Cooling of Electrical Enclosures

# Taking temperature under control.

Pfannenberg controller versions for  $\mathcal{E}$ COOL 6000 series.

POWER

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## Standard Controller

# Basic configuration for any cooling unit.

All Pfannenberg active cooling units of the 6000 series are equipped with a Standard Controller (SC). This type of controller is engineered especially to meet expectations of our customers with basic needs and is ready for standard applications. All parameters of the controller are pre-set factory wise and cooling unit is ready-to-use out of the box.

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Status LED informs the user about following statuses: power on, user warning, system fault and self test.

Main fault contact enables an output for any alarm type to a service interface or a simple visual alarm. Supported alarm types are: max. temperature, high pressure in refrigerant circuit, wrong controller settings and defective temperature sensor.

Door contact switches off the cooling unit in case of open enclosure door.

Integrated self test enables simple and fast functional test for OEMs and also a fast detection of machine availability at customer's side during a start up test.

Service interface at the rear of the cooling unit in combination with ECOOL-Plant software allows read outs and logging of temperature and error codes, adjustments of set temperature and switch hysteresis. (Converter to USB interface is available as accessory, main catalogue p. 82).

Anti freeze control is a unique feature especially for DTT top mounted units to shut off the cooling circuit and preventing formation of ice.



#### Standard Controller SC

| Status LED                                                               | ٠           |
|--------------------------------------------------------------------------|-------------|
| Main fault contact                                                       | •           |
| Door contact                                                             | •           |
| Integrated self test                                                     | •           |
| Service interface                                                        | •           |
| ECOOL-Plant V2 communication                                             | ٠           |
| Anti freeze control                                                      | • 1)        |
| Energy saving mode                                                       | —           |
| Temperature display                                                      | —           |
| Set buttons                                                              | —           |
| Multi Master                                                             | —           |
| Modbus interface                                                         | —           |
| BLDC technology                                                          | —           |
| Industry 4.0 ready                                                       | —           |
| Cloud capable                                                            | —           |
| <sup>1)</sup> Anti freeze functionality is stop mounted cooling units DT | tandard for |

## SC Control mode

- Characteristic saw tooth profile.
- · Basic switch-on/switch-off mode.

## Multi Controller

# Advanced technology in controlling.

For even more sophisticated applications we recommend Pfannenberg units equipped with Multi Controller (MC). One of the crucial benefits of this type of controller besides temperature display and set buttons is the extended energy saving functionality. Today's requirements of many end users are clear about energy saving – with the MC Multi Controller we are able to meet those high demands.

## In addition to all features of SC the Multi Controller includes also:

Temperature & error display and set buttons are implemented for more convenient usability of the cooling units. Main settings can now be done using the front panel directly.

Multi Master Function: The possibility to combine up to 6 cooling units for simultaneous operating mode by a simple two-wire connection. No complicated setting or programming of master and slave units by the operator is necessary: More safety and less costs.

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Extended energy saving function and prolonged durability is achieved by switching the internal fan off and by deactivation of the condensate evaporator. (see graph below).

Additional temperature probe is implemented for precise measurement of the internal cabinet temperature and to ensure correct operation of the Energy Savings Mode.



#### Multi Controller MC

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BACK

SET

| Status LED                                    | ٠          |
|-----------------------------------------------|------------|
| Main fault contact                            | ٠          |
| Door contact                                  | ٠          |
| Integrated self test                          | ٠          |
| Service interface                             | ٠          |
| ECOOL-Plant V2 communication                  | •          |
| Anti freeze control                           | • 1)       |
| Energy saving mode                            | ٠          |
| Temperature display                           | ٠          |
| Set buttons                                   | ٠          |
| Multi Master                                  | ٠          |
| Modbus interface                              | _          |
| BLDC technology                               | _          |
| Industry 4.0 ready                            |            |
| Cloud capable                                 | _          |
| <sup>1)</sup> Anti freeze functionality is st | andard for |

#### **MC Control mode**

top mounted cooling units D

- Cooling mode starts automatically upon exceeding the required cabinet temperature.
- Internal fan switches off when no temperature increase is registered; condensate evaporator will then be deactivated.

### **Extended Controller**

# Industry 4.0 ready solution.

Extended Controller (XC) offers the complete functionality of all Pfannenberg controller versions. The XC mainly focuses on operating of brushless DC driven cooling units of Pfannenberg's new X-series. Precise temperature management, high energy efficiency and Modbus interface make this controller a milestone on Pfannenberg's way towards Industry 4.0.



## In addition to all features of MC the Extended Controller includes also:

The Extended Controller is able to operate cooling units with BLDC technology: the innovative; brushless direct current technology (brushless DC) makes an extreme energy efficiency (EER) of >6 possible. Thereby, the cooling occurs with high precision within a very tight tolerance range.

Modbus: Open industry standard makes

communication between the cooling unit and machine control possible. Pfannenberg X-series cooling units can now be directly integrated into any machine and any production process.

Cloud capable: In cooperation with Telekom Deutschland GmbH, we have developed a cloud solution which makes it possible for the user to retrieve status data, diagnosis data and alarm statuses from any location worldwide and in real time via web browser. One main application would be pre-emptive maintenance: The system recognises cases of pending maintenance and creates an automatic appointment suggestion for the service technicians.



| Status LED                   | ٠ |
|------------------------------|---|
| Main fault contact           | ٠ |
| Door contact                 | ٠ |
| Integrated self test         | ٠ |
| Service interface            | ٠ |
| ECOOL-Plant V2 communication | ٠ |
| Anti freeze control          | ٠ |
| Energy saving mode           | ٠ |
| Temperature display          | ٠ |
| Set buttons                  | ۰ |
| Multi Master                 | ۰ |
| Modbus interface             | ٠ |
| BLDC technology              | ٠ |
| Industry 4.0 ready           | ٠ |
| Cloud capable                | ٠ |



#### **XC Control mode**

- Cooling unit levels off the temperature over time.
- Less stressful on components and energy saving.

## Feature overview.



|                                            | Standard Controller<br>SC                | Multi Controller<br>MC | Extended Controller<br>XC |  |  |
|--------------------------------------------|------------------------------------------|------------------------|---------------------------|--|--|
| Status LED                                 | ٥                                        | 0                      | ٠                         |  |  |
| Main fault contact                         | ۰                                        | •                      | ٠                         |  |  |
| Door contact                               | ۰                                        | ٠                      | ٠                         |  |  |
| Integrated self test                       | ٠                                        | ٠                      | ٠                         |  |  |
| Service interface                          | 0                                        | ٠                      | ٠                         |  |  |
| ECOOL-Plant V2 communication               | ٥                                        | 0                      | ۰                         |  |  |
| Anti freeze control                        | 1)                                       | ● 1)                   | ٠                         |  |  |
| Energy saving mode                         | _                                        | 0                      | 0                         |  |  |
| Temperature display                        | _                                        | 0                      | ۰                         |  |  |
| Set buttons                                | _                                        | 0                      | 0                         |  |  |
| Multi Master                               | _                                        | 0                      | ٥                         |  |  |
| Modbus interface                           | _                                        | —                      | ٠                         |  |  |
| BLDC technology                            | —                                        | —                      | 0                         |  |  |
| Cloud capable                              | -                                        | —                      | 0                         |  |  |
| <sup>1)</sup> Anti freeze functionality is | standard for top mounted cooling units I | DTT.                   |                           |  |  |

# Supported cooling units.

|         | 500 W        | 1,000 W       | 1,500 W       | 2,000 W      | 2,500 W      | 3,000 W  | 4,000 W      |
|---------|--------------|---------------|---------------|--------------|--------------|----------|--------------|
| SC   MC | —            | DTI/DTS 6201  | DTI/DTS 6301  | DTI/DTS 6401 | DTI/DTS 6501 | —        | DTI/DTS 6801 |
| SC   MC | _            | DTI/DTS 6201C | DTI/DTS 6301C | —            | —            | —        | —            |
| SC   MC | DTT 6101     | DTT 6201      | DTT 6301      | DTT 6401     | —            | DTT 6601 | DTT 6801     |
| XC      | DTI/DTS 6X1E |               |               | DTI/DTS 6X2E |              |          |              |

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