



AIR TECH
SYSTEMS

Technical brochure

LTG Air-Water Systems

LTG **Induction** LTG **FanPower** LTG **Decentral**

Decentralized control intelligence

LTG Connected Intelligence



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Decentralized control intelligence LTG Connected Intelligence

LTG Comfort Air Technology
Air-Water Systems
Air Diffusers
Air Distribution

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Notes

The current tender documents are available in Word format from your local branch or on our website at www.LTG-AG.com

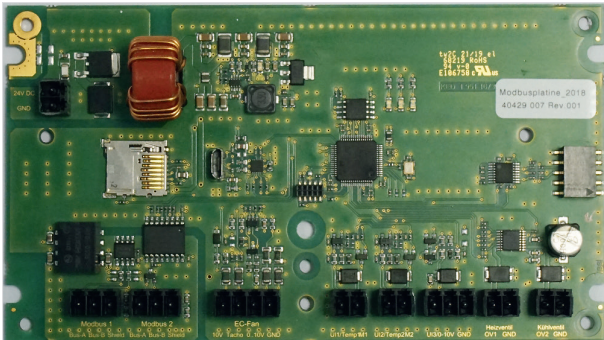
LTG planning tools – we support you!

Visit our website at www.LTG-AG.com to find helpful tools such as design programs, flow videos, and all product information!

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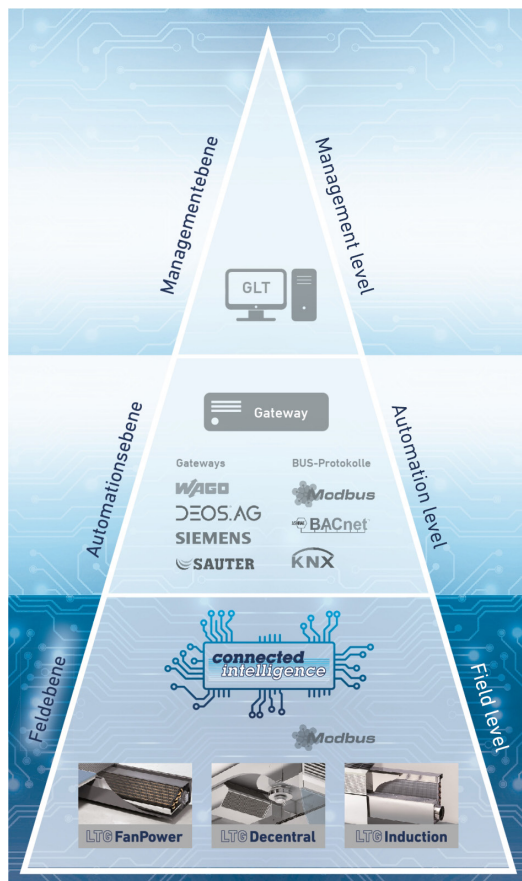
Unit view



CI circuit board with open bus system

Application

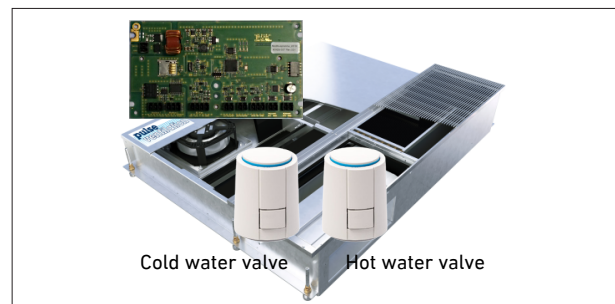
Connected Intelligence (CI) is a control concept for the decentralized control of air-water systems from LTG Aktiengesellschaft. At its heart is the individually configurable CI board, which is installed in every unit (decentralized ventilation unit FVPpulse, fan coil unit, or induction unit). It offers the possibility of controlling decentralized ventilation units, fan coil units, and induction units. „Connected Intelligence“ communicates via Modbus RTU and functions as a slave field unit, but can also take on master functions. This allows both stand-alone solutions and zone solutions with a higher-level building management system to be implemented in the building.



Functionality

The CI board controls the room temperature and air quality. All it needs as input is information about the desired operating mode and the setpoint and actual values in the control zone. The CI board independently controls the fan, cycle time, heating and cooling valves at the decentralized unit level. Depending on the building management system (BMS) concept implemented, it communicates with other bus participants or higher-level instances via Modbus RTU.

The unit, CI circuit board, and valves form a single unit and are completely wired together at the factory.



Example with the decentralized ventilation unit FVPpulse-B

Connections

The „Connected Intelligence“ is supplied with 24 V DC. Optionally, the 24 V DC power supply can be provided at an additional cost using a transformer installed in the ventilation unit.

The Modbus RTU is connected via a shielded twisted pair cable (line resistance 120 Ω). The maximum number of units is limited to 120 units per bus segment

Various sensors can be connected via three universal inputs (window contact, temperature sensor, CO₂ sensor, presence detector, etc.).

Two 24 V PWM outputs for controlling hot and cold water valves are provided as standard, as well as a fan or SmartFlow control including speed measurement and voltage feedback.

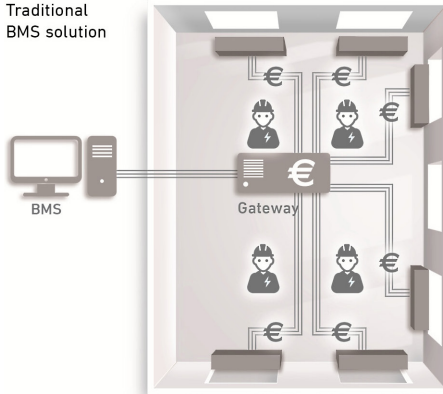
A micro USB port and an SD card slot are installed on the circuit board for parameterizing the „Connected Intelligence.“

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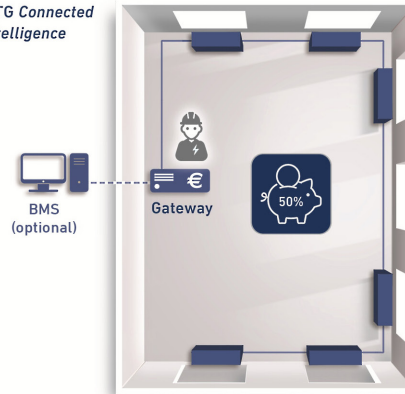
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Features

Traditional BMS solution

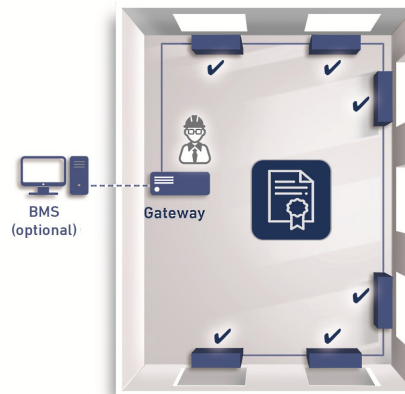
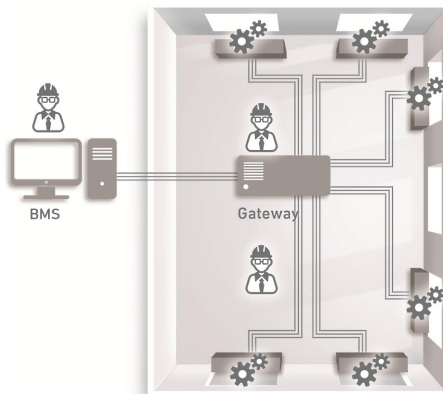


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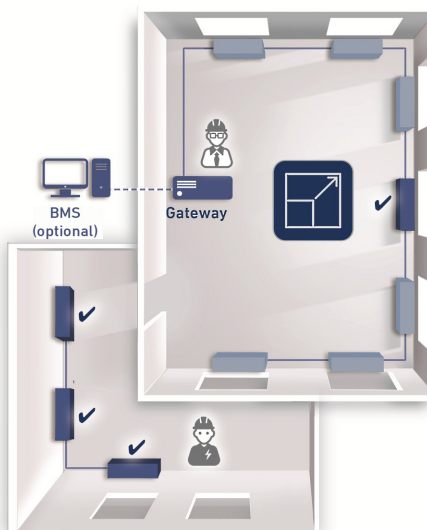
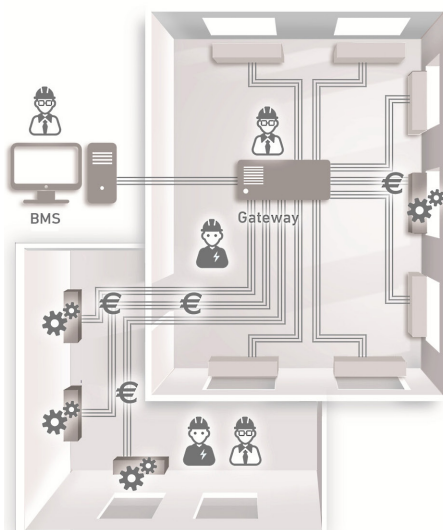
Cost savings

- Significant reduction in software/hardware data points and DDC costs through more compact components and LTG circuit boards
- Significant reduction in wiring effort and risk of errors on the construction site



Verified/open systems

- Integrated, product-optimized control loops for room temperature and air quality, as well as heat recovery optimization
- Open communication using Modbus as a protocol and available gateway modules and converters



Flexibility/scalability

- Cost-effective stand-alone solution for small zones (e.g., renovation of sub-areas without BMS connection)
- Subsequent connection to a BMS or existing system possible
- Can be expanded with various sensors without additional effort or modules



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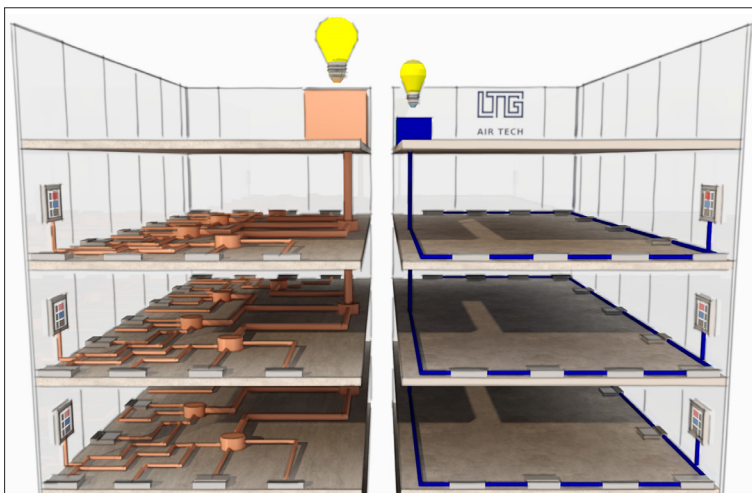
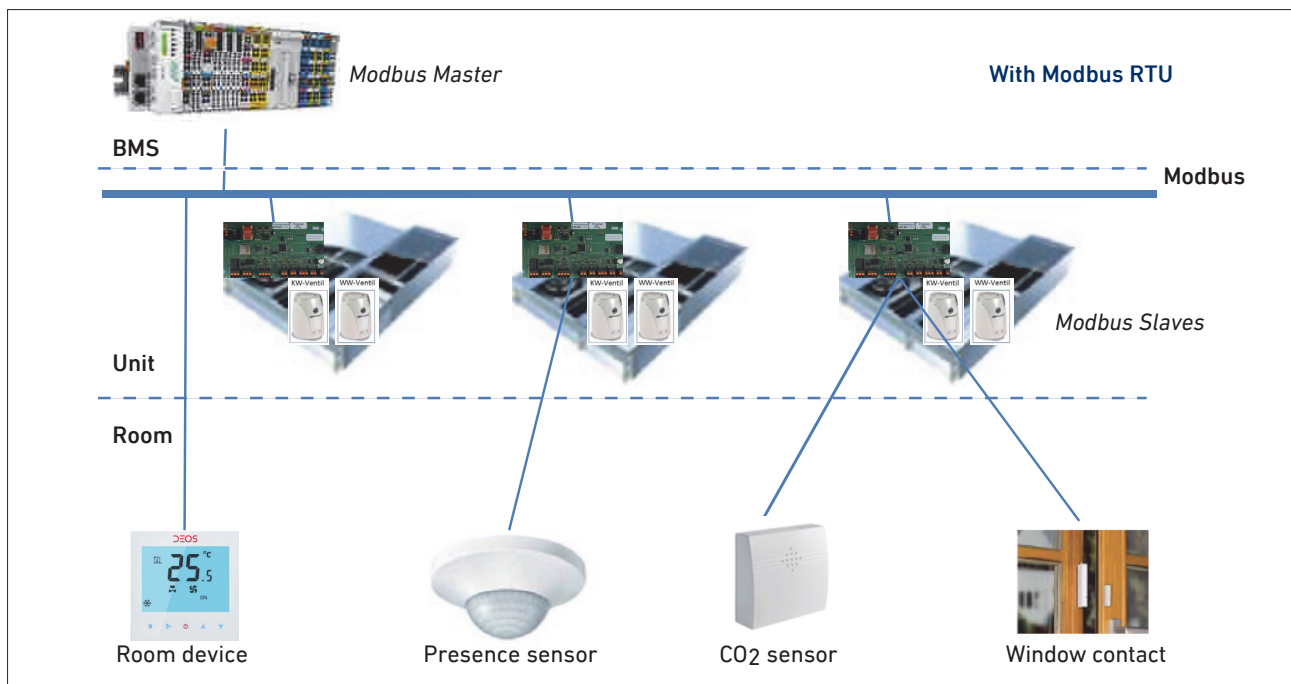
The following section shows the various options for integrating CI into a BMS concept.

With higher-level BMS, with Modbus RTU

As a rule, the ventilation units communicate with a higher-level BMS. This assigns the units to zones, reads room control units, and distributes the information to the slaves. These automatically regulate room temperature and, if necessary, air quality. Up to 120 LTG units (decentralized ventilation units FVPpulse, fan coil units, or induction units) can be networked together in a Modbus network.

In addition, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensors (Ni1000) for measuring room, outside, changeover, or supply air temperature;
- Normally closed or normally open contacts for changeover, presence, condensation, windows;
- CO₂ or VOC sensor (0...10 V DC signal; 24 V DC sensor supply available on the circuit board; 230/24 V transformer available as an option at extra cost).



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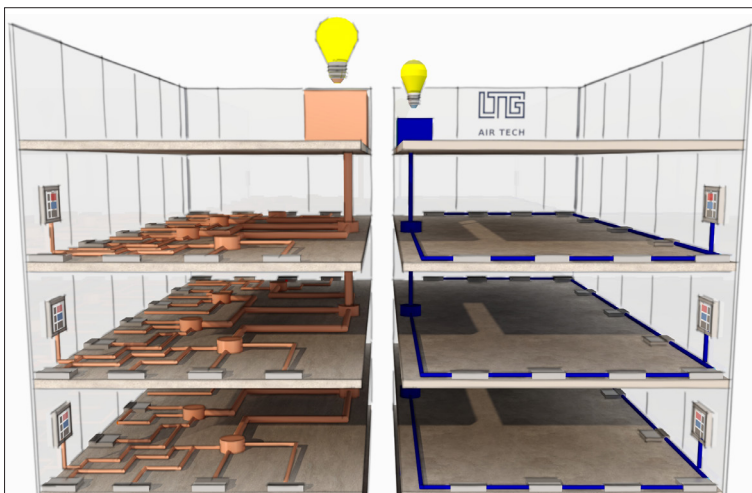
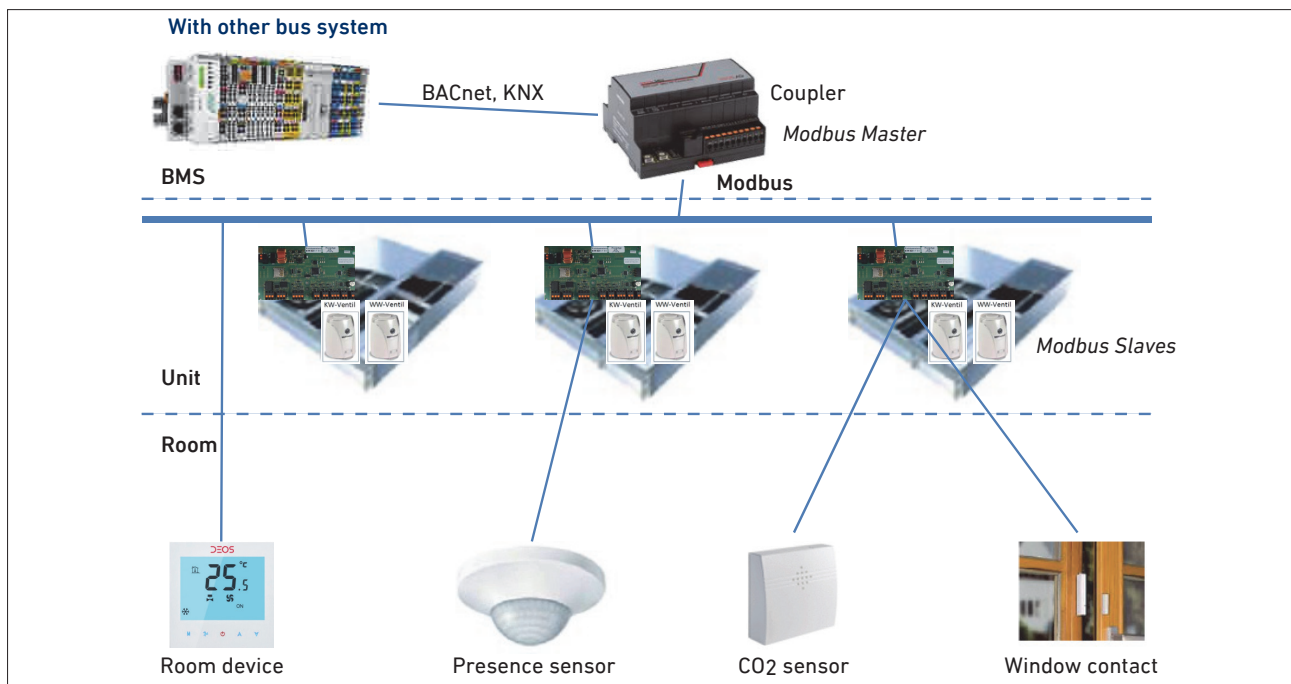
With higher-level BMS, with other bus system

In the case of a higher-level BMS that is not based on Modbus basis, a coupler/gateway is used, which is available as an option from LTG. This converts the information from Bacnet or KNX into Modbus RTU. We recommend using one coupler per floor, whereby the maximum number of 120 bus participants (CI boards, room control units, and possibly others) per coupler must not be exceeded.

The higher-level BMS again takes over the zonal assignment of the units, the reading of the room control units, and the distribution of the information to the slaves. The room temperature and, if necessary, air quality are controlled automatically by the CI board in the respective LTG unit.

In addition, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensors (Ni1000) for measuring room, outside, changeover, or supply air temperature,
- Normally closed or normally open contacts for changeover, presence, condensation, window,
- CO₂ or VOC sensor (0...10 V DC signal; 24 V DC sensor supply available on the circuit board; 230/24 V transformer available as an option at extra cost).



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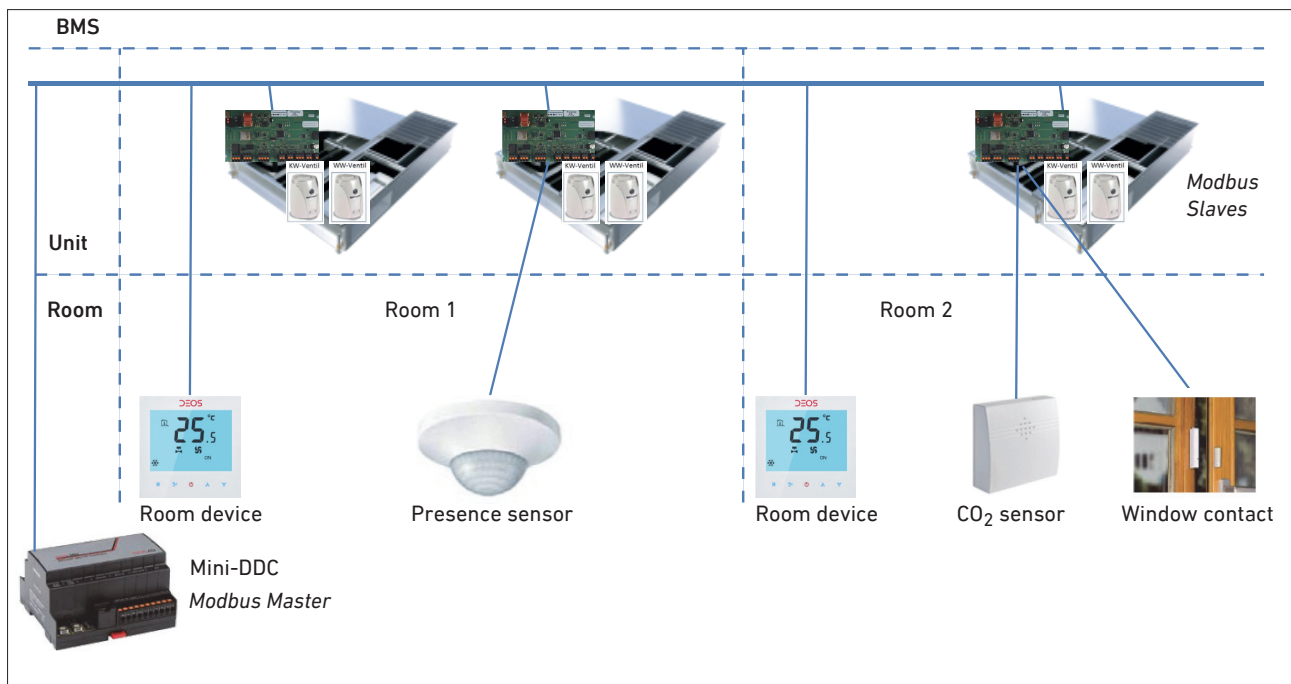
Without higher-level BMS, as a stand-alone solution with multiple rooms/control zones

In the event that no higher-level building management system is available, but several control zones are desired, a mini DDC must be used (not an LTG accessory). This takes over the zonal assignment of the units, the reading of the room control units, and the distribution of information to the slaves, whereby the maximum number of 120 bus participants (CI boards, room control units, and possibly others) per coupler must not be exceeded.

The room temperature and, if applicable, air quality are controlled automatically by the CI board in the respective LTG unit.

In addition, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensors (Ni1000) for measuring room, outside, changeover, or supply air temperature,
- Normally closed or normally open contacts for changeover, presence, condensation, windows,
- CO₂ or VOC sensors (0...10 V DC signal; 24 V DC sensor supply available on the board; 230/24 V transformer available as an option at extra cost).



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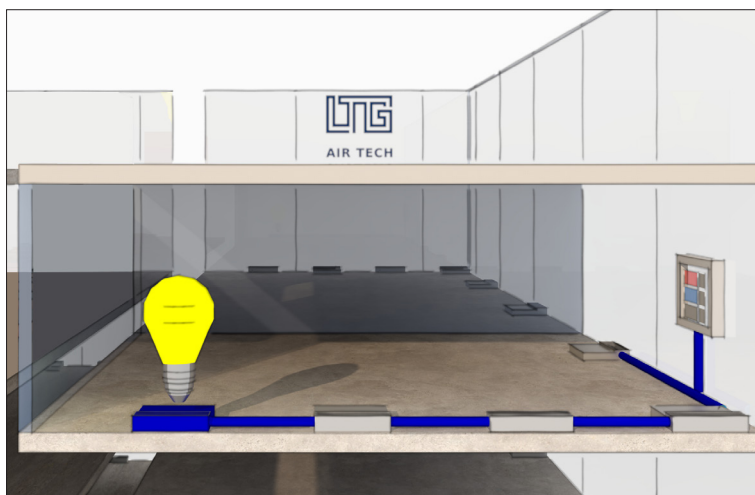
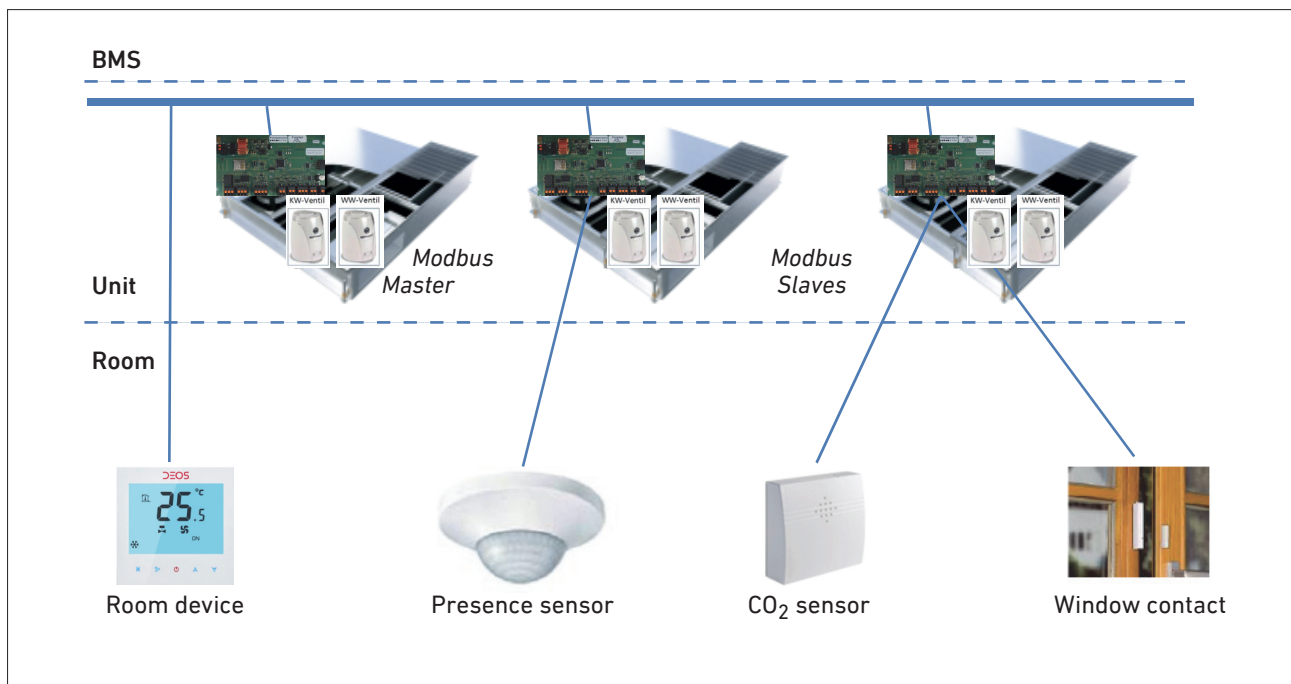
Without higher-level BMS, as a stand-alone solution with one room/control zone

If there is no higher-level building management system and only one control zone (e.g., a large conference room with multiple FVP units and/or fan coil units), additional higher-level components are not required. In this case, a CI board from the Modbus network can be re-parametrized so that, in addition to the control functions for the unit in which it is installed, it also takes over the master function for the other CI boards. It then takes over the reading of the room control units and the distribution of information to the slaves, whereby the maximum number of 6 bus participants (CI boards, room control units and possibly others) per network must not be exceeded.

Room temperature and, if applicable, air quality are automatically controlled by the CI circuit board in the respective LTG unit.

In addition, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensors (Ni1000) for measuring room, outside, changeover, or supply air temperature,
- Normally closed or normally open contacts for changeover, presence, condensation, window;
- CO₂ or VOC sensor (0...10 VDC signal; 24 VDC sensor supply available on the circuit board; 230/24 V transformer available as an option at extra cost).



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Protocol

The CI circuit board is a slave bus participant that is permitted to send data upon request from the higher-level building management system. In addition, it is possible to configure the circuit board as a master in order to query data points from up to 6 bus participants in a stand-alone solution and distribute target and actual values to them.

The protocol used complies with the specifications in:

- Modbus Application Protocol Specification V1.1b3
- Modbus over Serial Line Specification & Implementation guide V1.0

SD card

Micro SD cards can be used to install a new application or unit configuration.

- Only SDHC cards or SD cards formatted in the FAT32 file system can be used! SDXHC cards with NTFS and exFAT file systems are not supported. We recommend SDCardFormatter from Tuxera for formatting.

Configuration software

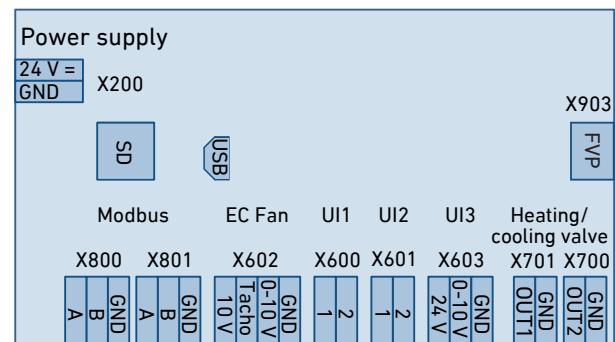
"Connected Intelligence" can be parameterized and read out using a terminal program such as TeraTerm. A detailed description of the configuration software can be found on page 16 and following.

Bootloader

A bootloader is integrated into the unit, which allows a new application (update, upgrade, downgrade) to be installed via SD card. The files must be named according to the specifications on page 18. To start the bootloader, the circuit board must be restarted either via the terminal program or by performing a power reset.

Electrical connections fan coil unit

Terminal	Name	Color	Description
X200	24 V =		Supply voltage 24 V DC
	PGND		Supply voltage GND
X600	1		Universal input 1
	2		Universal input 1
X601	1		Universal input 2
	2		Universal input 2
X602	1	red	Fan 10 V Out
	2	white	Fan speedometer OK
	3	yellow	Fan 0..10 V
	4	blue	Fan GND
X603	1		Universal input 3 24 V DC
	2		Universal input 3 0..10 V
	3		Universal input 3 GND
X700	OUT2	brown	Cooling valve PWM 24 V
	GND	blue	Cooling valve GND
X701	OUT1	brown	Heating valve PWM 24 V
	GND	blue	Heating valve GND
X800	A		Modbus A
	B		Modbus B
	Shield		Shield
X801	A		Modbus A
	B		Modbus B
	Shield		Shield



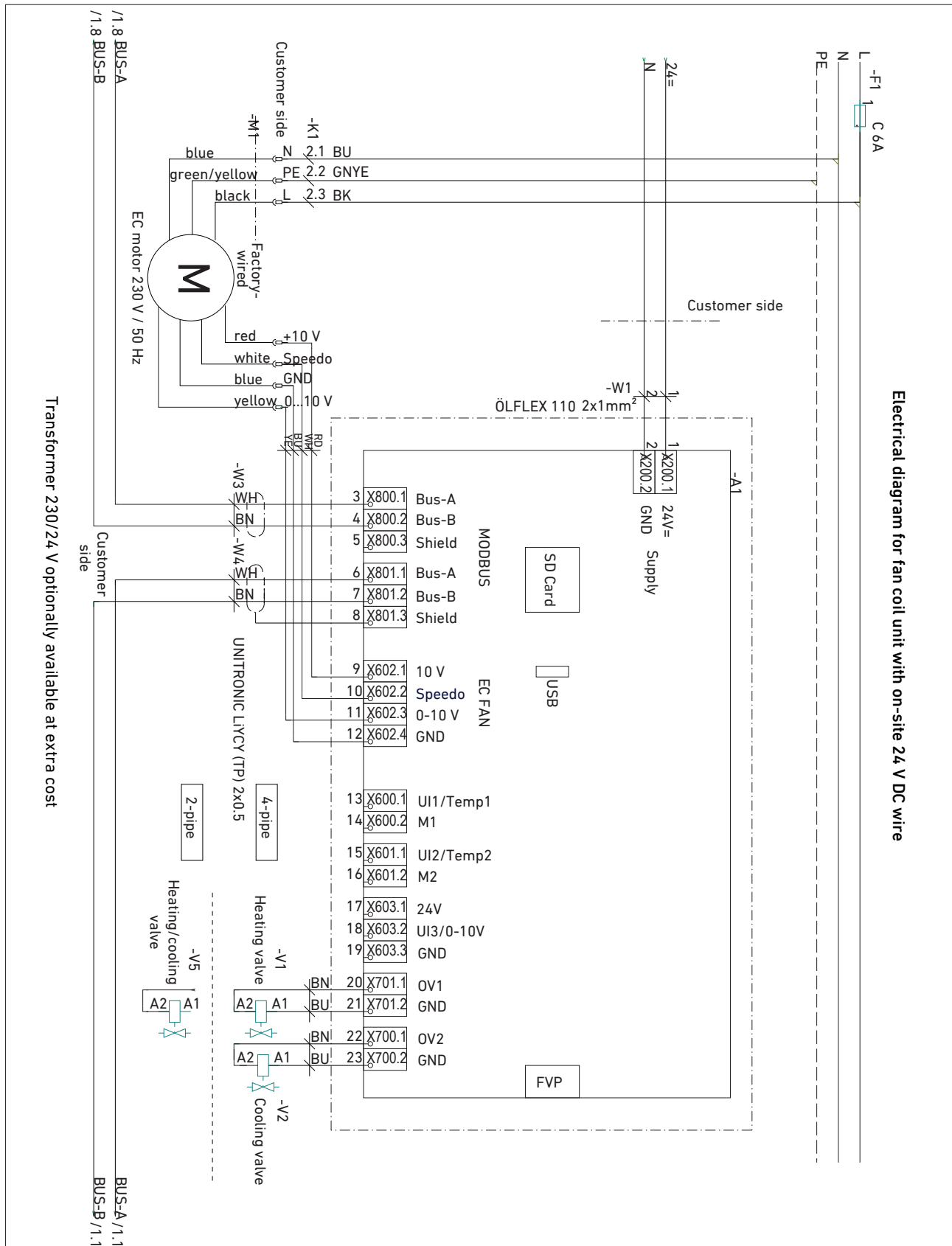
The Modbus RTU is connected via a shielded twisted pair cable (line resistance 120 Ω).

The power supply for the CI board (24 V DC) is wired using a two-core cable, the cross-section of which must be designed according to the number of units supplied in parallel and the cable length (rated current per CI board: 500 mA). Optionally, the 24 V DC power supply can be provided at an additional cost using a transformer installed in the ventilation unit.

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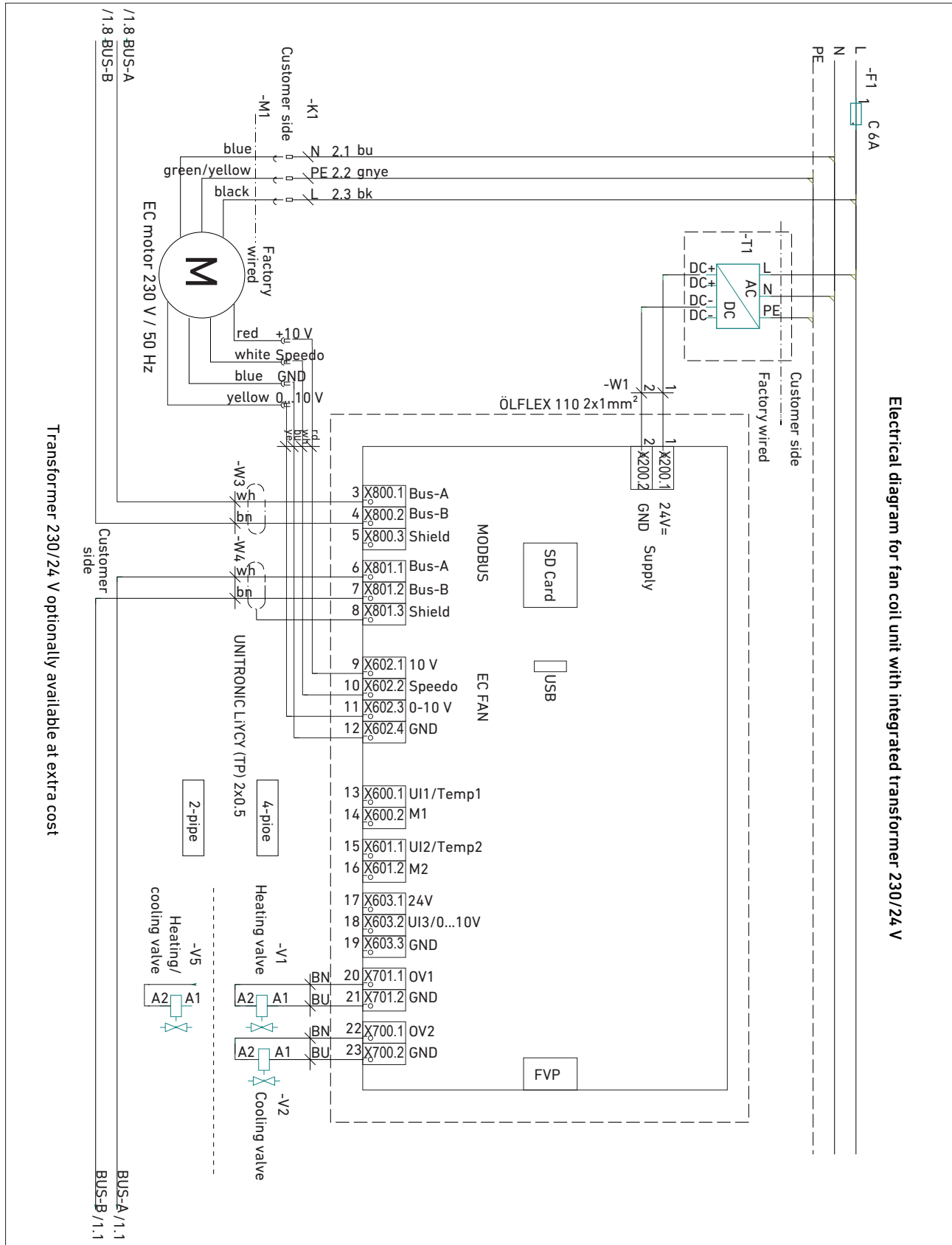
Electrical diagram for fan coil unit with on-site 24 V DC wire



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Electrical diagram for fan coil unit with integrated transformer 230/24 V



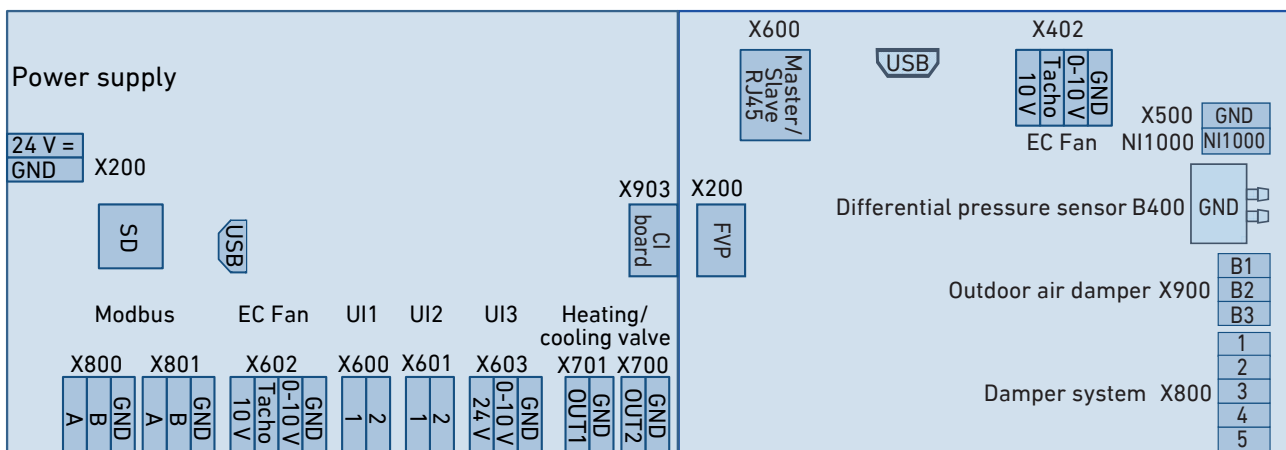
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Electrical connections for decentralized ventilation unit FVP

CI circuit board			
Terminal	Name	Color	Description
X200	24 V =		Supply voltage 24 V DC
	PGND		Supply voltage GND
X600	1		Universal input 1
	2		Universal input 1
X601	1		Universal input 2
	2		Universal input 2
X602	1	red	Fan 10 V Out
	2	white	Fan speedometer OK
	3	yellow	Fan 0..10 V
	4	blue	Fan GND
X603	1		Universal input 3 24 V DC
	2		Universal input 3 0..10 V
	3		Universal input 3 GND
X700	OUT2	brown	Cooling valve PWM 24 V
	GND	blue	Cooling valve GND
X701	OUT1	brown	Heating valve PWM 24 V
	GND	blue	Heating valve GND
X800	A		Modbus A
	B		Modbus B
	Shield		Shield
X801	A		Modbus A
	B		Modbus B
	Shield		Shield

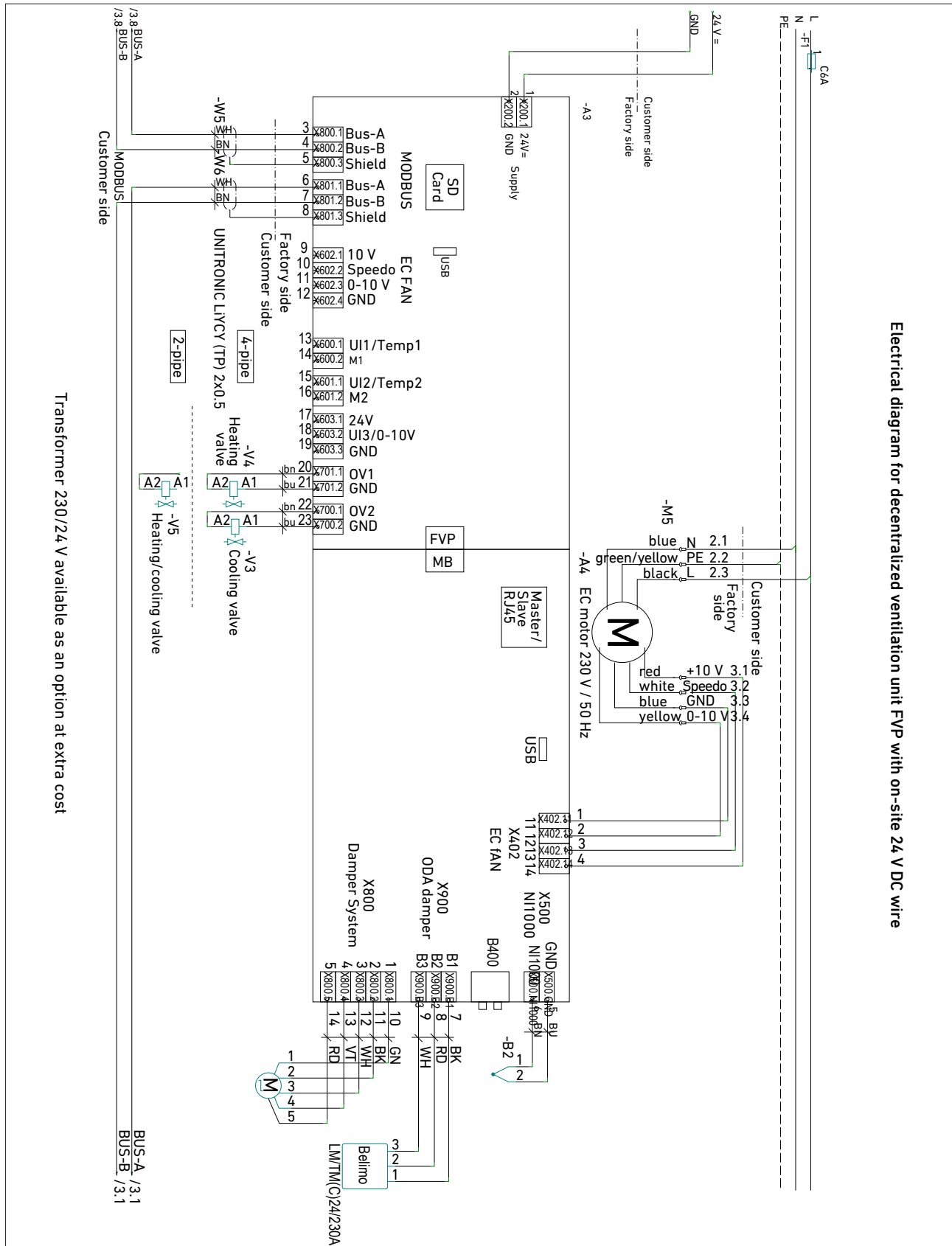
FVP circuit board			
Terminal	Name	Color	Description
X402	11	blue	GND
	12	yellow	0..10 V
	13	white	Speedometer
	14	red	10 V
X500	GND	blue	GND
	NI1000	brown	NI1000
X900	B1	black	Belimo GND
	B2	red	Belimo OPEN
	B3	white	Belimo CLOSED
X800	1	gray	GND
	2	purple	CH1
	3	white	CH2
	4	black	Damper motor -
	5	red	Damper motor +



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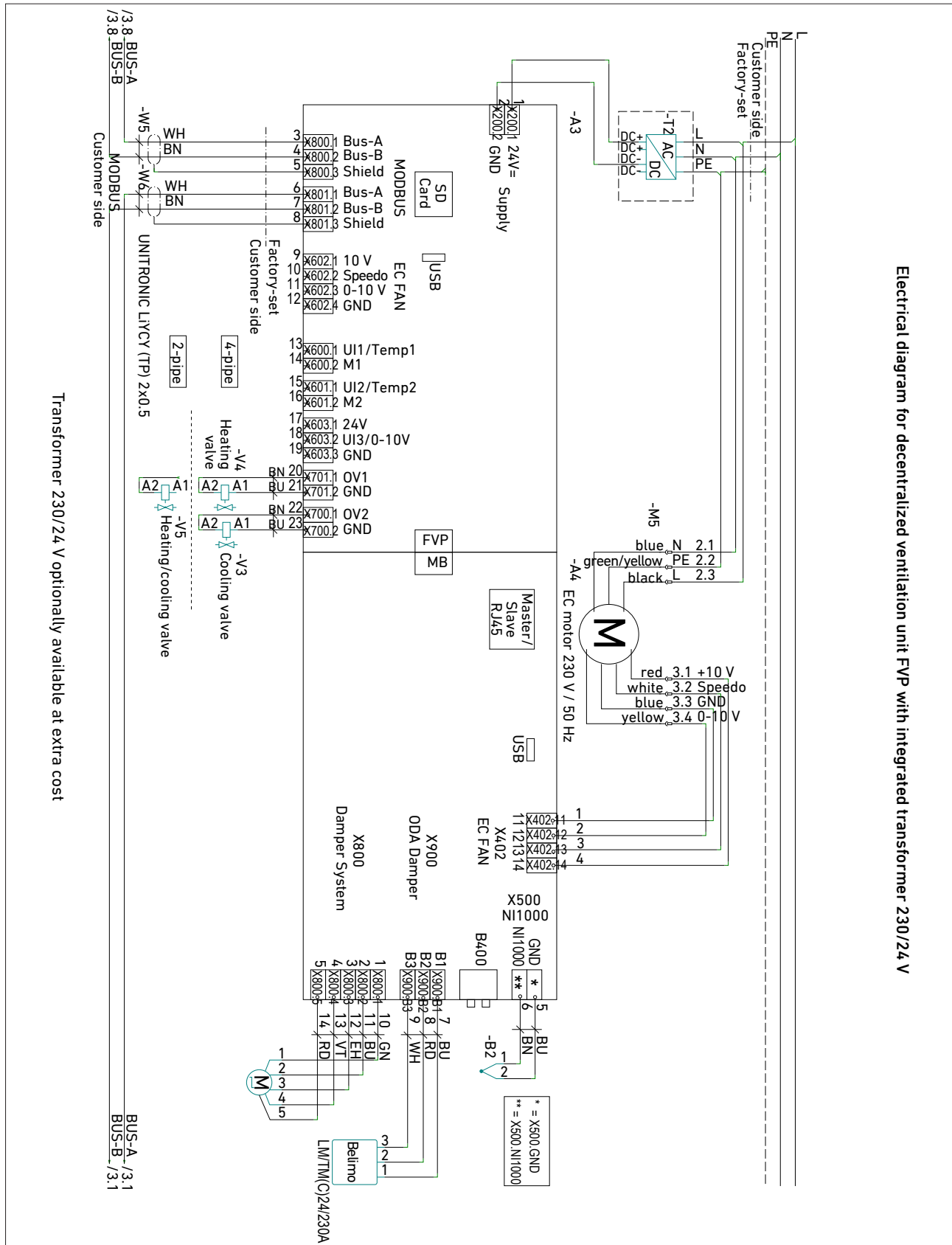
Electrical diagram for decentralized ventilation unit FVP with on-site 24 V DC wire



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Electrical diagram for decentralized ventilation unit FVP with integrated transformer 230/24 V



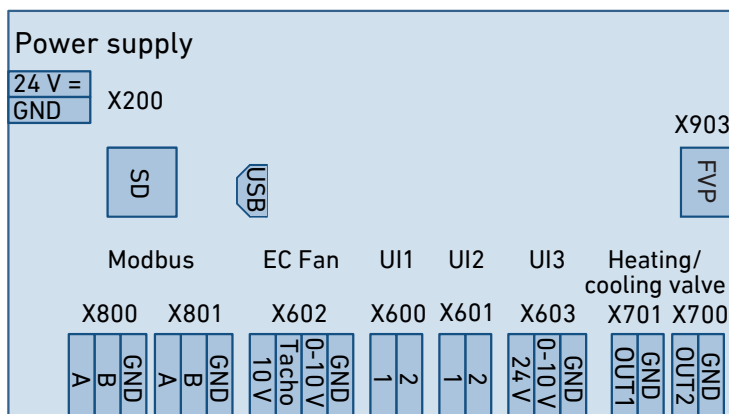
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Electrical connections for induction unit

Terminal	Name	Color	Description
X200	24 V =		Supply voltage 24 DC
	PGND		Supply voltage GND
X600	1		Universal input 1
	2		Universal input 1
X601	1		Universal input 2
	2		Universal input 2
X602	2		
	3	white	Belimo actuator 0...10 V
	4	black	Belimo actuator GND
X603	1	red	Belimo actuator 24 V DC *
	2		Universal input 3 0...10 V
	3		Universal input 3 GND
X700	OUT2	brown	Cooling valve PWM 24 V
	GND	blue	Cooling valve GND
X701	OUT1	brown	Heating valve PWM 24 V
	GND	blue	Heating valve GND
X800	A		Modbus A
	B		Modbus B
	Shield		Shield
X801	A		Modbus A
	B		Modbus B
	Shield		Shield

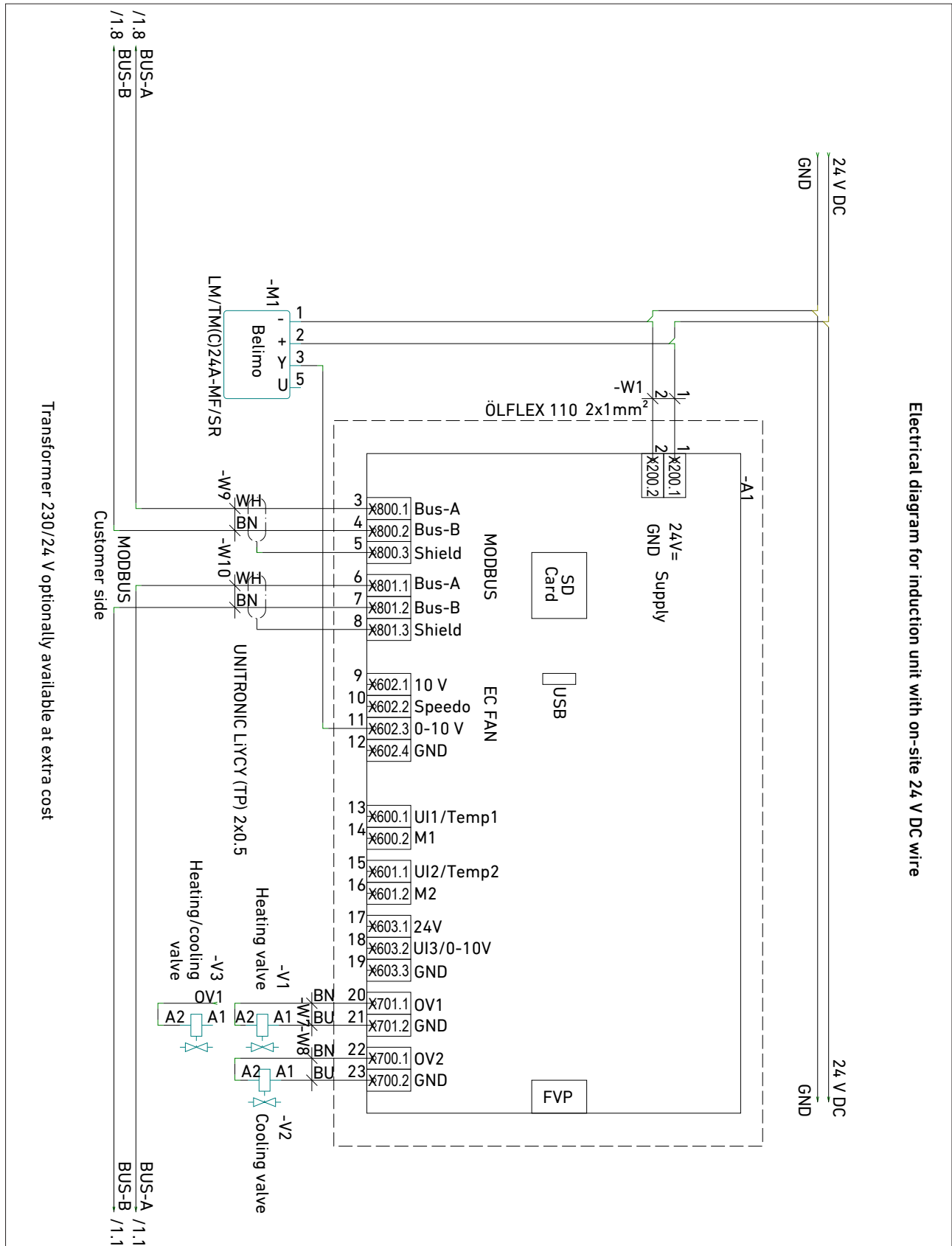
* If no 24 V DC supply is required for universal input X603.
Otherwise, see the electrical diagram on page 16.



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Electrical diagram for induction unit with on-site 24 V DC wire



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Modbus settings

The settings can be changed using parameters 211...217 (see list of data points).

Address

Address of the unit in the Modbus network. Addresses 1...247 can be set.
Factory setting: 1.

Adjustable baud rate

- 1200 Bd
- 2400 Bd
- 4800 Bd
- 9600 Bd
- 19200 Bd (factory setting)
- 38400 Bd
- 57600 Bd
- 115200 Bd

Parity

- None
- Odd
- Even (factory setting)

Number of stop bits

- 1 bit (factory setting)
- 2 bits

Master/Slave

- Slave (factory setting)
- Master

Number of data bits

- 7 bits
- 8 bits (factory setting)

Transmission mode

- RTU (factory setting)
- ASCII

Commands

All data points are located on the holding register.

Code: 0x03 / 0x10

Command: Read Holding Register (this command can be used to read the contents of multiple holding registers)

	Master	Slave
Example: Read	4 data bytes are transferred: - 1st Holding register address MSB - 1st holding register address LSB - Number of addresses to be read MSB - Number of addresses to be read LSB	Responds as follows: - Byte count (number of addresses times 2) - Data 1st holding register MSB - Data 1st holding register LSB - Data 2nd holding register MSB - Data 2nd Holding Register LSB - ... - Data according to Holding Register MSB - Data according to holding register LSB
Example: write	The following data bytes are transferred: - 1st Holding register address MSB - 1st Holding register address LSB - Number of addresses to be written MSB - Number of addresses to be written LSB - Byte count (number of addresses times 2) - Data 1st holding register MSB - Data 1st holding register LSB - Data 2nd holding register MSB - Data 2nd holding register LSB - ... - Data according to holding register MSB - Data according to holding register LSB	Responds with 4 data bytes: - 1st Holding register address MSB - 1st Holding register address LSB - Number of addresses to be written MSB - Number of addresses to be written LSB

Bus monitoring

Data points must be written at least every 60 s to monitor the bus line.

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Data point list

All data points are located on the holding register. Data source: Modbus master. (X = the respective data point must be used)
Code: 0x03 / 0x10

Command: Read Holding Register / Write Holding Register

Unit command data																
Data point	Modbus register	Name	Description	Input range	Default	Unit	Fan coil unit		Induction unit		FVP		Transparent mode 1		Transparent mode 2	
							2 pipe	4 pipe	2 pipe	4 pipe	2 pipe	4 pipe	2 pipe	4 pipe	2 pipe	4 pipe
1	40002	LTG_GENERAL_MODE	Operating mode 0 = OFF 1 = normal 2 = ECO 3 = Standby 4 = Night ventilation 5 = Hybrid 6 = Transparent mode 1 7 = Transparent mode 2	0...7	0	-	x	x	x	x	x	x	x	x	x	x
2	40003	LTG_GENERAL_CHANGEOVER	Changeover (winter/summer) 0 = Winter 1 = Summer	0...1	0	-	x		x							
3	40004	LTG_ROOM_T_SET	Rom temperature setpoint	150...400	240	0.1 °C	x	x	x	x	x	x				
4	40005	LTG_ROOM_T_ACTUAL	Actual room temperature	0...600		0.1 °C	x	x								
5	40006	LTG_ROOM_CO2_ACTUAL	CO2 actual value	0...3000		ppm			x	x	x	x				
6	40007	LTG_GENERAL_ODA	Outside air temperature	-500...1000		0.1 °C										
7	40008	LTG_ROOM_T_CHANGE	Target deviation room temp.	0...60	0	0.1 K										
8	40009	LTG_ROOM_OCCUPY	Presence 0 = empty 1 = occupied	0...1	0	-										
9	40010	LTG_ROOM_CO2_SET	CO2 setpoint	400...2000	900	ppm										
10	40011	LTG_TRANSPARENTMODE_FANSPEED	Fan setpoint	0...100	0	%					x	x	x	x	x	x
11	40012	LTG_TRANSPARENTMODE_HEATING	Heating valve setpoint	0...100	0	%					x	x	x	x	x	x
12	40013	LTG_TRANSPARENTMODE_COOLING	Cooling valve setpoint	0...100	0	%							x	x	x	x
13	40014	LTG_TRANSPARENTMODE_FANSTEP	Fan lecel setpoint (for TM2)	0...3	0	-								x	x	x
14	40015	LTG_ROOM_T_W1	Supply temperature	0...1000		0.1 °C										
15	40016	LTG_T_SUP_ACTUAL	Supply air temperature	0...1000		0.1 °C										
16	40017	LTG_ROOM_WINDOW	Window position 0 = closed 1 = open	0...1	0	-										
17	40018	LTG_ROOM_CONDENS	Condensate overflow/accumulation 0 = no condensate 1 = Condensate tray full / condensate overflowing	0...1	0	-										
18	40019	LTG_FVP_MASTERSLAVE_OP	FVP master/slave operating mode (same/opposite direction) 0 = same direction 1 = opposite	0...1	1	-					x	x				
19	40020	LTG_FVP_OP	FVP operating mode (supply air, extract air, pulsating) 1 = supply air 2 = extract air 3 = puls. oper.	1...3	3	-					x	x				
20	40021	LTG_UNIT_CLOCK	Time (in seconds / 2)	0...43200		-										

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Code: 0x03
Command: Read Holding Register

Unit status data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
400	40401	LTG_UNIT_VENTIL_HEATING	Valve position heating	0...100		%
401	40402	LTG_UNIT_VENTIL_COOLING	Valve position cooling	0...100		%
402	40403	LTG_UNIT_T_SUP	Supply air temperature	-500...500		0.1 °C
403	40404	LTG_UNIT_SUM_VOLUME32_1	Cumulative volume HighByte	0...50000	0	m ³
404	40405	LTG_UNIT_SUM_VOLUME32_2	Cumulative volume LowByte	0...50000	0	m ³
405	40406	LTG_UNIT_SUM_RUNTIME32_1	Cumulative operating time HighByte	0...1000000	0	h
406	40407	LTG_UNIT_SUM_RUNTIME32_2	Cumulative operating time LowByte	0...1000000	0	h
407	40408	LTG_UNIT_SUM_HEAT32_1	Cumulative heating energy HighByte	0...100000	0	Wh
408	40409	LTG_UNIT_SUM_HEAT32_2	Cumulative heating energy LowByte	0...100000	0	Wh
409	40410	LTG_UNIT_SUM_COOL32_1	Cumulative cooling energy HighByte	0...100000	0	Wh
410	40411	LTG_UNIT_SUM_COOL32_2	Cumulative cooling energy LowByte	0...100000	0	Wh
411	40412	LTG_UNIT_STATE	Control state according to logic diagram (see page 26)	0...82		-
412	40413	LTG_UNIT_MIN_T_SUP	Minimum measured supply air temp.	0...300		0.1 °C
413	40414	LTG_UNIT_MAX_T_SUP	Maximum measured supply air temp.	0...800		0.1 °C
414	40415	LTG_UNIT_FAN_FC_SPEED	Fan speed recirculation air	0...100		%
415	40416	LTG_UNIT_FAN_FVP_SPEED	Fan speed outdoor air	0...100		%
416	40417	LTG_UNIT_ERROR	Fault message (see error list page 27 and data points 431 & 433)	0...100	0	-
417	40418	LTG_UNIT_ONOFF	ON/OFF 0 = OFF 1 = ON	0...1	1	-
418	40419	LTG_UNIT_CONDENSATE	Condensate monitor message 0 = inactive 1 = active	0...1	0	-
419	40420	LTG_UNIT_UI1_ACTUAL	Current measured value at UI1	-500...2000		ppm/0.1 °C
420	40421	LTG_UNIT_UI2_ACTUAL	Current measured value at UI2	-500...2000		ppm/0.1 °C
421	40422	LTG_UNIT_UI3_ACTUAL	Current measured value at UI3	-500...2000		ppm/0.1 °C
422	40423	LTG_FVP_FILTER	Filter change request 0 = inactive 1 = active	0...1	0	-
423	40424	LTG_UNIT_UI1_STATE	Current digital measured value at UI1	0...1		-
424	40425	LTG_UNIT_UI2_STATE	Current digital measured value at UI2	0...1		-
425	40426	LTG_UNIT_UI3_STATE	Current digital measured value at UI3	0...1		-
426	40427	LTG_FVP_PRESSURE_actual	Differential pressure heat recovery	0...200		Pa
427	40428	LTG_FVP_FLOW_ACTUAL	Actual air flow rate	0...400		m ³ /h
428	40429	LTG_FLOW_CALC	Theoretical air flow rate from voltage specification LTG_UNIT_FAN_SPEED1	0...400		m ³ /h
429	40430	LTG_UNIT_ERROR_CODES	Error messages	0...65535	0	bin
430	40431	LTG_UNIT_WARNING_CODES	Information messages	0...65535	0	bin
431	40432	LTG_UNIT_MISSING_SETVAL	Missing setpoints	0...65535	0	bin

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Unit status data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
432	40433	LTG_UNIT_MISSING_ACTVAL	Missing actual values	0-65535	0	bin
433	40434	LTG_UNIT_FVP_ERROR	FVP fault	0-255	0	-
471	40472	LTG_UNIT_EFF_HEATING	EFF heating valve [%]			
472	40473	LTG_UNIT_EFF_COOLING	EFF cooling valve [%]			
473	40474	LTG_UNIT_CURRENT_CYCLETIME	Current cycle time [s]			
474	40475	LTG_UNIT_WRG	Recovery factor [%]			
701	40702	LTG_GENERAL_MODE_ACK	Operating mode 0 = Off 1 = Normal 2 = ECO 3 = Standby 4 = Night ventilation 5 = Hybrid 6 = Transparent mode1 7 = Transparent mode2	0...7	0	-
702	40703	LTG_GENERAL_CHANGEOVER_ACK	Changeover (winter/summer) 0 = Winter 1 = Summer	0...1	0	-
703	40704	LTG_ROOM_T_SET_ACK	Setpoint room temperature	150...400	240	0.1 °C
704	40705	LTG_ROOM_T_ACTUAL_ACK	Actual room temperature	0...600		0.1 °C
705	40706	LTG_ROOM_CO2_ACTUAL_ACK	CO ₂ actual value	0...3000		ppm
706	40707	LTG_GENERAL_ODA_ACK	Outside air temperature	-500...1000		0.1 °C
707	40708	LTG_ROOM_T_CHANGE_ACK	Setpoint deviation room temperature	0...60	0	0.1 K
708	40709	LTG_ROOM_occupy_ack	Presence 0 = empty 1 = occupied	0...1	0	-
709	40710	LTG_ROOM_CO2_SET_ACK	CO ₂ setpoint	400...2000	900	ppm
710	40711	LTG_TRANSPARENTMODE_FANSPEED_ACK	Fan setpoint	0...100	0	%
711	40712	LTG_TRANSPARENTMODE_HEATING_ACK	Heating valve setpoint	0...100	0	%
712	40713	LTG_TRANSPARENTMODE_COLLING_ACK	Cooling valve setpoint	0...100	0	%
713	40714	LTG_TRANSPARENTMODE_FANSTEP_ACK	Fan speed setpoint (for TM2)	0...3	0	-
714	40715	LTG_ROOM_T_W1_ACK	Supply temperature	0...1000		0.1 °C
715	40716	LTG_T_SUP__ACTUAL_ACK	Supply air temperature	0...1000		0.1 °C
716	40717	LTG_ROOM_WINDOW_ACK	Window position 0 = closed 1 = open	0...1	0	-
717	40718	LTG_ROOM_CONDENS_ACK	Condensate overflow/accumulation 0 = no condensate 1 = condensate tray full/condensate overflowing	0...1	0	-
718	40719	LTG_FVP_MASTERSLAVE_OP_ACK	FVP master/slave operating mode (same/opposite direction) 0 = same direction 1 = opposite	0...1	1	-
719	40720	LTG_FVP_OP_ACK	FVP operating mode (supply air, extract air, pulsating) 1 = supply air 2 = extract air 3 = pulsating operation	1...3	3	-
720	40721	LTG_UNIT_CLOCK_ACK	Time (in seconds / 2)	0...43200		-

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Code: 0x03 / 0x10

Befehl: Read Holding Register / Write Holding Register

Unit movement data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
101	40102	LTG_UNIT_CHANGEOVER_DELAY	Minimum runtime for calculating the changeover	0...300	200	s
102	40103	LTG_PARAMETER_TIME_DELAYOCCUPY	Presence delay	0...30	0	s
103	40104	LTG_PARAMETER_TIME_DELAYHYBRID	Hybrid delay	0...30	0	s
104	40105	LTG_PARAMETER_T_HIGHSTANDBY	Upper switch-on point standby	150...990	990	0.1 °C
105	40106	LTG_PARAMETER_T_HIGHECO	Upper switch-on point ECO	150...990	280	0.1 °C
106	40107	LTG_PARAMETER_T_LOWSTANDBY	Lower switch-on point standby	50...400	70	0.1 °C
107	40108	LTG_PARAMETER_T_LOWECO	Lower switch-on point ECO	150...400	160	0.1 °C
108	40109	LTG_PARAMETER_RT_T	Dead zone RT control	0...100	20	0.1 °C
109	40110	LTG_PARAMETER_RT_P	P factor RT control (gain)	0...1000	50	-
110	40111	LTG_PARAMETER_RT_IMAX	Max. I component	0...1000	50	-
111	40112	LTG_PARAMETER_RT_I	I factor RT control (integration time)	0...1000	50	-
112	40113	LTG_PARAMETER_RT_D	D factor RT control (lead time)	0...100	0	-
113	40114	LTG_PARAMETER_ROOM_CO2_OFF	CO ₂ switch-off hysteresis	0...2000	200	ppm
114	40115	LTG_PARAMETER_HEATINGMIN	Lower limit for heating output	0...100	0	%
115	40116	LTG_PARAMETER_FVP_PRESSURE_DELTA	Overpressure control	0...200	20	Pa
116	40117	LTG_PARAMETER_FVP_DT_FREECOOL	Minimum temperature difference (RT-OT) for free cooling	0...1000	40	0.1 K
117	40118	LTG_PARAMETER_FVP_DT_NIGHT	Minimum temperature difference (RT-OT) for night ventilation	0...1000	40	0.1 K
118	40119	LTG_PARAMETER_FAN_RAMP	Fan switch-on ramp	0...1000	100	%/min
119	40120	LTG_PARAMETER_FVP_CO2_P	P factor LQ control (gain)	0...100	100	-
120	40121	LTG_PARAMETER_FAN_FANSPEEDNIGHT	Night ventilation (fan speed)	0...100	44	%
121	40122	LTG_PARAMETER_FAN_FANSPEEDHYBRID	Hybrid (fan speed)	0...100	44	%
122	40123	LTG_PARAMETER_FAN_FANSPEED_MAX	Level 3 (fan speed)	0...100	44	%
123	40124	LTG_PARAMETER_FAN_FANSPEED_MID	Level 2 (fan speed)	0...100	33	%
124	40125	LTG_PARAMETER_FAN_FANSPEED_MIN	Level 1 (fan speed)	0...100	22	%
125	40126	LTG_PARAMETER_FREECOOLING	Free cooling on/off 0 = OFF 1 = ON	0...1	0	%
126	40127	LTG_PARAMETER_SPEED_DAMPER	Damper speed	26...100	50	%
127	40128	LTG_PARAMETER_T_SUP_LOWLIMIT	Lower limit for supply air temperature (cold blast protection)	0...200	100	0.1 °C
128	40129	LTG_PARAMETER_TRENDINTERVALL	Time interval between trend values	0...60	10	min
129	40130	LTG_PARAMETER_T_SUMMERFCHANGEOVER	Supply temperature limit for summer operation	0...200	180	0.1 °C
130	40131	LTG_PARAMETER_T_WINTERFCHANGEOVER	Supply temperature limit for winter operation	0...400	300	0.1 °C
131	40132	LTG_FVP_ROOM	Individual or open-plan office 0 = Individual 1 = Open-plan	0...1	0	-

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Unit movement data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
132	40133	LTG_FVP_TIME_CYCLE	Damper rest time	0...80	50	s
133	40134	LTG_FVP_AntiFreeze_Set	Frost protection setpoint	-500 ...500	50	0.1 °C
134	40135	LTG_FVP_PROP_FLOW_PRESSURE	Proportionality factor for calculating the actual air flow rate from heat recovery differential pressure (Zeta_WRG)	0...10000	1000	-
135	40136	LTG_FVP_PROP_FLOW_FANSPEED	Proportionality factor for calculating the theoretical air flow rate from Fan_SPEED	0...10000	5000	-
136	40137	LTG_FILTER_LIMIT	Filter monitoring limit (by what percentage may the actual air flow rate deviate from the theoretical value before a message is generated)	0...100	0	%

Code: 0x03 / 0x10

Command: Read Holding Register / Write Holding Register

Unit configuration data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
201	40202	LTG_PARAMETER_TYP	Type 0 = FVP 1 = FC (fan coil unit) 2 = HF (induction unit)	0...2	0	-
202	40203	LTG_PARAMETER_INPUT_UI3	Type of UI3 0 = free 1 = ChgOver NC 2 = ChgOver NO 3 = Presence NC 4 = Presence NO 5 = Condensate NC 6 = Condensate NO 7 = Window NC 8 = Window NO 9 = Humidity 10 = CO ₂ actual	0...8, 10	0	-
203	40204	LTG_PARAMETER_INPUT_UI2	Type of UI2 0 = free 1 = ChgOver NC 2 = ChgOver NO 3 = Presence NC 4 = Presence NO 5 = Condensate NC 6 = Condensate NO 7 = Window NC 8 = Window NO 11 = RT actual 12 = RT setpoint 13 = OT actual 14 = ChgOver temp 15 = T _{SUPPLY AIR} actual	0...8,11...15	0	-
204	40205	LTG_PARAMETER_INPUT_UI1	Type of UI1 0 = free 1 = ChgOver NC 2 = ChgOver NO 3 = Presence NC 4 = Presence NO 5 = Condensate NC 6 = Condensate NO 7 = Window NC 8 = Window NO 11 = RT actual 12 = RT setpoint 13 = OT actual 14 = ChgOver temp 15 = T _{SUPPLY AIR} actual	0...8,11...15	0	-
205	40206	LTG_PARAMETER_CO ₂ _MAX	End value for CO ₂ actual sensor	0...10000	5000	ppm
206	40207	LTG_PARAMETER_RTSET_MIN	Initial value at RT setpoint 0 Ohm	0 ... 400	150	0.1 °C
207	40208	LTG_PARAMETER_RTSET_MAX	End value at RT setpoint 10 kOhm	0 ... 400	400	0.1 °C
208	40209	LTG_FVP_MASTERSLAVE	FVP-Master/Slave 0 = Single unit 1 = Slave 2 = Master	0...2	0	-

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Unit configuration data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
209	40210	LTG_FVP_HARDWARE_TYP	FVP-Eco / Premium (without/with pressure sensor) 0 = Eco 1 = Premium	0...1	1	-
210	40211	LTG_UNIT_HE	Type of heat exchanger 0 = 2-pipe 1 = 4-pipe	0...1	0	-
211	40212	LTG_COM_MODBUS_MODE	RTU or ASCII protocol 0 = RTU 1 = ASCII	0...1	0	0
212	40213	LTG_COM_MODBUS_PARITY	Parity for Modbus communication 0 = Even 1 = ODD 2 = None	0...2	0	0
213	40214	LTG_COM_MODBUS_MASTERSLAVE	Modbus-master/slave 0 = Slave 1 = Master	0...1	0	0
214	40215	LTG_COM_MODBUS_STOPBITS	Modbus Stopbit count	1...2	1	1
215	40216	LTG_COM_MODBUS_BAUDRATE	Baud rate 0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400 6 = 57600 7 = 115200	0...7	4	-
216	40217	LTG_COM_MODBUS_ADRESS	Modbus address of the controller	1...247	1	-
217	40218	LTG_COM_MODBUS_DATA	Modbus data bit count	7-8	8	Bit
218	40219	LTG_FVP_FACTORYSET	FVP factory settings Profile No.	0-6	0	-
220	40221	LTG_PARAMETER_MIN_AT_K	Min OT for cold cycle	-500...1000	-20	
221	40222	LTG_PARAMETER_MAX_AT_K	Max OT for cold cycle	-500...1000	-150	
222	40223	LTG_PARAMETER_MIN_CYCLE	Min FVP_CYCLE [s]	0...80	20	
223	40224	LTG_PARAMETER_MAX_CYCLE	Max FVP_CYCLE [s]	0...80	80	
224	40225	LTG_PARAMETER_PWM_VALVE	PWM period valve [min]	0...60	4	
225	40226	LTG_PARAMETER_MIN_AT_W	Min OT for warm cycle	-500...1000	20	
226	40227	LTG_PARAMETER_MAX_AT_W	Max OT for warm cycle	-500...1000	150	
227	40228	LTG_PARAMETER_STANDARD_CYCLE	Standard FVP_CYCLE [s]	0...80	50	
228	40229	LTG_PARAMETER_DEADZONE_CYCLE	Dead zone for control cycle	0...50	50	
800	40801	Reset	Restarts Connected Intelligence	0...123	0	123 = Reset
801	40802	LTG_MASTER_CHG_OVER_SET	Master determines changeover from flow temperature 0 = no 1 = yes	0...1	0	-
802	40803	LTG_MASTER_OCCUPY_AKTIV	Master determines operating mode based on presence 0 = no 1 = Eco/Normal 2 = Stby Normal	0 - 2	0	-
803	40804	LTG_MASTER_ENERGIE	Master determines cycle time 0 = no 1 = yes	0...1	1	-
804	40805	LTG_MASTER_HYBRID	Master determines operating mode from window contact 0 = no 1 = Standby when window is open 2 = Hybrid when window is open	0...1	0	-
805	40806	WDog_timer off	Watchdog off 0 = Watchdog active 1 = inactive	0...1	1	-

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Decentralized control intelligence LTG Connected Intelligence

Code: 0x03 / 0x10

Command: Read Holding Register / Write Holding Register

Unit master data						
Data point	Modbus register	Name	Description	Input range	Default	Unit
301	40302	LTG_UNIT_SOFTWARE1	Software version Main and subversion	0...9999	-	-
302	40303	LTG_UNIT_SOFTWARE2	Software version Build no.	0...9999	-	-
303	40304	LTG_UNIT_SOFTWAREDATE	Version date		-	-
		Legend: 7bit year 4bit month 5bit day				
304	40305	LTG_UNIT_HW_SERN01	Hardware serial number circuit board HighByte	0...9999		
305	40306	LTG_UNIT_HW_SERN02	Hardware serial number board LowByte	0...9999		
306	40307	LTG_UNIT_SOFTWARE_FVP	Software version FVP	0...9999	-	-

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LTG_UNIT_STATE

1 = NR-FVP-2L-S-H	28 = NR-FC-2L-W	55 = Eco-HF-4L	82 = Stby-FVP-2L-W-K-N
2 = NR-FVP-2L-S-K-Hot	29 = NR-FC-2L-S	56 = Eco-FVP-2L-W	83 = Stby-FVP-4L-H-Cold
3 = NR-FVP-2L-S-K-N	30 = NR-HF-2L-W	57 = Eco-FVP-2L-S	84 = Stby-FVP-4L-H-N
4 = NR-FVP-2L-W-H-Cold	31 = NR-HF-2L-S	58 = Eco-FVP-4L	85 = Stby-FVP-4L-K-AT-MS
5 = NR-FVP-2L-W-H-N	32 = Eco-FVP-2L-S-H	59 = Eco-FC-2L-W	86 = Stby-FVP-4L-K-AT-N
6 = NR-FVP-2L-W-K-AT-MS	33 = Eco-FVP-2L-S-K-Hot	60 = Eco-FC-2L-S	87 = Stby-FVP-4L-K-N-Hot
7 = NR-FVP-2L-W-K-AT-N	34 = Eco-FVP-2L-S-K-N	61 = Eco-HF-2L-W	88 = Stby-FVP-4L-K-N-N
8 = NR-FVP-2L-W-K	35 = Eco-FVP-2L-W-H-Cold	62 = Eco-HF-2L-S	89 = Stby-FC-2L-S-H
9 = NR-FVP-4L-N-H-Cold	36 = Eco-FVP-2L-W-H-N	63 = NhtL-FVP-AT-GR	90 = Stby-FC-2L-S-N
10 = NR-FVP-4L-H-N	37 = Eco-FVP-2L-W-K-AT-MS	64 = NhtL-FVP-AT-EB	91 = Stby-FC-2L-W-H
11 = NR-FVP-4L-K-AT-MS	38 = Eco-FVP-2L-W-K-AT-N	65 = NhtL-FVP-N	92 = Stby-FC-2L-W-K
12 = NR-FVP-4L-K-AT-N	39 = Eco-FVP-2L-W-K-N	66 = NhtL-FC	93 = Stby-FC-4L
13 = NR-FVP-4L-K-N-Hot	40 = Eco-FVP-4L-H-Cold	67 = NhtL-HF	94 = Stby-HF-2L-S-H
14 = NR-FVP-4L-K-N-N	41 = Eco-FVP-4L-H-N	68 = HybL-FVP-AT	95 = Stby-HF-2L-S-N
15 = NR-FC-2L-S-H	42 = Eco-FVP-4L-K-AT_MS	69 = HybL-FVP-N-Hot	96 = Stby-HF-2L-W-H
16 = NR-FC-2L-S-K	43 = Eco-FVP-4L-K-AT_N	70 = HybL-FVP-N-N	97 = Stby-HF-2L-W-K
17 = NR-FC-2L-W-H	44 = Eco-FVP-4L-K-N-Hot	71 = HybL-FC	98 = Stby-HF-4L
18 = NR-FC-2L-W-K	45 = Eco-FVP-4L-K-N-N	72 = HybL-HF	99 = Stby-FVP-2L-W
19 = NR-FC-4L	46 = Eco-FC-2L-S-H	73 = Transparent Mode 1	100 = Stby-FVP-2L-S
20 = NR-HF-2L-S-H	47 = Eco-FC-2L-S-K	74 = Transparent Mode 2	101 = Stby-FVP-4L
21 = NR-HF-2L-S-K	48 = Eco-FC-2L-W-H	75 = Stby-FVP-2L-S-H	102 = Stby-FC-2L-W
22 = NR-HF-2L-W-H	49 = Eco-FC-2L-W-K	76 = Stby-FVP-2L-S-K-Hot	103 = Stby-FC-2L-S
23 = NR-HF-2L-W-K	50 = Eco-FC-4L	77 = Stby-FVP-2L-S-K-N	104 = Stby-HF-2L-W
24 = NR-HF-4L	51 = Eco-HF-2L-S-H	78 = Stby-FVP-2L-W-H-Cold	105 = Stby-HF-2L-S
25 = Eco-FVP-2L-W	52 = Eco-HF-2L-S-K	79 = Stby-FVP-2L-W-H-N	
26 = Eco-FVP-2L-S	53 = Eco-HF-2L-W-H	80 = Stby-FVP-2L-W-K-AT-MS	
27 = NR-FVP-4L	54 = Eco-HF-2L-W-K	81 = Stby-FVP-2L-W-K-AT-N	

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Key

Operating mode	
NR	Normal control
Eco	Eco mode
Standby	Standby mode
NhtL	Night ventilation mode
HybL	Hybrid ventilation mode

Unit type	
FVP	FVP
FC	Fan coil, fan coil unit
HF	Induction units

Heat exchanger (HE)	
2L	2-pipe heat exchanger
4L	4-pipe heat exchanger

Changeover	
S	Summer
W	Winter

Heating / Cooling	
H	Heating demand
K	Cooling demand

Supply air temperature monitoring	
Hot	Supply air temperature is unexpectedly higher than room temperature (RT)
Cold	Supply air temperature is unexpectedly lower than RT
Normal	Supply air temperature is as expected

Error list

Error message	
0	"No error"
1	"Fan defective"
2	"Valve defective"
3	"Sensor 1 defective"
4	"Sensor 2 defective"
5	"FVP error"
6	"No FVP com"
7	"Condensate msg"
8	"Error 8"
9	"Error 9"
10	"Error 10"
11	"Error 11"
12	"Error 12"
13	"Error 13"
14	"Error 14"
15	"Error 15"
16	"Error Ext. Slave"
17	"Setpoint missing"
18	"Actual value missing"
19	"Modbus error"
20	"Fan speed"
21	"Timeout FVP com"
22	"Supply air too cold"
23	"Supply air too warm"
24	"Condensate full"
25	"FVP filter full"
26	"Cold blow protection"
27	"Note 11"
28	"Note 12"
29	"Note 13"
30	"Note 14"
31	"Note 15"
32	"Note Ext. Slave"

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Verified components

Applications and library entries were developed and mutually tested in collaboration with manufacturers of other field and automation devices. Pre-configured data point lists and applications can be requested for these manufacturers.

Components from the following manufacturers have been tested in:

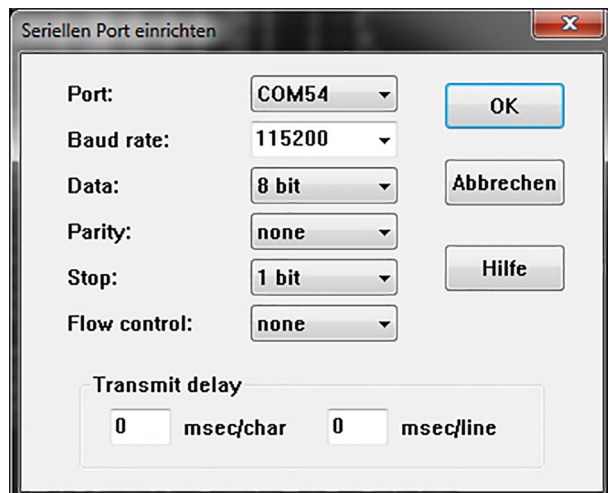
- Deos AG
- Sauter Cumulus GmbH
- Wago
- Siemens
- Thermokon AG

Parameterization

The controller can be connected to a PC or laptop via USB type 2.0 Micro-B. The corresponding parameters can be changed here using a terminal program (e.g., TeraTerm).

TeraTerm user interface

Before establishing the connection, connect the circuit board to the supply voltage (24 V DC). Connect the controller to a PC using a USB cable and connect (open) via TeraTerm. The COM port and interface parameters must be set via „Settings“ and „Serial Port.“ The interface parameters are: 115200 baud 8N1 (8 bits, no parity, 1 stopbit).



All available commands can be displayed by entering „h“ or „help“.

```
-----
Help MB (H 200) V0.60.54 2019/06/26 10:49:40
-----

help - Commands (help XXX fuer Details)
dp [read / write]
na [nr] [wert]
param [nr] [wert]
daten [nr] [wert]
dir [sd]
cd [Pfad]
copy [Name]
rm [Name]
rename [alt] [neu]
mb [copy / read / clear / master / slave]
ntc [wert]
fan [wert]
ana [Kanal]
kal <Kanal> <Null> <Offset> <Gain>
io
inp
heizen [wert]
kuehlen [wert]
fvp [String]
adm
deb <bits>
reset
d(ump) <adr> [<anz>dez] Gibt <anz> Byte von <adr> aus
ta(sk) zeigt Tasks und Stackusing
segment <adr> setzt die Segmentadresse
SNr <val> setzt die Seriennummer
```

To display the set parameters, the parameter list can be output using the „param“ command.

```
MB >param
```

NO	NAME	VAL	MIN	MAX	Str	len	typ	PNr	Ma	urcnt	tr	Wert
0:	Betriebsart	= 6	0	7	0	0	3	1	1	0	x	Transparentmode1
1:	Change Over	= 1	0	1	9	0	3	2	0	995	-	Sommer
2:	Soll Raumtemperatur	= 24.0	15.0	40.0	12	1	0	3	1	0	x	24.0
3:	Ist Raumtemperatur	= 0	0	60.0	13	1	0	4	1	0	x	0.0
4:	CO2 Istwert	= 4933	0	3000	14	0	0	5	1	0	x	4933
5:	Aussenlufttemp.	= 20.0	-50.0	100.0	15	1	1	6	0	0	x	20.0
6:	Sollabweichung RT	= 0	0	60	16	1	0	7	0	0	x	0.0
7:	Presenz	= 0	0	1	17	0	3	8	0	0	x	leer
8:	CO2 Sollwert	= 900	400	2000	20	0	0	9	0	0	-	900
9:	Th: soll fan (Z)	= 0	0	100	21	0	0	10	0	0	-	0
10:	Th: soll haet(Z)	= 0	0	100	22	0	0	11	0	0	-	0
11:	Th: soll cool(Z)	= 0	0	100	23	0	0	12	0	0	-	0
12:	Th: soll fan Stufe	= 0	0	3	24	0	0	13	0	0	-	0
13:	Vorlauftemperatur	= 20.0	0	100.0	25	1	0	14	0	0	x	20.0
14:	Zulufttemperatur	= 20.0	0	100.0	26	1	1	15	0	0	x	20.0
15:	Fensterstellung	= 0	0	1	27	0	3	16	0	0	x	geschlossen
16:	Kondensat	= 0	0	1	30	0	3	17	0	0	x	kein
17:	MasterSlaveOP	= 1	0	1	33	0	3	18	1	0	x	gegenseitig
18:	FVP BArt	= 3	0	3	36	0	3	19	1	0	x	Pulsbetrieb
19:	Uhrzeit	= 0	0	43200	41	0	12	20	0	0	x	00:00:00
20:	Changeover Delay(s)	= 200	0	300	42	0	0	101	0	0	-	200
21:	TIME DELAYVoccupy(s)	= 0	0	30	43	0	0	102	0	0	-	0
22:	TIME DELAYHybrid(s)	= 0	0	30	44	0	0	103	0	0	-	0
23:	T HIGH STANDBY(0..1C)	= 99.0	15.0	99.0	45	1	0	104	0	0	-	99.0
24:	T HIGH ECO(0..1C)	= 28.0	15.0	99.0	46	1	0	105	0	0	-	28.0
25:	T LOW STANDBY(0..1C)	= 7.0	5.0	40.0	47	1	0	106	0	0	-	7.0
26:	T LOW ECO(0..1C)	= 16.0	5.0	40.0	48	1	0	107	0	0	-	16.0
27:	RT Totzone	= 20	0	100	49	1	0	108	0	0	-	2.0
28:	RT P Faktor	= 50	0	100	50	0	0	109	0	0	-	50
29:	RT Inex	= 50	0	100	51	0	0	110	0	0	-	50
30:	RT I Faktor	= 50	0	100	52	0	0	111	0	0	-	50
31:	RT D Faktor	= 0	0	100	53	0	0	112	0	0	-	0
32:	CO2 Aus Hyst.(ppm)	= 200	0	2000	54	0	0	113	0	0	-	200
33:	Min Heizausgang	= 0	0	100	55	0	0	114	0	0	-	0
34:	FVP PresuraDelta(Pa)	= 20	0	200	56	0	0	115	0	0	-	20
35:	FVP TDiff Free(0..1K)	= 40	0	1000	57	1	0	116	0	0	-	4.0

Technical brochure

Decentralized control intelligence LTG Connected Intelligence

A shortened display with the most important values can be called up using the „daten“ command.

```
MB >daten
```

NO	NAME	VAL	Str	len	typ	PMr	tr	Hert
0:	Reglerstatus	=	56	162	81	3	411	× Transparent Mode 1
1:	Fehlertext	=	17	245	32	3	416	- Sollwert fehlt
2:	Stoerungen [hex]	=0x0000	279	0	10		429	- 0
3:	Hinweise [hex]	=0x0001	280	0	10		430	- 1
4:	Soll Liste[hex]	=0x0071	281	0	10		431	- 113
5:	Ist Liste [hex]	=0x0000	282	0	10		432	- 0
6:	FVP Fehlernummer	=	0	283	0	0	433	- 0
7:	Heizventil [X]	=	0	284	0	0	400	× 0
8:	Kuehlventil [X]	=	0	285	0	0	401	× 0
9:	FVP:Zulufttemp.	=	0	286	1	1	402	× 0.0
10:	FVP:Einatmtemp.	=	0	287	1	1	0	- 0.0
11:	Volumen [qm]	=	0	288	0	6	403	-
12:	Volumen [qm]	=	0	288	0	7	404	- 0
13:	BetriebsStd [h]	=	0	289	0	6	405	-
14:	BetriebsStd [h]	=	1	289	0	7	406	- 1
15:	Betriebszeit [s]	=	2885	290	0	0	0	- 2885
16:	Heizenergie [Wh]	=	0	291	0	6	407	-
17:	Heizenergie [Wh]	=	0	291	0	7	408	- 0
18:	Kuehlenergie [Wh]	=	0	292	0	6	409	-
19:	Kuehlenergie [Wh]	=	0	292	0	7	410	- 0
20:	Min. Zulufttemp.	=	0	293	1	1	412	- 0.0
21:	Max. Zulufttemp.	=	0	294	1	1	413	- 0.0
22:	Drehzahl FC Fan [X]	=	0	295	0	0	414	× 0
23:	Drehzahl FVP Fan[X]	=	0	296	0	0	415	× 0
24:	FC Drehzahl [U/min]	=	0	297	0	0	0	- 0
25:	FVP Drehzahl[U/min]	=	0	298	0	0	0	- 0
26:	Betrieb On/Off	=	1	299	1	3	417	- Ein
27:	Kondensatswaechter	=	0	302	1	3	418	× inaktiv
28:	FVP Filterwechsel	=	0	305	1	3	422	× inaktiv
29:	U111 f00h01	=	65535	208	2	0	0	- 65535

To evaluate the Modbus data, various displays can be called up using the „deb <bits>“ command.

```
MB >h deb
```

```
-----
Help MB (H 200) V0.60.54 2019/06/26 10:49:40
-----
```

```
deb <bits> Debugausgaben bitgesteuert aktivieren
0x00000001: allgemein
0x00000002: Statusablauf
0x00000004: Monitor Ablauf
0x00000008: Steuerung Ablauf
0x00000010: MB Master Write
0x00000020: Status Steuerung Verlauf
0x00000040: MB Slave Protokoll
0x00000080: MB Master Protokoll
0x00000100: MB Protokoll
0x00000200: FRAM Protokoll
0x00000400: FLASH / SPI Protokoll
0x00000800: MB Daten Protokoll
0x00001000: Status aktuell komplett 1 mal ausgeben
0x00002000: MB Write und Fehlerdaten
0x00004000: MB 485 Sende Daten
0x00008000: MB Master Zeiten Protokoll
0x00010000: FVP Rec. Daten Protokoll
0x00020000: FVP Snd. Daten Protokoll
0x00040000: FVP Status Protokoll
0x00080000: FVP Vorgabe Daten
```

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Decentralized control intelligence LTG Connected Intelligence

Working with SD card

Software

Copy the software to the SD card and rename it to *MB_Soft.hex*.

Insert SD card and perform reset (file is copied, watch the red LED!).

Then remove the SD card and perform a reset (the boot loader boots the new version).

Parameter set

Copy the parameter set to the SD card and rename it to *DP_liste.txt*. Insert the SD card and perform a reset (the file will be copied; note the red LED!). Then remove the SD card and perform a reset (the bootloader will boot the new version).

Structure of the *DP_liste.txt* file

Only the parameters to be changed need to be written in the text file. These can be taken from the „Unit configuration data“ table (see page 23). All parameters not included will not be overwritten.

```
DP[201] = 1
DP[204] = 11
DP[210] = 0
DP[216] = 2
```

Modbus master addressing

Copy the software to the SD card and rename it to *MBMaster.csv*. Insert the SD card and perform a reset (the file will be copied; note the red LED!). Then remove the SD card and perform a reset (the bootloader will boot the new version).

Structure of the *MBMaster.csv* file

In *MBMaster.csv*, data points can be linked to the data points of the slave participants. Templates for file for many products from different manufacturers are available from your LTG sales representative.

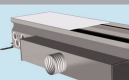
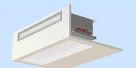
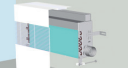
Variable	Source R	Source Adr	Master R	Factor	Slave1 R	Adr	Factor
RT_Setpoint cooling	30513	5	77775	1000	0	0	1000
RT_Setpoint heating	30512	5	77775	1000	0	0	1000
RT_Setpoint MW	77775	20	40004	1000	40004	32	1000
RT_Actual	30515	5	40005	1000	40005	32	1000
Presence	30522	5	40009	1000	40009	32	1000
Window	40425	32	40017	1000	40017	32	1000
Condensate	40018	20	0	1000	40018	32	1000

LED signals

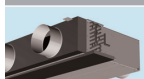
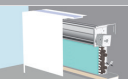
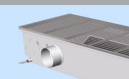
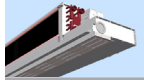
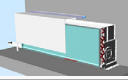
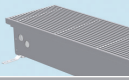
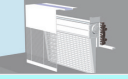
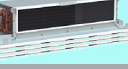
LED	Color	Signal	Description
Power (H200)	Bright green	Steady light	Power supply connected
LED green (H500)	Green	Flashes "x" times with pauses	Operating mode 1-7
LED yellow (H501)	Yellow	Flashes	Correct signal received via Modbus
LED red (H502)	Red	Steady light	Reading/writing SD card (do not interrupt)
		Slowly flashing	Warning, e.g., filter
		Flashing rapidly	Error/malfunction

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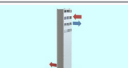
LTG Induction – Induction units

Ceiling	Sill	Floor
 HFF <i>suite</i> SilentSuite	 HFV <i>sf</i> System SmartFlow	 HFB / HFB <i>sf</i> System SmartFlow
 HFG-0/D	 HFG	

LTG FanPower – Fan coil units

Ceiling	Sill	Floor
 VKE	 VFC	 VKB
 VKL	 VFC-N	 SKB
	 QVC	
	 VKL-W	

LTG Decentral – Dezentralized ventilation units

Ceiling / Wall	Sill / Façade	Floor
 FVSEco ₂ <i>School</i>	 FVP <i>pulse</i> -V System PulseVentilation	 FVP <i>pulse</i> -B System PulseVentilation
 FVP <i>pulse</i> -D System PulseVentilation	 FVP <i>pulse</i> -S System PulseVentilation	

Engineering Services

	LTG Engineering Services Comfort Air Technology
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