



**INSTRUCTIONS, OPERATION  
AND MAINTENANCE MANUAL**

**HEAT RECOVERY UNITS**

**SERIES UR-URE**



|   |          |                         |  |           |
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## 0. INTRODUCTION

This manual has been compiled by TCF Srl to provide the installer, customer and user with instructions intended to ensure the proper management and use of the heat recovery units series UR and URE from the delivery up to the commissioning.

The recommendations which follow are intended to ensure a continuous and durative operating life of the heat recovery unit.

The procedures described below should be performed by skilled personnel with a good knowledge of air-conditioning systems design and operation, even though, thanks to the unit's simplicity of design, these could be carried out also by those unfamiliar with air handling.

## 1. DESCRIPTION OF THE HEAT RECOVERY UNIT

### 1.1 COMPOSITION

The heat recovery unit, in single-section, in its most complete execution, is made up from:

- Fresh air and exhaust dampers
- Filters section (supply/exhaust)
- Heat recovery section
- Heat exchanger section (heating)
- Supply fan section (supply/exhaust)
- Straight or circular type baffles silencer section (supply/exhaust)

### 1.2 PERMITTED USE

TCF heat recovery units are designed exclusively for CIVIL AND INDUSTRIAL AIR TREATMENT.

In case of CORROSIVE and/or EXPLOSIVE air flows, a number of special technical modifications must be made at the design stage which, altogether, adapt the machine for the treatment of special air flows.

The heat recovery units must at all times be used strictly in accordance with the design conditions established at the time of contract in agreement with the customer. ANY OTHER USE SHALL CONSTITUTE IMPROPER USE AND IS THEREFORE DANGEROUS. THE MANUFACTURER MAY NOT BE HELD LIABLE FOR DAMAGE CAUSED BY NON-STANDARD USE OR ANY USE NOT ENVISAGED IN THE CONTRACT.

## 2. CONTROL, PACKING, TRANSPORTATION

### 2.1 FACTORY INSPECTION OF THE SUPPLY

Prior to shipping, each TCF heat recovery unit is subject to all the functional tests listed on the attached UNIT INSPECTION SHEET. The controls concern:

- General machine dimensions
- Correct assembly of the various parts and sections
- Compliance with the various safety rules in force
- Integrity of all the system's component parts
- Application of the identification, operation and safety notices

On completion of the inspection, the Chief Inspector applies the EC mark demonstrating product compliance with prevailing European Union machine directives.

### 2.2 PACKING

The heat recovery units are usually supplied as fully-assembled monoblocks.

Only if the customer expressly requests it, the units can be split into sections to facilitate transportation and carriage through narrow apertures, stairs or corridors.

Transportation of the machines may be:

- normal
- special

In the former case, TCF Srl does not normally pack the units.

In case of special transportation, the packing requested is agreed at the time of contract and is entirely on the customer's charge.

Fragile components supplied separate from the unit, such as humidifiers, exchangers, recuperators, filters, control boards etc., are always delivered packed.

### 2.3 LOADING,TRANSPORT,UNLOADING

TCF Srl disclaims any liability for damage occurred to the heat recovery unit during loading, unloading and transportation. We therefore recommend that precautions be taken, including:

- The load must be firmly secured to ensure its integrity during transportation
- Handling must be performed without exerting force on protruding accessories (hydraulic attachments, handles, hinges, air locks, protection roof)
- Do not overturn the UR as you may otherwise break internal supports, components and dampers
- Do not subject the UR unit to violent impacts as you may damage its integrity
- If a forklift truck is used during the loading, unloading and handling operations, the forks of the truck must be at least the same length as the UR unit to ensure stability (fig. 1)
- If the heat recovery unit is fitted with a continuous steel base frame, handling may be carried out with a crane, using cables firmly secured to rods (sufficient for the stress involved) passing through the holes provided in the base.

If a crane is used, proceed as shown in the illustration, using spacers to protect the structure (fig. 2).

- During transportation, protect the UR unit from atmospheric agents. Special care must be taken if the unit is supplied disassembled or designed for internal use.

Fig. 1

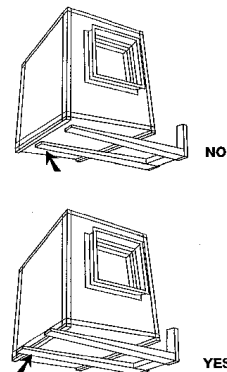
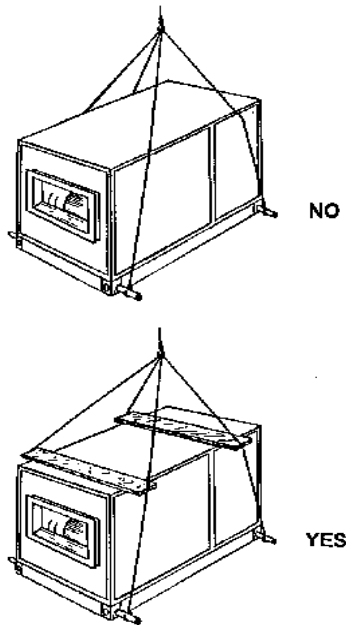


Fig. 2



### 3. ASSEMBLY ON SITE

#### 3.1 POST-TRANSPORTATION CHECK

Upon arrival of the heat recovery unit on site, TCF suggests the customers to perform an accurate check of the structure and of the components.

Should any transportation damage be detected, this must be notified on the delivery bill. The carrier must immediately file a report of the accident to obtain compensation from the insurance company.

#### 3.2 PRESERVATION ON SITE

In order to keep the heat recovery unit in good and efficient condition on site, the following steps must be taken first:

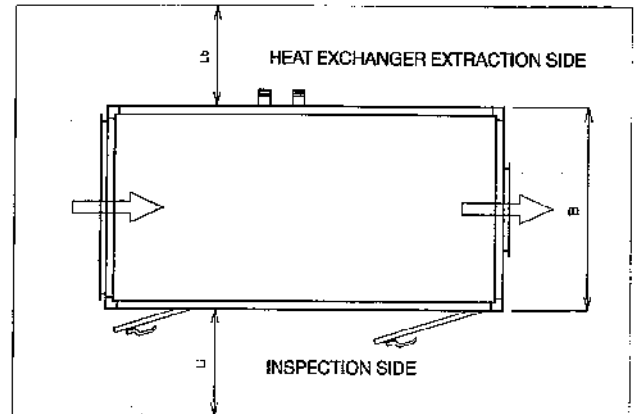
- prior to installation, position the unit and the accessories in a place offering the best possible protection against accidental knocks, dust and atmospheric agents
- carefully cover the inlets and outlets to prevent foreign matter from entering the unit and damaging the internal components of the UR unit
- extract the prefilters from the UR unit and put them in a protected place to preserve their filtrating efficiency. This is why the superior efficiency filters are delivered packed; they must be kept in their packages until the unit is put into service
- check that the hydraulic connections are protected by the relevant caps, as they were delivered by TCF. If they are not, plug them in order to protect them exchangers.

### 3.3 POSITIONING

#### 3.3.1 Dimensions of installation room

The heat recovery unit installation room must be of sufficient size to permit easy inspection, maintenance and component replacement. Accordingly, the following dimensions are recommended (fig. 3):

Fig. 3



- Heat exchanger extraction side:  
min. distance  $L_b = (B+0,2)$  m  
where B = machine width (m)
- inspection side:  
min. distance  $L_i = 1.2$  m

if you do not have the minimum space requirements as specified above, the units doors can, on request, be fitted using PVC clamps instead of hinges. In this case the minimum distance will be  $L_i = 0,7$  m.

#### 3.3.2 Base frame

The permanent installation of the heat recovery unit may be made:

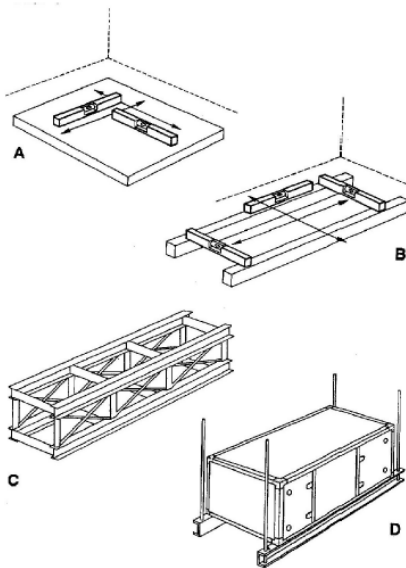
- directly on the floor (fig. 4a)
- on a concrete bed (fig. 4b)
- on a steel section bed (fig. 4c)
- on a suspended base (fig. 4d)

Both the floor and the beds must be capable of withstanding the machine weight to within the required safety margins. The heat recovery unit must be positioned on a horizontal surface so as to prevent:

- damage to the fan motor units caused by uneven weights on the vibration dampers
- malfunctioning of the condensate drains
- difficulty in opening and closing the inspection doors

The horizontal alignment of the support surface must be checked with a SPIRIT LEVEL; adjustments may be made using STEEL SHIMS.

FIG. 4

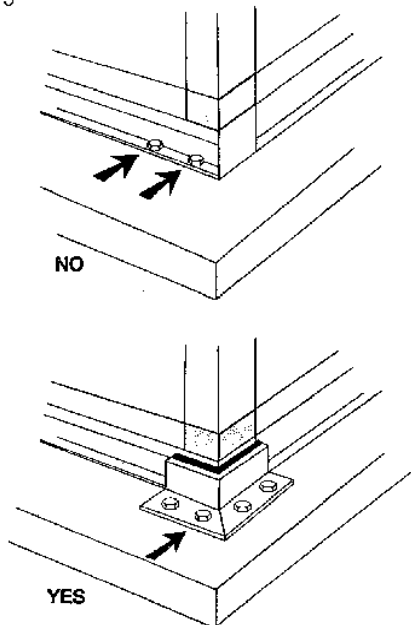


### 3.3.3 VIBRATION DAMPING

In order to ensure effective protection against vibrations, the heat recovery unit must be installed as follows:

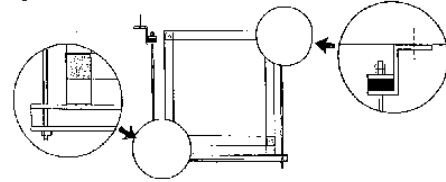
- suitable DAMPERS must be placed between the machine and the support surface, in material designed to withstand the weight involved
- the unit must not be fastened directly with screws but by means of brackets (fig. 5)

Fig. 5



Even in case of suspended installation of the unit, the supports must not be screwed directly into the ceiling; vibration damping material must always be placed between the support and the ceiling (fig. 6).

Fig. 6



## 4. CONNECTION TO SYSTEMS AND START UPS

### 4.1 CONNECTION TO DUCTS

At the point of connection to the air ducts, the heat recovery units have a smooth or a flanged surface.

In order to optimise the connection with the ducts, you must:

- clean the connection edges between duct and unit
- fit a seal to the flanges in order to prevent air infiltration
- tighten the connecting screws firmly
- treat the joint with silicone to enhance the seal

If the connection is made with rubber canvas joints, make sure they are not tightened on assembly completion, so as to prevent damage or the transmission of vibrations.

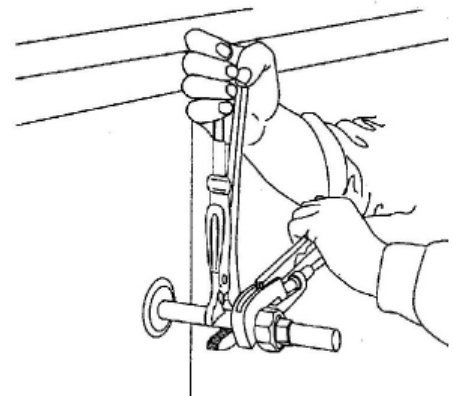
In order to ensure the tightness of the connections and the integrity of the unit, the weight of the ducts must under no circumstances bear down on the unit. The ducts must be supported by BRACKETS.

### 4.2 CONNECTION OF HEAT EXCHANGERS

In order to prevent damage to the exchanger at the joint between the steel manifold and the copper circuits, you must:

- use a pipe wrench to apply force in the opposite direction when making the connection to the mains pipe (fig. 7)
- fit brackets to support the connecting pipes; the weight of the pipes must under no circumstances bear down on the manifold.

FIG. 7



#### 4.2.1 Water heat exchangers

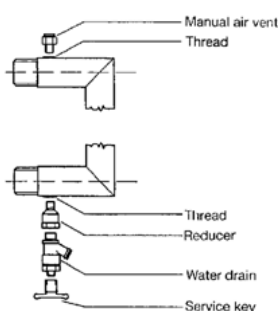
In order to ensure an optimum heat exchange, you must:

- WASH the heat exchanger before connecting it to the water mains
- Once installed in a state-of-the-art fashion, any air present in the hydraulic circuit must be expelled using the appropriate valve

To allow an easy extraction of the heat exchanger during maintenance:

- the connections to the mains must be made in such a way as to allow removal of the exchanger
- ON-OFF VALVES must be installed to exclude the heat exchanger from the hydraulic circuit
- on the lower manifold to allow for a complete drainage, and a VALVE must be fitted to the upper manifold to vent the air from the heat exchanger (fig. 8)

FIG. 8



The normal heat exchange in a heating or cooling water exchanger occurs in REVERSE CURRENT (fig. 9).

In presence of particularly low external temperatures, in order to prevent the formation of ice in the heating units, an EQUICURRENT heat exchange system may be provided (fig. 10). This configuration must be determined at the design stage and not during installation, since on obvious reduction in efficiency will result if a heat exchanger sized for reverse current is used for equicurrent operation.

FIG. 9

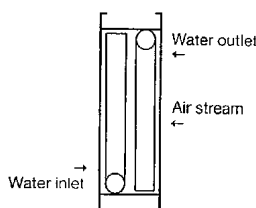
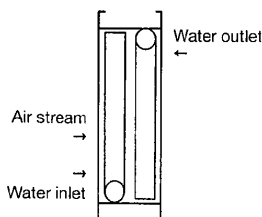


FIG. 10



#### 4.2.2 Electric batteries

Before the start-up:

- inspect the CONTROL BOARD and verify that the actuators and the protections of the electric heaters are sized for the maximum amperage. If the protection devices are sized for a value reasonably exceeding the nameplate value, it is necessary to ensure that the operating range is adequate
- make sure that the MAINS VOLTAGE is adequate to that of the electric batteries, indicated on the nameplate

The connection of the electric heaters basically differs on the grounds of the installed power, of the number of stages and of the type of supply: therefore **please refer to the diagrams supplied with the UR unit.**

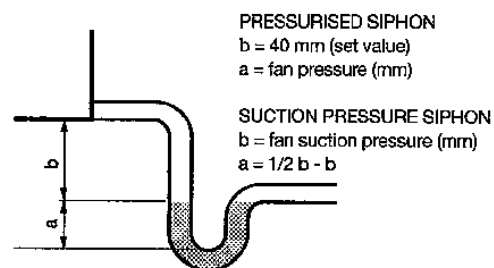
The sizing of the cables and electric protections must be made by skilled personnel according to the laws in force in the country where the unit is installed.

#### 4.3 DRAINAGE AND SIPHONING

Before positioning the heat recovery unit, make sure you have sufficient room to install the siphon and drainage pipe. TCF heat recovery units are fitted with a threaded drain pipe projecting laterally about 80 mm in correspondence to the heat recovery sections.

To allow for a regular outflow of water, every drain must be fitted with a correctly sized SIPHON (fig. 11).

FIG. 11



In order to prevent overflowing from the condensate collection tank and consequent flooding of the machine and the room it is installed in, the siphon must be fitted with a DRAIN VALVE to permit the removal of impurities which may deposit on the bottom (fig. 13).

FIG. 12A

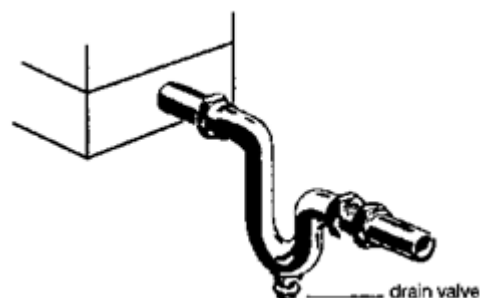
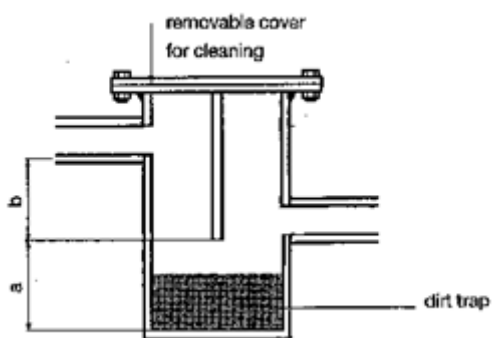


FIG 12B

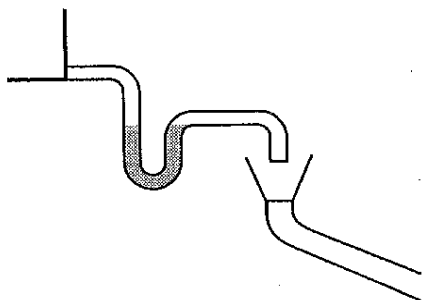


In order not to undermine the operation of the drainage system, pressurised siphons and siphons operating under suction pressure must not be connected together.

The WASTE PIPE (fig. 13) leading to the drainage network:

- must not be connected directly to the siphon in order to absorb air or waste backflow and to permit direct visual control of the correct outflow of waste water
- must have a diameter larger than the drain pipe and a minimum angle of 2% to ensure proper functioning.

FIG. 13



#### 4.4 FILTRATING SECTIONS

Check the correct installation of the prefilters located in the relevant counter frames with safety springs or guides.

#### 4.5 FAN-MOTOR UNITS (3-PHASES) series T

##### 4.5.1 Electric motors

Before starting up the unit:

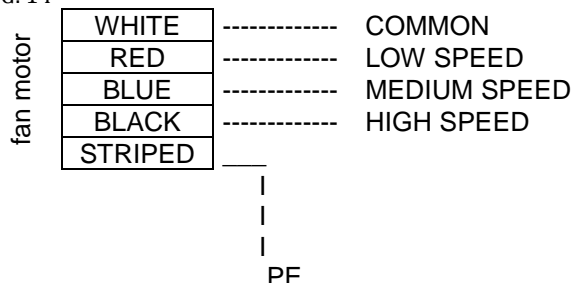
- inspect the CONTROL BOARD and verify that the actuators and the protections of the electric heaters are sized for the maximum amperage. If the protection devices are sized for a value reasonably exceeding the nameplate value, it is necessary to ensure that the operating range is adequate
- Check that the MAINS SUPPLY VOLTAGE is suited to that of the motors as indicated on the relevant plates

#### 4.5.2 Connection

##### 4.5.2.1 Series "URE"

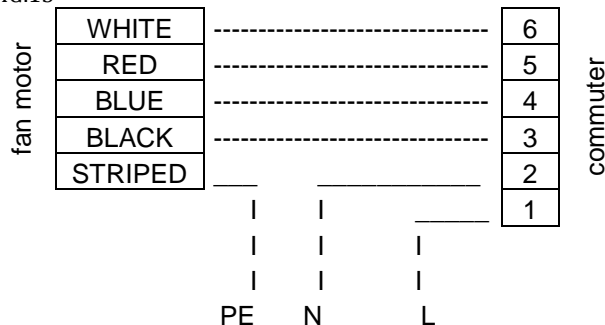
The scheme on fig. 14 shows the 'code colour' of the terminal plate installed on the fans used for the URE series.

FIG. 14



The scheme on fig. 15 shows the connection of a fan motor actuated by the 3-speed selector type '6990'.

FIG.15

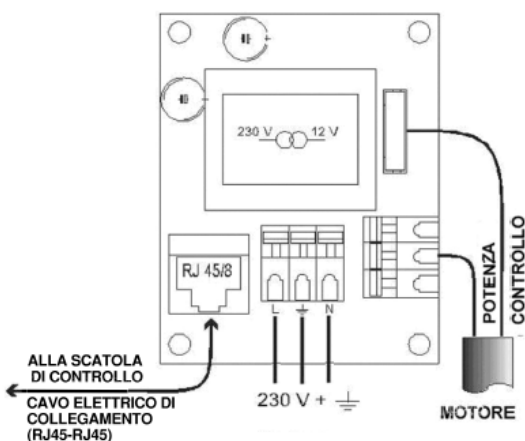


##### 4.5.2.2 Series "UR"

The ECM2 fans are supplied in 3 parts: the fan-motor assembly with power box (fig. 16) installed and wired, the control cable with connector RJ45, the control box.

The power circuit ECM2 is designed to be supplied at 230V - 50Hz.

FIG.16



#### 4.5.2.2.1 Selection of the airflow

By operating on the control board (fig. 17) it is possible to select one of the 31 available speeds:

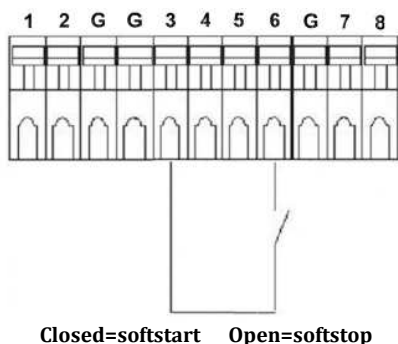
Position the dip-switches from 1 to 5 in the adequate position in order to obtain the desired air flow. The available combinations for each fan are indicated in the attachment 1.

FIG. 17



In order to avoid all problems related to current peaks during the start-up, caused by the condensers charge of the motors power circuit, we have arranged for a softstop/softstart (waiting time - consumption = 0,05W) as indicated in the connection diagram of the control box (fig. 25). **In case this option is not used, it will be necessary to bridge the contact between the terminals 3-6.**

FIG.25



#### 4.5.2.2.2 Alarm on the pressure

This alarm uses the dip-switches from 6 to 8, and allows to configure an alarm which will inform the user of a variation in pressure of +25, +50, +75, +100, +150, +200, +250 or +300 Pa in relation to the reference pressure. When these alarms activate, a LED light will switch on, and the transistor connected between the connectors G and 2 of the control box is a conductor.

##### a) how to memorize the reference pressure $P_{ref}$ .

$P_{ref}$  corresponds to the 'starting' pressure of the fan, that is the one corresponding to the initial operating point of the system (i.e. with clean filters). To elaborate the 'built-in' alarm you need to memorize this pressure with the microprocessor. Memorizing procedure: see attachment 2 page 14.

\*\*\*\*\*  
**ATTENTION**  
 \*\* The alarm in pressure is fixed only for ONE selected \*\*  
 \*\* air volume. Changing this air volume modifies the \*\*  
 \*\* pre-set alarm -  $P_{ref}$  is no longer correct and has to \*\*  
 \*\* be re-initialized. \*\*  
 \*\*\*\*\*

##### b) how to fix the increase factor

The choice of the increase factor depends on the application. You may choose one increase out of 8 with the help of the dip-switches from 6 to 8.

| DS 6-7-8 | $\Delta Pa$ per innescare l'allarme |
|----------|-------------------------------------|
| 000      | 25 Pa                               |
| 001      | 50 Pa                               |
| 010      | 75 Pa                               |
| 011      | 100 Pa                              |
| 100      | 150 Pa                              |
| 101      | 200 Pa                              |
| 110      | 250 Pa                              |
| 111      | 300 Pa                              |

0=OFF - 1=ON



ON = 1  
 OFF = 0

#### 4.5.3 Fan

Before start-up, carry out the following checks:

- make sure that the fan wheel is functioning correctly by rotating it manually

#### 4.5.3 Transmission

Before starting the heat recovery unit please check:

- the tension of the V-belts (section 5.2.3.1)
- that the pulleys are aligned (section 5.2.3.1)
- that the dowels, shown in fig. 20, in their possible installation positions, are doing their function of securing the pulleys to the hubs

#### 4.5.4 Noise level

The computation and control of noise emissions has today become particularly important, both during the design and installation phases.

The sound pressure values of our machines are indicated in our technical catalogues or may be supplied directly by our Technical Department according to the requested aerodynamic characteristics.

Being therefore aware of the sound emissions produced by the unit, the designer must make sure that, in treated environments, maximum values established by current regulations are not exceeded.

It must however be stressed that every environment has its own acoustic characteristics, which can considerably affect the sound pressure values of mechanical ventilation systems. THE NOISE LEVEL DATA SUPPLIED BY US SHOULD CONSEQUENTLY BE CONSIDERED AS A CALCULATION BASE FOR DEEPER CONSIDERATIONS, WHICH WILL TAKE INTO ACCOUNT THE SYSTEM AND BUILDING STRUCTURE AS A WHOLE.





#### 4.6 POWER BOARD AND CONTROLS

Please refer to the specific diagrams supplied with the UR units, since it is not possible to enlist here all the possible control configurations.

### 5. MAINTENANCE

#### 5.1 FOREWORD

TCF recommends that its customers carry out PREVENTIVE MAINTENANCE on the heat recovery units in order to ensure a long-term efficiency.

Such heat recovery units require little maintenance and have been designed to make each operation as easy and safe as possible.

#### 5.2 FILTRATING SECTIONS

The filtrating sections require the most frequent maintenance in order to:

- ensure that the air is filtered with the required efficiency in the treated environment;
- prevent the components of the heat recovery unit from damaging

##### 5.2.1 Reconditionable synthetic filters

These are cells measuring 50 or 100mm in thickness, also known as PREFILTERS, which offer the advantage of being reconditionable.

The RECONDITIONING may be performed using two different methods, depending on the type of dust to be treated:

- in case of DRY DUSTS, a compressed air jet has to be directed against the filter in the opposite direction to normal operation
- in case of WET DUSTS, the filtration diaphragm has to be washed (without removing it from the frame), if necessary using domestic detergents. To avoid damaging the filter, the temperature of the water must not exceed 50°C. Do not use solvents or caustic soda. Let the diaphragm dry by evaporation and refit it only when it is perfectly dry.

TCF recommends TO CHECK THE CONDITION OF THE FILTERS ON A WEEKLY BASIS.

THE PREFILTERS MUST BE RECONDITIONED EVERY 7-20 DAYS depending on the type of environment being treated. After 7 to 10 reconditioning operations, the diaphragms will tend to deteriorate and its original characteristics will be impaired; it should therefore be replaced.

#### 5.3 HEAT EXCHANGERS

##### 5.3.1 Water heat exchangers

In order to maintain an optimum water/air heat exchange, the following MAINTENANCE OPERATIONS must be performed regularly on the exchangers:

- At the beginning of each operating season, remove the air present in the heat exchanger circuit using the relevant air relief valve;
- At the beginning of each operating season, remove dust and deposits from the finned pack. Proceed as follows:
  1. use a jet of compressed air in the opposite direction to the air flow during normal unit operation, or
  2. wash the finned pack with water, non-corrosive components and a wire brush
- Remove any deposit from the condensate drain pan. This operation must be repeated every month in order to prevent flooding of the machine and of the room where it is installed.

To avoid causing irreparable damage to the heat exchangers, you must make sure that the primary fluid will not freeze when winter comes. For this purpose TCF recommends the following steps:

- in case of prolonged standstill of the heat exchanger circuits, they should be completely drained
  - where an anti-freeze system based on heating elements is provided, to protect the exchanger, make sure that the control board is constantly powered;
  - on systems operating with anti-freeze mixture, check their efficiency and fill them up or replace if necessary
- ANTI-FREEZE LIQUID MUST NEVER BE INTRODUCED INTO A CIRCUIT NOT SPECIFICALLY SIEZED FOR THIS PURPOSE as it would jeopardize the correct operation of the pump and the efficiency of the heat exchanger.

##### 5.3.2 Extraction of the heat exchangers

Frequently insufficient space in the room makes it often impossible to carry out the necessary maintenance on the heat exchanger while installed inside the unit.

In these cases it is necessary to extract the exchanger, an operation which calls for the utmost care.

To remove the exchanger you must:

- make sure that you have enough room for the removal and temporary accommodation of the heat exchanger
- consider that an ordinary Cu/Al coil has a mass of approximately 10 kg/m<sup>2</sup> of frontal area per row; therefore, prepare supports if necessary
- completely drain the heat exchanger
- remove the unit panel covering the hydraulic connections and the panel through which the exchanger will be removed
- release the heat exchanger by undoing the relevant clamps and extract it
- on completion of the maintenance operations, restore the ideal operating conditions of the exchanger;

##### 5.3.3 FAN SECTION

###### 5.4.1 Fan



In order to keep the fan in perfect working order, WE RECOMMEND YOU TO CHECK THE FOLLOWING AT LEAST ONCE A MONTH:

- The cleanliness of the shell and wheel; remove any deposits
- Damage and corrosion to the fan components; in case remedy with zinc-powder paint
- The tightness of the parts comprising the fan section
- Seal of the vibration-damping joint fitted to the fan supply mouth
- Absence of abnormal noises due to deterioration of the bearings. If necessary, replace them.

#### 5.4.2 Motor

In order to maintain the motor in perfect working order, TCF recommends the FOLLOWING MONTHLY CHECKS:

- Cleanliness: remove any deposits
- Absence of abnormal noise due to deterioration of the bearings

### 5.5 HEAT RECOVERY UNITS

#### 5.5.1 Cross-flow heat exchanger

Not having any moving parts, the maintenance of this unit is limited to the pure CLEANING. This consists in:

- removing the dust from the recuperator using a jet of compressed air and a metal brush
- clean the finned pack from deposits of grease with hot water or steam and, if necessary, adding domestic detergents
- control, on a monthly basis, the correct operation of the condensate discharge, removing any deposits which should accumulate

#### 5.6.1 ACCESSORIES

##### 5.6.1 Control dampers

The TCF control dampers of the SAL range do not require particular maintenance. It is however recommended to verify the alignment of the gears and the smooth operation of the fins. This could be damaged by the weight of ducts in case they bear down of the dampers themselves, by deflecting them (condition to be avoided).

##### 5.6.2 Fresh air inlet grilles

They must frequently be cleaned by deposits which obstruct the air passage, jeopardizing the correct operation of the whole installation.

##### 5.6.3 Silencer

The silencers installed in TCF units are of the SOUND ABSORBING BAFFLE type. They do not require particular maintenance, but dust could accumulate on them, which can be removed with a simple vacuum cleaner.

### 5.7 TROUBLESHOOTING

The most common MALFUNCTIONS in heat recovery units are:

- reduced flow rate
- increased flow rate
- reduction in heat exchanger efficiency
- reduction in the heat recuperator capacity
- abnormal noise

#### 5.7.1 Reduction in flow rate

This is the result of an uncontrolled increase in resistance in the aeraulic circuit which alters the fan operating point.

Even though the UR units are equipped with self-regulating fans, which keep the air volume constant at the variation of the pressure drop (within the mechanical limits of the unit), here follow some of the causes which could generate such effect. The most frequent causes are:

- excessively clogged filters
- formation of frost or ice on the front surface of the prefilters in particularly damp and cold climates on units operating entirely with external air
- blockage of the intake grille(s) (especially external air intake)
- fully or partially closed control air locks
- activation of fire dampers
- deposits and dirt on the heat exchangers

#### 5.7.2 Increased flow rate

Even though the UR units are equipped with self-regulating fans, which keep the air volume constant at the variation of the pressure drop (within the mechanical limits of the unit), here follow some of the causes which could generate such effect. The most frequent causes are:

- incorrect setting of any mechanical flow controls or zone air locks
- non-replacement of filters after ordinary maintenance operations
- open or partially closed inspection doors

#### 5.7.3 Reduced heat exchanger efficiency

The most common causes are:

- clogging of finned pack
- formation of air bubbles inside the exchangers
- feed fluids at temperatures lower than the design temperature
- malfunction or breakdown of control valve actuators
- water flow rate below design values

#### 5.7.4 Reduced heat recuperator efficiency

For the cross-flow heat recuperator the causes may be:

- accumulation of dust and dirt on the heat recovery deck
- clogging due to foreign matter in between the fins
- abnormal air by-pass on the recuperator



### 5.7.5 Abnormal noise level

With regard to the fan, the causes may be:

- worn-out or defective bearings
- fan off-balance
- foreign matter in the fan wheel

With regard to the electric motor, the causes may be:

- worn-out or defective bearings

In order to remedy the malfunctions listed above (and not the entire air-conditioning system), CONSULT THE CHAPTER RELATED TO THE MAINTENANCE (ch. 5) OR, IF THE PROBLEM PERSISTS, CONTACT OUR TECHNICAL DEPARTMENT.

## 6. SAFETY

### 6.1 SAFETY-RELATED FEATURES OF HEAT RECOVERY UNITS

TCF Srl has fitted its heat recovery units with every possible safety feature to prevent accidents, especially during start-up and maintenance.

Some of the SAFETY FEATURES are listed below:

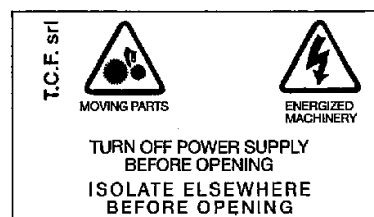
- INSPECTION DOORS THAT CAN ONLY BE OPENED WITH A KEY are installed in the sections housing rotating parts and drives
- the GRATES and HOUSINGS protecting rotating parts and drives can only be removed with a key
- the outside of the structure has ROUNDED EDGES
- elimination of sharp-edged steel sheet parts inside and outside of the unit
- use of SELF-TAPPING SCREWS WITH NON-PROTUDING TIPS inside sections and panels

we always recommend to install, inside the fan section, an ELECTRIC ISOLATOR, which has the function of preventing the fan-motor assembly from getting started during maintenance operations, thus jeopardising the safety of the technician.

### 6.2 SAFETY NOTICES APPLIED TO THE UR UNITS

The inspection doors of the heat recovery unit carry SAFETY NOTICES drawing the operator's attention to the danger connected with moving parts and warning him to disconnect the system power before opening the inspection doors (fig. 19).

FIG.19



### 6.3 PRACTICAL ACCIDENT-PREVENTION TIPS

- Open the inspection doors only when the fan is at a standstill
- Before carrying out maintenance work on the fan motor unit, make sure that the motor cannot be restarted by accident
- Before operating on the motor, make sure that it has cooled down completely
- In order to protect your hands, use a lever to remove the belts
- Block the fan wheel before maintaining it, since (especially when the belt is removed) the 'updraft effect' caused by the ducts could make it rotate and cause injury

## 7. WARRANTY

TCF Srl guarantees its products for 12 months from shipment date.

The warranty covers the normal operation of the individual components installed on our units, such as motors, fans, heat exchangers, humidifiers and other parts.

It should be stressed that the warranty covers manufacturing defects in these parts, while their efficiency is categorically excluded since this is determined by the characteristics of the aeraulic and hydraulic systems and by the design, and does not therefore fall within our sphere of responsibility.

TCF therefore undertakes to replace any individual component which malfunctions as rapidly as possible and subject to stocks. The part should be sent (freight costs pre-paid) to our headquarters and the replacement part will be sent ex-works.

Please note, too, that the warranty does not include the service of our personnel for the replacement of the part on site; this cost is entirely on the installer's account.

On receipt of the returned material deemed to be defective, an inspection will be carried out to establish whether the part reveals abnormalities justifying application of the warranty. If it is established that the defect is due to external factors, the replacement part will be charged to the customer.

It should furthermore be noted that the warranty shall not apply in the case of tampering or in case the failure is a consequence of incorrect installation or connection.

On this behalf, reference will be made to the instructions contained in this Installation, Operation and Maintenance Manual which accompanies each of our machines.

TCF Srl



8. ATTACHMENT 1

| DD 9-9 ECMd2 1/2 |              |                |                 |                 |        |           |       |
|------------------|--------------|----------------|-----------------|-----------------|--------|-----------|-------|
|                  | Dip-switches | Portata "alta" | Portata "media" | Portata "bassa" | Pa max | W ass max | I max |
|                  | 1 à 5        | m³/h           | m³/h            | m³/h            | Pa     | W         | A     |
| 31               | 11111        | 2900           | 1915            | 960             | 165    | 550       | 3,3   |
| 30               | 11110        | 2825           | 1870            | 930             | 205    | 560       | 3,4   |
| 29               | 11101        | 2750           | 1815            | 910             | 240    | 570       | 3,4   |
| 28               | 11100        | 2670           | 1760            | 880             | 270    | 570       | 3,4   |
| 27               | 11011        | 2595           | 1710            | 855             | 290    | 570       | 3,4   |
| 26               | 11010        | 2515           | 1660            | 830             | 305    | 560       | 3,4   |
| 25               | 11001        | 2440           | 1610            | 805             | 315    | 550       | 3,3   |
| 24               | 11000        | 2360           | 1560            | 780             | 320    | 535       | 3,3   |
| 23               | 10111        | 2285           | 1510            | 755             | 325    | 530       | 3,2   |
| 22               | 10110        | 2210           | 1460            | 730             | 335    | 515       | 3,2   |
| 21               | 10101        | 2130           | 1405            | 705             | 345    | 500       | 3,1   |
| 20               | 10100        | 2055           | 1355            | 680             | 350    | 490       | 3,0   |
| 19               | 10011        | 1980           | 1305            | 650             | 355    | 480       | 2,9   |
| 18               | 10010        | 1900           | 1255            | 630             | 365    | 465       | 2,9   |
| 17               | 10001        | 1825           | 1205            | 600             | 370    | 550       | 2,8   |
| 16               | 10000        | 1745           | 1150            | 600             | 380    | 435       | 2,7   |
| 15               | 01111        | 1670           | 1100            | 600             | 390    | 425       | 2,6   |
| 14               | 01110        | 1590           | 1050            | 600             | 400    | 415       | 2,6   |
| 13               | 01101        | 1515           | 1000            | 600             | 410    | 400       | 2,5   |
| 12               | 01100        | 1440           | 950             | 600             | 420    | 395       | 2,5   |
| 11               | 01011        | 1360           | 900             | 600             | 430    | 385       | 2,4   |
| 10               | 01010        | 1285           | 850             | 600             | 440    | 375       | 2,4   |
| 9                | 01001        | 1205           | 800             | 600             | 450    | 365       | 2,3   |
| 8                | 01000        | 1130           | 745             | 600             | 460    | 355       | 2,3   |
| 7                | 00111        | 1050           | 700             | 600             | 480    | 350       | 2,2   |
| 6                | 00110        | 975            | 644             | 600             | 595    | 340       | 2,2   |
| 5                | 00101        | 900            | 600             | 600             | 515    | 330       | 2,1   |
| 4                | 00100        | 820            | 600             | 600             | 530    | 325       | 2,0   |
| 3                | 00011        | 745            | 600             | 600             | 545    | 320       | 2,0   |
| 2                | 00010        | 670            | 600             | 600             | 560    | 320       | 2,0   |
| 1                | 00001        | 600            | 600             | 600             | 580    | 315       | 2,0   |
| 0                | 00000        | Softstop       | Softstop        | Softstop        | -      | -         | -     |

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| DD 10-10 ECMd2 3/4 |              |                |                 |                 |        |           |       |
|--------------------|--------------|----------------|-----------------|-----------------|--------|-----------|-------|
|                    | Dip-switches | Portata "alta" | Portata "media" | Portata "bassa" | Pa max | W ass max | I max |
|                    | 1 à 5        | m³/h           | m³/h            | m³/h            | Pa     | W         | A     |
| 31                 | 11111        | 3800           | 2510            | 1255            | 220    | 810       | 4,7   |
| 30                 | 11110        | 3690           | 2435            | 1220            | 275    | 850       | 4,9   |
| 29                 | 11101        | 3590           | 2370            | 1185            | 320    | 875       | 5,0   |
| 28                 | 11100        | 3490           | 2305            | 1150            | 350    | 890       | 5,1   |
| 27                 | 11011        | 3370           | 2225            | 1110            | 390    | 910       | 5,2   |
| 26                 | 11010        | 3270           | 2160            | 1080            | 420    | 920       | 5,3   |
| 25                 | 11001        | 3170           | 2090            | 1045            | 445    | 925       | 5,3   |
| 24                 | 11000        | 3050           | 2015            | 1005            | 470    | 925       | 5,3   |
| 23                 | 10111        | 2950           | 1945            | 975             | 485    | 925       | 5,3   |
| 22                 | 10110        | 2850           | 1880            | 940             | 505    | 915       | 5,3   |
| 21                 | 10101        | 2750           | 1815            | 910             | 520    | 905       | 5,2   |
| 20                 | 10100        | 2645           | 1745            | 875             | 530    | 895       | 5,1   |
| 19                 | 10011        | 2545           | 1680            | 840             | 540    | 880       | 5,0   |
| 18                 | 10010        | 2445           | 1615            | 805             | 550    | 860       | 5,0   |
| 17                 | 10001        | 2345           | 1550            | 775             | 560    | 845       | 4,9   |
| 16                 | 10000        | 2240           | 1480            | 740             | 570    | 825       | 4,8   |
| 15                 | 01111        | 2140           | 1415            | 705             | 580    | 810       | 4,7   |
| 14                 | 01110        | 2040           | 1345            | 700             | 595    | 795       | 4,6   |
| 13                 | 01101        | 1920           | 1265            | 700             | 600    | 775       | 4,5   |
| 12                 | 01100        | 1820           | 1200            | 700             | 620    | 760       | 4,4   |
| 11                 | 01011        | 1720           | 1135            | 700             | 635    | 740       | 4,3   |
| 10                 | 01010        | 1620           | 1070            | 700             | 655    | 725       | 4,3   |
| 9                  | 01001        | 1515           | 1000            | 700             | 665    | 710       | 4,2   |
| 8                  | 01000        | 1415           | 935             | 700             | 690    | 690       | 4,1   |
| 7                  | 00111        | 1300           | 860             | 700             | 710    | 675       | 4,0   |
| 6                  | 00110        | 1200           | 790             | 700             | 730    | 660       | 3,9   |
| 5                  | 00101        | 1095           | 725             | 700             | 755    | 650       | 3,9   |
| 4                  | 00100        | 995            | 700             | 700             | 770    | 640       | 3,8   |
| 3                  | 00011        | 895            | 700             | 700             | 795    | 635       | 3,8   |
| 2                  | 00010        | 790            | 700             | 700             | 815    | 630       | 3,8   |
| 1                  | 00001        | 700            | 700             | 700             | 835    | 625       | 3,7   |
| 0                  | 00000        | Softstop       | Softstop        | Softstop        | -      | -         | -     |

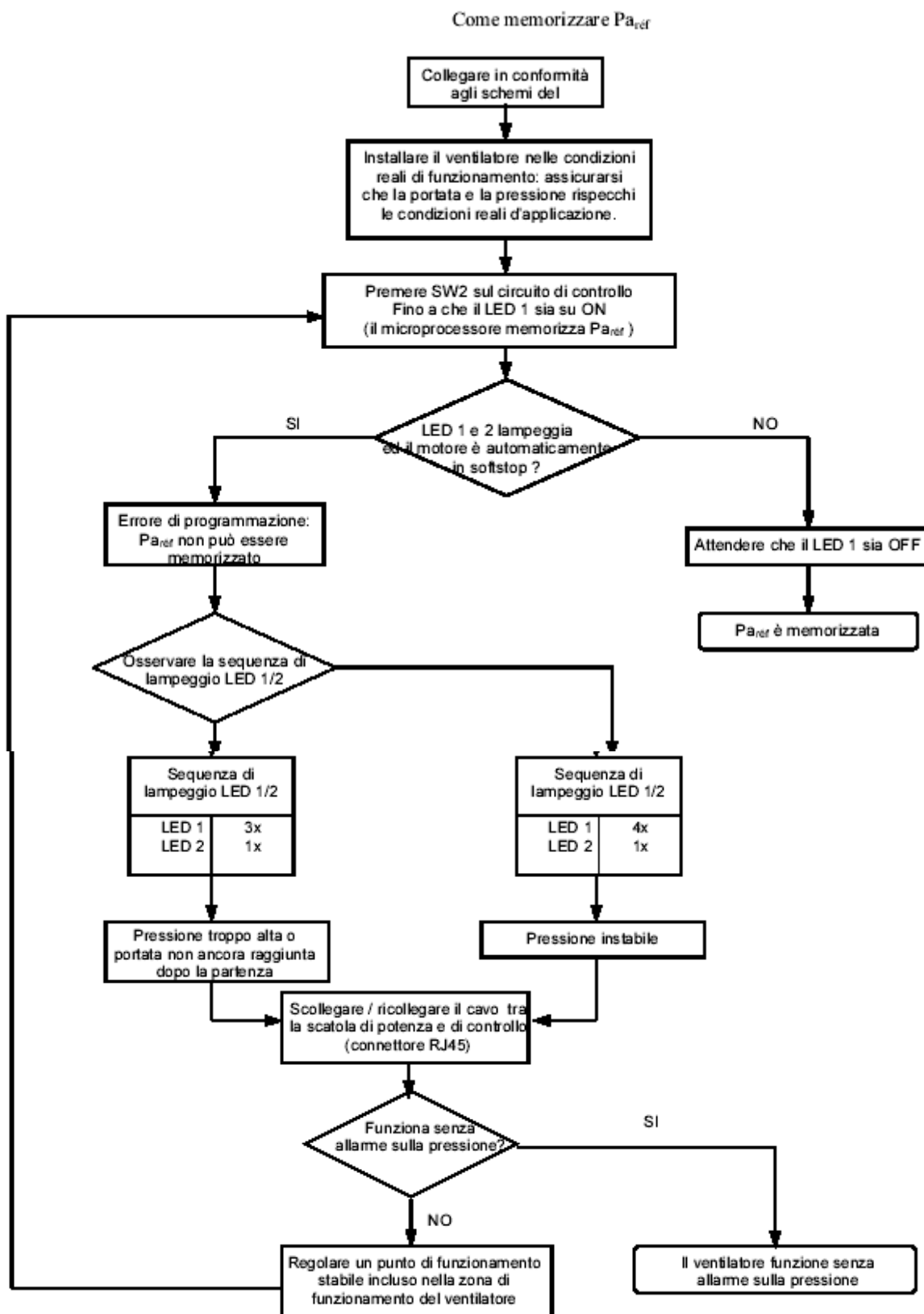
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| DD 11-11 ECMd2 1/1 |              |                |                 |                 |        |           |       |
|--------------------|--------------|----------------|-----------------|-----------------|--------|-----------|-------|
|                    | Dip-switches | Portata "alta" | Portata "media" | Portata "bassa" | Pa max | W ass max | I max |
|                    | 1 à 5        | m³/h           | m³/h            | m³/h            | Pa     | W         | A     |
| 31                 | 11111        | 4400           | 2905            | 1450            | 160    | 1030      | 5,8   |
| 30                 | 11110        | 4260           | 2810            | 1405            | 235    | 1080      | 6,1   |
| 29                 | 11101        | 4145           | 2735            | 1370            | 285    | 1120      | 6,3   |
| 28                 | 11100        | 4015           | 2650            | 1325            | 320    | 1145      | 6,4   |
| 27                 | 11011        | 3900           | 2575            | 1285            | 380    | 1165      | 6,5   |
| 26                 | 11010        | 3770           | 2490            | 1245            | 410    | 1180      | 6,6   |
| 25                 | 11001        | 3655           | 2410            | 1205            | 450    | 1190      | 6,6   |
| 24                 | 11000        | 3525           | 2325            | 1165            | 470    | 1185      | 6,6   |
| 23                 | 10111        | 3410           | 2250            | 1125            | 495    | 1180      | 6,6   |
| 22                 | 10110        | 3280           | 2165            | 1080            | 505    | 1165      | 6,5   |
| 21                 | 10101        | 3165           | 2090            | 1045            | 510    | 1155      | 6,5   |
| 20                 | 10100        | 3035           | 2005            | 1000            | 545    | 1130      | 6,4   |
| 19                 | 10011        | 2920           | 1925            | 965             | 545    | 1110      | 6,2   |
| 18                 | 10010        | 2790           | 1840            | 920             | 555    | 1090      | 6,1   |
| 17                 | 10001        | 2675           | 1765            | 885             | 565    | 1060      | 6,0   |
| 16                 | 10000        | 2560           | 1690            | 845             | 570    | 1035      | 5,9   |
| 15                 | 01111        | 2430           | 1605            | 800             | 575    | 1005      | 5,7   |
| 14                 | 01110        | 2315           | 1530            | 765             | 585    | 970       | 5,5   |
| 13                 | 01101        | 2185           | 1440            | 750             | 590    | 950       | 5,4   |
| 12                 | 01100        | 2070           | 1365            | 750             | 595    | 930       | 5,3   |
| 11                 | 01011        | 1940           | 1280            | 750             | 620    | 905       | 5,2   |
| 10                 | 01010        | 1825           | 1205            | 750             | 635    | 885       | 5,1   |
| 9                  | 01001        | 1695           | 1120            | 750             | 665    | 870       | 5,5   |
| 8                  | 01000        | 1580           | 1045            | 750             | 685    | 855       | 4,9   |
| 7                  | 00111        | 1450           | 955             | 750             | 715    | 840       | 4,8   |
| 6                  | 00110        | 1335           | 880             | 750             | 735    | 825       | 4,8   |
| 5                  | 00101        | 1205           | 795             | 750             | 760    | 815       | 4,7   |
| 4                  | 00100        | 1090           | 750             | 750             | 790    | 800       | 4,6   |
| 3                  | 00011        | 960            | 750             | 750             | 815    | 790       | 4,6   |
| 2                  | 00010        | 845            | 750             | 750             | 840    | 780       | 4,5   |
| 1                  | 00001        | 750            | 750             | 750             | 860    | 775       | 4,5   |
| 0                  | 00000        | Softstop       | Softstop        | Softstop        | -      | -         | -     |

Pa max / W ass max e I max : dati per le portate "alte"

9. ATTACHMENT 2





## 10. ATTACHMENT 3: Characteristics of input/output signals

Attention: all connections not compliant with the specifications may damage the circuit irreversibly. This might redefine the warranty conditions.

### Cables and connections

#### 1. Control cables

All the connections must be carried out in strict compliance with the wiring diagram indicated in this document. The connection cables must be shielded, of maximum section 0,5 mm<sup>2</sup>. The mass braid of the cable must be connected to a G connector of the control box. In order to prevent all interferences, we recommend to separate the cable of all the external sources of disturbance. Use one of the cables of the following list (or equivalent):

|           |
|-----------|
| LIYCY     |
| LI2YCHM2  |
| LIFYCYB   |
| LIYCPY    |
| LIYCPCY   |
| LI2YCHM2B |
| LIYSTY    |
| LI2YSTCY  |

#### 2. Connecting cables between the power box and the control box

UTP cable / category 5 / 8 threads. Maximum length = 100 m

RJ45 connectors: no particular specification

#### External contacts K'1 and K'2:

Contacts free from potentials

Mx. impedance : 10 KΩ

#### 12V feed available on output:

Output voltage: 12 Vdc ±2% (between the connector G and 7)

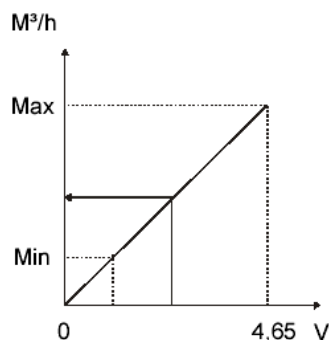
Max. available I: 80 mA

#### Output signal: 'feedback' of the rate

Analogic signal between the connectors G and 8 of the control circuit corresponding to the airflow of the fan

Minimum impedance: 10 MΩ. Tolerance: ±5%

| Ventilatore         | CID ventilatore | Portata minima |              | Portata massima |
|---------------------|-----------------|----------------|--------------|-----------------|
|                     |                 | Portata        | Tensione (V) | 4,65 V          |
| DD 9-7 TH ECM 1/2   | 720054          | 400            | 0,92         | 2000            |
| DD 9-9 ECM 1/2      | 720055          | 600            | 0,95         | 2900            |
| DD 10-10 ECM 3/4    | 720056          | 700            | 0,85         | 3800            |
| DD 11-11 ECM 1/1    | 720057          | 750            | 0,78         | 4400            |
| DP 6-6 ECM 1/2      | 720058          | 500            | 1,05         | 2200            |
| DP 9-7 TH ECM 1/1   | 720059          | 600            | 0,77         | 3600            |
| DP 9-9 ECM 1/1      | 720060          | 1100           | 0,89         | 5700            |
| DS 10-4 ECM 1/2     | 720061          | 300            | 0,92         | 1500            |
| DS 11-4 ECM 1/2 (*) | 720062          | 400            | 0,97         | 1900            |
| DS 12-5 ECM 3/4 (*) | 720063          | 600            | 1,06         | 2600            |



Example: If you measure 2,38V within G and 8 on a DD 9-9 ECMd2, the airflow of the fan is  $(2900 * (2,38 / 4,65))$  m<sup>3</sup>h 1485.



**TERMOVENTILATORI  
CONDIZIONATORI  
FELSINEA**

Via Giuseppe di Vittorio, 5 - 40057 Cadriano di Granarolo Emilia (Bologna)  
Tel. 051765002 - Fax 051765317 - Internet [www.tcf.it](http://www.tcf.it)