NORDcanopy

UV Integrated Cleaning System Automation Guide

ETS NORD

Contents

1. UV Building Automation 3
2. P&I Diagram 4
3. Electrical Connection and Example Circuit Breaker Configuration 5
4. UV Control Unit System Modbus Connection 6
5. Master UV Control Unit Operation Permission Signal (BMS) 7
6. Master UV Control Unit Output Signals (BMS) 8
7. Master UV Control Unit Alternative Management 9
8. Master UV Control Unit External Devices Connection Diagram 1 10
9. Master UV Control Unit External Devices Connection Diagram 2 11
10. Master UV Control Unit External Devices Connection Diagram 3 12
11. UV Modbus Register List 13

1. UV Building Automation

UV cleaning system can be combined with building automation using a programmable logic controller (PLC). By combining it with building automation, it is possible to receive notifications about alarms from the Master UV control unit and to control the system by giving it permission to work when the ventilation is turned on.

For setup you will need:

- (Master) UV control unit (UV-L or UV-S)
- Building Management System (PLC)

The UV cleaning system is intended for commercial kitchen usage to help keep the ventilation air cleanliness in the canopy exhaust chamber. UV-L and UV-S control units are used in this UV cleaning system to control UV lamps.

Standard delivery includes:

- Selected quantity of control units (UV-L and/or UV-S) according to the order
- LCD control panel
- Differential pressure sensors according to the order
- Power cables with C13 plugs according to the order
- Lamp cables, protection switch cables and differential pressure sensor cables with canopy sections
- M-Link with connection cable

Optional accessories which can be order from ETS NORD include:

- 4G modem if there is no possibility to use the building local network for Internet connection
- External antenna for 4G modem
- LED notification panel indication of UV Cleaning System state
- Relay box for distribution of signals between LED notification panel and Building Management System Input/Output

Canopy section can be used as a part of multisection canopy or solitary canopy (stand-alone canopy). For the last case the connection cables for UV lamps that are included in standard ETS NORD delivery may not be sufficiently long (default length 10m). For this reason, accessory connection cables are offered by ETS NORD.

NB! Maximum length of cable between control unit and UV lamp is 25 m!

Accessory extention cables with connectors for UV lamps:

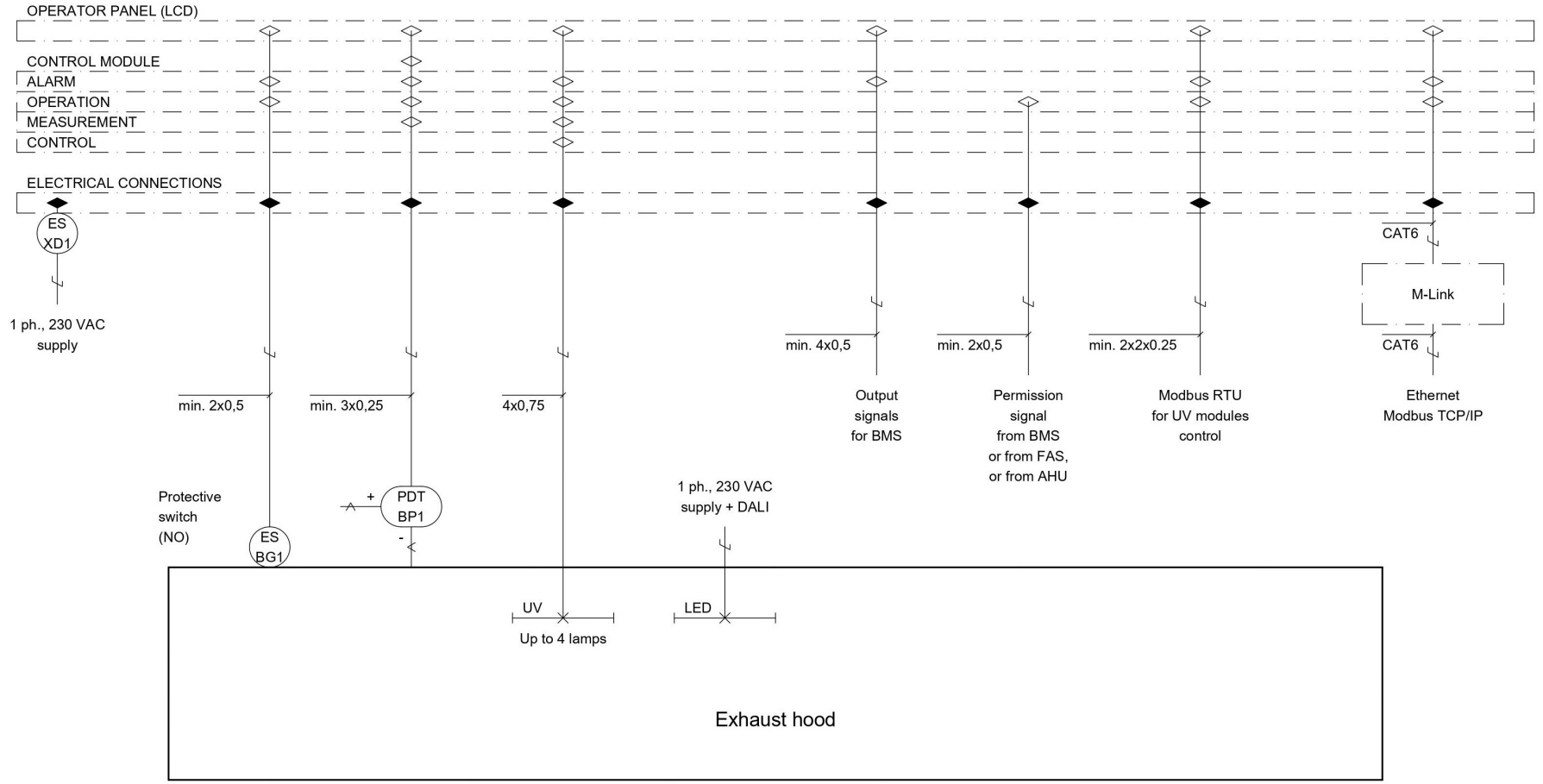
- 3 m
- 5 m
- 15 m

Necessary extension cables are selected by the customer, strongly advise to consult with ETS NORD sales department beforehand.

Cables for protection switches and differential pressure sensors (default length 10m) could be extended by the customer himself (e.g. with connection box and splicing connectors).

Use work permission input only with potential-free output!
All electrical installation works must be done by qualified electricians according to the national regulations.

2. P&I Diagram



Used symbol's explanation

ES XD1 — Electric switch
Circuit diagram reference designation

PDT BP1 — Differential pressure transmitter (sensor)
Circuit diagram reference designation

UV — UV mercury amalgam discharge lamp

LED — LED luminaire for canopy lighting

◆ Physical value

◇ Virtual value

BMS - building management system
FAS - fire alarm system
AHU - air handling unit

3. Electrical Connection and Example Circuit Breaker Configuration

Power and current consumption of UV-cleaning systems

UV - L 1.1

Number of UV-lamps	Type of UV-lamps			
	L = 900 mm		L = 1200 mm	
	Power, W	Current, A	Power, W	Current, A
1	160	0,74	235	1,1
2	310	1,4	460	2,1
3	460	2,1	680	3,1
4	610	2,7	910	4,1

UV - S 1.1

Number of UV-lamps	Type of UV-lamps	
	L = 900 mm	
	Power, W	Current, A
1	185	0,90

UV - S 1.2

Number of UV-lamps	Type of UV-lamps			
	L = 900 mm		L = 1200 mm	
	Power, W	Current, A	Power, W	Current, A
1	190	0,88	232	1,05

Selection of cables and circuit breakers for power supply of HV grease canopies with UV cleaning system

Type of circuit breaker	Cable	Quantity of UV - L	Quantity of UV - S	Possible combination of UV - L + UV - S
C6	3G0,75 mm2 or 3G1,5 mm2 (note 1)	1	3	Not applicable
C10	3G1,5 mm2	1	6	1 UV - L + 3 UV - S
C13	3G1,5 mm2 or 3G2,5 mm2 (note 2)	2	Note 3	1 UV - L + 3 UV - S 2 UV - L + 1 UV - S
C16	3G2,5 mm2	3	Note 3	1 UV - L + 5 UV - S 2 UV - L + 3 UV - S

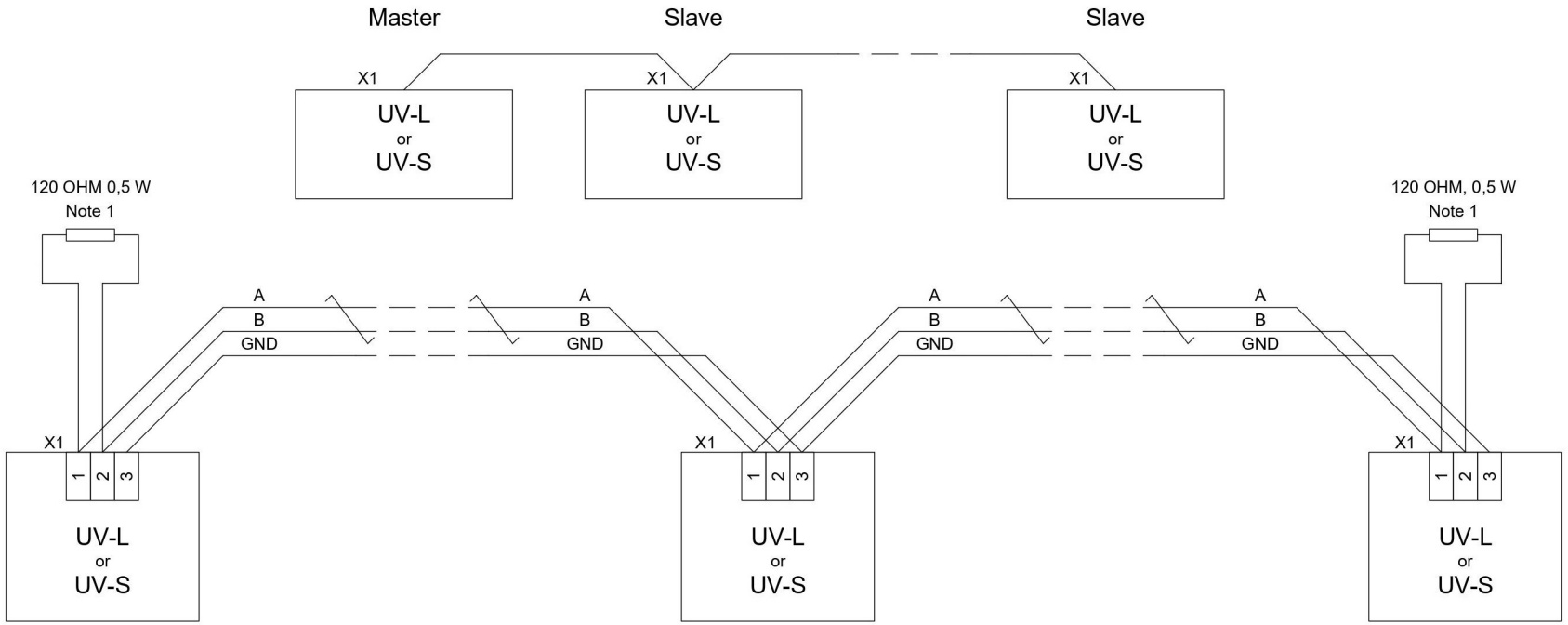
Note 1. Only flexible 3G0,75 mm2 cable can be used according to IEC 60364-5-52; voltage drop from distribution board to device should be taken into account.

Note 2. Cable 3G1,5 mm2 can be used not for installation type A2 according to IEC 60364-5-52; voltage drop from distribution board to device shoud be taken into account.

Note 3. More than 6 UV - S supplied from one circuit breaker are not applicated - one UV cleaning system supports up to 6 UV control units.

4. UV Control Unit System Modbus Connection

Max. 6 UV control units in one system (1 master + 5 slaves)



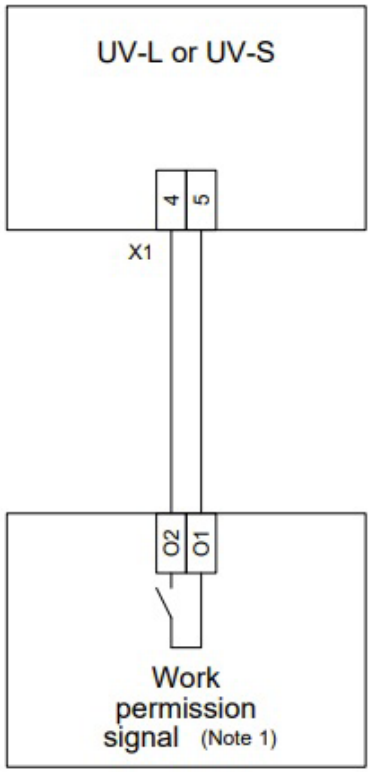
All the cables are installed and connected to the connectors X1 at the installation site by the customer.

Use twisted pair cables (shielded are preferable) for Modbus connections (e.g. CAT5E, CAT6, NOMAK 2x2x0,5+0,5, JAMAK 2x(2+1)x0,5). Maximum cable core cross-section is 0,5 mm2. Cables are supplied by the customer.

Connect shielding of whole Modbus cabling to the earth only at one place (it is convenient at the Modbus master X1:4 terminal).

Note 1. It is recommended to use termination resistors for good signal propagation. They should be installed at both ends of network.

5. Master UV Control Unit Operation Permission Signal (BMS)



Use potential-free contacts

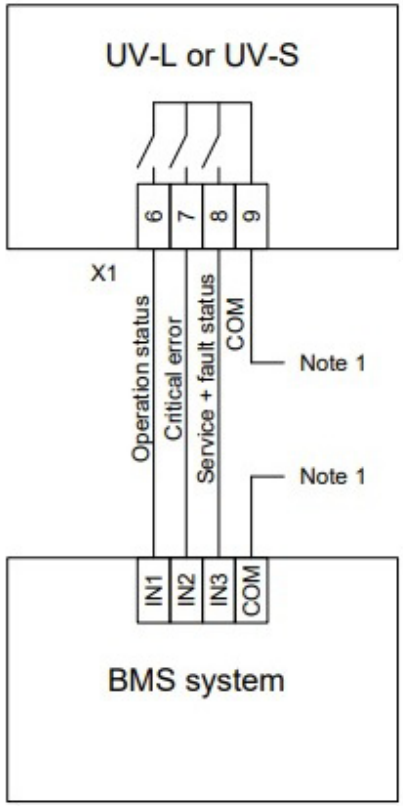
These connections are only used for the UV master or single control unit.
Single control unit is the only control unit in the UV cleaning system without slave control units.

All the cables are supplied, installed and connected to the connectors X1 at the installation site by the customer.

Terminals 4 , 5 of X1 connector are potential-free relay contacts: max. 160 V AC/DC, 5 A.
Max. cable core cross-section is 1,5 mm2 (solid conductors) for X1 connector.

Note 1. The work permission signal can be applied, for example, from a fire alarm system, building automation system or a building ventilation control system.

6. Master UV Control Unit Output Signals (BMS)



BMS - building management system.

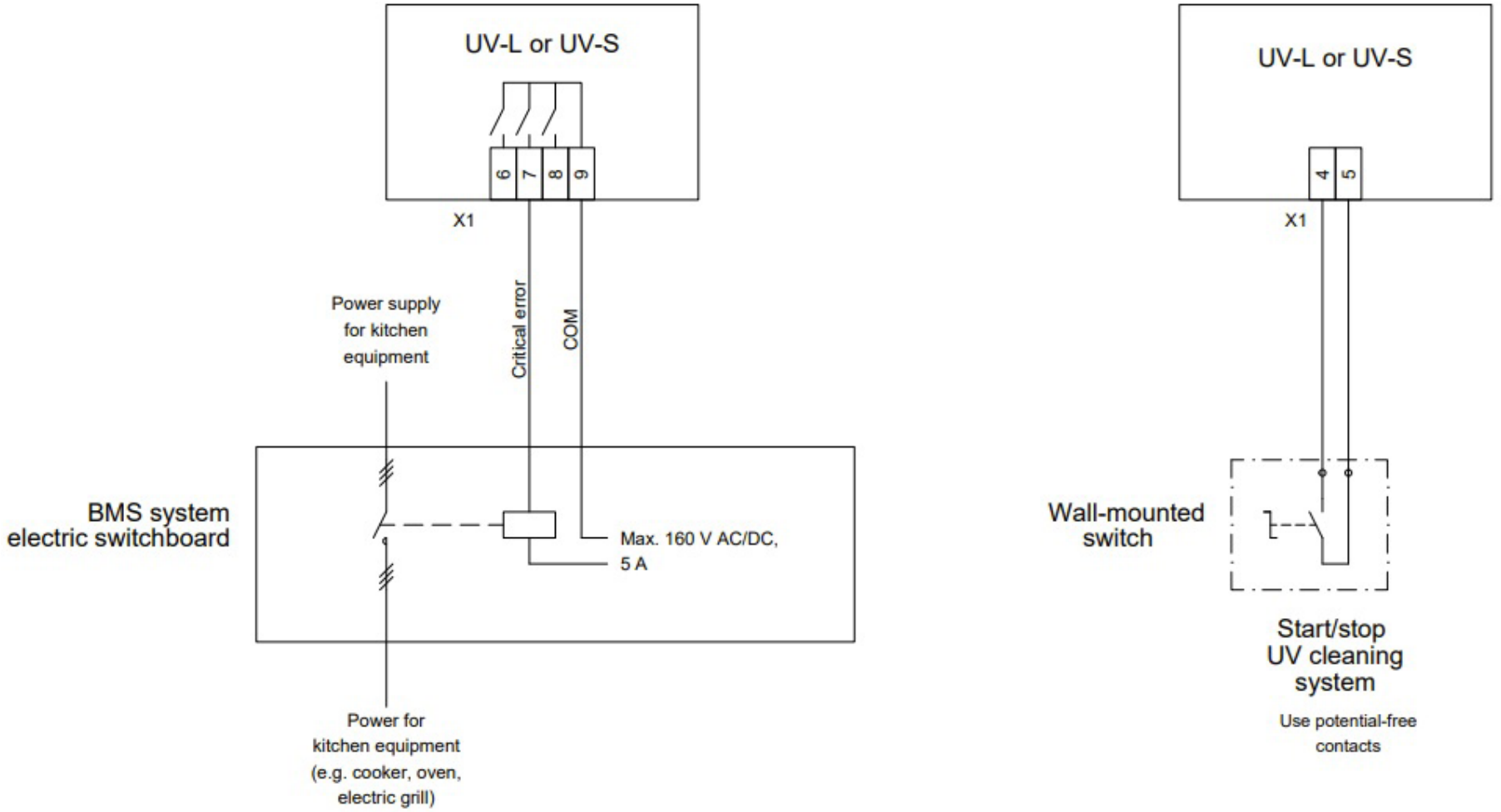
These connections are only used for the UV master or single control unit.
Single control unit is the only control unit in the UV cleaning system without slave control units.

All the cables are supplied, installed and connected to the connectors X1 at the installation site by the customer.

Terminals 6 , 7 of X1 connector are potential-free relay contacts: max. 160 V AC/DC, 5 A.
Max. cable core cross-section is 1,5 mm2 (solid conductors) for X1 connector.

Note 1. 24V or 0V can be used as COM input depending on the control device inputs (PNP or NPN).
In case of questions, consult with ETS NORD SERVICE department.

7. Master UV Control Unit Alternative Management

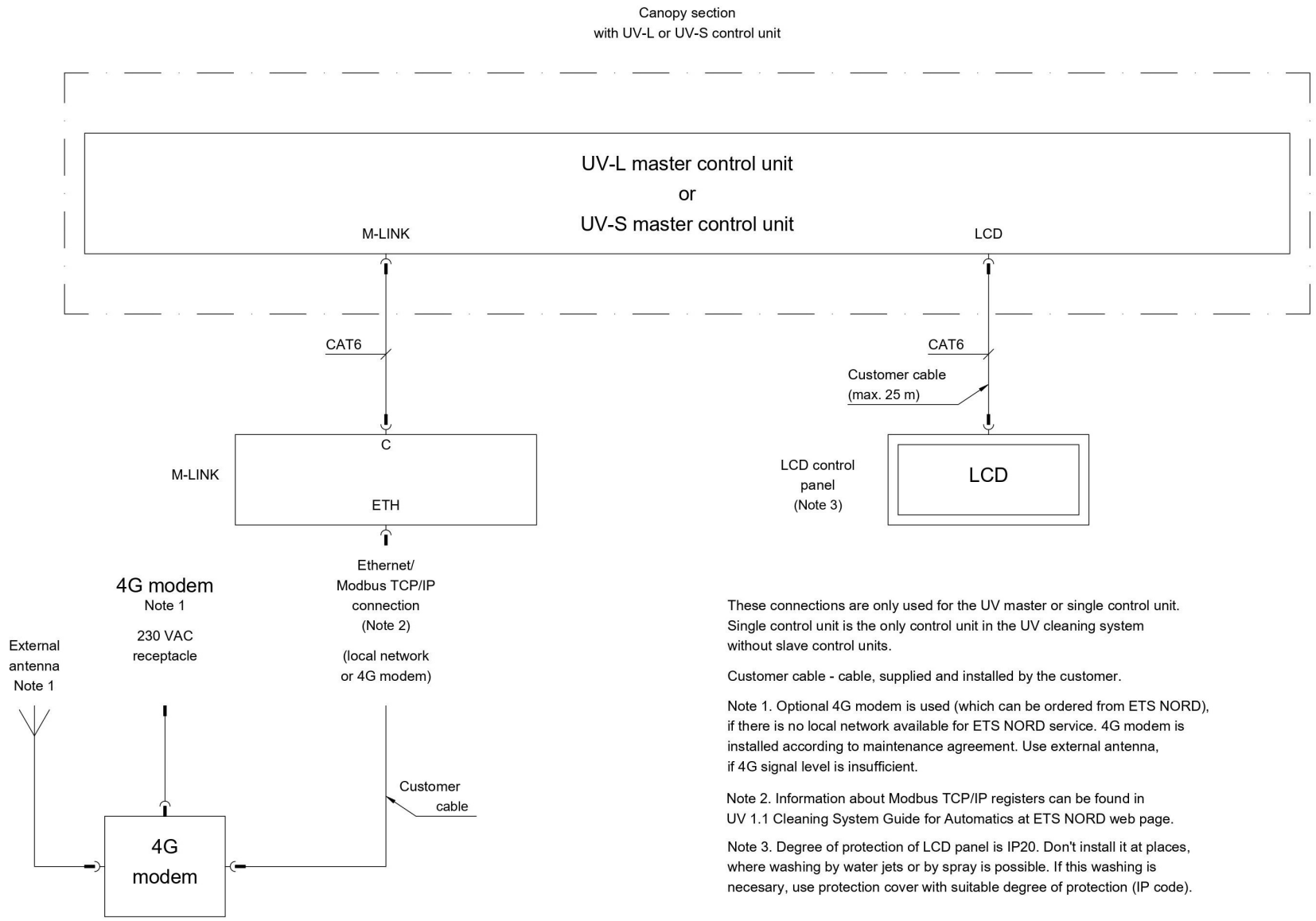


BMS - building management system.

These connections are only used for the UV master or single control unit.
Single control unit is the only control unit in the UV cleaning system without slave control units.

All the cables are supplied, installed and connected to the connectors X1 at the installation site by the customer.
Max. cable core cross-section is 1,5 mm2 (solid conductors) for X1 connector.

8. Master UV Control Unit External Devices Connection Diagram 1



These connections are only used for the UV master or single control unit. Single control unit is the only control unit in the UV cleaning system without slave control units.

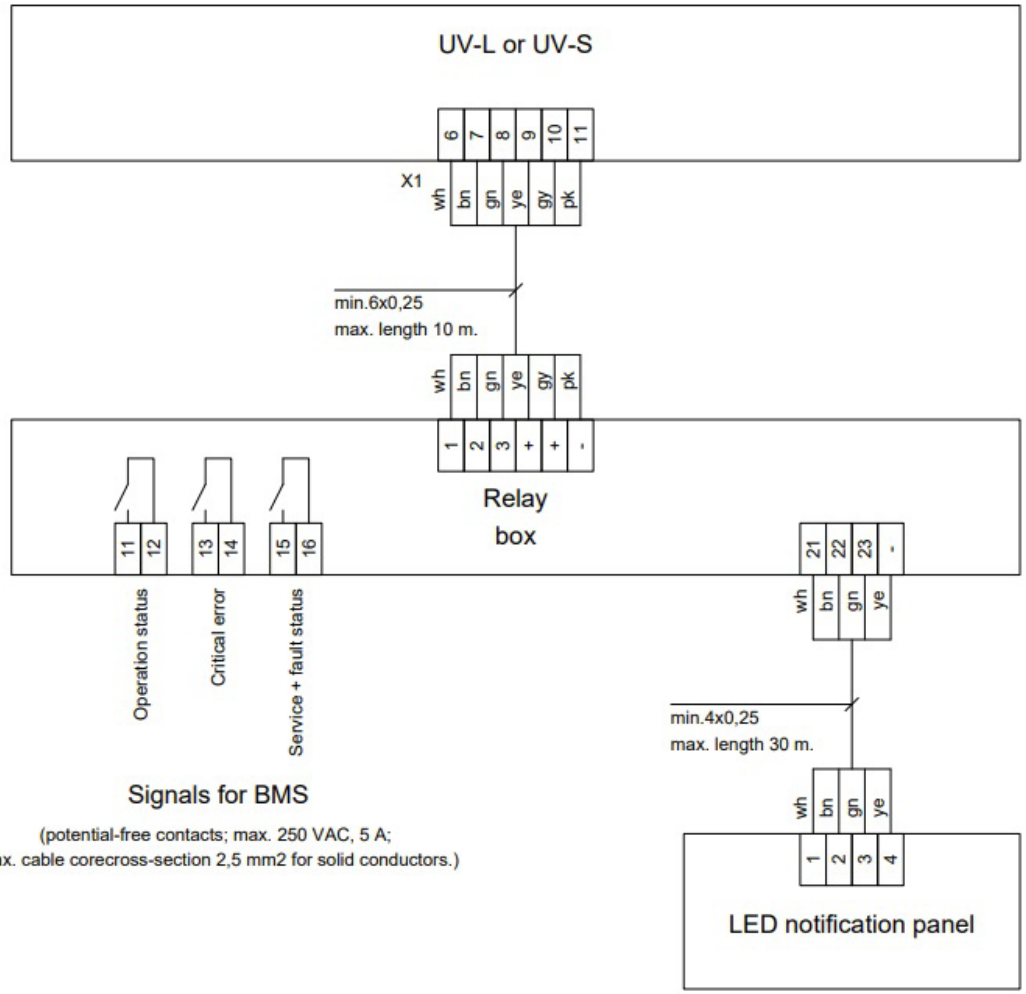
Customer cable - cable, supplied and installed by the customer.

Note 1. Optional 4G modem is used (which can be ordered from ETS NORD), if there is no local network available for ETS NORD service. 4G modem is installed according to maintenance agreement. Use external antenna, if 4G signal level is insufficient.

Note 2. Information about Modbus TCP/IP registers can be found in UV 1.1 Cleaning System Guide for Automatics at ETS NORD web page.

Note 3. Degree of protection of LCD panel is IP20. Don't install it at places, where washing by water jets or by spray is possible. If this washing is necesary, use protection cover with suitable degree of protection (IP code).

9. Master UV Control Unit External Devices Connection Diagram 2



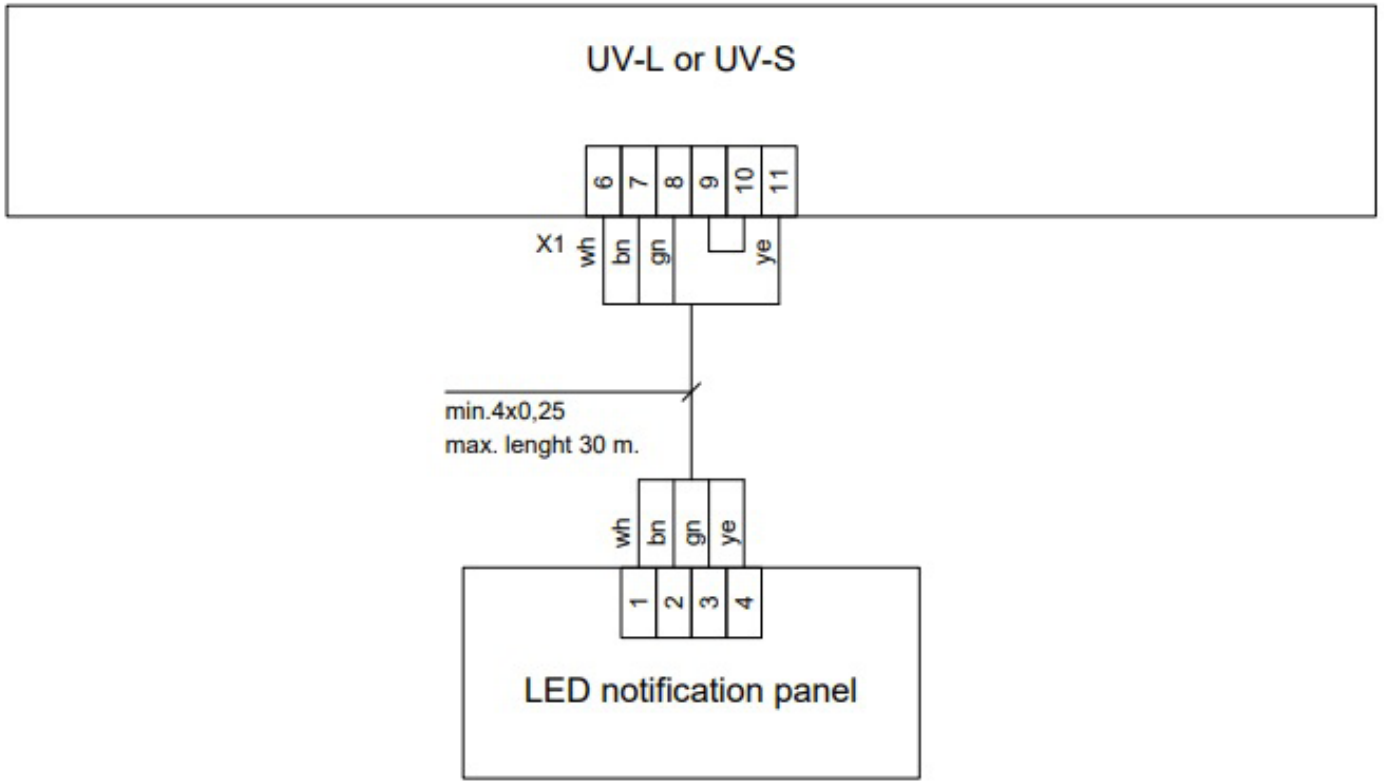
Colours of cable cores are not obligatory!
wh - white
bn - brown
gn - green
ye - yellow
gy - grey
pk - pink

BMS - building management system.

These connections are only used for the UV master or single control unit.
Single control unit is the only control unit in the UV cleaning system without slave control units.

All the cables are supplied, installed and connected to the devices at the installation site by the customer.
Max. cable core cross-section is 1,5 mm2 (solid conductors) for X1 connector.

10. Master UV Control Unit External Devices Connection Diagram 3



Colours of cable cores are not obligatory!
wh - white
bn - brown
gn - green
ye - yellow

These connections are only used for the UV master or single control unit.
Single control unit is the only control unit in the UV cleaning system without slave control units.

All the cables are supplied, installed and connected to the devices at the installation site by the customer.
Max. cable core cross-section is 1,5 mm2 (solid conductors) for X1 connector.

11. UV Modbus Register List

All registers are type HOLDING.
Master UV control unit can be scanned through Modbus TCP/IP network this requires remote access device (M-Link).

If the register points listed below are not reflected correctly in the registers, then please contact ETS NORD service technician. At the time of your application, please add the building automation reading result so that we can better understand the situation.

Abbreviation legend:

R - read W - write RW - read & write D - digital A - analog

Master UV control unit							
Name	Reg.	Object type	Read/ Write	Unit	Address format	Enum	Note
Pressure 1.1	205	A	R	Pa	S16		The pressure difference between the room and the canopy extraction chamber. This reading shows whether the device with the canopy is under negative pressure or not.
Pressure 1.2	206	A	R	Pa	S16		
Pressure 1.3	207	A	R	Pa	S16		
Pressure 1.4	208	A	R	Pa	S16		
Operation status	223	D	R		U16	0 = Off; 1 = On	System is working or not
Critical error	224	D	R		U16	0 = Normal; 1 = Alarm	System hardware faults
Service	225	D	R		U16	0 = Normal; 1 = Alarm	System maintenance status
System work permission	268	D	R		U16	0 = Disabled; 1 = Enabled	System permission status
Airflow 1.1	270	A	R	l/s	S16		Displays the amount of airflow that is passing through the exhaust chamber in the given canopy section.
Airflow 1.2	271	A	R	l/s	S16		
Airflow 1.3	272	A	R	l/s	S16		
Airflow 1.4	273	A	R	l/s	S16		
Time to next service	276	A	R	d	S16		Days left until service A maintenance
Lamp 1 running hours	280	A	R	h	S16		Displays the operating hours of the UV lamp
Lamp 2 running hours	283	A	R	h	S16		
Lamp 3 running hours	286	A	R	h	S16		
Lamp 4 running hours	289	A	R	h	S16		
Contact function	314	D	RW		S16	0 = NO 1 = NC	Connection type used with BMS
Emergency stop input	315	D	RW		S16	0 = Bus 1 = DI 2 = Not used	Connection type used with BMS
Modbus work permission	316	D	RW		U16	0 = Disabled; 1 = Enabled	Remote Modbus permission used when emergency stop input type is **Bus**
System state	328	D	RW		S16	0 = Off 1 = On 2 = Smart Schedule	Stops/starts UV lamps for all units

Slave device registers							
Name	Reg.	Object type	Read/ Write	Unit	Address format	Enum	Note
2nd UV control unit							
Pressure 2.1	404	A	R	Pa	S16		The pressure difference between the room and the canopy extraction chamber. This reading shows whether the device with the canopy is under negative pressure or not.
Pressure 2.2	405	A	R	Pa	S16		
Pressure 2.3	406	A	R	Pa	S16		
Pressure 2.4	407	A	R	Pa	S16		
Operation status	410	D	R		U16	0 = Off; 1 = On	UV control unit 2 is working or not
Critical error	408	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 2 hardware faults
Service	409	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 2 maintenance status
Airflow 2.1	417	A	R	l/s	S16		Displays the amount of airflow that is passing through the exhaust chamber in the given canopy section.
Airflow 2.2	418	A	R	l/s	S16		
Airflow 2.3	419	A	R	l/s	S16		
Airflow 2.4	420	A	R	l/s	S16		
Lamp 1 running hours	423	A	R	h	S16		Displays the operating hours of the UV lamp.
Lamp 2 running hours	426	A	R	h	S16		
Lamp 3 running hours	429	A	R	h	S16		
Lamp 4 running hours	432	A	R	h	S16		
*Device not responding	465	A	R		U16	0 = Normal 1 = Alarm	Connection status is lost when alarm is active
*This alarm has its own 16-bit register, where the last number (LSB 1) shows the status of the alarm. In other words, the inactive alarm is displayed in the register as such: $36_{10} = 24_{16} = 10010\mathbf{0}$ (the red number indicates the alarm status).							
3rd UV control unit							
Pressure 3.1	504	A	R	Pa	S16		The pressure difference between the room and the canopy extraction chamber. This reading shows whether the device with the canopy is under negative pressure or not.
Pressure 3.2	505	A	R	Pa	S16		
Pressure 3.3	506	A	R	Pa	S16		
Pressure 3.4	507	A	R	Pa	S16		
Operation status	510	D	R		U16	0 = Off; 1 = On	UV control unit 3 is working or not
Critical error	508	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 3 hardware faults
Service	509	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 3 maintenance status
Airflow 3.1	517	A	R	l/s	S16		Displays the amount of airflow that is passing through the exhaust chamber in the given canopy section.
Airflow 3.2	518	A	R	l/s	S16		
Airflow 3.3	519	A	R	l/s	S16		
Airflow 3.4	520	A	R	l/s	S16		

Slave device registers							
Name	Reg.	Object type	Read/ Write	Unit	Address format	Enum	Note
Lamp 1 running hours	523	A	R	h	S16		Displays the operating hours of the UV lamp.
Lamp 2 running hours	526	A	R	h	S16		
Lamp 3 running hours	529	A	R	h	S16		
Lamp 4 running hours	532	A	R	h	S16		
*Device not responding	565	A	R		U16	0 = Normal; 1 = Alarm	Connection status is lost when alarm is active
*This alarm has its own 16-bit register, where the last number (LSB 1) shows the status of the alarm. In other words, the inactive alarm is displayed in the register as such: $36_{10} = 24_{16} = 10010$0 (the red number indicates the alarm status).							
4th UV control unit							
Pressure 4.1	604	A	R	Pa	S16		The pressure difference between the room and the canopy extraction chamber. This reading shows whether the device with the canopy is under negative pressure or not.
Pressure 4.2	605	A	R	Pa	S16		
Pressure 4.3	606	A	R	Pa	S16		
Pressure 4.4	607	A	R	Pa	S16		
Operation status	610	D	R		U16	0 = Off; 1 = On	UV control unit 4 is working or not
Critical error	608	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 4 hardware faults
Service	609	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 4 maintenance status
Airflow 4.1	617	A	R	l/s	S16		Displays the amount of airflow that is passing through the exhaust chamber in the given canopy section.
Airflow 4.2	618	A	R	l/s	S16		
Airflow 4.3	619	A	R	l/s	S16		
Airflow 4.4	620	A	R	l/s	S16		
Lamp 1 running hours	623	A	R	h	S16		Displays the operating hours of the UV lamp.
Lamp 2 running hours	627	A	R	h	S16		
Lamp 3 running hours	629	A	R	h	S16		
Lamp 4 running hours	632	A	R	h	S16		
*Device not responding	665	A	R		U16	0 = Normal; 1 = Alarm	Connection status is lost when alarm is active
*This alarm has its own 16-bit register, where the last number (LSB 1) shows the status of the alarm. In other words, the inactive alarm is displayed in the register as such: $36_{10} = 24_{16} = 10010$0 (the red number indicates the alarm status).							
5th UV control unit							
Pressure 5.1	704	A	R	Pa	S16		The pressure difference between the room and the canopy extraction chamber. This reading shows whether the device with the canopy is under negative pressure or not.
Pressure 5.2	705	A	R	Pa	S16		
Pressure 5.3	706	A	R	Pa	S16		
Pressure 5.4	707	A	R	Pa	S16		
Operation status	710	D	R		U16	0 = Off; 1 = On	UV control unit 5 is working or not
Critical error	708	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 5 hardware faults

Slave device registers							
Name	Reg.	Object type	Read/ Write	Unit	Address format	Enum	Note
Service	709	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 5 maintenance status
Airflow 5.1	717	A	R	l/s	S16		Displays the amount of airflow that is passing through the exhaust chamber in the given canopy section.
Airflow 5.2	718	A	R	l/s	S16		
Airflow 5.3	719	A	R	l/s	S16		
Airflow 5.4	720	A	R	l/s	S16		
Lamp 1 running hours	723	A	R	h	S16		Displays the operating hours of the UV lamp.
Lamp 2 running hours	727	A	R	h	S16		
Lamp 3 running hours	729	A	R	h	S16		
Lamp 4 running hours	732	A	R	h	S16		
*Device not responding	765	A	R		U16	0 = Normal; 1 = Alarm	Connection status is lost when alarm is active
*This alarm has its own 16-bit register, where the last number (LSB 1) shows the status of the alarm. In other words, the inactive alarm is displayed in the register as such: $36_{10} = 24_{16} = 10010\mathbf{0}$ (the red number indicates the alarm status).							
6th UV control unit							
Pressure 6.1	804	A	R	Pa	S16		The pressure difference between the room and the canopy extraction chamber. This reading shows whether the device with the canopy is under negative pressure or not.
Pressure 6.2	805	A	R	Pa	S16		
Pressure 6.3	806	A	R	Pa	S16		
Pressure 6.4	807	A	R	Pa	S16		
Operation status	810	D	R		U16	0 = Off; 1 = On	UV control unit 6 is working or not
Critical error	808	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 6 hardware faults
Service	809	D	R		U16	0 = Normal; 1 = Alarm	UV control unit 6 maintenance status
Airflow 6.1	817	A	R	l/s	S16		Displays the amount of airflow that is passing through the exhaust chamber in the given canopy section.
Airflow 6.2	818	A	R	l/s	S16		
Airflow 6.3	819	A	R	l/s	S16		
Airflow 6.4	820	A	R	l/s	S16		
Lamp 1 running hours	823	A	R	h	S16		Displays the operating hours of the UV lamp.
Lamp 2 running hours	827	A	R	h	S16		
Lamp 3 running hours	829	A	R	h	S16		
Lamp 4 running hours	832	A	R	h	S16		
*Device not responding	865	A	R		U16	0 = Normal; 1 = Alarm	Connection status is lost when alarm is active
*This alarm has its own 16-bit register, where the last number (LSB 1) shows the status of the alarm. In other words, the inactive alarm is displayed in the register as such: $36_{10} = 24_{16} = 10010\mathbf{0}$ (the red number indicates the alarm status).							

The UV cleaning system is made up of one Master UV control unit and up to five Slave UV control units (addresses 2-6).

Using register ***"System state"*** you can turn the entire system on or off. When you wish to use the BMS to provide a work permission to the system that will allow the UV control units to work according to the ventilation schedule, then you need to use the following registers:

- ***"Emergency stop input"*** to specify whether it's a cable connection (DI) or not (Bus)
- ***"Contact function"*** to specify whether the cable connection is normal open (NO) or normal close (NC).
- ***"Modbus work permission"*** to give the disable or enable command when BMS connection is not physical (cable).
- Register ***"System work permission"*** indicates whether the UV cleaning system has a work permission from the BMS or not.

Example: ***"System state"*** value is ***On***, ***"Emergency stop input"*** value is ***DI*** and the ***"Contact function"*** is ***NO***. Now you can operate the system using the work permission.

Register ***"Operation status"*** indicates the whole system state. For instance, if UV control unit 2 is not working the system operation status is ***On*** because all other units are operational.

Register ***"Critical error"*** indicates whether there is a faulty unit in the system or not. For instance, if UV control unit 2 is experiencing a critical error, then the critical error state is ***Alarm***.

Register ***"Service"*** indicates whether a unit needs maintenance or not. For instance, if UV control unit 2 has reached its required maintenance time, then the service state is ***Alarm***.

Register ***"Time to next service"*** indicates how many days are left until service type A (days) is needed to be performed on the UV control units. Once the days have reached 0 an alarm will be automatically activated that will notify on this maintenance event. The alarm will be active until maintenance has been performed.

If the UV control unit UV-lamp running hours have reached 10 000 hours, then service type B (hours) maintenance needs to be performed on the device. An alarm will be automatically activated that will notify on this maintenance event. The alarm will be active until maintenance has been performed.

If there is a need for BMS to give a more precise overview of the UV control unit maintenance needs, the following example can be used:

Register ***"Time to next service"*** shows how many days are left until UV control unit type A maintenance (days 365). When the days have reached zero, an alarm is automatically activated to notify of this event. The alarm is active until maintenance is performed.

365 calendar days: 0% need for maintenance	182 calendar days: 50% need for maintenance
37 calendar days: 90% need for maintenance	
0 calendar days: 100% need for maintenance	-2 calendar days: 100% need for maintenance and over

Etc. that is, the negative time increases until maintenance is performed on the device and a new update is performed on the Master device during maintenance.

Register ***"Lamp 1 runtime"*** has reached 10,000 hours, the device must have type B maintenance (hours) performed on it. An alarm is automatically activated to inform about this maintenance event. The alarm is active until maintenance is performed - register ***"Service"*** (this register is responsible for the entire UV control unit system).

Each UV control unit has its own lamp working hours - so if the object has more than one UV control unit, BMS can collect their information from the Master UV control unit.

0 h: 0% need for maintenance	5000 h: 50% need for maintenance
9 000 h: 90% need for maintenance	
10 000 h: 100% need for maintenance	12 000 h: 100% need for maintenance and over

Register ***"Critical error"*** - Hardware error in the system - if an error has occurred in the system, then one or two devices in the UV cleaning system are broken.

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