MIXIT integration FAQ

FAQ 2022

GRUNDFOS

BMS integration of MIXIT – FAQ

I WANT TO CONTROL THE VALVE POSITION DIRECTLY INSTEAD OF SETTING A TEMPERATURE SETPOINT. HOW CAN I DO THAT?

MIXIT does not offer control of the valve position for several reasons:

1. Recognizing that the majority of BMS vendors have the needed skills to make a well-functioning control loop, we have seen many control loops that are detuned, some to the extent that the valve position set by the BMS system is oscillating a lot and rapidly.

   This can go on for years without being noticed as the thermal capacity of the heating system smoothens the immediate fluctuations seen at the mixing point of the water. Eventually the valve will wear out prematurely in these systems.

   Grundfos products are designed for a long lifetime, but as any mechanical component, the lifetime of MIXIT is not infinite. We will not accept reduced lifetime of our products due to a bad integration, e.g. such as a detuned control loop. We are responsible for the warranty period and that the product works as intended many years after.

   We also recognize that some applications may require slightly different settings, than the factory default ones. Therefore, it is possible for the BMS vendor with the needed skills to tune the controller slightly different. This can be done through well-known PI controller settings (Kp and Ti) using the Grundfos GO app, e.g. see section 0. Setting Kp will scale both the integral <u>gain</u> and the proportional gain. Ti is the integral time.

2. We have extensively tested the valve and seals in rough conditions; therefore, we know better than any BMS vendor how often an anti-block cycle is needed to avoid the valve sticking and keeping the seals well-functioning during the lifetime of the MIXIT valve.

3. Modern valves provide balancing based on flow measurements and limitation of the valve stroke or valve rotation. MIXIT uses a similar solution. Effectively it is a saturation of the control signal that for gain and anti-wind-up reasons must be handled together with the temperature control loop, so it makes sense to integrate them together. Grundfos has taken care of all that through a parametrized setup in the Grundfos GO app.

4. To make a mechanical compact solution and making it easier to integrate mechanically; MIXIT comes as a three-port valve with the return temperature sensor in the shunt. The downside of this is that the sensor only measures correctly if there is a flow in the shunt!

   However, having access to the temperature sensor in the pump (via communication between the TPE3/MAGNA3 pump and MIXIT) and the supply temperature sensor in the valve, our algorithm detects whether there is a flow in the shunt or not, and thus if the return temperature sensor may be trusted or not. We even force a flow in the shunt when needed to detect the return temperature by closing the valve a little bit when the shunt flow is low.

   The location of sensors and especially the return temperature sensor are critical for the implementation of safety functions, such as a coil preheat function or a coil frost protection. Therefore, we have done functions that works with our MIXIT sensor integration.

The BMS vendor can still use their own frost detection protection function if they want. There is a register on the field bus where frost risk may be signaled, whereby the valve will open fully. This can also be activated on a digital input.

In any case the coil frost protection <u>always</u> has priority over the temperature control loop.

5. Some BMS vendors forget to read the position feedback of the valve but takes the percentual setpoint as the actual position. In that case they may not know if the valve is blocked before visible at temperatures. We have integrated that function, so it is never forgotten. It is part of the position calibration and anti-block feature of the valve.

I WOULD LIKE TO HAVE MIXIT CONTROL THE ROOM TEMPERATURE, IS THAT POSSIBLE?

No, it is not a natural part of the valve control. We find the room temperature control is better left for the BMS vendors to do, or by thermostats if such are present.

If the application is an air handling unit, a cascaded room temperature control loop can be implemented together with MIXIT though air supply or water temperature setpoints.

I NEED CONTROL OF THE VALVE POSITION VIA BUS FOR FAULT FINDING AND SERVICE OF MY SYSTEM. HOW CAN I DO THAT?

There is an interface on the fieldbus where the valve opening degree can be controlled at 0%, 25%, 50%, 75% and 100% independent of the internal control loop.

I'M INTEGRATING WITH AN AHU, WHY CAN'T MIXIT CONTROL ALL THE AHU FUNCTIONS, E.G. ?

We believe the BMS vendors are better at knowing how the AHU shall be controlled in terms of temperature setpoints, balance between heat regeneration and heat injection from the mixing loop, defrosting of heat exchangers when to start/stop afterheat coils etc. Additionally, MIXIT does not have all the data points needed for controlling the advanced functions of the AHU.

I USE MIXIT WITH THE HEATING COIL APPLICATION, BUT THE INLET AIR TEMPERATURE CONTROL IN MIXIT IS RESPONDING SLOWER THAN I'M USED TO. WHAT CAN I DO TO IMPROVE IT?

You can access the PI control parameters with the Grundfos GO app. for iOS or Android under: Settings > Application Settings > Temperature controller, e.g. see figure 5.

The control loop is a PI controller that is parametrized as you are used to with proportional gain K_p and integral time T_i. If the response is too slow, please start by adjusting to loop gain K_p a little higher. Setting K_p will scale both the integral <u>gain</u> and the proportional gain as T_i is the integral time. Reducing T_i will increase the integral gain.

When you do the tuning please make sure the valve does not limit cycle (make frequent oscillations) and that the temperature does not make large oscillations around its setpoint.
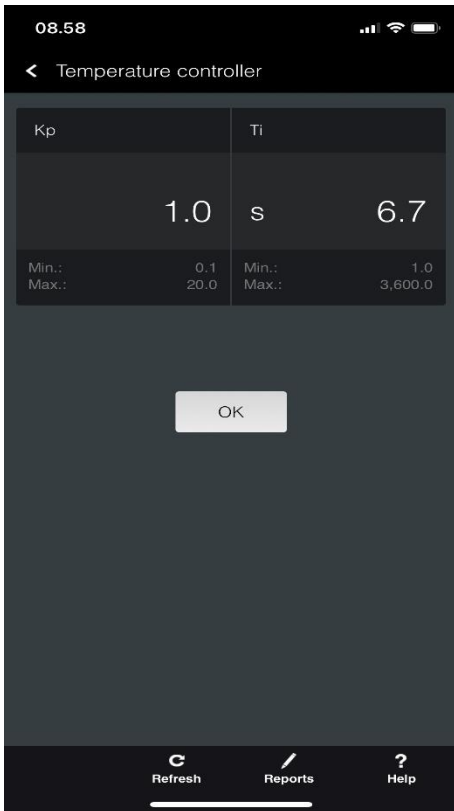
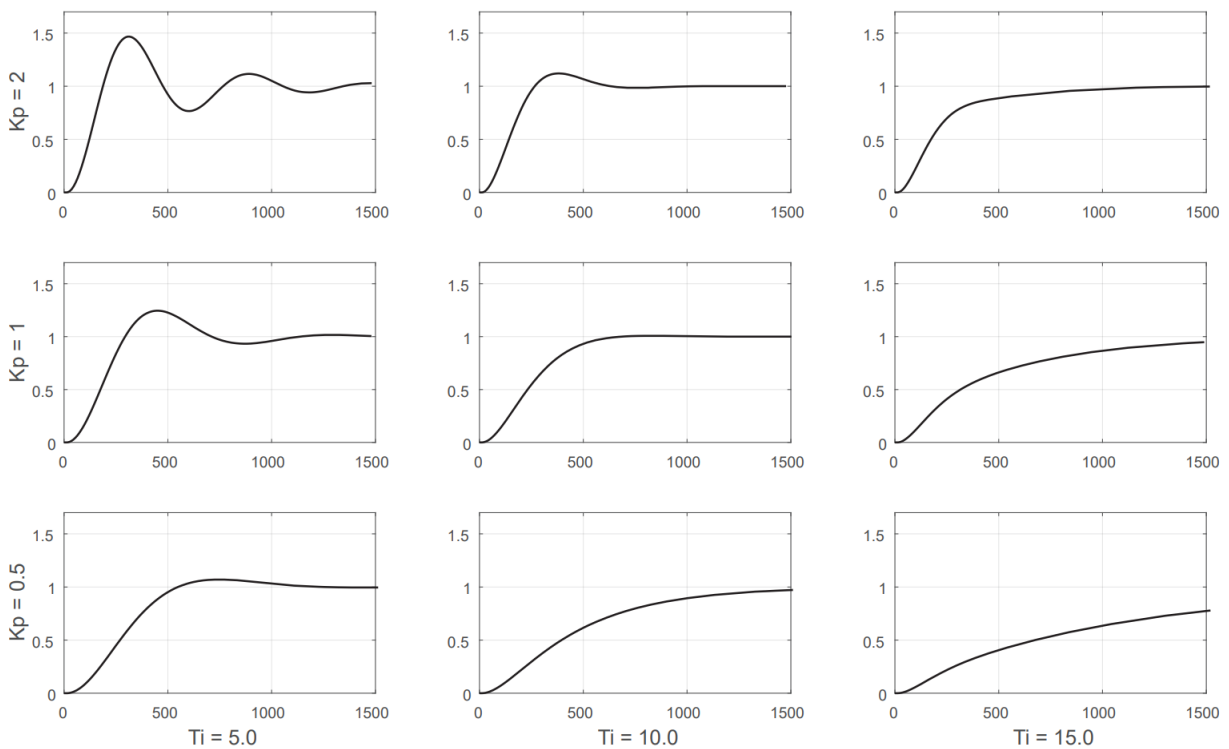**Figure 1: Configuration of PI controller parameters with Grundfos GO.**

Figure 2: Examples of how PI controller parameters influence transient response of a control loop.

HOW CAN I MAKE SURE THE INLET TEMPERATURE CONTROL LOOP IN MIXIT AND THE INLET TEMPERATURE CONTROL LOOP OF MY HEAT REGENERATION LOOP AT THE AHU DO NOT INTERACT?

There are more ways to make sure of that. Making a solution that takes into account if the controller for the heat regeneration is saturated is preferred, e.g. see no. 1 to 3 below.

1. When the heat load can be met by heat regeneration alone, send a stop signal to MIXIT whereby the pump will stop, and the valve will close. **Please be aware that the coil frost protection is not active when the MIXIT system is stopped.**
2. In periods where the heat load can barely but sometimes be met by heat regeneration alone let MIXIT run with a setpoint a little (0.5 – 1 degrees Celsius) below the setpoint of the temperature controller for the heat regeneration. In this way MIXIT will not take over the heat supply from regeneration, but it will kick in when the temperature drops too far from the setpoint. In periods where there may be a frost risk this is the preferred option.
3. In periods where the heat regeneration cannot cope with the heat demand and therefore is saturated remove the temperature offset of the setpoint

An alternative method is:

4. Tune one control loop slower than the other, then the two loops will not oscillate against each other the faster controller will be in control when not saturated. However, also make sure there is not a negative offset of the temperature sensor used with MIXIT (if more than one sensor is used). Since the temperature controller in MIXIT is a PI controller, the integral part may gradually take over due to offset errors, even though it is tuned to be slow.

HOW CAN I USE THE SAME AIR TEMPERATURE SENSOR FOR CONTROL OF MIXIT AND THE CONTROL LOOP OF MY HEAT REGENERATION?

The temperature sensor shall be connected to MIXIT via the configurable analogue input, the value can then be read via the field bus. If the AHU controller does not feature an appropriate fieldbus to read the temperature from MIXIT a signal converter/splitter is needed.

Providing MIXIT with the air temperature via the fieldbus is not currently possible. It is planned in a future release, e.g. see Figure 3.
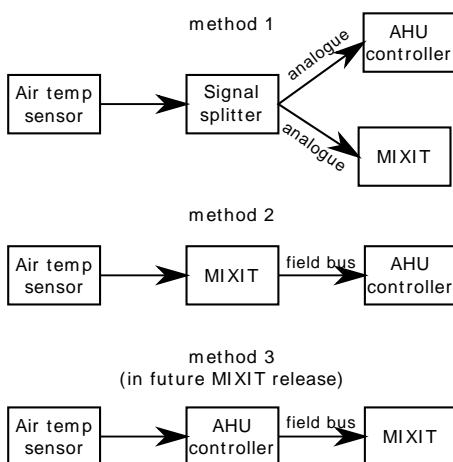

Figure 3: Ways of sharing the air temperature signal with MIXIT.

I DON'T WANT THE PREHEAT FUNCTION TO BE ACTIVE, WHAT SHALL I DO?

Use Grundfos GO for iOS or Android to turn the preheat function off under: Settings > Application settings > Coil preheat and frost protection, e.g. see figure 7.
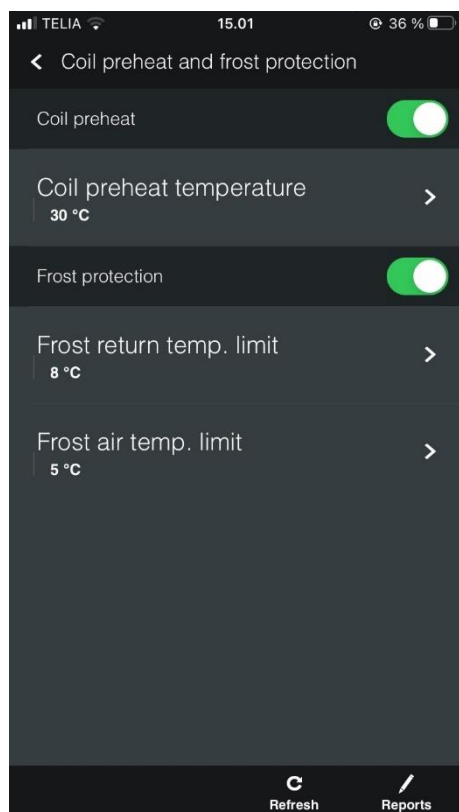

Figure 4: Menu in Grundfos GO where the preheat and frost protection functions may be disabled.

Coil preheat is turned on by factory default. For energy saving, we recommend it is turned off if preheating of the coil is not needed.

CAN I DO MY OWN COIL PREHEAT FUNCTION?

The preheat function must take several sensor signals into account because the return temperature sensor is in the shunt connection. However, there is an interface on the fieldbus where the valve opening degree can be controlled at 0%, 25%, 50%, 75% and 100%. If this is sufficient for you to do a preheat function, you are welcome to try it out.

I WANT TO DETECT A FROST RISK AT THE COIL IN A DIFFERENT WAY THAN THE MIXIT IMPLEMENTATION, HOW CAN I BYPASS IT?

The integrated coil frost protection function can be turned off by using Grundfos GO at: Settings > Application settings > Coil preheat and frost protection, e.g. see Figure 4. Frost risk can still be signaled via the fieldbus or a digital input based on any external frost risk criterion. When a frost risk is signaled, MIXIT will open the valve 100%. The integrated frost protection function is turned on by factory default.

I WANT TO USE THE COIL FROST PROTECTION FUNCTION IN MIXIT TOGETHER WITH MY OWN FUNCTION HOW CAN I DO THIS?

External frost risk signaling via fieldbus or a digital input has the same priority as the integrated frost risk detection. Hence, if either an external function detects and signals a frost risk to MIXIT or the internal frost risk detection detects a frost risk, MIXIT will go into coil frost protection state by opening the valve 100%.

Make sure the internal coil frost protection function is turned on by using Grundfos GO for iOS or Android at: Settings > Application settings > Coil preheat and frost protection, e.g. see Figure 4 above.

HOW DOES THE COIL FROST PROTECTION FUNCTION IN MIXIT WORK?

When MIXIT is not stopped externally, and the coil frost protection function has not been disabled by Grundfos GO, frost is detected if the air temperature OR the return temperature falls below their configured limits. These limits can be configured by Grundfos GO at : Settings > Application settings > Coil preheat and frost protection, e.g. see Figure 4 above.

THE CONTROLLER I USE FOR AHU CONTROL USES LON CAN I USE MIXIT TOGETHER WITH AN AHU ANYWAY?

It is possible. Either use a BUS converter between LON and one of the fieldbus protocols supported by MIXIT (BACnet MS/TP, BACnet IP, Modbus RTU and Modbus TCP) or integrate MIXIT via analogue signals.