Configuration of the parameters for starting and stopping the drive with a soft starter

1. Purpose of the exercise:

Get acquainted with the operation and the possibility of soft-starting the motor using a modern soft starter.

2. Tasks to be completed:

- To learn the rules of device parameterization, built-in start-up functions, available protections, and their testing.
- To compare the soft starter starting properties to the most common method of direct motor starting.

3. Theoretical introduction

The soft starter limits the current surge when the motor is started. During start-up, soft starters reduce the voltage at the motor terminals and then increase it to the rated voltage. This way, soft starters limit the peak values of currents drawn during start-up and eliminate mechanical shocks.

Soft start reduces the loads acting on the motor, which results in its lower wear and longer failure-free life. Also, it minimizes the load on the local network supplying the motor.

The soft starter consists of two oppositely connected thyristors in each phase. A microprocessor controls the thyristor system. During start-up, the thyristors are controlled so that the last fragment of each half-period of the supply voltage is passed - the control angle. Then, the control angle is reduced in each half-period by earlier switching on the thyristors' start signal until the full supply voltage is obtained. Similarly, the soft stop process takes place. The control angle reduces the supply voltage from 100% to zero (soft stop).

Wrocław University
of Science and Technology

ABB

Soft starter parameter choice:

Choosing the right soft starter requires a thorough knowledge of the system in which it is to work:

- rated current - the value of the rated current of the soft starter must be equal to or greater than the current or the sum of the rated currents of the motors it will start,

- rated power range - when choosing this parameter, pay attention to the type of system in which the soft starter is to be used. For example, in systems where we start idle motors, we can use a soft starter with a rated power matched to the rated power of the motor. On the other hand, in applications with high starting power, we choose soft starters with a higher power rating than the drive power.

- the control voltage of the soft starter and its type,

- start-up time,

- starting torque - defines the power with which the drives will start at the start,

- maximum operating voltage - it is usually at the level of 600V,

- overload capacity – this parameter should correspond to the overload capacity of the motor,

- number of revolutions per minute,

- number of starts per hour,

- additional equipment – today, soft starters are often equipped with additional functions that facilitate installation and diagnostics, e.g., displays, indicator lights, current limiters, and the presence of a bypass.

- ambient temperature – determines the allowable operating range of the soft starters.
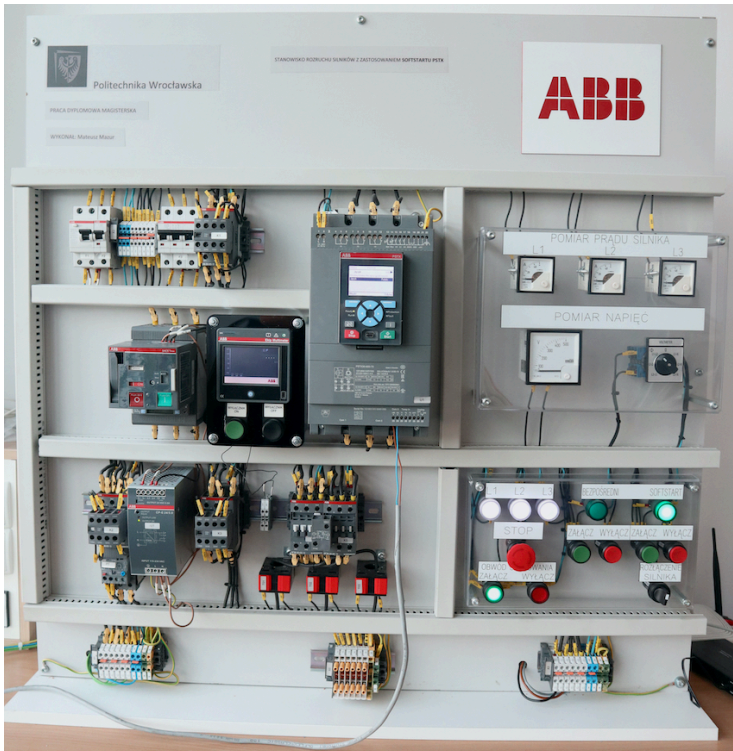
Figure 1. A Laboratory stand for testing drive with the softstarter

Soft starter application

We will use the soft starter when dealing with rare start-ups of high-power systems with possible loads at the start. Soft starter applications include crushers, mixers, conveyors, centrifugal pumps, and escalators.

4. Guidance questions - check yourself

▪ What is the difference between a direct-on start and a soft starter?

▪ Can you explain the working principle of a soft starter?

▪ Softstar parameterization. What parameters should be set on the device for it to work correctly?

5. Exercise program

A. Soft start parametrization:

In order to prepare the stand for soft starter operation, first switch on the current circuit of the device and the motor.

On the control panel, dedicated buttons can control the current paths. By pressing the start button for the soft starter operating mode, the device is ready to start the motor.

Performing a soft motor start requires initial parameterization of the soft starter. All necessary settings of motor data and starting parameters are made from the user interface (soft starter control panel).

Parameterization can also be performed in the application dedicated to this device.

B. Performing a direct motor start on a mock-up: for comparison purposes, write down and evaluate the starting current, voltage drop in the power supply network, and starting time.

C. Performing a direct-on-line start on a soft starter (option "full voltage start") for comparison purposes, write down and evaluate the starting current, mains voltage drop, and starting time.

D. Performing a soft start using the "linear voltage change" option:

▪ Start ramp inclination level in the range of 10 - 99%,

(Allows you to set the voltage level at which starting ramping starts)

▪ Start ramp time from 1 - 120 seconds, parameter 02.04,

(Allows you to set the adequate time needed to reach the whole voltage level).

E. Performing a soft stop using the "linear voltage change" option

- Specify the level of the stop ramp inclination in the range of 10 - 99%,

(Sets the level at which the voltage ramp stops)

- Enter the stop ramp time in the range of 1 - 120 seconds (Set the necessary time to reach the final voltage)

F. Performance of dynamic braking

Do not use the "linear voltage change" option!