

Home Refueling Appliance for CNG vehicles Mod. HRA G 1.5 P30 & P36



Installation Maintenance and Safety Manual

This Home Refueling Appliance (HRA) should only be installed and serviced by authorized and trained personnel.

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1. SAFETY INSTRUCTIONS

- **COMPONENTS ARE NON REPLACEABLE BY USER**

USERS SHOULD NOT CARRY OUT ANY MAINTENANCE ON INTERNAL COMPONENTS.

Internal components should only be maintained and overhauled at BRC FuelMaker's premises or by authorized dealers.

Do not open or tamper with modules or the warranty will be invalidated; tampering with or opening modules could be dangerous and cause damage to the compressor and cause serious injury or even death.

- **READ CAREFULLY BEFORE INSTALLATION**

HRAs should only be installed by trained and personnel authorized by BRC FuelMaker.

Please read carefully the manual provided before installation and use. If you have any questions or concerns during installation, please contact BRC FuelMaker Technical Support.

- **LOCATION OF HOME REFUELLING APPLIANCE (HRA)**

HRAs can be installed both indoors (Garage) and outdoors in safe and protected areas as per installation instructions and local jurisdictional codes.

The HRA and vehicle have to be located in the same ambient temperature during the refuelling operation to ensure correct temperature compensation.

See Table 2 for temperature compensated maximum fuelling pressures.

- **REFUELING APPLIANCE FOR CNG (Compressed Natural Gas) VEHICLES ONLY**

Do not use HRA for any other purpose or it may results in serious injury and/or death to and also cause serious damage to structures. Vehicle gas cylinder should be certified for storing CNG at a 3600 psig or 250 Bar pressure or higher. HRA is suitable for residential applications, and all installations must comply with installation manuals and local jurisdictional code requirements.

- **REFUELING INSTRUCTIONS**

Do not refuel with engine turned on and be sure that any possible ignition source is absent. Do not smoke or expose to open flames during refuelling.

- **IF YOU SMELL GAS**

Open all windows and doors in the location of the HRA if the unit is installed indoors.

Immediately close the manual valve on natural gas supply line; and, if possible, the valve on the vehicle cylinder. Switch off any possible ignition sources and contact an Authorized Service Centre.

- **REFUELING HOSE**

The refuelling hose must be protected from damage and abrasion. After refuelling your car, ensure that the refuelling nozzle is returned to its' holder. In case of hose and connector abrasions or wear, contact your Authorized Technical Centre for service.



WARNING : DO NOT USE SOLVENT OR AGGRESSIVE CHEMICAL AGENTS FOR CLEANING THE OUTSIDE. USE DETERGENTS OR DOMESTIC GENTLE SOAP.

2. INTRODUCTION

HRA has been developed for both indoors (Garage) and outdoors installation, for compressing Natural Gas for vehicle use.

Model P30 is designed to refuel at a pressure of 207 bar/3,000 psi at 20° C/68° F (ambient temperature) with a Nominal Flow of 1,3 sm³/h at 50 Hz (1.01 scfm-0.5 GGE/h at 60 Hz).

Model P36 is designed to refuel at a pressure of 248 bar/3,600 psi at 15° C/59° F (ambient temperature) with a Nominal Flow of 1,3 sm³/h at 50 Hz (1.01 scfm-0.5 GGE/h at 60 Hz).

A HRA is equipped with Internal Gas Sensor/Air Flow Switch and Internal Dryer.

3. PHILL MODELS

CODE	E77HRAG15P 30	E77HRAG15 P36	E77HRAG15P 30B	E77HRAG15 P36B	E77HRAG15P 30L	E77HRAG15P 36L
MODEL	HRA P30 Gen 1.5	HRA P36 Gen 1.5	HRA P30 Gen 1.5	HRA P36 Gen 1.5	HRA P30 Gen 1.5	HRA P36 Gen 1.5
DESCRIPTION	STANDARD (FULL EQUIPPED)		BASIC		SMART	
LOCATION	Indoor / outdoor	Indoor / outdoor	Indoor / outdoor	Indoor / outdoor	Outdoor	Outdoor
INTERNAL DEVICES						
Internal Gas Detector	YES	YES	YES	YES	NO	NO
Air Flow switch	YES	YES	YES	YES	NO	NO
Gas Dryer	YES	YES	NO	NO	NO	NO

Tabella 1 - Phill models



WARNING Phill models without the gas dryer (Smart and Basic) are available but they can be used only if the gas is already dried. We recommend to use gas with dew point at the maximum delivery pressure of 5°C lower than the minimum ambient temperature.



WARNING In case of outdoor installation with adequate ventilation the Phill Smart use without the internal gas detector is allowed

The Phill software is designed for the constant monitoring of the all compressor components. The software checks for the pressure increasing as well as the maximum filling pressure compensation in reference to the ambient temperature in order to avoid overpressures due to external temperature rising after filling. The automatic compensation system is determined by the temperature sensor installed on the main board (function activated by the manufacturer).

The Phill is air cooled and admits operating temperature between -40°C/-40°F and +45°C/113°F.

The Phill ventilation system operates through a fan located in the compressor lower side. The cooling air inlet is equipped with a grid while the exhaust is located in the compressor upper side or rear side.

Start, stop, and monitoring are performed by the User Control Panel.

4. TECHNICAL SPECIFICATIONS

GAS CIRCUIT	
Max Filling Pressure	207 bar (3000 psig) at 20° C (68°F) ambient 248 bar (3600 psig) at 15° C (59°F) ambient
Min Inlet Pressure	17 mbar (7" w.c.)
Max Inlet Pressure	35 mbar (14" w.c.)
Nominal Flow	1.3 sm ³ /h a 20°C - 0.017 bar inlet 1.01 scfm/0.5 GGE/h @ 68°F 7" w.c.
WIRING CIRCUIT	
Electrical Supply	220-240 Volt AC Single Phase, 50/60 Hz
Wiring Circuit Capacity	15 Amp
Full Load Amperes	5.5/5.0 Amp
Average Consumption	0.85 kWh
MECHANICS	
Dimensions (L x P x A)	762 x 356 x 330 mm/30"x14"x13"
Weight	49 Kg/110 lb (packaging included)
Noise	40 dBA at 5 mt (16.5 ft)
Covering Protection Level	IP 24
Operating Temperature	from - 40° C to + 46° C (-40°F +115°F)

Tabella 2 - Technical Specification

5. INSTALLATION INSTRUCTIONS

5.1 GENERAL INFORMATION

Open packaging and verify the condition of the appliance; in case of damage due to transportation immediately contact your local dealer.

Ensure that the gas supply and the electrical supply provided correspond to the values indicated on the serial number plate. The Natural Gas connection should be properly done using suitable piping, following installation and testing procedures in accordance with all codes in place by the authorities having jurisdiction. A shut-off valve must be installed on the gas supply line, and with a pressure regulator, if the supply pressure exceeds the max value allowed.

Electrical installation should be properly done in accordance with codes determined by the authorities having jurisdiction. Natural Gas must be odorised. The installation of a HRA must comply with all codes determined by the authorities having jurisdiction and those outlined in this manual, in each case the more stringent rule must be followed.



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- Noise

Phill (HRA) soundproof version emits roughly 40 dBA (Hemispheric Field) at a distance of 5 m (16.5 ft). The installer should ensure that no noise regulations are in place by the authorities having jurisdiction. Avoid installing a HRA next to neighbours' windows or walls that can amplify noise.

5.2 APPLIANCE LOCATION

- Structure requirements

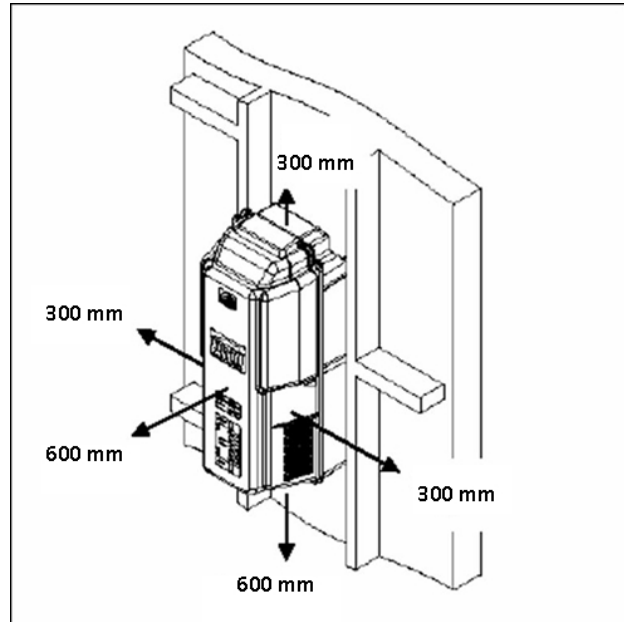
HRA weighs roughly 43 Kg (95 lb) and should be installed on a wall or a structure made of non-combustible material able to support min 90 kg (198 lb). The support frame has been designed to reduce noise and vibration transmission to the wall.

- Vehicle Refueling Point

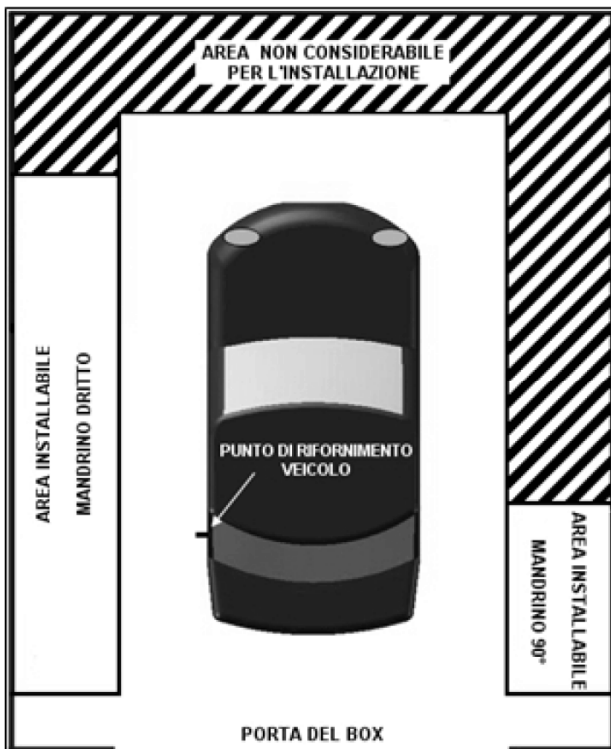
A HRA must be installed next to the vehicle being refuelled due to an automatic temperature compensation system between outlet and ambient temperature pressures; always consider the max length of refuelling pipe and do not obstruct pedestrian crossing or passages. Choose a location to install a HRA on the basis of the vehicle refuelling point and HRA location, in order to ensure proper operation of the hose breakaway device in the event of a driveway while the hose is connected (see pict. 2-3-4).

- Service Clearances

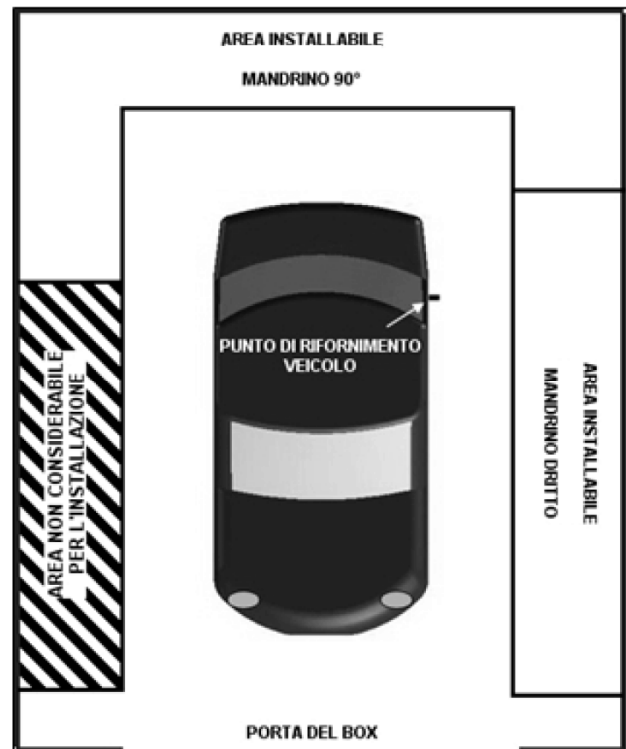
Be sure that Services Clearances are observed (see pict. 1). If Service Clearances cannot be observed, please contact Technical Support. Avoid areas that may allow possible gas accumulation such as overhangs and/or eaves. Avoid areas next to vegetation that could obstruct air grilles or subject to the possible damage due to falling material.



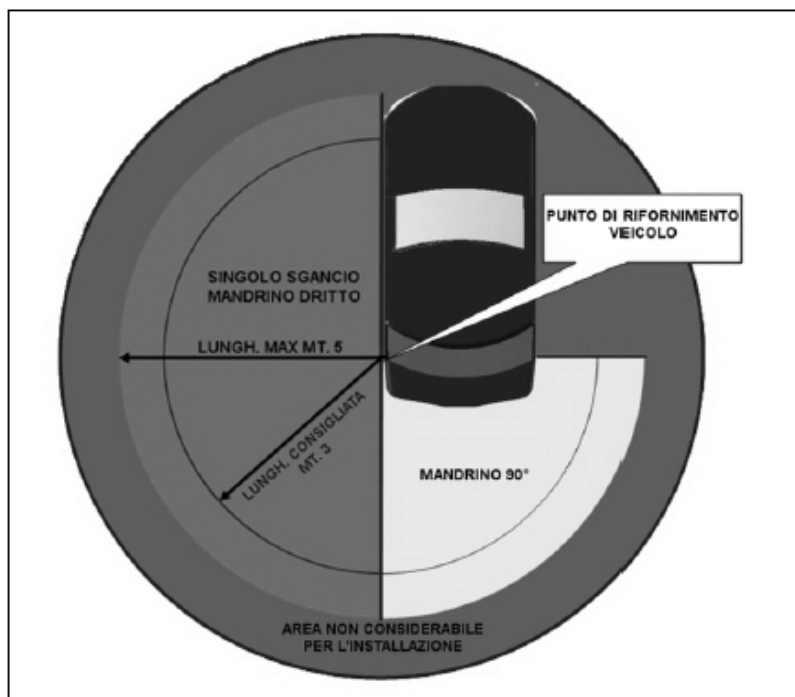
Picture 1 – Service Clearances.



Picture 2 - Example of installation



Picture 3 - Example of installation

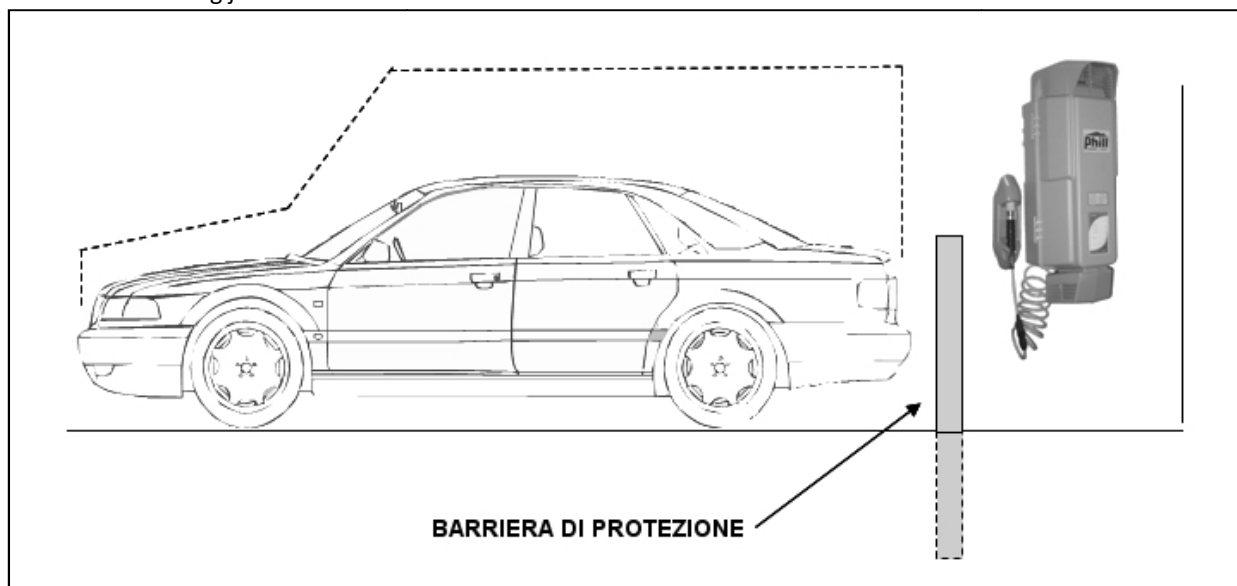


Picture 4 - Installation Distances

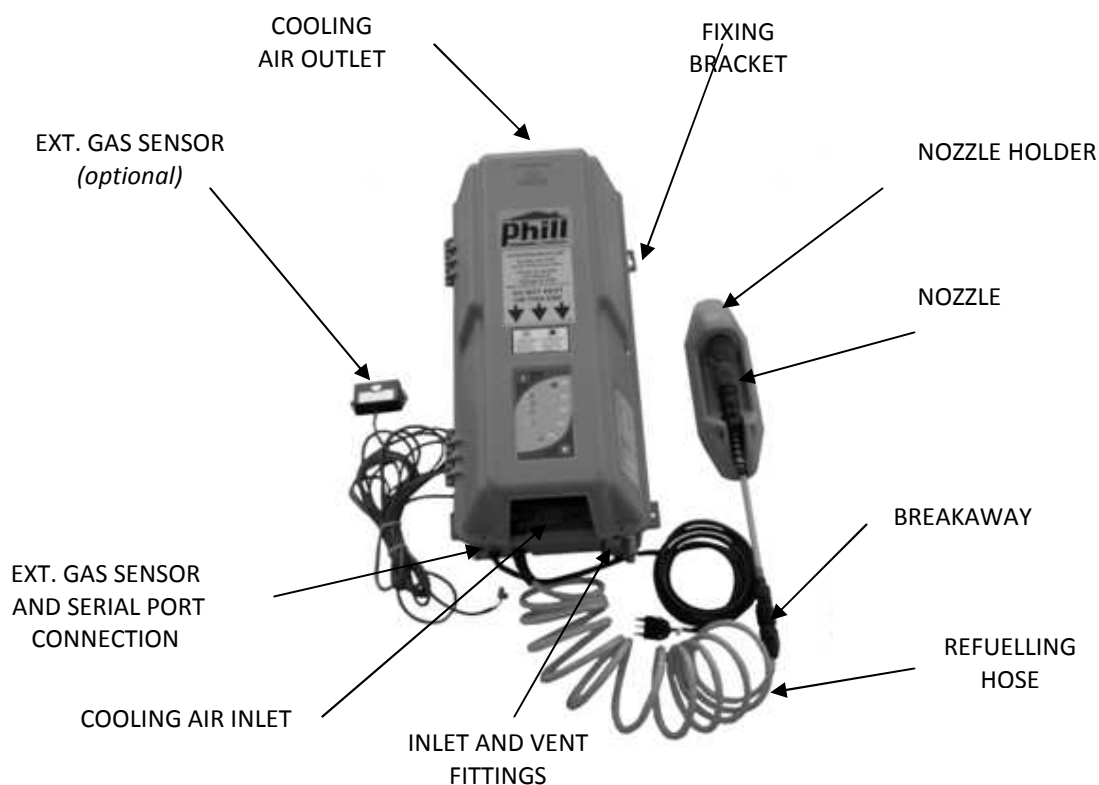
A breakaway device allows the hose to separate if vehicle drives away while the refuelling hose is still connected. It parts in two to avoid pulling the HRA from its support. In the event of a drive away while the fuelling hose is connected to the vehicle, the fuelling hose connected to the vehicle can only be removed by means of a depressurizing tool.

- Impact Protection

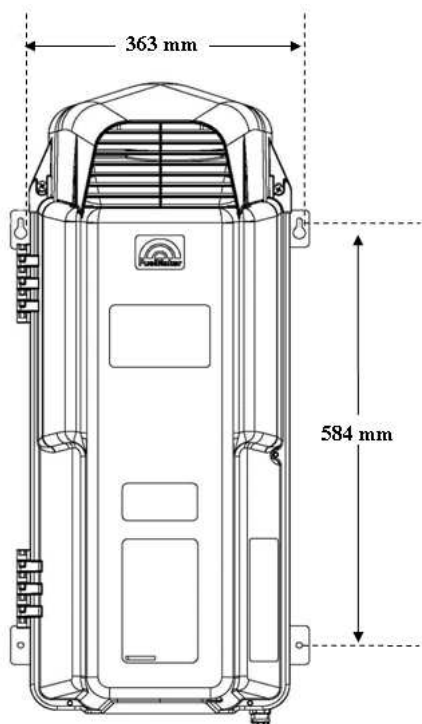
HRA should be installed 1,5 mt (5 ft) high from the floor or in a location that will ensure that there is no risk of impact from a vehicle or other objects in the vicinity. In some cases such as use of a bigger vehicle, such as VAN or SUV, the HRA may require impact protection such as a bollard (*see pict. 5*). Always make reference local codes determined by the authorities having jurisdiction.



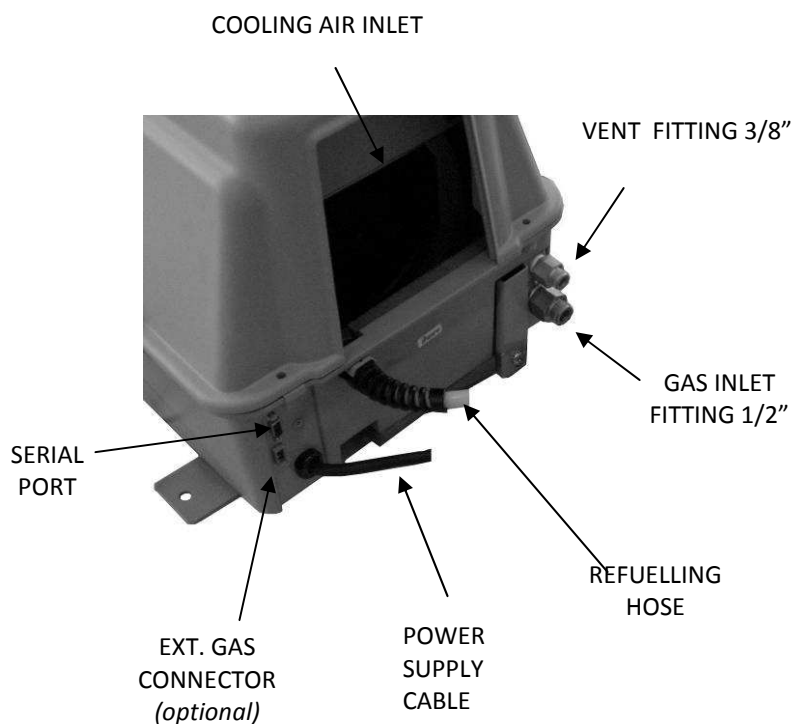
Picture 5 – Impact Protection



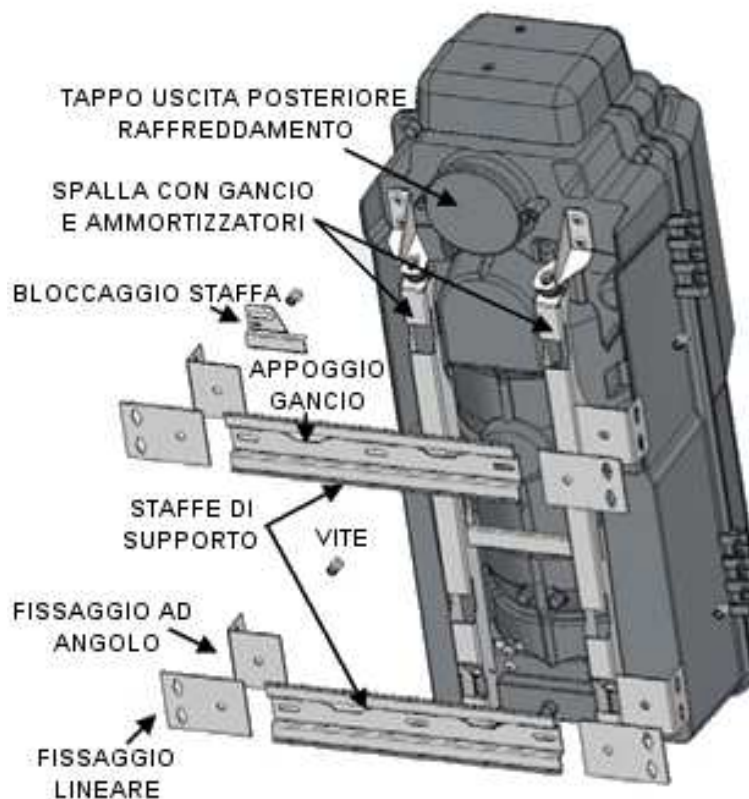
Picture 6 - Frontal View



Picture 7 – Hard Mount Brackets



Picture 8 - Lower View



Picture 9 - Support Kit with Soft Mount Vibration and Noise Suppression

5.3 HRA INSTALLATION

- Wall installation

Determine the best mounting method for the HRA from the preceding information. If it's equipped with hard mount brackets (*see pict. 7*), use brackets holes as a template. If it's equipped with Soft Mount Vibration and Noise Suppression (*see pict. 9*), the kit will include:

- No. 2 Support Brackets
- No. 4 90° Fixing Brackets with Threaded Bush
- No. 4 Linear Fixing Brackets with Threaded Bush
- No. 1 Bracket Fixing Device

The HRA can be built-in installed between wall studs using the 90° Fixing Brackets or on a flat surface using the Linear Fixing Brackets. Use the template found in the Accessories Box to mark the brackets mounting holes and the Cooling Rear Outlet vent path if necessary. Attach the mounting bracket to the wall, do not tighten screws completely and hang compressor in place on the mounting brackets being careful with to ensure rear hooks ensuring the bracket is correctly mounted. Once mounted correctly and perpendicular, tighten bracket screws and close the mounting lock plate.

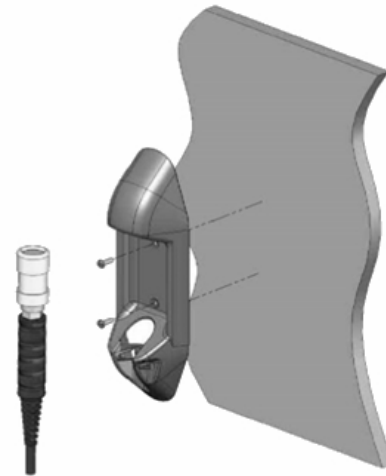


WARNING: Wall mounts must support the HRA weight and be able to support the unit in the event of a vehicle driveway while connected to the Phill ensuring that the breakaway on the hose will disconnect safely.

Affix nozzle holder to the wall, next to the HRA (*see pict. 11*).



Picture 10 - Fixing Screws



Picture 11 – Nozzle Holder Mounting

Once correctly mounted, open the front cover of the HRA by removing the 5 cover screws. Loosen the three transportation mounts (see pict. 10), but do not remove or attempt to remove these mounts. The screws are mounted to rubber grommets to hold the internal components in place during shipment.



WARNING: HRA can be seriously damaged if you do not loosen the 3 transportation screws. In case having to ship the HRA, tighten the 3 transportation screws again before shipping, in order to avoid any damage.

- Gas pipe - Inlet

HRA should be installed where natural gas network assures a max humidity ratio of 110 mg/m³ (0.24 lb) (-20° C/-4°F DewPoint). Inlet pressure should not be lower than 17 mBar (7" w.c.) or higher than the one indicated by technical information plate in order to avoid damages to the appliance. Install a pressure regulator on the inlet line if necessary.

Gas installation should be properly done by trained and certified personnel. A manual shut-off valve should be installed in an easy-to-access position on gas pipe. In addition a dirt trap and test port need to be installed before the inlet to the HRA unit.

Gas inlet pipe is connected to the HRA through the GAS ½" threaded fitting supplied (see pict. 8). In case where inflexible NG supply pipe is fixed to the wall, we suggest using a flex pipe from the pipe to the connection on the HRA to prevent the transmission of vibration and noise to the building.

Pipes and connectors should be free from rust, oil, shavings and metallic chards. Liquid or rubber sealant products should not obstruct pipe.

In case of supply low pressure (17 mBar - 7" w.c.) pipe should have minimum diameter 1", if pipe is shorter than 3 mt/10 ft. you can use a ø ¾" pipe.

HRA could switch off if other home appliances are working at the same time (e.g. Stove, Heating) on the same supply line. Regulators installed by gas suppliers and for use at the HRA should be equipped with a device to adjust the supply line flow and be tested when all natural gas appliances are running.

Check the regulator adjustment by running the HRA compressor and all other home appliances working on the same NG supply line, adjust to ensure that the minimum inlet pressure to the HRA is maintained.

Materials, installation and testing procedures should comply with applicable laws in force (e.g. UNI-CIG 7129)

- Gas pipe - Outlet

The HRA refuelling hose should not be replaced by unauthorized personnel not trained by BRC-FuelMaker. Only approved BRC FuelMaker HRA refuelling hoses can be used as use of unauthorized hoses may cause injury, property damage and/or death.

- Pressure Relief connection

HRA is equipped with a Pressure Relief with an outlet Gas threaded fitting Gas 3/8" (*see pict. 9*). The Pressure Relief has a cap with a screen insert to prevent intrusion of foreign bodies or ice accumulation. The Pressure Relief discharges gas coming out from Safety Valve set at a max pressure of 3 barg (43.5 psi) situated inside the HRA control module. In the event that natural gas is released, the check valve on the vehicle fuelling receptacle will require service.

If HRA needs to be installed in passages, next to windows or next to doors, you will need to connect a pipe to the pressure relief having inside min $\varnothing$ 10 mm. (3/8") and this pipe run to an area for the safe release of NG, at least 3 mt above the floor or grade. Safety distance from discharge point should be at least of 2,5 mt (8.2 ft) sideways from any possible opening (windows, air inlets or priming sources) and 1 mt (3.3 ft) from below. It is very important that the pressure relief is free from debris and that water cannot enter into the pipe and freeze. Apply cap with the screen at the end of the pressure relief line, or provide similar protection (Stainless Steel net).

Please make reference to codes in force by the authorities having jurisdiction about the pressure relief pipe position and pipe dimension.

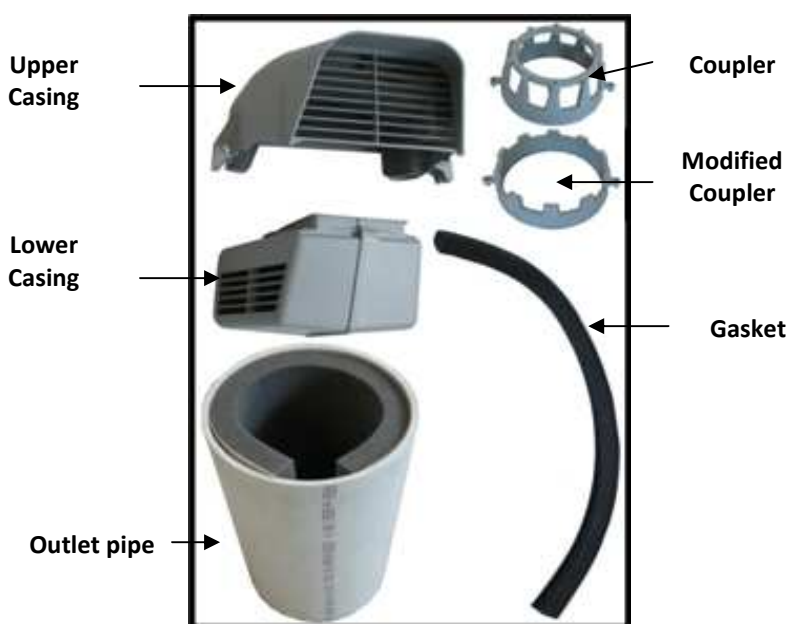
- Electrical Supply Connection

Electrical installation should be properly done in accordance with the codes in force by the authorities having jurisdiction. The HRA requires a 220-240VAC electric supply line that should be protected from overcurrent installed in a visible and easy-to-access position. Check with the authorities having jurisdiction for minimum requirements and location of a shut off switch.

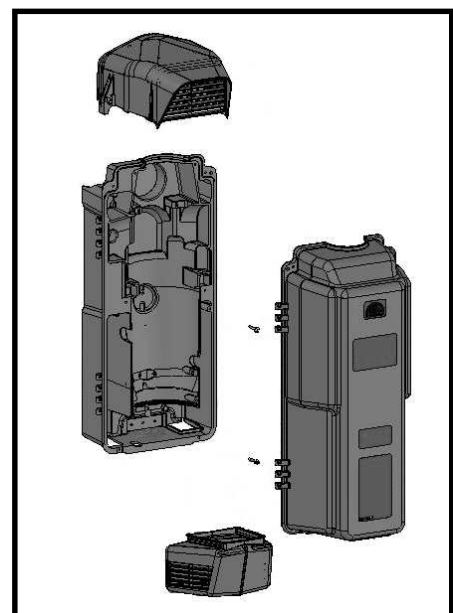
- Cooling Air Ventilation System Connection

The HRA is equipped with a Cooling AirVentilation system with a fan located internally in the unit. The air enters from the lower grille (*see pict. 8*) and exits from either an upper vent (*see pict. 7*) or a rear vent (*see pict. 9*), used according to needs. The HRA is normally provided with the rear hole closed and the upper one open.

An Soundproof Ventilation Kit can also be purchased (*see pict. 12*).



Picture 12 - Soundproof Ventilation Kit



Picture 13 - Casings

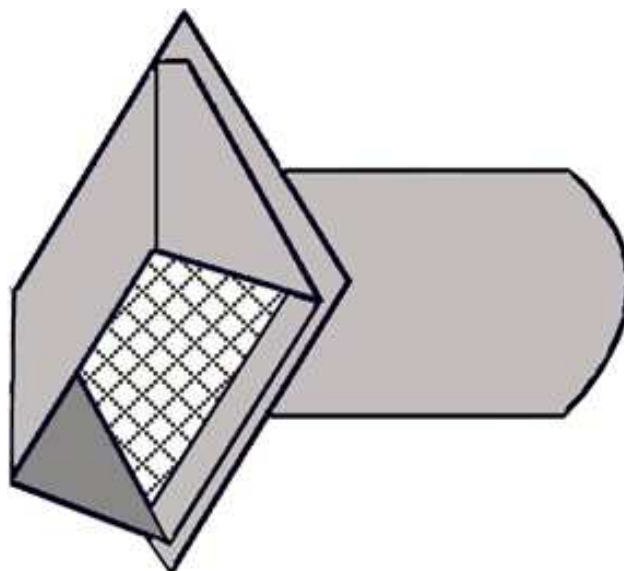
In case of an outdoors installation, install the lower casing (if supplied) and the upper top casing (*see pict. 13*), following installation instructions.

In case of an indoors installation when using the upper exhaust vent, open the frontal covering, insert modified coupler supplied in its suitable housing, fix it with the two screws and close covering again. Install a $\varnothing 127$ mm (5") pipe using gasket supplied (*see pict. 14*) then route the vent piping outside.

It is mandatory to install Lower Casing on HRA.

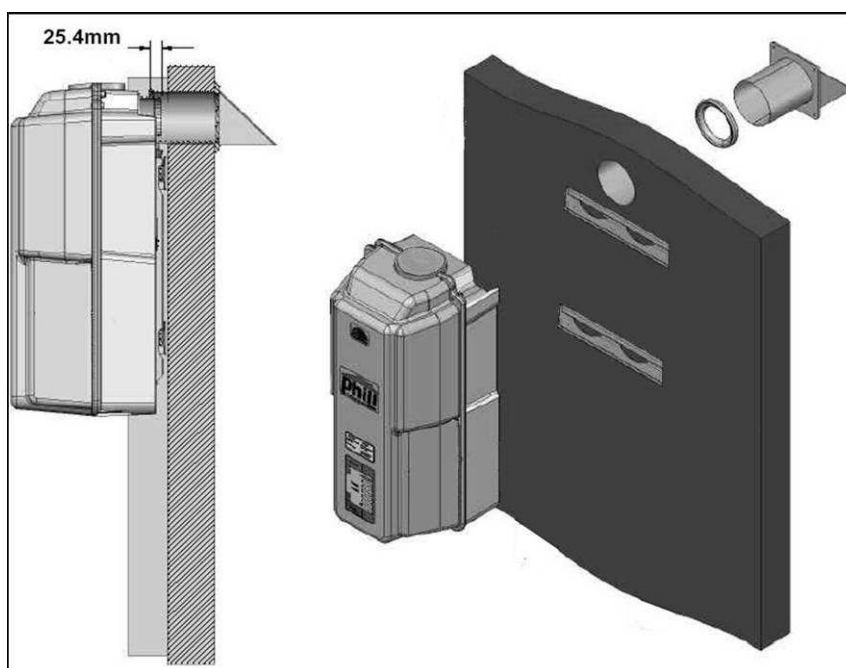


Picture 14 - Coupler



Picture 15 - External Hood

If using the exhaust vent rear hole, the template provide in the accessory kit will allow you to mark out an exit hole (hole $\varnothing 170$ mm/6.7") while installing mounting brackets. Remove the rear exhaust cap and secure it onto the upper hole housing. Place coupler on rear hole using the two screws supplied. We suggest to use an external grille as shown in picture in order to avoid air entering into the discharge duct causing defaults or block of HRA (*see pictures 15 and 16*).



Picture 16 - Ventilation with Rear hole

5.4 EXTERNAL GAS SENSOR INSTALLATION

HRA can be equipped with External Gas Sensor (*Optional*) if necessary. The connector on the cable from the external gas sensor needs to be connected to port situated in the lower side of HRA, next to the serial one (*see pict. 8*). Once the sensor installed, you need to enable through the software. Connect diagnostic tool HTTP4 (*Optional*) to the serial port, following instructions under programming, turn the External Interlock to ON.



IMPORTANT: Disconnect electrical supply for at least 1 minute after resetting the programming. Failure to turn the unit off for 1 minute and restarting the HRA will not reset the programming.

6. COMMISSIONING



WARNING: HRA should only be commissioned by qualified personnel. Local laws in force could require site and/or installation inspection before starting up. Contact authorities having jurisdiction and gas supplier company for further requirements and information.

6.1 INITIAL START-UP

- Purge inlet pipes and equipment of air before the initial start-up.

- Switch HRA on.
- Open manual valve of gas inlet line.
- Wait for the end of software control cycle (Blinking Green LED becomes fixed).
- Connect Refuelling hose nozzle to an open refuelling receptacle.
- Push the START button and let the pipe discharge for 30seconds.
- Check that cooling fan is working good verifying air flow coming out from the front grille if equipped with upper casing, or opening the front covering.
- After discharging, stop compressor, disconnect pipe and start HRA again waiting for its automatic stopping.
- Check possible leakages from equipment and connection using a leak detector.

Pressure P30	Pressure P36	Ambient Temperature
207 ± 7bar (3,000± 100 psi)	248 ± 7.0 bar (3,600 ± 100 psi)	21° / 15° C (70° / 59° F) or higher
183 ± 7.5 bar (2,654 ± 108 psi)	229 ± 7.5 bar (3,321 ± 108 psi)	10° C – 50° F
166 ± 8.0 bar (2,407 ± 116 psi)	211 ± 8.0 bar (3,060 ± 116 psi)	0° C – 32° F
150 ± 8.5 bar (2,175 ± 123 psi)	194 ± 8.5 bar (2,813 ± 123 psi)	- 10° C – 14° F
133 ± 9.0 bar (1,929 ± 130.5 psi)	177 ± 9.0 bar (2,567 ± 130.5 psi)	- 20° C - -4° F
116 ± 9.5 bar (1,682 ± 137.7 psi)	160 ± 9.5 bar (2,320 ± 137.7 psi)	- 30° C - -22°F
100 ± 10.0 bar (1,450 ± 145 psi)	143 ± 10.0 bar (2,074 ± 145 psi)	- 40° C - -40° F

Tabella 3 - Stopping Pressure compared with Ambient Temperature

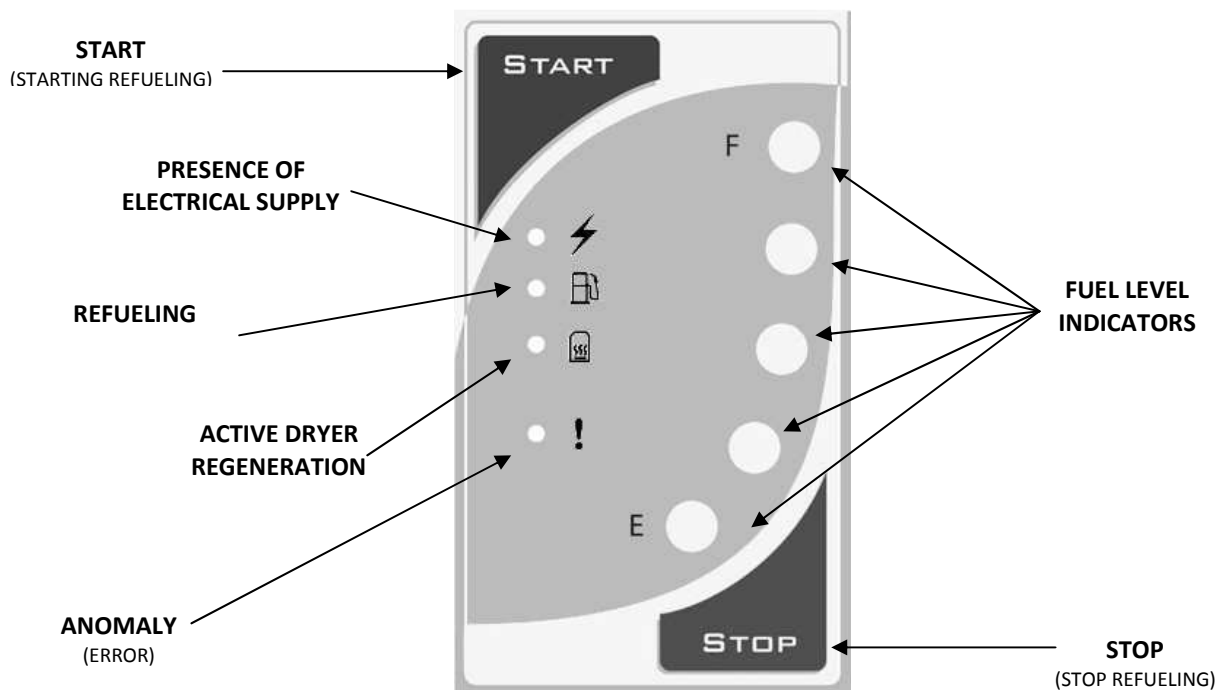
If ambient temperature detected is lower than - 40° C (-40° F) or higher than +45° C (113° F) the software will not allow the HRA start-up for safety reasons and an error condition will be indicated on the User's Control Panel.

6.2 INSTRUCTIONS FOR FINAL USER

Before leaving, installer should verify the complete installation and advise the customer not to service HRA internal components. He should give user the HRA User Manual together with suitable instructions about operation, error codes and what to do in the case of an error code. Routine maintenance instructions should be given to the customer including hose inspection and nozzle cleaning. Have the HRA User fill in the form outlining understanding of the unit. The End User should periodically verify that air inlets and discharge system are free from dirt or obstructed, that refueling hose does not show abrasions or signs of breakage and that vehicle fuelling system is tested and compliant to safety regulations.

7. FUNCTIONS OF USER'S CONTROL PANEL

Through the User's Panel, you can Start, Stop and Control unit Error or State Codes. Panel has a START button (Green), a STOP button (Red), three LEDs (Green) on the left showing State of the unit, Presence of Electrical Supply, Refuelling, Active Dryer Regeneration and Error (Red), and 5 LEDs on the right showing Fuel level indication, Errors or Working Hours (see pict. 17).



Picture 17 - User's Control Panel

HRA is equipped with a diagnostic software constantly controlling the unit working. Light indicators can show different conditions by pushing START and STOP buttons in a specific sequence.

6.1 DISPLAY HRA WORKING HOURS

Push STOP to reset panel, then keep START and STOP buttons pressed. Fuel level indicators lights will show unit working hours. See table below to identify hours code (see table 3).

Da 0 a 249	Da 250 a 449	Da 500 a 749	Da 750 a 999	Da 1000 a 1249	Da 1250 a 1449	Da 1500 a 1749	Da 1750 a 1999
Da 2000 a 2249	Da 2250 a 2449	Da 2500 a 2749	Da 2750 a 2999	Da 3000 a 3249	Da 3250 a 3499	Da 3500 a 3749	Da 3750 a 3999
Da 4000 a 4249	Da 4250 a 4449	Da 4500 a 4749	Da 4750 a 4999	Da 5000 a 5249	Da 5250 a 5499	Da 5500 a 5749	Da 5750 a 6000

Tabella 4 - Working Hours codes

7.1 DISPLAY ERRORS

In case of an error condition, the system stops the HRA operation. Depending on the error condition, the unit may be reset or service may be required. If the system considers the error condition not dangerous, refuelling will restart by first pushing the STOP button to reset Panel and then the START one. In case of an error code showing a possibly dangerous situation, this operation will lock out and a service technician will be required to examine the unit.



WARNING: If software blocks HRA from operation, do not disconnect electrical supply as the unit will ensure that natural gas does not accumulate to prevent damage, injury and/or death.

By keeping the STOP button pressed, User's panel will display the last error code recorded. A PC diagnostic software is available to display unit current parameters and Errors Archive. See table below to identify error code and know the possible corrective action to carry out.

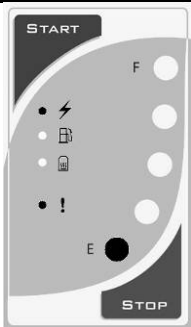
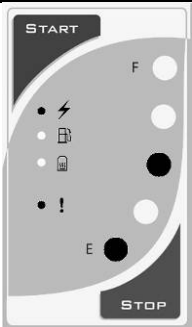
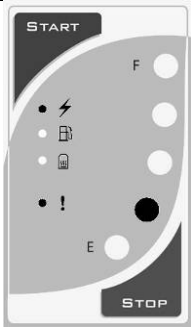
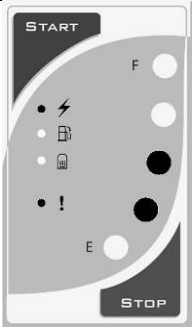
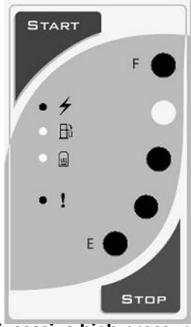
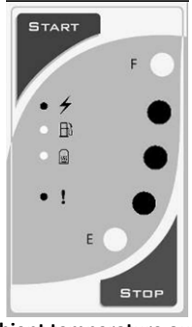
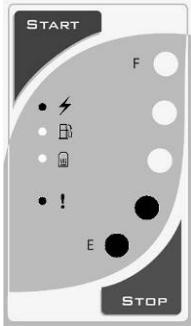
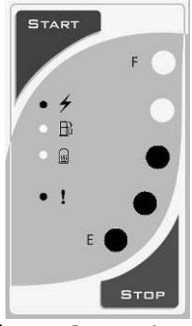
ERROR CODE	CORRECTIVE ACTION	ERROR CODE	CORRECTIVE ACTION
 Low Inlet Pressure 00001	- Check the right inlet pressure - Check that inlet manual valve is open - Check the adequate diameter of supply pipe - Check reducer (if present).	 Engine Overvoltage 00101	- Check that voltage range is included between 216 V AC and 252 V AC - Check right connection to the electrical supply line.
 High pressure sensor malfunction 00010	- Disconnect electrical supply for 1 minute and connect it again. - If anomaly persists, call technical support.	 Int. Gas Sensor Alarm 00110	- Check possible external cause: - Refueling fitting - Vehicle equipment - Refueling pipe - Gas Inlet pipe - Material stored into refueling area If no causes are found, close gas manually and call technical support.
 Excessive high pressure detected 10111	- Disconnect electrical supply for 1 minute and connect it again. - If anomaly persists, call technical support.	 Ambient temperature out of range 01110	- Ambient temperature out of max allowed threshold: _ Tamb < -45°C _ Tamb > 55°C - Temperature sensor malfunction: - Call technical support.
 Excessive blow down pressure 00011	Possible high pressure gas inlet from tank. Try to stop and restart the appliance every 5-10 minutes. If problem persists, close vehicle manual valve, call technical support. Do not use vehicle until anomaly has been detected.	 Inadequate Pressure Increase 00111	Check possible leakages: - Safety Disconnection device - Refueling fitting - Vehicle filling point This same error can occur if vehicle tank is almost empty. Partially refill tank. Try to restart the appliance many times.

Table 5 – Error diagnostics

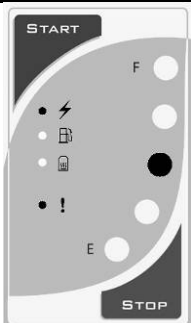
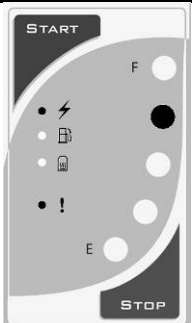
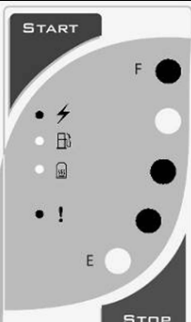
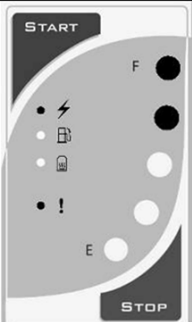
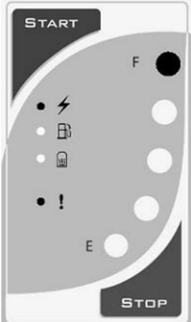
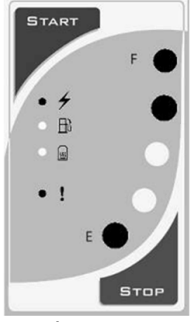
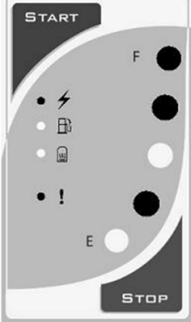
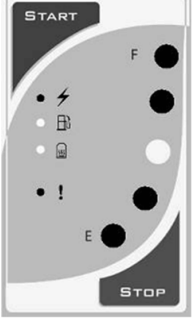
ERROR CODE	CORRECTIVE ACTION	ERROR CODE	CORRECTIVE ACTION
 Engine Overtemperature 00100	Check: - Supply voltage. - Possible air inlets obstruction - Air discharge dimension, min 125 mm max length 15 mt with max 3 changes of direction.	 High Pressure Drop 01000	Check possible leakages: - Safety Disconnection device - Refueling fitting - Vehicle equipment and filling point.
 Combi-valve Malfunction 10110	- Disconnect electrical supply for 1 minute and connect it again. - If anomaly persists, call technical support.	 Bypass-valve Malfunction 11000	- Disconnect electrical supply for 1 minute and connect it again. - If anomaly persists, call technical support.
 Dryer Malfunction 10000	Dryer Condenser or vaporizer or heater malfunctioning. Call technical support.	 Dryer condenser temperature out of range 11001	Dryer condenser temperature out fo range <-55 °C or > 105°C Call technical support.
 Dryer vaporizer temperature out of range 11010	Dryer vaporizer temperature out of range <-55 °C or > 105°C Call technical support.	 Excessive Peltier absorption 11011	- Disconnect electrical supply for 1 minute and connect it again. - If anomaly persists, call technical support.

Table 5 – Error diagnostic (Continued)

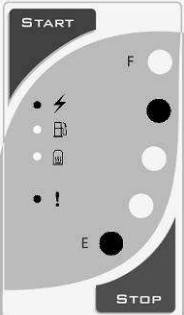
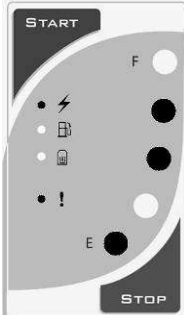
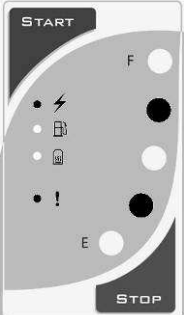
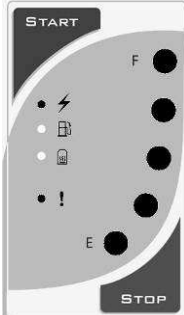
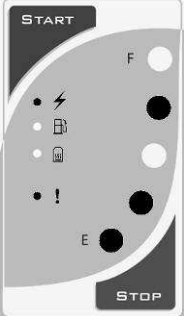
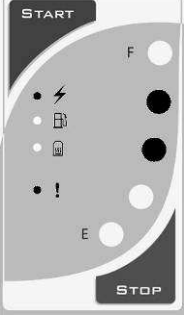
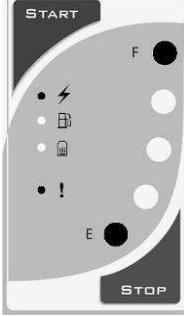
ERROR CODE	CORRECTIVE ACTION	ERROR CODE	CORRECTIVE ACTION
 Inadequate Cooling Air Flow 01001	Check: - Possible cooling air inlets obstruction - Air discharge dimension, min 125 mm max length 15 mt with max 3 changes of direction - Fan	 Ext. Gas Sensor Alarm 01101	- Check possible external cause: - Refueling fitting - Vehicle equipment - Refueling pipe - Gas Inlet pipe - Material stored into refueling area Eliminate leakage source (close manual valve) and call authorized technical support.
 Max Refueling Time 01010	- Check possible leakages: - Refueling fitting - Vehicle equipment - Refueling pipe Restart the appliance.	 Memory error (EPROM, FLASH, RAM) 11111	Disconnect electrical supply for 1 minute and connect it again. If anomaly persists, call technical support.
 High Inlet Pressure 01011	Check conformity of gas supply line pressure to technical specifications. Check the right kind and setting of reducer (if present).	 Back-Pressure 22222	Do not disconnect electrical supply. Do not force refueling fitting disconnection from vehicle. Try to stop and restart HRA every 5-10 minutes. If problem persists, close vehicle manual valve, call technical support. Do not use vehicle until anomaly has been detected.
 High Pressure Gas Leakage 01100	Check possible obstructions or damages: - Safety Disconnection device - Refueling fitting - Vehicle filling point - Refueling pipe	 Start Button Error 10001	Check: - Connections - Adapter board - Cables Try to stop and restart the appliance. If problem persists, replace user's control panel.

Table 5 – Error diagnostic (Continued)

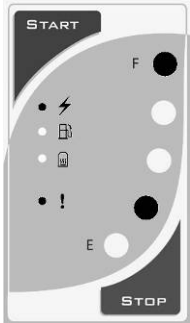
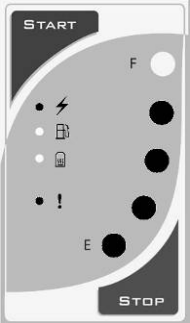
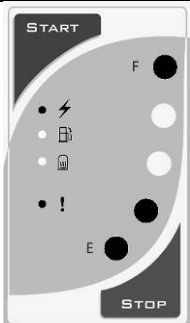
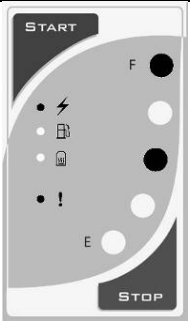
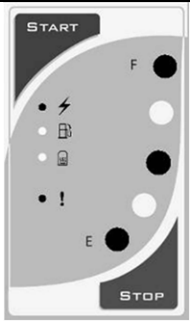
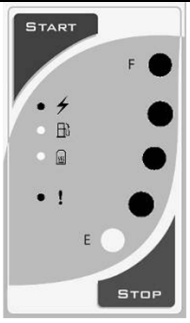
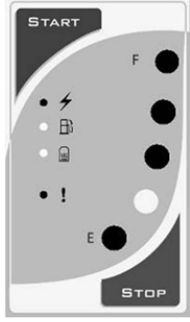
ERROR CODE	CORRECTIVE ACTION	ERROR CODE	CORRECTIVE ACTION
 Stop Button Error 10010	Check: - Connections - Adapter board - Cables Try to stop and restart the appliance. If problem persists, replace user's control panel.	 Flow Meter Error 01111	- Check possible cooling system obstruction - Check the free movement of flow meter blade - Check sensor supply voltage - Replace flow meter
 Int. Gas Sensor Error 10011	- Check and clean internal gas sensor - Check connections - Check sensor supply voltage - Replace sensor	 Wrong Int. Gas Sensor Calibration 10100	- Check sensor supply voltage - Replace sensor
 TRIAC Error 10101	Disconnect electrical supply for 1 minute and connect it again. - If anomaly persists, call technical support.	 POWER OFF Error 11110	- Problem probably due to excessive line voltage brownout. - If line is ok, disconnect electrical supply for 1 minute and connect it again. If problem persists, call technical support.
 Remote Communication Error 11101	- Possible communication failure of tao remove device, check connection - If connection is ok, call technical support	 Unexpected pressure increase 11100	- Possible high pressure pipe obstruction in case of unexpected pressure increase - Call technical support.

Table 5 – Error diagnostic (Continued)

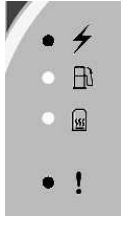
ERROR CODE	CORRECTIVE ACTION	ERROR CODE	CORRECTIVE ACTION
 Mapping Error	EEprom mapping has not been correctly recorded. - Disconnect electrical supply for 1 minute and connect it again. If problem persists, call technical support.	 System in Boot Loader	- Software should be reloaded onto the board. - Call technical support.

Table 5 – Error diagnostic (Continued)

6.2 SPECIAL FUNCTIONS

Optional functions that can be only supplied by the manufacturer:

- “Empty Tank” function
If tank is completely empty, this function allows realizing a forced compression to create condition needed to overcome High Pressure Gas Leakage.
Compressor lays in stand-by and refueling and anomaly indicators start to blink. Press three times, in three seconds, START button to enable this function (in case of fault procedure, the High Pressure Gas Leakage error is shown)
During compression, refueling indicator is on while the anomaly one is blinking.
At the end of compression a leakage test is carried out. If there are no leaks anomaly indicator switch off and compressor keep compressing (on the contrary, the High Pressure Gas Leakage error is shown and compressor stops).
“Empty Tank” function can be interrupted through the STOP button at any time; the High Pressure Gas Leakage error is shown.
During the Empty tank phase (anomaly indicator is blinking) user’s monitoring is suggested.
- “Final Pressure Compensation” function according to temperature.
If temperature changes, final refueling pressure changes according to the installation Country’s laws in force. This function can be disabled if not required.
- “Regeneration Bypass” function
If a dryer error persists during regeneration, compressor stops this operation and allows restoring system compression functions.
During regeneration bypass, regeneration indicator is blinking. If regeneration ends successfully, bypass the indicator will switch off.
- Diaphragm Vaporizer function (Nafion function)
If diaphragm temperature is lower than 5°C, this function switches diaphragm heater on. It will switch off when temperature goes beyond the 7°C. It is necessary to avoid possible freezing of water present into the diaphragm.
- CMPDrying
This function can be carried out before regeneration to collect humidity present into the compressor (some conditions should be satisfied: regeneration time, refueling has started from 4s only, outlet pressure ≤400 psi). This function is not available for versions without dryer.
- Dryer, GAS leakage detection, Air Flow Control
Versions without one of this element are available, as already said.

Optional functions that can be enabled by the dealer, after manufacturer’s authorization:

- External gas sensor (provided by the manufacturer).
- Max time configuration of a single compression.
- Pressure increase control (Inadequate pressure increase).
- Service option enabling (gradual decrease of final pressure after passing max working hours set up by the manufacturer).
- Configuration of compression time between two regenerations.

8. MAINTENANCE INSTRUCTIONS

The end user or unauthorized personnel should not access internal components for safety reasons; after installation, authorized personnel should close Cover applying the suitable seal provided with the handbook. HRA should only kept maintained by authorized personnel suitably trained.

Technical service should always:

- 1 Compare errors shown by HRA with table 4
- 2 Try to solve problem verifying installation or replacing components
- 3 Test HRA to verify if problems have been eliminated
- 4 Close and seal HRA



WARNING:

Any other operation not described in this manual should only be carried out by BRC-FuelMaker at its premises. Any service completed by UNAUTHORIZED personnel will invalidate the warranty and may cause damage to the compressor, serious injury and/or death .

- Ordinary Maintenance Inspection

Periodically check the outlet pressure to ensure proper operation (see table 2), verify that refuelling hose does not show abrasions, cutting or swelling; replace it if necessary. Always check refuelling nozzle and breakaway device, replace them if necessary. Check that pressure relief and front/rear air inlets are free from material or ice.

Any attempt to tamper with or open modules can cause damage to property, serious injury and/or death; and will invalidate the warranty.

9. HRA REMOVAL

If you need to remove the unit, follow these instructions:

- Check that Electric Supply button is OFF and gas inlet valve closed.
- Check the absence of voltage on electric supply cable and disconnect it.
- Disconnect Inlet and Discharge pipe from HRA verifying the absence of overpressures; close fittings.
- Pack HRA with its original packaging.

For further information, please feel free to contact Technical Service.

10. SAFETY AND DIAGNOSTIC FUNCTIONS

10.1 SAFETY FUNCTIONS

The following table shows appliance safety functions. They are indicated by the letter SF (Safety Function) followed by a progressive index.

Safety functions					
Number	Description	Operation mode	Phase involved	Application	Exception
SF1	Leaks detection on Gas high pressure line	Protection – Low demand mode	Refueling	Outdoor / Indoor	-
SF2	Humidity elimination through Dryer function	Control and monitoring – Continuous mode (dryer) periodically activated (Regeneration)	Refueling, Regeneration	Outdoor / Indoor	CNG dew point
SF3	Gas Leakage detection	Protection – Low demand mode	Always, except for the first minute from starting	Indoor	-
SF4	Detection of inadequate air flow	Protection – Low demand mode	Refueling, Regeneration	Indoor	-
SF5	Inlet pressure detection and verification of limits allowed	Protection – Low demand mode	Refueling, Regeneration	Outdoor / Indoor	-
SF6	Outlet pressure control and monitoring	Protection – Low demand mode Control and monitoring – Continuous mode	First seconds from starting, Refueling	Outdoor / Indoor	-

Tabella 6 – Safety functions

The following table shows system response when a safety function is broken (hazard).

System puts itself in safe condition:

- o Engine off.
- o Combi Valve off (eventually switched on again in case of Blowback anomaly detected).
- o All Dryer actuators off (Peltier-Condenser, ByPass Valve, Column heater, Diaphragm Heater-Vaporizer if Nafion function is disabled).
- o Buzzer, indicators, fan, engine relay and blow back managed according to the specific safety function.

Appliance response in case of Safety Function Intervention		
Safety function	System response	User's Interface Response
SF1	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds
SF2	Dryer function (gas dehumidifier) always activated. Dryer regeneration uses: Engine, ByPass Valve (Combi Valve should be off), Fan, Diaphragm Vaporizer, Column Heater, Condenser (Peltier). If anomaly is detected during regeneration, system puts itself in safe condition (the specific response depends on the kind of anomaly).	- ANOMALY indicator off (if there are no anomalies detected) - REFUELING indicator off - REGENERATION indicator on (if there are no anomalies detected) - Buzzer off (if there are no anomalies detected)
SF3	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer on
SF4	System puts itself in safe condition and: - Fan on (except for flow meter error and max number of restarting, allowed after an anomaly detected, not yet achieved) - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds
SF5	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds
SF6	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on * - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds

Table 7 – Appliance response

*In case of BlowBack enabled error, buzzer emits an intermittent sound. In case of BlowBack enabled and/or detected error, refueling indicators (DISPLAY) start to blink.

The following table shows time intervals of safety functions and system response times in case of violation (this estimates software and actuators response time).

Test interval does not consider: sensors response time, input acquisition time (including average calculation and software filters implemented, that change from input to input according to the kind), test duration.

System Response Time		
Safety function	Test Interval	Response Time
SF1	After 6 seconds from refueling (repeated after 36 seconds if first test fails, repeated after the Empty Tank if enabled), every 130 min of refueling and when outlet pressure is 97% of the final allowed one and the system is refueling from at least 5 min.	~ 2 s
SF2	Dryer function is always enabled during compression when gas passes through. Regeneration enabled: -every lapse of time expected between two regenerations if outlet pressure is > 400 PSI. -If filling final pressure has been > 400PSI and at least 75% of max time between two regenerations is elapsed and system is in stand-by from at least 30 min.	~ 2 s
SF3	About every 10ms (except during the first minute of refueling)	~ 2 s
SF4	About every 10ms (except during the first seconds of refueling)*.	~ 2 s
SF5	About every 10ms (except during the first seconds of refueling; pressure higher limit is verified only after at least 5 min running)*.	~ 2 s
SF6	About every 10ms (final pressure is verified during refueling). About every 10ms: outlet pressure sensor limit are verified (except during the first seconds of refueling)* About every 1s during refueling: Unexpected increase/drop of outlet pressure. 5s after the end of refueling and during the first seconds of supply (about after 6 sec), BlowBack is enabled (if test KO, system repeats after 16 sec and then after every 15 min; test can be forced by pressing STOP button). When system starts refueling/regeneration process, software carries out the blow down test.	~ 2 s

Table 8 – Appliance response time

*In case of condition violation, the system reacts (putting itself in safe condition) just in case of refuelling or regeneration.

With Running, we intend refueling or regeneration started from a refueling process.

10.2 DIAGNOSTIC FUNCTIONS

The following table shows diagnostic functions and system response when a Fault/Hazard is detected.

System puts itself in safe condition:

- o Engine off.
- o Combi Valve off (eventually switched on again in case of Blowback anomaly detected).
- o All Dryer actuators off (Peltier-Condenser, ByPass Valve, Column heater, Diaphragm Heater-Vaporizer if Nafion function is disabled).
- o Buzzer, indicators, fan, engine relay and blow back managed according to the specific Hazard/Fault detected.

The table also shows Diagnostic Coverage of single functions.

Appliance response in case of Diagnostic Functions intervention					
Number	Device/function	Description	System response	User's interface response	Diagnostic Coverage
Hazard					
1	LPT (Low Pressure Transducer – low limit)	Low inlet pressure	System puts itself in safe condition and: -Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
2	LPT (Low Pressure Transducer – high limit)	High inlet pressure	System puts itself in safe condition and: -Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
3	HPT (High Pressure Transducer – high limit)	Excessive high pressure detected	System puts itself in safe condition and: -Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%

Table 9 - Appliance response

Appliance response in case of Diagnostic Functions intervention					
4	HPT (High Pressure Transducer – low limit)	High pressure sensor malfunction	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
5	AIR FLOW (inadequate air flow)	Inadequate cooling air flow	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
6	AIR FLOW (flow meter out of order)	Flow meter error	System puts itself in safe condition and: - Fan on (except for max number of restarting after anomaly is passed) - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
7	COMBI VALVE	Combi Valve malfunction	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
8	INTERNAL GAS ALARM	Internal gas sensor alarm	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer on	Low – 60% High – 90%

Table 9 – Appliance response (Continued)

Appliance response in case of Diagnostic Functions intervention					
9	INTERNAL GAS ALARM	Wrong Internal gas sensor Calibration	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer on	Low – 60% High – 90%
10	INTERNAL GAS ALARM	Internal gas sensor Error	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer on	Low – 60% High – 90%
11	EXTERNAL GAS SENSOR (OPTIONAL)	External gas sensor alarm	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer on	Low – 60% High – 90%
12	DRYER GENERAL	Dryer malfunction	System puts itself in safe condition and: - Fan on - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Medium – 90%
13	BY PASS VALVE	ByPass Valve malfunction	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
14	DRYER CONDENSER TEMPERATURE	Dryer condenser temperature out of range	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Medium – 90%

Table 9 – Appliance response (Continued)

Appliance response in case of Diagnostic Functions intervention					
15	DRYER EVAPORATOR TEMPERATURE	Dryer vaporizer temperature out of range	System puts itself in safe condition and: -Fan on -Vaporizer switching off (even if Vaporizer function is enabled) - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	Medium – 90%
16	DRYER Peltier CURRENT	Excessive Peltier absorption (Condenser)	System puts itself in safe condition and: -Fan on - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
17	MOTOR TRIAC	Triac error	System puts itself in safe condition and: -Fan on -Engine relay opening - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
18	MOTOR TCO	Engine overtemperature (TCO)	System puts itself in safe condition and: -Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%
19	MOTOR	Engine Overcurrent	System puts itself in safe condition and: -Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	High – 90%

Table 9 – Appliance response (Continued)

Appliance response in case of Diagnostic Functions intervention					
20	SUDDEN PRESSURE DROP TEST	Outlet high pressure unexpected drop	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
21	BLOWDOWN	Excessive BlowDown pressure	System puts itself in safe condition and: - Fan on - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
22	BLOWBACK	Back-pressure (BlowBack)	System puts itself in safe condition and: - Fan on - Combi Valve on (except when system verifies if pressure decreases to not dangerous values) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer blinking - Refueling indicators (DISPLAY) blinking	NA
23	SUDDEN PRESSURE RISE	Outlet pressure unexpected increase	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
24	HOSE TEST	High pressure gas leakage	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
Hardware fault					
25	AMBIENT TEMPERATURE SENSORS	Ambient temperature out of range	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%

Table 9 – Appliance response (Continued)

Appliance response in case of Diagnostic Functions intervention					
26	START BUTTON	START button error	System puts itself in safe condition and: - Fan on (is system was refueling/regenerating) - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
27	STOP BUTTON	Stop button failure	System puts itself in safe condition and: - Fan off - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
Pressure management faults					
28	PRESSURE RISE TEST	Inadequate pressure increase	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
Counter timer faults					
29	MAX RESTART	Max allowed number of error for compressor restart passed	System puts itself in safe condition and: - Fan on - BlowBack enabled from last error detected (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
30	MAXFILL TIME	Max filling time	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA

Table 9 – Appliance response (Continued)

Appliance response in case of Diagnostic Functions intervention					
31	POWER OFF	Max allowed number of reset (e.g. Watch Dog) in refueling/regeneration passed	System puts itself in safe condition and: - Fan on - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	NA
Software faults					
32	EEPROM	EEPROM Error	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
33	FLASH	FLASH Error	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
34	RAM	RAM Error	System puts itself in safe condition and: - Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Medium – 90%
35	MAP EEPROM KO	Mapping/Calibration error	System puts itself in safe condition and: - Fan on	- Supply indicator blinking - ANOMALY indicator on - REFUELING indicator off - REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%

Table 9 – Appliance response (Continued)

Appliance response in case of Diagnostic Functions intervention					
35	MAP EEPROM KO	Mapping/Calibration error	System puts itself in safe condition and: -Fan on	- Supply indicator blinking - ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
36	REMOTE COMMUNIC. STATUS	Remote communication error	System puts itself in safe condition and: -Fan on - BlowBack algorithm activation (if system was refuelling) - Anomaly recorded on memory	- ANOMALY indicator on - REFUELING indicator off -REGENERATION indicator off - Buzzer is on for 5 seconds	Low – 60%
37	RS-232	RS-232 CRC error	No system response because the problem only concerns communication with diagnostic interface	- Diagnostic interface disconnected or problems in displaying parameters	High – 90%
38	WATCH DOG	Watch Dog function	System switches off and then restarts	- Supply indicator blinking for system restarting	Low – 60%

Table 9 – Appliance response (Continued)

Notes:

- DC shown in table is the Diagnostic Coverage concerning failures for diagnosed block as a whole, while DC shown in FMEDA should be the specific value of single failure mode;
- In table, DC = 90% has been conservatively used even in case of DC High

The following table shows time intervals of diagnostic functions and system response times in case of violation (this estimates software and actuators response time).

Test interval does not consider: sensors response time, input acquisition time (including average calculation and software filters implemented, that change from input to input according to the kind), test duration.

The system can carry out manual/automatic restarting in the same refueling/regeneration cycle after a fault/hazard detection. The first starting can only be manual.

The following table shows (in error type column) the kind of restarting determined by corresponding fault/hazard:

- Type A: automatic restarting after 15s;
- Type B: automatic restarting when anomaly has been solved (and at least after 15s from its detection);
- Type C: automatic restarting after 10minutes, you can advance restarting manually;
- Type D: manual restarting;
- Type E: manual restarting if anomaly has been solved;
- Type F: automatic restarting is possible but a switching off (< 1 minute) is necessary. If system is not reset, appliance cannot restart (if you press stop and then start the system starts a new cycle but error is promptly detected because the anomaly can only be erased through a compressor reset);
- Type G: manual restarting is possible but a switching off (< 1 minute) is necessary. If system is not reset, restarting is impossible;
- Type H: some anomalies prevent from restarting, system should be reset by switching off > 1minute or through the STOP;

- Type I: some anomalies reset restarting and cancel this function;
- Type L: some anomalies reset restarting and cancel this function blocking the system (if anomaly persists, just a reset can unblock the system);

Note: automatic restarting is possible only if system is in running condition (refueling or regeneration started from a refueling process). In any other case (such as regeneration automatically started from a stand-by after a filling), only manual restarting is possible.

The table also shows Fault/Hazard conditions.

System Response Time, type of restarting and Fault/Hazard conditions					
Number	Device/function	Fault/Hazard condition	Error type	Test Interval	Response time
Hazard					
1	LPT (Low Pressure Transducer – low limit)	Inlet Pressure < 3.5" water column	B	~ 10ms (test disabled during the first seconds of appliance supply)	~ 2 s
2	LPT (Low Pressure Transducer – high limit)	Inlet Pressure > 20" water column	B	~ 10ms (tested only after 5 minutes running)	~ 2 s
3	HPT (High Pressure Transducer – high limit)	Outlet Pressure > 2% of max allowed pressure	B	~ 10ms (test disabled during the first seconds of appliance supply)	~ 2 s
4	HPT (High Pressure Transducer – low limit)	Sensor signal under voltage < 0.4V	B	~ 10ms (test disabled during the first seconds of appliance supply)	~ 2 s
5	AIR FLOW (inadequate air flow)	Air Flow position incoherent with fan condition. Fan on and Air Flow down.	B	~ 10ms (test disabled during the first seconds of appliance supply)	~ 2 s
6	AIR FLOW (flow meter out of order)	Air Flow position incoherent with fan condition. Fan off and Air Flow up.	B	~ 10ms (test disabled during the first seconds of appliance supply)	~ 2 s
7	COMBI VALVE	With Combi Valve on, current <=300mA or > 2A. With Combi Valve off, current > 300mA.	A	~ 10ms (test disabled for 2s when element is ON or OFF)	~ 2 s
8	INTERNAL GAS ALARM	Gas concentration > 20% LEL	E	~ 10ms (test disabled during the first minute of system starting)	~ 2 s
9	INTERNAL GAS ALARM	Gas sensor reference voltage < 1V o > 3,2V	E	~ 10ms (test disabled during the first minute of system starting)	~ 2 s
10	INTERNAL GAS ALARM	Gas sensor heat current < 25mA o > 90mA	E	~ 10ms (test disabled during the first minute of system starting)	~ 2 s
11	EXTERNAL GAS SENSOR (OPTIONAL)	Gas concentration > 20% LEL	E	~ 10ms (test disabled during the first minute of system starting)	~ 2 s

Table 10 – System response time

System Response Time, type of restarting and Fault/Hazard conditions					
12	DRYER GENERAL	Condenser (Peltier), Vaporizer or Column Heater are not working correctly or current into the condenser < 3A	A	Condenser (Peltier), Vaporizer or Column Heater are verified in regeneration in times Tmis_pelt, Tmis_naf, Tmis_col (mapped parameters). Condenser current verified every 10ms when is on (test disabled in the first seconds of starting and for 2s when element is ON)	~ 2 s
13	BY PASS VALVE	With ByPass Valve on, current <=200mA or > 2A. With ByPass Valve off, current > 200mA.	A	~ 10ms (test disabled for 2s when element is ON or OFF)	~ 2 s
14	DRYER CONDENSER TEMPERATURE	Condenser temperature < -55°C or > 105°C	B	~ 10ms (test disabled in the first seconds of appliance starting)	~ 2 s
15	DRYER EVAPORATOR TEMPERATURE	Vaporizer temperature < -55°C or > 105°C	B	~ 10ms (test disabled in the first seconds of appliance starting)	~ 2 s
16	DRYER PELTIER CURRENT	Condenser current >10A	A	~ 10ms Condenser current verified every 10ms Condenser over current verified every ~ 10ms (test disabled in the first seconds of appliance starting and for 2s when element is ON)	~ 2 s
17	MOTOR TRIAC	Triac short circuit	G	~ 10ms when engine is off (test disabled when element is OFF)	~ 2 s
18	MOTOR TCO	TCO open for excessive engine temperature	C	~ 10ms when engine is on (test disabled for 1s when element is ON)	~ 2 s
19	MOTOR	Engine current < 1A or >10A.	A	~ 10ms when engine is on (test disabled for 12s, if Tamb<-10°C, or 7s, if Tamb≥-10°C, when element is ON)	~ 2 s
20	SUDDEN PRESSURE DROP TEST	Unexpected outlet pressure drop	D	~ 1s during refuelling	~ 2 s

Table 10 – System Response Time (Continued)

System Response Time, type of restarting and Fault/Hazard conditions					
21	BLOWDOWN	Excessive BlowDown pressure	A	When a refueling or a regeneration starts	~ 2 s
22	BLOWBACK	Back-pressure (BlowBack)	E	5s after the refueling stop and during the first seconds of supply (after about 6 sec) BlowBack activates (if test KO, system repeats after 16 sec then every 15 min; you can force test by pressing STOP)	~ 2 s
23	SUDDEN PRESSURE RISE	Unexpected outlet pressure increase	D	~ 1s during refueling	~ 2 s
24	HOSE TEST	High pressure gas leakage	D	After 6 seconds refueling (repeated after 36 seconds if first test fails, repeated after empty tank if enabled), every 130 min refueling and when outlet pressure is 97% of the final one allowed and system is refueling from at least 5 min.	~ 2 s
Hardware fault					
25	AMBIENT TEMPERATURE SENSORS	Amb temp -45°C or > 55°C Difference of temperature between the two sensors > 8°C	B	~ 10ms (test disabled in the first seconds of appliance starting)	~ 2 s
26	START BUTTON	Start button pressed for > 30s	B	~ 10ms when start signal is present (except if during the first minute of system starting is in Map/Cal error)	~ 2 s
27	STOP BUTTON	Stop button pressed for > 30s	I	~ 10ms when stop signal is present (except if during the first minute of system starting is in Map/Cal error)	~ 2 s
Pressure management faults					
28	PRESSURE RISE TEST	Inadequate outlet pressure increase	D	~ 10 minute refueling	~ 2 s

Table 10 – System Response Time (Continued)

System Response Time, type of restarting and Fault/Hazard conditions					
Counter timer faults					
29	MAX RESTART	Max number of error for restarting reached	H	After a refueling/regeneration stop due to error. At any appliance starting (supply).	~ 2 s
30	MAXFILL TIME	Max refueling time allowed for refueling reached	D	~ 1 s refueling	~ 2 s
31	POWER OFF	Max number of appliance reset during a refueling/regeneration cycle for restarting reached	H	At any appliance starting (supply).	~ 2 s
Software faults					
32	EEPROM	EEPROM writing error	F	At any EEPROM writing	~ 2 s
33	FLASH	FLASH corruption (CRC error)	F	~ 40 s	~ 2 s
34	RAM	RAM corruption	F	~ 1 s (test disabled in the first 10s of system supply)	~ 2 s
35	MAP EEPROM KO	EEPROM mapping/calibration parameters error	L	At any appliance starting (supply).	~ 2 s
36	REMOTE COMMUNIC. STATUS	Communication failure	B	~ 10ms	~ 2 s
37	RS-232	Corruption of packages sent to RS232 (CRC error)	NA	At any packaged received	NA
38	WATCH DOG	SW execution interrupted (e.g. in case of endless loop) for >260ms	A	~ 260ms	~ 2 s

Table 11 – System Response Time (Continued)

Notes: test effects (if enabled) are active only if system is in a precise condition (in addition to table indications) when the appliance is required to put itself in safe condition:

- Refueling /Regeneration: 1,3,4,5,6,7,13,14,15,18,19,21,25,32,33,34,36
- Running (refueling or regeneration started from refueling): 2
- Regeneration: 12, 16
- Refueling: 20, 23, 24, 28, 30
- All conditions: 8, 9, 10, 11, 17, 26, 27, 38
- Refueling and during the first seconds of supply: 22
- Refueling /Regeneration and at system starting (supply): 29
- At system starting (supply): 31, 35
- No effect: 37

11. RELIABILITY TECHNICAL DATA

The tables show appliance reliability data:

- λ_S failure probability for Safety failures;
- $\lambda_{D(DD)}$ failure probability for diagnosed Dangerous failures;
- $\lambda_{D(DU)}$ failure probability for not diagnosed Dangerous failures;
- λ_{NE} failure probability for failures not involving safety functions and with no effect;
- Diagnostic Coverage (DC);
- Safe Failure Fraction (SFF).

		λ_S [1/h]	$\lambda_{D(DD)}$ [1/h]	$\lambda_{D(DU)}$ [1/h]	λ_{NE} [1/h]
Funzioni di Safety functions	SF1	6,793E-06	7,882E-07	2,896E-07	2,927E-07
	SF2	6,857E-06	3,662E-06	6,512E-07	3,737E-07
	SF3	3,034E-06	2,721E-06	8,574E-07	2,020E-07
	SF4	2,166E-08	5,674E-07	2,307E-07	1,920E-07
	SF5	3,180E-09	5,261E-07	2,244E-07	1,895E-07
	SF6	6,636E-06	1,122E-06	6,836E-07	2,017E-07

Table 11 – Failure Probability

		$\lambda_{D(DD)} / \lambda_D$ [%]
Diagnostic Coverage	SF1	73,13
	SF2	84,90
	SF3	76,04
	SF4	71,10
	SF5	70,10
	SF6	62,15

Tabella 12 - Diagnostic Coverage

		$(\lambda_S + \lambda_{D(DD)}) / (\lambda_S + \lambda_D)$ [%]
Safe Failure Fraction	SF1	96,32
	SF2	94,17
	SF3	87,03
	SF4	71,86
	SF5	70,23
	SF6	91,90

Table 13 - Safe Failure Fraction

- HFT = 0 (Hardware Fault Tolerance)
- SC = 1 (Systematic Capability)
- Tipo = B

Reliability data are assured for a life expectancy of 10 years.

12. DISPOSAL

RIGHT DISPOSAL

At the end of the HRA's life, it should be removed and disposed according to installation Country authorities having jurisdiction.

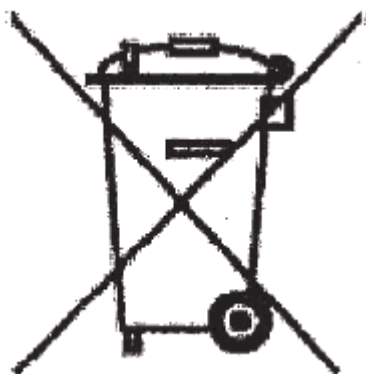
A suitable separate collection for the following recycle and environmental disposal helps to avoid possible negative effects on environment and health and favours re-use and/or recycle of HRA materials.



DO NOT DISPOSE COMPRESSOR TOGETHER WITH DOMESTIC WASTE



PHILL CONTAINS MATERIAL ABSORBING MERCAPTAN FROM NATURAL GAS DURING REFUELING OPERATIONS



Waste from Electrical and Electronic Equipment (WEEE)
(Valid for European Union and other European Countries with waste separate collection systems)



This symbol  on HRA, or on its documents means that product should be disposed at the end of its life according to directive 2002/96/CE about waste from Electrical and Electronic Equipment (WEEE) and implementation in national law.

HRA should not be disposed as urban waste but rather be delivered to the suitable collection point for electrical and electronic equipment. Phill contains material absorbing mercaptan from natural gas during refueling operations.

In case of wrong HRA disposal, you will be responsible for it in accordance with laws in force.

13. WARRANTY CERTIFICATE

WARRANTY CONDITIONS

M.T.M. Srl guarantees products for 24 months starting from the date of purchasing, within the limit of 2,000 working hours.

Purchasing should be proved by a fiscally valid receipt issued by the seller (fiscal ticket, invoice or transportation bill) identifying the product, the date of purchasing and/or delivery.

During the whole warranty period M.T.M. Srl engages itself to:

- (a) restore faulty products assuming all burdens of expenses concerning spare parts and transportation
- (b) replace faulty products not usefully repairable (e.g. when repair will cost more than replacement).

GENERAL CONDITIONS

In order to benefit from warranty, the user will contact the seller and/or installer that will repair the machine having ascertained the working defect.

If seller and/or installer cannot solve the problem, the machine will be forwarded to BRC FuelMaker that will repair it or replace it with a new one at its own discretion.

The machine will be returned to BRC FuelMaker in its original packaging; lack of this packaging will automatically cause the warranty forfeiture.

Warranty will be acknowledged only if the purchasing receipt will be sent by fax or mail at the moment of the intervention request:

BRC FuelMaker – Warranty Dept.

Fax: +39 0172.486.630

E.mail: Compressorservice@brc.it

This warranty will not cover:

- a) Fair wear and tear
- b) Damages deliberately caused or due to negligence
- c) Damages caused by inobservance of working instruction or by a wrong installation
- d) Damages on non-functioning components that do not jeopardize the regular machine work, scratches and difference in colours included
- e) Accidental damages caused by foreign body or substance, especially included the non-standard composition of the gas supplied to the machine (gas quality).
- f) Repairs carried out by unauthorized assistance centres or repairs realized with non original spare parts
- g) Damages caused by transportation

14. CE CONFORMITY DECLARATION

BRC FuelMaker
M.T.M. S.r.l.
Via La Morra n°1
12062 Cherasco (CN) _ Italy



Tel. +39 017248681
Fax. +39 0172593113

CE DECLARATION OF CONFORMITY **DICHIARAZIONE DI CONFORMITA' CE**

Application of Council Directives: 2006/42/CE - Machinery Directive
Direttive comunitarie applicate 2006/95/CE - Low Voltage Equipment
2004/108/CE - The EMC Directive
97/23/CE - PED Directive

Notified body charged of the conformity assessment:
CSI S.p.A. – V.le Lombardia, 20 – 20021 BOLLATE (MI) – N.Id. 0497
Terms of CE certificate according to B procedure: PED/0497/612/06
Terms of CE certificate according to D procedure: PED/0497/613/06

Manufacturer's Name: MTM S.r.l. Società Unipersonale
Costruttore
Manufacturer's Address: Via La Morra n°1
Indirizzo del costruttore 12062 Cherasco Cn, Italia

Equipment Type: Vehicle Refuelling Appliance
Tipologia apparecchiatura *Apparecchio di erogazione ad uso privato di Gas Naturale per autotrazione.*

Trade Name Model No(s): HRA-P30-G1.5; HRA-P36-G1.5
Modello
Trade Mark: BRC FuelMaker
Marchio

Standard(s) to which Conformity is Declared:
Normative applicabili a cui si dichiara la conformità:

	Standard	Description
1	EN 60335-1:2002	Household and similar electrical appliances - Safety Part 1: General requirements
2	UNI EN ISO 12100-1 UNI EN ISO 12100-2	List of Hazards assessment
3	E.S.R. (2006/42/CE)	List of Essential Health and Safety Requirements Applicable Standards for the Adopted Solutions
4	UNI EN ISO 14121: 2009	Safety of machinery – Principles for risk assessment
5	EN 60950-1 : 2001	Information Technology Equipment –Safety – Part 1: General requirements
6	EN 60730-1	Automatic electrical controls for household and similar use. General requirements
7	EN 60730-2-9	Automatic electrical controls for household and similar use; Part.2: Particular requirements for temperature sensing controls
8	EN 61508	Functional safety of electrical / electronic / programmable electronic safety-related systems
9	UL 1998	Software in Programmable Components
10	NGV1/ISO 14469	Road Vehicle – Compressed Natural Gas Vehicle Refuelling Systems
11	NGV4.4/CSA 12.54 – 1999	Breakaway Devices for Natural Gas Dispensing Hoses and Systems
12	NGV4.2/CSA 12.52 -1999	Hoses for Natural Gas Vehicles and Dispensing Systems
13	PrEN 13945	Draft European standard for NGV refuelling appliances - at polling stage
14	CSA 12.6 - 04	Vehicle Refuelling Appliances
15	AGA 2-90	Natural Gas Vehicle Fueling Appliances
16	AFG GNV1	Domestic Filling Equipment for Vehicles Running on Natural Gas
17	NFPA-52: 2006	Compressed Natural Gas (CNG) Vehicular Fuel System Code
18	AG806 - 1992	Approval Requirements for Vehicle Refuelling Appliances
19	C22.2 No. 182.3 – M1987	Special Use Attachment Plugs, Receptacles, and Connectors.
20	C22.2 No. 14-95 (R2000)	Industrial Control Equipment
21	C22.2 No. 77-95 (R2000)	Motors With Inherent Overheating Protection
22	UL Std No. 508	Safety requirements for Industrial Control Equipment
23	UL Std No. 508C	Safety Power Conversion Equipment
24	C22.2 No.236-M2005	Heating and Cooling Equipment

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25	EN 55022:1998+A1:2000	Electromagnetic Immunity
26	EN 55014-1:2000	Discontinuous Test
27	EN 61000-6-1:2001	Generic Immunity standard for residential, Commercial and light-industrial environments
28	EN 61000-6-3:2001	Generic Emission standard for residential, Commercial and light-industrial environments
29	EN 61000-4-2	Electrostatic Discharge Test
30	EN 61000-4-3	Radiated RF Immunity Test
31	EN 61000-4-4	Electric Fast Transient Test
32	EN 61000-4-5	Fast Surge Test
33	EN 61000-4-6	Conducted Immunity Test
34	EN 61000-4-11	Voltage Dip and Interruptions
35	EN 61000-3-2	Harmonic
36	EN 61000-3-3: 1995, +A1: 2001	Flicker

We, hereby declare that the BRC FuelMaker Vehicle Refuelling Appliance conforms to the following directives:
Si dichiara inoltre che il VRA della BRC-FuelMaker soddisfa le seguenti normative:

- Test Report EN 60335-1: Household and similar electrical appliances – Safety Part 1: General requirements
- Risk Assessment as per EN 1050 & List of Hazards as per ISO 12100 (EN292)
- Machinery Directive (2006/42/CE) – List of Essential Health and Safety Requirements Applicable Standards for the Adopted Solutions
- Machinery Directive (2006/42/CE) – Description of problem and solution
- CSA Test Report 159937-1799097, Project 1799097: Performance testing to cover HRA for residential indoor and outdoor installation and operation
- CSA Test Report 159937-1799099, Project 1799099: Evaluation of the – Controller Module with Integral Power Supply
- CSA Test Report 159937-1805736, Project 1875401: Evaluation of the of the Safety Control Software
- CSA Test Report 159937-1601190, Project 1898919: Evaluation of Cable Pass Through
- CSA Test Report 159937-1591887 , Project 1591887: Electromagnetic Compatibility of HRA for residential and commercial installation and operation.

Mariano Costamagna
The Legal Representative
Il Legale Rappresentante

M.T.M. srl
Società Unipersonale
IL PRESIDENTE
Costamagna Mariano

Date 15/02/2011
Data

15. CERTIFICATE SIL 1

TEST CERTIFICATE

CERTIFICATO DI PROVA

REGISTRATION No.	:	827
NUMERO DI REGISTRAZIONE		
PRODUCT	:	HOME REFUELING APPLIANCE
PRODOTTO		
APPLICANT	:	M.T.M. S.r.l.
RICHIEDENTE		VIA LA MORRA 1 - 12062 CHERASCO CN
MANUFACTURER	:	M.T.M. S.r.l.
COSTRUTTORE		
TRADE MARK	:	M.T.M.
MARCA		
MODEL/TYPE REF.	:	HRA 1.5
MODELLO/RIF. DI TIPO		

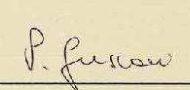
TEST RESULTS
RISULTATO DELLE PROVE

A sample of above product was found to be in compliance with the
 Technical specification(s) / standard(s) listed below.
*Un campione del prodotto specificato è stato provato ed è risultato conforme alle
 norme/specifiche tecniche qui sotto indicate*

TEST DETAILS
DETTAGLI DELLE PROVE

TEST REPORTS REFERENCES NO. RIFERIMENTO RAPPORTI DI PROVA	TECHNICAL SPECIFICATIONS / STANDARDS SPECIFICHE TECNICHE / NORME DI RIFERIMENTO
50AL00032	IEC 61508 : 2010 SIL 1 FOR ALL SAFETY FUNCTION

Place and Date of issue : Milan, 2012/09/27
LUOGO E DATA DI EMISSIONE


IMQ

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 Questo Certificato di Prova è il risultato delle prove effettuate sul campione di prodotto presentato, seguendo le prescrizioni della corrispondente norma/ specifica tecnica citata. Esso non implica un giudizio sulla produzione e non permette l'uso di un marchio di conformità. Solo la completa riproduzione del Certificato è permessa senza l'autorizzazione scritta dell'IMQ.



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