Application Note AN0302
Using Solid State Relays on bentrup controllers

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1.) Advantages using Solid State Relays

Using solid state relays (SSR) provides the advantage of silent operation as well as almost unlimited lifetime (mechanical contactors are limited to several hundred thousand switching cycles). Furthermore higher cycle times can be used on solid state relays ensuring more steady and accurate heating. Also note that EMC problems are reduced when using SSRs.

2.) Important Notes

Keep in mind that a SSR has a power dissapation of roughly 1 W per Amp. Carefully check the technical specifications coming with the SSR. A proper sized heatsink with sufficient cooling power is mandatory. If you are not familiar with calculating heatsinks contact us for assistance. Keep in mind that data provided with the heatsink assume maximum air convection.

Keep in mind that of course ambient temperature is an important issue in kiln enviroments. Typical calculation examples assume ambient temperatures of 25°C or even less. In an kiln enviroment temperatures reach often 40°C or even more causing the need of larger heatsinks. Forced air convection using fans should also be considered. In this case temperature limit switch is even more important if fan stucks or fails.

Example: A 3 phase kiln rated 18 kW at 380V (triangle) operated at a maximum ambient temperature of 40°C needs a heatsink of 0.5 K/W or less ! In critical enviroments we recommend protecting the SSR using a temperature switch mounted on the heatsink (N/C switch opening at 70°C).

3.) Safety

A SSR does not provide safe isolation in OFF state. Therefore regulations require to have another device providing cutting off electricity when accessing the kiln. Usually this is done by a separate safety contactor controlled by the bentrup.

Note that when a SSR fails it likely stays ON continuously. To avoid kiln damage we strongly recommend using a mechanical safety contactor driven by a safety output of the bentrup.

4.) Adapting the bentrup Controller for using SSRs

Basically all bentrup controller can be used controlling SSR. However, the required adaptions depends on the SSR model. They come in two types:

a.) standard input voltage (100 to 240V AC)

When using this kind of SSR you only have to change the cyclus time of the bentrup controller from default (30 seconds) to 4 seconds to improve accuracy. You can use a standard bentrup controller.

b.) low input voltage (3 to 32V DC)

For this kind of SSR you have to require a modified bentrup controller. The modification is free of charge; the controller is marked with "SSR" on the type label. The cyclus time will be set to 4 seconds ex factory.

We recommend using SSR as specified under b.) since also controller output is non-mechanical.

CAUTION: A controller marked as SSR can only be used for the kind of SSRs as specified under 4 b.). To drive the kind of SSRs as specified under 4a.) you have to use a standard relay output controller.

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