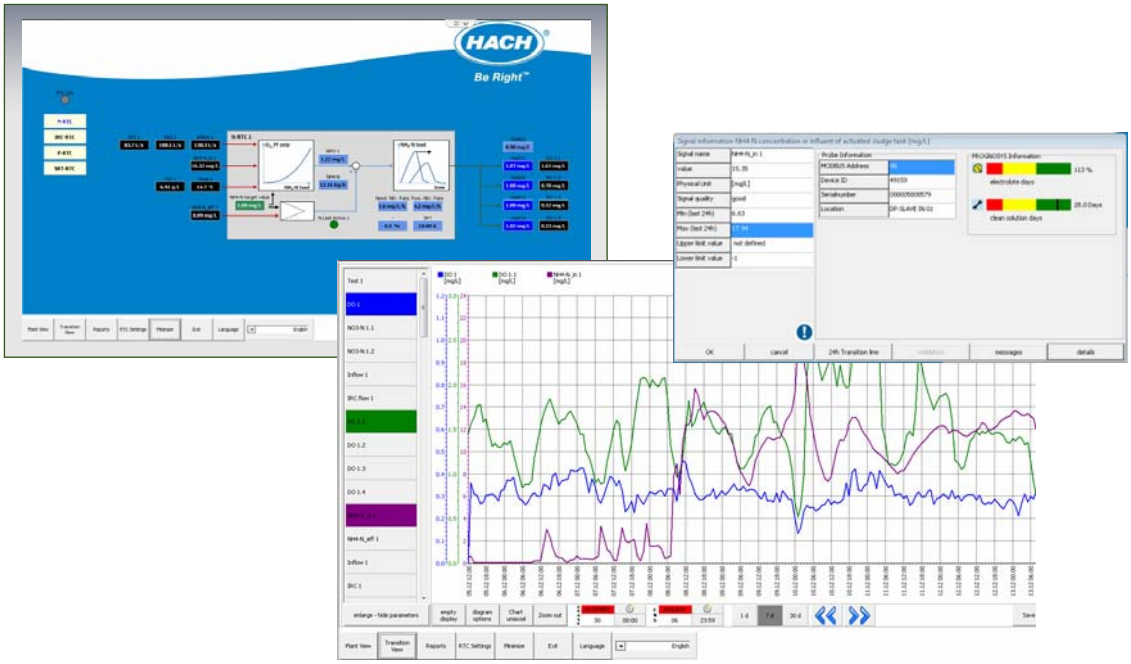
Process Management

Real Time Control Modules
for Biological Waste Water Treatment
- Product Range and Description -



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HACH
Be Right™

RTC Standardized Combined Product Range

Process	Product decription		Abbrevation	Article #
PO4-P precipitation (RTC-P)	Closed loop control PO4, Output: precipitant flowrate	1 Channel 2 Channel	RTC-P_CL (1C) RTC-P_CL (2C)	LXZ515.53.A1010 LXZ515.53.A1011
	Open loop control PO4, Output: precipitant flowrate	1 Channel 2 Channel	RTC-P_OL (1C) RTC-P_OL (2C)	LXZ515.53.A1110 LXZ515.53.A1111
	Closed loop control PO4 considering P_tot / TSS in effluent, Output: precipitant flowrate	1 Channel	RTC-P_CLCL	LXZ515.53.A1210
	Combination open / closed loop control PO4, Output: precipitant flowrate	1 Channel 2 Channel	RTC-P_OLCL (1C) RTC-P _OLCL (2C)	LXZ515.53.A1310 LXZ515.53.A1411
	Closed loop PO4 control, Output: precip. flowrate 1 combined with open loop PO4 control, Output: precip. flowrate 2	2 Channel	RTC-P_CLOL	LXZ515.53.A1311
Intermittend denitrification (RTC-N/DN)	Intermittent aeration control, Output: Aeration on/off	1 Channel 2 Channel	RTC-N/DN (1C) RTC-N/DN (2C)	LXZ520.53.C0101 LXZ520.53.C0111
	Intermittent aeration & O2 control, Output: Aeration on/off, 1 aeration stage, VSD	1 Channel 2 Channel	RTC-N/DN_DO (1C) RTC-N/DN_DO (2C)	LXZ520.53.C3101 LXZ520.53.C3111
	Intermittent aeration & O2 control, Output: Aeration on/off, 6 aeration stages, 2 VSD	1 Channel 2 Channel	RTC-N/DN_DO 2VSD (1C) RTC-N/DN_DO 2VSD (2C)	LXZ520.53.C2101 LXZ520.53.C2111
SBR (Intermittend denitrification) (RTC-N/DNSBR)	Intermittent aeration control (SBR), Output: Aeration on/off	1 Channel 2 Channel	RTC-N/DN SBR (1C) RTC-N/DN SBR (2C)	LXZ520.53.D0101 LXZ520.53.D0111
	Intermittent aeration & O2 control (SBR), Output: Aeration on/off, 1 aeration stage, VSD	1 Channel 2 Channel	RTC-N/DN SBR_DO (1C) RTC-N/DN SBR_DO (2C)	LXZ520.53.D3101 LXZ520.53.D3111
	Intermittent aeration (SBR) & O2 control, Output: Aeration on/off, 6 aeration stages, 2 VSD	1 Channel 2 Channel	RTC-N/DN SBR_DO 2VSD RTC-N/DN SBR_DO 2VSD	LXZ520.53.D2101 LXZ520.53.D2111
Simultaneous denitrification (RTC-SND)	NH4 & NO3 control, Output: Aerated volume (0…100%)	1 Channel 2 Channel	RTC-SND (1C) RTC-SND (2C)	LXZ522.53.A0101 LXZ522.53.A0111
	NH4 & NO3 control, Output: Aerated volume (0…100%), Output: 6 stages, 2 VSD	1 Channel 2 Channel	RTC-SND (1C6Z) RTC-SND (2C6Z)	LXZ522.53.B0101 LXZ522.53.B0111
Nitrification, plug flow (RTC-N)	Combination open / closed loop NH4 control, Output: O2 setpoint	1 Channel 2 Channel	RTC-N-RTC (1C) RTC-N-RTC (2C)	LXZ519.53.B0101 LXZ519.53.B0111
	Combination open / closed loop NH4 control, Output: Aeration on/off, 1 aeration stage, VSD	1 Channel 2 Channel	RTC-N_DO (1C) RTC-N_DO (2C)	LXZ519.53.B3101 LXZ519.53.B3111
	Combination open / closed loop NH4 control, with O2 control, Output: O2 setpoint, 6 aeration stages, 2 VSD)	1 Channel 2 Channel	RTC-N_DO 2VFD (1C) RTC-N_DO 2VFD (2C)	LXZ519.53.B2101 LXZ519.53.B2111
	Combination open / closed loop NH4 control, Output: O2 setpoints for 4 zones, control of one swing zone	1 Channel 2 Channel	RTC-N_4Z (1C) RTC-N_4Z (2C)	LXZ519.53.D0101 LXZ519.53.D0111
	Combining open / closed loop NH4 control on Step Feed reactors, Output: O2 set points for 3 zones	1 Channel 2 Channel	RTC-N_STEP (1C) RTC-N_STEP (2C)	LXZ519.53.D1101 LXZ519.53.D1111
DO control (RTC-DO)	Closed loop zone DO control. Output: Aeration intensity	4 valves 8 valves 12 valves 16 valves	RTC-DO (4C) RTC-DO (8C) RTC-DO (12C) RTC-DO (16C)	LXZ530.53.C0101 LXZ530.53.D0101 LXZ530.53.C0111 LXZ530.53.D0111
Most open valve DO control (RTC-MOV)	Closed loop zone DO control. Output: Air valve position, pressure on manifold or overall	4 valves 8 valves 12 valves 16 valves	RTC-MOV (4C) RTC-MOV (8C) RTC-MOV (12C) RTC-MOV (16C)	LXZ530.53.A0101 LXZ530.53.B0101 LXZ530.53.A0111 LXZ530.53.B0111
Denitrification (RTC-DN)	Closed loop contol NO3 effluent anoxic or aeration. Output: Internal recirculation	1 Channel 2 Channel	RTC-DN_IRC (1C) RTC-DN_IRC(2C)	LXZ521.53.A0101 LXZ521.53.A0111
	Closed loop contol NO3 effluent denitrification or effluent aeration. Output: Internal recirculation and external carbon	1 Channel 2 Channel	RTC-DN_IRC_C (1C) RTC-DN_IRC_C (2C)	LXZ521.53.B0101 LXZ521.53.B0111
	Combination open / closed loop NO3-N control. Output: External carbon flow	1 Channel 2 Channel	RTC-DN_C (1C) RTC-DN_C (2C)	LXZ514.99.B0101 LXZ521.53.D0111
Nutrient dosing (RTC-C/N/P)	Organic load based nutrient dosing combined with effluent nutrient control. Output: External Nitrogen and Phosphorous dosing rate	1 channel 2 channel	RTC-C/N/P (1C) RTC-C/N/P (2C)	LXZ514.53.B0101 LXZ514.53.B0111
Sludge retention time (RTC SRT)	Adjustment of sludge retention time according to temperature. Output: Surplus activated sludge flow rate	1 Channel 2 Channel	RTC-SRT (1C) RTC-SRT (2C)	LXZ518.53.A0101 LXZ518.53.A0111
Chlor-Dechlor (CL2-RTC)	Closed loop adjustment of Total Residual Chlorine (TRC) after waste water disinfection. Output: CL2 dosing and dosing of de-Cl compound	1 Channel 2 Channel	RTC-CL2 (1C) RTC-CL2 (2C)	LXZ531.53.A1010 LXZ531.53.A1011
Sludge Thickening (RTC-ST)	Open and closed loop contr. of TSS in thickened sludge and/or filtrate. Output: Polymer flow and/or feed flow	1 Channel 2 Channel	RTC-ST (1C) RTC-ST (2C)	LXZ517.53.A0101 LXZ517.53.A0111
Sludge dewatering (RTC-SD)	Control of TSS in dewatered sludge or centrate: Output: Polymer flow or feedflow	1 Channel 2 Channel	RTC-SD (1C) RTC-SD (2C)	LXZ516.53.A0101 LXZ516.53.A0111
Dissolved air flotation (RTC-DAF)	Control of TSS in flotated sludge and TSS in clear water. Output: Dosing of Coagulant and polymer, dosing of acid and or caustic	1 Channel 2 Channel	RTC-DAF (1C) RTC-DAF (2C)	LXZ517.53.B0101 LXZ517.53.B0111
	OPC SERVER including configuration (Brand and type of PLC has to be defined)		OPC	LXZ515.99.B0000

	Product decription	Article #
Hardware	DIN Rail IPC with UI and Basic SW (CX5130 Beckhoff)	LXV515.99.0005B
	11,6" touch wide screen (CP2711, Beckhoff)	LXV515.99.0002B
	15,6" touch wide screen (CP2716, Beckhoff)	LXV515.99.0003B
	18,5" touch wide screen (CP2718, Beckhoff)	LXV515.99.0004B
	DIN Rail IPC with UI and Basic SW (SIEMENS IPC427E Microbox)	LXV515.99.0005C
	15" touch wide screen (SIEMENS IPC477E)	LXV515.99.0003C
	19" touch wide screen (SIEMENS IPC477E)	LXV515.99.0004C
Remote	4G SIM Card Router with Power Supply	LZH371
Others	RTC upgrade from std. single to std. combined	LXZ515.99.00001
	Std. combined extension	LXZ515.99.00002
	RTC basic software configuration on existing hardware (Visualization and data base)	LXZ515.99.00003
	RTC Software adoption / modfication / extension (after consultation with RTC BU)	LXZ515.99.00005

PO4-P precipitation

P-RTC application area

- Plants with chemical P-removal (measurement point before or after the point of chemical application or any combination of those).
- Plants with varying phosphorus loads in their inflow
- Plants using Al, Fe, and combination products as precipitant

P-RTC description

Control module for load-dependent precipitant dosage for chemical phosphate elimination.

The P-RTC (Phosphate Removal Real Time Controller) controls the PO4-P (soluble phosphorus) concentration based on the continuously measured PO4-P concentration and the waste water flow rate. The open loop P-RTC considers the biological phosphorous uptake and true chemical efficiency to ensure the minimum amount of precipitant is added to meet the PO4-P setpoint. Closed loop control uses specialized PID loops to ensure very low set points can be used without problematic over reaction common in conventional PID loops. Combination of these advanced controls ensures a direct "fit" to almost any plant configuration and allows new strategies not previously available. Namely, dynamic PO4-P set points to automatically react to solids loss events, or automated "policing" dosing to ensure separate dosing systems work in harmony to secure total P and where applicable metal ion compliance.

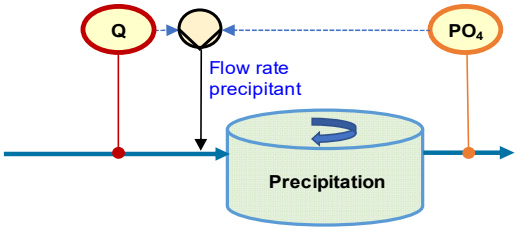
Robust fall back strategies are integral to Hach RTC. If input signals for inflow or ortho phosphate concentration are not available, the system automatically switches to a user defined fall back strategy choice.

P-RTC benefit

- supports compliance on P_TOT as precipitant is added according to the actual PO4-P load to be precipitated
- avoids overdosing of precipitant resulting in
  - no over spending for precipitant
  - no increased production of precipitation sludge which has to be treated and disposed
  - no loss of acid capacity, potentially harming nitrification

Versions

LXZ515.53.A1010 (single Channel) **LXZ515.53.A1011 (double Channel)**
VERSION: **RTC-P_CL (1C)** **RTC-P_CL (2C)**
Closed loop control PO4, Output: precipitant flowrate



In this version the ortho phosphate concentration is measured after the precipitant is added. A specialized PID algorithm considering flow rates is applied to provide stable control even at ortho phosphorus set-points < 0,5mg/l. The closed loop control approach ensures that the ortho phosphate concentration of the effluent is constantly kept to the desired set point and provides a measurement value to prove effective control.

Precipitant has to be well mixed with the waste water stream before the measurement sample is taken. The application of this technique is not specifically limited by hydraulic retention time. As the precipitation chemicals are highly acidic they "equalize" rapidly across a settlement or aeration phase (just as pH adjustment rapidly effects the whole tank volume).

Typical configuration:
Dosing effluent aeration / PO4-P measurement distribution chamber to the final sediment

I/O and param. / channel

RTC-P output

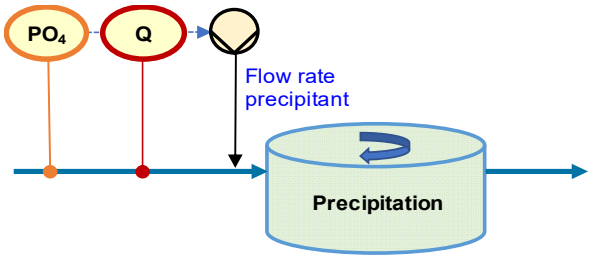
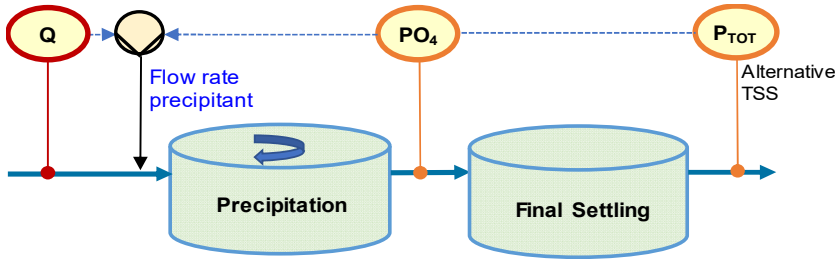
- Precipitant flow rate
- Controller status signal

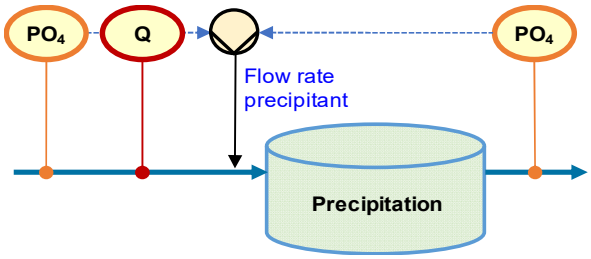
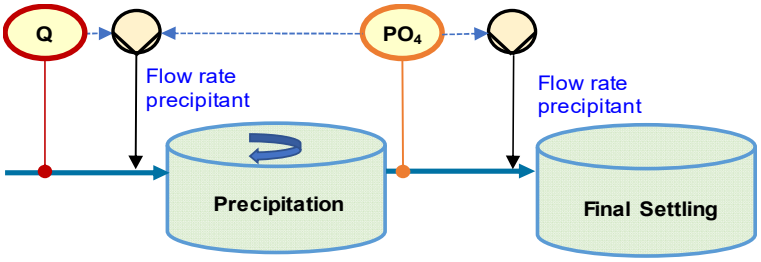
RTC-P input

- PO4-P concentration
- Flow rate inflow wwtp
- Flow rate return activated sludge and internal recirculation (if available)

RTC-P control parameter

- Set point for PO4-P
- Min/max precipitant flow rate

Versions	I/O and param. / channel
LXZ515.53.A1110 (single Channel) **LXZ515.53.A1111 (double Channel)** **VERSION:** **RTC-P_OL (1C)** **RTC-P_OL (2C)** **Open loop control PO4, Output: precipitant flowrate**  In this version the ortho phosphate concentration is measured before the precipitant is added. Allowances are then made for chemical efficiency and bio-P uptake. Knowing the concentration of ortho phosphorus in the feed and relating that to the user defined set point ensures chemical efficiency is correctly acounted for. This understanding sets HACH feed forward control appart from simple static stoichiometric approaches common in the industry and is particularly important when low ortho phosphorus set points are required. Typical configuration - Dosing point: Flow channel toward FST/ PO4-P measurement: Effluent aeration	**RTC-P output** - Precipitant flow rate - Controller status signal **RTC-P input** - PO4-P concentration - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) **RTC-P control parameter** - Set point PO4-P open loop control - Min/max precipitant flow
LXZ515.53.A1210 (single Channel) **VERSION:** **RTC-P_CLCL** **Closed loop control PO4 considering P_tot / TSS in effluent, Output: precipitant flowrate**  This RTC-P variant automatically reacts to elevated phosphorus associated with suspended solids in the final effluent. Using either a total phosphorus or suspended solids measurement in the final effluent, a user defined trigger level forces a lower ortho phosphorus set point in the primary control system to compensate for phosphorus unaffected by chemical dosing (particulate P). The combination of interlinking control loops is of particular importance when considering low phosphorus limits, short term events such as pin point floc or solids loss spikes due to flow conditions represent significant P compliance risk with lower phosphorus limits.	**RTC-P output** - Precipitant flow rate - Controller status signal **RTC-P input** - PO4-P concentration after dosing point - Ptot in plant effluent - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) **RTC-P control parameter** - Set point PO4-P closed loop control - Set point P_TOT closed loop - Min/max precipitant flow

Versions	I/O and param. / channel
LXZ515.53.A1310 (single Channel) **LXZ515.53.A1411 (double Channel)** **VERSION: RTC-P_OLCL (1C) RTC-P _OLCL (2C)** **Combination open / closed loop control PO4, Output: precipitant flowrate**  This RTC-P variant combines primary open loop control with closed loop "fine trim", informing the precipitant flow rate for one dosing point. This philosophy is particularly useful for sites with oversized assets where immediate reaction to load peaks is especially important.	**RTC-P output** - Precipitant flow rate for one dosing point - Controller status signal **RTC-P input** - PO4-P concentration before dosing - PO4-P in after dosing - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) **RTC-P control parameter** - Set point PO4-P closed loop - Min/max precipitant flow
LXZ515.53.A1311 **VERSION: RTC-P_CLOL** **Combination open / closed loop control PO4, Output: precipitant flowrate**  This RTC-P variant enables two dose points to be optimized from one ortho phosphate measurement Firstly, closed loop algorithms using a specialized PID control loop allow stable ortho phosphate levels to be passed forward to the secondary dose point. This allows residual phosphorus to be always made available to the biological stage. This residual can then be safely reduced to very low levels using an open loop philosophy on the secondary dose point. Alternatively, if the load conditions overwhelm the primary dosing point, the secondary open loop control can compensate to ensure breakthrough of orthophosphate does not occur. The ability to choose the balance of phosphorus removal across to dosing points opens up further chemical efficiency. This approach is particularly suited to WwTW's with low total phosphorus consents, challenging chemistry or extreme ortho phosphate load conditions. Typical configuration: Precipitant dosing 1: Aeration / PO4-P measurement effluent aeration Precipitant dosing 2: Inflow final sedimentation (after PO4-P measurement)	**RTC-P output** - Precipitant flow rate for 2 dosing points - Controller status signal **RTC-P input** - PO4-P concentration near/after dosing point - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) **RTC-P control parameter** - Set point PO4-P closed loop control - Set point PO4-P open loop control - Min/max precipitant flow

Intermittend denitrification

N/DN-RTC application area

- All plants including SBR plants with intermittent denitrification

N/DN-RTC Description

The N/DN RTC provides the ideal balance of aerated / non-aerated phases for intermittently operated plants or for SBR plants. The time interval for nitrification and denitrification phases is based on real time measurements of NH4-N and NO3-N in the aeration tank. Understanding both NH4-N and NO3-N levels in the treatment basin ensures the correct level of DO for the nitrification stage and prevents nitrate exhaustion causing orthophosphate release during the denitrification state or untreated nitrate harming the total nitrogen compliance. Should the WwTW have a specific ammonium and total nitrogen limit, functionality is built in to allow priority to be given to a particular parameter, giving the plant maximum compliance protection and treatment flexibility.

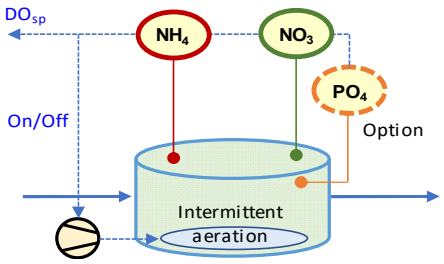
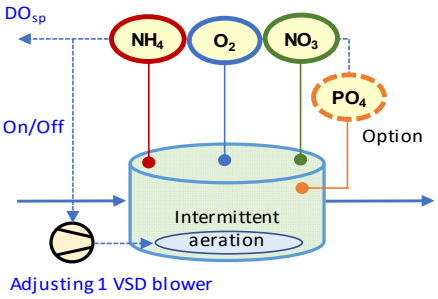
Optionally an additional DO controller compliments the RTC N/DN. This DO controller activates
- in the single DO version a single aeration device equipped with a VSD
- in the 6 stage VSD version up to six aeration devices, two of those optionally equipped with a variable frequency drive (VFD)

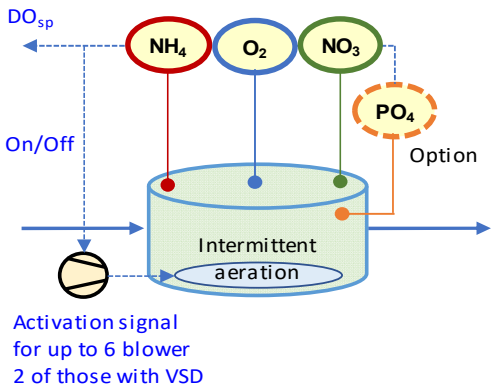
providing smooth adjustment of aeration intensity, high blower efficiency and protection against excessive switching of duty.

Robust fall back strategies are an integral part of Hach RTC control. If input signals for ammonium and nitrate are not available, alternate (user selectable) fall back strategies are automatically activated to protect compliance.

N/DN-RTC benefit

Effectively increases treatment capacity compared to fixed timeframe control or methods based on measuring reductive conditions.
- Much lower total N consents can be met with existing assets.
- Sludge settlement characteristics improved as high aeration rates are not used in the absence of NH4/COD load.
- Maximum performance on "nitrate harvesting" to drive low total nitrogen.
- Optimum enrgergy usage (typical savings of circa 20%), providing air only when required and maximising the available nitrate benefit
- Maximum alkalinity recovery to protect the nitrifcation rate and maximise available treatment without additional chemical treatment.
- Protects against off gassing of nitrogen in final tanks or SBR generating solids loss issues.

Versions	I/O and param. / channel
LXZ520.53.C0101 (single Channel) **LXZ520.53.C0111 (double channel)** **LXZ520.53.D0101 (single Channel SBR)** **LXZ520.53.D0111 (double Channel SBR)** **VERSION: RTC-N/DN (1C)** **RTC-N/DN (2C)** **RTC-N/DN SBR (1C)** **RTC-N/DN SBR (2C)** **Intermittent aeration control, Output: Aeration on/off** 	**RTC N/DN output** - Activation signal for aeration - DO set-point - Controller status signal **RTC N/DN input** - NH4-N and NO3-N - SBR Version: Activation signal (filling) - Option: Flow rate wwtp **RTC N/DN control parameter** - Target value NH4-N & NO3-N - Weighting NH4-N & NO3-N - Maximum NH4-N (stop deni) - Min/max DO concentration
LXZ520.53.C3101 (single Channel) **LXZ520.53.C3111 (double channel)** **LXZ520.53.D3101 (single Channel SBR)** **LXZ520.53.D3111 (double Channel SBR)** **VERSION: RTC-N/DN_DO (1C)** **RTC-N/DN_DO (2C)** **RTC-N/DN SBR_DO (1C)** **RTC-N/DN SBR_DO (2C)** **Intermittent aeration & O2 control, Output: Aeration on/off, 1 aeration stage, VSD** 	**RTC N/DN output** - Activation signal for aeration - DO set-point - Blower frequency [0 ...100%] - Controller status signal **RTC N/DN input** - NH4-N and NO3-N - SBR Version: Activation signal (filling) - DO concentration - Option: Flow rate wwtp, PO4-P **RTC N/DN control parameter** - Target value NH4-N & NO3-N - Weighting NH4-N & NO3-N - Maximum NH4-N (stop deni) - Min/max DO concentration - Parameter for DO PID control (closed-loop)

Versions	I/O and param. / channel
LXZ520.53.C2101 (single Channel) **LXZ520.53.C2111 (double channel)** **LXZ520.53.D2101 (single Channel SBR)** **LXZ520.53.D2111 (double Channel SBR)** **VERSION: RTC-N/DN_DO 2VSD (1C)** **RTC-N/DN_DO 2VSD (2C)** **RTC-N/DN SBR_DO 2VSD (1C)** **RTC-N/DN SBR_DO 2VSD (2C)** **Intermittent aeration & O2 control, Output: Aeration on/off, 6 aeration stages, 2 VSD**  	**RTC N/DN Output** - Activation signal for aeration - DO set-point per channel - Blower stage [1…6] - Blower frequency [0 …100%] - Controller status signal **RTC N/DN Input** - NH4-N and NO3-N - SBR Version: Activation signal (filling) - DO concentration for each lane - Option: Flow rate wwtp **Main control parameter** - Target value NH4-N & NO3-N - Weighting NH4-N & NO3-N - Maximum NH4-N (stop deni) - Min/max DO concentration - Parameter for DO PID control (closed-loop)

Simultaneous denitrification (RTC-SND)

RTC-SND application area

Typically carousel mixed (not plug flow) Activated sludge systems with aerated and non aerated zones within treatment basin. All plants with simultaneous nitrification/denitrification controlling aerated volume.

RTC-SND description:

Carousel flow ASP's often suffer from the problem of where to place the DO probe. The RTC-SND control system removes the problem entirely. Direct measurement for NH4-N and NO3-N in the treatment basin allows the control to safely step away from DO set points, instead relying on aeration intensity as a means of controlling aeration and anoxic volume within the tank. Measurement of NO3-N allows safe minimum aeration to drive NO3-N consumption as an oxygen source without the risk of resolubilization of ortho phosphate. Measurement of ammonium allows a clear understanding of aeration intensity requirement and ensures the discharge levels meets the user defined set points. More than this the user can decide which parameter takes priority for treatment, so if the site has a particularly challenging ammonium permit limit for example, higher priority can be given to this.

Optionally 6 digital and 2 analog signals are provided to provide specific control to the aerators / aeration zones in the aeration tank, based on the calculated RTC-SND calculated output.

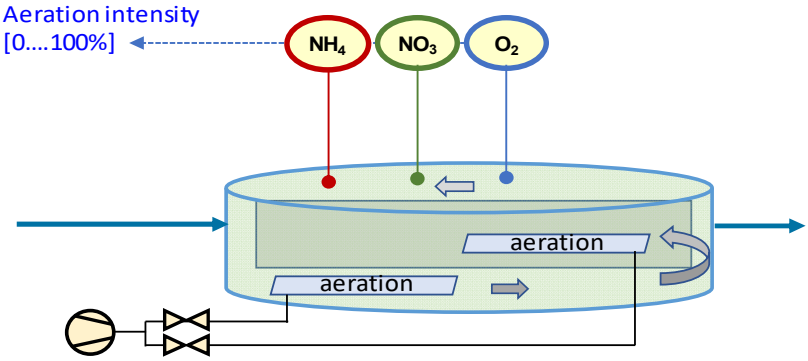
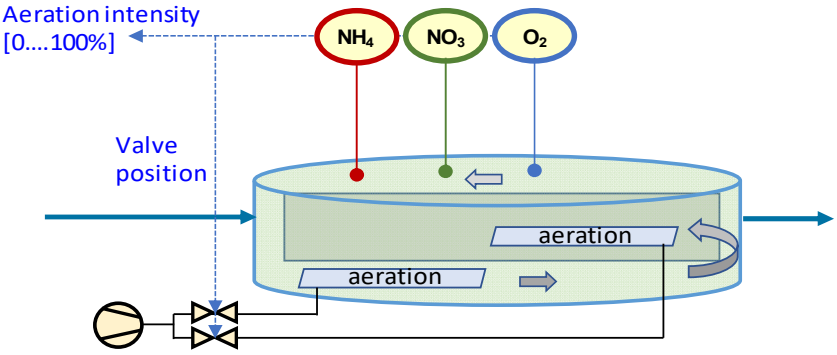
Additionally to this the control can be linked with RTC-SRT. Sludge age can be particularly difficult to control well on these plants as it depends on aerated volume which can be highly variable (compared to plug flow ASP's). RTC-SRT for this type of plant automatically estimates aerated volume to provide a high quality sludge wastage rate using measured DO within the tank.

Further value can be obtained from this measurement to ensure a minimum DO threshold is maintained. If this falls below or exceeds adjustable limits, the aeration intensity signal is increased/decreased and aerators are activated/deactivated ensuring the DO concentration is between the limits.

If input signals for NH4-N, NO3-N or DO are not available the system automatically switches to fallback strategies.

RTC-SND benefit

- Improves settlement characteristics of MLSS due to reliable maintenance of anoxic zones providing unfavorable conditions for filamentous bacteria.
- Opens the opportunity to achieve much lower total nitrogen levels than conventional control can deliver.
- Significant savings on aeration energy due applying only the air that is required and unlocking the nitrate value present from effective denitrification (typical 10 %.... 20% compared to fixed DO aeration methods)
- Improved acid capacity/alkalinity recovery due to enhanced denitrification
- Minimized denitrification/off gassing in final clarification tank
- Constant validated proof control maintaining user specified set points

Versions	I/O and param. / channel
LXZ522.53.A0101 (single Channel) **LXZ522.53.A0111 (double Channel)** **VERSION: RTC-SND (1C) RTC-SND (2C)** **NH4 & NO3 control, Output: Aerated volume (0…100%)** 	**RTC-SND output** - Aeration intensity [0…100%] - Controller status signal **RTC-SND input** - NH4-N and NO3-N concentration - DO concentration - Option: Flow rate wwtp **RTC-SND control parameter** - Target value NH4-N & NO3-N - Weighting factor NH4-N & NO3-N - Min/max DO concentration
LXZ522.53.B0101 (single Channel) **LXZ522.53.B0111 (double Channel)** **VERSION: RTC-SND (1C6Z) RTC-SND (2C6Z)** **NH4 & NO3 control, Output: Aerated volume (0…100%), Output: 6 stages, 2 VSD** 	**RTC-SND output** - Aeration intensity [0…100%] - Blower / valve stage [1…6] - Blower frequency [0 …100%] - Controller status signal **RTC-SND intput** - NH4-N and NO3-N concentration - DO concentration - Option: Flow rate wwtp **RTC-SND control parameter** - Target value NH4-N & NO3-N - Weighting factor NH4-N & NO3-N - Min/max DO concentration

Nitrification, plug flow

RTC-N application area
- Plants with plug flow nitrification basins
- Step feed plants (cascade denitrfication)

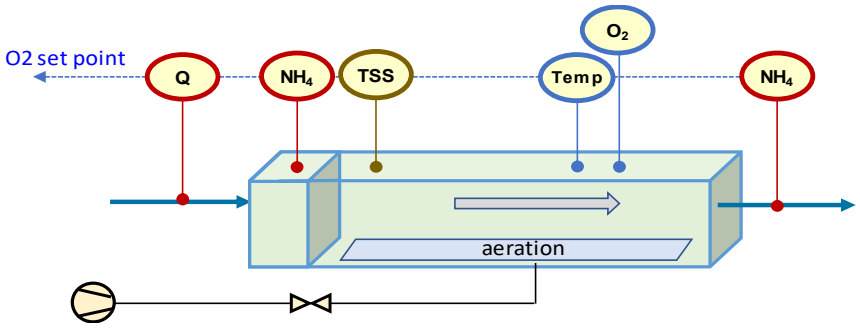
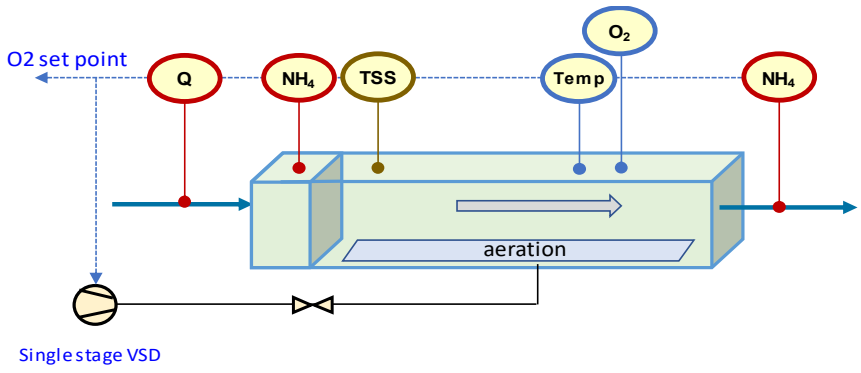
RTC-N description:
The RTC-N control software calculates the required DO concentration in the aeration basins to achieve a user defined NH4-N set point concentration in the aeration effluent. To do this (amongst other factors), it accounts for temperature, hydraulic retention time, amount of nitrifying bacteria in the MLSS and actual discharged ammonium concentration in the aeration effluent. More than this it provides ideal dissolved oxygen levels for each of the ASP aerated zones as the ammonium load travels along the lanes. Concentrating the air to the zones of greatest need both saves energy and maximizes the value of the available process air. This has the potential to unlock performance not typically observed on ASP's and provide enhanced compliance security. By combining an accurate open loop dissolved oxygen set point with closed loop fine trim, a much more dynamic DO set point can safely be used to save energy and provide greater treatment capacity every day.

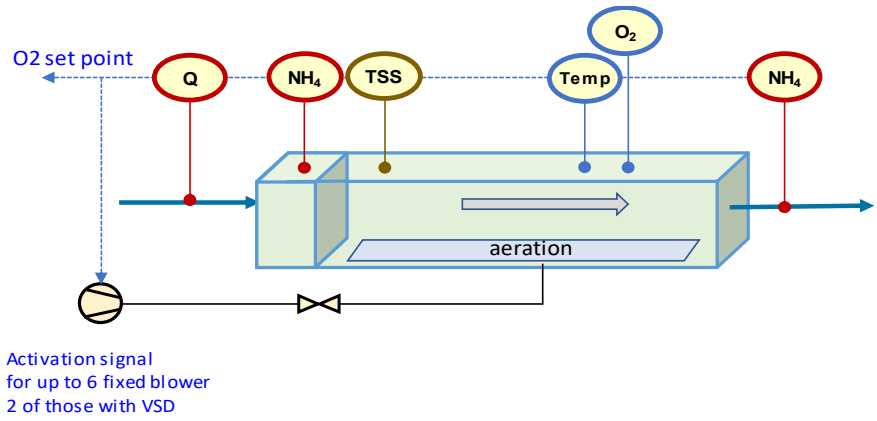
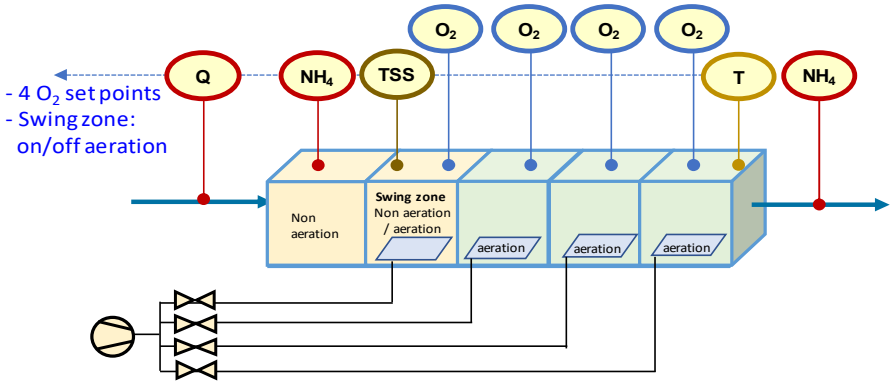
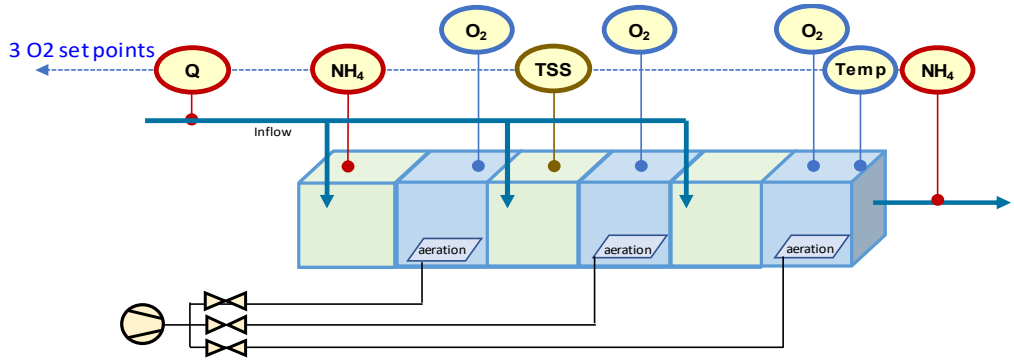
The RTC-N can be used in conjunction with IRC, SZ, SRT

Optionally an additional DO controller compliments the RTC-N. This DO controller activates
- in the single DO version a single aeration device equipped with a VSD
- in the 6 stage VSD version up to six aeration devices, two of those optionally equipped with a variable frequency drive (VFD) providing smooth adjustment of aeration intensity, high blower efficiency and protection against excessive switching of duty.

If input signals for NH4-N, NO3-N or TSS are not available the system automatically switches to fallback strategies.

RTC-N benefits:
- Ensure compliance on NH4-N due to load based O2 set point adjustment
- Improved denitrification and compliance on N_TOT due to load based aeration (less O2 recirculated)
- Energy savings: 10 %.... 20% due to lower DO concentration in aeration (compared to fixed O2 control on 1,5mg/l ... 2,5mg/l)
- DO recovery due to improved denitrification.
- Focused air supply to areas of highest requirement (RTC-N4Z)
- Improved denitrification capacity due to adjusted volume for nitrificaion (RTC-N4Z)
- Improved sludge settlement qualities through DO levels matching organic load and well maintained anoxic zones

Versions	I/O and param. / channel
LXZ519.53.B0101 (single Channel) **LXZ519.53.B0111 (double Channel)** **VERSION: RTC-N-RTC (1C) RTC-N-RTC (2C)** **Combination open / closed loop NH4 control, Output: O2 setpoint** 	**RTC-N output** - DO set-point - Controller status signal **RTC-N input** - NH4-N inlet and effluent - TSS concentration aeration - DO concentration - Flow rates: inflow, internal recirculation; surplus activated sludge **RTC-N control parameter** - Parameter for NH4-N PID control - Min/max DO, max. rate of change
LXZ519.53.B3101 (single Channel) **LXZ519.53.B3111 (double Channel)** **VERSION: RTC-N_DO (1C) RTC-N_DO (2C)** **Combination open / closed loop NH4 control, Output: Aeration on/off, 1 aeration stage, VSD** 	**RTC-N output** - DO set-point - Blower frequency [0 ...100%] - Controller status signal **RTC-N input** - NH4-N inlet and affluent - TSS concentration aeration - DO concentration - Flow rates: inflow, internal recirculation, surplus activated sludge **RTC-N control parameter** - NH4-N set point effluent aeration - Parameter for NH4-N PID control - Min/max DO, max. rate of change

Versions	I/O and param. / channel
LXZ519.53.B2101 (singel Channel) LXZ519.53.B2111 (double Channel) **VERSION: RTC-N_DO 2VFD (1C) RTC-N_DO 2VFD (2C)** **Combination open / closed loop NH4 control, with O2 control, Output: O2 setpoint, 6 aeration stages, 2 VSD)** 	**RTC-N output** - DO set-point - Blower stage [1…6] - Blower frequency [0 …100%] - Controller status signal **RTC-N input** - NH4-N inlet and effluent - TSS concentration aeration - DO concentration in each zone - Flow rates: inflow, internal recirculation; surplus activated sludge **RTC-N control parameter** - NH4-N set point effluent aeration - Parameter for NH4-N PID control - Min/max DO, max. rate of change
LXZ519.53.D0101 (single Channel) LXZ519.53.D0111 (double Channel) **VERSION: RTC-N_4Z (1C) RTC-N_4Z (2C)** **Combination open / closed loop NH4 control, Output: O2 setpoints for 4 zones, control of one swing zone**  The RTC N_4Z considers for up to 4 aerated zones the hydraulic retention time of the NH4-N load in each aerated zone for set point calculation. This feature allows to provide the air exactly to the zones with the highest air demand. Based on the inflow load and the current nitrification capacity the RTC N_4Z calculates if a swing zone has to be aerated and used for nitrification to meet the NH4-N effluent target or if it can be operated as an anoxic zone for enhanced denitrification in order to minimize the N_TOT effluent concentration and cost for aeration.	**RTC-N output** - DO set-point for up to 4 zones (one zone facultative aeration) - Controller status signal **RTC-N input** - NH4-N inlet and affluent - TSS concentration aeration - DO concentration in each zone - Flow rates: inflow, internal recirculation, surplus activated sludge **RTC-N control parameter** - NH4-N set point effluent aeration - Parameter for NH4-N PID control - Min/max DO, max. rate of change for each zone
LXZ519.53.D1101 (single Channel) LXZ519.53.D1111 (double Channel) **VERSION: RTC-N_STEP (1C) RTC-N_STEP (2C)** **Combining open / closed loop NH4 control on Step Feed reactors, Output: O2 set points for 3 zones**  The RTC-N_STEP is designed for step feed resp. cascade denitrification plants. Based on the influent NH4-N concentration and the settled sewage inflow rate to each denitrification zone, for each nitrification zone the RTC-N_STEP calculates the DO concentration required to reach the NH4-N target concentration is calculated.	**RTC-N output** - DO set-point for up to 3 zones - Controller status signal **RTC-N input** - NH4-N concentration inlet and effluent - TSS concentration aeration - DO concentration in each zone - Flow rates: inflow, internal recirculation; surplus activated sludge **RTC-N control parameter** - NH4-N set point effluent aeration - Parameter for NH4-N PID control - Min/max DO, max rate of change for each zone

DO control (RTC-DO)

RTC-DO application area

Biological Waster Water treatment plants. Independent DO control in multiple zones of an aeration tank. Each aerated zone is equipped with an actor (e.g. dedicated blower, surface aerator, air control valve with fixed pressure in manifold) and a dedicated DO sensor to control the DO concentration to a desired DO set point.

The RTC-DO can be combined with a RTC-N_4Z zone controller which provides up to 4 DO setpoints based on the current NH4-N loading of a lane.

RTC-DO description

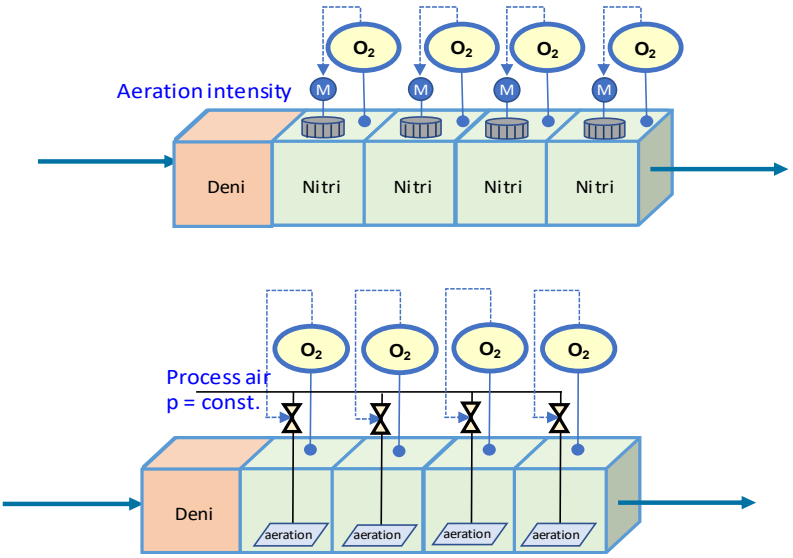
The RTC DO independently controls in up to 16 zones the DO concentration to a desired DO set point. Adjusted variable is the aeration intensity to the corresponding zone. If diffused aeration is applied, air flow measurements and valve positions can be monitored if available.

RTC-DO benefits

- minimizes aeration energy / drives cost savings
- Increase process treatmeant capacity in an ASP

Versions

LXZ530.53.C0101 4 actors LXZ530.53.D0101 8 actors
LXZ530.53.C0111 12 actors LXZ530.53.D0111 16 actors



I/O and param. / channel

DO-RTC output

- up to 16 valve setpoints for zone valve opening degrees
- Option: Up to 16 set points for zone air flow
- Controller status signal

DO-RTC input

- up to 16 zone DO concentration
- up to 16 zone aeration intensity signals
- Optionally: DO setpoints from N-RTC

DO-RTC control parameter

- PID-control parameter

Most open valve DO control (RTC-MOV)

RTC-MOV application area

All waste water treatment plants with multiple aeration zones. Process air is provided from a manifold. Each aerated zone is equipped with an automatic air valve and a DO sensor to control the DO concentration to a desired DO set point.

The MOV controller can be combined with a N-RTC 4 zone controller which provides up to 4 DO setpoints based on the current NH4-N loading of a lane.

RTC-MOV description

The RTC-MOV (Most open valve) independently controls in up to 16 zones the DO concentration to a desired DO set point. Adjusted variable is the opening degree of the air valve assigned to the corresponding zone. If the air is provided through a common manifold, the RTC-MOV can provide a set point for the manifold air pressure ensuring that the valve assigned to the volume with highest air demand has got the highest opening degree (Most open valve control). Optionally a set point for the overall air flow can be provided. The pressure on the manifold has to be controlled by the PLC.

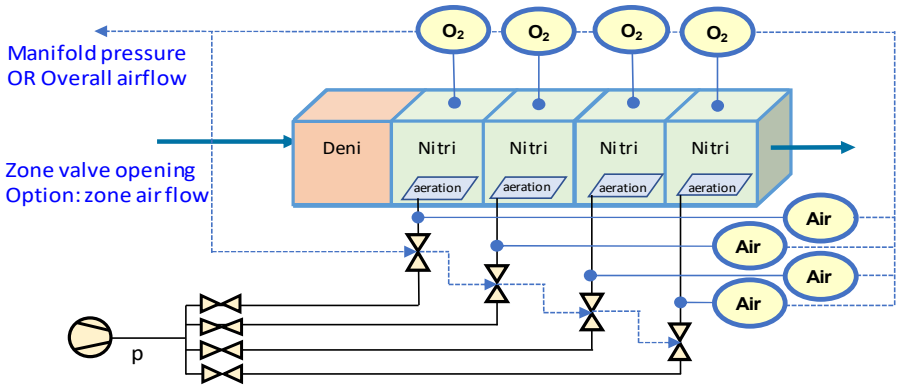
In order to react fast to changes in the manifold pressure (caused by load changes or changes in the opening degree of the other air valves) the MOV-RTC can be designed as **a** cascade controller

RTC-MOV benefits

- Efficiently drives process air to zones of greatest need, maximising treatment potential of ASP
- minimize aeration energy / drive cost savings
- Increase process treatmeant capacity in an ASP

Versions

LXZ530.53.A0101 4 valves **LXZ530.53.B0101 8 valves**
LXZ530.53.A0111 12 valves **LXZ530.53.B0111 16 valves**



I/O and param. / channel

MOV-RTC output

- up to 16 valve setpoints for zone valve opening degrees
- Option: Up to 16 set points for zone air flow
- setpoint for manifold pressure
- Option: Overall airflow set point
- Controller status signal

MOV-RTC input

- up to 16 zone DO concentration
- up to 16 zone air flow signals
- Optionally: DO setpoints from N-RTC

MOV-RTC control parameter

- PID-control parameter

Denitrification (RTC-DN)

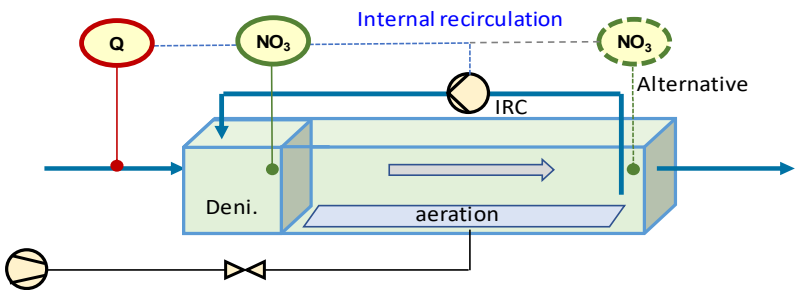
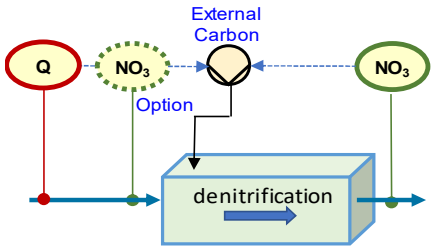
RTC-DN application area
- Pre-denitrification plants with internal recirculation
- Plants dosing external carbon to ensure compliance on N_TOT

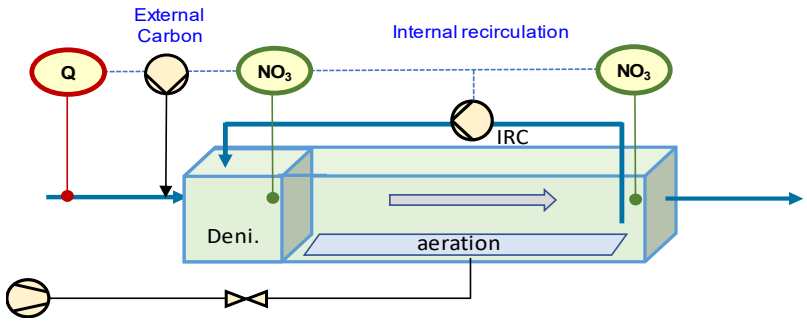
RTC-DN description
The controller optimises both internal recirculation and/or carbon dose flow rates to maximise the available NO3-N removal of an ASP. Both approaches are based on measured NO3-N concentration typically at the discharge of the denitrification stage. Further treatment enhancements are provided by protection against oxygen carryover from the internal recirculation.

For plug flow ASP's a particularly helpful addition is the swing zone controller (in conjunction with N-RTC). This safely allows the ASP to extend the anoxic zone by "sacrificing" aeration volume (zone 1 of a lane) when load conditions allow. Especially useful in low flow / load conditions (every night) where minimum air flow requirments often cause oxygen carry over to inhibit denitrification.

If input signals for NO3-N, DO or flow rate are not available, the system automatically switches to considered fallback strategies.

RTC-DN benefits
- Maximized leverage of denitrification capacity and improved compliance on N_TOT due to minimized O2 transfer from nitrification to denitrification
- Reduced O2 demand (less aeration energy) due to O2 recovery from denitrification
- Reduced risk breaching COD effluent limit due to overdosing of external carbon
- Minimized cost for product and aeration (if overdosed)
- Improved acid capacity (alkalinity) recovery

Versions	I/O and param. / channel
LXZ521.53.A0101 (single Channel) **LXZ521.53.A0111 (double Channel)** **VERSION: RTC-DN_IRC (1C) RTC-DN_IRC(2C)** **Closed loop contol NO3 effluent anoxic or aeration. Output: Internal recirculation** 	**RTC-DN_IRC output** - Internal recirculation flow [L/s] - Controller status signal **RTC-DN_IRC input** - NO3-N concentration effluent denitrification or effluent aeration - Option: DO concentration effluent aeration - Flow rate **RTC-DN_IRC control parameter** - Target value for NO3-N effluent denitrification zone - Option: Target value for NO3-N effluent nitrification zone - Min/max IRC flow rate
LXZ521.53.D0101 (single Channel) **LXZ521.53.D0111 (double Channel)** **VERSION: RTC-DN_C (1C) RTC-DN_C (2C)** **Combination open / closed loop NO3-N control. Output: External carbon flow** 	**RTC-DN_C output** - Set point ext. C dosing rate [L/h] - Controller status signal **RTC-DN_C intput** - NO3-N concentration effluent denitrification - Option: NO3-N inflow denitrification - Flow rate (pot. incl. IRC) **RTC-DN_C control parameter** - Set point NO3-N effluent denitrification - PID control parameter - Min/max extenral Carbon flow rate

Versions	I/O and param. / channel
LXZ521.53.B0101 (single Channel) **LXZ521.53.B0111 (double Channel)** **VERSION:** **RTC-DN_IRC_C (1C)** **RTC-DN_IRC_C (2C)** **Closed loop contol NO3 effluent denitrification or effluent aeration. Output: Internal recirculation and external carbon**  	**RTC-DN_IRC_C output** - Set point internal recirculation flow rate [L/s] - Set point external C dosing rate [L/h] - Controller status signal **RTC-DN_IRC_C intput** - NO3-N concentration effluent denitrification - NO3-N concentration effluent aeration - Option: DO concentration NO3-N concentration effluent aeration **RTC-DN_IRC_C control parameter** - Target value NO3-N effluent denitrification - Min/max IRC flow rate - Min/max external C flow rate - PID control parameter

Nutrient dosing

RTC-C/N/P application area

- All biological treated waste with an imbalance of Nitrogen and/or Phosphorus with respect to COD/BOD.
- The RTC-C/N/P can be combined with the SRT-RTC to avoid the growth of nitrifiers further enhancing COD removal

RTC-C/N/P description

The RTC C/N/P maintains ideal nutrient levels within wastewater to ensure COD/BOD treatment is not biologically limited. This is achieved using feed forward control with online TOC measurement allied to feedback control using ammonium and ortho phosphate measurement. Further flexibility allows user defined nutrient ratios to be input for specific process waste streams. Additionally, there is an option to supplement the feed forward algorithm with N and /or P measurements to automatically account for variations in background nutrient levels and TOC values.

In order to avoid unwanted nitrification, nitrate concentration in the effluent can be measured to inform aeration conditions.

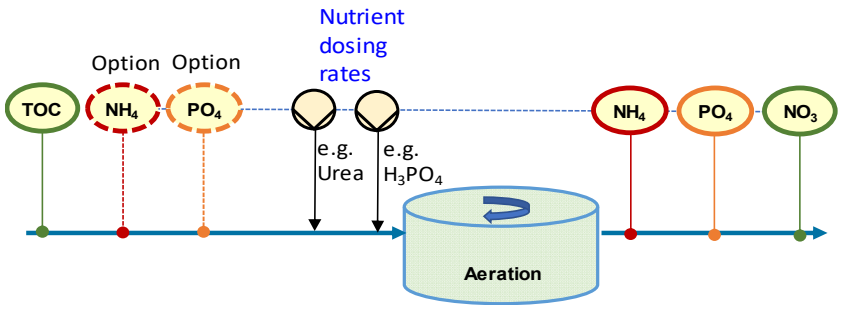
If input signals for TOC, NH4-N, PO4-P, NO3-N or flow rate are not available, the system automatically switches to considered fallback strategies.

RTC-C/N/P benefits

- Ensure compliance on COD/BOD, NH4 / total N and PO4
- Improved sludge sedimentation characteristics
- Avoid nitrification (in conjunction with RTC-SRT)
- Minimized cost on nutrients added.
-Ineffective aeration avoided

Versions

LXZ514.53.B0101 (single Channel) **LXZ514.53.B0111 (double Channel)**
VERSION: RTC-C/N/P (1C) **RTC-C/N/P (2C)**
Organic load based nutrient dosing combined with effluent nutrient control. Output: External Nitrogen and Phosphorous dosing rate



I/O and param. / channel

RTC-C/N/P output

- Set point dosing rate urea [L/h]
- Set point dosing rate phosphoric acid [L/h]
- Specific nutrient dosing rates (N/TOC and P/TOC)
- Controller status signal

RTC-C/N/P input

- TOC concentration
- Option: Inflow: NH4-N and PO4-P
- Effluent: NH4-N, NO3-N-, PO4-P
- Inflow
- Flow rate Urea
- Flow rate Phosphoric acid

RTC-C/N/P control parameter:

- Specific urea dosing rates N/TOC
- Specific phosphoric acid dosing rates P/TOC
- Set point PO4-P, NH4-N and NO3-N effluent aeration
- Min / Max dosing rate
- Min / Max specific dosing rate
- PID Control parameter

Sludge retention time (RTC SRT)

RTC-SRT application area

- All biological stages requiring wastage of biology (Activated sludge systems)

RTC-SRT Description

The SRT controller automatically maintains the correct amount and type of biology in the treatment basin. Biological growth and decay rates are determined using measured sewage temperature (typically from DO probe). The aerated treatment volume is taken into account (particularly important with intermittant or carousel ASP's), then the mass of biology to be wasted can accurately be determined. Measurement of solids within the wasteactivated sludge (typically RAS) allows conversion to a waste volume that can then be acted on. An additional solids measurement in the final effluent can be incorporated into the control to account for additional solids lost from the treatment system.

This control can be used to provide ideal conditions for ammonium removal (avoiding high MLSS in summer placing uneccesary pressure on aeration systems, and too low MLSS in winter risking ammonium compliance). Alternatively a sludge age can be manually entered (e.g 3.5 days) to inhibit nitrification and direct process air more specifically for COD/BOD treatment - esspecially useful for sites without ammonium limits.

Additionally to this the user can specify minimum and maximum MLSS levels in the aeration basin. So if a plant temporarily suffers poor settlement problems, the mass flux of the final tanks can be calculated and the controller will not allow the MLSS to raise above that point, protecting against sludge blanket loss.

Additional safety factors are built in to protect the sludge volume wasted does not exceed the sludge processing capacity of a facility.

If input signals for TSS or DO are not available, the system automatically switches to considered fallback strategies.

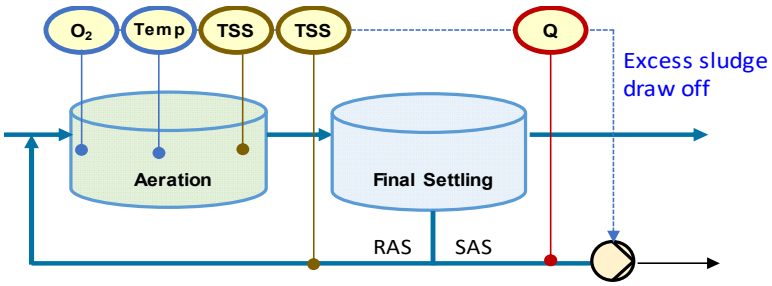
RTC-SRT benefits

- Ensures compliance on ammonium or COD/BOD
- Prevents excessive air demand on blower system in warmer weather
- Saves on aeration energy (circa 5-10%)
- Improves sludge age calculation accuracy by considering large data sets (reduces human error in this area)

Versions

LXZ518.53.A0101 (single Channel) **LXZ518.53.A0111 (double Channel)**

VERSION: **RTC-SRT (1C)** **RTC-SRT (2C)**



I/O and param. / channel

RTC-SRT output

- Flow rate excess sludge [L/s]
- Controller status signal

RTC-SRT input

- TSS concentration activated sludge [g/L]
- TSS concentration surplus activated sludge [g/L]
- DO concentration in up to 4 zones [mg/L]
- Temperature [°C]
- Excess sludge flow rate [L/s]

RTC-SRT control parameter

- Table for SRT target value
- Safety factor for SRT calculation
- Min/Max flow rate for SAS
- Min/max TSS concentration in activated sludge tank

Chlor-Dechlor (CL2-RTC)

RTC-CL2 application area

- Waste Water Treatmant plants with Disinfection processes based on Chlorine

RTC-CL2 Description

The Chlorination Controller controls the Total Residual Chlorine (TRC) or Total Free Chlorine concentration measured after the disinfection contact chamber. The controller includes an open loop controller which calculates a Chlorine dosage required to meet an adjustable specific chlorine dosing rate [mg Cl2/l] considering the actual waste water flow rate at the dosing point. This flow proportional control can be combined with a closed loop control of the TRC or the TFC concentration measured after the contact chamber. Optionally the contact time Contact Time (CT) measured by the TRC effluent disinfection actual flow rate and the volume of the contact chamber can be controlled to a desired set point. Actuated variable is the change in the specific chlorine dosing rate. To compensate for pH and temperature changes the Setpoints for TRC, TFC or CT can automatically be adjusted to the measured pH and temperature in the inflow according to an input table with 4 supporting points.

An additional De-Chlorination Controller controls the level of TRC in the plant effluent. The De-chlorination controller is designed as an open loop controller. Based on TRC concentration measured after disinfection, the chemical properties of the reducing agent and the flow rate it calculates the amount of reducing agent required to meet the desired TRC concentration in the final plant effluent. If a quantitative TRC measurement is available, this open loop calculation can be combined with a closed loop control of the TRC concentration measured in plant effluent.

Optionally an ORP measurement can be added to identify a potential TRC breakthrough in plant effluent. An alarm is indicated if change in the ORP signal is above an adjustable limit.

Disinfection characteristics like Contact time, Chlorine demand, Decay and simultaneous demand and Log inactivation are also estimated and indicated.

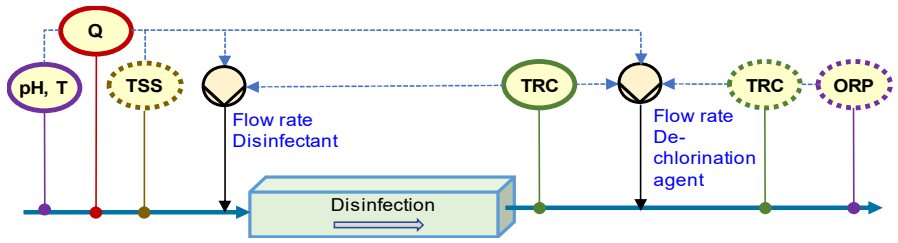
RTC-CL2 benefits

- Ensures compliance solids TRC
- Savings on chemicals
- Transparency on disinfection process

Versions

LXZ531.53.A1010 (single Channel) **LXZ531.53.A1011 (double Channel)**

VERSION: **RTC-CL2 (1C)** **RTC-CL2 (2C)**



I/O and param. / channel

RTC-CL2 output

- Flow rate Chlorine dosing
- Flow rate de-chlorination agent
- Controller status signal

RTC-CL2 input

- pH, T influent contact chamber
- Total Residual Chlorine (TRC), alternative Total Free Chlorine (TFC)
- Option: ORP

RTC-CL2 control parameter

- Specific dosing rate (mg CL2/L)
- PID Parameter
- Min/Max Chlorine dosing rate

Sludge Thickening

RTC-ST application area

- Plants with mechanical sludge thickening devices (belt / drum thickeners etc.)
- Plant with varying TSS concentration in thickener feed flow
- Plants applying fixed polymer dosing rate / periodical adjustment based on visual judgement or lab results / flow proportional dosing
- Plants with low solids capture rate, unstable TSS concentration in filtrate and thickened sludge

RTC-ST description

The RTC-ST (sludge thickening) controller improves and stabilises thickened sludge concentration or filtrate quality in mechanical sludge thickening. Based on the solids load in the feed flow, either the polymer dosing rate or the feed flow rate is adjusted to a specific polymer dosingr rate [g/kg]. This feed forward control can be combined with a feed back control of the TSS in the thickened sludge or in the filtrate to either increase or decrease the specific polymer dosing rate (within a user defined window).

Fixed polymer dosing rate vaiable feed sludge flow rate is particularly helpful strategy if an asset experiences solids feed overload.

RTC-ST benefits

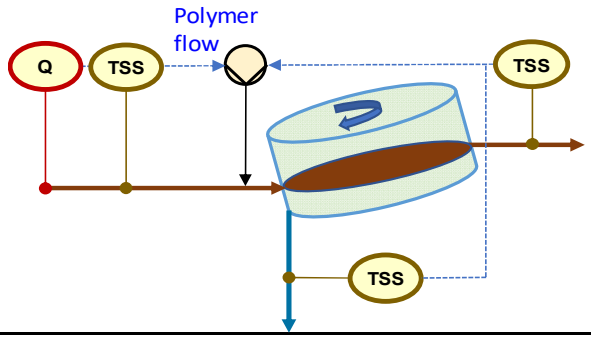
- Increased gas yield on anaerobic digestion due to high TSS in thickened sludge
- No polymer overdosing. Reduced maintenance work on sludge thickening maschines (no belt blending).
- Reduced amount of polymer dosed
- Improved solids capture preventing recycling of solids to head of works

Versions

LXZ517.53.A0101 (singel Channel) **LXZ517.53.A0111 (double Channel)**

VERSION: **RTC-ST (1C)** **RTC-ST (2C)**

Open and closed loop contr. of TSS in thickened sludge and/or filtrate. Output: Polymer flow and/or feed flow



I/O and param. / channel

RTC-ST output

- Polymer dosing flow rate or feed flow rate
- Controller status signal

RTC-ST input

- TSS concentration in feed flow
- TSS concentration in thickened sludge / filtrate
- Feed flow dewatering device
- Flow rate polymer dosing

RTC-ST control parameter

- Specific dosing rate (kg polymer / t TSS)
- PID Parameter for thickened sludge or filtrate TSS control

Sludge dewatering

RTC-SD application area

- Plants with sludge dewatering devices (centrifuges)
- Plants with changing TSS concentration in feed flow to the centrifuges
- Plants applying fixed polymer dosing rates based on visual judgement / lab results / flow paced

RTC-SD Description

The SD-RTC (sludge dewatering) controller adjusts polymer dosing rate or feed flow rate in mechanical sludge dewatering. Based on the current solids feed load (TSS concentration and flow rate), either the polymer dosing rate or the sludge feed flow rate is controlled ensuring an adjustable specific polymer dosingr rate [gg/kg]. This feed forward control can be combined with a feed back control of the TSS in the centrate or dewatered sludge.

If input signals inflow or TSS concentration are not available the system automatically switches to fallback strategies.

RTC-SD benefits

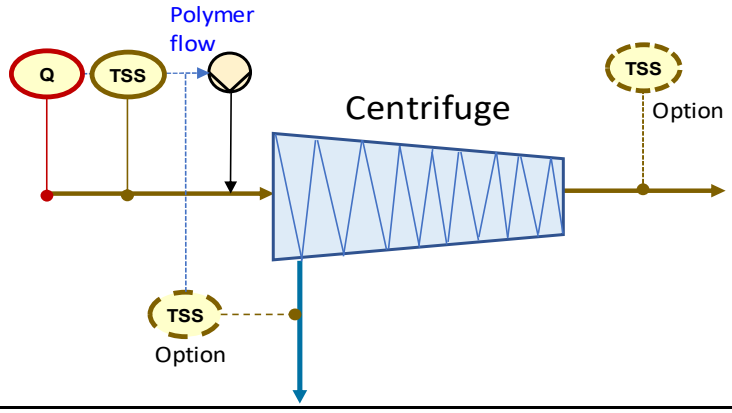
- Savings on polymer (typical 10 - 15% compared to fixed dosing rate)
- More consistent dewatered product
- Increased TSS concentration in dewatered sludge and subsequently decreased cost for sludge disposal
- Decreased TSS concentration in centrate and reduce issues on process water returns
- Reduce issues of foaming due to polymer overdose

Versions

LXZ517.53.B0101 (single Channel) **LXZ517.53.B0111 (double Channel)**

VERSION: **RTC-SD (1C)** **RTC-SD (2C)**

Control of TSS in dewatered sludge or centrate: Output: Polymer flow or feedflow



I/O and param. / channel

SD-RTC Output signals

- Polymer dosing flow rate or feed flow rate
- Controller status signal

SD-RTC Input signals

- TSS concentration in feed flow
- TSS concentration in dewatered sludge / centrate
- Feed flow dewatering device
- Flow rate polymer dosing

Main control parameter

- Specific doding rate (kg polymer / t TSS)
- PID Parameter for dweatered sludge or centrate TSS control

Dissolved air flotation (RTC-DAF)

RTC-DAF application area

- Dissolved Air Flotation processes (DAF) in water treatment
- Plants with changing TSS (TOC) concentration in DAF feed
- Processes with unusable TSS in floated sludge
- Processes with poor solids capture (high solids in clear water)

RTC-DAF Description

This controller maximizes the solids removal and clear water quality through real time measurements. The DAF-RTC adjusts coagulant and flocculant dosing rates in Dissolved Air Flotation processes using a feed forward and 2 interlinking feedback control loops. Based on the current solids feed load (either TSS or TOC), the coagulant and flocculant dosing rates are added proportionally. To support coagulation the pH value in the inflow can be automatically buffered to a user defined point. In case the pH-value falls below or exceeds an adjustable pH limiting value, dosing of coagulant and flocculant are stopped.

The feedback trim then calculates the desired specific dosing rates for coagulant and flocculant are tuned based on the TSS concentration measured in the floated sludge and on the TSS (TOC) concentration measured in the clear water effluent respectively.

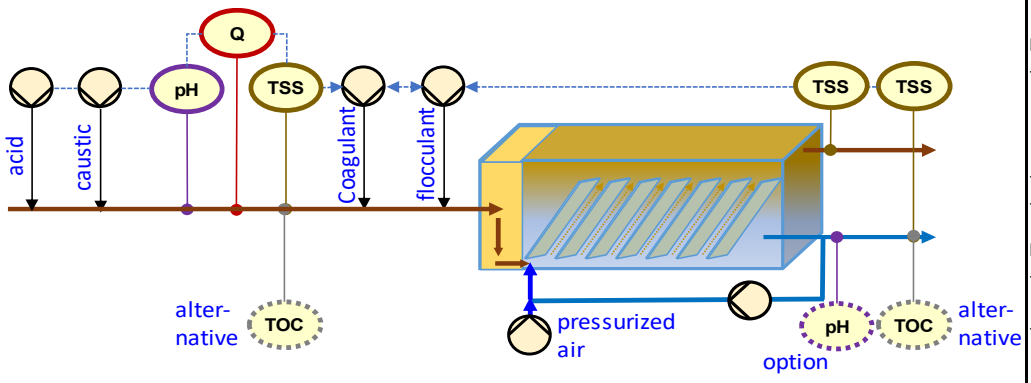
If input signals inflow or TSS (TOC) concentration are not available the system automatically switches to fallback strategies.

RTC-DAF benefits

- achieve savings on coagulant, flocculant and caustic/acid flow rates
- increase TSS concentration in flotaed sludge and cost for further sludge treatment
- improve solids capture respectively decrease TSS concentration in clear water effluent

Versions

LXZ517.53.B0101 (single Channel) **LXZ517.53.B0111 (double Channel)**
VERSION: **RTC-DAF (1C)** **RTC-DAF (2C)**
Control of TSS in flotated sludge and TSS in clear water. Output: Dosing of Coagulant and polymer, dosing of acid and or caustic



I/O and param. / channel

RTC DAF output

- Coag. / floccul. dosing rate
- caustic / acid flow rate
- feed flow rate
- Controller status signal

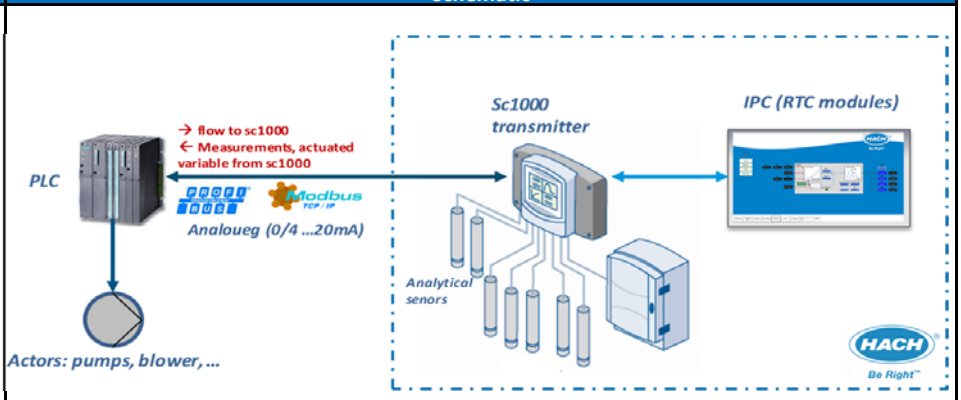
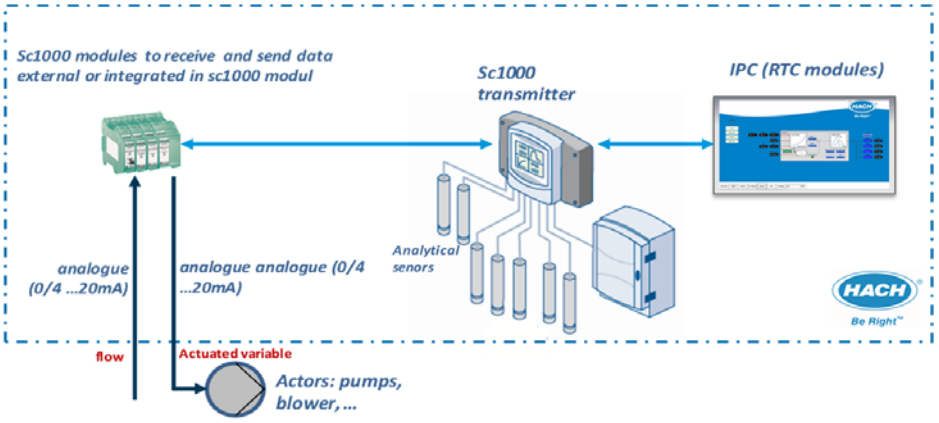
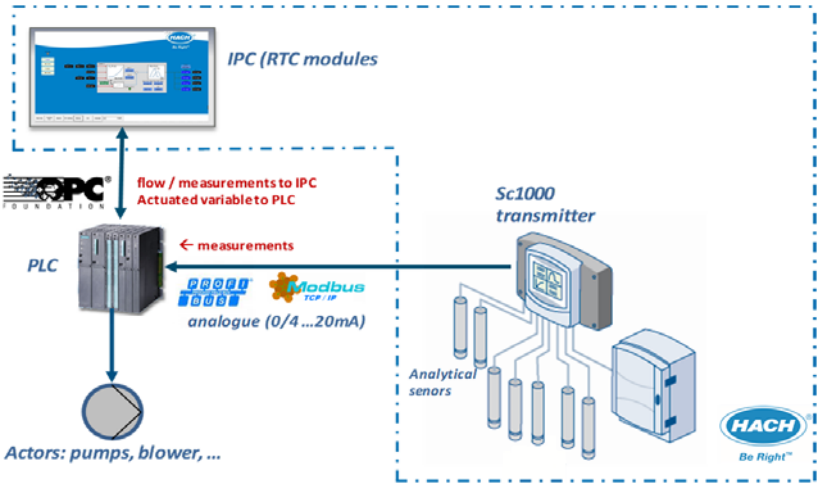
RTC DAF input

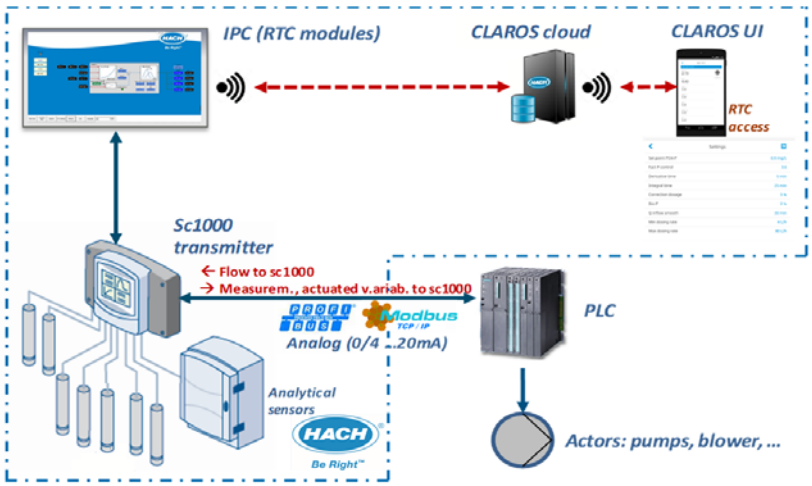
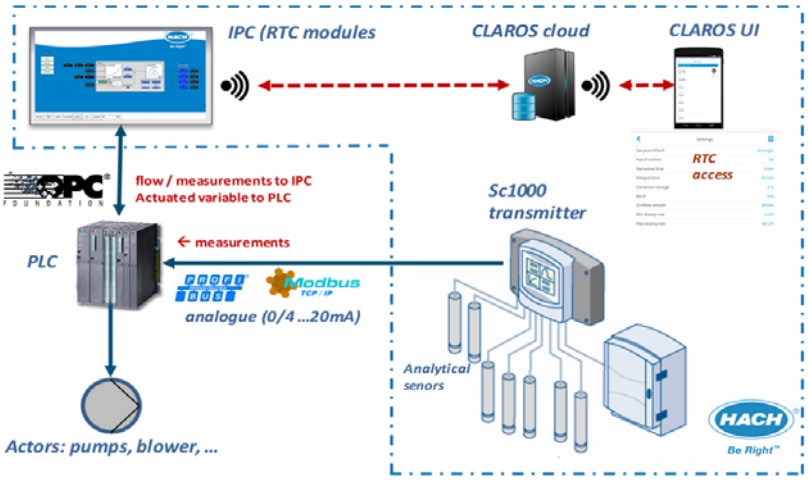
- TSS concentration in
  - feed flow
  - flotated sludge
  - clear waer effluent
- Feed flow rate
- Flow rate polymer / coagulant

RTC DAF control parameter

- Specific doding rates kg polymer / t TSS)
- PID Parameter for flotated sludge resp. clear water TSS (TOC) control
- PID parameter for pH control

General	Hardware
Hardware (Touch Pannel): Industrial multi-touch built-in Panel PC designed for installation in the front door of a control cabinet. The IPC has got aluminum housing with glass front and one slot for one MicroSD Flash Card which is accessible from outside. **RTC Integration** The IPC is connected to the HACH LANGE measurement transmitter (sc1000) via RTC communication cards, which are installed in the sc1000 and enable data transmission between RTC and sc1000.	**LXV515.99.0002B 11,6" touch wide screen (CP2711, Beckhoff)** **LXV515.99.0003B 15,6" touch wide screen (CP2716, Beckhoff)** **LXV515.99.0004B 18,5" touch wide screen (CP2718, Beckhoff)** **see https://www.beckhoff.com/ for detailed specification**  **LXV515.99.0003C 15" touch wide screen (SIEMENS IPC477E)** **LXV515.99.0004C 19" touch wide screen (SIEMENS IPC477E)** **see https://www.siemens.com/ for detailed specification** 
Hardware (Din Rail): Industrial DIN Rail PC designed for installation in control cabinet. One Micro SD Flash Card which is accessible from outside. **RTC Integration** The IPC is connected to the HACH LANGE measurement transmitter (sc1000) via RTC communication cards, which are installed in the sc1000 and enable data transmission between RTC and sc1000. Access to the IPC can be given via VNC viewer or Team Viewer.	**LXV515.99.0005B DIN Rail IPC with UI and Basic SW (CX5130 Beckhoff)** **see https://www.beckhoff.com/ for detailed specification**  **LXV515.99.0005C DIN Rail IPC with UI and Basic SW (SIEMENS IPC427E Microbox)** **see https://www.siemens.com/ for detailed specification** 

Integration via sc1000	Schematic
The RTC modules are installed on an industrial PC. PLC is communicating to sc1000 via Profibus, Modbus TCP/IP or analogue (0/4…20mA). The internal communication card YAB117 is used to for data exchange between IPC and sc1000.	
The RTC modules are installed on an industrial PC. Direct communication to flow sensors and actuators is done via external communication cards or internal cards integrated in the sc1000 transmitter.	
Integration via OPC	**Schematic**
RTC modules are installed on an industrial PC. PLC receives analytical data from sc1000 via Profibus, Modbus TCP/IP or analogue (0/4…20mA). IPC hosting the RTC modules is communicating to PLC via OPC server installed on IPC.	

RTC modules are installed on an industrial PC. PLC is communicating to sc1000 via Profibus, Modbus TCP/IP or analogue (0/4…20mA). The internal communication card YAB117 is used to for data exchange between IPC and sc1000. Remote access to RTC via CLAROS cloud (Data view and control parameter exchange). Currently limited to P-, N/DN, N, SRT, SD, ST-RTC.	
CLAROS conncetivity	**Schematic**
RTC modules are installed on an industrial PC. PLC receives analytical data from sc1000 via Profibus, Modbus TCP/IP or analogue (0/4…20mA). IPC hosting the RTC modules is communicating to PLC via OPC server installed on IPC. Remote access to RTC via CLAROS cloud (Data view and control parameter exchange). Currently limited to P-, N/DN, N, SRT, SD, ST-RTC.	
CLAROS & MSM conncetivity	**Schematic**
RTC modules are installed on an industrial PC. PLC receives analytical data from sc4200 via Profibus, Modbus TCP/IP or analogue (0/4…20mA). ProfiNet and Ethernet/IP options availabel via Kunbus Gateway. IPC hosting the RTC modules is communicating to PLC via OPC server installed on IPC. Remote access to RTC and MSM access via CLAROS cloud. Currently limited to P-, N/DN, N, SRT, SD, ST-RTC.