, line 1			
	Baabi, Daa15	Fan circuit breaker 15, line 1			
	Baabj, Daa16	Fan circuit breaker 16, line 1			
	Baabk, Daa17	Common fan circuit breaker, line 1			
	Baabl	Heat recovery, line 1			
	Baacn	pRack automatic or manual operation status			
	Baacx, Egaa01	ChillBooster fault, line 1			
	Baacl, Caa00, Dad08	Setpoint compensation, line 1			
	Daa52	Anti noise, line 1			
	Daa53	Split condenser, line 1			
	Eeaa02	Heat recovery activation, line 1			
	Baade, Eia04	HPV alarm			
	Baadf, Eia05	RPRV alarm			
	Eaaa55	Maximum receiver oil level, line 1			

	Mask index	Description	Channel	Logic	Notes
Other functions	Eaaa56	Minimum receiver oil level, line 1			
	Eaaa57	Oil level compressor 1 line 1			
	Eaaa58	Oil level compressor 2 line 1			
	Eaaa59	Oil level compressor 3 line 1			
	Eaaa60	Oil level compressor 4 line 1			
	Eaaa61	Oil level compressor 5 line 1			
	Eaaa62	Oil level compressor 6 line 1			

Line 2

	Mask index	Description	Channel	Logic	Notes
Suction	Ac08, Baacy	ON/OFF unit, line 2			
	Baaap, Cbaah	Common low pressure switch, line 2			
	Baadb, Cba14	Compressor inverter warning, line 2			
	Baaar, Cbaaj	Common oil alarm, line 2			
	Baa61, Cba01	Alarm 1 compressor 1, line 2			
	Baa62, Cba02	Alarm 2, compressor 1 line 2			
	Baa63, Cba03	Alarm 3, compressor 1 line 2			
	Baa64, Cba04	Alarm 4, compressor 1 line 2			
	Baa65, Cba05	Alarm 5, compressor 1 line 2			
	Baa66, Cba06	Alarm 6, compressor 1 line 2			
	Baa67, Cba07	Alarm 7, compressor 1 line 2			
	Baa68, Cba15	Alarm 1 compressor 2, line 2			
	Baa69, Cba16	Alarm 2, compressor 2 line 2			
	Baa70, Cba17	Alarm 3, compressor 2 line 2			
	Baa71, Cba18	Alarm 4, compressor 2 line 2			
	Baa72, Cba19	Alarm 5, compressor 2 line 2			
	Baa73, Cba20	Alarm 6, compressor 2 line 2			
	Baa74, Cba21	Alarm 7, compressor 2 line 2			
	Baa76, Cba28	Alarm 1, compressor 3 line 2			
	Baa77, Cba29	Alarm 2, compressor 3 line 2			
	Baa78, Cba30	Alarm 3, compressor 3 line 2			
	Baa79, Cba31	Alarm 4, compressor 3 line 2			
	Baa80, Cba32	Alarm 5, compressor 3 line 2			
	Baa81, Cba33	Alarm 6, compressor 3 line 2			
	Baa82, Cba34	Alarm 7, compressor 3 line 2			
	Baa83, Cba40	Alarm 1, compressor 4 line 2			
	Baa84, Cba41	Alarm 2, compressor 4 line 2			
	Baa85, Cba42	Alarm 3, compressor 4 line 2			
	Baa86, Cba43	Alarm 4, compressor 4 line 2			
	Baa87, Cba44	Alarm 5, compressor 4 line 2			
	Baa88, Cba45	Alarm 6, compressor 4 line 2			
	Baa89, Cba46	Alarm 7, compressor 4 line 2			
	Baa91, Cba53	Alarm 1, compressor 3 line 2			
	Baa92, Cba54	Alarm 2, compressor 3 line 2			
	Baa93, Cba55	Alarm 3, compressor 3 line 2			
	Baa94, Cba56	Alarm 4, compressor 3 line 2			
	Baa95, Cba57	Alarm 5, compressor 3 line 2			
	Baa96, Cba58	Alarm 6, compressor 3 line 2			
	Baa97, Cba59	Alarm 7, compressor 3 line 2			
	Baa98, Cba65	Alarm 1, compressor 4 line 2			
	Baa99, cba66	Alarm 2, compressor 4 line 2			
	Baaaa, Cba67	Alarm 3, compressor 4 line 2			
	Baaab, Cba68	Alarm 4, compressor 4 line 2			
	Baaac, Cba69	Alarm 5, compressor 4 line 2			
	Baaad, Cba70	Alarm 6, compressor 4 line 2			
	Baaae, Cba71	Alarm 7, compressor 4 line 2			
	Baaag, Cba78	Alarm 1, compressor 7 line 2			
	Baaah, Cba79	Alarm 2, compressor 7 line 2			
	Baaai, Cba84	Alarm 1, compressor 8 line 2			
	Baaaj, Cba85	Alarm 2, compressor 8 line 2			
	Baaak, Cba90	Alarm 1, compressor 9 line 2			
	Baaal, Cba91	Alarm 2, compressor 9 line 2			
	Baaam, Cba95	Alarm 1, compressor 10 line 2			
	Baaan, Cba99	Alarm 1, compressor 11 line 2			
	Baaao, Cbaad	Alarm 1, compressor 12 line 2			
	Baaas, Cbaak	Liquid level alarm, line 2			
Condenser	Baadd	Fan inverter warning, line 2			
	Baaaq	Common high pressure switch, line 2			
	Baabn, Dba01	Fan circuit breaker 1, line 2			
	Baabo, Dba02	Fan circuit breaker 2, line 2			
	Baabp, Dba03	Fan circuit breaker 3, line 2			
	Baabq, Dba04	Fan circuit breaker 4, line 2			
	Baabr, Dba05	Fan circuit breaker 5, line 2			
	Baabs, Dba06	Fan circuit breaker 6, line 2			
	Baabt, Dba07	Fan circuit breaker 7, line 2			
	Baabu, Dba08	Fan circuit breaker 8, line 2			
	Baabv, Dba09	Fan circuit breaker 9, line 2			
	Baabw, Dba10	Fan circuit breaker 10, line 2			
	Baabx, Dba11	Fan circuit breaker 11, line 2			
	Baaby, Dba12	Fan circuit breaker 12, line 2			
	Baabz, Dba13	Fan circuit breaker 13, line 2			
	Baaca, Dba14	Fan circuit breaker 14, line 2			
	Baacb, Dba15	Fan circuit breaker 15, line 2			
	Baacc, Dba16	Fan circuit breaker 16, line 2			
	Baacd, Dba17	Common fan circuit breaker, line 2			

	Mask index	Description	Channel	Logic	Notes
Other functions	Baace	Heat recovery, line 2			
	Baadq, Eqba01	ChillBooster fault, line 2			
	Baade	Enable floating condenser, line 2			
	Baacm, Cbd06, Dbd08	Setpoint compensation, line 2			
	Baacn	pRack automatic or manual operation status			
	Dba52	Anti noise, line 2			
	Dba53	Split condenser, line 2			
	Eeba02	Heat recovery activation, line 2			
	Eaba15	Maximum receiver oil level, line 2			
	Eaba16	Minimum receiver oil level, line 2			
	Eaba17	Oil level compressor 1 line 2			
	Eaba18	Oil level compressor 2 line 2			
	Eaba19	Oil level compressor 3 line 2			
	Eaba20	Oil level compressor 4 line 2			
	Eaba21	Oil level compressor 5 line 2			
	Eaba22	Oil level compressor 6 line 2			
Generic F.	Baacf, Efe16	DI generic input F			
	Baacg, Efe17	DI generic input G			
	Baach, Efe18	DI generic input H			
	Baaci, Efe19	DI generic input I			
	Baacj, Efe20	DI generic input J			

Digital outputs

Line 1

	Mask index	Description	Channel	Logic	Notes
Suction	Bac02, Caa08	Line relay compressor 1 line 1			
		Partwinding/ Star relay compressor 1 line 1			
		Delta relay compressor 1 line 1			
	Bac03, Caa09	Valve 1, compressor 1 line 1			
	Bac04, Caa10	Valve 2, compressor 1 line 1			
	Bac05, Caa11	Valve 3, compressor 1 line 1			
	Bac07, Caa12	Equalization valve compressor 1 line 1			
	Bac08, Caa22	Line relay compressor 2 line 1			
		Partwinding/ Star relay compressor 2 line 1			
		Delta relay compressor 2 line 1			
	Bac10, Caa23	Valve 1, compressor 2 line 1			
	Bac11, Caa24	Valve 2, compressor 1 line 1			
	Bac12, Caa25	Valve 3, compressor 1 line 1			
	Bac13, Caa26	Equalization valve compressor 1 line 1			
	Bac15, Caa35	Line relay compressor 3 line 1			
		Partwinding/ Star relay compressor 3 line 1			
		Delta relay compressor 3 line 1			
	Bac16, Caa36	Valve 1, compressor 3 line 1			
	Bac17, Caa37	Valve 2, compressor 3 line 1			
	Bac18, Caa38	Valve 3, compressor 3 line 1			
	Bac20, Caa39	Equalization valve compressor 3 line 1			
	Bac21, Caa47	Line relay compressor 4 line 1			
		Partwinding/ Star relay compressor 4 line 1			
		Delta relay compressor 4 line 1			
	Bac22, Caa48	Valve 1, compressor 4 line 1			
	Bac23, Caa49	Valve 2, compressor 4 line 1			
	Bac24, Caa50	Valve 3, compressor 4 line 1			
	Bac26, Caa51	Equalization valve compressor 4 line 1			
	Bac28, Caa60	Line relay compressor 5 line 1			
		Partwinding/ Star relay compressor 5 line 1			
		Delta relay compressor 5 line 1			
	Bac29, Caa61	Valve 1, compressor 5 line 1			
	Bac30, Caa62	Valve 2, compressor 5 line 1			
	Bac31, Caa63	Valve 3, compressor 5 line 1			
	Bac33, Caa64	Equalization valve compressor 5 line 1			
	Bac34, Caa72	Line relay compressor 6 line 1			
		Partwinding/ Star relay compressor 6 line 1			
		Delta relay compressor 6 line 1			
	Bac35, Caa73	Valve 1, compressor 6 line 1			
	Bac36, Caa74	Valve 2, compressor 6 line 1			
	Bac37, Caa75	Valve 3, compressor 6 line 1			
	Bac39, Caa76	Equalization valve compressor 6 line 1			
	Bac41, Caa80	Line relay compressor 7 line 1			
		Partwinding/ Star relay compressor 7 line 1			
		Delta relay compressor 7 line 1			
	Bac42, Caa81	Valve 1, compressor 7 line 1			
	Bac43, Caa82	Valve 2, compressor 7 line 1			
	Bac45, Caa83	Equalization valve compressor 7 line 1			
	Bac46, Caa86	Line relay compressor 8 line 1			
		Partwinding/ Star relay compressor 8 line 1			
		Delta relay compressor 8 line 1			
	Bac47, Caa87	Valve 1, compressor 8 line 1			
	Bac48, Caa88	Valve 2, compressor 8 line 1			
	Bac50, Caa89	Equalization valve compressor 8 line 1			
	Bac51, Caa92	Line relay compressor 9 line 1			
		Partwinding/ Star relay compressor 9 line 1			
		Delta relay compressor 9 line 1			
	Bac52, Caa93	Valve 1, compressor 9 line 1			
	Bac55, Caa94	Equalization valve compressor 9 line 1			
	Bac56, Caa96	Line relay compressor 10 line 1			
		Partwinding/ Star relay compressor 10 line 1			
		Delta relay compressor 10 line 1			
	Bac57, Caa97	Valve 1, compressor 10 line 1			
	Bac60, Caa98	Equalization valve compressor 10 line 1			
	Bac61, Caaaa	Line relay compressor 11 line 1			
		Partwinding/ Star relay compressor 11 line 1			
		Delta relay compressor 11 line 1			
	Bac62, Caaab	Valve 1, compressor 11 line 1			
	Bac65, Caaac	Equalization valve compressor 11 line 1			

	Mask index	Description	Channel	Logic	Notes
Suction	Bac66, Caaae	Line relay compressor 12 line 1			
		Partwinding/ Star relay compressor 12 line 1			
		Delta relay compressor 12 line 1			
	Bac67, Caaaf	Valve 1, compressor 12 line 1			
	Bac70, Caaag	Equalization valve compressor 12 line 1			
Condenser	Bacbt, Daa21	Fan 1 line 1			
	Bacbu, Daa22	Fan 2 line 1			
	Bacbv, Daa23	Fan 3 line 1			
	Bacbw, Daa24	Fan 4 line 1			
	Bacbx, Daa25	Fan 5 line 1			
	Bacby, Daa26	Fan 6 line 1			
	Bacbz, Daa27	Fan 7 line 1			
	Bacca, Daa28	Fan 8 line 1			
	Baccb, Daa29	Fan 9 line 1			
	Baccc, Daa30	Fan 10 line 1			
	Baccd, Daa31	Fan 11 line 1			
	Bacce, Daa32	Fan 12 line 1			
	Baccf, Daa33	Fan 13 line 1			
	Baccg, Daa34	Fan 14 line 1			
	Bacch, Daa35	Fan 15 line 1			
	Bacci, Daa36	Fan 16 line 1			
Other functions	Bacck, Eeaa03	Heat recovery pump, line 1			
	Baccl, Eqaa02	ChillBooster line 1			
	Bacdp, Eaaa11	Oil pump 1 line 1			
	Bacdq, Eaaa12	Oil pump 2 line 1			
	Bacdr, Eaaa13	Oil fan 1 line 1			
	Bacdv, Ecaa07, Edaa07	Liquid injection valve / Economizer compressor 1 line 1			
	Bacdw, Ecaa08, Edaa08	Liquid injection valve / Economizer compressor 2 line 1			
	Bacdx, Ecaa09, Edaa09	Liquid injection valve / Economizer compressor 3 line 1			
	Bacdy, Ecaa10, Edaa10	Liquid injection valve / Economizer compressor 4 line 1			
	Bacdz, Ecaa11, Edaa11	Liquid injection valve / Economizer compressor 5 line 1			
	Bacea, Ecaa12, Edaa12	Liquid injection valve / Economizer compressor 6 line 1			
	Bacei	Forcing from BMS, line 1			
	Bacej	Non return of liquid, line 1			
	Bacek, Ebaa01	Subcooling, line 1			
	Eaaa40	Oil level valve compressor 1 line 1			
	Eaaa41	Oil level valve compressor 2 line 1			
	Eaaa42	Oil level valve compressor 3 line 1			
	Eaaa43	Oil level valve compressor 4 line 1			
	Eaaa44	Oil level valve compressor 5 line 1			
	Eaaa45	Oil level valve compressor 6 line 1			
	Bac71	Oil receiver line 1			
	Eaaa16	Oil cooling compressor 1 line 1			
	Eaaa19	Oil cooling compressor 2 line 1			
	Eaaa22	Oil cooling compressor 3 line 1			
	Eaaa25	Oil cooling compressor 4 line 1			
	Eaaa28	Oil cooling compressor 5 line 1			
	Eaaa31	Oil cooling compressor 6 line 1			
	Eaaa54	Common oil level valve line 2			
	Ebaa01	Subcooling valve (line 1)			
	Baceh	Sign of life			
	Bacem	Normal alarm			
	Bacen	Serious alarm			

Line 2

	Mask index	Description	Channel	Logic	Notes
Suction	Bac73, Cba08	Line relay compressor 1 line 2			
		Partwinding/ Star relay compressor 1 line 2			
		Delta relay compressor 1 line 2			
	Bac74, Cba09	Valve 1, compressor 1 line 2			
	Bac75, Cba10	Valve 2, compressor 1 line 2			
	Bac76, Cba11	Valve 3, compressor 1 line 2			
	Bac78, Cba12	Equalization valve compressor 1 line 2			
	Bac79, Cba22	Line relay compressor 2 line 2			
		Partwinding/ Star relay compressor 2 line 2			
		Delta relay compressor 2 line 2			
	Bac80, Cba23	Valve 1, compressor 2 line 2			
	Bac81, Cba24	Valve 2, compressor 1 line 2			
	Bac82, Cba25	Valve 3, compressor 1 line 2			
	Bac84, Cba26	Equalization valve compressor 1 line 2			
	Bac86, Cba35	Line relay compressor 3 line 2			
		Partwinding/ Star relay compressor 3 line 2			
		Delta relay compressor 3 line 2			
	Bac87, Cba36	Valve 1, compressor 3 line 2			
	Bac88, Cba37	Valve 2, compressor 3 line 2			
	Bac89, Cba38	Valve 3, compressor 3 line 2			
	Bac91, Cba39	Equalization valve compressor 3 line 2			
	Bac92, Cba47	Line relay compressor 4 line 2			
		Partwinding/ Star relay compressor 4 line 2			
		Delta relay compressor 4 line 2			
	Bac94, Cba48	Valve 1, compressor 4 line 2			
	Bac95, Cba49	Valve 2, compressor 4 line 2			
	Bac96, Cba50	Valve 3, compressor 4 line 2			
	Bac98, Cba51	Equalization valve compressor 4 line 2			
	Bacaa, Cba60	Line relay compressor 5 line 2			
		Partwinding/ Star relay compressor 5 line 2			
		Delta relay compressor 5 line 2			
	Bacab, Cba61	Valve 1, compressor 5 line 2			
	Bacac, Cba62	Valve 2, compressor 5 line 2			
	Bacad, Cba63	Valve 3, compressor 5 line 2			
	Bacaf, Cba64	Equalization valve compressor 5 line 2			
	Bacag, Cba72	Line relay compressor 6 line 2			
		Partwinding/ Star relay compressor 6 line 2			
		Delta relay compressor 6 line 2			
	Bacah, Cba73	Valve 1, compressor 6 line 2			
	Bacai, Cba74	Valve 2, compressor 6 line 2			
	Bacaj, Cba75	Valve 3, compressor 6 line 2			
	Bacal, Cba76	Equalization valve compressor 6 line 2			

	Mask index	Description	Channel	Logic	Notes
Suction	Bacan, Cba80	Line relay compressor 7 line 2			
		Partwinding/ Star relay compressor 7 line 2			
		Delta relay compressor 7 line 2			
	Bacao, Cba81	Valve 1, compressor 7 line 2			
	Bacap, Cba82	Valve 2, compressor 7 line 2			
	Bacar, Cba83	Equalization valve compressor 7 line 2			
	Bacas Cba86	Line relay compressor 8 line 2			
		Partwinding/ Star relay compressor 8 line 2			
		Delta relay compressor 8 line 2			
	Bacat, Cba87	Valve 1, compressor 8 line 2			
	Bacau, Cba88	Valve 2, compressor 8 line 2			
	Bacaw, Cba89	Equalization valve compressor 8 line 2			
	Bacax, Cba92	Line relay compressor 9 line 2			
		Partwinding/ Star relay compressor 9 line 2			
		Delta relay compressor 9 line 2			
	Bacay, Cba93	Valve 1, compressor 9 line 2			
	Bacbb, Cba94	Equalization valve compressor 9 line 2			
	Bacbc, Cba96	Line relay compressor 10 line 2			
		Partwinding/ Star relay compressor 10 line 2			
		Delta relay compressor 12 line 2			
	Bacbd, Cba97	Valve 1, compressor 10 line 2			
	Bacbg, Cba98	Equalization valve compressor 10 line 2			
	Bacbh, Cbaaa	Line relay compressor 11 line 2			
		Partwinding/ Star relay compressor 11 line 2			
		Delta relay compressor 11 line 2			
	Bacbi, Cbaab	Valve 1, compressor 11 line 2			
	Bacbl, Cbaac	Equalization valve compressor 11 line 2			
	Bacbm, Cbaae	Line relay compressor 12 line 2			
		Partwinding/ Star relay compressor 12 line 2			
		Delta relay compressor 12 line 2			
	Bacbn, Cbaaf	Valve 1, compressor 12 line 2			
	Bacbq, Cbaag	Equalization valve compressor 12 line 2			
Condenser	Baccn, Dba20	Fan 1 line 2			
	Bacco, Dba21	Fan 2 line 2			
	Baccp, Dba22	Fan 3 line 2			
	Baccq, Dba23	Fan 4 line 2			
	Baccr, Dba24	Fan 5 line 2			
	Baccs, Dba25	Fan 6 line 2			
	Bacct, Dba26	Fan 7 line 2			
	Baccu, Dba27	Fan 8 line 2			
	Baccv, Dba28	Fan 9 line 2			
	Baccw, Dba29	Fan 10 line 2			
	Baccx, Dba30	Fan 11 line 2			
	Baccy, Dba31	Fan 12 line 2			
	Baccz, Dba32	Fan 13 line 2			
	Bacda, Dba33	Fan 14 line 2			
	Bacdb, Dba34	Fan 15 line 2			
	Bacdc, Dba35	Fan 16 line 2			
	Bacdd, Dba36	Fan inverter warning, line 1			
Other functions	Bacde, Eeba03	Heat recovery pump, line 2			
	Bacdf, Egba02	ChillBooster line 2			
	Bacds, Eaba10	Oil pump 1 line 2			
	Bacdt, Eaba11	Oil pump 2 line 2			
	Bacdu, Eaba12	Oil fan line 2			
	Baceb, Ecba07, Edba07	Liquid injection valve compressor 1 line 2			
	Bacec, Ebca08, Edba08	Liquid injection valve compressor 2 line 2			
	Baced, Ecba09, Edba09	Liquid injection valve compressor 3 line 2			
	Bacee, Ecba10, Edba10	Liquid injection valve compressor 4 line 2			
	Bacef, Ecba11, Edba11	Liquid injection valve compressor 5 line 2			
	Baceg, Ecba12, Edba12	Liquid injection valve compressor 6 line 2			
	Bac72	Non return of liquid, line 2			
	Bacep	Forcing from BMS, line 2			
	Bacel, Ebbb01	Subcooling, line 2			
	Eaba23	Common oil level valve line 2			
	Eaba40	Oil level valve compressor 1 line 2			
	Eaba41	Oil level valve compressor 2 line 2			
	Eaba42	Oil level valve compressor 3 line 2			
	Eaba43	Oil level valve compressor 4 line 2			
	Eaba44	Oil level valve compressor 5 line 2			
	Eaba45	Oil level valve compressor 6 line 2			
	Ebaa01	Subcooling valve line 2			
	Baceo	Oil receiver line 2			
	Bacdg, Efe21	Stage 1 generic function			
	Bacdh, Efe22	Stage 2 generic function			
	Bacdi, Efe23	Stage 3 generic function			
	Bacdj, Efe24	Stage 4 generic function			
	Bacdk, Efe25	Stage 5 generic function			
	Bacdl	Alarms present			
	Bacdm, Efe26	Generic alarm function 1			
	Bacdn, Efe27	Generic alarm function 2			
	Bacdo, Efe28	General scheduling function			

Analog inputs

Line 1

	Mask index	Description	Channel	Logic	Notes
Asp.	Bab01, Caaal	Suction pressure probe line 1			
	Bab02, Caaam	Suction pressure backup probe type line 1			
	Bab03, Caaao	Suction temperature probe line 1			
	Bab60	Suction pressure probe compensation line 1			
Cond.	Bab04, Daa39	Gas cooler pressure probe line 1			
	Bab09, Daa40	Gas cooler backup pressure probe line 1			
	Bab61, Daa43	Gas cooler output temperature probe line 1			
	Bab62, Daa44	Gas cooler temperature backup probe			
Other functions	Bab11, Daa41	Discharge temperature probe line 1			
	Bab12	Liquid temperature probe line 1			
	Bab13, Eeaa05	Heat recovery output temperature probe line 1			
	Bab15, Daa20	External temperature probe line 1			
	Bab16	Room temperature probe line 1			
	Bab17, Eaaa04	Oil temperature probe line 1			
	Bab29, Ecaa01, Edaa01	Discharge temperature probe compressor 1 line 1			
	Bab30, Ecaa02 Edaa02	Discharge temperature probe compressor 2 line 1			
	Bab31, Ecaa03, Edaa03	Discharge temperature probe compressor 3 line 1			
	Bab32, Ecaa04, Edaa04	Discharge temperature probe compressor 4 line 1			
	Bab33, Ecaa05, Edaa05	Discharge temperature probe compressor 5 line 1			
	Bab34, Ecaa06, Edaa06	Discharge temperature probe compressor 6 line 1			
	Bab41, Eaaa05	Oil temperature probe compressor 1 line 1			
	Bab42, Eaaa06	Oil temperature probe compressor 2 line 1			
	Bab43, Eaaa07	Oil temperature probe compressor 3 line 1			
	Bab44, Eaaa08	Oil temperature probe compressor 4 line 1			
	Bab45, Eaaa09	Oil temperature probe compressor 5 line 1			
	Bab46, Eaaa10	Oil temperature probe compressor 6 line 1			
	Bab63	Oil receiver differential pressure probe line 1			
	Bab66, Eia01	RPRV receiver pressure probe			
	Bab67, Eia02	HPV Feedback (not used)			
	Bab68, Eia03	RPRV Feedback (not used)			
	Eeaa06	HPV setpoint compensation and floating condensing with heat recovery			

Line 2

	Mask index	Description	Channel	Logic	Notes
Asp.	Bab05, Caal	Suction pressure probe line 2			
	Bab06, Caaam	Suction pressure backup probe type line 2			
	Bab07, Caaao	Suction temperature probe line 2			
	Bab64	Suction pressure probe compensation line 2			
Con.	Bab08, Dba39	Condensing pressure probe line 2			
	Bab10, Dba40	Condensing pressure backup probe line 2			
Altre funzioni	Bab48, Dba38	Discharge temperature probe line 2			
	Bab49	Liquid temperature probe line 2			
	Bab14, Eeba05	Heat recovery output temperature probe line 2			
	Bab18, Eaba04	Oil temperature probe line 2			
	Bab35, Ecba01, Edba01	Discharge temperature probe compressor 1 line 2			
	Bab36, Ecba02, Edba02	Discharge temperature probe compressor 2 line 2			
	Bab37, Ecba03, Edba03	Discharge temperature probe compressor 3 line 2			
	Bab38, Ecba04, Edba04	Discharge temperature probe compressor 4 line 2			
	Bab39, Ecba05, Edba05	Discharge temperature probe compressor 5 line 2			
	Bab40, Ecba06, Edba06	Discharge temperature probe compressor 6 line 2			
	Bab47, Eaba05	Oil temperature probe compressor 1 line 2			
	Bab65	Oil receiver differential pressure probe line 2			
	Eaba05	Oil temperature probe compressor 1 line 2			
	Eaba06	Oil temperature probe compressor 2 line 2			
	Eaba07	Oil temperature probe compressor 3 line 2			
	Eaba08	Oil temperature probe compressor 4 line 2			
	Eaba09	Oil temperature probe compressor 5 line 2			
	Eaba10	Oil temperature probe compressor 6 line 2			
	Bab20, Efe07	Passive generic probe A			
	Bab21, Efe08	Active generic probe B			
	Bab22, Efe09	Passive generic probe B			
	Bab23, Efe10	Active generic probe C			
	Bab24, Efe11	Passive generic probe C			
Altre f.	Bab25, Efe12	Active generic probe D			
	Bab26, Efe13	Passive generic probe D			
	Bab27, Efe14	Active generic probe E			
	Bab28, Efe15	Passive generic probe E			

Analog outputs

Line 1

Mask index	Description	Channel	Logic	Notes
Bad01, Caa14	Compressor inverter output line 1			
Bad02, Eaaa14	Oil pump output line 1			
Bad07, Daa38	Inverter fan output line 1			
Bad08, Eeaa04	Heat recovery valve output line 1			
Bad12, Efe29	Modulating generic output 1			
Bad14, Eia06	HPV valve output			
Bad15, Eia07	RPRV valve output			

Line 2

Mask index	Description	Channel	Logic	Notes
Bad04	Compressor inverter output line 2			
Bad05, Eaba14	Oil pump output line 2			
Bad10, Dba37	Inverter fan output line 2			
Bad11, Eeba04	Heat recovery valve output line 2			
Bad13, Efe30	Modulating generic output 2			

8. ALARMS

pRack PR300T can manage both alarms relating to the status of the digital inputs and to operation of the system. For each alarm, the following are controlled:
- The actions on the devices, if necessary
- The output relays (one global and two with different priorities, if configured)
- The red LED on the terminal and the buzzer, where present
- The type of acknowledgement (automatic, manual, semiautomatic)
- Any activation delay

The complete list of alarms, with the related information as described above, is available in Alarm table.

8.1 Alarm management

All alarms feature the following behaviour:
- When an alarm is activated, the red LED flashes and the buzzer is activated (where present); the output relays corresponding to the global alarm and to any alarms with priority are activated (if configured)
- Pressing the ⚠ (Alarm) button, the red LED stays on steady, the buzzer is muted and the alarm screen is shown
- If there is more than one active alarm, these can be scrolled using ↑ (Up) ↓ (Down). This condition is signalled by an arrow at the bottom right of the screen
- Pressing the ⚠ (Alarm) button again for at least 3 seconds acknowledges the alarms manually, and these are cleared from the display unless others are active (they are saved in the log)

8.1.1 Priority

For certain alarms, the alarm output relay can be set with two types of priority:
- R1: serious alarm
- R2: normal alarm

The corresponding relays, once configured, are activated when an alarm with the corresponding priority occurs. For the other alarms, the priority is fixed and is associated by default with one of the two relays.

8.1.2 Acknowledgement

The alarms can have manual, automatic or semiautomatic acknowledgement:
- Manual: the alarm is acknowledged by pressing the ⚠ (Alarm) button twice, the first time displays the corresponding alarm screen and mutes the buzzer, the second (extended, for at least 3 seconds) cancels the alarm (which is saved in the log). If the alarm is still active, acknowledgement has no effect and the signal is shown again.
- Automatic: when the alarm condition ceases, the alarm is automatically reset, the LED comes on steady and the corresponding screen remains displayed until the ⚠ (Alarm) button is pressed and held; the alarm is saved in the log.
- Semiautomatic: acknowledgement is automatic, until a maximum number of activations in set time. If the number reaches the maximum set, acknowledgement becomes manual.

For manual acknowledgement, the functions associated with the alarm are not reactivated until acknowledgement has been completed, while for automatic acknowledgement they're reactivated as soon as the alarm condition ceases.

8.1.3 Log

The alarm log can be accessed:
- from branch G.a of the main menu
- by pressing the ⚠ (Alarm) button and then ↵ (Enter) when there are no active alarms
- by pressing ↵ (Enter) after having scrolled all the alarms.

The alarm log screens show:
1. Order of activation (no. 01 is the oldest alarm)
2. Hour and date the alarm was activated
3. Short description
4. Main values recorded at the moment the alarm was activated (suction pressure and condensing pressure).

Note: A maximum of 50 alarms can be logged; after this limit any new events overwrite the oldest ones, which are therefore deleted.

8.2 Compressor alarms

The number of alarms for each compressor can be set during the configuration phase using the Wizard or subsequently from branch C.a.e/ C.b.e of the main menu. The number of alarms is the same for all the compressors on the same line.

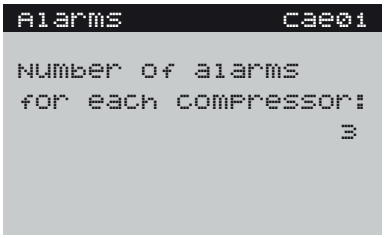


Fig. 8.a

Note: The maximum number of alarms that can be configured for each compressor depends not only on the type of compressor, but also on the size of pRack and the number of compressors fitted.

After having selected the number of alarms (maximum 4), the settings can be configured for each alarm, choosing a description from the options shown in the table, the output relay, the type of reset, delay and priority. The effect of the alarm on the devices is set and involves stopping the compressor, except for the oil warning.

Possible descriptions for compressor alarms

Reciprocating or scroll
Generic
Overload
High pressure
Low pressure
Oil

Tab. 8.a

An example of a screen for selecting the description of the alarm is shown in the figure:

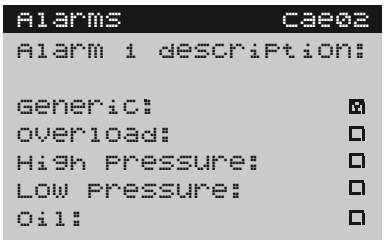


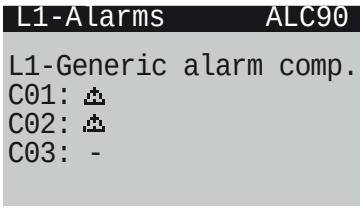
Fig. 8.b

After having selected the 'generic' description, no other description can be selected. In general, the descriptions are divided in:
- overload,
- oil,
- high pressure
- low pressure.

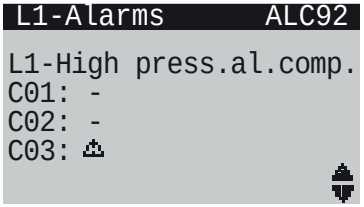
After a description has been selected for a certain group, descriptions from a different group can not be selected for that alarm. For example, generic only, or overload + oil, or rotation only or overload + high pressure., etc. can be selected. Each alarm will have one alarm screen, which will show all the descriptions associated to that alarm.

Starting from version 3.3.0, the main alarms relating to the compressors have been grouped together; specifically, the alarms can be configured in the path: C.Compressors → d.Alarms → Cae01 (Fig.8.a). The screens show which compressors (only those configured) will be shutdown (and which not) when a specific alarm is activated (generic alarm, high pressure..); for example, with 3 compressors and the first 2 with alarms, the following will occur:

According to the number of alarms selected, the default associated descriptions will be as shown in the table.



Further example:



The same applies to the following alarms:
- L1 – Compressors overload alarm
- L1 – Compressors high pressure
- L1 – Compressors low pressure
- L1 – Compressors oil alarm
- L2 – Compressors generic alarm
- L2 – Compressors overload alarm
- L2 – Compressors high pressure
- L2 – Compressors low pressure
- L2 – Compressors oil alarm

Default descriptions based on the number of alarms

Number of alarms	Descriptions
1	Generic
2	Overload
	HP-LP
3	Overload
	HP-LP
	Oil
4	Overload
	HP
	LP
	Oil

Tab. 8.b

Note: for oil alarms, special management is available whereby the alarm is interpreted as an oil level alarm. When the alarm is activated, a number of attempts are made to restore the level for a set time before the alarm is signalled and the compressor stopped.

If a modulating device is used for the compressors, further alarms become available:
- compressor inverter warning, common for the entire suction line, when the device is an inverter
- oil sump temperature alarm, high discharge temperature and oil dilution, for Digital Scroll™ compressors

For each compressor, two alarm variables are sent to the supervisor, one for each priority. As well as the alarm signal, the description of the alarm is also sent to the supervisor, using the values shown in the table:

The supervisor can interpret the variables sent by pRack PR300T and provide the correct description of the alarm.

8.3 Pressure and prevent alarms

pRack PR300T can manage pressure alarms from a pressure switch or probe, according to the following diagram.

Alarms from pressure switch:
- Low suction pressure
- High condensing pressure

Alarms from probe:
- Low suction pressure
- High suction pressure
- Low condensing pressure
- High condensing pressure

One possible example for the low pressure alarms is shown in the figure:

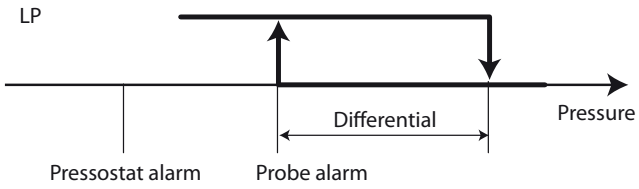


Fig. 8.c

In addition, the high pressure alarm features a prevent function, available by manually overriding the devices as well as using additional functions, such as heat recovery and ChillBooster. Operation of the alarms and prevent function is described below.

8.3.1 Pressure alarms from pressure switch

The parameters corresponding to these alarms can be set in branch G.c.a/G.c.b of the main menu.

Low suction pressure from pressure switch

The low suction pressure alarm from pressure switch has the effect of stopping all the compressors without observing the various times, therefore when the digital input configured as low pressure switch is activated, all the compressors on the line affected are stopped immediately.

This alarm features semiautomatic reset, and both the monitoring time and the number of activations in the specified period can be set. If the number of activations is higher, reset becomes manual.
In addition, the delay after which the alarm is activated on both start-up and during operation can be set.
The delay at start-up only applies to unit start-up and not compressor power-up.

High condensing pressure from pressure switch

The high condensing pressure alarm from pressure switch has the effect of stopping all the compressors without observing the various times and forcing the fans on at maximum speed, therefore when the digital input configured as high pressure switch is activated, all the compressors on the line affected are stopped immediately and the fans operate at maximum output.

This alarm features manual or automatic reset, as configured by the user. The delay after which the alarm is activated can also be set

8.3.2 Pressure alarms from probe

The parameters corresponding to these alarms can be set in branch C.a.e/C.b.e of the main menu for the suction pressure and D.a.e/D.b.e for the condensing pressure.

For these types of alarms, reset is automatic and the activation threshold and differential can be set, as well as the type of threshold, which may be absolute or relative to the control set point. The figure shows an example of setting the threshold to relative.

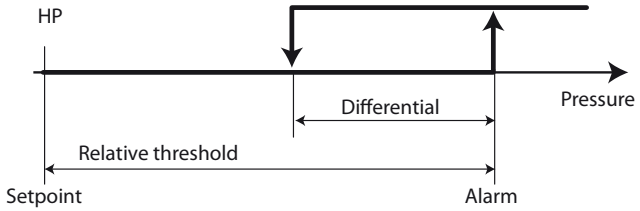


Fig. 8.d

Note: for temperature control, the alarms from probe are managed based on temperature even when pressure probes are fitted.

The effects of the different pressure alarms from probe are described below.

Low suction pressure from probe
The low suction pressure alarm from probe has the effect of stopping all the compressors, ignoring the times.

High suction pressure from probe
The high suction pressure alarm from probe has the effect of forcing all the compressors on, ignoring the control times, but observing the compressor protection times.

Low condensing pressure from probe
The low condensing pressure alarm from probe has the effect of stopping all the fans, ignoring the times.

High condensing pressure from probe
The high condensing pressure alarm from probe has the effect of forcing all the fans on and stopping all the compressors, ignoring the times. The reference for the alarm will be the discharge pressure probe (Bab75 or Bbb75), or if this is not configured, the gas cooler / intercooler pressure probe (Bab04 and Dba39).

8.3.3 High pressure prevention

pRack PR300T can manage 3 types of high condensing pressure prevention actions, involving:
- overriding the compressors and fans
- activating heat recovery
- activating ChillBooster

Prevent by overriding the compressors and fans
The parameters relating to this function can be set in branch G.b.a/G.b.b of the main menu.

The effect of this type of prevent action is to force all the fans on at maximum and switch all the compressors off, except for the minimum capacity stage, ignoring the control times but observing the compressor protection times. The minimum capacity stage means one compressor in the case of compressors without capacity control and modulation devices, or the minimum capacity stage for capacity-controlled compressors (e.g. 25%), or alternatively the minimum output of the modulation device in the case of inverters, Digital Scroll™.
As well as the activation threshold, which is always absolute, and the activation differential, a compressor deactivation time can be set, corresponding to the time needed to switch off all the compressors, except for the minimum capacity stage.
In addition, both the monitoring time and the number of activations in the specified period can be set. If the number of activations is higher, reset becomes manual.

Prevent by activating heat recovery
The parameters corresponding to this function can be set in branch G.b.a/G.b.b of the main menu, if the heat recovery function is present.
As well as enabling the function, an offset from the activation threshold for the prevent by overriding devices function must be set. The activation differential for this function is the same as set for the prevent by overriding devices function.
When reaching the threshold, pRack PR300T activates the heat recovery function, if the conditions allow.

Prevent by activating ChillBooster
The parameters relating to this function can be set in branch G.b.a/G.b.b of the main menu, if the ChillBooster function is present.
As well as enabling the function, an offset from the activation threshold for the prevent by overriding devices function must be set. The activation differential for this function is the same as set for the prevent by overriding devices function.
When reaching the threshold, pRack PR300T force activates the ChillBooster, if the conditions allow.
The following figure illustrates the activation thresholds for the prevent function and the safety devices:

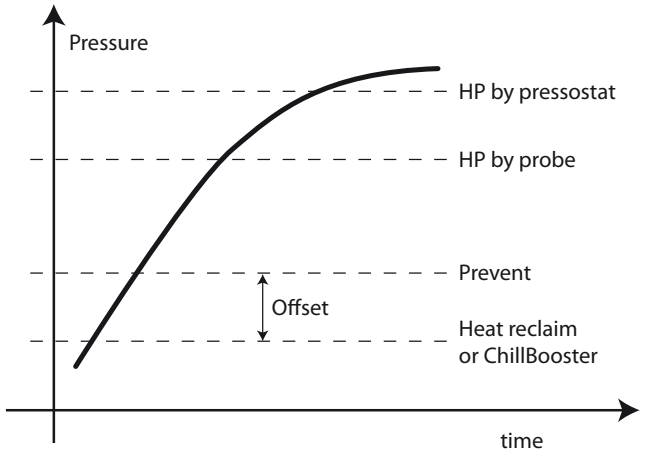


Fig. 8.e

9. SUPERVISORY AND COMMISSIONING SYSTEMS

pRack PR300T can be connected to various supervisory systems, specifically the Carel and Modbus communication protocols can be used. For the Carel protocol, the PlantVisor PRO and PlantWatch PRO models are available. In addition, pRack PR300T can be connected to the pRack Manager commissioning software.

9.1 PlantVisor PRO and PlantWatch PRO supervisory systems

Connection to Carel PlantVisor PRO and PlantWatch PRO supervisor systems uses the RS485 card already fitted on some models of pRack PR300T. For details on the models of card available, see Chapter 1.

Note: In general, the pRack boards that manage the suction lines must be fitted with the supervisor connection card, consequently boards with pLAN address 1 or 2.

Three different models of PlantVisor PRO and PlantWatch PRO are available, used to supervise system configurations with one or two lines:
- L1 – one line: can be used for system configurations with just one suction and/or condenser line.
- L2 – one line: can be used for system configurations with two suction and/or condenser lines, and the two suction lines are managed by separate boards.
- Two lines: can be used for system configurations with two suction and/or condenser lines, and the two suction lines are managed by the same board.

Important: model L2 – One line must be used only in association with model L1 – One line. For supervision of system configurations with just one line only model L1 – One line can be used.

Tutorial: the rule applied for using the models is summarised below:
- cconfiguration with board with pLAN address 2 → separate models
- configuration without board with pLAN address 2 → one model only

A connection example for using PlantVisor PRO and PlantWatch PRO is shown in the figure.

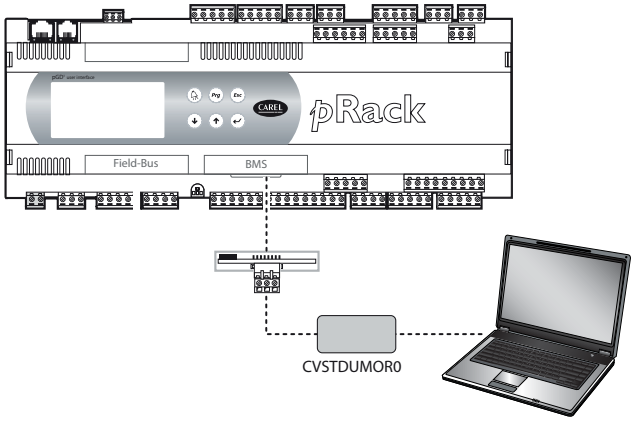


Fig. 9.a

The complete list of supervisor variables, with the corresponding addresses and descriptions, can be supplied upon request.

9.2 Commissioning software

pRack Manager is configuration and real-time monitoring software used to check the operation of pRack PR300T, for commissioning, debug and maintenance operations.

The software is available on the internet at http://ksa.CAREL.com in the section "download à support à software utilities".The installation includes, in addition to the program, the user manual and the necessary drivers.

pRack Manager can be used to set the configuration parameters, modify the values of volatile and permanent variables, save graphs of the main system values to file, manually manage the unit I/Os using simulation files and monitor/reset alarms on the unit where the device is installed.

pRack PR300T is able to virtualise all the inputs and outputs, both digital and analogue, therefore each input and output can be overridden by pRack Manager.

pRack Manager manages <file name>.DEV files that contain the user parameter configurations and that can be downloaded from the pRack PR300T board and then subsequently uploaded.

To use the pRack Manager program, a serial converter output RS485 with CVSTDUTLF0 (telephone connector) or CVSTDUMOR0 (3 pin terminal) must be connected to the board.
The connection to pRack Manager can be made:
1. Via the RS485 serial port used for the "pLAN" connection
2. Via the BMS serial port with RS485 serial card and activating the pRack Manager protocol by parameter on screen Fca01 or connecting pRack Manager and selecting SearchDevice = Auto (BMS or FB) on the "Connection settings" tab. In this case, the connection is established after around 15-20 seconds.

Important: the BMS serial port should only be used for monitoring the variables, while to update the software use the RS485 serial port dedicated to the pLAN connection.

The following figure shows an example of connection to the PC via the RS485 serial port used for the "pLAN" connection

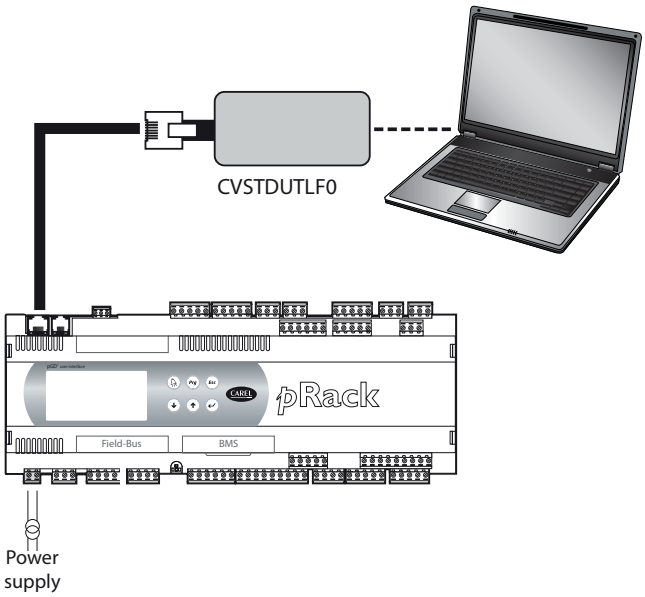


Fig. 9.b

Note: for further details see the pRack Manager program online help.

10. SOFTWARE UPDATE AND CONFIGURATION

10.1 Smart Key: operating instructions

Fig. 10.a

Programming the Smart Key via Personal Computer

The operating modes described in the table below can be configured using a program on the PC. The program can also load the software to the key or transfer logged data from the controller to disk.

Type	Function	Mode button
B	Update software from key to pRack (BIOS, application, parameters, etc.)	Disabled
C*	Copy software from pRack to pRack (BIOS, application, parameters, etc.)	Switches the key from write mode to read mode

*: Default mode

Tab. 10.a

The key is factory-programmed in read/write mode (type C) so that it can be used immediately to transfer software from one controller to another. When the key is connected to the personal computer, the symbols have the following meanings:

↑ ↓	Flashing	Waiting for connection to PC
	Alternating	When connected to PC indicates data transfer in progress

The programming key is compatible starting from BIOS version 3.43 and BOOT version 3.01. For more detailed information on programming the key, see the pRack Manager program manual.

Using the Smart Key with the pRack

Switch off the pRack, remove any peripherals connected in the pLAN and plug the key into the telephone connector on the controller. When switching on again, all the symbols light up momentarily and the buzzer emits a beep. A few seconds later the key becomes operational. During this period the symbols ↑ ↓ will flash. The controller then enters programming mode and the start button lights up steadily. Press the button to start data transfer.

⚠ **Important:** If the key is type B or C pressing the start button will immediately delete the software already loaded on the pRack.

⚠ **Important:** Do not remove the key while data is being transferred to the key itself, as the file being transferred will be lost and the corresponding space will not be restored. To restore the original capacity all the files will need to be deleted. If the key is type "C", simply perform a new application read operation.

Meanings of Buttons/Symbols

↑ ↓	Flashing: The key is connecting to the pRack. During this phase, which may last a few seconds, the start button is disabled.
start	Flashing: The key has detected the pRack and is checking the access rights.
start + ↑	On steady: Pressing the start button will start writing the software to the pRack.
start + ↓	On steady: Pressing the start button will start reading the software from the pRack.
start + 📄	On steady: Pressing the start button will start reading the logs from the pRack.
mode	On steady: In case of C, pressing the button for 1 second switches from read to write.

Tab. 10.b

If the key is type C, pressing the **"mode"** button for 1 second switches from read to write. The symbols ↑ (write to pRack), ↓ (read from pRack), 📄 (read logs) reflect the selected status. **If the key is not type "C", the "mode" button is disabled and off.** The **"start"** button starts the read or write operation, indicated by the flashing of the corresponding symbol (↑ or ↓) at a frequency proportional to the progress of the operation. When the operation is completed, the buzzer will sound intermittently for 2 seconds. Pressing the "start" button again will make the buzzer sound without repeating the operation. To repeat the operation, the key must first be unplugged. In case of error the symbol will light up together with the other LEDs. The following table can help you find the cause of the problem.

Errors before pressing the START button

⚠ + ↑ + ↓	Symbols flashing	Communication error: No response from the pRack or: Key firmware version is incompatible.
⚠ +**mode**	Symbols steady	Password error
⚠ +**mode**	Symbols flashing	Type of key is incompatible.
⚠ + ↑	Symbols steady	The key is missing one or more required files (memory empty; no kit for the type of pRack connected).
⚠ + ↑ +**start**	Symbols steady + flashing start	Incompatibility between the software on the key and the pRack HW.
⚠ + ↑ +**mode**	Symbols steady + flashing mode	Incompatibility between pRack application and HW (application size).
⚠ + ↑ + 📄	Symbols steady	No logged data present on the pRack.
⚠	Steady	Type of key not programmed.

Tab. 10.c

Errors after pressing the START button

⚠ +**start**+ ↑ +buzzer	Symbols flashing and buzzer sounding intermittently	Write operation failed.
⚠ +**start**+ ↓ +buzzer	Symbols flashing and buzzer sounding intermittently	Read operation failed.
⚠ +**start**+ 📄 +buzzer	Symbols flashing and buzzer sounding intermittently	Read logs operation failed.
⚠ + ↑ + 📄	Symbols steady + 📄 flashing	Incompatibility between log configuration and pRack HW (no dedicated flash memory). This error does not prevent writing other files.
⚠ + 📄	Steady	Insufficient space to read logs.
⚠	Flashing	Generic error

Tab. 10.d

10.2 pRack Manager: operating instructions

pRack Manager is a program that lets you manage all the configuration, debugging and maintenance operations on CAREL pRack devices. pRack Manager can be installed by itself or as part of the 1Tool programming environment.

Installing pRack Manager

On http://ksa.carel.com, under the section "software & support/ Configuration & updating software/parametric controller software", select pRack_manager. After having selected the most recent version of the tool, click "download " and accept the general terms and conditions for the free software user license; the program can then be installed on the computer.

Connecting the PC to the pRack

Connect a cable with USB/RS485 converter to the USB port on the computer, and connect the converter to a telephone cable plugged into the pLAN port of the pRack. Additional connection methods are described in par. 6.5.

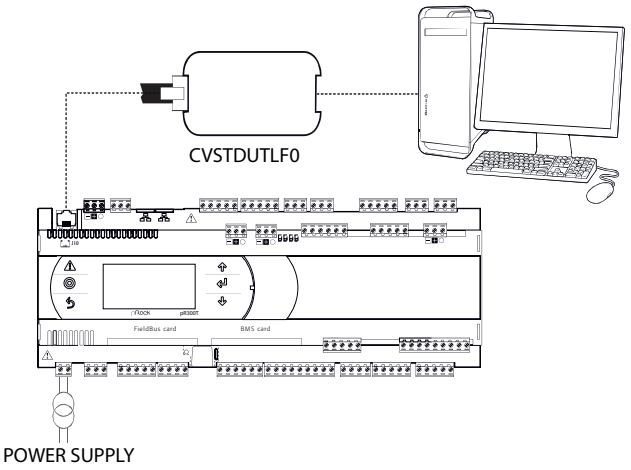


Fig. 10.b

Upon launching, pRack_manager will display a screen showing the connection settings in the upper right-hand corner. Choose:
1) "connessione locale" [local connection]
2) baud rate: Auto
3) "ricerca dispositivo" [find device]: Auto (pLAN)
As for the port number, follow the Wizard's instructions for the port to be identified automatically (e.g. COM4).

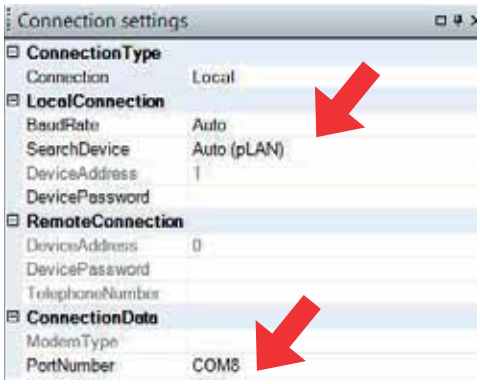


Fig. 10.c

Switch the controller off and then on again and use the Connect command to establish the connection. When the connection is established the flashing message "ONLINE" will appear at the bottom left of the screen.

Fig. 10.d

10.2.1 Installing the application to update the software

Select the directory containing the application program files and click "Upload" to upload the program to the pRack controller.

Fig. 10.e

10.2.2 Commissioning

Using the mouse, select "Commissioning" at the bottom left. A new work environment will appear.

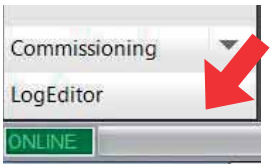


Fig. 10.f

Click on "configura dispositivo" [configure device] to display all the application variables. The variables can be selected according to the categories that appear at the bottom.

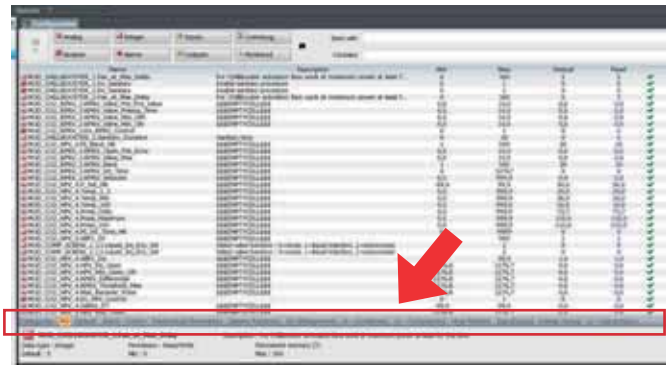


Fig. 10.g

10.2.3 Changing a parameter

Select the parameter category and then the parameter that you want to edit. The parameter (e.g. recovery.recovery_type) will be highlighted in blue.

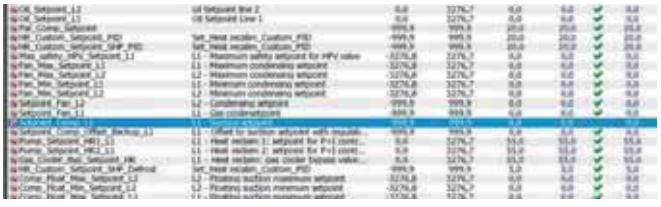


Fig. 10.h

1. Double-click on the column marked "letto" [read]. A window will appear in which you can enter the new value for the parameter.

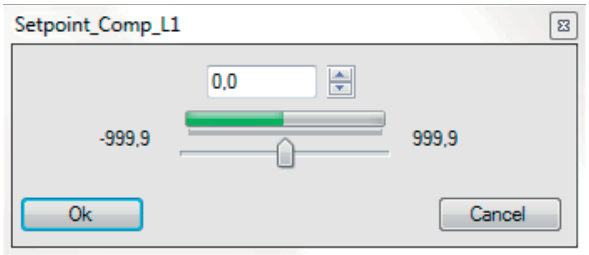


Fig. 10.i

2. Enter the new value (e.g. 3) and click OK. The new value will appear in the column marked "scritto" [written]. To write the parameter to the pRack controller, right-click and select "scrivi selezionate" [write selected]. The new value will appear in the column marked "scritto" [written], meaning that the parameter has been written to the controller.

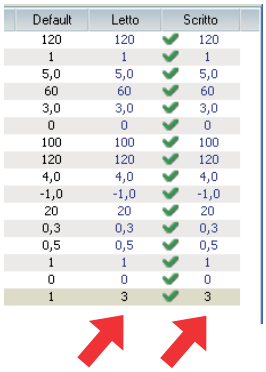


Fig. 10.j

Click on "Salva" [Save] to generate the project's ".2cw" file.

10.2.4 Commissioning: basic concepts

Note: The following paragraphs are from the online help of pRack Manager, to which the user is referred for further details.

Commissioning is a configuring and real-time monitoring software that can be used to supervise the performance of an application program installed on a pRack, to start up the pRack and to perform debugging and maintenance.

Operators using Commissioning for maintenance will be able to see the necessary variables and to draw from preset configuration values.

10.2.5 Support files

Once the design of the application is completed, 1Tool generates a number of files in the compiling stage, two of which are required by Commissioning:

- <nomeApplicativo>.2CF [<ApplicationName>.2CF] (variable descriptor)
- <nomeApplicativo>.2CD [<ApplicationName>.2CD] (category and access profile descriptor)

In addition to these files, the software also manages the <nome applicativo>.DEV [<Application Name>.DEV] file, which contains the unit's preset parameters.

When the user has finished using Commissioning, whether for configuration or monitoring purposes, the following files can be generated:

- <nomeApplicativo>.2CW [<ApplicationName>.2CW] (descriptor for categories, access profiles, monitoring groups)
- <nomefileCommissioningLog>.CSV [<FilenameCommissioningLog>.CSV] (file used for the commissioning log, containing data of the variables logged during monitoring)

Therefore, to configure Commissioning the following files are required:.2CF, 2CD and, if necessary, the.DEV file, which can be imported or exported.
For monitoring purposes, in addition to the files above, it might also be necessary to have the.2CW file, containing the definition of the work environment. The commissioning log file is a simple output file.

10.2.6 pRack Load: basic concepts

pRackLoad is the module that manages:

- uploading to the flash memory (of the device or of the ProgKeyX key installed on the pRack);
- uploading to the NAND memory of certain devices;
- downloading the log file,.DEV file and P memory (from the flash memory);
- downloading files from the NAND memory, if present.

The files exchanged with the Flash memories of pRack controllers are:

- BOOT.BIN (download reserved, upload enabled from menu)
- BIOS.BIN (download reserved)
- <nomeApplicativo>.BLB [<ApplicationName>.BLB] (download reserved)
- <nomeApplicativo>.BIN [<ApplicationName>.BIN] (download reserved)
- <nomeApplicativo>.DEV [<ApplicationName>.DEV]
- <nomeApplicativo>.GRT [<ApplicationName>.GRT] (upload only, from which the.GRP file is extracted)
- <nomeApplicativo>.IUP [<ApplicationName>.IUP]
- <nomeApplicativo>.LCT [<ApplicationName>.LCT]
- <nomeApplicativo>.PVT [<ApplicationName>.PVT]
- <nomepRacklog>.BIN, <nomepRacklog>.CSV, <nomepRacklog_GRAPH>.CSV [<pRacklogName>.BIN, <pRacklogName>.CSV, <pRacklog_GRAPHName>.CSV] (only if log files have been configured, download only).

The files exchanged with the NAND memories of pRack controllers are:

- any file that the pRack can independently copy to the flash memory (see above list);
- external files (e.g..pdf or.doc files for documentation).

10.3 Pendrive: operating instructions

10.3.1 File extensions, names and contents

Various types of files can be uploaded and downloaded and are distinguished by their extension.

File names

In order to be recognised, the names of the directories and files on the pendrive must have no more than 8 characters; the controller makes no distinction between upper-case and lower-case characters. However, during DOWNLOAD the names of the directories created by the controller on the pendrive are always in upper-case.

FILE TYPES FOR UPLOAD

File extension	Description
.IUP	Contains the definitions of the screens on the terminal
.BLB	Contains the application
.BIN	Contains the application (with pLAN table)
.BLX	Contains the Logique of atoms custom in C language
.GRP	Contains the graphics
.DEV	Contains the preset configuration parameter values
PVT,.LCT	Contains the descriptions of the public variables to be logged. Generated by 1Tool, this is used by the LogEditor module and must be loaded together with the.LCT file

Downloaded files are saved in directories created automatically, with the following name format:

NAMXY_WZ

Where:
NAM: identifies the type of data downloaded (LOG for logs, BKP for the application, DEV for the buffer memory, CPY for all the data from the controller).
XY: progressive number from 0 to 99
WZ: controller pLAN address.

Example: a directory named LOG00_01 contains the log files (LOG) downloaded from a device whose pLAN address is 1. Since the key contained no directory of this type before download, it is indicated with 00.

Important: No more than 100 files of the same type can be downloaded to the pendrive, as the directories created can only be numbered with XY=00 to 99.

FILE TYPES FOR DOWNLOAD (controller pLAN address = 1)

File extension	Directory name	Description
.DWL	LOG00_01	Logged data
.DWL,.DEV,.LCT,.PVT	BKP00_01	Application
.DEV	DEV00_01	Non-volatile parameters
.DWL,.DEV,.LCT,.PVT	CPY00_01	All data on the controller

Tab. 10.e

The downloaded files to have fixed names. In particular, the application file is called "ppl–pRack.dwl", the BIOS file "bios–pRack.bin", the files containing the logs and related information are "logs.dwl", "logs.lot" and "logs.pvt", respectively. Finally, the buffer memory is saved to the file on the pendrive.

Menu access

The following are the steps for accessing the pendrive management menu. Procedure:

1. Connect the pendrive to the master port.

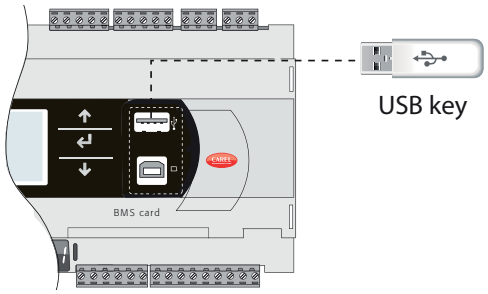


Fig. 10.k

2. Press Alarm and Enter together for 3 seconds to enter the option menu. Select FLASH/USB memory and press Enter to confirm.

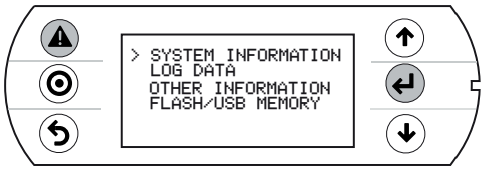


Fig. 10.l

3. Select USB pen drive and press Enter to confirm.

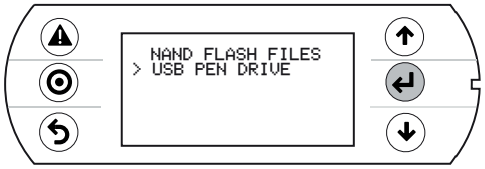


Fig. 10.m

Important: Wait a few seconds after the pendrive has been plugged in for it to be recognised by the controller. If the message "No USB disk or PC connected" is displayed momentarily with the request to connect a pendrive key or computer USB cable, wait a few seconds until the recognition message is shown ("USB disk found") and the following screen appears.

4. Select UPLOAD.

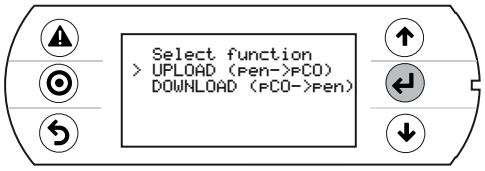


Fig. 10.n

10.3.2 Upload

An application plus BIOS or buffer memory (parameters) can be uploaded from the pendrive. The following modes are available: automatic, autorun and manual. Automatic and autorun modes require using configuration files.

Configuration file structure

Configuration files must start with the string "[FUNCTION]" followed by a string that identifies the function, as shown in the table.

Function	String
UPLOAD an application or a BIOS file plus an application	Upload application
UPLOAD non-volatile memory (.dev)	Upload non volatile memory
UPLOAD the entire contents of the pRack	Copy pRack upload

After the description of the desired function, various options are available:

1. To copy the complete contents of the directory, simply write the name of the directory (e.g. the entire contents of the CHILLER directory):

```
[FUNCTION]
Upload non volatile memory

[DIR]
CHILLER
```

2. To copy just 1 file in a directory, enter the file's name (e.g. the CHILLER.DEV file in the CHILLER directory).

```
[FUNCTION]
Upload non volatile memory

[DIR]
CHILLER

CHILLER.DEV
```

To show a string on the display describing the operation being performed, add the "[NAM]" instruction, followed by the string to display. The following file will display the string:

"UPL CHILLER.DEV"

```
[FUNCTION]
Upload non volatile memory

[DIR]
CHILLER

[NAM]
UPL CHILLER.DEV

CHILLER.DEV
```

3. To select only some of the files in the same directory, list them after a label. The following labels are allowed and **must be entered in the order shown in the table:**

UPLOAD file labels

No.	Label	File type	No.	Label	File type
1	[BIO] (*)	file.bin	6	[PVT]	file.pvt
2	[IUP]	file.iup	7	[LCT]	file.lct
3	[BIN]	file.bin, blb	8	[OED]	file.oed
4	[DEV]	file.dev	9	[SGN]	file.sgn
5	[GRP]	file.grp			

(*) BIO = BIOS file

Notes:

- to get the.bin file from the BIOS in the format available on http://ksa.carel.com (.os file), unzip the.os file;
- the [IUP] label can be followed by one or more ".iup" files.

Important:

- the order in which the file names are entered is fundamental and must not be changed;
- do not enter empty lines or spaces in the file (e.g. at the end of a line);
- each file after the last line of code must contain a "carriage return" character (CR↵), as shown in the following example.

Example: The following file will upload the BIOS and an application.

```
[FUNCTION]↵
Upload application↵
↵
[DIR] ↵
NEW AHU ↵
↵
[NAM] ↵
BIOS+APPL+LOGSv58B36 ↵
↵
bisn509.bin ↵
↵
[IUP] ↵
AHU_EN.iup ↵
AHU_IT.iup ↵
↵
[BIN] ↵
AHU.blb ↵
↵
[DEV] ↵
AHU.dev ↵
↵
[GRP] ↵
AHU.grp ↵
↵
[PVT] ↵
AHU.pvt ↵
↵
[LCT] ↵
AHU.lct ↵
```

10.3.3 Automatic upload

To automatically upload the parameter memory using the first configuration file shown in the preceding paragraph, access the system menu as previously described and proceed as follows:

1. Select automatic mode. A screen is shown describing the function of the buttons. Press Enter to confirm.

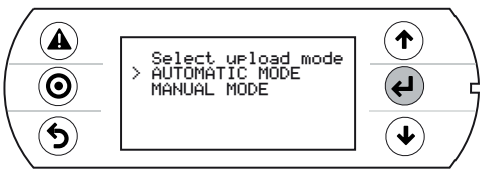


Fig. 10.o

2. Confirm by selecting Prg. A screen is displayed requesting confirmation to upload the non-volatile memory. Press Enter to confirm.

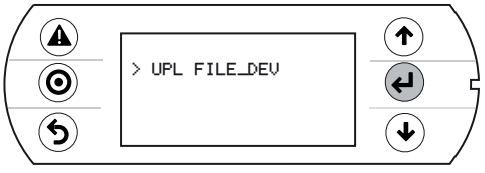


Fig. 10.p

3. At the end a message will ask the user to remove the pendrive.

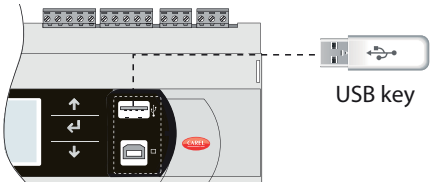
Fig. 10.q

10.3.4 Upload in autorun mode

Uploading in autorun mode is a special case of uploading in automatic mode. Unlike automatic mode, the user must wait for a specific message to appear on the display to start or disable the operation described in the configuration file. To upload a file in autorun mode, a configuration file must be created and named "autorun.txt". Example of uploading BIOS+application. The upload involves two steps: first the BIOS is updated and then the application. The information is shown on the pRack's built-in display and on the pGDE terminal, when both are featured.

Procedure:

1. Connect the pendrive to port A.



2. After a few seconds, Autorun mode starts. Press Enter to confirm.

Fig. 10.r

3. The validity of the FW is checked and the BIOS is loaded.

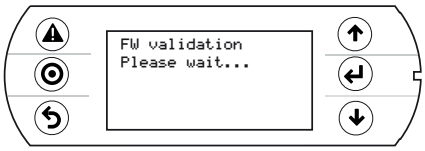


Fig. 10.s

4. The display flashes to indicate that after loading the new BIOS the controller is being reset.

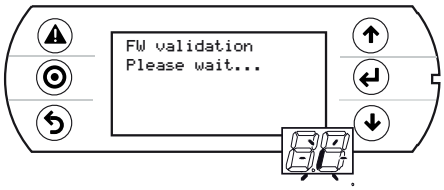


Fig. 10.t

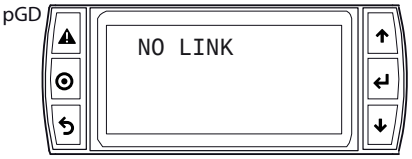


Fig. 10.u

5. The test phase starts.

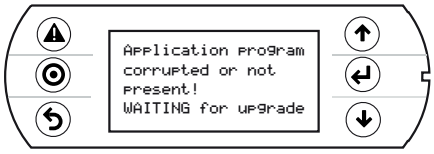


Fig. 10.v

pGD

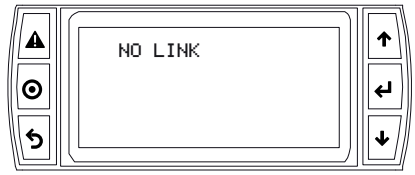


Fig. 10.w

6. The controller warns that no application has been loaded.

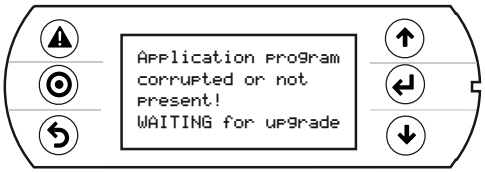


Fig. 10.x

pGD

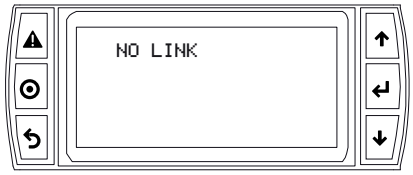


Fig. 10.y

7. The application update then starts.

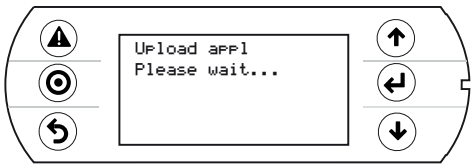


Fig. 10.z

pGD

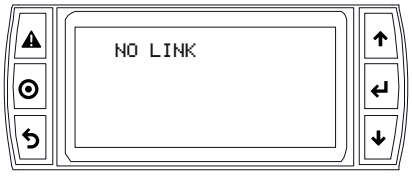


Fig. 10.aa

8. Remove the pendrive. The update is complete. Wait for the display to stop flashing, indicating that the controller is being reset before restarting.

Fig. 10.ab

pGD

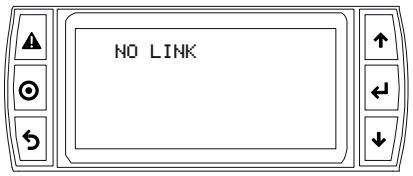


Fig. 10.ac

Important: As can be seen, when updating the BIOS and the application, the pGDE terminal shows the message "NO LINK", meaning that no connection is established. Do not remove the terminal and wait for the end of the update procedure, when the pGDE terminal replicates the messages on the built-in display.

Note: Autorun run is especially useful in those cases in which the same operation needs to be performed on several controllers. For example, to load different applications on controllers connected in a pLAN network, only one autorun file needs to be created; this uploads the various directories contained on the pendrive based on the address of the controllers. The controller with address XY will only load the directory called "nomedir_XY" ["DirName_XY"]. The pendrive then only needs to be plugged into each controller to run the upload, confirming from the shared terminal.

10.3.5 Manual upload

To manually upload the contents of the pendrive the user must access the management menu from the system screens, selecting UPLOAD and then MANUAL. The files are selected by pressing ENTER when the cursor is on the desired file name. A selected file is marked by the symbol "*" on the left. Once the files have been selected (all in the same directory), press PRG to start the upload. To display the contents of a directory press ENTER. To go up one directory level press ESC. Once the upload has started, the messages shown on the screen are the same as in automatic and autorun mode.

10.3.6 Download

As mentioned above, the DOWNLOAD operation can be managed in two ways:

1. Manual mode: follow the steps described in the paragraph "Automatic upload" and select manual operation. Then each file must be selected and downloaded.
2. Autorun mode: prepare a file called "autorun.txt", containing a string that identifies the function to be performed.

Function	String
DOWNLOAD the application	Download application
DOWNLOAD non-volatile memory	Download non volatile memory (.dev)
DOWNLOAD the entire contents of the pRack	Copy pRack download

The result is the creation of files with the required extensions, which will be placed in the respective directories as described in the paragraph "File names". When the operation is completed, the display shows a message with the name of the directory created.

[FUNCTION]
Download application

The following screen will be displayed.

1. Press Enter to confirm.

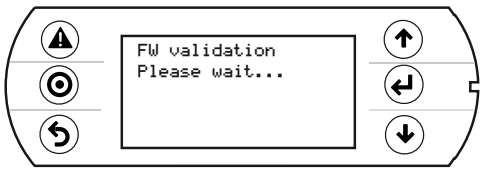


Fig. 10.ad

2. Download completed.

Fig. 10.ae

Example: On the controller with address 1, the autorun file will create a directory called BKP00_01 and copy the files APPL_PRack.DWL and FILE_DEV.DEV to this directory.

Connecting to a computer

Connect the slave USB port on the controller to the USB port on the computer where pRack Manager is installed.

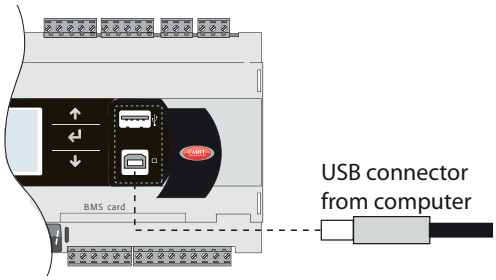


Fig. 10.af

Important:
• do not install any type of converter between the computer and port B, even if requested by the program's guided procedure;
• pRack Manager manages compressed files (.GRT/.OS).
Once the connection is established, the following operations are available:
1. UPLOADING the application or BIOS+application.
2. DOWNLOADING the non-volatile memory.
3. Commissioning
4. Managing the NAND flash memory.

Once the USB cable is removed, the port will become available again after approximately 5 s.

Important: If no connection is established with pRack Manager after plugging in the USB cable, wait at least 1 minute before using the USB ports again after removing the cable.

10.4 Configuring pCOWeb/pCOnet from a system screen

See par. 6.6 for information on how to access the BIOS system menu.
Starting from:
- BIOS release 5.16 BIOS, and from
- pCOWeb firmware version A1.5.0, and from
- pCOnet firmware version A485_A1.2.1

pCOWeb and pCOnet communication parameters can be configured. The purpose is to configure the network (Ethernet for pCOWeb, RS485 for pCOnet) when the respective card is installed for the first time. The remaining parameters (alarms, events, etc.) can be configured using the usual tools, i.e. BACset or web interface (pCOWeb only). Configuration can be done either when using the Modbus protocol or the CAREL protocol, but only on the BMS1 serial port. The screens for configuring pCOWeb and pCOnet can be opened by accessing the system screens and selecting OTHER INFORMATION and then PCOWEB/NET Konfig. Then, select "PCOWEB settings" to configure pCOWeb parameters or "PCONET settings" to configure pCOnet parameters.

Configuring pCOWeb

When you select "PCOWEB settings" the following screen will appear:

D	H	C	P	:		-	-	-											
I	P		A	D	D	R	E	S	S										
			-	-	-	.	-	-	-	.	-	-	-	.	-	-	-			

After a short time the fields are populated with the current parameters. If the fields are not populated with the current parameters, check the firmware version of pCOWeb and the protocol used by the BMS serial port. The parameters can now be edited by selecting the respective fields using the ENTER button and setting the desired values using the UP/DOWN buttons. If the DHCP option is set to ON, the IP address and Netmask fields cannot be changed. Pressing ENTER repeatedly will display all the parameters available, as listed in the following screens:

N	e	t	m	a	s	k	:												
		-	-	-	.	-	-	-	.	-	-	-	.	-	-	-			
G	a	t	e	w	a	y	:												
		-	-	-	.	-	-	-	.	-	-	-	.	-	-	-			

D	N	S	1	:															
		-	-	-	.	-	-	-	.	-	-	-	.	-	-	-			
D	N	S	1	:															
		-	-	-	.	-	-	-	.	-	-	-	.	-	-	-			

B	A	C	n	e	t		I	D	:										
								-	-	-	-	-	-	-					
B	A	C	n	e	t		T	y	p	e	:								
								-	-	-	-	-	-	-					

Once the parameters have been chosen they can be updated by going to the following screen and pressing ENTER.

P	C	O	W	E	B		C	O	N	F	I	G		E	N	A	B	L	E
U	p	d	a	t	e		p	C	O	W	e	b	?		N	O			

While the parameters are being updated, the following message is displayed:

P	C	O	W	E	B		C	O	N	F	I	G		E	N	A	B	L	E
P	l	e	a	s	e		w	a	i	t		f	o	r					
e	n	d		o	f		u	p	d	a	t	e							

At the end, the screen shows:

P	C	O	W	E	B		C	O	N	F	I	G		E	N	A	B	L	E
U	p	d	a	t	e		c	o	m	p	l	e	t	e					
R	e	b	o	o	t		p	C	O	W	e	b		t	o				
a	p	p	l	y		n	e	w		s	e	t	t	i	n	g			

Configuring pCOnet

When you select "PCONET settings" the following screen will appear:

B	A	C	n	e	t		I	D	:										
								-	-	-	-	-	-	-					
B	A	C	n	e	t		b	a	u	d	:								
						-	-	-	-	-	-	-	-						

After a short time the fields are populated with the current parameters. The parameters can now be edited by selecting the respective fields using the ENTER button and setting the desired values using the UP/DOWN buttons. Pressing ENTER repeatedly will display all the parameters available, as listed in the following screen:

B	A	C	n	e	t		M	A	C	:		-	-	-					
M	a	x		M	a	s	t	e	r	s	:		-	-	-				
M	a	x		F	r	a	m	e	s	:		-	-	-	-	-			

Once the parameters have been chosen they can be updated following the procedure described for configuring pCOWeb.

11. APPENDIX

A.1 System configurations with more than one pLAN board

If the system configuration involves the connection of more than one board in a pLAN, the addresses must be set correctly before selecting a configuration solution. pRack pR300T can use two user terminals (as well as a built-in terminal) with addresses 31 and 32. The default user terminal address is 32, so only if a second terminal is required must the address of this be set to 31, as described below. The address of the terminal is also required when having to set the address of the pRack pR300T boards, when multiple boards are connected to the pLAN. After having correctly connected and configured the pLAN network of pRack pR300T boards, the system can be configured as described in paragraph 4.1.

A.1.1 Setting the terminal address

IThe pRack pR300T user terminal is supplied with the default address 32, allowing the terminal to be used without requiring any additional operations; nonetheless, in order to use an additional terminal or configure the pLAN address of the boards, it needs to be changed according to the following procedure:

1. power the terminal via the telephone connector;
2. press the three buttons ↑, ↓ & ↵ together for at least 5 seconds; the terminal will display a screen similar to the one below, with the cursor flashing in the top left corner:

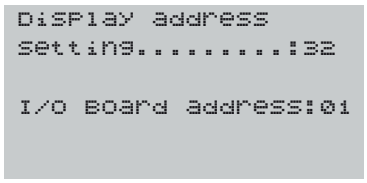


Fig. A.a

3. press ↵ once: the cursor will move to the "Display address setting" field;
4. select the desired value using ↑ & ↓, and confirm by pressing ↵ again; if the value selected is different from the value saved, the following screen will be displayed and the new value will be saved to the display's permanent memory.

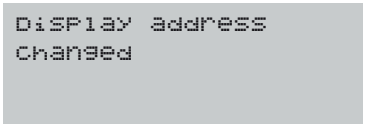


Fig. A.b

Note: if the address field is set to 0, the "I/O Board address" field is no longer displayed, as it has no meaning.

Important:

- if the settings are not made correctly, the text and the images on the display will be displayed incorrectly and out of order.
- if during this operation the terminal detects inactivity of the pRack board whose output is being displayed, the display is cleared and a message similar to the one below is shown.

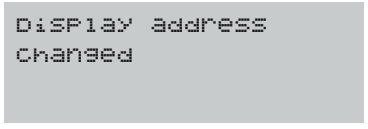


Fig. A.c

If the terminal detects inactivity of the entire pLAN network, that is, it does not receive any messages from the network for 10 seconds consecutively, it clears the display and shows the following message:

Fig. A.d

A.1.2 Setting the pRack pR300T board address

The pLAN address of the pRack boards can be set from any pGD1 terminal, using the following procedure:

1. set address 0 on the terminal (see the previous paragraph for details on how to set this address);
2. power down the pRack pR300T board;
3. disconnect any pLAN connections to other boards from the pRack pR300T board;
4. connect the terminal to the pRack pR300T board;
5. power up the pRack pR300T board, while pressing ↑ & ⚠ on the terminal together. After a few seconds the pRack pR300T board begins the start-up sequence and the display shows a screen similar to the one below:

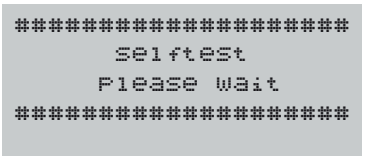


Fig. A.e

6. when this screen is displayed, wait 10 seconds and then release the buttons;
7. the pRack pR300T board interrupts the start-up sequence and shows a configuration screen, similar to the one below :

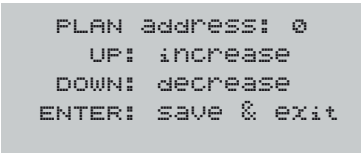


Fig. A.f

Then, modify the pLAN address using the ↑ & ↓ buttons on the terminal.

8. Confirm the address by pressing ↵: the pRack pR300T board completes the start-up sequence and uses the set address.

1. Displaying the pLAN address

- press briefly (no more than 5 seconds) button A to display the current controller pLAN address. The display is cleared 5 seconds after releasing the button.

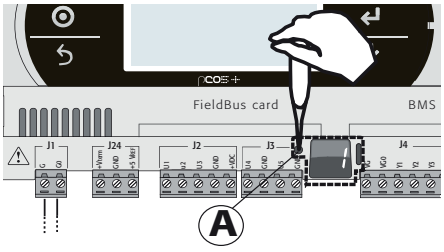


Fig. A.g

Setting the pLAN address

1. press button A for 5 seconds. The pLAN address will start flashing;
2. press repeatedly or press and hold the button until reaching the desired address (e.g. 7); remove the screwdriver;
3. wait until the address starts flashing quickly. The address is now saved but not yet active for the application program;
4. power down the controller;
5. power up the controller again. The address will now be activated.

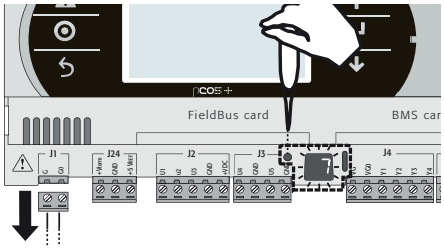


Fig. A.h

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Agenzia / Agency:

pRack PR300T +0300018EN rel. 1.5 - 02.05.2017

WARNING: Although every attempt to ensure parameters are correct, it is ultimately the Installer and or the Commissioning Engineers responsibility to check and ensure the correct parameters have been programmed and tested

Mask	Index	Description	Value	UOM	Type	Channel	Min	Max	Offset
Cab01	L1	Compressors regulation type		PROPORTIONAL BAND					
Cab01	L1	Compressors control mode		--					
Cab02	L1	Minimum suction setpoint							
Cab02	L1	Maximum suction setpoint							
Cab03	L1	Setpoint chiller running	0						
Cba05	L1	Suction differential	0						
Cab08	L1	Increasing zone differential for compressors regulation (neutral zone)	0						
Cab08	L1	Decreasing zone differential for compressors regulation (neutral zone)	0						
Cab12	L1	Compressors neutral zone minimum complete activation time (neutral zone)	0	s					
Cab12	L1	Compressors neutral zone maximum complete activation time (neutral zone)	256	s					
Cab13	L1	Compressors neutral zone minimum complete deactivation time (neutral zone)	0	s					
Cab13	L1	Compressors neutral zone maximum complete deactivation time (neutral zone)	0	s					
Cad08	L1	Enable floating suction setpoint compensation	0	NO					
Cad09	L1	Floating suction maximum setpoint	0						
Cad09	L1	Floating suction minimum setpoint	0						
Cad10	L1	Floating suction maximum delta admitted	0						
Caf02	L1	Compressors type	0	RECIPROCATING					
Caf02	L1	Number of compressors	1	-					
Caf04	L1	Suction refrigerant type	0	R22					
Caf10	L1	Compressors rotation type	0	-					
Caf15	L1	Compressors modulating device type	0	NONE					
Caf91	L1	Compressors size 1	0						
Caf91	L1	Compressors size 2	0						
Caf91	L1	Compressors size 3	0						
Caf91	L1	Compressors size 4	0						
Caf16	L1	Compressors inverter minimum frequency	10	Hz					
Caf16	L1	Compressors inverter maximum frequency	850	Hz					
Cag01	L1	Compressors inverter minimum voltage	0						
Cag01	L1	Compressors inverter maximum voltage	0						
Cag01	L1	Compressors inverter nominal frequency	0	Hz					
Cag01	L1	Compressors inverter nominal power	0						
Cag02	L1	Compressors inverter rising time	0	s					
Cag02	L1	Compressors inverter falling time	0	s					
**********			--	--					
L2 - COMPRESSORS			--	--					
**********			--	--					
Cbb01	L2	Compressors regulation type	0	PROPORTIONAL BAND					
Cbb01	L2	Compressors control mode	0	PRESSURE					
Cbb02	L2	Minimum suction setpoint	18						
Cbb02	L2	Maximum suction setpoint	0						
Cbb03	L2	Suction setpoint	0						
Cbb05	L2	Suction differential	100						
Cbb08	L2	Increasing zone differential for compressors regulation (neutral zone)	0						
Cbb08	L2	Decreasing zone differential for compressors regulation (neutral zone)	0						
Cbb12	L2	Compressors neutral zone minimum complete activation time (neutral zone)	150	s					
Cbb12	L2	Compressors neutral zone maximum complete activation time (neutral zone)	65531	s					
Cbb13	L2	Compressors neutral zone minimum complete deactivation time (neutral zone)	0	s					
Cbb13	L2	Compressors neutral zone maximum complete deactivation time (neutral zone)	0	s					
Cbd08	L2	Enable floating suction setpoint compensation	1	YES					
Cbd09	L2	Floating suction maximum setpoint	5						
Cbd09	L2	Floating suction minimum setpoint	0						
Cbd10	L2	Floating suction maximum delta admitted	2						
Cbf02	L2	Compressors type	0	RECIPROCATING					
Cbf02	L2	Number of compressors	3	-					
Cbf04	L2	Suction refrigerant type	2						
Cbf10	L2	Compressors rotation type	0	-					
Cbf15	L2	Compressors modulating device type	0	NONE					
Cbf41	L2	Compressors size 1	0						
Cbf41	L2	Compressors size 2	0						
Cbf41	L2	Compressors size 3	0						
Cbf41	L2	Compressors size 4	0						
Cbf16	L2	Compressors inverter minimum frequency	1	Hz					
Cbf16	L2	Compressors inverter maximum frequency	256	Hz					
Cbg01	L2	Compressors inverter minimum voltage	2						
Cbg01	L2	Compressors inverter maximum voltage	0						
Cbg01	L2	Compressors inverter nominal frequency	0	Hz					
Cbg01	L2	Compressors inverter nominal power	25						
Cbg02	L2	Compressors inverter rising time	0	s					
Cbg02	L2	Compressors inverter falling time	30	s					
**********			--	--					
L1 - FANS			--	--					
**********			--	--					
Dab01	L1	Fans regulation type	59	--					
Dab01	L1	Fans control mode	0	PRESSURE					
Dab02	L1	Minimum gas cooler setpoint	0						
Dab02	L1	Maximum gas cooler setpoint	10						
Dab03	L1	Gas cooler setpoint	0						
Dab14	L1	Gas cooler neutral zone minimum complete activation time (neutral zone)	0	s					
Dab14	L1	Gas cooler neutral zone maximum complete activation time (neutral zone)	0	s					
Dab15	L1	Gas cooler neutral zone minimum complete deactivation time (neutral zone)	0	s					
Dab15	L1	Gas cooler neutral zone maximum complete deactivation time (neutral zone)	60	s					
Dad05	L1	Enable floating condensing setpoint compensation	0	°F					
Dad06	L1	Floating condensing offset	0						
Daf01	L1	Number of fans	15	--					
Daf04	L1	Gas cooler refrigerant type	0	R22					
Daf05	L1	Fans rotation type	200	--					
Dag01	L1	Fans modulating device type	0	NONE					
Dag02	L1	Fan inverter minimum voltage	0	V					
Dag02	L1	Fan inverter maxiimum voltage	0	V					
Dag02	L1	Fan inverter minimum activation	20	%					
Dag02	L1	Fan inverter maxiimum activation	0	%					
**********			--	--					
L2 - FANS			--	--					
**********			--	--					
Dbb01	L2	Fans regulation type	0	PROPORTIONAL BAND					
Dbb01	L2	Fans control mode	0	PRESSURE					
Dbb02	L2	Minimum Intercooler setpoint	0						
Dbb02	L2	Maximum Intercooler setpoint	0						
Dbb03	L2	Intercooler setpoint	0						
Dbb14	L2	Intercooler neutral zone minimum complete activation time (neutral zone)	10	s					
Dbb14	L2	Intercooler neutral zone maximum complete activation time (neutral zone)	0	s					
Dbb15	L2	Intercooler neutral zone minimum complete deactivation time (neutral zone)	30	s					
Dbb15	L2	Intercooler neutral zone maximum complete deactivation time (neutral zone)	4	s					
Dbf01	L2	Number of fans	0	--					
Dbf04	L1	Intercooler refrigerant type	0	R22					
Dbf05	L2	Fans rotation type	10	--					
Dbg01	L2	Fans modulating device type	4	--					
Dbg02	L2	Fan inverter minimum voltage	0	V					
Dbg02	L2	Fan inverter maxiimum voltage	0	V					
Dbg02	L2	Fan inverter minimum activation	1	%					
Dbg02	L2	Fan inverter maxiimum activation	0	%					
**********			--	--					
TRANSCRITICAL			--	--					
**********			--	--					
Eib01	L1	Enable HPV control	0	NO					
Eib05	L1	HPV valve regulation: pressure P100	0						
Eib05	L1	HPV valve regulation: maximum pressure	0						
Eib05	L1	HPV valve regulation: critical pressure	0						
Eib05	L1	HPV valve regulation: temperature T12	0						
Eib05	L1	HPV valve regulation: temperature T23	0						
Eib05	L1	HPV valve regulation: temperature Tmin	0						
Eib06	L1	HPV valve regulation: temperature T100	10						
Eib06	L1	HPV valve regulation: delta subcooling correspondant to T23	0						
Eib06	L1	HPV valve regulation: coefficient (m1)	0						
Eib07	L1	HPV valve regulation: proportional gain	0	%/10psig					
Eib07	L1	HPV valve regulation: integral time	0	s					
Eib28	L1	HPV valve maximum safety setpoint	0						
Eib28	L1	HPV valve minimum setpoint	0						
Eib11	L1	HPV valve regulation: delta temperature on external temperature with gas cooler probe in alarm	0						
Eib12	L1	Enable HPV safeties on receiver pressure	50	--					
Eib18	L1	Enable RPRV control	0	NO					
Eib22	L1	RPRV valve regulation: setpoint	0						
Eib22	L1	RPRV valve regulation: proportional gain	0	%/10psig					
Eib22	L1	RPRV valve regulation: integral time	0	s					
Eic01		Enable HPV control on EVD	0	NO					
Eic01		Enable RPRV control on EVD	0	NO					
Eic01		EVD network address	0	--					
Eic01		HPV/RPRV valve routing	4	--					
Eic02		HPV valve type	0	CUSTOM					
Eic02		RPRV valve type	0	CUSTOM					
Eic03		HPV: EEV minimum steps custom	0	stp					
Eic03		HPV: EEV maximum steps custom	0	stp					
Eic03		HPV: EEV full close steps custom	3	stp					
Eic03		HPV: EEV move rate custom	0	stp/s					
Eic03		HPV: EEV move current custom	0	mA					
Eic03		HPV: EEV holding current custom	0	mA					
Eic04		HPV: move duty cycle custom	30	%					
Eic04		HPV: EEV fast closing move rate custom	0	--					
Eic05		RPRV: EEV minimum steps custom	0	stp					
Eic05		RPRV: EEV maximum steps custom	0	stp					
Eic05		RPRV: EEV full close steps custom	0	stp					
Eic05		RPRV: EEV move rate custom	0	stp/s					
Eic05		RPRV: EEV move current custom	0	mA					
Eic05		RPRV: EEV holding current custom	0	mA					
Eic06		RPRV: move duty cycle custom	0	%					
Eic06		RPRV: EEV fast closing move rate custom	0	--					
Eic22		Enable HPV backup function	0	NO					
Eic22		Enable RPRV backup function	0	NO					

**********			--	--					
PARALLEL COMPRESSORS			--	--					
**********			--	--					
Cca01	L1	Enable parallal compressor	0	NO					
Cca01	L1	Parallel compressor control mode	990	--					
Cca02	L1	Parallel compressor: RPRV activation threshold	0	%					
Cca02	L1	Parallel compressor: evalution time on RPRV opening	0	s					
Cca02	L1	Parallel compressor: activation threshold	0						
Cca02	L1	Parallel compressor: deactivation threshold	0						
Cca03	L1	Offset to RPRV setpoint with parallel compressor active	0						
Cca04	L1	Parallel compressor regulation (internal management): setpoint	0						
Cca04	L1	Parallel compressor regulation (internal management): proportional gain	0	%/10psig					
Cca04	L1	Parallel compressor regulation (internal management): integral time	0	s					
Cca04	L1	Parallel compressor regulation (internal management): derivative time	0	s					
**********			--	--					
CHILLER REGULATION			--	--					
**********			--	--					
Cab22		Chiller regulation is enabled on L1	0	NO					
Cab22		Type of regolation	0	Water outlet temperature					
Cab23	L1	Setpoint chiller running	0						
Cab23		Chiller kp value for PID running	0	°F					
Cab23		Chiller ti value for PID running	0	s					
Cab24	L1	Suction setpoint chiller startup	1						
Cab24		Chiller kp value for PID startup	0	°F					
Cab25		Chiller ti value for PID Startup	0	s					
Cab26		Time of start up duration phase	0	s					
Analog Input									
MaskIndex	VarDesc		VarValue	Uom	Type	Channel	Min	Max	Offset
Bab01	L1	Suction pressure	0						
Bab60	L1	Suction setpoint compensation from analog input	0	°F	NTC	---	40		
Bab02	L1	Suction pressure backup	0						
Bab03	L1	Suction temperature	0						
Bab79		q	0						
Bab59		Chiller water inlet temperature on L1	0						
Bab97		Chiller Anti freeze temperature on L1	0						
Bab75	L1	Discharge pressure	0						
Bab11	L1	Discharge temperature	0						
Bab04	L1	Gas cooler pressure	0						
Bab09	L1	Gas cooler pressure backup	0						
Bab61	L1	Gas cooler outlet temperature	0						
Bab62	L1	Gas cooler outlet temperature backup	0						
Bab70	L1	Gas cooler inlet temperature	0						
Bab71	L1	Gas cooler setpoint compensation from analog input	0	psig	--	---	0		
Bab63	L1	Oil reserve pressure	0						
Bab90	L1	Temperature between the heat exchangers of heat reclaim 1 and 2	0						
Bab13	L1	Heat Reclaim 1 temperature	0						
Bab05	L2	Suction pressure	0						
Bbb75	L2	Discharge pressure	0						
Bab48	L2	Discharge temperature	0						
Bab49	L1	Heat reclaim 1 request from externa 0/10V signal	0	psig	---	---	0	0	0
Bab64	L2	Suction setpoint compensation from analog input	0	psig	--	---	0		
Bab06	L2	Suction pressure backup	0						
Bab07	L2	Suction temperature	0						
Bab73	L2	Intercooler temperature	0						
Bab14	L2	Heat reclaim 2 temperature	0						
Bab65	L2	Oil reserve pressure	0						
Bab18	L2	Common oil temperature	0						
Bab15	L1	External temperature	0						
Bab16		Room temperature	0						
Bab17	L1	Common oil temperature	0						
Bab20	L1	Generic probe 1	0						
Bab22	L1	Generic probe 2	0						
Bab24	L1	Generic probe 3	0						
Bab26	L1	Generic probe 4	0						
Bab28	L1	Generic probe 5	0						
Bab29	L1	Discharge temperature of compressor 1	0						
Bab30	L1	Discharge temperature of compressor 2	0						
Bab31	L1	Discharge temperature of compressor 3	0						
Bab32	L1	Discharge temperature of compressor 4	0						
Bab33	L1	Discharge temperature of compressor 5	0						
Bab34	L1	Discharge temperature of compressor 6	0						
Bab35	L2	Discharge temperature of compressor 1	0						
Bab36	L2	Discharge temperature of compressor 2	0						
Bab37	L2	Discharge temperature of compressor 3	0						
Bab38	L2	Discharge temperature of compressor 4	0						
Bab39	L2	Discharge temperature of compressor 5	0						
Bab40	L2	Discharge temperature of compressor 6	0						
Bab41	L1	Oil temperature of compressor 1	0						
Bab42	L1	Oil temperature of compressor 2	0						
Bab43	L1	Oil temperature of compressor 3	0						
Bab44	L1	Oil temperature of compressor 4	0						
Bab45	L1	Oil temperature of compressor 5	0						
Bab46	L1	Oil temperature of compressor 6	0						
Bab47	L2	Oil temperature of compressor 1	0						
Bab66	L1	Receiver pressure	0						
Bab67		HPV opening feedback	0						
Bab68		RPRV opening feedback	0						
Bab72	L1	HPV setpoint compensation from analog input	0						
Bab98		Percentage of max power on L1 from analog input	0						
Bab99		Percentage of max power on L2 from analog input	0						
Eeaa04	L1	Heat reclaim 1 water inlet temperature	0						
Eeaa13	L1	Heat reclaim 2 water outlet temperature	0						
Eeaa14	L1	Heat reclaim 2 water inlet temperature	0						
Eeaa15	L1	Heat reclaim 2 request from externa 0/10V signal	0	%	---	---	0	0	256
Eeaa27	L1	Gas cooler bypassed temperature	0						
Digital input									
MaskIndex		VarDesc	VarValue	Type	Channel				
Baa56	L1	Common low pressure from pressostat	0	NO	---				
Baa57	L1	Common high pressure from pressostat	0	NC	--				
Baada	L1	Compressor inverter warning	0	NC	EXP U03				
Baa02	L1	Alarm 1 of compressor 1	0	NC	---				
Baa02	L1	Alarm of parallel compressor	0	NC	---				
Baa03	L1	Alarm 2 of compressor 1	0	NC	---				
Baa04	L1	Alarm 3 of compressor 1	0	NC	---				
Baa05	L1	Alarm 4 of compressor 1	0	NC	---				
Baa06	L1	Alarm 5 of compressor 1	0	NC	---				
Baa07	L1	Alarm 6 of compressor 1	0	NC	---				
Baa08	L1	Alarm 7 of compressor 1	0	NC	--				
Baa09	L1	Alarm 1 of compressor 2	0	NC	---				
Baa10	L1	Alarm 2 of compressor 2	0	NC	---				
Baa11	L1	Alarm 3 of compressor 2	0	NC	pCO ID05				
Baa12	L1	Alarm 4 of compressor 2	0	NC	---				
Baa13	L1	Alarm 5 of compressor 2	0	NC	--				
Baa14	L1	Alarm 6 of compressor 2	0	NC	--				
Baa15	L1	Alarm 7 of compressor 2	0	NC	pCO ID05				
Baa17	L1	Alarm 1 of compressor 3	0	NC	pCO ID06				
Baa18	L1	Alarm 2 of compressor 3	0	NC	---				
Baa19	L1	Alarm 3 of compressor 3	0	NC	pCO ID01				
Baa20	L1	Alarm 4 of compressor 3	0	NC	--				
Baa21	L1	Alarm 5 of compressor 3	0	NC	---				
Baa22	L1	Alarm 6 of compressor 3	0	NC	---				
Baa23	L1	Alarm 7 of compressor 3	0	--	---				
Baa24	L1	Alarm 1 of compressor 4	0	NC	---				
Baa25	L1	Alarm 2 of compressor 4	0	NC	---				
Baa26	L1	Alarm 3 of compressor 4	0	--	---				
Baa27	L1	Alarm 4 of compressor 4	0	NC	---				
Baa28	L1	Alarm 4 of compressor 5	0	NC	pCO ID01				
Baa29	L1	Alarm 6 of compressor 4	0	NC	---				
Baa30	L1	Alarm 7 of compressor 4	0	NC	pCO ID02				
Baa32	L1	Alarm 1 of compressor 5	0	NC	---				
Baa33	L1	Alarm 2 of compressor 5	0	NC	---				
Baa34	L1	Alarm 3 of compressor 5	0	NC	---				
Baa35	L1	Alarm 4 of compressor 5	0	NC	---				
Baa36	L1	Alarm 5 of compressor 5	0	NC	---				
Baa37	L1	Alarm 6 of compressor 5	0	NC	---				
Baa38	L1	Alarm 7 of compressor 5	0	NO	--				
Baa39	L1	Alarm 1 of compressor 6	0	NC	---				
Baa40	L1	Alarm 2 of compressor 6	0	NC	--				
Baa41	L1	Alarm 3 of compressor 6	0	NC	---				
Baa42	L1	Alarm 4 of compressor 6	0	NC	pCO ID01				
Baa43	L1	Alarm 5 of compressor 6	0	NC	---				
Baa44	L1	Alarm 6 of compressor 6	0	NC	---				
Baa45	L1	Alarm 7 of compressor 6	0	NC	--				
Baa47	L1	Alarm 1 of compressor 7	0	--	---				
Baa48	L1	Alarm 2 of compressor 7	0	NC	---				
Baa49	L1	Alarm 1 of compressor 8	0	NC	pCO ID01				
Baa50	L1	Alarm 2 of compressor 8	0	NC	---				
Baa51	L1	Alarm 1 of compressor 9	0	NC	---				
Baa52	L1	Alarm 2 of compressor 9	0	--	pCO ID09				
Baa53	L1	Alarm 1 of compressor 10	0	NC	---				
Baa54	L1	Alarm 1 of compressor 11	0	NO	---				
Baa55	L1	Alarm 1 of compressor 12	0	NC	---				
Baa58	L1	Common oil alarm	0	NC	---				
Baa59	L1	Liquid level alarm	0	NC	---				
Baadh	L1	CO2 leakage alarm	0	NC	---				
Baadi		CO2 level alarm	0	--	--				

Baadt		Chiller water flow switch	0	--	---				
Baaap	L2	Common low pressure	0	NC	---				
Baadb	L2	Compressor inverter warning	0	--	---				
Baaag	L2	Common high pressure	0	NC	---				
Baaar	L2	Common pressostat for oil alarm	0	NC	---				
Baa61	L2	Alarm 1 of compressor 1	0	NC	---				
Baa62	L2	Alarm 2 of compressor 1	0	NC	pCO ID06				
Baa63	L2	Alarm 3 of compressor 1	0	NC	---				
Baa64	L2	Alarm 4 of compressor 1	0	NC	---				
Baa65	L2	Alarm 5 of compressor 1	0	NC	pCO ID05				
Baa66	L2	Alarm 6 of compressor 1	0	NC	---				
Baa67	L2	Alarm 7 of compressor 1	0	NC	---				
Baa68	L2	Alarm 1 of compressor 2	0	NC	---				
Baa69	L2	Alarm 2 of compressor 2	0	NC	---				
Baa70	L2	Alarm 3 of compressor 2	0	NC	---				
Baa71	L2	Alarm 4 of compressor 2	0	--	---				
Baa72	L2	Alarm 5 of compressor 2	0	NC	---				
Baa73	L2	Alarm 6 of compressor 2	0	NC	---				
Baa74	L2	Alarm 7 of compressor 2	0	NC	--				
Baa76	L2	Alarm 1 of compressor 3	0	NC	---				
Baa77	L2	Alarm 2 of compressor 3	0	NC	---				
Baa78	L2	Alarm 3 of compressor 3	0	NC	pCO ID05				
Baa79	L2	Alarm 4 of compressor 3	0	NC	--				
Baa80	L2	Alarm 5 of compressor 3	0	NC	---				
Baa81	L2	Alarm 6 of compressor 3	0	NC	---				
Baa82	L2	Alarm 7 of compressor 3	0	NC	--				
Baa83	L2	Alarm 1 of compressor 4	0	NC	---				
Baa84	L2	Alarm 2 of compressor 4	0	NC	---				
Baa85	L2	Alarm 3 of compressor 4	0	NC	---				
Baa86	L2	Alarm 4 of compressor 4	0	NC	---				
Baa87	L2	Alarm 5 of compressor 4	0	NC	---				
Baa88	L2	Alarm 6 of compressor 4	0	NC	pCO ID01				
Baa89	L2	Alarm 7 of compressor 4	0	NC	---				
Baa91	L2	Alarm 1 of compressor 5	0	NC	---				
Baa92	L2	Alarm 2 of compressor 5	0	NC	---				
Baa93	L2	Alarm 3 of compressor 5	0	NC	---				
Baa94	L2	Alarm 4 of compressor 5	0	NC	---				
Baa95	L2	Alarm 5 of compressor 5	0	NC	---				
Baa96	L2	Alarm 6 of compressor 5	0	NC	---				
Baa97	L2	Alarm 7 of compressor 5	0	NC	---				
Baa98	L2	Alarm 1 of compressor 6	0	NC	pCO ID15				
Baa99	L2	Alarm 2 of compressor 6	0	NC	---				
Baaaa	L2	Alarm 3 of compressor 6	0	NC	---				
Baaab	L2	Alarm 4 of compressor 6	0	NC	---				
Baaac	L2	Alarm 5 of compressor 6	0	NC	---				
Baaad	L2	Alarm 6 of compressor 6	0	NC	---				
Baaae	L2	Alarm 7 of compressor 6	0	--	--				
Baaag	L2	Alarm 1 of compressor 7	0	NC	---				
Baaah	L2	Alarm 2 of compressor 7	0	NC	---				
Baaai	L2	Alarm 1 of compressor 8	0	NC	---				
Baaaj	L2	Alarm 2 of compressor 8	0	NC	---				
Baaak	L2	Alarm 1 of compressor 9	0	NC	--				
Baaal	L2	Alarm 2 of compressor 9	0	NC	---				
Baaam	L2	Alarm 1 of compressor 10	0	NC	---				
Baaan	L2	Alarm 1 of compressor 11	0	--	---				
Baaao	L2	Alarm 1 of compressor 12	0	NC	---				
Baaas	L2	Liquid level larm	0	NC	---				
Baadc	L1	Fan inverter warning	0	NC	EXP U07				
Baadf	L1	High pressure prevent	0	NC	---				
Baadu		Enable Max Power L1 from digital input	0	NC	---				
Baab1		Enable Max Power L2 from digital input	0	--	EVD ID02				
Baaau	L1	Fan 1 overload	0	--	---				
Baaav	L1	Fan 2 overload	0	NC	---				
Baaaw	L1	Fan 3 overload	0	NC	---				
Baaax	L1	Fan 4 overload	0	NC	---				
Baaay	L1	Fan 5 overload	0	NC	---				
Baaaz	L1	Fan 6 overload	0	NC	---				
Baaba	L1	Fan 7 overload	0	NC	--				
Baabb	L1	Fan 8 overload	0	NC	EVD ID01				
Baabc	L1	Fan 9 overload	0	NC	---				
Baabd	L1	Fan 10 overload	0	--	pCO ID10				
Baabe	L1	Fan 11 overload	0	NC	---				
Baabf	L1	Fan 12 overload	0	NC	---				
Baabg	L1	Fan 13 overload	0	NC	---				
Baabh	L1	Fan 14 overload	0	NC	---				
Baabi	L1	Fan 15 overload	0	--	---				
Baabj	L1	Fan 16 overload	0	NC	---				
Baabk	L1	Fan common overload	0	NC	---				
Baacz		Parallel compressor(s) is(are) running	0	NC	---				
Baacx	L1	Chillbooster fault from DI	0	NC	pCO ID15				
Baac1			0	NC	---				
Baadv		HPV backup L1 enable	0	NC	---				
Baadw		RPRV backup L1 enable	0	NC	EVD ID02				
Baadd	L2	Fan inverter warning	0	NC	---				
Baabn	L2	Fan 1 overload	0	NC	--				
Baabo	L2	Fan 2 overload	0	NC	---				
Baabp	L2	Fan 3 overload	0	--	--				
Baabq	L2	Fan 4 overload	0	NC	--				
Baabr	L2	Fan 5 overload	0	NC	---				
Baabs	L2	Fan 6 overload	0	NC	---				
Baabt	L2	Fan 7 overload	0	NC	---				
Baabu	L2	Fan 8 overload	0	--	---				
Baabv	L2	Fan 9 overload	0	--	---				
Baabw	L2	Fan 10 overload	0	NC	---				
Baabx	L2	Fan 11 overload	0	NC	---				
Baaby	L2	Fan 12 overload	0	NC	pCO ID05				
Baabz	L2	Fan 13 overload	0	NC	---				
Baaca	L2	Fan 14 overload	0	NC	---				
Baacb	L2	Fan 15 overload	0	NO	---				
Baacc	L2	Fan 16 overload	0	--	---				
Baacd	L2	Fan common overload	0	NC	---				
Baace	L2	Heat reclaim activation request	0	NC	---				
Baadg	L2	Chillbooster fault from DI	0	NC	---				
Baacf		Generic digital input F status	0	NC	---				
Baacg		Generic digital input G status	0	--	---				
Baach		Generic digital input H status	0	NC	--				
Baaci		Generic digital input I status	0	--	---				
Baacj		Generic digital input J status	0	NC	---				
Baack	L1	On/Off by digital input	0	NC	---				
Baacy	L2	On/Off by digital input	0	NC	---				
Baacl	L1	Setpoint change command from digital input	0	NC	---				
Baacm	L1	Setpoint change command from digital input	0	NC	---				
Baacn		pRack is working in Manual or Automatic mode	0	NC	---				
Baade		HPV alarm from digital input	0	NC	---				
Baadf		RPRV alarm from digital input	0	NC	---				
Eeaa02	L1	Heat reclaim 1 activation/enable from digital input	0	NC	---				
Eeaa120	L1	Heat reclaim 1 flow switch	0	--	---				
Eeaa12	L1	Heat reclaim 2 activation/enable from digital input	0	NC	---				
Eeaa20	L1	Heat reclaim 2 flow switch	0	NC	---				
Analog Output									
MaskIndex		VarDesc	VarValue	Uom	Type	Channel	Min	Max	Offset
Bad01	L1	Compressor modulating device output	0	%	0-10V	---	--	--	--
Bad02	L1	Oil pump analog output	0						
Bad04	L2	Compressor modulating device output	0	%	0-10V	---	--	--	--
Bad05	L2	Oil pump analog output	0						
Bad07	L1	Fan modulating device output	0	%	0-10V	---	--	--	--
Bad14		HPV valve opening	0						
Bad15		RPRV valve opening	0						
Bad16		Parallel compressor modulating signal	0	%	0-10V	--	--	--	--
Bad08	L1	Heat reclaim 1 analog output	0	%	0-10V	---	--	--	--
Bad10	L2	Fan modulating device output	0	%	0-10V	---	--	--	--
Bad11	L2	Heat reclaim analog output	0	%	0-10V	---	--	--	--
Bad12		Generic modulating function 1 analog output	0						
Bad13		Generic modulating function 2 analog output	0						
Eeaa09	L1	Heat reclaim 1 pump signal	0	%	0-10V	---	--	--	--
Eeaa17	L1	Heat reclaim 2 valve opening	0	%	0-10V	---	--	--	--
Eeaa19	L1	Heat reclaim 2 pump signal	0	%	0-10V	---	--	--	--
Eeaa22	L1	Heat reclaim 1 3way bypass modulating valve	0						
Digital Output									
MaskIndex	VarDesc		VarValue	Type	Channel				
Bac02	L1	Compressor 1 line relay	0	NO	---				
Bac02	L1	Compressor 1 delta relay	0	NO	---				
Bac02	L1	Compressor 1 star relay	0	NO	pCO DO3				
Bac03	L1	Compressor 1 unloader 1	0	NO	---				
Bac04	L1	Compressor 1 unloader 2	0	NC	---				
Bac05	L1	Compressor 1 unloader 3	0	NC	---				
Bac06	L1	Compressor 1 unloader 4	0	NO	pCO DO5				
Bac07	L1	Compressor 1 equalization valve	1	NO	--				
Bac08	L1	Compressor 2 line relay	0	NO	---				
Bac08	L1	Compressor 2 delta relay	0	NO	---				
Bac08	L1	Compressor 2 star relay	0	NO	---				
Bac10	L1	Compressor 2 unloader 1	0	NO	pCO DO5				
Bac11	L1	Compressor 2 unloader 2	0	NO	---				
Bac12	L1	Compressor 2 unloader 3	0	--	---				
Bac09	L1	Compressor 2 unloader 4	0	NO	---				
Bac13	L1	Compressor 2 equalization valve	0	NO	---				

Bac15	L1	Compressor 3 line relay	0	NO	pCO DO20				
Bac15	L1	Compressor 3 delta relay	0	NO	--				
Bac15	L1	Compressor 3 star relay	0	NO	---				
Bac16	L1	Compressor 3 unloader 1	0	--	---				
Bac17	L1	Compressor 3 unloader 2	0	NC	---				
Bac18	L1	Compressor 3 unloader 3	0	NO	---				
Bac19	L1	Compressor 3 unloader 4	0	NO	--				
Bac20	L1	Compressor 3 equalization valve	0	NO	pCO DO20				
Bac21	L1	Compressor 4 line relay	0	NO	--				
Bac21	L1	Compressor 4 delta relay	0	NO	--				
Bac21	L1	Compressor 4 star relay	0	NO	---				
Bac22	L1	Compressor 4 unloader 1	0	NO	--				
Bac23	L1	Compressor 4 unloader 2	0	NO	pCO DO2				
Bac24	L1	Compressor 4 unloader 3	0	NO	---				
Bac25	L1	Compressor 4 unloader 4	0	NO	---				
Bac26	L1	Compressor 4 equalization valve	0	NO	---				
Bac28	L1	Compressor 5 line relay	0	NO	--				
Bac28	L1	Compressor 5 delta relay	0	NO	--				
Bac28	L1	Compressor 5 star relay	0	NO	pCO DO2				
Bac29	L1	Compressor 5 unloader 1	0	NO	---				
Bac30	L1	Compressor 5 unloader 2	0	NO	--				
Bac31	L1	Compressor 5 unloader 3	0	--	---				
Bac32	L1	Compressor 5 unloader 4	0	NO	---				
Bac33	L1	Compressor 5 equalization valve	0	--	--				
Bac34	L1	Compressor 6 line relay	0	NO	pCO DO20				
Bac34	L1	Compressor 6 delta relay	0	NO	---				
Bac34	L1	Compressor 6 star relay	0	NO	pCO DO1				
Bac35	L1	Compressor 6 unloader 1	0	NO	---				
Bac36	L1	Compressor 6 unloader 2	0	--	---				
Bac37	L1	Compressor 6 unloader 3	0	NO	EXP DO1				
Bac38	L1	Compressor 6 unloader 4	0	--	---				
Bac39	L1	Compressor 6 equalization valve	0	NO	---				
Bac41	L1	Compressor 7 line relay	0	NO	---				
Bac41	L1	Compressor 7 partwinding relay	0	NO	---				
Bac42	L1	Compressor 7 unloader 1	0	NO	---				
Bac43	L1	Compressor 7 unloader 2	0	NO	---				
Bac44	L1	Compressor 7 unloader 3	0	NO	---				
Bac45	L1	Compressor 7 equalization valve	0	NO	---				
Bac46	L1	Compressor 8 line relay	0	NO	---				
Bac46	L1	Compressor 8 partwinding relay	0	NO	---				
Bac47	L1	Compressor 8 unloader 1	0	NO	--				
Bac48	L1	Compressor 8 unloader 2	0	NO	---				
Bac49	L1	Compressor 8 unloader 3	0	NO	---				
Bac50	L1	Compressor 8 equalization valve	0	NO	---				
Bac51	L1	Compressor 9 line relay	0	NO	---				
Bac51	L1	Compressor 9 partwinding relay	0	NO	---				
Bac52	L1	Compressor 9 unloader 1	0	NO	---				
Bac53	L1	Compressor 9 unloader 2	0	--	---				
Bac54	L1	Compressor 9 unloader 3	0	NO	---				
Bac55	L1	Compressor 9 equalization valve	0	--	---				
Bac56	L1	Compressor 10 line relay	0	NO	---				
Bac56	L1	Compressor 10 partwinding relay	0	NO	---				
Bac56	L1	Compressor 10 unloader 1	0	NO	---				
Bac57	L1	Compressor 10 unloader 2	0	NO	---				
Bac58	L1	Compressor 10 unloader 3	0	NO	---				
Bac59	L1	Compressor 10 equalization valve	0	NO	---				
Bac61	L1	Compressor 11 line relay	0	--	---				
Bac61	L1	Compressor 11 partwinding relay	0	--	---				
Bac62	L1	Compressor 11 unloader 1	0	NO	---				
Bac63	L1	Compressor 11 unloader 2	0	NO	---				
Bac64	L1	Compressor 11 unloader 3	0	NO	---				
Bac65	L1	Compressor 11 equalization valve	0	NO	pCO DO1				
Bac66	L1	Compressor 12 line relay	0	NO	---				
Bac66	L1	Compressor 12 partwinding relay	0	NO	---				
Bac67	L1	Compressor 12 unloader 1	0	NO	---				
Bac68	L1	Compressor 12 unloader 2	0	NO	EXP DO1				
Bac69	L1	Compressor 12 unloader 3	0	NO	---				
Bac70	L1	Compressor 12 equalization valve	0	NO	---				
Bac71	L1	Oil reserve digital output	0	--	---				
Bac73	L2	Compressor 1 line relay	0	NO	---				
Bac73	L2	Compressor 1 delta relay	0	NO	---				
Bac73	L2	Compressor 1 star relay	0	NO	---				
Bac74	L2	Compressor 1 unloader 1	0	NO	--				
Bac75	L2	Compressor 1 unloader 2	0	NO	--				
Bac76	L2	Compressor 1 unloader 3	0	NO	---				
Bac77	L2	Compressor 1 unloader 4	0	--	---				
Bac78	L2	Compressor 1 equalization valve	0	NO	---				
Bac79	L2	Compressor 2 line relay	0	NO	EXP DO6				
Bac79	L2	Compressor 2 delta relay	0	NO	---				
Bac79	L2	Compressor 2 star relay	0	NO	---				
Bac80	L2	Compressor 2 unloader 1	0	NO	--				
Bac81	L2	Compressor 2 unloader 2	0	NO	--				
Bac82	L2	Compressor 2 unloader 3	0	NO	---				
Bac83	L2	Compressor 2 unloader 4	0	--	pCO DO1				
Bac84	L2	Compressor 2 equalization valve	0	NO	pCO DO1				
Bac86	L2	Compressor 3 line relay	0	NO	---				
Bac86	L2	Compressor 3 delta relay	0	NO	EXP DO1				
Bac86	L2	Compressor 3 star relay	0	NO	cPco DO5				
Bac87	L2	Compressor 3 unloader 1	0	NC	---				
Bac88	L2	Compressor 3 unloader 2	0	NO	---				
Bac89	L2	Compressor 3 unloader 3	0	NO	---				
Bac90	L2	Compressor 3 unloader 4	0	--	---				
Bac91	L2	Compressor 3 equalization valve	0	NO	---				
Bac92	L2	Compressor 4 line relay	0	NO	--				
Bac92	L2	Compressor 4 delta relay	0	NO	pCO DO1				
Bac92	L2	Compressor 4 star relay	0	NO	---				
Bac94	L2	Compressor 4 unloader 1	0	NO	---				
Bac95	L2	Compressor 4 unloader 2	0	NO	---				
Bac96	L2	Compressor 4 unloader 3	0	NO	---				
Bac97	L2	Compressor 4 unloader 4	0	NO	---				
Bacaa	L2	Compressor 4 equalization valve	0	NC	---				
Bacaa	L2	Compressor 5 line relay	0	NC	---				
Bacaa	L2	Compressor 5 delta relay	0	NC	---				
Bacab	L2	Compressor 5 star relay	0	--	--				
Bacac	L2	Compressor 5 unloader 1	0	NO	---				
Bacad	L2	Compressor 5 unloader 2	0	NO	---				
Bacae	L2	Compressor 5 unloader 3	0	NO	---				
Bacaf	L2	Compressor 5 unloader 4	0	NO	---				
Bacag	L2	Compressor 5 equalization valve	0	NO	---				
Bacag	L2	Compressor 6 line relay	0	NO	pCO DO1				
Bacag	L2	Compressor 6 delta relay	0	NO	--				
Bacah	L2	Compressor 6 star relay	0	NO	pCO DO1				
Bacai	L2	Compressor 6 unloader 1	0	NO	---				
Bacaj	L2	Compressor 6 unloader 2	0	NO	---				
Bacak	L2	Compressor 6 unloader 3	0	NO	---				
Bacal	L2	Compressor 6 unloader 4	0	NO	---				
Bacan	L2	Compressor 6 equalization valve	0	NO	---				
Bacan	L2	Compressor 7 line relay	0	NO	---				
Bacan	L2	Compressor 7 partwinding relay	0	NO	--				
Bacao	L2	Compressor 7 unloader 1	0	NO	---				
Bacap	L2	Compressor 7 unloader 2	0	NO	---				
Bacaq	L2	Compressor 7 unloader 3	0	NO	---				
Bacar	L2	Compressor 7 equalization valve	0	NO	---				
Bacas	L2	Compressor 8 line relay	0	NO	---				
Bacas	L2	Compressor 8 partwinding relay	0	NO	---				
Bacat	L2	Compressor 8 unloader 1	0	NO	---				
Bacau	L2	Compressor 8 unloader 2	0	NO	---				
Bacav	L2	Compressor 8 unloader 3	0	NO	---				
Bacaw	L2	Compressor 8 equalization valve	0	NO	---				
Bacax	L2	Compressor 9 line relay	0	NO	---				
Bacax	L2	Compressor 9 partwinding relay	0	NO	---				
Bacay	L2	Compressor 9 unloader 1	0	NO	---				
Bacaz	L2	Compressor 9 unloader 2	0	NO	pCO DO3				
Bacba	L2	Compressor 9 unloader 3	0	NO	---				
Bacbb	L2	Compressor 9 equalization valve	0	NO	---				
Bacbc	L2	Compressor 10 line relay	0	NC	pCO DO13				
Bacbc	L2	Compressor 10 partwinding relay	0	NC	---				
Bacbd	L2	Compressor 10 unloader 1	0	NO	---				
Bacbe	L2	Compressor 10 unloader 2	0	--	---				
Bacbf	L2	Compressor 10 unloader 3	0	NO	---				
Bacbg	L2	Compressor 10 equalization valve	0	NO	---				
Bacbh	L2	Compressor 11 line relay	0	NO	---				
Bacbh	L2	Compressor 11 partwinding relay	0	NO	---				
Bacbi	L2	Compressor 11 unloader 1	0	NO	pCO DO1				
Bacbj	L2	Compressor 11 unloader 2	0	--	---				
Bacbk	L2	Compressor 11 unloader 3	0	NO	---				
Bacbl	L2	Compressor 11 equalization valve	0	NO	---				
Bacbm	L2	Compressor 12 line relay	0	NO	---				
Bacbm	L2	Compressor 12 partwinding relay	0	NO	---				
Bacbn	L2	Compressor 12 unloader 1	0	NO	---				
Bacbo	L2	Compressor 12 unloader 2	0	NO	pCO DO1				
Bacbp	L2	Compressor 12 unloader 3	0	NO	---				
Bacbq	L2	Compressor 12 equalization valve	0	NO	pCO DO6				
Baceo	L2	Oil reserve	0	NO	---				
Bacbt	L1	Fan 1 status	0	--	---				
Bacbu	L1	Fan 2 status	0	NO	EXP DO1				
Bacbv	L1	Fan 3 status	0	NO	---				
Bacbw	L1	Fan 4 status	0	NO	---				
Bacbx	L1	Fan 5 status	0	NO	---				
Bacby	L1	Fan 6 status	0	NO	---				

Bacbz	L1	Fan 7 status	0	NO	---				
Bacca	L1	Fan 8 status	0	NC	--				
Baccb	L1	Fan 9 status	0	NO	pCO DO1				
Baccc	L1	Fan 10 status	0	NC	---				
Baccd	L1	Fan 9 status	0	NO	---				
Bacce	L1	Fan 12 status	0	NO	---				
Baccf	L1	Fan 13 status	0	--	---				
Baccg	L1	Fan 14 status	0	NC	pCO DO4				
Bacch	L1	Fan 15 status	0	NO	---				
Bacci	L1	Fan 16 status	0	NO	--				
Bacck	L1	Heat reclaim 1 pump on	0	NO	---				
Bacef		Parallel compressor line relay	0	--	---				
Baccl	L1	chillbooster status	0	NO	---				
Baceu	L1	HPV Backup consent	0	NO	---				
Bacev	L1	RPRV Backup consent	0	--	---				
Bacew		Digital Output that close the HPV valve	0	NO	---				
Bacex		Digital Output that close the RPRV valve	0	NO	---				
Baccn	L2	Fan 1 status	0	NO	--				
Bacco	L2	Fan 2 status	0	NO	pCO DO10				
Baccp	L2	Fan 3 status	0	NO	---				
Baccq	L2	Fan 4 status	0	--	--				
Baccr	L2	Fan 5 status	0	NO	---				
Baccs	L2	Fan 6 status	0	--	---				
Bacct	L2	Fan 7 status	0	NO	---				
Baccu	L2	Fan 8 status	0	NO	---				
Baccv	L2	Fan 9 status	0	NO	---				
Baccw	L2	Fan 10 status	0	NO	---				
Baccx	L2	Fan 11 status	0	NO	---				
Baccy	L2	Fan 12 status	0	NO	---				
Baccz	L2	Fan 13 status	0	--	---				
Bacda	L2	Fan 14 status	0	NO	---				
Bacdb	L2	Fan 15 status	0	NO	---				
Bacdc	L2	Fan 16 status	0	NO	---				
Bacde	L2	Heat reclaim pump on/off	0	NO	---				
Bacdf	L2	Chillbooster status	0	NO	---				
Bacdg	L1	Thermostat generic function A out output	0	NO	---				
Bacdh	L1	Thermostat generic function B out output	0	NO	---				
Bacdi	L1	Thermostat generic function C out output	0	NO	---				
Bacdj	L1	Thermostat generic function D out output	0	NO	---				
Bacdk	L1	Thermostat generic function E out output	0	NO	---				
Bacdl		Global alarm status	0	NO	---				
Bacdm		Generic alarm 1 status	0	NO	---				
Bacdn		Generic alarm 2 status	0	NO	---				
Bacdo		Generic scheduler output	0	NO	pCO DO10				
Bacdp	L1	Oil pump 1 status	0	NO	---				
Bacdq	L1	Oil pump 2 status	0	NO	---				
Bacdr	L1	Oil cooler fan status	0	NO	---				
Bacds	L2	Oil pump 1 status	0	NO	---				
Bacdt	L2	Oil pump 2 status	0	NO	---				
Bacdu	L2	Oil cooler fan status	0	NO	---				
Bacdv	L1	Compressor 1 liquid injection status	0	NO	---				
Bacdw	L1	Compressor 2 liquid injection status	0	NO	pCO DO5				
Bacdx	L1	Compressor 3 liquid injection status	0	NC	---				
Bacdy	L1	Compressor 4 liquid injection status	0	NO	---				
Bacdz	L1	Compressor 5 liquid injection status	0	--	---				
Bacea	L1	Compressor 6 liquid injection status	0	NO	--				
Baceb	L2	Compressor 1 liquid injection status	0	NO	--				
Bacec	L2	Compressor 2 liquid injection status	0	NO	--				
Baced	L2	Compressor 3 liquid injection status	0	--	pCO DO1				
Bacee	L2	Compressor 4 liquid injection status	0	--	---				
Bacef	L2	Compressor 5 liquid injection status	0	NO	---				
Baceg	L2	Compressor 6 liquid injection status	0	NO	---				
Baceh		pRack power on status	0	NO	---				
Bacei	L1	Forcing digital output	0	NO	---				
Bacej	L1	Anti liquid return status	0	NO	--				
Bac72	L2	Anti liquid return status	0	NO	pCO DO1				
Bacep	L2	Forcing Digital Output	0	NO	---				
Bacek	L1	Subcooling status	0	NO	---				
Bacel	L2	Subcooling status	0	NO	---				
Bacem		Normal alarm status	0	NC	---				
Bacen		Serious alarm status	0	NO	---				
Eeaa06	L1	Heat reclaim 1 status	0	NO	---				
Eeaa16	L1	Heat reclaim 2 status	0	NO	EXP DO1				
Eeaa21	L1	Heat reclaim 1 3way bypass on/off valve	0	NO	pCO DO10				

7. ABB Inverter non default settings

ABB inverters are factory set and tested on these units. Further details on ABB installation and set-up available on request

Device Info

ACS380 MT

Type

Model ACS380

Serial AMCK208x

Drive parameters

Index	Name	Value	Unit	Min	Max	Default
7.	System info					
35	Drive configuration	0x0004	NoUnit	0x0000	0xffff	0x0000
11.	Standard DIO, FI, FO					
5	DIO1 configuration	Digital output	NoUnit	0	2	Input
6	DIO1 output source	Started	NoUnit			Not energized
7	DIO1 ON delay	77.0	s	0.0	3000.0	0.0
9	DIO2 function	Input	NoUnit	0	2	Digital output
12.	Standard AI					
20	AI1 scaled at AI1 max	4800.000	NoUnit	-32768.000	32767.000	50.000
20.	Start/stop/direction					
1	Ext1 commands	In1 Start	NoUnit	0	23	In1 Start; In2 Dir
4	Ext1 in2 source	Always off	NoUnit			DI2
12	Run enable 1 source	DI2	NoUnit			Selected
21.	Start/stop mode					
1	Start mode	Automatic	NoUnit	0	2	Const time
2	Magnetization time	200	ms	0	10000	500
6	Zero speed limit	1200.00	rpm	0.00	30000.00	30.00
22.	Speed reference selection					
22	Constant speed sel1	P.11.2.0 -	NoUnit			DI3
23	Constant speed sel2	Always off	NoUnit			DI4
26	Constant speed 1	2700.00	rpm	-30000.00	30000.00	300.00
226	Crane motpot min value	-1500.00	NoUnit	-30000.00	30000.00	-50.00
227	Crane motpot max value	1500.00	NoUnit	-30000.00	30000.00	50.00
23.	Speed reference ramp					
11	Ramp set selection	P.32.1.0	NoUnit			DIO1

Index	Name	Value	Unit	Min	Max	Default
12	Acceleration time 1	8.000	s	0.000	1800.000	3.000
13	Deceleration time 1	10.000	s	0.000	1800.000	3.000
14	Acceleration time 2	200.000	s	0.000	1800.000	60.000
15	Deceleration time 2	10.000	s	0.000	1800.000	60.000
25.	Speed control					
2	Speed proportional gain	2.50	NoUnit	0.00	250.00	10.00
3	Speed integration time	2.00	s	0.00	1000.00	2.50
30.	Limits					
11	Minimum speed	2700.00	rpm	-30000.00	30000.00	-1500.00
12	Maximum speed	4800.00	rpm	-30000.00	30000.00	1500.00
13	Minimum frequency	0.00	Hz	-500.00	500.00	-50.00
17	Maximum current	24.00	A	0.00	30.60	27.54
31.	Fault functions					
11	Fault reset selection	Not used	NoUnit			Not used
12	Autoreset selection	0x0807	NoUnit	0x0000	0xffff	0x0000
14	Number of trials	5	NoUnit	0	5	0
15	Total trials time	60.0	s	1.0	600.0	30.0
16	Delay time	10.0	s	0.0	120.0	0.0
30	Overspeed trip margin	10000.00	rpm	0.00	10000.00	500.00
32.	Supervision					
5	Supervision 1 function	High	NoUnit	0	7	Disabled
7	Supervision 1 signal	Speed	NoUnit			Frequency
9	Supervision 1 low	1200.00	NoUnit	-21474836.00	21474836.00	0.00
10	Supervision 1 high	1200.00	NoUnit	-21474836.00	21474836.00	0.00
33.	Generic timer & counter					
75	HS Counter upper limit	0	NoUnit	0	4294967295	4294967295
43.	Brake chopper					
11	Brake resistor fault limit	105	%	0	150	105
45.	Energy efficiency					

Index	Name	Value	Unit	Min	Max	Default
19	Comparison power	2.70	kW	0.00	10000000.00	0.00
46.	Monitoring/scaling settings					
1	Speed scaling	4800.00	rpm	0.10	30000.00	1500.00
2	Frequency scaling	160.00	Hz	0.10	1000.00	50.00
4	Power scaling	1000.00	NoUnit	0.10	30000.00	100.00
5	Current scaling	10000	A	0	30000	100
11	Filter time motor speed	2	ms	2	20000	500
12	Filter time output frequency	2	ms	2	20000	500
13	Filter time motor torque	2	ms	2	20000	100
14	Filter time power	2	ms	2	20000	100
96.	System					
1	Language	Italiano	NoUnit	0	3082	Not selected
97.	Motor control					
1	Switching frequency reference	8 kHz	NoUnit	4	12	4 kHz
98.	User motor parameters					
2	Rs user	0.02713	p.u.	0.00000	0.50000	0.00000
6	Ld user	0.36092	p.u.	0.00000	10.00000	0.00000
7	Lq user	0.54159	p.u.	0.00000	10.00000	0.00000
8	PM flux user	1.00000	p.u.	0.00000	2.00000	0.00000
9	Rs user SI	0.22321	Ohm	0.00000	100.00000	0.00000
13	Ld user SI	2.95	mH	0.00	100000.01	0.00
14	Lq user SI	4.43	mH	0.00	100000.01	0.00
99.	Motor data					
3	Motor type	Permanent magnet motor	NoUnit	0	2	Asynchronous motor
4	Motor control mode	Vector	NoUnit	0	1	Scalar
6	Motor nominal current	12.00	A	4.17	50.00	20.70
7	Motor nominal voltage	171.0	V	69.2	830.0	400.0
8	Motor nominal frequency	160.00	Hz	0.00	500.00	50.00
9	Motor nominal speed	4800	rpm	0	30000	1463

Index	Name	Value	Unit	Min	Max	Default
10	Motor nominal power	3.30	kW	0.00	10000.00	11.00

ABB MACHINERY DRIVES

ACS380 drive

Quick installation and start-up guide

Safety instructions

Read the safety instructions in *ACS380 Hardware manual* (3AXD50000029274 [EN]).

WARNING! Obey these safety instructions to prevent physical injury or death, or damage to the equipment. If you are not a qualified electrician, do not do electrical installation or maintenance work.
- When you install the drive, make sure that dust does not go into the drive.
- When the drive or connected equipment is energized, do not do work on the drive, motor cable, motor, control cables or control circuits.
- After you disconnect the input power, wait for 5 minutes to let the intermediate circuit capacitors discharge.
- Make sure that the installation is not energized:
  - Use a multimeter with an impedance of at least 1 Mohm.
  - Make sure that the voltage between the drive output terminals (U, V, W) and the ground (PE) is 0 V.
  - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the ground (PE) is 0 V.
  - Make sure that the voltage between the DC and brake resistor terminals (UDC+, UDC- and R-) and the ground (PE) is 0 V.
- If you use a permanent magnet synchronous motor, do not do work on the drive when the motor rotates. A permanent magnet motor that rotates energizes the drive and the input power terminals.

WARNING! The installation, start-up and operation of this equipment requires detailed instructions. Refer to this quick guide and the user interface guide in the drive package. Retain the guides with this device at all times. For more information, refer to the hardware manual and firmware manual. You can download these manuals from the ABB website or order hard copies of the manuals with the delivery.

1. Examine the installation area

The drive is intended for cabinet installation and has an ingress protection rating of IP20.

Make sure that in the installation area:
- There is sufficient cooling and hot air does not recirculate.
- The ambient conditions are suitable. Refer to *Ambient conditions*.
- The mounting surface is non-flammable and can hold the weight of the drive. Refer to *Declaration of conformity*.
- Materials near the drive are non-flammable.
- There is sufficient space above and below the drive for maintenance work. Refer to *Free space requirements*.

2. Install the drive

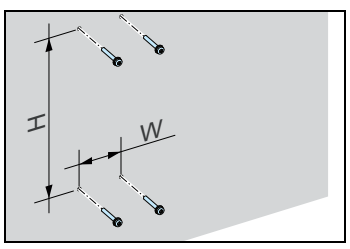
You can install the drive with screws or to a DIN rail.

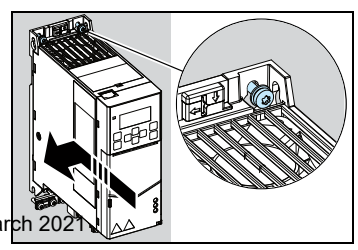
Installation requirements:
- Make sure that there is a minimum of 75 mm of free space at the top and bottom of the drive for cooling air.
- Install R0 drives upright. R0 drives do not have a fan.
- You can install R1, R2, R3 and R4 drives tilted by up to 90 degrees, from vertical to fully horizontal orientation.
- You can install several drives side by side. Side-mounted options require approximately 20 mm of space on the right side of the drive.

WARNING! Do not install the drive upside down. Make sure that the cooling air exhaust (at the top) is always above the cooling air inlet (at the bottom).

To install the drive with screws

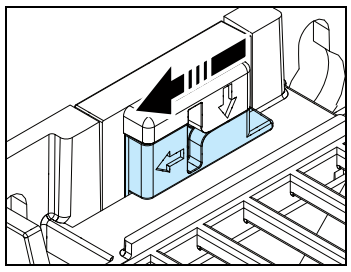
1. Make marks onto the surface for the mounting holes. Refer to *Declaration of conformity*. The R3 and R4 drives contain a mounting template.
2. Make the holes for the mounting screws and install suitable plugs or anchors.
3. Start to tighten the screws into the mounting holes.
4. Install the drive onto the mounting screws.
5. Tighten the mounting screws.



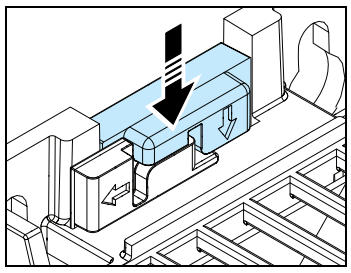


To install the drive to a DIN rail

1. Move the locking part to the left.
2. Push and hold the locking button down.
3. Put the top tabs of the drive onto the top edge of the DIN installation rail.
4. Put the drive against the bottom edge of the DIN installation rail.



5. Release the locking button.
6. Move the locking part to the right.
7. Make sure that the drive is correctly installed.
8. To remove the drive, use a flat-head screwdriver to open the locking part.

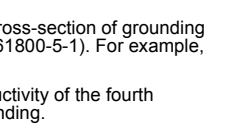


3. Measure the insulation resistance

Drive: Do not do voltage tolerance or insulation resistance tests on the drive, because this can cause damage to the drive.

Input power cable: Before you connect the input power cable, measure the insulation of the input power cable. Obey the local regulations.

Motor and motor cable:
1. Make sure that the motor cable is connected to the motor and disconnected from the drive output terminals T1/U, T2/V and T3/W.
2. Use a voltage of 500 V DC to measure the insulation resistance between each phase conductor and the protective earth conductor. The insulation resistance of an ABB motor must be more than 100 Mohm (at 25 °C/77 °F). For the insulation resistance of other motors, refer to the manufacturer's documentation.
   Moisture in the motor decreases the insulation resistance. If you think that there is moisture in the motor, dry the motor and do the measurement again.



4. Select the cables

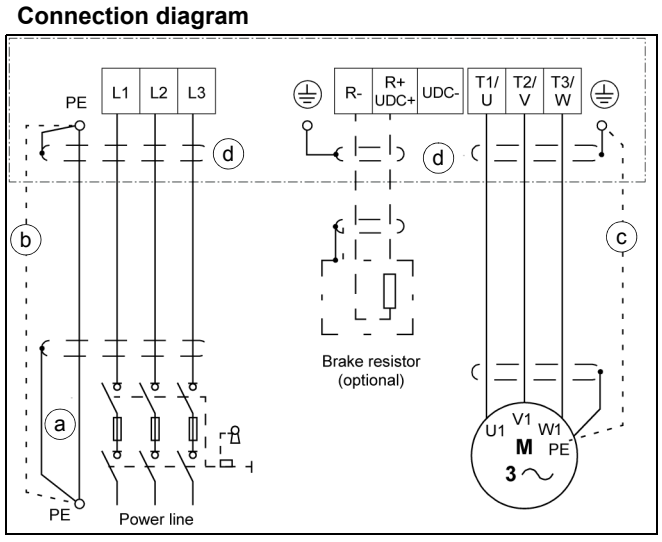
Input power cable: For the best EMC performance, use a symmetrical shielded cable and two grounding conductors.

Motor cable: Use a symmetrical shielded cable.

Control cable: Use a double-shielded twisted-pair cable for analog signals. Use a single-shielded cable for digital, relay and I/O signals. Use separate cables for analog and relay signals.

5. Connect the power cables

Connection diagram



a. Two grounding conductors. Use two conductors if the cross-section of grounding conductor is less than 10 mm^2 Cu or 16 mm^2 Al (IEC/EN 61800-5-1). For example, use the cable shield in addition to the fourth conductor.

b. Separate grounding cable (line side). Use it if the conductivity of the fourth conductor or shield is not sufficient for the protective grounding.

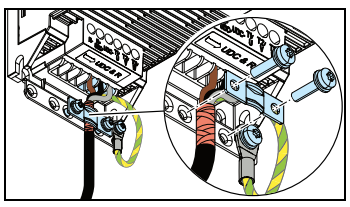
c. Separate grounding cable (motor side). Use it if the conductivity of the shield is not sufficient for the protective grounding, or there is no symmetrically constructed grounding conductor in the cable.

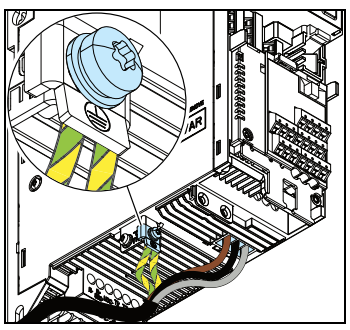
d. 360-degree grounding of the cable shield. Required for the motor cable and brake resistor cable, recommended for the input power cable.

Connection procedure

WARNING! Obey the safety instructions in the *ACS380 Hardware manual* (3AXD50000029274 [English]). If you ignore them, injury or death, or damage to the equipment can occur.
WARNING! If the drive is connected to an IT (non-grounded) system or to a corner-grounded TN system, disconnect the EMC filter grounding screw.

1. Strip the motor cable.
2. Ground the motor cable shield under the grounding clamp.
3. Twist the motor cable shield into a bundle, mark it accordingly and connect it to the grounding terminal.
4. Connect the phase conductors of the motor cable to the T1/U, T2/V and T3/W motor terminals. Torque the terminals to 0.8 N·m (7 lbf·in).
5. If it is applicable, connect the brake resistor cable to the R- and UDC+ terminals. Torque the terminals to 0.8 N·m (7 lbf·in). Use a shielded cable and ground the shield under the grounding clamp.
6. Strip the input power cable.
7. If the input power cable has a shield, twist it into a bundle, mark it and connect it to the grounding terminal.
8. Connect the PE conductor of the input power cable to the grounding terminal. If it is necessary, use a second PE conductor.





9. Connect the phase conductors of the input power cable to the L1, L2 and L3 input terminals. Torque the terminals to 0.8 N·m (7 lbf·in).
10. Mechanically attach the cables on the outside of the drive.

Make sure that there are no sources of strong magnetic fields such as high-current single-core conductors or contactor coils near the drive. A strong magnetic field can cause interference or inaccuracy in the operation of the drive. If there is interference, move the source of the magnetic field away from the drive.

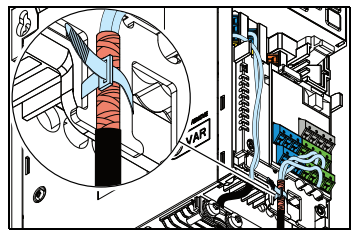
6. Connect the control cables

Connection procedure

Do the connections according to the default control connections of the application macro that you select. For the connections of the factory default macro (ABB standard macro), refer to *Default I/O connections (ABB standard macro)*, for the connections of fieldbus default macro, refer to *Fieldbus connections*. For the other macros, refer to the *ACS380 Firmware manual* (3AXD50000029275 [English]).

Keep the signal wire pairs twisted as near to the terminals as possible to prevent inductive coupling.

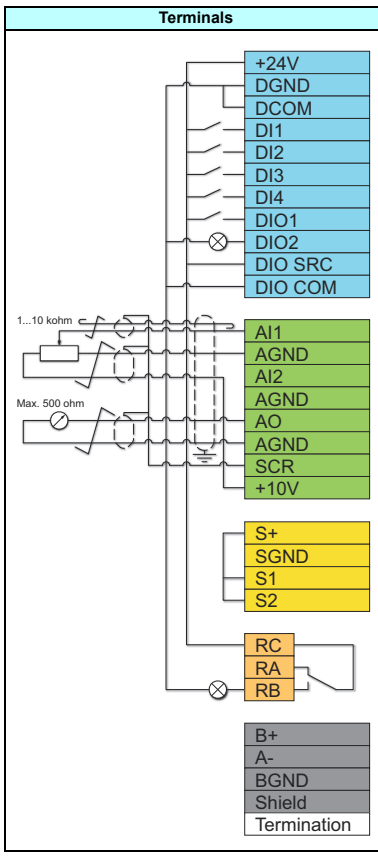
1. Strip a part of the outer shield of the control cable for grounding.
2. Use a cable tie to ground the outer shield to the grounding tab.
3. Use metal cable ties for 360-degree grounding.
4. Strip the control cable conductors.
5. Connect the conductors to the correct control terminals. Torque the terminals to 0.5 N·m (4.4 lbf·in).
6. Connect the shields of the twisted pairs and grounding wires to the SCR terminal. Torque the terminals to 0.5 N·m (4.4 lbf·in).



7. Mechanically attach the control cables on the outside of the drive.

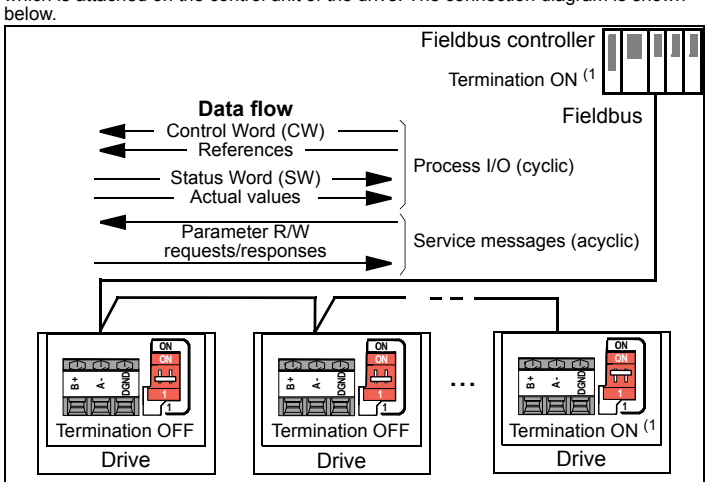
Default I/O connections (ABB standard macro)

For the standard variant (I/O & Modbus) (type ACS380-04x**S**).

Terminals	Descriptions
	**Digital I/O connections**
+24V	Aux. +24 V DC, max. 200 mA
DGND	Aux. voltage output common
DCOM	Digital input common
DI1	Stop (0) / Start (1)
DI2	Forward (0) / Reverse (1)
DI3	Speed selection
DI4	Speed selection
DIO1	Ramp 1 (0) / Ramp 2 (1)
DIO2	Ready (0) / Not ready (1)
DIO SRC	Digital output auxiliary voltage
DIO COM	Digital input/output common
	Analog I/O
AI1	Freq. ref. / Speed ref. (0...10 V)
AGND	Analog input circuit common
AI2	Not configured
AGND	Analog input circuit common
AO	Output frequency (0...20 mA)
AGND	Analog output circuit common
SCR	Signal cable shield (screen)
+10V	Reference voltage
	Safe torque off (STO)
S+	Safe torque off function. Connected at factory.
SGND	Drive starts only if both circuits are closed.
S1	
S2	
	Relay output
RC	Relay output 1
RA	No fault [Fault (-1)]
RB	
	EIA-485 Modbus RTU
B+	Embedded Modbus RTU (EIA-485)
A-	
BGND	
Shield	
Termination	

Connecting EIA-485 Modbus RTU terminal to drive

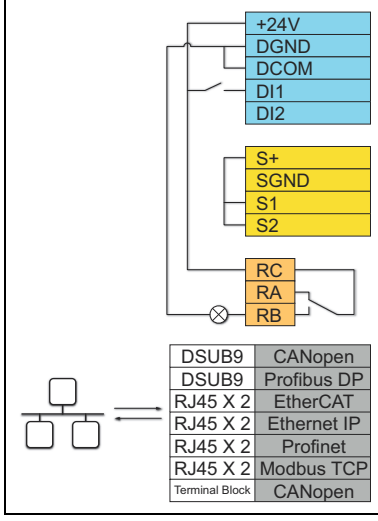
Connect the fieldbus to the EIA-485 Modbus RTU terminal on the BMIO-01 module which is attached on the control unit of the drive. The connection diagram is shown below.



1) The device at both ends on the fieldbus must have termination set to ON.

Fieldbus connections

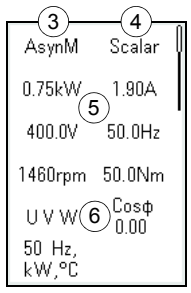
For the configured drives with the preconfigured fieldbus protocol (type ACS380-04x**C**).

Terminals	Descriptions
	**Digital I/O connections**
+24V	Aux. +24 V DC, 200 mA
DGND	Aux. voltage output common
DCOM	Digital input common
DI1	Fault reset
DI2	Not configured
	Safe torque off (STO)
S+	Safe torque off function. Connected at factory.
SGND	Drive starts only if both circuits are closed.
S1	
S2	
	Relay output
RC	Relay output 1
RA	No fault [Fault (-1)]
RB	
	Extension module connections
DSUB9 CANopen	+K457 FCAN-01-M CANopen
DSUB9 Profibus DP	+K454 FPBA-01-M Profibus DP
RJ45 X 2 EtherCAT	+K469 FECA-01-M EtherCAT
RJ45 X 2 Ethernet IP	+K475 FENA-21-M Ethernet/IP, Profinet, Modbus TCP
RJ45 X 2 Profinet	+K495 BCAN-11 CANopen interface
RJ45 X 2 Modbus TCP	+K470 FEPL-02 Ethernet power link (RJ45x2)
Terminal Block CANopen	+K451 FDNA-01, DeviceNet (Terminal Block)

7. Start up the drive

For information on the user interface, refer to the *ACS380 User interface guide* (3AXD50000022224 [English]).

1. Power up the drive.
2. The drive software recognizes the connected adapter (I/O & Modbus module or some of the fieldbus modules) and selects the correct settings. For fieldbus communication refer also to *Configure fieldbus communications*.
3. Select the unit (international or US). In the *Motor data* view, set the motor type:
   AsynM: Asynchronous motor
   PMSM: Permanent magnet synchronous motor
   SynMR: Synchronous reluctance motor
4. Set the motor control mode:
   Vector: Speed reference. This is suitable for most cases. The drive does an automatic standstill ID run when the drive is started for the first time.
   Scalar: Frequency reference. Do not use this mode for permanent magnet synchronous motors.
   Use this mode when:
   - The number of motors can change.
   - The nominal motor current is less than 20% of the nominal drive current.
5. Set the nominal motor values.
6. Examine the direction of the motor.
   If it is necessary, set the motor direction with the **Phase order** setting or with the phase order of the motor cable.
7. In the *Motor control* view, set the start and stop mode.
8. Set the acceleration and deceleration times.
9. Set the maximum and minimum speeds.
10. In the *Control macros* view, select the applicable macro. To configure fieldbus communications, refer to *Configure fieldbus communications*.
11. Tune the drive parameters to the application. You can use the Assistant control panel (ACS-AP-x) or the DriveComposer PC tool. Refer to the *ACS380 Firmware manual* (3AXD50000029275 [English]).



Configure fieldbus communications

If you have a configured variant with the preconfigured fieldbus protocol, you can control the drive from an external control system through the fieldbus.

When the fieldbus adapter is connected to the drive, the drive control program sets the applicable parameters. The preconfigured settings apply to the CANopen, EtherCAT, Profibus and Profinet (default in FENA-21 adapter) protocols. If you have a CANopen variant with the BCAN-11 adapter, refer to the exceptions in the table. In other fieldbus protocols (DeviceNet, Powerlink,...) refer to *ACS380 Firmware manual* (3AXD50000029275 [English]) and the applicable fieldbus adapter documentation.

To configure fieldbus communications:

1. Power up the drive.
2. The drive software recognizes the connected fieldbus adapter and selects the correct fieldbus control macro.
   The changed parameters which apply to all fieldbus adapters:

Parameter	Setting (general)	Setting (CANopen with BCAN-11)
20.01 Ext1 commands	Fieldbus A	Embedded fieldbus
20.03 Ext1 in1	Not selected	Not selected
20.04 Ext1 in2	Not selected	Not selected
22.11 Ext1 speed ref1	FB A ref1	EFB ref1
22.22 Constant speed sel1	Not selected	Not selected
22.23 Constant speed sel2	Not selected	Not selected
23.11 Ramp set selection	Acc/Dec time 1	Acc/Dec time 1
28.11 Ext1 frequency ref1	FB A ref1	EFB ref1
28.22 Constant frequency sel1	Not selected	Not selected
28.23 Constant frequency sel2	Not selected	Not selected
28.71 Freq. ramp set selection	Acc/Dec time 1	Acc/Dec time 1
31.11 Fault reset selection	DI2	DI1
50.01 FBA A enable	Enable	N/A
50.02 FBA A comm loss func	Fault	N/A

The parameters that apply only to specific fieldbus adapters:

Parameter	Setting
CANopen (FCAN-01-M)	
51.05 Profile	CiA 402
EtherCAT	
51.02 Profile	CiA 402
Profibus	
51.02 Node address	3
51.05 Profile	ABB Drives
52.01 FBA A data in1	SW 16 bit
52.02 FBA A data in2	Act1 16 bit
53.01 FBA A data out1	CW 16 bit
53.02 FBA A data out2	Ref1 16 bit
Profinet	
51.02 Protocol/Profile	PNIO ABB Pro
51.04 IP configuration	Static IP
52.01 FBA A data in1	SW 16 bit
52.02 FBA A data in2	Act1 16 bit
53.01 FBA A data out1	CW 16 bit
53.02 FBA A data out2	Ref 1 16 bit
Modbus TCP/IP	
51.02 Protocol/Profile	MB/TCP ABB C
Ethernet IP	
51.02 Protocol/Profile	EIP ABB Pro
CANopen (BCAN-11)	
58.01 Protocol enable	CANopen

3. You can see the selected fieldbus control macro in the *Control macros* view or from parameter 96.05. In the *Control macros view*, you can also change some adapter specific settings.
4. If you need to change other parameters, you can set them manually. Refer to the *ACS380 Firmware manual* (3AXD50000029275 [English]) and the applicable fieldbus adapter documentation.

Warnings and faults generated by the drive

Warning	Fault	Description
A2A1	2281	Warning: Current calibration is done at the next start. Fault: Output phase current measurement fault.
A2B1	2310	Overcurrent. The output current is more than the internal limit. This can be caused by an earth fault or phase loss.
A2B3	2330	Earth leakage. A load unbalance that is typically caused by an earth fault in the motor or the motor cable.
A2B4	2340	Short circuit. There is a short circuit in the motor or the motor cable.
	3130	Input phase loss. The intermediate DC circuit voltage oscillates.
	3181	Cross connection. The input and motor cable connections are incorrect.
A3A1	3210	DC link overvoltage. There is an overvoltage in the intermediate DC circuit.
A3A2	3220	DC link undervoltage. There is an undervoltage in the intermediate DC circuit.
	3381	Output phase loss. All three phases are not connected to the motor.
A5A0	5091	Safe torque off. The Safe torque off (STO) function is on.
	6681	EFB communication loss. Break in embedded fieldbus communication.
	7510	FBA A communication. Communication lost between drive and fieldbus adapter.
AFF6		Identification run. The motor ID run occurs at the next start.
FA81		Safe torque off 1. The Safe torque off circuit 1 is broken.
FA82		Safe torque off 2. The Safe torque off circuit 2 is broken.

For the complete list of warnings and faults, refer to the *ACS380 Firmware manual* (3AXD50000029275 [English]).

Ratings

IEC ratings

Type ACS380-04xx	Input rating	Input with choke	Max. current	Output ratings						Frame size
				Nominal use		Light-duty use		Heavy-duty use		
	I_{1N}	I_{1N}	I_{max}	I_N	P_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	A	kW	A	kW	A	kW	
1-phase U_N = 200…240 V										
02A4-1	5.0	4.2	3.2	2.4	0.37	2.3	0.37	1.8	0.25	R0
03A7-1	7.8	6.4	4.3	3.7	0.55	3.5	0.55	2.4	0.37	R0
04A8-1	10.1	8.3	6.7	4.8	0.75	4.6	0.75	3.7	0.55	R1
06A9-1	14.5	11.9	8.6	6.9	1.10	6.6	1.10	4.8	0.75	R1
07A8-1	16.4	13.5	12.4	7.8	1.5	7.4	1.5	6.9	1.1	R1
09A8-1	20.6	17.0	14.0	9.8	2.2	9.3	2.2	7.8	1.5	R2
12A2-1	25.6	21.1	17.6	12.2	3.0	11.6	3.0	9.8	2.2	R2
3-phase U_N = 200…240 V										
02A4-2	3.8	2.4	2.2	2.4	0.37	2.3	0.37	1.2	0.25	R1
03A7-2	5.9	3.7	3.2	3.7	0.55	3.5	0.55	1.8	0.37	R1
04A8-2	7.7	4.8	6.7	4.8	0.75	4.6	0.75	3.7	0.55	R1
06A9-2	11.0	6.9	8.6	6.9	1.1	6.6	1.1	4.8	0.75	R1
07A8-2	12.5	7.8	12.4	7.8	1.5	7.4	1.5	6.9	1.1	R1
09A8-2	15.7	9.8	14.0	9.8	2.2	9.3	2.2	7.8	1.5	R1
12A2-2	19.5	12.2	17.6	12.2	3.0	11.6	3.0	9.8	2.2	R2
17A5-2	28.0	17.5	22.0	17.5	4.0	16.7	4.0	12.2	3.0	R3
25A0-2	40.0	25.0	31.5	25.0	5.5	24.2	5.5	17.5	4.0	R3
032A-2	51.2	32.0	45.0	32.0	7.5	30.8	7.5	25.0	5.5	R3
048A-2	76.8	48.0	57.6	48.0	11.0	46.2	11.0	32.0	7.5	R4
055A-2	88.0	55.0	86.4	55.0	15.0	52.8	15.0	48.0	11.0	R4
3-phase U_N = 380…480 V										
01A8-4	2.9	1.8	2.2	1.8	0.55	1.7	0.55	1.2	0.37	R0
02A6-4	4.2	2.6	3.2	2.6	0.75	2.5	0.75	1.8	0.55	R1
03A3-4	5.3	3.3	4.7	3.3	1.1	3.1	1.1	2.6	0.75	R1
04A0-4	6.4	4.0	5.9	4.0	1.5	3.8	1.5	3.3	1.1	R1
05A6-4	9.0	5.6	7.2	5.6	2.2	5.3	2.2	4.0	1.5	R1
07A2-4	11.5	7.2	10.1	7.2	3.0	6.8	3.0	5.6	2.2	R1
09A4-4	15.0	9.4	13.0	9.4	4.0	8.9	4.0	7.2	3.0	R1
12A6-4	20.2	12.6	16.9	12.6	5.5	12.0	5.5	9.4	4.0	R2
17A0-4	27.2	17.0	22.7	17.0	7.5	16.2	7.5	12.6	5.5	R3
25A0-4	40.0	25.0	30.6	25.0	11.0	23.8	11.0	17.0	7.5	R3
032A-4	45.0	32.0	45.0	32.0	15.0	30.5	15.0	25.0	11.0	R4
038A-4	50.0	38.0	57.6	38.0	18.5	36.0	18.5	32.0	15.0	R4
045A-4	56.0	45.0	68.4	45.0	22.0	42.8	22.0	38.0	18.5	R4
050A-4	60.0	50.0	81.0	50.0	22.0	48.0	22.0	45.0	22.0	R4

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NEMA ratings

Type ACS380-04xx	Input rating	Input with choke	Output ratings				Frame size
			Nominal use		Heavy-duty use		
	I_{1N}	I_{1N}	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	hp	A	hp	
3-phase U_N = 460 V (440…480 V)							
01A8-4	2.6	1.6	1.6	0.75	1.1	0.50	R0
02A6-4	3.4	2.1	2.1	1.0	1.6	0.75	R1
03A3-4	4.8	3.0	3.0	1.5	2.1	1.0	R1
04A0-4	5.4	3.4	3.5	2.0	3.0	1.5	R1
05A6-4	7.7	4.8	4.8	2.0	3.4	2.0	R1
07A2-4	9.6	6.0	6.0	3.0	4.0	2.0	R1
09A4-4	12.2	7.6	7.6	5.0	4.8	3.0	R1
12A6-4	17.6	11.0	11.0	7.5	7.6	5.0	R2
17A0-4	22.4	14.0	14.0	10.0	11.0	7.5	R3
25A0-4	33.6	21.0	21.0	15.0	14.0	10.0	R3
032A-4	37.9	27.0	27.0	20.0	12.0	15.0	R4
038A-4	44.7	34.0	34.0	25.0	27.0	20.0	R4
045A-4	49.8	40.0	40.0	30.0	34.0	25.0	R4
050A-4	50.4	42.0	42.0	30.0	40.0	30.0	R4

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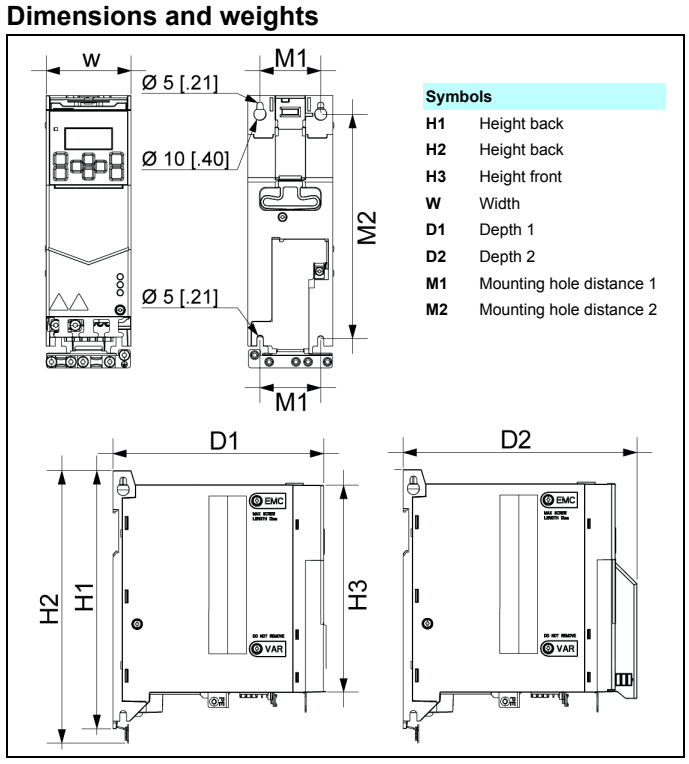
Fuses

For more information on fuses, circuit breakers and manual motor protectors, refer to the *ACS380 Hardware manual* (3AXD50000029274 [English]).

Dimensions and weights



Frame size	Dimensions and weights																	
	H1		H2		H3		W		D1		D2		M1		M2		Weight	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb
R0	205	8.07	223	8.78	170	6.69	70	2.76	174	6.85	191	7.52	50	1.97	191	7.52	1.4	3.1
R1	205	8.07	223	8.78	170	6.69	70	2.76	174	6.85	191	7.52	50	1.97	191	7.52	1.6	3.5
R2	205	8.07	223	8.78	170	6.69	95	3.74	174	6.85	191	7.52	75	2.95	191	7.52	1.9	4.2
R3	205	8.07	223	8.78	170	6.69	169	6.65	181	7.13	191	7.52	148	5.83	191	7.52	2.9	6.4
R4	205	8.07	240	9.45	170	6.69	260	10.24	181	7.13	191	7.52	238	9.37	191	7.52	5.8	12.8

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Free space requirements

Frame size	Free space required					
	Above		Below		Sides	
	mm	in	mm	in	mm	in
R0-R4	75	2.95	75	2.95	0	0

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Ambient conditions

Requirement	During operation (installed for stationary use)
Installation altitude	**230 V units**: 0...2000 m above sea level (with derating above 1000 m) **400 V units**: 0...4000 m above sea level (with derating above 1000 m)(1
Air temperature	-10...+50 °C (14...122 °F). Up to +60 °C with derating (except R0). No frost allowed.
Relative humidity	Up to 95% without condensation
Contamination levels (IEC 60721-3-3)	Class 3C2
	Class 3S2
Shock (IEC 60068-2-27, ISTA 1A)	Not allowed
Free fall	Not allowed

1) Up to 4000 m altitude is possible for 400 V units when these conditions are taken into account:

- The maximum switching voltage for integrated Relay Output 1 is 30 V at 4000 m (for example, do not connect 250 V to Relay Output 1).
- With the BREL-01 side option module, the maximum potential difference between adjacent relays is 30 V (for example, do not connect 250 V to Relay Output 2 and 30 V to Relay Output 3).
- If the conditions are not met, the maximum installation altitude is 2000 m.
- For a 3-phase 400 V drive at 2000...4000 m, only the following power systems are permitted: TN-S, TN-c, TN-CS, TT (not corner earthed).

Certifications

The applicable certifications are shown on the product's type label.

CE marking · EAC marking · UL marking · TÜV Nord marking · RCM marking

Declaration of conformity

Power and productivity for a better world™

EU Declaration of Conformity

Low Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU

We

Manufacturer: ABB Oy
Address: Hiomotie 13, 00380 Helsinki, Finland.
Phone: +358 10 22 11

declare under our sole responsibility that the following product

Frequency converter

ACS380-04xx (frames R0 – R2, 1ph 200 - 240Vac)
ACS380-04xx (frames R0 – R4, 3ph 380 - 480Vac)
ACS380-04xx (frames R1 – R4, 3ph 200 – 240Vac)

is in conformity with the relevant requirements of Low Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU, provided that the equipment is selected, installed and used according to given instructions.

The following harmonized standards have been applied:

EN 61800-5-1:2007	*Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy*
EN 61800-3:2004 + A1:2012	*Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods*

The product referred in this Declaration of conformity fulfils the relevant provisions of other European Union Directives which are notified in Single EU Declaration of conformity 3AXD10000495941.

Helsinki, 23rd March 2018

Manufacturer representative:

Vesa Kandell
Vice President, ABB Oy

Related documents

Document	Code (English)
ACS380 User interface guide	*3AXD50000022224 [English]*
ACS380 Hardware manual	*3AXD50000029274 [English]*
ACS380 Firmware manual	*3AXD50000029275 [English]*

Online list of the manuals applicable to this product:

Online videos related to the installation of this product:

https://www.youtube.com/watch?v=L-rGHZ8I1zg
https://www.youtube.com/watch?v=nICGj9ntzA0
https://www.youtube.com/watch?v=0aTWO7U2fas

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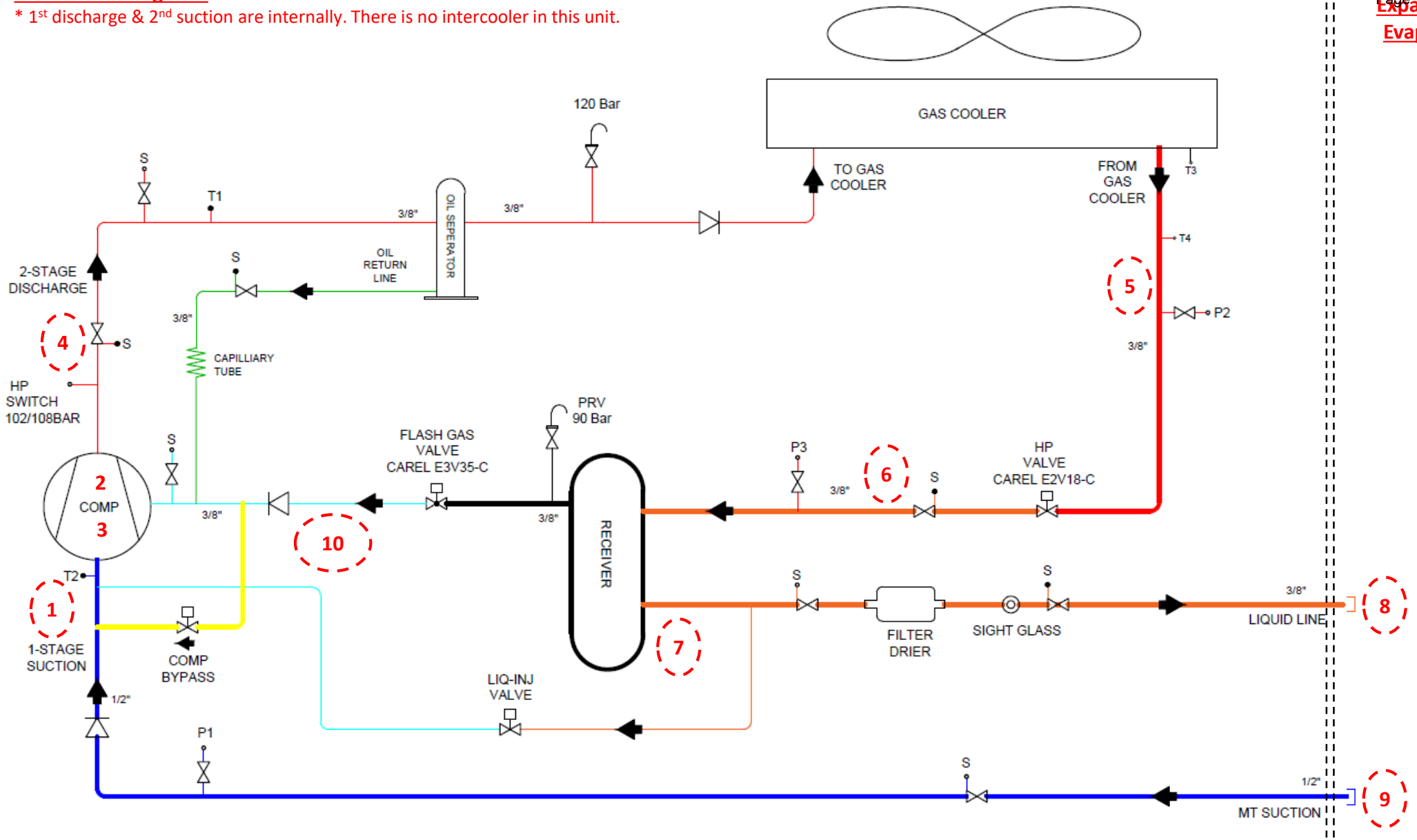
P4367 Rev 01

8. PRESSURE & ENTHALPY DIAGRAM FOR R744 REFRIGERANT

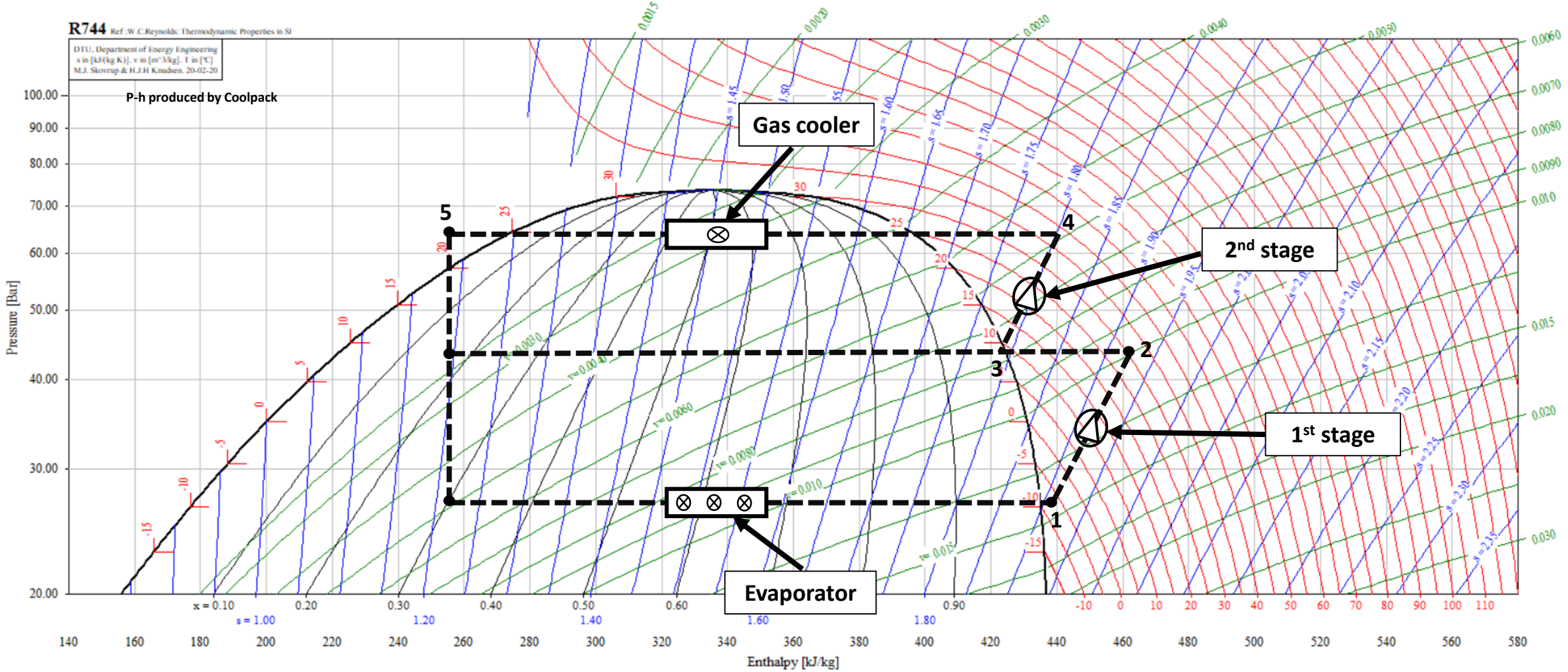
4HP Condensing Unit

* 1st discharge & 2nd suction are internally. There is no intercooler in this unit.

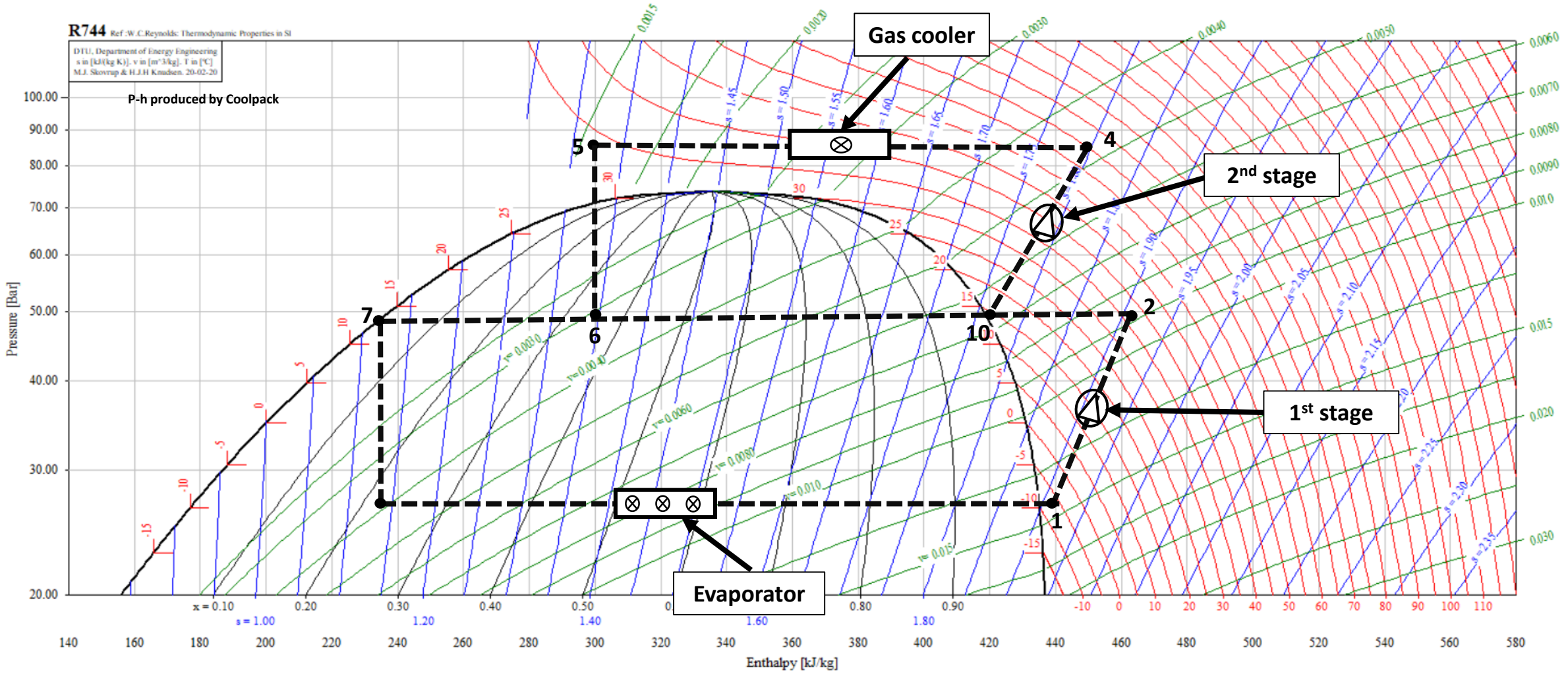
Expansion & Evaporator



R744 (CO2) P-h Diagram - Subcritical



R744 (CO2) P-h Diagram - Transcritical



9. Commissioning Form

CO2 Hermetic Rotary Condending Unit
COMMISSIONING FORM

MODEL		**SERIAL No**		**DATE:**
Site address				
Initial Refrigerant Charge				kg
Initial Oil Charge				kg
Pipe length to evap.				m.
Comments				

Compressor					
Oil Level correct	Oil / Refrigerant ≥ 35 (wt %)			Y/N	
HP switch					bar
Crankcase heater					
Line 1 current					amps
Line 2 current					amps
Line 3 current					amps
Overload 1 set	amps	Overload 2 set		Star / Delta timer set	
Gas cooler fan 1 current					amps
Lt Suction set piont		Mt Suction set point		MT Suction Pressure	Bar
Ambient probe position		HP safety set point		Ambient temp	°C
HPV correct operation		RPRV correct operation			
Discharge pressure	Bar	Gas cooler probe position			
Gas cooler pressure	Bar	Gas cooler outlet temp	°C		
MT discharge temp	°C	Receiver set piont			
Refrigerant level correct		Comp. Inverter healthy			
Oil added to system	Litres				
Discharge PRV					Bar
Reciever PRV					Bar
PRV labels stamped					Y/N
	Comments				Y/N
Listen for unuseual noises					
Control alarms cleared					
Clean pack					
Fit all panels					
Name:		Signature:		Date:	

CO2 Hermetic Rotary Condending Unit
COMMISSIONING FORM

Additional Comments

Name:	Signature:	Date:

ECO Design

Directive 2009/125/EC

Model	**HCU2040PXB1**		
Refrigerant	**R744**		
Item	Symbol	Value	Units
Evaporating Temperature	t	-35	°C
Annual electricity consumption	Q	15,046	kWh/a
Seasonal energy performance ratio	SEPR	1.50	
Parameters at full load and ambient temperature at 32°C			
Rated cooling capacity	P_A	3.03	kW
Rated power input	D_A	3.79	kW
Rated COP	COP_A	0.80	-
Parameters at full load and ambient temperature at 25°C			
Rated cooling capacity	P_B	2.90	kW
Rated power input	D_B	2.84	kW
Rated COP	COP_B	1.02	-
Parameters at full load and ambient temperature at 15°C			
Rated cooling capacity	P_c	2.70	kW
Rated power input	D_C	1.97	kW
Rated COP	COP_C	1.37	-
Parameters at full load and ambient temperature at 5°C			
Rated cooling capacity	P_D	2.40	kW
Rated power input	D_D	1.22	kW
Rated COP	COP_D	1.97	-
Parameters at full load and ambient temperature at 43°C			
Rated cooling capacity	P_3	2.27	kW
Rated power input	D_3	3.91	kW
Rated COP	COP_3	0.58	-
Other items:			
Capacity control	Fixed		
Contact details			

11. Evaporator Installation Guide

Information relates to the following models, please review and read carefully as contains important safety information.

Hubbard Rotary Condensing Units are NOT supplied with Suction Pressure Relief Valves. These will need to be installed on the field pipework near the condensing unit in a safe location, this PRV must be securely clamped in position not just connected to the pipework.

MEDIUM TEMPERATURE Rotary Condensing Units	MT 2 HP Rotary CCU	GCU2020PXB1
	MT 4 HP Rotary CCU	GCU2040PXB1
	MT 10 HP Rotary CCU	GCU4070PXB1
	MT 20 HP Rotary CCU	GCU5140PXB1
LOW TEMPERATURE Rotary Condensing Units	LT 2 HP Rotary CCU	HCU2020PXB1
	LT 4 HP Rotary CCU	HCU2040PXB1
	LT 20 HP Rotary CCU	HCU5140PXB1

IMPORTANT NOTE:

Consider only the max allowable pressures (PS) for standstill operation or in the event of a mains power failure.

Pressure Relief Valves (PRV's) and Pressure Safety Switches (PSS) are installed on the unit in accordance with recommendations detailed in EN378.

CONDENSING UNIT PRV'S & MAXIMUM OPERATING PRESSURES:

PRV Ratings & Maximum Design Temperatures for each model, Hubbard Rotary **Condensing Units are NOT supplied with Suction PRV's**, please see details on the next pages.

MODEL	DESCRIPTION	DISCHARGE PRV	INTERMEDIATE PRESSURE PRV	SUCTION PRESSURE RATING	MAXIMUM LIQUID RUNNING PRESSURE
HCU2020PXB1	LT 2 HP CCU	None Fitted	90 Bar(g)	90 Bar(g)	71 Bar(g)
HCU2040PXB1	LT 4 HP CCU	120 bar(g)	90 Bar(g)	90 Bar(g)	71 Bar(g)
HCU4070PXB1	LT 10 HP CCU	120 bar(g)	80 Bar(g)	80 Bar(g)	67 Bar(g)
HCU5140PXB1	LT 20 HP CCU	120 bar(g)	80 Bar(g)	80 Bar(g)	67 Bar(g)

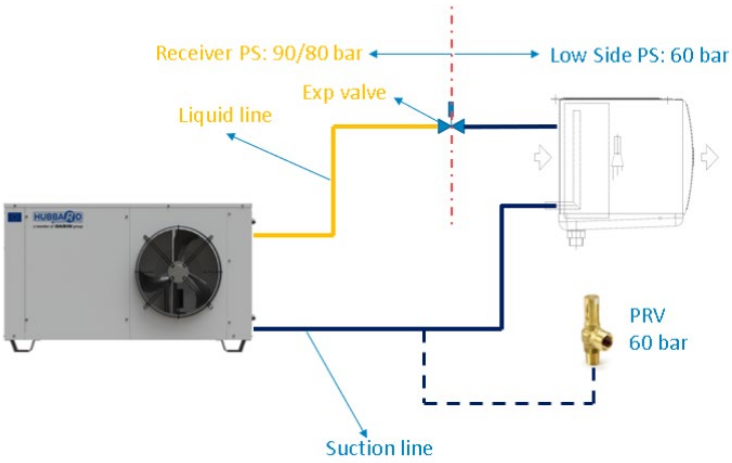
MODEL	DESCRIPTION	DISCHARGE PRV	INTERMEDIATE PRESSURE PRV	MAXIMUM RUNNING RATING	MAXIMUM LIQUID RUNNING PRESSURE
GCU2020PXB1	MT 2 HP CCU	None Fitted	90 Bar(g)	90 Bar(g)	71 Bar(g)
GCU2040PXB1	MT 4 HP CCU	120 bar(g)	90 Bar(g)	90 Bar(g)	71 Bar(g)
GCU4070PXB1	MT 10 HP CCU	120 bar(g)	80 Bar(g)	80 Bar(g)	67 Bar(g)
GCU5140PXB1	MT 20 HP CCU	120 bar(g)	80 Bar(g)	80 Bar(g)	67 Bar(g)

DEFINITIONS:

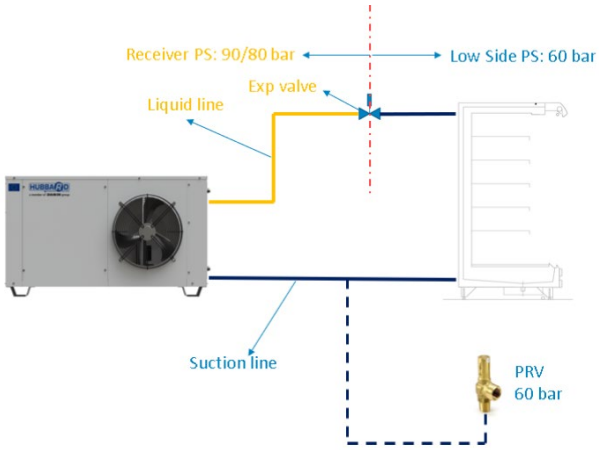
Max Allowable Gas Temperatures (TS):	All units CO_2 operation temperatures -45°C to +130°C
Maximum operating Temperature (Tamb):	Designed & tested to a maximum of +43°C
Maximum Running Pressure:	Liquid pressure relationship based on Tamb +43°C
Max Liquid Pressure:	Refers to liquid line pressure (before expansion valve) at the highest ambient temperature of 43°C.
Pressure Rating (PS):	The safety rating of the line components such as Solenoid Valves, Thermal Expansion Valves, Sight Glass evaporators, Ball Valves etc.

Fig.1: 60 BAR PS RATING ALL EVAPORATORS (Coldroom or Display Cabinet Evaporators)

COLDROOM EVAPORATORS



DISPLAY SHOWCASE EVAPORATORS



LOW PRESSURE SIDE: All Field and Evaporator Pipework, Expansion Valves, Evaporators, Line Components etc. **MUST** have a **MINIMUM PS rating**:

MODEL	EVAPORATOR COIL	SUCTION LINE	SUCTION LINE COMPONENTS	SUCTION PRV REQUIRED?	SUCTION PRV RATING
HCU2020PXB1 HCU2040PXB1 GCU2020PXB1 GCU2040PXB1	60 Bar(g)	60 Bar(g)	60 Bar(g)	YES	60 Bar(g)
HCU4070PXB1 HCU5140PXB1 GCU4070PXB1 GCU5140PXB1	60 Bar(g)	60 Bar(g)	60 Bar(g)	YES	60 Bar(g)

HIGH PRESSURE SIDE: All Field and Evaporator Pipework, Valves, etc. **MUST** have a **MINIMUM PS rating**:

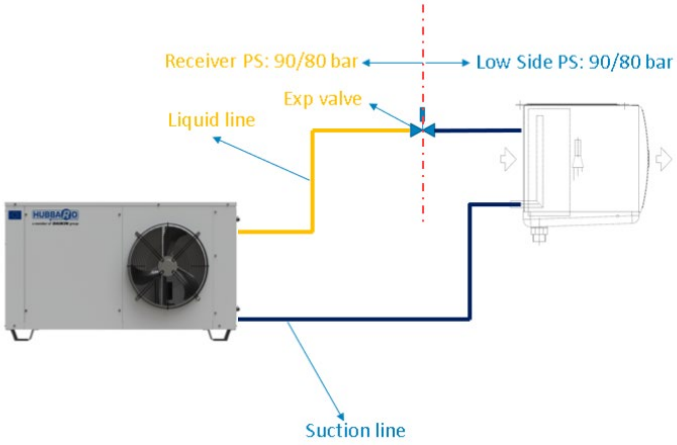
MODEL	LIQUID LINE*	EXPANSION VALVE	LIQUID LINE COMPONENTS	SUCTION PRV REQUIRED?	SUCTION PRV RATING
HCU2020PXB1 HCU2040PXB1 GCU2020PXB1 GCU2040PXB1	90 Bar(g)	90 Bar(g)	90 Bar(g)	YES	60 Bar(g)
HCU4070PXB1 HCU5140PXB1 GCU4070PXB1 GCU5140PXB1	80 Bar(g)	80 Bar(g)	80 Bar(g)	YES	60 Bar(g)

LIQUID LINE PRE-INSTALLED TAILS & EXPANSION VALVES*

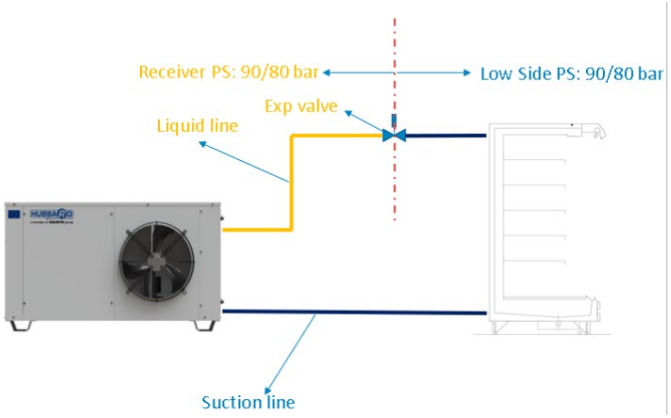
If the evaporator is supplied with pipework tails to connect the field pipework to the Refrigerated Display Cabinet (i.e. the tails installed from the ball valve connection on the top or underside of the display cabinets). The length of liquid line pipework between the connection point and the inlet of the expansion device MUST be the correct pressure rating.

Fig.2: 80 or 90 BAR PS RATING ALL EVAPORATORS (Coldroom or Display Cabinet Evaporators)

COLDROOM EVAPORATORS



DISPLAY SHOWCASE EVAPORATORS



LOW PRESSURE SIDE: All Field and Evaporator Pipework, Expansion Valves, Evaporators, Line Components etc. **MUST** have a **MINIMUM PS rating**:

MODEL	EVAPORATOR COIL	SUCTION LINE	SUCTION LINE COMPONENTS	SUCTION PRV REQUIRED?	SUCTION PRESSURE RATING
HCU2020PXB1 HCU2040PXB1 GCU2020PXB1 GCU2040PXB1	90 Bar(g)	90 Bar(g)	90 Bar(g)	NO	90 Bar(g)
HCU4070PXB1 HCU5140PXB1 GCU4070PXB1 GCU5140PXB1	80 Bar(g)	80 Bar(g)	80 Bar(g)	NO	80 Bar(g)

HIGH PRESSURE SIDE: All Field and Evaporator Pipework, Valves, etc. **MUST** have a **MINIMUM PS rating**:

MODEL	LIQUID LINE*	EXPANSION VALVE	LIQUID LINE COMPONENTS	SUCTION PRV REQUIRED?	SUCTION PRESSURE RATING
HCU2020PXB1 HCU2040PXB1 GCU2020PXB1 GCU2040PXB1	90 Bar(g)	90 Bar(g)	90 Bar(g)	NO	90 Bar(g)
HCU4070PXB1 HCU5140PXB1 GCU4070PXB1 GCU5140PXB1	80 Bar(g)	80 Bar(g)	80 Bar(g)	NO	80 Bar(g)

LIQUID LINE PRE-INSTALLED TAILS & EXPANSION VALVES*

If the evaporator is supplied with pipework tails to connect the field pipework to the Refrigerated Display Cabinet (i.e. the tails are installed from the ball valve connection on the top or underside of the display cabinets). The length of liquid line pipework between the connection point and the inlet of the expansion device MUST be the correct pressure rating.