

# NEWEL 3



## USER MANUAL

### HEAT RECOVERY

Digitel reserves the right to modify the technical characteristics described without prior notice.

Non-contractual document

Digitel SA

All rights reserved

## 1. HEAT RECOVERY

### 1.1. INTRODUCTION

The reader of this document must read the chapter [Error! Reference source not found. Error! Reference source not found.](#) before reading the rest of this manual. It contains all the basic information indispensable to understand this document and the concept of the NEWE3 series.

This manual describes the operation of the modules in terms of **heat recovery**. Parameter [r1] of the operating mode is therefore programmed to **2**.

### 1.2. GENERAL DESCRIPTION. BASIC CONNECTIONS

Heat recovery is handled by two DC24TR modules.

The principle of operation is shown in [Figure 1.2.1](#). The connections are made according to [Figure 7.2.2](#)

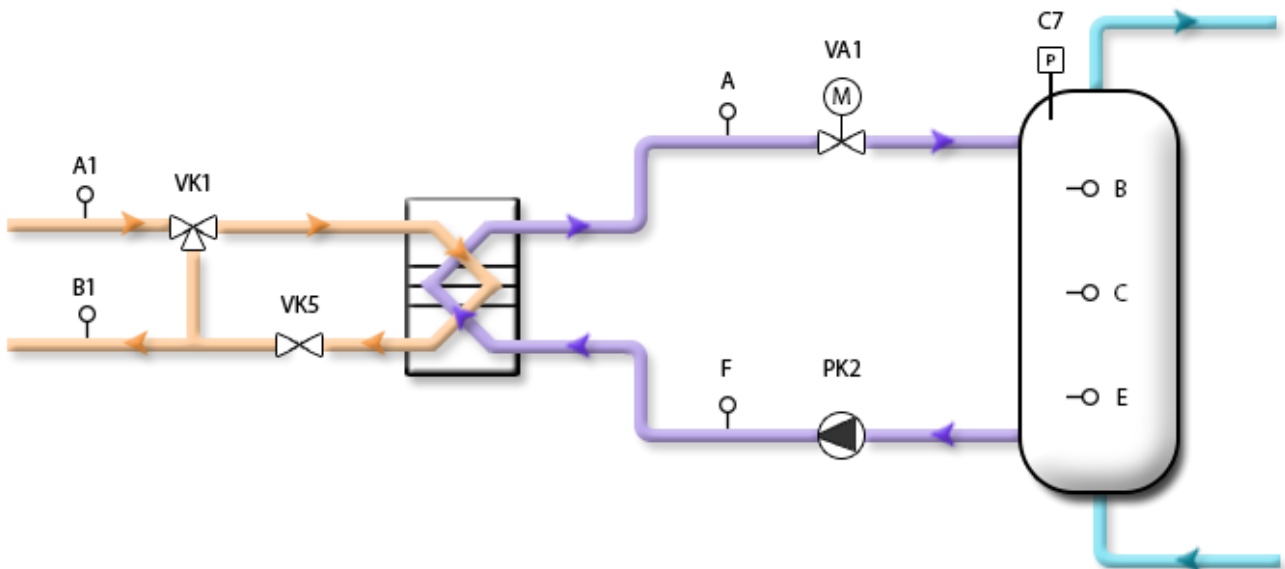


Figure 1.2.1

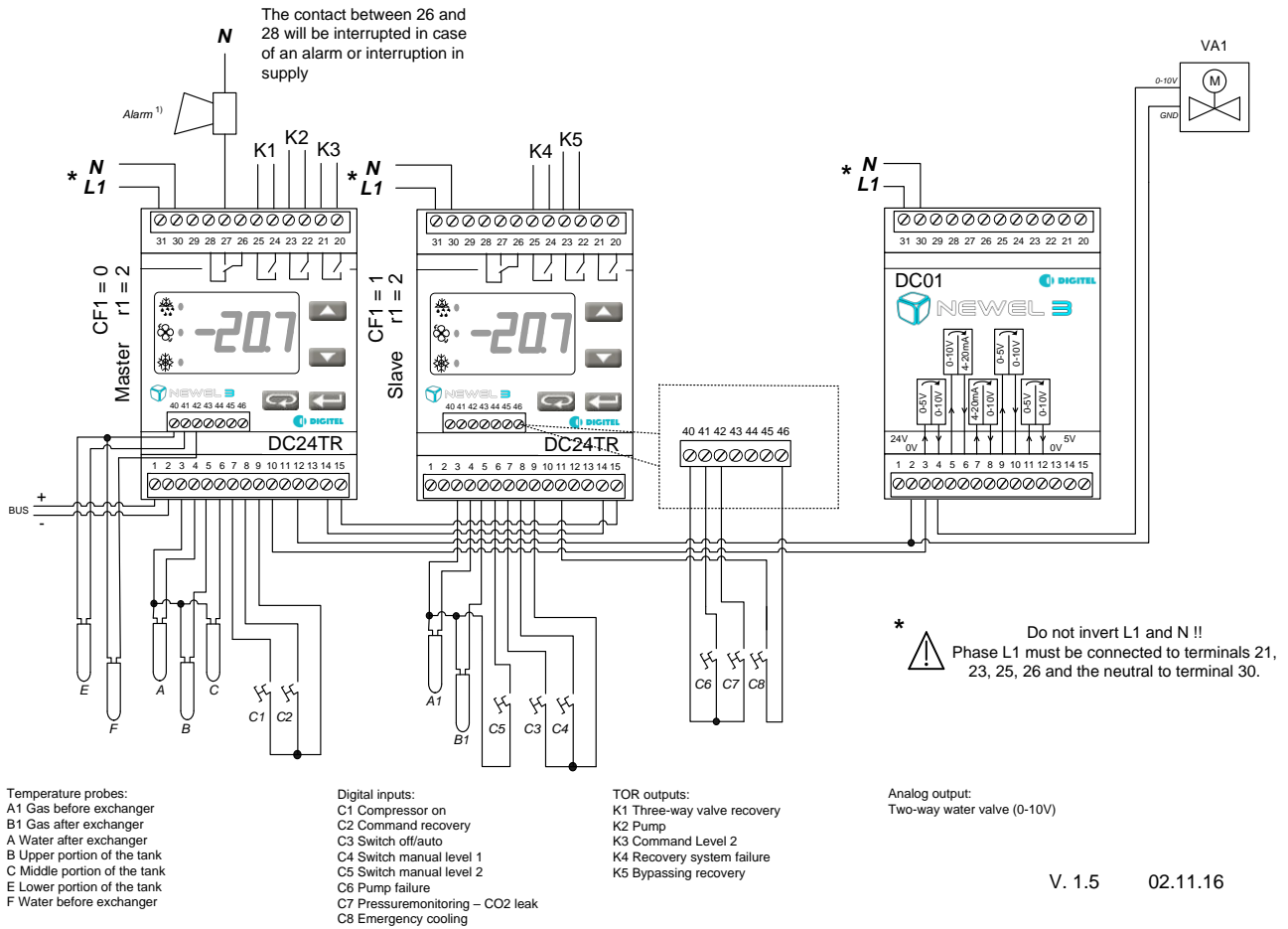


Figure 1.2.2

Control of heat recovery functions normally when the following conditions are met:

- The temperature difference (probe A1 - probe B) is greater than the value of parameter [S1]
- Contact C1 closed. At least one compressor is running.
- C2 closed. Recovery request.
- C3 closed. Auto control mode.
- C6 closed. Pump in order.
- C7 closed. No leak detected.
- C8 closed. Emergency cooling is not running.
- No sensor fault is detected.

Otherwise, the control is deactivated. The three-way valve cuts the flow of fluid through the heat exchanger and pump PK2 is stopped. Contacts C4 and C5 manually bypass the blockage and operate the control at level 1 and level 2, respectively, regardless of the conditions above.

In normal operation, when the temperature of sensor C drops below the value of parameter **[t1]**, level 1 of the recovery is activated. In this mode, output K1 controls the three-way valve VK1 and passes the hot gas into the heat exchanger. After the delay set in parameter **[S2]**, pump PK2 is activated in the low flow regime. The control maintains the temperature of the outlet of the exchanger (probe A) to the value set in parameter **[E1]** by acting on the opening degree of valve VA1. This is PID control. Its behaviour can be tuned by adjusting parameters **[E4]** (proportional coefficient), **[E5]** (integration coefficient) and **[E6]** (differential coefficient). Valve VK1 is closed when the temperature of probe E exceeds the value of parameter **[t2]**. Pump PK2 stops after the delay programmed in parameter **[S3]**.

Level 2 of the recovery is activated when temperature sensor B remains below the value of parameter **[t3]** longer than the value of parameter **[t5]**. Output K3 is activated to cause upward shifting of the high pressure set point and the gas cooler set point in the corresponding controls. Output K3 also activates the high speed of pump PK2. Level 2 is stopped when temperature sensor E rises above the value of parameter **[t4]**. The control then returns to level 1 (output K3 is disabled, the offsets of the HP and cooler set points are removed and the pump returns to the low flow mode).

To avoid wasteful operation at level 2, temperature B1 is monitored. When it rises above the value of parameter **[S4]**, after a time delay **[S5]** output K4 is enabled, the operation at level 2 is interrupted and the control returns to level 1. When temperature B1 drops below **[S4]**, output K4 is switched off after the programmed delay in **[S6]**. From that point, level 2 can be activated again after timeout **[t5]**, if necessary.

### 1.3. EMERGENCY COOLING

With the opening of contact C8, the "emergency cooling" mode is activated. In this mode, valve VK1 is controlled and the hot gas is passed into the heat exchanger; valve AP1 regulates the water temperature, but pump PK2 is stopped. An alarm is triggered.

### 1.4. PRESSURE MONITORING

The pressure in the hot water circuit is monitored by pressure switch C7. When it rises too high (e.g. due to leakage of CO<sub>2</sub>), contact C7 opens. In this case, valve VK1 shuts off the hot gases in the heat exchanger and output K5 is controlled to isolate the recovery circuit of the hot gas circuit with valve VK5.

---

|             |   |
|-------------|---|
| <b>[E1]</b> | Set the water temperature (Settings menu)             |
| <b>[E4]</b> | PID – P control (Settings menu)                       |
| <b>[E5]</b> | PID – I control (Settings menu)                       |
| <b>[E6]</b> | PID – D control (Settings menu)                       |
| <b>[t1]</b> | Level 1 start temperature (Settings menu)             |
| <b>[t2]</b> | Level 1 stop temperature (Settings menu)              |
| <b>[t3]</b> | Level 2 start temperature (Settings menu)             |
| <b>[t4]</b> | Level 2 stop temperature (Settings menu)              |
| <b>[t5]</b> | Level 2 start delay (Settings menu)                   |
| <b>[S2]</b> | Pump start delay (Settings menu)                      |
| <b>[S3]</b> | Pump stop delay (Settings menu)                       |
| <b>[S4]</b> | B1 temperature limit – fault recovery (Settings menu) |
| <b>[S5]</b> | K4 start delay (fault recovery) (Settings menu)       |
| <b>[S6]</b> | K4 stop delay (fault recovery) (Settings menu)        |

## 1.5. PARAMETERS

### Basic configuration

| Sym. | Lev. | Operation  | Rem. | Default value | Min | Max |
|------|------|--|------|---------------|-----|-----|
| PAS  | 0    | Password   |      | 0             |     |     |
| r1   | 3    | Operating mode<br><i>0 = Cooler 1 = Pressure control 2 = Heat recovery</i>                         |      | 2             |     |     |
| Ad   | 3    | Module address<br><i>Do not change when the module is connected to a DI58 / DC58 central unit!</i> |      |               |     |     |

### Settings with r1 = 2 Heat recovery

| Sym.       | Lev. | Operation  | Rem. | Default value | Min | Max  |
|------------|------|--|------|---------------|-----|------|
| PAS        | 0    | Password   |      | 0             | 0   | 999  |
| Control    | E1   | Set the water temperature (° C)                    |      | 45.0          | 0   | 90.0 |
|            | E2   | Minimum opening of the valve VA1 (%)               |      | 20.0          | 0   | 100  |
|            | E3   | Maximum aperture of the valve VA1 (%)              |      | 100           | 0   | 100  |
|            | E4   | PID - P control (proportional coefficient) (%)     |      | 30            | 0   | 100  |
|            | E5   | PID - I control (integration coefficient) (%)      |      | 30            | 0   | 100  |
|            | E6   | PID - D control (differential coefficient) (%)     |      | 30            | 0   | 100  |
| Levels 1/2 | t1   | Level 1 start temperature (° C)                    |      | 45.0          | 0   | 90.0 |
|            | t2   | Level 1 stop temperature (° C)                     |      | 50.0          | 0   | 90.0 |
|            | t3   | Level 2 start temperature (° C)                    |      | 42.0          | 0   | 90.0 |
|            | t4   | Level 2 stop temperature (° C)                     |      | 48.0          | 0   | 90.0 |
|            | t5   | Level 2 start delay (min.)                         |      | 5.0           | 0   | 900  |
| Safeties   | S1   | Minimum temperature difference (sensors A1-C; ° K) |      | 10.0          | 0   | 60.0 |
|            | S2   | Pump start delay (dry)                             |      | 20.0          | 0   | 60.0 |
|            | S3   | Pump stop delay (min)                              |      | 0.0           | 0   | 60.0 |
|            | S4   | B1 temperature limit - fault recovery (° C)        |      | 50.0          | 0   | 100  |
|            | S5   | K4 start delay (fault recovery) (min)              |      | 10.0          | 0   | 450  |
|            | S6   | K4 stop delay (fault recovery) (min)               |      | 10.0          | 0   | 60.0 |
| Time, date | H1   | Hours settings                                     |      | 5             | 0   | 23   |
|            | H2   | Minutes settings                                   |      | 8             | 0   | 59   |
|            | H3   | Day and month settings                             |      | 1             | 1   | 31   |
|            | H4   | Month settings                                     |      | 1             | 1   | 12   |
|            | H5   | Year settings                                      |      | 0             | 0   | 99   |
|            | H6   | Day of the week settings                           |      | 5             | 1   | 7    |

---

| Alarms | Alarm code                |                                 |
|--------|---------------------------|---------------------------------|
|        | 13                        | Pump fault                      |
|        | 17                        | Auxiliary mode does not respond |
|        | 18                        | Recovery failure                |
|        | 19                        | Emergency cooling               |
|        | 20                        | Probe A failure                 |
|        | 21                        | Probe B failure                 |
|        | 22                        | Probe C failure                 |
|        | 24                        | Probe E failure                 |
|        | 25                        | Probe F failure                 |
|        | 26                        | Probe A1 failure                |
|        | 27                        | Probe B1 failure                |
| 28     | Pressure - leak detection |                                 |