INSTALLATION PROCEDURE AND OPERATION MANUAL OF EQOBRUSH FOR HEAT EXCHANGERS AND CONDENSORS

PROJECT:
PROJECT No.:

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INTRODUCTION:

To start the installation of the brush-cleaning-system the heat exchanger's interior must be reachable without covers. If on height, the owner must place a safe scaffolding to reach the pipe plates.
Consider safety of installation staff by making sure:

- Working space is safely accessible
- Workers are secured when working on scaffolding or heights
- Sufficient light in the working area to ensure safety and quality of work
- Arrange for proper ventilation

MATERIAL CHECK:

- Check if the BILL OF QUANITY (BOQ) matches with the heat-exchanger.

- Confirm the Packing list details with the BOQ. The provided components basically consist of following components:
    - Baskets and brushes
    - Reversing valve
    - Actuator (geared drive for reversing valve)
    - Position switch
    - Control panel
    - Utility materials (fasteners, cement, cups)

- Check the pipe end with a socket if the sizing is correct. The socket end must go smooth in the pipe and stop at the first ring on the socket.

- Check the brush size by putting one brush in a pipe. The brush hair must be slightly oversized to the inner pipe diameter.

NOTE – IMPORTANT
Make sure all electrical installation works are executed by qualified electrical installation personnel only.

SECTION 1: INSTALLATION SOCKETS, BASKETS & BRUSHES

NOTE:
Instructions to be followed carefully to avoid performance loss! We actually recommend owner's verification of the quality of the socket installation. Glue residues will obstruct brushes which in turn lead to non-treated (dirty) pipes and possible unnecessary pressure losses in the installation.

UNIT PREPARATION:
The sockets will be glued in the pipes end with special metal cement.
Therefore, the pipe-ends need to be free from burrs and grease or oil. Before starting the pipe-ends need to be extra cleaned with P-C-444 Cleaning Compound, Solvent Soluble, Grease Emulsifying or equivalent cleaning compound.
The purpose of cleaning compounds is to remove oil, grease and other foreign matter from pipe ends to ensure good contact between the cement and the inner pipe wall.

PROCEDURE:
The brushes, sockets and baskets cleaning cloth, cement, paper cups and application brushes are all provided with the system components. The cleaning solvent needs to be supplied by the owner.

Clean about 100 pipes starting from the bottom of the heat exchanger.

The cement will remain processable for 30 to 45 min. Prepare small portions (according to cup size) to have smooth cement available at all times throughout the installation process.

Mix ¾ of black cement with ¼ white hardener and stir it properly with the supplied spatula.

Stir till you have a coherent mass. Due to the chemical reaction the cement gets warm.

With the brush supplied put a thin layer of glue on the ringed end of the socket. Make sure all rings are covered in cement.

Cement brush and socket

Cement on brush

Apply cement on socket

Socket with cement layer

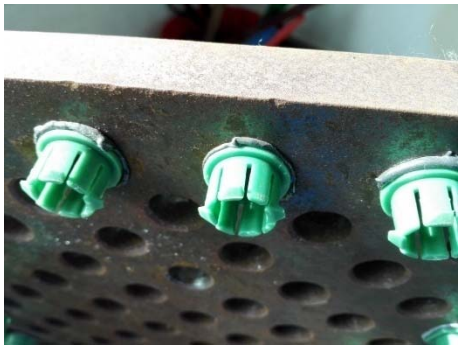
Make sure that there is no glue inside the brush channel. Remove glue from inside of brush channel.

Place the socket on the hand tool. Push-in the socket into the pipe plate.

A cement ring forms around the holder.

FINISHING:

Once all the sockets are in place, put in the brushes at one end. ONE brush for each pipe.
Once all the brushes are in place put on the basket and check that every socket, brush and basket is placed properly.
The cement needs about 24 hours to cure before the heat-exchanger can be used.



Well glued sockets

Put on the basket

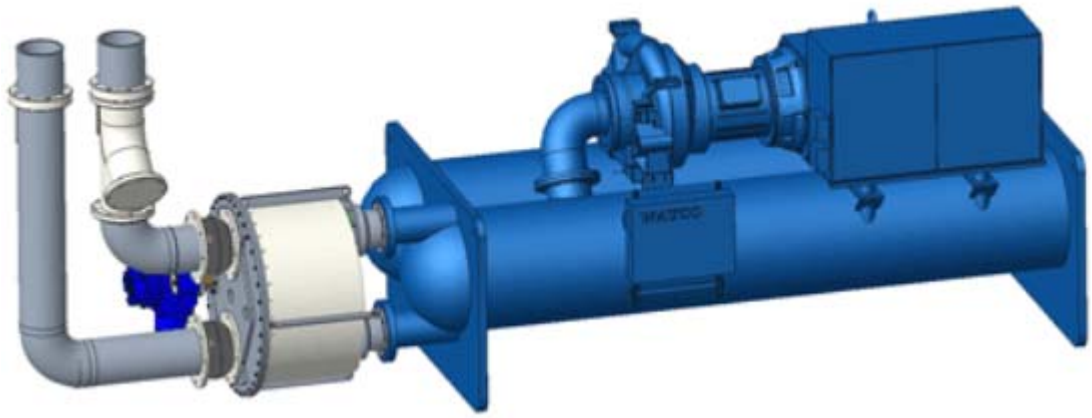
SECTION 2: INSTALLATION OF THE FLOW REVERSAL VALVE

INSTRUCTION AND REQUIREMENTS OF VALVE

The valve should be installed in the piping system as per drawings provided. Any type of structure to support the valve body may be added.

The bottom or back side of the valve (the side that connects to heat exchanger/condenser) can be installed in the pipe work without extra precautions, while the top or front side of the valve (at the cover flange where actuator is to be installed) the piping **MUST BE INSTALLED WITHOUT STRESS OR ANY FORCES ON THE VALVE BODY**. We recommend rubber compensators in the piping of valve. **The compensators supplied should be installed on the actuator (cooling tower) side of the valve**

Demountable pipe section at the inlet and outlet from the valve-front is required.



SECTION 3: INSTALLATION PLC CONTROL PANEL

Install the panel according the given electrical details and apply the power lines as well the connection of the motor to the panel (R-S-T-0-GR) and the position indicator (8 x 0.75 mm^2).

Confirm that the control panel receives power.

Actuator & Position Indicator:
Connect the cables according the diagram (appendix 1) and check if power is brought to the panel.

WARNING: Do not stick any body parts into the reversing valve when actuator is powered

After actuator and position indicator are properly mounted and all wirings are connected according to the diagram, follow below steps to adjust position indicator which controls the initial alignment position of valve inlet/outlet holes and swing box hole of the valve.

The PLC control panel (5 valve-set up)

Remark: PLC will automatically activate every 4 hours to complete a cleaning cycle. It is programmed to record the number of automatic cycles completed (downloadable to PC with specific software)

NOTE: Confirm the position of the swing box in “operation” mode (which is where the swing box comes to rest after its initial run that it makes when the system is powered up).
Flow through the valve should be straight, Front-In is straight opposite “Back-out” and vice versa.

SECTION 4: SAFETY FEATURES

A. Motor Current Control.

Every valve has a dedicated over current relay installed in the control panel.
In case the swing box is obstructed (by external objects in the valve) during its movement, the increased power consumption in the actuator will trigger the swing box to return to its starting position (either operational or cleaning position). The alarm light will blink and the system needs to be reset for it to resume operations.

Reset of the alarm by releasing the over-current relay.

If the problem persists it may be necessary to remove the feed pipes from the front of valve and check for debris blocking the swing box.

B. Run time Control.

The run time is the time the swing box needs to travel from start to end position. The maximum run time is set in the PLC.
Run time is different for each valve size and is pre-programmed into PLC.

If the actual run time is longer than the programmed one, the safety control function will run the swing box back to its starting position and trigger the alarm.

The system needs to be reset for it to resume operation.

If the problem persists it may be necessary to remove the feed pipes from the front of valve and check for debris blocking the swing box.

REMARKS:

If EQOBRUSH is operated on chillers running at top load, it might occur that they trip on high pressure. This depends on the chiller brand and the design of the circulation system. In general, there are 3 solutions:

A: The time in flush position is standard 10 to 15 seconds. This might be too short in a certain mode of operation. The flush time can then be extended to 60 or 90 seconds.

B: The cleaning cycles to be chosen at the down time of the chiller, e.g. several cleanings in the morning before the peak load comes up, and several cleanings after the peak load is dissipating at the end of the day.

C: Use a signal from the EQOBRUSH PLC to run down the load to <60% 5 minutes before the cleaning cycle starts. After the cleaning cycle is finished, the chiller can be operated at the required load again. This session might take up to max. 10 minutes.

All these functions are programmable in the PLC.

SECTION 6: START-UP / OPERATION / MAINTENANCE

A) START-UP

To start up the water system follow the instructions from the chiller/heat exchanger. Make sure the valve and flange connections do not leak and that there are no air pockets in the pipe work. (Install deaeration valves there where necessary).
Once the system pump(s) is running for a while, the first cleaning cycles can be activated manually.
Monitor the valve behavior during operation and confirm that the swing box runs smoothly. If not, there may still be air pockets in the system. Let the pumps run for a while till all air pockets are filled.

STEP 1:
Before electrical activation, the valve should be operated manually to see if the valve travel is free and smooth. Putting down the hand lever and turn the valve by hand into the reversal position and back. If the runway is smooth the panel can be activated.

STEP 2:
Set the switch on the actuator to "LOCAL". Then activate a cleaning cycle by turning the function knob to "close" direction. Once arrived, turn the function knob to "open" direction. The valve travel should be smooth.

STEP 3:
Set the switch on the actuator to "REMOTE". The panel will activate the actuator.
Lock the function switch so that it is non-turntable.

STEP 4:
Activate a few manual cleaning cycles by pushing the green function light button on the panel. Also now the valve should run smoothly.

The actuator is fully switched off if the function knob in locked in "STOP" position.

B) AUTOMATIC OPERATION

Once the power is activated and the system runs smoothly, every 4 hours there will be an automatic cleaning cycle. The time of the cycle is stored in the PLC history.

C) SERVICE AND MAINTENANCE

Brushes and Baskets

The system is maintenance free and runs 1 to 2 years without any attention.
Every 2 to 5 years the heat exchanger heads should be opened to check the condition of the pipes, brushes and baskets.
Replace internal components if required.

Valve and Actuator

The actual running time of the actuator is quite limited: +/- 2 minutes a day or +/-12 hours per year.
An oil replacement in the actuator is advised every 2 years depending on the ambient conditions of the valve/actuator set. Contact WATCO for more details.

D) NOTES

EQOBRUSH avoids fouling and scaling deposits to settle in the heat exchanger/condenser pipes. However, EQOBRUSH does not remove deposits in pipes that have already hardened.

Install after cleaning or on new equipment
It is therefore strongly recommended to install the units only on clean heat exchanger systems (either immediately after manual cleaning or on new equipment).

Operate only with active EQB-reversing valve
We also recommend not running the heat exchanger system without activating the reversing valve over periods longer than 12 hours as this may allow calcium deposits to deposit and harden.

Heat Exchanger when not in use

During periods when Heat Exchanger or Condenser is not in use we recommend to:

- Keep system (Heat Exchanger and Reversing Valve) filled with water
- Do not stop the reversing valve from moving in its set interval. This will minimize risk of valve getting stuck in its position over prolonged period of time

Water inlet strainer

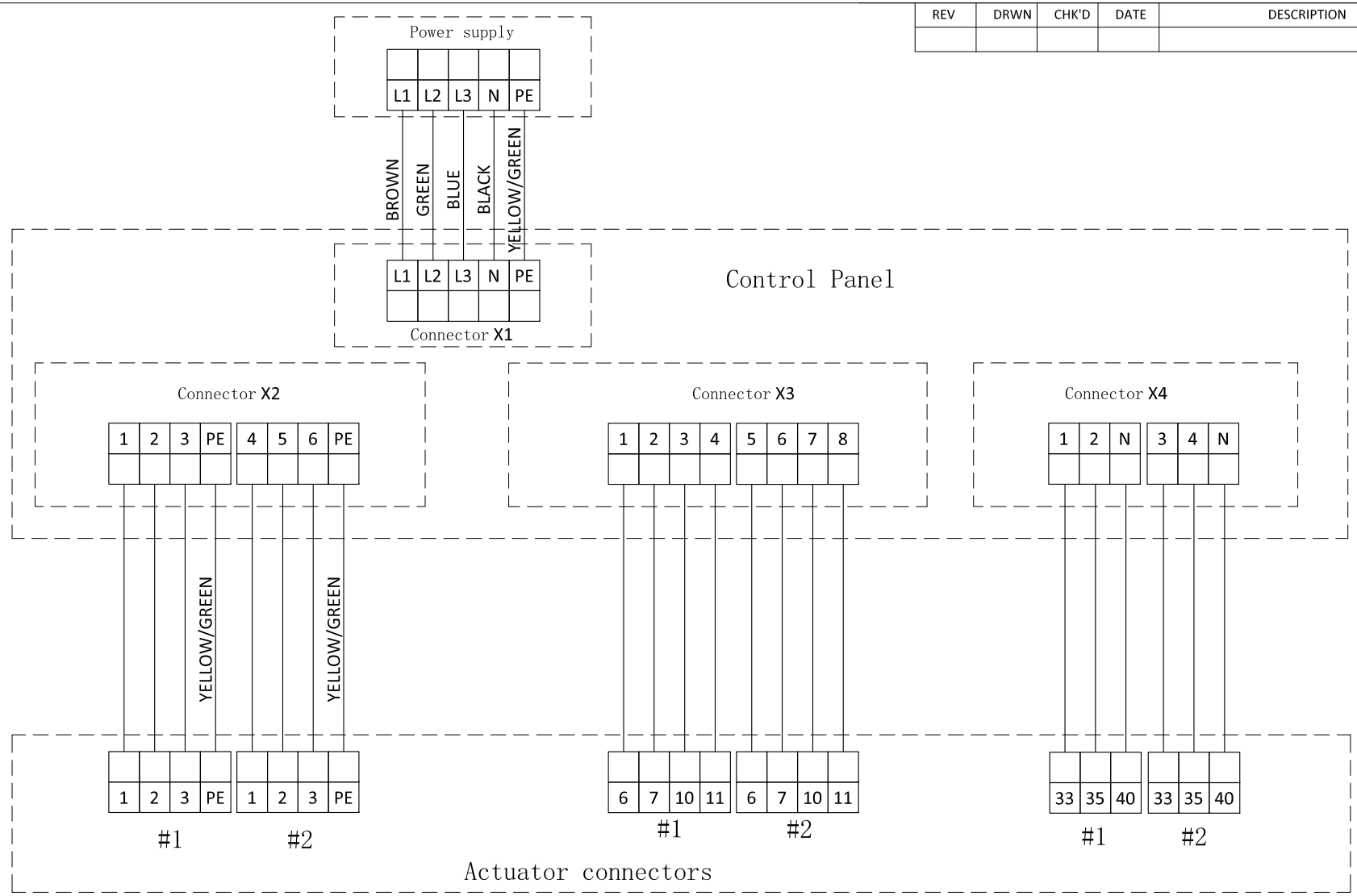
To remove possible foreign objects obstructing the valve it is necessary to disconnect the piping, hence this requires a stop of the installation. We suggest regular checking to prevent this (mostly caused by defect strainers at the water inlet) from happening.

Placement of control panel

The EQOBRUSH system can operate completely independent and does not interfere with any of the thermal systems connected to the heat exchanger or condenser. It is therefore not necessary to connect to other operational control systems in use. However, we do strongly recommend installing the control panel in a location where it is clearly visible to the operating staff as to ensure any blinking alarm to be visible.

Congratulations for having purchased our EQOBRUSH system. You will not only start saving on energy now, but also contributing to a better environment.
Thank you for your business!

REV	DRWN	CHK'D	DATE	DESCRIPTION



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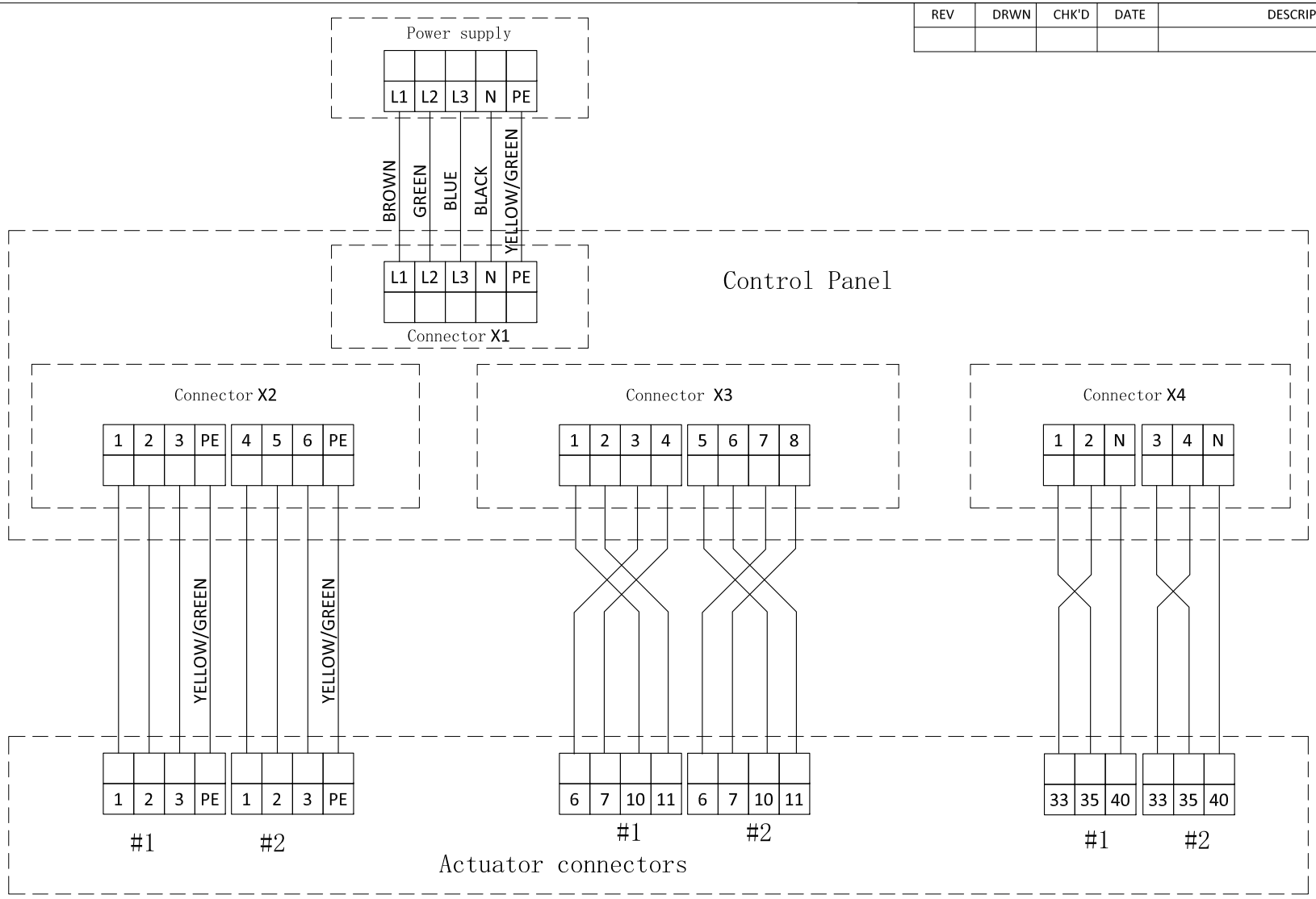

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