GALILEO TP
PROCESS EQUIPMENT

CERTUS

AUTOMATIC EVACUATING AND HYDROCARBONS CHARGING EQUIPMENT

INSTRUCTIONS FOR USE AND INSTALLATION

Translated from original code: 8.023.0.005_rev13

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SOMMARIO

1 INTRODUCTION

1.1 GENERAL RULES

This typology of plants has been engineered and manufactured to be used on refrigerant equipment lines (refrigerators, freezers, etc.) in order to vacuum, detect possible leaks or clogs in the circuit and naturally, to charge them with the appropriate refrigerant.
The plant is made to respond to requirements of productions with accurate doses. The plant is designed to be used on production with high level of cadency even with automated lines.
The plant is constituted by a single cabinet that contain all the functional parts:

- electronic control unit with microprocessor;
- user interface system with 7" touch screen display;
- vacuum line for the evacuation of the refrigerant circuits;
- dosing system for HC, CFC, HCFC, HFC and mixture
- fillers for the charge of refrigerant fluid

The instruction contained in the following manual will illustrate how to operate, install and service the equipment.
Maintenance and installation operations must be performed solely by trained and skilled persons (technicians with electronic, electrical and mechanical background) who have fully read and understood this use and installation manual.

The heads of departments, where the plant will be installed have an obligation, under current rules carefully read the contents of this manual and read it to the operators and maintenance personnel, for the parties to which they compete.

The manufacturer reserves the right to modify and upgrade the equipment without communication.
For any information contact customer service via service@galileotp.com.

MANUFACTURERS WILL BE NOT HELD RESPONSIBLE FOR:

- Use of the system by not properly trained personnel.
- Incorrect use of the equipment.
- Incorrect installation.
- Defects of electrical and/or refrigerant and compressed air supply not in accordance with the technical data mentioned in TECHNICAL CHARACTERISTICS.
- Inobservance of the maintenance criteria.
- Non-authorized modifications and/or interventions.
- Use of non-original or non-specific spare parts.
- Inobservance of the instructions.

1.2 TECHNICAL CHARACTERISTICS

N° of charging fillers	1
Length of the fillers	3.5 m (others on request)
Programmable cycles number	200 (more on request)
Connection type to the refrigerating circuit	¼", 3/8" Hansen™ female quick coupler Pipe sealer (for smooth pipes with outer diameter 6 mm) PCU models 61, 71 series 250 Nitto SP CUPLA type A ¼", 3/8"
N° of dosing systems	1 ÷ 2 depending on the model
Type of dosing system	Volumetric dosing system with single effect Displacement 130 cm^3 (≈70 g R600a o ≈150 g R134a)
Programmable barcodes number	1000 (more on request)
Programmable measurement units **Weight** **Vacuum** **Pressure** **Temperature**	 g, oz Pa, µHg, mbar kPa, psi, bar °C, °F
Vacuum pump	Double stage, 18 m^3/h (other on request)
Pump final vacuum	<$1x10^{-2}$ Pa ($1x10^{-4}$ mbar)
Dimensions (HxWxD)	1350x700x810 mm
Weight	222 kg (model C12)
Work temperature	0 ÷ +50 °C
Storage temperature	-20 ÷ +70 °C
Electric supply voltage	Δ 200 ÷ 230 / Y 380 ÷ 415 V 50 Hz 3 Ph Δ 200 ÷ 230 / Y 460 V 60 Hz 3 Ph (other on request)
Power consumption	900 W
Compressed Air	600 ÷ 800 kPa (6÷8 bar) The air must be filtered to 20µ and dehumidified
Noise Level	< 70 dB (A)
Refrigerants	HC, CFC, HCFC, HFC, new mixtures
Refrigerant supply pressure	1000 ÷ 2800 kPa (10 ÷ 28 bar)
Maximum rerigerant working pressure	3800 kPa (38 bar)
Programmable Charge	10.0 ÷ 99999.9 g
Minimum charging increase	0.1 g
Accuracy HC (doses<100 g) **Accuracy HC (doses >100 g)**	±0.5 g (@25 bar) ±0.5 % (@25 bar)
Accuracy HFC (doses <200g) **Accuracy HFC (doses >200 g)**	±1.0 g (@25 bar) ±0.5 % (@25 bar)
Maximum charging speed	Up to 45 g/s (with R134a a 25 °C, density ≅ 1,2 kg/m^3) Up to 35 g/s (with R600a a 25 °C, density ≅ 0,6 kg/m^3)

1.3 SYMBOLS, CONTROLS and CONVENTIONS

This symbol identifies operations that - if not executed according to the instructions – might damage the equipment or injure the people working at it.

Operator's commands:
The equipment is provided with touch screen monitor, so the operator can send commands by typing directly on the monitor.

In the programming procedures the default values are indicated:
The term **default** indicates the values automatically loaded by the program at the first ignition or after the manual reset of the memory. These values can be left unchanged or be modified by the user according to his own requirements.

1.4 STORAGE, HANDLING, MOVING, DISMANTLING AND SCRAPPING

If not in use for long periods of the plant, storage or transport, it is essential to proceed first to the disconnection of all sources and run the discharge of all refrigerants in it.
The equipment should be stored in a place sheltered from bad weather and direct heat sources. Places with condensing vapours should also be avoided (the allowed temperatures are indicated among the technical characteristics. Should the equipment be stored for a long period, it would be expedient to cover it and to introduce a hygroscopic salt bag inside each box. We also suggest placing the equipment on a pallet, so that it does not stand directly on the ground

For long trips and / or for the overcoming of obstacles you need to use a trans-pallet or forklift with a minimum capacity of 500 kg by inserting the forks under the base of the plant.
The plant must be transported and stored in a vertical position otherwise could be a leak of oil of the vacuum pump.

WARNING: During the transport do not incline the equipment with an angle above 10° to the vertical line to avoid the danger of an overturning. For steeper slopes the equipment should be sling.

To dismantle the system, execute the procedures for automatic unloading, if any. Afterwards disconnect it from all power sources (electric, pneumatic, working fluids) and provide, in accordance with relevant legislation, exhaust, recovery, recycling and/or dismantling of:

- working fluids contained in the pipes.
- oil contained in the vacuum pump.

WARNING: During the dismantling take care about pressurized fluids that may be trapped in the pipes.

To scrap the plant call on specialized companies for disposal in compliance with current regulations.

1.5 SECURITY AND CONTROLS

1.5.1 CONSTRUCTION STANDARDS

The whole electrical supply and control part has been manufactured in compliance with the EN60204-1 standards, (Electrical equipment of machines). The electrical components installed inside the dangerous zones are in accordance to EN50014 standards (Electrical apparatus for potentially explosive atmospheres - General requirements), EN60079-10 (Explosive atmospheres. Classification of areas. Explosive gas atmospheres), EN 60079-17 (Explosive atmospheres. Electrical installations inspection and maintenance), EN60079-14 (Electrical apparatus for explosive gas atmospheres. Part 14: Electrical installations in hazardous areas (other than mines) and particularly in appliance with the following standards:

- EN60079-11 (Explosive atmospheres. Equipment protection by intrinsic safety "i"). These systems have been used to interface all ports from AD zone with the electrical control system.
- EN60079-7(Explosive atmospheres. Equipment protection by increased safety "e") and EN60079-18 (Electrical apparatus for explosive gas atmospheres. Construction, test and marking of type of protection encapsulation "m" electrical apparatus). These systems have been used for the vacuum pump engine and for the actuators installed in the hazardous zones.

The cabinet part containing the electrical supply and control devices is tight and completely separated from the rest of the equipment. The eventual presence of inflammable gas is avoided by the suction system inside the dosing section.

1.5.2 ELECTRICAL SAFETY DEVICES

Safety devices are placed on the power electric panel and are accessible by opening the rear door of the equipment:

- FUSES:
  FS1 and FS2 = T2A 500V 6,3x32 (1500A). They are used for the protection of the transformer's primary, which supplies the solenoid valves and the 220 VAC apparatus. The indicated values refer to the equipment supplied with a voltage of 380V 3ph 50Hz.
  FS3 = T2A 500V 6,3x32 (1500A). It is used for the 220 Volt secondary of the transformer supplying the electronic rack and the 220 Volt uses.
  FS4 = T2A 250V 5x20 (1500A) IEC127. It is used for the protection of the 24 Volt secondary of the transformer supplying the solenoid valves.
  FS5 = T5A 250V 5x20 (1500A) IEC127. It is used for the protection of the 24 Volt secondary of the transformer supplying the general ON/OFF switch of the equipment.
  FS6 = T1A 250V 5x20 (1500A) IEC127. It is used for the protection of the 24 Volt secondary of the transformer supplying the solenoid valves.
  FS7 = T1A 250V 5x20 (1500A) IEC127 It is used for the protection of the shut off valve.

- CONTACTOR:
  K1 = contactor K1 is used for the cutting of the power to the pump and for the retention / release of the control signals the start / stop of the plant.

- MAGNETOTHERMIC SWITCH:
  IA1 = It is used for the magnetothermic protection of the vacuum pump engine.

1.5.3 MECHANICAL SAFETY DEVICES

Safety devices for pressure build-up are mounted on each of the dosing cylinders and corresponding exhausts are configured to release externally.
Access to the dosing systems can be obtained by opening the door on the lower side of the machine:

- Safety Valves:
  SV50, SV60: regulated at 38 barg[1], exhaust capacity 313 Nl/min.

1.5.4 OPERATING BUTTONS

The operating panel and buttons utilize non hazardous electrical tensions (max 24 VAC):

- Display for diagnostics and operation.

- Red mushroom shaped button to deactivate the machine. Once pressed, it will be necessary to pull out to reactivate.

- Switch positioned on the back side door. When positioned on “0 OFF” the electrical voltage is blocked. **The voltage is present only on the connection cable of the electrical plug**. It is hence necessary to unplug the electrical cord before operating on the supply line.

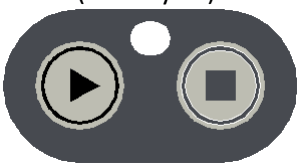
Switch position to “I ON” position to supply electricity to the machine

[1] Barg = bar gauge = relative bar

Switch position to “I OFF” position to switch off the power to the machine

- Start button on the control panel marked with "**I**".

- START (start cycle) and EXIT (exit alarms) button positioned on the filler.



1.6 INTERCEPTING VALVE WITH SUCTION BOX (codice 2.002.2.500)

"Intercepting valve with suction box kit" is a necessary device that grants the safety of the charging area of a flammable refrigerant charging machine.
Through its use it is possible to limit the extension of the dangerous area relevant to the sectioning valves of the refrigerant fluid distribution line inside a closed container (in case the ventilation system is properly proportioned). This way the dangerous zone is prevented to interest any other equipment near the charging machine (par. 1.7.4.4).
The result is the only sources of danger for the area around the machine are:

- The filler (par.1.7.4.2)
- The refrigerator group charged with refrigerant until the welding station.

A metallic cabinet whose dimensions are 400 x 600 x 250 composes the kit.
This cabinet is connected to the dosing box of the plant charging machine by a flexible hose (diameter 60 mm). Through this hose the cabinet and the dosing box are kept under constant depression by the centralized suction system (not provided). Each group "interception valve with aspired box" can be connected to one or two dosing systems of the charging machine, if they uses the same refrigerant. Therefore a possible gas leak from one of the valves inside the cabinets is immediately sucked out. Inside the machine lower cabinet there must be a gas sensor, which will give a pre-alarm or an alarm level according to the flammable gas concentration detected.

Inside the sectioning valve cabinet there are:

- Pneumatic sectioning valve of the adduction refrigerant line. The charging machine controls this valve, which closes automatically when the charging machine is electrically switched off. In case of a gas alarm the supervision system (not provided) has to take off the electrical supply to the charging machine, then the above valve stops the refrigerant fluid flow to the charging unit.
- Manual sectioning valve of the flammable refrigerant adduction line. This valve has to be used each time the production stops to provide a better safety level to the equipment.
- Two safety valves at 38 bar. These valves open in case the refrigerant fluid liquid pressure inside the hose gets over 38 bar (due to temperature variations); the discharge line of these valves has to be ducted outside the building, in a safe area; this area is continuously controlled by means of a thermostat, which is able to detect leaks from the overpressure valves by detecting the temperature fall down caused by the refrigerant evaporation.
- Mechanical Refrigerant fluid filter (filter capacity 10 μm).
- A differential pressure switch, which checks on the depression level inside the cabinet and the dosing box of the charging machine. The lack of the minimum depression level might depend on:
    - A large refrigerant leak;
    - An inefficient aspiration system;
    - Leak of the minimum hermetic level of the cabinet (i.e. a door which opens).

  If the depression level is not enough (due to a break in the aspiration system hose or to a large leak), the supervision system (not provided) has to issue an alarm condition.

The machine could be provided also without the "Intercepting valve with suction box" group, but only in case of a small gas supply line and reservoir (such as a small tank located near the machine).

In any case, a qualified designer must validate the safety of the area, in accordance with the relevant regulations in force in the country of installation.

1.7 DEFINITION AND CLASSIFICATION OF THE HAZARDOUS AREAS AROUND THE EQUIPMENT

1.7.1 CLASSIFICATION METHOD OF THE HAZARDOUS AREAS AND OF THE ELECTRICAL EQUIPMENT INSPECTION

The classification of the hazardous areas is made according to the standard EN 60079-10 “Explosive atmospheres. Classification of areas. Explosive gas atmospheres”.
Referring to the standard EN 60079-10 it is possible, by the known released gas quantity and present ventilation, to calculate the “hypothetical volume Vz“. This volume allows an approximately valuation of the hazardous area created by the considered emission.
At the limit of such area, the gas concentration or vapour is considerably lower than LEL; that is the hypothetical volume (where the concentration is higher than LEL), is lower than Vz.

For that purpose, it is used the following formula:

$$V_z = \frac{Q}{k \cdot LEL \cdot C}$$

where:

Vz	=	hypothetical volume (m^3)
Q	=	release rate (m^3/h)
k	=	0.25/0.5 safety factor
C	=	number of air change for time unit (1/h)
LEL	=	lower explosive limit

The mentioned standard refers only to the general criterion for the valuation of the hazardous area extension. To define the alarm area and the safety criterion to be adopted inside the factory you must consider each single operative contest. In view of this fact, we have followed the indications of standard CEI 64-2, as suggested by standard CEI EN60079-10.
As to the electrical equipment conformity to the area classification, for the hazardous areas included in the application field of the standard, the selection of the electrical equipment models must be carried out according to the table IV of the standard CEI 64-2, to its modification, to EN60079-10 standard.

1.7.2 FLAMMABLE MATERIAL

The flammable material, hazardous for a possible explosion, is ISOBUTANE (R600a) and PROPANE (R290). The characteristics of the flammable material states at no. 208 of the Table I of the standard CEI 64-2 with the following data:

	ISOBUTANE	**PROPANE**
Density relevant to air	2,01	1,56
Electrical assembly group	IIA	IIA
Switching on temperature	460°C	432°C
Temperature class	T2	T2
Lower explosion limit	1,8 % in volume	2,1 % in volume
Upper explosion limit	8,4 % in volume	9,5 % in volume

The isobutane and propane density relevant to air is upper than 1, therefore the classification is made according to standards and prescriptions relevant to the vapours and heavy gases.

1.7.3 SOURCES OF RELEASE

The sources of releases on the equipment are composed of (see drawing 7.007.0.058):

a) Flanged systems and block/shut off valves, installed in the metering systems box of the equipment.
b) Filler and refrigerator group provided charged and not sealed.
c) Discharging pipes (to be installed by the customer).
d) Sectioning valves of the refrigerant supply line.

As for the sources of release a), b) and d) no leaks are foreseen during the normal functioning, therefore they are considered of 2° grade source of release.
The source of release c) determines emissions during the normal functioning and therefore is considered 1° grade source of release.

1.7.4 CLASSIFICATION AND EXTENT OF EX ZONE

1.7.4.1 Metering systems box

Inside the metering system box there are 2° grade source of release.
During the ventilation system guess we have considered the possibility of the entire refrigerant inside a machine line to be released in about 5 seconds.

A complete line volume from the pneumatic valve of sectioning until the filler is 720 ml (in case there is a sectioning valve kit with suction box – code 2.002.2.500 –). If you consider that isobutane and propane are at gaseous state at normal working temperatures and at atmospheric pressure, the refrigerant quantity released has an approximate volume of 170 l (200 l. of propane) which involves a leak of 122 m^3/h (145 m^3/h for propane). The aspiration system has to be positioned in order not to allow this refrigerant release to get out of the metering system box.
To grant this condition the aspiration system has to be able to keep a depression level even in the phase of maximum refrigerant release. These are the characteristics demanded to grant the E zone is not spreading out of the metering device box.
Capacity: 75 m^3/h (150 m^3/h in case of pre-alarm or alarm);
Depression: 1 mbar (3 mbar);
A gas detector inside the metering system box.

When the Intercepting valve with suction box is not present, the maximum leak is normally given by the maximum flow of the refrigerant transfer pump. This refrigerant flow is lower than the leak previously considered.
In this case, and whenever the leak rate is lower than the suction system flow, the released gas stays confined in the metering system box.

If a leak can produce a temporary lack of depression inside the sucked box, a pressure switch gets involved as well as the gas detection system, which starts an alarm condition that increases the suction speed.

1.7.4.2 Injector

After the injection phase some residual gas inside the filler is released in the discharging conduct to prevent the machine from gas or refrigerant vapour releases in normal use conditions.
However, in case of trouble, the filler might release some refrigerant vapours so it has to be considered a 2° grade source of release. The dangerous area extension due to the filler might be calculated in an hypothetical way with the formula shown at 1.7.1, if you consider a source of release of 122 m^3/h for isobutane (141 m^3/h for propane) and the real functioning of the ventilation system.
The amount of gas that can be released from the injector if the group in charge disconnects from the machine during the injection phase is equal to the programmed quantity of refrigerant in the cycle execution, and can therefore be greater than the quantity contained within a single dosing system.

The hypothetical volume application to the operative reality of the charging machine shall be evaluated for each single case in compliance with the following characteristics:

- Ventilation efficiency
- Efficiency and effectiveness of the diagnostic system of the machine (pressure sensor injector)
- Presence and entity of the air flow inside the factory
- Position and typology of the suction hood
- Functioning logic of the gas monitoring system
- Position and typology of the gas sensors used
- Position and typology of the equipments inside the charging machine
- Position and typology of possible storage areas for isobutane gas (which has a density higher than air).

1.7.4.3 Gas exhaust pipe

At the end of each charge cycle the residual gas inside the filler is discharged into the gas exhaust pipe. Moreover, during the filler discharging procedure, the whole of dosing system content is piped into this hose. Those two operations originate a release condition like the one of a 1st grade source of release.
The leaks of some metering system seals which are piped into the discharging hoses originate a condition like the one of a 2° grade source of release.
The discharging hose has to be piped outside the building.
If this hose is made in compliance with relevant current standards, the hose section is not considered as a source of release. This hypothesis is showing no sources of release inside the building. Dangerous zone around release outside building must be considered. With reference to the dangerous area extension around the release, it is only to be considered the metering device-discharging phase (which is certainly the most critic).

This phase develops the release of a metering device content in air in about one minute. Relevant leak has an average delivery of 110/60 = 1,83 l/s (6,6 m^3/h).

Since the release has to be effected in a natural ventilation environment, C is supposed to have a minimum value of 100 air-changes/h. This value is suggested by the standard concerning very weak ventilation cases (air speed = 0,5 m/s).

As a consequence the Vz volume is:

Vz = 6,6 / (0,25 x 0.018 x 100) = 14,6 m^3

The shape of this dangerous area depends on:

- Chimney high complying to the roof;
  - Presence of leading winds.

1.7.4.4 Sectioning valves installed in the vented box

The interception valve (V1) on refrigerant distribution line is installed inside the sucked box (code 2.002.2.500), and the possible leaks on the isobutane distribution line components are to be managed as leaks inside the metering device box (par.1.7.4.1).
Any possible leak from the sucked box with a delivery capacity lower than the capacity granted by the suction box cannot leave the box. If a leak can produce a temporary lack of depression inside the sucked box, a pressure switch gets involved as well as the gas detection system, which starts an alarm condition that increases the suction speed. When managing big leaks, the pressure switch controlling the aspiration system efficiency of the metering device box as well as the interception valve box grants a faster

involvement of the gas detector. Actually a gas leak inside the sucked boxes is completely managed by the suction system with an increased speed of 150 m^3/h.

2 EQUIPMENT STANDARD USE

2.1 QUALIFICATIONS AND OBLIGATIONS OF EQUIPMENT OPERATOR

The equipment is intended for professional and specific industrial applications, hence it can only be maneuvered by qualified personnel that:

- is not underage;
- is physically and mentally capable to the use and maintenance of the equipment;
- has been trained on the use and maintenance of the equipment;
- has been selected by the employer as capable of performing the required task;
- are capable of understanding the instruction manual, specifically the operational and safety chapters;
- Is informed on safety and emergency measures and capable of performing them;
- Is capable of operating the equipment;
- Is knowledgeable of relating specific norms;
- Has understood the operational procedures indicated by the manufacturer
- Wear protective gloves, glasses, protective clothing covering all the upper and lower limbs of the type provided by law.

2.2 INTENDED USE

The plant is designed and built to be used in production lines of refrigerant systems (refrigerators, freezers, etc.) to execute the evacuation, the search for possible leaks or cloggings present in the circuit and of course to make their fill with the fluid appropriate refrigerant.

Attention: the equipment has been engineered to operate at a maximum inlet pressure of 2800 kPa (28 bar) and at a maximum working (compression/injection) pressure of 3800 kPa (38 bar).
It is allowed to use only refrigerant fluids with vapour pressure lower than the maximum working pressure of the equipment.
These limits must be respected within all the expected temperature range for the equipment.

The system must be protected upstream with suitable protection systems from overpressure.
The operating temperatures of the system are given in par. 1.2; for different conditions please contact the manufacturer.
If used with flammable refrigerant must be met minimum safety requirements specified in par. 3.1.
For proper installation, refer to Chapter 3.

2.3 PREVENTABLE WRONGFUL USE

The equipment may be utilized with different types of refrigerant (HCs, HCFCs, HFCs);
please always contact the manufacturer before utilizing a refrigerant that is different from the one specified on the purchase order.

Attention: in the case of use of the equipment with multiple refrigerants, the selection of the correct refrigerant will depend on how the machine has been programmed. The manufacturer declines any responsibility for the wrong selection of the refrigerant due to wrongful programming.

Attention: make sure that when starting the equipment there are no devices connected to the USB port on the front panel.

2.4 PROHIBITED USE

The manufacturer declines any responsibility deriving from improper use of the equipment

Attention: if the equipment is utilized with flammable refrigerant must be grant the safety condition indicated at chapter 3.2.

2.5 HARZARDOUS AND RESIDUL RISK

During the engineering phase, the various potential hazards, static and dynamic, have been evaluated.

Even so, the following risks can be present in case of improper maneuvering or maintenance of the equipment:

- Cold burns in case of refrigerant leakage;
- High pressure leaks;
- In case of use of combustible refrigerants, work place hazards have to be taken into consideration, in compliance with EN60079-10;
- Risk of electric shock from direct contacts: this risk is present only in case of maintenance operation of the machine as indicated in to the user manual and has to be done by qualified personnel only.

ATTENTION: never aim the injector towards people during work and maintenance operations.

ATTENTION: the operator must wear proper equipment, such as protective gloves, goggles, and the work wear needed to comply with local work regulations.

2.6 HAZARDS INTERACTIONS AMONG MACHINE AUTOMATIC

The failure of the supply circuit of electric power may lead to hazardous situations where the interruption occurs during the various stages of the work cycle, because all actuators are inhibited. In case the injector is connected to a unit that is in motion on an automatic line is necessary to stop the line in case of lack of power supply to the machine.

3 INSTALLATION

3.1 GENERAL INFORMATIONS

WARNING: the operations described in this manual must only be performed by qualified personnel, hence skilled operators specialized in mechanical, electrical and electronic sectors that have read and understood this manual.

The following information are enough to install correctly the charging machine. However, before starting up the machine in any production line it is necessary to grant the requested safety level according to current standards.
Before each operation, ensure that the wheels are blocked and that the system is perfectly stable in its position.
The work area where the plant is to be installed must have a level surface with no slope, the environment must be possibly ventilated and well-lighted.
If the equipment is used with not explosive gases you are not demanded to apply the safety standards described in chapter 1.7 and to install the interception valve kit described in chapter1.6.

The equipment safety depend on the following components:

1. Stocking and distribution system of refrigerant fluid.
2. Gas detection system.
3. Suction system.
4. Factory layout.

As explained in par. 1.7 the extension and typology of danger zones relevant to machine depends on the above-mentioned components features. Before using the charging machine to produce refrigerator circuits the whole of the system has to be controlled to result in compliance with current safety standards.

WARNING: after a long period of inactivity of one metering device, it is mandatory discharge of the device, some calibration cycles and check proper behaviour.

WARNING: this equipment must be installed in a place protected from weathering. In any case, working requirements described in this manual must be complied to. Also, you must avoid placing the product in a wet/cool environment as to prevent condensation.

WARNING: the machine has not to be installed under direct sunrays that can generates high temperatures on metallic surfaces.

3.2 SAFETY PRECONDITIONS TO USE INFLAMMABLE FLUIDS CHARGING EQUIPMENT WITH GAS CONTROL SYSTEMS AND VENTILATION SYSTEMS NOT PROVIDED BY GALILEO TP Process Equipment S.r.l

Inside the lower section of the charging machine and the box with interception pneumatic valve, there are second-degree emission sources (according to EN 60079-10 reference standard). To grant a correct functioning in safety conditions you are demanded to:

1. **Grant a constant depression level inside this section (even in case of maximum release of refrigerant).**

2. **Check on inflammable refrigerant gas concentration inside the charging machine. This way you can manage correctly a hypothetical important concentration.**
3. **Take automatically off the voltage to the machine in case of anomaly detected on functions at points 1 or 2.**

NOTE: This document does not deal with how to manage in safety the charging area external to the charging machine. Who plans/builds relevant work area has to take care of such an operation.

3.2.1 SUCTION

The suction system has to present the following characteristics:

Capacity:	75 m^3/h during regular machine functioning (150 m^3/h in case of pre-alarm or alarm)
Minimum depression inside suction vane:	1 mbar - 3 mbar (pressure difference minor than atmosphere)

The suction system should be connected to the charging equipment by means of the round coupler inside the charging machine pump vane (diam. 60 mm).
The suction system should be turned on while the machine is working, whereas it can be left in stand-by in stop phases. However, it must be ready to be started automatically 24 hours a day in case the control system should detect gas beyond the PRE-ALARM set point.

The charging machine is equipped with a differential pressure switch with N.C contact free from tension; this pressure switch should be calibrated at 0.8 mbar and connected to the control system, which must be provided with an intrinsic safety barrier for pressure switch connection.
This device is used to detect any possible malfunctioning of the suction system or any lack of sealing of the machine area controlled. The pressure switch is provided along with the accessory box containing the refrigerant interception pneumatic valve; it is installed on the box itself to allow checking on any eventual depression even inside the box.

3.2.2 GAS SENSOR (R600a o R290)

In order to promptly detect a leak with the dosing section, and hence guarantee the necessary increase in the aspiration speed or the blockage of the machine, it is necessary to install on the lower side of the machine a gas sensor. The sensor must be installed on the plate where the dosing cylinders are positioned, on the opposite side of the air intake**.**

WARNING: in order to properly install and utilize the gas sensor, please refer to the sensor's specific instruction manual.

WARNING: In case of halogen refrigerants, catalytic sensors may not be utilized.

3.2.3 CONTROL SYSTEM FUNCTIONING

Gas sensors control system must be realised in compliance with EN60079-29-1 standards. Gas control system must work 24 hours a day; it has to manage the signal coming from the pressure switch controlling the ventilation and it has to work as it follows:

EVENT	RESULT
Depression OK, gas not detected	OK
Gas detected = (15 ÷ 30) % L.E.L.	PRE-ALARM
Gas detected > 30% L.E.L.	ALARM
Lack of suctioning in the dosing section (opening of pressure switch contact)	ALARM

I. Pre-alarm conditions:

The suction system must double the suctioning speed inside the charging machine.
Under this circumstance, the equipment can keep on working.

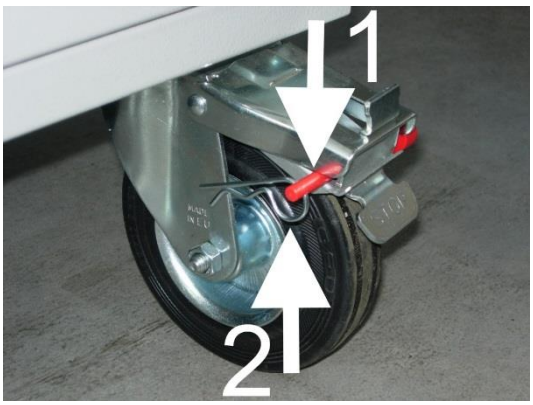
II. Alarm condition:

- **The electric supply of the charging machine must be automatically and immediately disabled.**
- **The suction system must keep the double suction speed inside the charging machine, like in fore-alarm condition (only in case of alarm due to gas detected > 30% L.E.L.).**
- **To leave the alarm condition, you must do a manual reset.**

DO NOT start up the equipment if you have not followed carefully the above-mentioned prescriptions.

3.2.4 FIXED POSITIONING PLANT IN WORK AREA

The system must be fixed within the work area so that the top of the machine does not fall within any area classified according to standard EN60079-10.
To facilitate this operation, the plant is equipped with two pins with cotter pins to be used to lock the brakes of the front wheels.



To do this, follow the steps below by referring to the opposite:

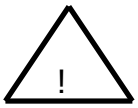
- Place the plant in the final position and lock the wheels in position STOP;
- Insert the pins (1) into the opening above the pedals STOP;
- Insert the cotter pins (2) into the hole of the pins

If you have not met all the requirements described above, it is not possible to service the machine charge.

3.3 ELECTRIC SUPPLY

The electrical supply of the machine needs to be compliant to the following specifications:

Voltage	: See machine plate (standard: 3Ph+PE, 230/400 V - 50/60 Hz)
Deliverable power	: 1 kW
Current protection	: 16 A
Cable type	: 4G 2.5 mm^2 minimum, 500/700 V



WARNING: be sure to power off the voltage source before working with the supply cable. Moreover, the electrical system of the factory plant must be correctly dimensioned for operate this machine and it must have a good, mandatory, electrical earth protection (PE).

The electrical supply cable should enter into the section above of the machine cabinet through the cable gland labeled POWER SUPPLY.
Connect the mandatory protection earth conductor YELLOW-GREEN (ground) to the screw marked as (PE) placed near the general sectioning switch.
Connect then the three active conductors of the cable to the terminals 1, 3 and 5 of the general sectioning switch.

3.3.1 PHASE CHECK SEQUENCE

The plant is equipped with a control relay phase sequence that prevents the start in case of connection with phase sequence wrong. In this way the sensitive elements are protected to the direction of rotation.
In the event that the car does not start when you press the RUN key, you need to reverse two of the three phases to the unit (L1, L2, L3).

WARNING: the correct phase sequence procedure must be carried out whenever you change the sequence of the power supply phases. Basically you need to check when you change the power plug or disconnect and reconnect the cable to the power terminals of the system. Otherwise the system will not start.

WARNING: Do not tamper with the power cabling system downstream of the isolator S1 because you could lose the synchronism between the sequence relay and the rotation of the pump, with the risk of causing a damage to the pump itself.

3.4 COMPRESSED AIR SUPPLY

The compressed air inlet tube should be connected to the quick coupler labeled COMPR. AIR SUPPLY on the back of the upper cabinet section.
Compressed air is used to:

- activate the pneumatic valves;
- activate the dosing pistons;
- take off the residual gas in the internal volumes of the filler at the end the injection phase.

The charging equipment compressed air supply should have the following characteristics:

Work pressure	600 ÷ 800 kPa (6 ÷ 8 bar);
Average consumption	20 Nl/min;
Max. instantaneous consumption:	100 Nl/min;
Filtering	Dehumidification and filtering of at least 20 μ;
Inlet pipe	8x6 mm RYLSAN tube. A section valve must be present on the air supply line.

On the machine there is a pressure switch able to detect the presence of the compressed air.

3.5 REFRIGERANT SUPPLY

According to the charging equipment configuration there can be up to 2 pipelines (labeled R.X SUPPLY) for the inlet of the refrigerant to be injected.
The refrigerant inlet pipeline configuration depends on the type of refrigerant used:

Non-flammable gases or without the “intercepting valve with suction box” group:
In this case the machine is provided with a flexible pipe on each input refrigerant line.

Pipes features*:*

- Work pressure MAX : 3800 kPa (38 bar)
- Inner diameter : 3/16"
- Length : 3 m
- Connection : Hansen™ male 1/4"

Flammable gases:
In this case the refrigerant supply pipe must be connected to the group sectioning valves, housed in the box aspirated. The distribution line of the refrigerant fluid must arrive to the charging zone with the following characteristics:

- Work pressure MAX : 3800 kPa (38 bar)
- Connection : 3/8” Female Gas;

The intercepting valve with suction box group is provided with fittings for the connection to the refrigerant supply line.

In case of rigid refrigerant supply line from an outer tank position, only the last section of pipe of refrigerant supply line should be inside the building.

3.6 GAS/ COMPRESSED AIR DISCHARGE

A release pipeline named GAS OUTPUT comes out from the lowest section of the machine. To this connection a discharging pipe has to be connected, with the following characteristics:

Working pressure : 200 kPa (2 bar)
Internal diameter : 1/2"
Connection : 1/2" GAS

This tube pipes the refrigerant fluid and compressed air mixture that is produced at the end of the injection phase when the internal volumes of the filler are washed out. Even the whole of the content of filler might be piped when the filler release procedure is carried out.

The tube release must be piped outside the factory (better on the roof) far from electrical devices, air passageways or other releases since it is a 1° grade source of release.

3.7 SAFETY VALVE DISCHARGE

3.7.1 With “intercepting valve with suction box”

Every safety valve of the machine has its discharge channeled inside the intercepting valve box.
From the intercepting valve box, a global discharge line must be channeled outside the building through a pipe with the following characteristics required:

Max Working pressure : 4000 kPa (40 bar)
Internal diameter : 1/2"
Connection : 1/2" GAS

Galileo TP would provide the pipefittings for the connection to the discharge line.

The discharge line must be located near the interception box, in compliance with the global design of the area and the relevant regulations in force in the country of installation.

For each refrigerant line with “intercepting valve with suction box” group, a dedicated discharge pipeline must be present.

3.7.2 Without “intercepting valve with suction box”

Every safety valve of the machine has its discharge channeled in the back of the machine, to a connection label “DISCHARGE”.
Galileo TP supply includes a flexible pipe (3/16’’ inner diameter and 1/8’’G connections), for the connection to a discharge pipeline with the following characteristics required:

Max Working pressure : 4000 kPa (40 bar)
Internal diameter : 1/2"
Connection : 1/2" GAS

The discharge line must be located near the interception box, in compliance with the global design of the area and the relevant regulations in force in the country of installation.

3.8 SUCTION SYSTEM

The suction system must be connected to the hole in the vacuum pump box.
The hole has a diameter of 60 mm. As described in par. 1.7.4.1, the suction level to be granted:

Capacity: 75/150 m^3/h @ (1÷3) mbar.

Since the machine filler and the fridge charged represent a source of release, the suction system must grant the requested air exchange in the injection area (see par.1.7.4.2).

3.9 GAS DETECTORS

A gas detector connected to the detection and safety system must be installed inside the filler box. The number and position of sensors in the charging area must be determined from the supplier of the safety system in compliance with the information at paragraphs 1.7.4.2 e 1.7.4.4.

3.10 GROUNING OF THE METERING SYSTEMS BOX

The metering systems box and the installation ambient shall be equipotential, so that is necessary to connect the metering systems box to the ground line of the workplace. To do that, connect the ground line to the appropriate connection in the machine, located in the vacuum pump compartment and indicated by a tag with the grounding graphic symbol.

3.11 WORK AREA LIGHTING

The equipment must be installed in a work area that has a proper illumination able to guarantee light values on the program panel in the range of 200/300 lux.

4 USE OF THE MACHINE

The machine uses a login system to grant a greater level of safety during the using. In facts, at system boot it is not possible to do any operation until it is not executed the user login that can be done pressing the button  according to the following privilege levels:

- *Operator level:* he can only access to the working screen and execute cycles.
- *Administrator level:* he can access to all machine functionalities, included programming and diagnostic ones.

4.1 PROGRAMMING AND DIAGNOSTIC

WARNING: the programming and diagnostics of the machine must be done by adequate skilled personnel only.

WARNING: in case of the operator has not been adequately skilled for programming and diagnostic of the plant, it is necessary to restrict his privilege level to operator level only and not to grant him administrator level.

WARNING: Be sure that there is no pressure inside the filler before entering in the working phase the first time after have switched on the machine

Logging with administrator level it is possible to the following functionalities:

- ***Programming:*** it allows the working parameters programming (referigerant, machine settings, working cycles, barcode etc…);

- ***Diagnostic***: it allows to access to the functional and maintenance diagnostic for verify the correct behavior of the plant and for a diagnosis of eventually machine alarms.

WARNING: pay attention during actuators/solenoid handling because any wrong sequence may led dangerous conditions for person and/or for sensors and seals.

- ***Calibration***: it allows dosing system, pressure sensor and vacuum sensor calibration.
  Please note that for a correct dosing system calibration it is necessary to position the filler in the same position that will be used during working cycles.

4.2 WORKING PHASE

4.2.1 GENERAL RULES

For entering in the working phase it is necessary to log in and pressing the  button located at the main screen.
As soon as you enter the work phase the stand by window is displayed. The principal function of this window is the selection of the work cycle to be carried out and to show the data of the cycle.
The work cycle may be selected manually or automatically based on the programming done on the menu **Cycle Selection Mode** of the machine settings window.

If you choose the **Manual** selection mode it is possible to select the work cycle only through a barcode reader or by using two buttons:

-  **Cycle selection:** which allows to choose the work cycle from the list of programmed cycles;

-  **Code:** which allows entering manually the barcode of the product to select automatically the work cycle.

If you want to select a cycle by means of a barcode, you are previously requested to combine the work cycle to be carried out with the barcode entered.

If you choose the **Automatic** selection mode it is possible to select the work cycle only through a barcode (by means of a barcode reader or by means of the manual insertion pressing the **Code** button).

If you press the **Report**  button it is possible to show the table of the values related to the last work cycle executed by the machine.

The start buttons of the injector are present on the screen: if the buttons of the injector are fault, it is possible to enable the visualization of the start button on the screen to continue the use of the plant.

4.2.2 WORK CYCLES EXECUTION

Once the user has selected the requested work cycle, the operator can connect the filler to the refrigerant group.
The female Hansen™ coupler is usually open by default so you have just to connect the filler to the male coupler of the refrigerant group and press the START key (on the filler or on the screen). The program closes the coupler automatically to open it back at the end of the cycle. On the contrary, if you have programmed the Hansen™ opening function through the user demand in stand by phase, the coupler is close and you are requested to keep the EXIT key pressed to open/close the coupler.
The cycle is automatically carried out and once it comes to an end an alarm signal warns the user.

When carrying out the work cycle, by pressing on the button it is possible to enable the visualization of the following working phases:

Phase number:	Displayed value:
FOREVACUUM	-
EVACUATION	Vacuum value
LEAK TEST	Vacuum value

FILLING UP	-
COMPRESSION	-
INJECTION	Injected grams
FLOWING	-
DISCHARGE	-

NOTE : The cycle can be interrupted pushing the EXIT key on the filler for 2 seconds during the FOREVACUUM, EVACUATION and LEAK TEST phases.

During the work phase, the filler must not be subjected to strong traction. It is necessary to avoid extreme stress to the connection pipes and earth cable, avoid efforts to the movements of connection of the filler and avoid deformation of the copper pipe of connection between the filler and the compressor. Otherwise some anomaly may present: leak in the vacuum line, wrong vacuum measure, lack of grounding and bad charges.

4.2.3 DOSAGE TESTING

For the execution of doses of verification and / or calibration the user must comply with the following conditions:

1. The test bottle used shall have a comparable volume or in any case not lower volume than the volume of refrigerant circuit to be charged.
2. The test bottle used must be at the same temperature of the refrigerant unit.
3. Place the test bottle so that the coupler with the injector is in vertical position.
4. The cylinder test doses must be perfectly dry on it surface, therefore, traces of condensation shall not be observed, whose presence can distort measurements.

5 ALARMS AND TROUBLE SHOOTING

This chapter describes all the operations necessary to set the correct working conditions of the equipment in case of an alarm intervention during the work cycle.
Anyway, contact our technical assistance for the correct execution of the operations.

IMPORTANT NOTES:

WARNING: Before executing any intervention regarding components (dosing system, filler etc.) and tubes containing refrigerant discharge the dosing line.

WARNING: Before executing any operation disconnect the equipment from the electrical supply by positioning the general switch placed on the left door on '0'.

WARNING: Before executing any operation concerning components (solenoid valves, dosing system etc.) containing compressed air disconnect the relative supply line and depressurize it.

WARNING: The operations described in this paragraph must be executed only by skilled workers, i.e. by technical staff with a special skill in the electrotechnical, electronic and mechanical sector, according to the requested operations

WARNING: the operator must wear proper equipment, such as protective gloves, goggles, and the work wear needed to comply with local work regulations.

WARNING: If any control is executed on the equipment with its doors open, pay attention to the moving members of the dosing pistons and to the electrical parts of the power panel.

WARNING: REMAINS THE RISK OF RESIDUAL RISK OF ELECTRIC SHOCK IF IT SHOULD WORK WITH PARTS UNDER VOLTAGE INSIDE THE MACHINE FOR MAINTENANCE / ADJUSTMENT.

5.1 GENERALITY

5.1.1 GENERAL NOTES

a) For trouble identification there are references to drawings collected in 8.016.0.088, in particular to the functional diagram 7.001.0.202 and to the general wiring diagrams 7.002.0.308, 7.002.0.314.
b) In the description of the tests executed for the failure search the solenoid valves mentioned are those of the dosing / injection line n°1 version K1. If the problem to be solved concerns the other dosing lines it is necessary to operate and control their respective valves and sensors.
c) When the replacement of electrical components is mentioned (Ex barriers, sensors etc.) it is necessary to consider the respective component of the dosing / injection line by referring to the functional diagram and to the general wiring diagrams.
As for the codes and the components to be replaced see 8.016.0.088.

5.1.2 SENSOR CONTROL PROCEDURES

Each sensor is equipped with a measuring circuit consisting of: sensor, intrinsic safety barriers Ex and SGP32 board (2.501.0.051). In case of malfunctioning the first thing to check is that there is no interruption on the electrical cable between the sensor and the connectors of the electronic rack by referring to the wiring diagram 7.002.0.314. Check that the cable connectors are correctly inserted into the respective electronic rack connectors.

Then execute the below mentioned tests according to the malfunctioning sensor:

PRESSURE SENSOR P50 P60 P91: (Vacuum collector rif.3 dis 2.002.0.549, dos. rif.15 dis 2.005.0.046)

Display the value read by the sensor. At the atmospheric pressure the sensor should measure 1540 bit ± 20 bit.
Measuring circuit check:

a) Measure the voltage present at the terminal blocks of Ex barrier. The circuit of the barrier is working correctly if the tension value is between 15,5Vcc and 24Vcc.
b) Disconnect the wire connected to the terminal block 1 (or 2) of the barrier and connect it serially to an amperometer which can measure current values between 4 and 20mA. The sensor is working correctly if at the atmospheric pressure it erogates 4 mA. At the maximum working pressure the sensor should erogate 20mA (range 16mA).
c) The barrier is working correctly if the same current value is measured by serially connecting the amperometer to the terminal blocks 11 or 12.
d) Replace SGP32V2 board if the tests described in a), b), c) had a negative outcome.

VACUUM SENSOR P90: (rif.4 dis.2.002.0.549)

Display the value read by the sensor. With a vacuum value < 1 Pa the sensor should measure 1540 ± 100 bit.

Measuring circuit check:

a) Measure the tension present at the terminal blocks 2 and 5 of the Ex barrier. The circuit of the barrier is working correctly if the tension value is between 15,5Vcc and 24Vcc.
b) Disconnect the wire connected to the terminal block 2 of the barrier and connect it serially to an amperometer which can measure current values between 4 and 20mA. The sensor is working correctly if at the atmospheric pressure it erogates 20mA. At the minimum working pressure the sensor should erogate 4mA (range 16mA).
c) The barrier is working correctly if the same current value is measured by serially connecting the amperometer to the terminal block 12.
a) Replace SGP32V2 board if the tests described at a), b), c) had a negative outcome.

TEMPERATURE SENSOR T50 T60:(rif.13 dis 2.005.0.046)

Display the value read by the sensor. The sensor should measure 1540 bit at a temperature of 0°C with an increase of 123.2 bit every °C.

Measuring circuit check:

a) The temperature sensor can be tested with an ohmmeter by verifying that the resistance measured at its ends is of about 100 ohm (R at 0 °C) + Room temperature * 0.39 ohm/°C; (es. at 20 °C 100 + 20 * 0,39= 107,8 ohm.
b) To check the efficiency of the barrier disconnect the wire connected to the terminal block 4 (or 5) and connect it serially to an amperometer which can measure current values between 4 and 20mA. The barrier works in the temperature range -10 °C (output 4 mA) ÷ +50 °C (output 20 mA). The current increases of 0,32 mA every centigrade degree. Example: at 20 °C the output should be 10,2 mA.
a) Replace the SGP32V2 board if the tests described at a) e b) had a negative outcome.

POSITION SENSORS (POTENTIOMETERS) POT50 POT60: (rif.14 dis 2.005.0.046)

Display the value read by the sensor. The measuring range (total stroke of the rod) should be between 1540 bit ± 10 bit and 7700 bit ± 10 bit.

Measuring circuit check:

a) The position sensor can be tested with an ohmmeter by verifying that the resistance measured at its ends (pin 1 and 3) is of 2300 ohm ± 20%. By moving the potentiometer cursor manually check that between the central wire (pin 4) and one of the side wires (pin 1 or 3) there is the whole resistive excursion (from 0 to the value measured in the previous test).
b) To check the efficiency of the barrier disconnect the wire connected to the terminal block 1 (or 2) and connect it serially to an amperometer which can measure current values between 4 and 20mA. The barrier is working correctly if, by moving the potentiometer cursor manually, there is the whole excursion between 4 and 20 mA.
c) Replace the SGP32V2 board if the tests described at a) and b) had a negative outcome.

5.1.3 SOLENOID VALVES CHECKING PROCEDURES

Check the functioning of a solenoid valve by following the instructions reported in the section devoted to the single failure search.

In order to check the valves open them by using the diagnostic function.

In case of malfunctioning the first thing to check is that there is no interruption on the electrical cable between the solenoid valve and the electronic rack connectors by referring to the wiring diagram 7.002.0.314.

Check that the cable connectors are correctly inserted into the relative electronic board connectors. Beside, check the integrity of the fuse (FS1 and FS2) on the SGP32V2 electronic board.

5.2 ALARMS AND TROUBLE SHOOTING TABLE

During the work cycle execution there is a check over all the parameters that concern it. In case of parameters' measures out of the values admitted, the alarm starts.
The alarm is indicated acoustically and through relevant description on the display.
To get out from the acoustic and light signals press either EXIT on the filler or EXIT on the control panel.
The alarm description mentions the components which filler 1 and dosing system 1 are made of.

WARNING: In case of alarm DO NOT switch off the equipment supply but press (EXIT) either on the keyboard or on the filler. When the alarm stops, if requested, the program carries out a discharge cycle on the filler and on the vacuum line to bring back the equipment to safety conditions. Please carry out all the procedures requested to reset the correct functioning of the equipment.

Display:	Sources:
CHARGED CIRCUIT **(1)**	The alarm gets involved during the FOREVACUUM phase when the pressure inside the refrigerant circuit is more than 120-kPa abs. It shows the circuit might be already charged with gas.
EVACUATION FAILED: **(2)**	This alarm gets involved during the vacuum test phases and it shows the preset low vacuum set point has not been reached during total time (T1) or evacuation time (T2). This alarm shows the following anomalies: • Refrigerant circuit in vacuum leak or incorrectly emptied; • Times and vacuum set points not programmed correctly; • Leaks on the vacuum line (i.e. leaks on PV96); • Damage of the OR2056 installed inside the female Hansen coupler of the filler. • Vacuum sensor not calibrated. Check the vacuum sensor reading in diagnostic opening only PV90. If the value is more than 10 Pa, the sensor is not calibrated.
STATIC LEAK TEST FAILED **(3)**	This alarm gets involved during the leak test phases. It shows that during the leak test has elapsed the total time (T1). This alarm shows the following anomalies: • Refrigerant circuit in vacuum leak or incorrectly emptied; • Times and vacuum set points not programmed correctly; • Leaks on the vacuum line (i.e. leaks on PV96); • Damage of the OR2056 installed inside the female Hansen coupler of the filler. Vacuum sensor not calibrated. Check the vacuum sensor reading in diagnostic opening only PV90. If the value is more than 10 Pa, the sensor is not calibrated.
CLOGGED CIRCUIT **(4)**	This alarm gets involved during the phase of refrigerant filling inside the refrigerant circuit. The alarm shows the dosing piston is moving very slowly or not moving at all. It also shows the following anomalies: • Refrigerant circuit with clogged coupler or clogged inlet pipeline. • Rotor of the turbine mechanically clogged because of dirt or metallic or plastic chips. • Bad functioning of the solenoid valve of injection. • The dosing filler pressure is greater than the air compressor pressure.

Display:	Sources:
CLOGGED CIRCUIT: GAS INFILTRATION IN COMPLEMENTARY DOSING SYSTEM **(5)**	This alarm activates during the injection phase of the refrigerant in the refrigerant circuit. The alarm indicates the presence of anomalies on the cooling circuit as a connection or inlet pipe clogged or partially clogged. This alarm may occur only on machines that have two dosing systems for injection line and implies that the refrigerant dosed by one dosing system is partially or totally infiltrated into the complementary dosing system.
REFRIGERANT HIGH TEMPERATURE **(10)**	Before the refrigerant charging, refrigerant temperature was more than 50°C. See chapter 5.1.2.
REFRIGERANT LOW TEMPERATURE **(11)**	Before the refrigerant charging, refrigerant temperature was less than 1°C. See chapter 5.1.2.
REFRIGERANT HIGH PRESSURE **(12)**	This alarm gets involved while the dosing system is filled with refrigerant at liquid state coming from the supply line. If the pressure measured by sensor P50 is more than the high inlet set point, the alarm gets involved.
REFRIGERANT LOW PRESSURE **(13)**	This alarm gets involved while the dosing system is filled with refrigerant at liquid state coming from the supply line. If the pressure measured by sensor P50 is less than the low inlet set point, the alarm gets involved. If the pressure is correct and the set points are properly programmed, check on the filter.
BLOCKED POTENTIOMETER **(14)**	This alarm gets involved while the dosing system is filled with refrigerant at liquid state coming from the supply line. The alarm starts if the dosing piston cannot fill itself, i.e. when the potentiometer does not achieve the end stroke stopper. Usually this alarm indicates the missing of refrigerant at liquid state on the supply line (there is only gas which cannot fill the dosing system). If the pressure is correct and the set points are properly programmed, check on the filter.
COMPRESSED AIR HIGH PRESSURE **(15)**	This alarm gets involved during the refrigerant compression phase. The refrigerant is compressed inside the dosing cylinder using the shove provided by an automatic piston. If the pressure measured by sensor P50 is more than the high outlet set point, the alarm gets involved. You are requested to set RV1 accordingly.
COMPRESSED AIR LOW PRESSURE **(16)**	This alarm gets involved during the refrigerant compression phase. The refrigerant is compressed inside the dosing cylinder using the shove provided by an automatic piston. If the pressure measured by sensor P50 is less than the low outlet set point, the alarm gets involved. You are requested to set RV1 accordingly.
DOSING SYSTEM END OF STROKE **(17)**	This alarm shows the piston stroke did not stop when the injection solenoid valve was closing. It means the solenoid valve is still open.
DOSING SYSTEM ERROR **(18)**	This alarm is triggered during the control of the dose in the injection phase. Indicates that the system has not been able to verify the accuracy of the dose.
REFRIGERANT LEAK IN DOSING SYSTEM **(20…24)**	Before the injection phase, the equipment compresses the refrigerant inside the dosing cylinder to make sure all the fluid dosed is at liquid state. The alarm gets involved if during the compression phase the dosing piston does not stop because the refrigerant is not at complete liquid state. Actually this alarm gets only involved in case of big refrigerant leaks from the dosing system, since the worsening of the compression quality is indicated from various pre-alarm levels signalled at the end of each charging cycle. Pre-alarms levels are listed from 1 to 10. The alarm starts at pre-alarm level 10. It can be produced by: • Not condensable gases on the refrigerant supply line. • Leak in the dosing piston gaskets.

Display:	Sources:
INSUFFICIENT VACUUM TO PERFORM CYCLE **(30)**	At the beginning of the cycle the program checks on the efficiency of the pumping system. Normally this alarm shows the vacuum pump is still.
PRESSURE LOSS IN THE FILLER **(31)**	High pressure in the injector caused by a leak in the injection valves.
VACUUM LEAK IN THE FILLER **(32)**	At the beginning of the cycle the program checks on the good sealing of the filler box towards the injection valve and towards the outside. This alarm can be produced by: • Refrigerant drawing from the injection valve towards the injection box. • Damage of the seal gasket (OR2056) between the female Hansen coupler of the filler and the male Hansen coupler of the refrigerator. • Filler not correctly inserted in the male junction of the refrigeration unit.
REFRIGERANT NOT DISCHARGED **(33)**	This alarm starts during the dosing systems discharge phase if the pressure inside the systems themselves is higher than 50 kPa abs. WARNING: This alarm shows the presence of gas inside the dosing cylinder, the filler pipeline and the inlet pipeline. If you do not get any positive result in the following attempts of discharge, pay the utmost attention while disassembling these parts.
LEAK IN ISOLVACUUM VALVE **(34)**	During the work cycle the equipment checks on the good sealing of the PV91 pneumatic valve of vacuum isolation. The alarm gets involved in case of infiltrations while the valve is closed.
LEAK IN LEAK TEST VALVE **(35)**	During the work cycle the equipment checks on the good sealing of the PV90 pneumatic valve of leak test. The alarm gets involved in case of infiltrations while the valve is closed.
REFRIGERANT INFILTRATION IN VACUUM LINE **(36)**	This alarm shows the vacuum pneumatic valve does not assure a perfect tightness during the refrigerant injection phase. In this case there might be some infiltrations in the vacuum pipeline.
CYCLE STOPPED BY OPERATOR **(37)**	This alarm shows that the cycle has been interrupted by operator by pressing (EXIT) push button on the filler. The alarm could also indicates a remote “stop cycle” command (only when the line interface kit with enabled inputs is present).
CYCLE DESELECTED BY OPERATOR (**38**)	This alarm shows that in a cycle combi a part of the semi-cycle has been skipped by the operator by pressing the button skip in the working window.

At the end of the work cycle the leak pre-alarm might get involved. It consists of a message displaying.
This pre-alarm warns the user that the gaskets of the dosing piston used do not assure a perfect tightness any longer and that it is therefore necessary to program a maintenance intervention on the dosing system the pre-alarm is signaling.
The number of the dosing system is displayed, along with the relative pre-alarm level that can have a value from 1 to 10. This way it is possible for the user to control the development of the leak extent. When level 10 is reached the equipment functioning is blocked with the alarm "REFR. LEAK IN DOSING SYSTEM".

Anyway, up to the pre-alarm level 10, the equipment goes on working regularly as the possible refrigerant leaks are directed into the discharge line and the program activates an automatic correcting procedure to preserve the dosage accuracy declared in the technical characteristics.

5.3 ERRORS TABLE

The following table illustrates every possible error message that may appear while operating the machine.

Display:	Source:
INDEX OF INJECTOR EXCEEDING THE LIMITS **(20)**	Main error, contact assistance
INDEX OF DOSING CYLINDER EXCEEDING THE LIMITS **(21)**	Main error, contact assistance
INDEX OF CYCLE EXCEEDING THE LIMITS **(22)**	Indicates that the operator has tried to program a cycle that is not contained within the imposed limits (1-200)
INDEX OF BARCODE EXCEEDING THE LIMITS **(23)**	Indicates that the operator has tried to barcode association that is not contained within the imposed limits (1-1000)
SELECTED CYCLE NOT CONFIGURED **(24)**	This error message appears when the operator try to select a cycle that has yet to be configured, of which the parameters have not been programmed
INDEX OF REFRIGERANT NOT WITHIN THE LIMITS **(25)**	Main error, contact assistance
REFRIGERANT NOT AVAILABLE **(26)**	The selected refrigerant is not available
NO CORRESPONDANCE FOR THE BC **(27)**	No work cycle is associated to the selected barcode
NO CYCLE SELECTED **(28)**	Indicates that the operator has tried to perform the work cycle without having selected the work cycle to perform
REFRIGERANT NOT ASSOCIATED TO THE DOSING SYSTEM **(29)**	The work cycle parameters contain a refrigerant that is not available on the dosing system
CYCLE NOT AVAILABLE WITH THE SELECTED INJECTOR **(30)**	Indicates that the correct pressure sequence on the start button of the injectors is not in place with the type of cycle selected
LOW COMPRESSED AIR PRESSURE **(31)**	Indicates that the operator is attempting to execute a cycle with low pressure air. Check the supply of the compressed air.
INSERTED BARCODE ALREADY PRESENT **(32)**	This error can be generated inside the barcode programming window when the user attempt to insert a barcode already present in the table
DOSING SYSTEM NOT CHARGED **(33)**	Dosing system not charged or possible leak in the injection line. Check the dosing system was charged and possible leaks in the injection line.
LOW PRESSURE IN THE COMPLEMENTARY DOSING SYSTEM **(34)**	The pressure inside the complementary dosing system is not enough. Verify if the dosing system is filled with refrigerant and control the presence of leakages. Eventually, modify the pressure setups, in order to prevent an improper appearance of the error.

Display:	Source:
INSERTED TWO IDENTICAL BARCODES **(36)**	Indicates that two identical barcodes have been inserted with the "Bar Code Check" option enabled.
CYCLE INHIBITED FROM GEDA (**41**)	The cycle can not be executed because in a previous station the piece has failed the test
CYCLE INHIBITED FROM GEDA_PATH (**42**)	The cycle can not be executed because the piece has skipped a previous station.
CYCLE INHIBITED FROM GEDA_FAIL+PATH (**43**)	The cycle can not be executed because in a previous station the piece has failed the test and the piece also has skipped a previous station.
TIMEOUT GEDA FOR CYCLE INHIBITION (**44**)	Elapsed timeout of the cycle inhibition request.
INSERTED TWO IDENTICAL BARCODES WITH INHIBITION **(45)**	Indicates that two identical barcodes have been inserted with the "Bar Code Inhibition time" option not 0.
START CYCLE INHIBITION **(51)**	Start cycle inhibited by an external signal
INTERNAL ERROR **(255)**	Internal error, please contact our Support

5.4 MAINTENANCE GUIDE

This guide plans the equipment maintenance so as to keep its efficiency and its functional characteristics.
The main parts to be periodically checked are:

a) FILLER
b) DOSING SYSTEM
c) VACUUM PUMP
d) ELECTRONIC COMPONENTS AND MEASUREMENT SYSTEMS

The following table lists the operations to be carried out on every part, as well as their frequency.
The column marked with * lists the operations to be carried out frequently, according to the production (e.g weekly).
The operations listed in the column * should be carried out also in the PERIODS 1 and 2.
The operations listed in the PERIOD 1 column should be carried out also in PERIOD 2.

PART	*****	***PERIOD 1*** ***Every 1000 hours***	***PERIOD 2*** ***Every 2000 hours***
FILLER	Replace the gasket OR2056 of the quick coupler	Grease the movement springs of the pin and of the quick coupler. Check the wear of the gaskets.	Replace the gaskets of the kit 2.002.1.295 STANDARD 2.002.1.051 CN
DOSING SYSTEM	Check the doses calibration	• Check the doses calibration • Replace the dosing system inlet filter 2.002.2.561.	• Check the doses calibration • Replace the dosing system inlet filter 2.002.2.561.

			• Replace the gaskets of the kit 2.002.1.052.
VACUUM PUMPING GROUP	• Verify the vacuum pump oil level (see pump manual). • Pump ballasting (see pump manual).	• Clean the vacuum line and sensor by eliminating the oil residues sucked in by the refrigerant circuits. • Clean the suction filter and the oil discharging filter of the pump (see pump manual).	Substitute the oil in the pump (for the characteristics of the oil and the substitution procedure see the relative instructions for use and maintenance).
ELECTRONIC COMPONENTS			Replace the litium battery CR2032 placed on the SGP32V2 board (every 3 years only).

In addition to that it is necessary to substitute the safety valves every 5 years.
All the operations necessary for the ordinary and extraordinary maintenance, as well as the operations carried out by our technical staff, should be registered in a maintenance table (see example in the next page).

EQUIPMENT MAINTENANCE FORM

TYPE OF EQUIPMENT:

SERIAL NUMBER:

INSTALLATION DATE:

TYPE OF ASSISTANCE	DATE	HOURS	ASSISTANCE CARRIED OUT	PIECES REPLACED

CE

6 DICHIARAZIONE DI CONFORMITÀ (DECLARATION OF CONFORMITY)

(ANNEX IIA DIR. 2006/42/CE)

Galileo TP Process Equipment S.r.l.
50018 Scandicci (Firenze) - Italy

DICHIARIAMO CHE LA SEGUENTE MACCHINA
(WE DECLARE THE FOLLOWING MACHINE)

UNITÀ PER L'EVACUAZIONE E CARICA DI IDROCARBURI E FLUIDI FRIGORIGENI "CERTUS"
(HYDROCARBONS / REFRIGERANT EVACUATING AND CHARGING EQUIPMENT "CERTUS")

MODEL Ex C11	**PART NUMBER 4.001.2.001**
MODEL Ex C12	**PART NUMBER 4.001.2.002**
MODEL Ex EC11	**PART NUMBER 4.001.2.012**
MODEL Ex EC12	**PART NUMBER 4.001.2.013**
MODEL Ex CN C11	**PART NUMBER 4.001.2.018**
MODEL Ex CN C12	**PART NUMBER 4.001.2.019**

SERIAL NUMBER__

È STATA COSTRUITA NEL RISPETTO DELLE SEGUENTI DIRETTIVE
(MEETS THE REQUIREMENTS OF THE FOLLOWING DIRECTIVES)

- Direttiva Macchine (2006/42/CE) (Directive on Machinery)
- Direttiva Bassa tensione (2014/35/UE) (Low Voltage Directive)
- Direttiva Compatibilità Elettromagnetica (2014/30/UE) (Directive on Electromagnetic Compatibility)
- Direttiva Atex (2014/34/UE) (Atex directive)
- Direttiva Atex (99/92/EC) (Atex directive)

È CONFORME ALLE SEGUENTI NORME ARMONIZZATE
(APPLIED HARMONIZED STANDARDS)

- Sicurezza del macchinario - Concetti fondamentali, principi generali di progettazione EN 12100 (Safety of machinery - Basic concepts, general principles for design)
- Sicurezza del macchinario - Equipaggiamento elettrico delle macchine Parte 1: Regole generali (EN 60204-1) (Safety of machinery. Electrical equipment of machines. General requirements)
- Atmosfere esplosive Parte 10-1: Classificazione dei luoghi. Atmosfere esplosive per la presenza di gas (EN 60079-10-1) (Explosive atmospheres. Classification of areas. Explosive gas atmospheres)
- Atmosfere esplosive Parte 0: Apparecchiature - Prescrizioni generali (EN 60079-0) (Explosive atmospheres. Equipment. General requirements)

- Atmosfere esplosive Parte 14: Progettazione, scelta e installazione degli impianti elettrici (EN 60079-14) (Explosive atmospheres. Electrical installations design, selection and erection)
- Atmosfere esplosive Parte 7: Apparecchiature con modo di protezione a sicurezza aumentata "e" (EN 60079-7) (Explosive atmospheres. Equipment protection by increased safety "e")
- Atmosfere esplosive Parte 11: Apparecchiature con modo di protezione a sicurezza intrinseca "i" (EN 60079-11) (Explosive atmospheres. Equipment protection by intrinsic safety "i")
- Apparecchi a radiofrequenza industriali, scientifici e medicali (ISM) - Caratteristiche di radiodisturbo - Limiti e metodi di misura (EN 55011) (Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement)
- Compatibilità elettromagnetica (EMC) Parte 6-4: Norme generiche - Emissione per gli ambienti industriali (EN 61000-6-4) (Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments)
- Compatibilità elettromagnetica (EMC) Parte 6-2: Norme generiche - Immunità per gli ambienti industriali (EN 61000-6-2) (Electromagnetic compatibility (EMC) - Part 6-2: Generic standards – Immunity for industrial environments)
- Compatibilità elettromagnetica (EMC) Parte 4-2: Tecniche di prova e di misura - Prove di immunità a scariche di elettricità statica (EN 61000-4-2) (Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrostatic discharge immunity test)
- Compatibilità elettromagnetica (EMC) Parte 4-5: Tecniche di prova e di misura - Prova di immunità ad impulso (61000-4-5) (Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test)
- Compatibilità elettromagnetica (EMC) Parte 4-3: Tecniche di prova e di misura - Prova di immunità ai campi elettromagnetici a radiofrequenza irradiati (EN 61000-4-3) (Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio-frequency, electromagnetic field immunity test)
- Compatibilità elettromagnetica (EMC) Parte 4-4: Tecniche di prova e di misura - Prova di immunità a transitori/raffiche di impulsi elettrici veloci (EN 61000-4-4) (Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrical fast transient/burst immunity test)
- Compatibilità elettromagnetica (EMC) Parte 4-8: Tecniche di prova e di misura - Prova di immunità a campi magnetici e frequenze (EN 61000-4-8) (Electromagnetic compatibility (EMC). Testing and measurement techniques. Power frequency magnetic field immunity test)

È STATA COSTRUITA NEL RISPETTO DELLE SEGUENTI NORMATIVE
(MEETS THE REQUIREMENTS OF THE FOLLOWING STANDARDS)

- Impianti elettrici nei luoghi con pericolo di esplosione. Prescrizioni specifiche per la presenza di polveri infiammabili e sostanze esplosive (CEI 64-2) (Electrical installations in locations with explosion hazard)

Si dichiara inoltre che, come richiesto dalla Direttiva 2006/42/CE, è stato autorizzato a costituire apposito fascicolo tecnico:
(Moreover we declare that, as required by Directive 2006/42/CE, we authorized to compile appropriate technical file:)

NOME Giovanni Gonfiantini
(Name)

INDIRIZZO Via del Pantano 73 **CAP** 50018
(ADDRESS) (ZIP)

CITTÀ Scandicci
(PLACE)

PROVINCIA FI
(PROVINCE)

Scandicci
Data (Date) 06/2020

Il fabbricante (The manufacturer)