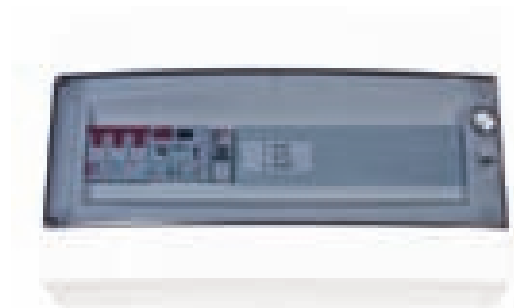




EN

Compact control boxes NVS... CG OPTIMA SUP for supply duct air handling units

Compact control boxes NVS... CG 0-2 for exhaust ventilating units

Operation and Maintenance manual



Control boxes NVS... CG OPTIMA SUP and NVS... CG 0-2 are designed according to the European standards: EN 60335-1; EN 60439-1; EN 60439-3; EN 50082-1; EN 50081-1

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I. USER'S MANUAL

INTRODUCTION - NVS... CG OPTIMA SUP



Type:

Appliance with electronic controller and text HMI, capable of programmed operation according to the calendar.

Application:

Protection and control of supply duct air handling units equipped with:

- single fan set with direct starting motor
- single air damper
- cooler and heater

Range of operation:

NVS 23 CG OPTIMA SUP - unit with 0,55kW motor

NVS 39 CG OPTIMA SUP - unit with 1,1kW motor

NVS 65 CG OPTIMA SUP - unit with 2,2kW motor

NVS 80 CG OPTIMA SUP - unit with 4,0kW motor

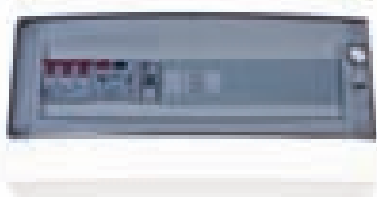
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Note! For further information refer to USER'S MANUAL NVS CG OPTIMA

Note! NVS ventilating units can optionally operate with frequency converters and different type of control boxes. In such case refer to respective chapter of „Compact control gear for Supply and Supply-Exhaust Air Handling Units“.

INTRODUCTION - NVS... CG 0-2



Type:

Simplified appliance without electronic controller or HMI.

Application:

Protection and control of exhaust duct exhaust units equipped with:

- single fan set with direct starting motor
- single air damper

Range of operation:

NVS 23 CG 0-2 - unit with 0,55kW motor

NVS 39 CG 0-2 - unit with 1,1kW motor

NVS 65 CG 0-2 - unit with 2,2kW motor

NVS 80 CG 0-2 - unit with 4,0kW motor



Note! Exhaust control box can operate together with supply control box, making uniform supply-exhaust system.

Note! For further information refer to USER'S MANUAL NVS CG 0-2

USER'S MANUAL NVS CG 0-2

1. DESCRIPTION OF CONTROLS

MAINS SWITCH



Function:

Switching the control box On / Off

MOTOR SWITCH



Function:

Overload and short circuit protection of the motor. If tripped or turned off, the motor is disconnected and stopped and the damper is being closed.

The alarm signal from voltage-free contact, can be sent to another devices.

Note! The switch is not intended for starting / stopping the motor. This functionality is controlled via the contactor and the control mode switch.

Note! The state of the motor switch doesn't affect operation of the contactor directly.



Observe the setting of the motor switch. Must be identical to the rated current of protected motor.

CONTROL MODE SWITCH



O - STOP
Fan turned off.



I - AUTO
Unit in automatic mode. Can be started remotely via terminal X1:4
See the electrical diagrams for further details. External source of 24V AC or X1:1 voltage can be used.

	Note! Auto mode should be used to control exhaust unit from the supply control box NVS... CG OPTIMA.
	II - START Fan turned on.

Note! For details of connection, refer to control box diagrams and to application diagrams included by the end of that manual. Connection as a secondary unit to NVS CG OPTIMA is also included there.

USER'S MANUAL NVS CG OPTIMA

1. DESCRIPTION OF CONTROLS

MAINS SWITCH



Function:

Switching the control box On / Off

MOTOR SWITCH



Function:

Overload and short circuit protection of the motor. If tripped or turned off, the motor is disconnected and the signal is sent to the controller in order to trigger an alarm and stop the operation of the air handling unit.

Note! The switch is not intended for starting / stopping the motor. This functionality is controlled via the contactor and the controller.



Observe the setting of the motor switch. Must be identical to the rated current of protected motor.

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SIGNALLING CONTROLLER STATUS

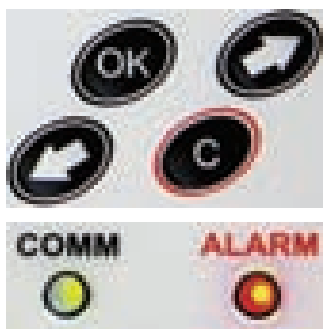
By the top edge of the PCB there are two LED indicators:

1. **Red – ALR** – to indicate the alarm conditions of the controller or the application
 - a. **Off** – if no alarms are recognized
 - b. **Blinking** – in case of alarm conditions
2. **Green – COMM** – to indicate the state of Modbus Master communication line
 - a. **Off** – no communication, HMI OPTIMA not connected
 - b. **Blinking** – in case of stable communication



1. All control boxes of the NVS CG OPTIMA typeline need to be powered from the main switchgear equipped with appropriate protection of wires powering the control box.
2. Assembly, wiring and start-up of the control gear should be done by qualified staff only.
3. Control boxes NVS CG OPTIMA are intended only for indoor operation.

CONTROL PANEL HMI OPTIMA



LCD Display

Displaying available parameters, settings and current values

Top line – name of the parameter

Bottom line – value or selected option

Note! If the text length exceeds the line limit, the text begins to scroll.

Keypad

- Left / Right arrows

to navigate across the menus and to change the parameter value

- OK

to enter another level of the menu, to enter parameters, to approve and save changed settings, to acknowledge alarms

- C

to leave current menu level, to cancel settings and selections

Note! The mark → shows a link to the next screen. Push OK to enter.

Keep the [OK] button pressed for approx. 3 seconds to enter internal HMI menu

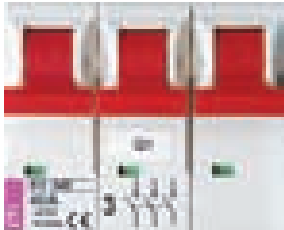
Keep the [C] button pressed for approx. 3 seconds to enter Alarm menu

Refer to Advanced Manual for details.

Inbuilt temperature sensor

Measurement of room temperature.

Note! Mind the proper installation and placing of the HMI SIMPLE if it is intended to measure room temperature in the reliable way.

	LED Indicators Alarm and Comm. Indication of the unit and HMI state • both Off – no power supply, lost communication with the controller, HMI malfunction possible • Comm blinking green – correct and stable communication with the controller • Alarm flashing red – new alarm needs to be acknowledged • Alarm permanent red – acknowledged alarm requires further actions to remove the cause of the problem
Function: • Air handling unit operation, parameterization and maintenance • Selection of control application • Access to operation parameters of the AHU subassemblies • Time zones setting • Displaying and canceling alarm statuses, viewing alarm history	
	<i>Parameters available in the LCD window depends on a AHU type and the control application. Hence in AHUs not equipped with heater, options related to the heating module will not be visible.</i>
SYSTEM START-UP	
	<i>Operation of the AHU is strictly arrested by the fire-protection alarm, activation of the thermal protection of fans' motors and threefold activation of the anti-frost thermostat. Each of these events requires removing the cause of the alarm and then canceling it (see more details in Advanced Manual).</i>
SWITCHING ON POWER SUPPLY	
	
Switching on power supply of the control gear with the mains switch (Q1M). Correct controller operation is indicated by green LED "COMM" blinking on the PCB inside the control box and on the HMI SIMPLE device. The system is ready for operation immediately after switching on.	
QUICK START	
For quick access there are four screens with the most basic information and settings. These are sufficient for daily operation. To run the unit quickly just do: • Check the Unit state screen Stop means, the unit is already configured, free of alarms and other malfunctions and is ready to run • Check the Temp. setting and put the correct value if necessary • Check the Temp.readout This is current measurement on the main sensor. • Select the Operation mode according to current expectations	Unit state Stop Operation mode Stop Temp. setting 22.0°C

1. **Stop** – unit remains stopped
2. **Stage I** – unit run
3. **Standby** – unit stopped to save energy, but ready for automatic start up, to keep the temperature within specified safe range
4. **Calendar** – unit working automatically, according to the real time clock settings

Temp. readout
23.3°C

2. APPLICATION BASICS

Unit state – indicates the current state of the air handling unit and the control system

- **Stop** – normal stop of the unit
- **Running** – normal operation of the unit with ventilation and heating / cooling enabled according to current unit state and demand
- **Alarm state** – unit in alarm state
- **Fault stop** – unit stopped by a fault
- **Init. heating** – initial heating of the water heater, to prevent from frost alarm during start-up
- **Service mode** – unit ready to change basic settings like application code

Note! That is initial factory setting of the controller. See Advanced Manual for details.

- **Overrun** – special mode for stopping the unit if equipped with DX-cooler, delays stopping the fan, until safe conditions for the heat exchanger are established

Operation mode – used to set the main operating mode from the HMI

- **Stop** – unit stopped
- **Stage I** – unit running

Note! However Stage II can be also selected, it will be automatically forced to Stage I, as direct starting motors run always at one fixed speed and there's no possibility to change the rpm of the fan.

- **Standby** – unit stopped to save energy, but ready for automatic start up, to keep the main temperature within specified safe range
- **Calendar** – unit working automatically, according to the real time clock settings

Temp. setting – setpoint for temperature regulator

- Low limit: 5°C
- High limit: 35°C
- Default: 22°C

Temp. readout – current value of the temperature measured by the main sensor

Unit state
Stop

Operation mode
Stop

Temp. setting
22.0°C

Temp. readout
23.3°C

PARAMETERS →

CALENDAR →

SETTINGS →

SERVICE MENU →

EN / PL / RU →

Change password

v.2.0 31-04-12
VS OPTIMA

PARAMETERS – jump to read out the main working conditions CALENDAR – jump to settings for time scheduled operation SETTINGS – jump to detailed controller configuration SERVICE MENU – jump to fundamental settings of the control system, like application code, used in Service mode of the controller EN / PL / RU – jump to language selection Change password – allows entering specific password to protect the controller from unintended access v.2.0 31-04-12 – application version identifier VS OPTIMA – controller type identifier <i>Note! All the menus are dynamically changed, as they depend on the application settings and the password level</i>	
	<i>If the system did not start, check the F1 protection status</i> <i>Correct device operation depends on the application settings. Choosing and setting up the application should be done by qualified service provider, according to recommendations of Advanced Manual</i>
HMI SETTINGS & CONNECTING TO THE CONTROLLER	
Holding the [OK] button, the internal menu of the HMI can be entered. Choose device – can be used for operation of single HMI with multiple controllers ▪ Only one device – used for 1:1 connection with single controller at fixed address “1” (recommended mode) ▪ Scan devices – searching through the bus to detect all addresses occupied by several controllers Communication period – gap between updating information with the controller. ▪ Low limit: 0.0s ▪ High limit: 10.0s ▪ Default: 0.5s (recommended) Communication timeout – limit for the response from the controller. Check if using converters / repeaters on the communication line. ▪ Low limit: 0.0s ▪ High limit: 5.0s ▪ Default: 0.5s (recommended) Contrast / Minimal brightness / Maximal brightness – settings for the LCD appearance Activity time – time to switch to idle state if no button operation is performed	Choose device Communic. period 0.5s Communic.timeout 0.5s

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After activity time – defines the HMI behavior after switching to idle state

- **Nothing** – don't change the screen
- **Alarms menu** – jump to alarms menu if any alarm is reported
- **Alarms/1st page** – jump to alarms menu in case of the alarm otherwise jump to main menu

HMI com speed / RS485M com speed – settings for communication speed between the HMI and the controller. First parameter refers to HMI speed, the other refers to the controller.

Note! The speed settings must match each other. Otherwise the connection will be lost.

Observe communication speed in case of faulty connection.

See the electrical diagrams for the details.

LANGUAGE SELECTION English / Polski / Русский

HMI supports the following languages:

EN - English

PL - Polish

RU - Russian

English is set as a default language.

Note! The alarm descriptions are always given in English.

ENTERING THE PASSWORD

Some menus are protected with a password, to avoid unintentional change, that could be dangerous for the unit or for the user. To access that parts of the menu, you will be asked to enter the password.

Default password: 1111

To enter the numbers use arrow keys and confirm each time with [OK] button.

Enter password

0 _ _ _

3. CALENDAR →

Calendar is an automatic functionality to provide scheduled operation of the air handling unit according to the Real Time Clock

Set date – shows current date and allows for entering new value

Set time – shows current time and allows for entering new value

Note! At first power up the RTC could be blocked. It's easy to find by not running seconds on the display. However, after any change of the time set, RTC retains normal operation.

Annual – 1st (the highest) priority schedule for setting special dates like holidays.

CALENDAR

Set date

Th 24-02-11

Set time

10:05.11

Annual

Monthly – 2nd priority schedule for setting special dates according to monthly routines, like factory maintenance each 1st day of the month. Weekly – 3rd priority schedule for weekly routines, like weekends Daily – 4th priority schedule for daily routines, like working hours Clear all – erase all settings for calendar	Monthly Weekly Daily Clear all
CALENDAR → ANNUAL →	
Inside the “Annual” menu there are visible all previously stored programs and also the link to “New program” editor. Entering new program allows for setting: ▪ Date and Time “from” ▪ Date and Time “to” ▪ Operation mode ▪ Temperature setpoint New program editor ends with SAVE option. Each program must be saved before leaving the editor. Entering existing program allows for changing the settings (which must be confirmed with SAVE option). There's also DELETE function, to erase selected program.	New program → 01-01 00:00.00 02-01 07:00.00 24-12 15:00.00 27-12 07:00.00
CALENDAR → MONTHLY →	
Entering new program allows for setting: ▪ Day and Time “from” ▪ Day and Time “to” ▪ Operation mode ▪ Temperature setpoint	New program → 01 18:00.00 01 22:00.00
CALENDAR → WEEKLY →	
Entering new program allows for setting: ▪ Week day and Time “from” ▪ Week day and Time “to” ▪ Operation mode ▪ Temperature setpoint	New program → Пт 18:00.00 Пн 06:55.00

CALENDAR → DAILY →

Entering new program allows for setting:

- Time “from”
- Time “to”
- Operation mode
- Temperature setpoint

New program →

07:00.00
14:55.00

14:55.00
17:10.00

17:10.00
07:00.00

CALENDAR EXAMPLE

Intended scheme of operation for the office:

1. Daily:

- a. Normal working hours: 7 – 15 – work in “comfort” conditions
- b. Overtime: 15 – 17 – work in “comfort” conditions, but save energy
- c. Office empty overnight – keep only safe conditions, save much energy

2. Weekly:

- a. Working days: Monday to Friday
- b. Weekend: keep only safe conditions, save much energy

3. Yearly:

- a. Christmas: 24th – 26th December – keep only safe conditions, save much energy

Programming step 1 – do the settings for holidays

CALENDAR → ANNUAL → NEW PROGRAM

Date from: 24-12

Time from: 17:00.00

Date to: 27-12

Time to: 07:00.00

Operation mode: Standby

Temp. setting: 18°C

Note! Always remember to save your settings!

Programming step 2 – do the settings for weekend exception

New program →

Date from
31-12

Time from
17:00.00

Date to
27-12

Time to
07:00.00

Operation mode
Standby

Temp. setting
18°C

Save

CALENDAR → WEEKLY → NEW PROGRAM Week day from: Friday Time from: 17:00.00 Week day to: Monday Time to: 07:00.00 Operation mode: Standby Temp. setting: 18°C <i>Note! Always remember to save your settings!</i>	New program → Week day from Fr Time from 17:00.00 Week day to Mo Time to 07:00.00 Operation mode Standby Temp. setting 18°C Save
Programming steps 3/4/5 – do the settings for daily operation CALENDAR → DAILY → NEW PROGRAM Time from: 07:00.00 Time to: 15:00.00 Operation mode: Stage I Temp. setting: 22°C CALENDAR → DAILY → NEW PROGRAM Time from: 15:00.00 Time to: 17:00.00 Operation mode: Stage I Temp. setting: 21°C CALENDAR → DAILY → NEW PROGRAM Time from: 17:00.00 Time to: 07:00.00 Operation mode: Standby Temp. setting: 18°C <i>Note! Always remember to save your settings!</i>	New program → Time from 17:00.00 Time to 07:00.00 Operation mode Standby Temp. setting 18°C Save

4. PARAMETERS →

Menu "Parameters" gives information on actual status of the unit.

Note! Data in "Parameters" is read only. For setpoints, limits, PI tuning refer to "Settings".

PARAMETERS →

PARAMETERS → DAMPERS →

State of the intake / outlet dampers

- Closed
- Opened

Dampers
Closed

PARAMETERS → FANS →

State of the fans

Fans status – indicates which fans are currently running

- Stop – none
- Supply – supply fan is running
- Supply/Exhaust – both fans are running

Fan status
Stop

PARAMETERS → WATER HEATER →

State of the water heater

Pump status – state of the circulation pump

- Off
- On

Valve opening – control signal for the 3-way valve, range 0..100% (corresponding to 0..10V hardware output)

WATER HEATER →

Pump status
Off

Valve opening
0%

PARAMETERS → COOLER →

State of the cooler

Cooler status - state of the cooling devices

- Off
- On

Cooling rate - percentage of cooling control signal, range 0..100% (corresponding to 0..10V hardware output)

COOLER →

Cooler status
Off

Cooling rate
0%

PARAMETERS → PREHEATER →

State of the water pre-heater

Pump status – state of the circulation pump

- Off
- On

Valve opening – control signal for the 3-way valve, range 0..100% (corresponding to 0..10V hardware output)

PREHEATER →

Pump status
Off

	Valve opening 0%
5. SETTINGS →	
Settings is the part of the menu, where setpoints, limits, PI parameters and other configurable values are accessed.	SETTINGS →
SETTINGS → DEF. WORK MODE →	
Defines the default working mode for the calendar if none of the settings matches current date and time. This could happen if the “Calendar” operation will be selected as the operation mode while the whole calendar was left blank. ▪ Stop (factory setting) ▪ Stage I ▪ Standby Note! In such case, the temperature setpoint is taken from the general setpoint from the main menu. Note! However Stage II can be also selected, it will be automatically forced to Stage I, as direct starting motors run always at one fixed speed and there's no possibility to change the rpm of the fan.	Def. work mode Stop
SETTINGS → STANDBY MODE →	
Defines the conditions for the “standby” functionality to be activated. Active for – enables the standby function for different types of heat exchangers ▪ None – standby function disabled (factory setting) ▪ Heating – standby enabled only for heating (unit starts when the room gets too cold) ▪ Cooling – standby enabled only for cooling (unit starts when the room gets too warm) ▪ Heating/Cooling – standby enabled for both situations Note! Standby mode settings must be related to the heat exchangers actually available in the unit. Standby hyster. - defines how much the actual temperature should differ from the temperature setpoint to activate the standby heating up or cooling down Note! The acceptable range of room temperatures in standby mode equals the temperature setpoint +/- hysteresis.	STANDBY MODE → Active for None Standby hyster. 4.0°C

SETTINGS → PERFORMANCE →

Settings related to the capacity of heat exchangers.

Stge I Htg-limit - defines the max. value of control signal for the heater, when the unit Operation mode is set to Stage I

- Low limit: 10%
- High limit: 100%
- Default: 100%

Stage I Clg-limit – defines the max. control signal for the cooler, when the unit Operation mode is set to Stage I

- Low limit: 10%
- High limit: 100%
- Default: 100%

PERFORMANCE →

Stge I Htg-limit
100%

Stage I Clg-limit
100%

SETTINGS → TEMP. REGULATOR →

Supply Tmax – setting for the upper limit of supply air temperature

- Low limit: 20°C
- High limit: 50°C
- Default: 40°C

Supply Tmin – setting for the lower limit of supply air temperature

- Low limit: 0°C
- High limit: 30°C
- Default: 15°C

Min.cooling temp. - lower limit for activating the cooling. When the external temperature falls below the limit, the cooling functionality is disabled and the unit can only ventilate to cool down the room.

- Low limit: -10°C
- High limit: 20°C
- Default: 12°C

Heating PI / Cooling PI / Supply PI – settings for PI regulators in temperature control loop

- Kp – gain for the regulator
- Ti – integral factor for the regulator
- Default for heating and cooling: Kp=1; Ti=60s
- Default for supply limits: Kp=2; Ti=10s

TEMP.REGULATOR →

Supply Tmax
40°C

Supply Tmin
15°C

Min.cooling temp
12°C

Heating PI →

Kp for heating
1.0

Ti for heating
60 s

Supply PI →

Kp for supply
2.0

Ti for supply
30 s

SETTINGS → FANS →

Switch-on delay – startup delay for the unit.

- Low limit: 0s
- High limit: 3600s
- Default: 5s

Switch-off delay – delay for stopping the fan

- Low limit: 0s
- High limit: 3600s
- Default: 5s

FANS →

Switch-on delay
5 s

Switch-off delay
5 s

SETTINGS → HEATER →

Initial heating / Max T.Out – upper temperature limit for the initial heating procedure. At this point the valve begins to open

- Low limit: 0°C
- High limit: 30°C
- Default: 8°C

Initial heating / Min T.Out – lower temperature limit for the initial heating procedure. At this point the valve reaches 100% opening

- Low limit: -40°C
- High limit: 0°C
- Default: -15°C

Note! Between the points of Max and Min T.Out the valve position is calculated with linear characteristics. For example at half the range, the valve will be 50% opened.

Initial heating / Preheating time – setting for the initial heating timer. After that time unit starts normal operation and the valve opening relies on the PI regulators for heating sequence.

- Low limit: 0s
- High limit: 3600s
- Default: 30s

Initial heating / Fall ramp – time for the valve to close after completing the initial heating procedure. By the time of controlled closing, the valve position should meet the actual signal from the PI output, so the crossing through 0% valve opening will be avoided. The fall ramp is intended to minimize the risk of freezing alarms, which could happen in case of closing the valve suddenly.

- Low limit: 0s
- High limit: 3600s
- Default: 30s

HEATER →

Initial heating →

Max T.Out
8°C

Min T.Out
-14°C

Preheating time
30 s

Fall ramp
60 s

Pump work temp.
10°C

Min. valve open
20%

PUMP PROTECT. →

Set protection
Active

Stoppage period
7d

EN

Pump work temp. – setting for the external temperature which forces the circulation pump to work continuously.

- Low limit: -20°C
- High limit: 15°C
- Default: 10°C

Min. valve open – lower limit for the valve position. In working unit, the valve control signal will be at least at that level

- Low limit: 0%
- High limit: 100%
- Default: 20%

Pump protection / Set protection – setting to enable/disable the protection against sticky sealing issue. The sticky sealing could happen in case of long term inactivity of the pump, when contaminations and deposits from the water could damage the mechanical sealing

- Not active
- Active (default setting)

Pump protection / Stoppage period – setting of the resting time for the pump

- Low limit: 1day
- High limit: 30days
- Default: 7days

Pump protection / Run time – setting of the operation time for the pump

- Low limit: 1s
- High limit: 3600s
- Default: 30s

Tbwtr setpoint - setting for the desired temperature of the backwater from the heater. If unit stopped, regulator keeps exactly the setpoint. If unit running, Tbwtr setpoint is considered as lower limit of backwater temperature. If the Tbwtr drops, the regulator forces the valve to open regardless to the main control loop for heating.

- Low limit: 20°C
- High limit: 70°C
- Default: 50°C

Note! The room could be overheated by backwater control feature. Tbwtr control has got higher priority than the main temperature control loop.

Note! The backwater control feature is blocked if the outside temperature is higher than Pump work temp.

- **Kp Tbwtr** - gain for the regulator
- **Ti Tbwtr** - integral factor for the regulator
- **Default:** Kp=1 / Ti=60s

Run time
30s

Tbwtr setpoint
50°C

Kp Tbwtr
1.0

Ti Tbwtr
60s

SETTINGS → PREHEATER →

Temp. setting - setpoint for initial heater.

Note! Preheating regulator compares the setpoint with the B3 sensor readout. Regulation goal is to keep the B3 temperature equal to the setpoint.

Note! Observe the application diagrams for proper placement of the sensors.

- Low limit: -24°C
- High limit: 0°C
- Default: -9°C
- Kp - gain for the regulator
- Ti - integral factor for the regulator
- Default: Kp=1 / Ti=60s

Min. valve open – lower limit for the valve position. In working unit, the valve control signal will be at least at that level

- Low limit: 0%
- High limit: 100%
- Default: 20%

Pump protection / Set protection – setting to enable/disable the protection against sticky sealing issue. The sticky sealing could happen in case of long term inactivity of the pump, when contaminations and deposits from the water could damage the mechanical sealing

- Not active
- Active (default setting)

Pump protection / Stoppage period – setting of the resting time for the pump

- Low limit: 1day
- High limit: 30days
- Default: 7days

Pump protection / Run time – setting of the operation time for the pump

- Low limit: 1s
- High limit: 3600s
- Default: 30s

PREHEATER →

Temp.setting
-9°CKp
1.0Ti
60sMin. valve open
20%

PUMP PROTECT. →

Set protection
ActiveStoppage period
7dRun time
30s

EN

II. ADVANCED MANUAL

6. SERVICE MENU →

Service menu contains the most fundamental settings, necessary for proper configuration and safe startup of the unit. Moreover, some service-oriented functions are available here for easy maintenance and troubleshooting for service staff.

SERVICE MENU → SERVICE MODE →

Service mode – setting to enable/disable service mode

- **Off** – the service mode disabled, controller ready for normal operation
- **On** – service mode enabled, controller ready for configuration and locked – no control functions can be executed
- **Default state for first power-up is On** – the service mode is factory state, as the controller requires configuration before normal operation.

Note! The controller wouldn't start for normal operation if set to Service mode. After completing all the configuration, switch the Service mode to Off!

SERVICE MENU → CHOOSE APPLICATION →

Choose application – sub-menu for entering the Application Code that defines the actual type of the unit that will be controlled by the control box.

- **Application type** – setting for the letters from the application code given in the datasheet of the air handling unit
- **ND**
- **NS**
- **Application code** – the number from the application code
- **0..255**

Note! However application types AD, AP, AR, AS could be also selected, they are not used for NVS units.

- **Confirm code** – indication if entered code is included in the list of allowed applications
- **Error** – check the settings for the type and code of the application
- **OK** – settings approved

SERVICE MENU → CONFIGURATION →

S6 switch mode – setting for the universal digital input DI1 if configured as auxiliary start/stop switch S6 (Aux).

- **OR** – switch S6 is digital OR with start / stop command set in the HMI

Note! OR is default configuration.

- **AND** – switch S6 is digital AND with start / stop command set in the HMI

DI1 input mode - configuration of the universal digital input DI1, three different modes can be selected

- S1F (Fire) - fire alarm signal, stops and locks the AHU if triggered, NC voltage free contact
- xSxH (Filters) - filter pressure drop warning, default setting for DI1, displays an alarm without affecting AHU operation, NO voltage free contact
- S6 (Aux) - external start/stop signal, NO voltage free contact

Main sensor / Main sensor – selection of main temperature sensor for temperature regulation.

- **P1 T.Sup** – supply air duct temperature sensor
- **HMI** – room temperature sensor inbuilt in the HMI

Main sensor / Max. HMI resp. time – timeout for communication. If exceeded, the controller will report the error of main temperature measurement.

- Low limit: 0s
- High limit: 100s
- Default: 15s

Tbwtr control - activation of the backwater temperature regulator

- **Disabled** - backwater regulator not active
- **Enabled** - backwater regulator active - default for Nx... applications

Note! The backwater temperature regulation is available only for Nx... applications!



Supply FC and Exhaust FC - these are submenus for configuration of frequency converters. The NVS control boxes described in this manual are not capable of connecting those devices. If your duct AHU is powered from frequency converter, it requires different type of control box VS...CG OPTIMA or VS...CG 0-1, instead of NVS...CG types. Refer to their specific manuals.

Communication - activating Modbus communication to the frequency converter

- **Disabled** - communication not active
- **Enabled** - communication active

Modbus address - setting the Modbus address for frequency converter

- Default address: 2 for Supply and 3 for Exhaust

Min frequency - setting the lower limit of operating frequency

- Low limit: 10Hz
- High limit: 50Hz
- Default: 10Hz

Max frequency - setting the upper limit of operating frequency

- Low limit: 10Hz
- High limit: 100Hz
- Default: 50Hz

Acceleration - setting the speed-up time of the fan

- Low limit: 30s
- High limit: 120s
- Default: 30s

Deceleration - setting the slow-down time of the fan

- Low limit: 30s
- High limit: 120s
- Default: 30s

Response timeout – setting for max waiting for a slave to respond. If the time was exceeded, the error will be detected. It is recommended to not modify that parameter.

Factory setting: 0.30s

Comm break time – setting for idle time on the communication line between sending next packets. It is recommended to not modify that parameter.

Factory setting: 2.0s

SERVICE MENU → INPUT STATES →

Digital inputs – readout of the actual states of hardware digital inputs

- D1 – Opened / Closed
- D2 – Opened / Closed
- D3 – Opened / Closed
- D4 – Opened / Closed

Sensor inputs – readout of actual values read by temperature sensors Pt1000

- P1
- P2
- P3

Note! Normal measurement limits, ranges from -75°C to +110°C.

If the readout is actually too low, -75°C remains on the display. If too high, NS is displayed. Check the sensor and the cabling in such situations.

SERVICE MENU → OUTPUT STATES →

Relay outputs – readout of the actual states of hardware digital outputs

- REL1 – Off / On
- REL2 – Off / On
- REL3 – Off / On

Analog outputs – readout of actual values sent to hardware analog outputs

- A1 – 0..10B
- A2 – 0..10B

SERVICE MENU → INPUT EMULATION →

Digital inputs – overwriting the states of hardware digital inputs

- **D1** – None / Set opened / Set closed
- **D2** – None / Set opened / Set closed
- **D3** – None / Set opened / Set closed
- **D4** – None / Set opened / Set closed

Sensor inputs – overwriting the actual values read by temperature sensors Pt1000

- **P1 emulate** – Disabled / Enabled – select to activate the overwriting
- **P1 temp.** – enter the value
- **P2 emulate** – Disabled / Enabled – select to activate the overwriting
- **P2 temp.** – enter the value
- **P3 emulate** – Disabled / Enabled – select to activate the overwriting
- **P3 temp.** – enter the value

SERVICE MENU → OUTPUT FORCING →

Relay outputs – overwriting the actual states of hardware digital outputs

- **REL1** – None / Force Off / Force On
- **REL2** – None / Force Off / Force On
- **REL3** – None / Force Off / Force On

Analog outputs – overwriting the actual values sent to hardware analog outputs

- **A1 forcing** – Disabled / Enabled – select to activate the overwriting
- **A1 voltage** – 0..10V
- **A2 forcing** – Disabled / Enabled – select to activate the overwriting
- **A2 voltage** – 0..10V

SERVICE MENU → RESTORE DEFAULT SETTINGS →



To restore default settings of the controller press OK. Then confirm once again.

Note! Restoring default values causes irreversible erase of all settings done before. Full re-configuration of the controller is required.

In case of failure with the restore via HMI (e.g. HMI wouldn't communicate with the controller), follow another procedure:

- turn off the power supply
- set all the addressing dip-switches to ON (remember original setting, to apply that after the restore procedure)
- turn on the power supply (alarm LED should light up continuously)
- turn off the power again
- set the addressing dip switches to previous combination and turn on the power supply
- (done)

SERVICE MENU → ALGORITHM LPS →

Algorithm LPS indicates the speed of application execution in “loops per second”.

8. ALARM HANDLING

Alarm states are indicated by blinking display and flashing LED lamp on the HMI SIMPLE device, by switching the relay output and by the LED lamp on the main controller PCB inside the control box.

In the HMI, alarms can be accessed via the Alarm Menu. The menu is available on long-pressing of the button [C] (approx. 3s).

Note! In the default factory mode, the HMI switches to the Alarm Menu automatically when the alarm appears. The actual behavior depends on the HMI settings.

Each alarm is displayed in the following manner:

A9_HW_ThAir
09:05.16 26-10

where A9_HW_ThAir stands for the name of the alarm and the bottom line indicates the time and date when the alarm was detected. Except of the displayed text, the alarm LED starts to blink when new alarm is detected.

All the alarms can be divided in two groups:

- **Self-release alarms** – the unit is restarted automatically when the alarm signal disappears, marked with A1, A2... codes
- **Blocking alarms** – manual acknowledge is required to restart the unit, marked with A50, A51... codes

To acknowledge the alarm hold the [OK] button. Earlier, the cause of the alarm should be eliminated. Otherwise, the [*] symbol will appear next to the name of the alarm, to indicate that the cause of the alarm is still valid, regardless to the alarm confirmation. In such case, the LED stops blinking and switches to solid red light.

Note! Each blocking alarm needs to be acknowledged separately. Holding the [OK] button affects only the alarm, that is currently displayed on the HMI.

LIST OF SELF RELEASE ALARMS

Alarm name	Description	Input	Controller reaction
A1_Filter	dirty filter indication	D1	no reaction
A4_Tmain	main temperature sensor lost	-	unit stop
A5_Tsup	supply temperature sensor lost	P1	unit stop
A6_Tout	external temperature sensor lost	P2	unit stop
A9_HW_ThAir	frost alarm of water heater	D2	unit stop, pump On, valve 100%
A12_InEmul	emulation of input	-	unit stop
A13_OutForce	force of output	-	unit stop
A14_Troom	HMI room sensor lost	Modbus	unit stop
A15_preHW_ThAir	frost alarm of water pre-heater	D3	unit stop

LIST OF BLOCKING ALARMS

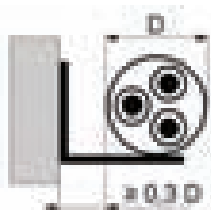
A50_MotSup	supply motor protection alarm	D4	unit stop
A51_MotExh	exhaust motor protection alarm	D4	unit stop
A52_3xTmain	main temperature sensor error repeated 3x within one hour	-	unit stop
A53_3xTsup	supply temperature sensor error repeated 3x within one hour	P1	unit stop
A54_3xTout	external temperature sensor error repeated 3x within one hour	P2	unit stop
A57_3xHW_ThAir	frost alarm of water heater repeated 3x within one hour	D2	unit stop
A60_Fire	fire protection activated via binary input	D1	unit stop
A61_3xTroom	room temperature sensor error repeated 3x within one hour	-	остановка вентиляционной установки

9. TECHNICAL DATA

Parameter	NVS ... CG OPTIMA SUP	NVS ... CG 0-2
Weight	5.5kg	5kg
Dimensions W x H x D	380 x 320 x 150 mm	395 x 235 x 115
Electrical supply system	TN	
Rated power supply voltage	3~400V	
Rated current I _n	9A	8.5A
Rated insulation voltage U _i	400V	
Rated impulse withstand voltage U _{imp}	2.5kV	
Rated short-time withstand current I _{cw} for respective circuits – effective value of alternating current component withstood during 1 second, i.e. short-circuit current expected at rated connecting voltage	6kA	
Rated peak withstand current (i _{pk}) at cosφ= 0.5	10.2kA	
Rated short-circuit current	6kA	
Coincidence factor	0.9	
Rated frequency	50Hz ±1Hz	
Protection class	IP54	IP20
Acceptable operating temperature	0..40°C	
Supply voltage of control circuits	24V AC	
EMC environment	1	

PARAMETERS OF PROTECTION UNITS	
F1	0.63A / 250V 5x20 slow glass fuse
F2	6,3A / 250V 5x20 glass fuse
F3	16,0A / 250V 5x20 ceramic fuse
F4	16,0A / 250V 5x20 ceramic fuse
INPUT / OUTPUT HARDWARE CHARACTERISTICS	
Digital inputs D1..D4	
Nominal input voltage	24V AC / 24V DC
High state detected within range	15..27V AC / 16..38V DC
Temperature measurement inputs P1..P3	
Sensor type	Pt1000
Min. load resistance	0Ω
Refresh time	60ms
Range	-76..105°C
Accuracy	±0.5°C
Resolution	8bits / °C
Analog outputs A1, A2	
Rated voltage	0..10V
Max. load	20mA
Min. load resistance	500Ω
Resolution	7bits / V
Relay outputs	
Max. switching voltage	250VAC
Min. switching voltage	5VDC
Rated current in AC1 / DC1 class	8A
Min. current	10mA
Rated long term load	8A

10. CABLING



Connect power leads of the control box and the fan motor according to the Electric diagram. The wire cross-sections have been selected for long term current capacity for cables arranged in the air (supported on brackets, cable racks, in perforated trays) with spacing from the wall of min. 0.3 cable diameter, insulated with PVC, for 3-conductors loaded. Due to the protection selectivity, length, cable placement method and short-circuit currents, revise the feeders' cross-sections in the table below.

Wire type	Picture	Description	Parameters	
[1]		Power wires with copper cores. PVC isolation.	Nominal voltage: 450/750V	
[2]		Ambient temp: -40 .. 70°C	Номинальное напряжение: 450/750В Температура окружающей среды: -40 .. 70°C	
[3]		Shielded power cables with copper cores. PVC isolation.	Nominal voltage: 450/750V	
[4]		Ambient temp: -40 .. 70°C	Номинальное напряжение: 300/500В Температура окружающей среды: -40 .. 70°C	
[5]		Control wires with copper cores. PVC isolation.	Nominal voltage: 300/500V	
Name of the element / connection point		Symbol	Wire type	No. of wires X Cross section [mm ²]
power supply for the control gear		CG	[1]	see Table A
fire alarm switch		S1F	[3]	2x0,75
multi-function switch		S6	[3]	2x0,75
supply air temperature sensor		B1	[4]	3x0,75
external air temperature sensor		B3	[4]	3x0,75
HW back-water sensor		B7	[4]	3x0,75
HW anti-frost thermostat		S2F	[3]	2x0,75
HW analog controlled valve		Y1	[4]	3x0,75
HW circulating pump		M1	[1]	3x1,0
glycol pre-heater anti-frost thermostat		S6F	[3]	2x0,75
glycol pre-heater analog valve		Y6	[4]	3x0,75
glycol pre-heater circulating pump		M3	[3]	3x1,0

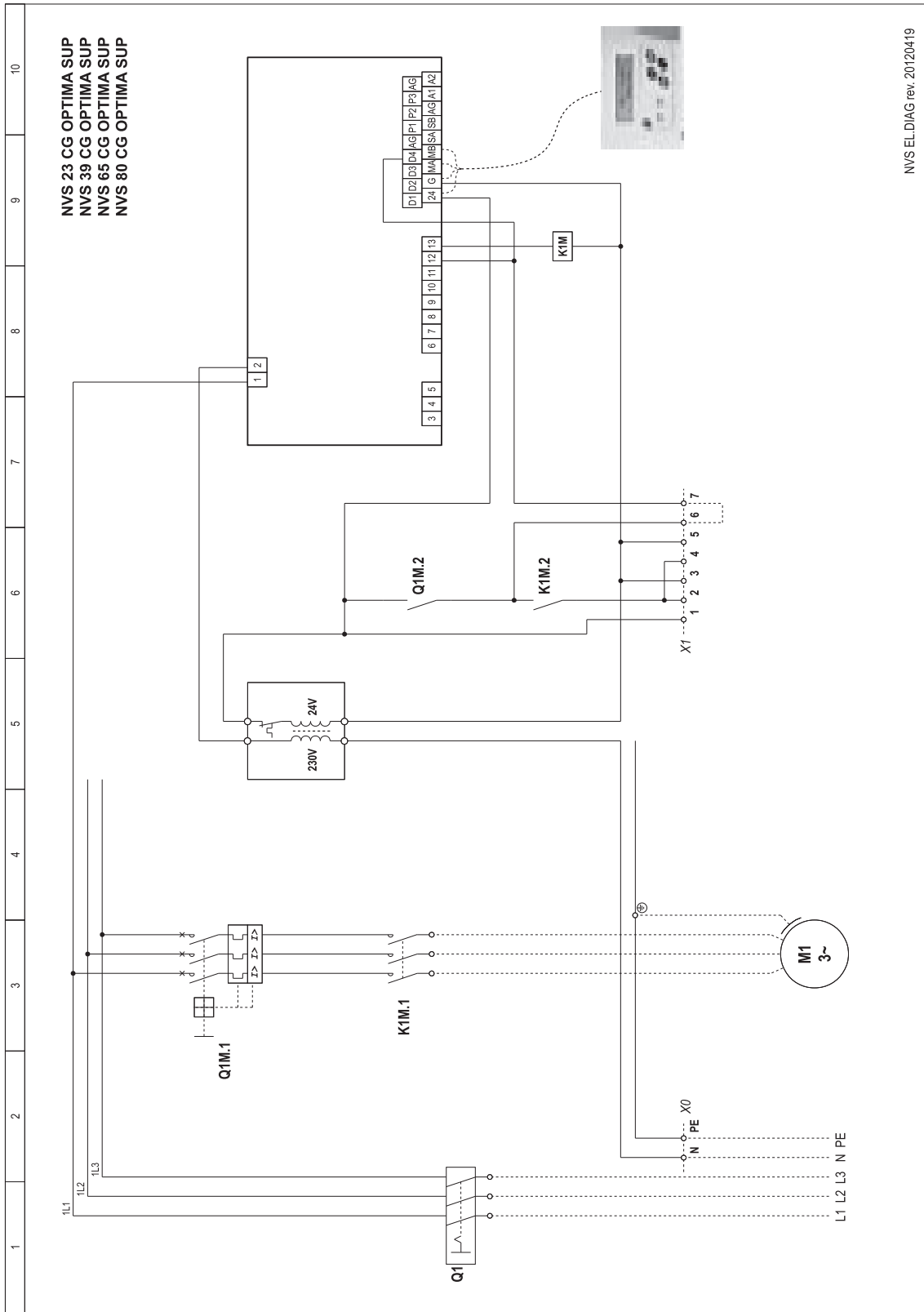
Name of the element / connection point	Symbol	Wire type	No. of wires X Cross section [mm ²]
cooling device start input	E1	[3]	2x0,75
cooling device alarm switch	S5F	[3]	2x0,75
cooling device analog control signal (valve)	Y2	[4]	3x0,75
HMI	N3	[5]	UTP 2 pairs
pressure control – supply primary/secondary filters	1S1H / 1S2H	[3]	2x0,75
pressure control – exhaust primary/secondary filters	2S1H / 2S2H	[3]	2x0,75
intake damper actuator	1Y1	[3]	2x0,75 / 3x,75
outlet damper actuator	2Y2	[3]	2x0,75 / 3x,75

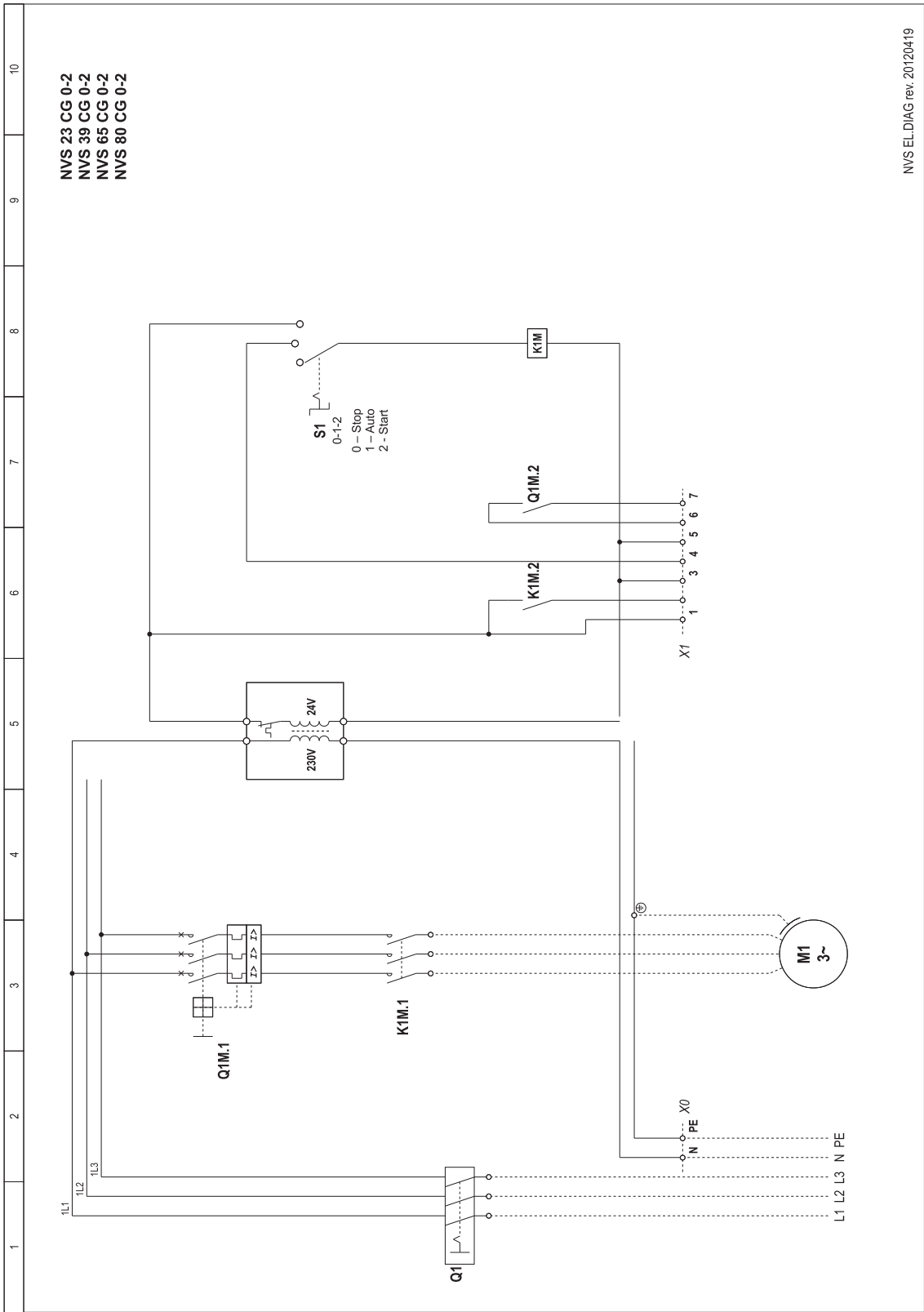
Note! Observe the control application diagrams for connection details.

Table A

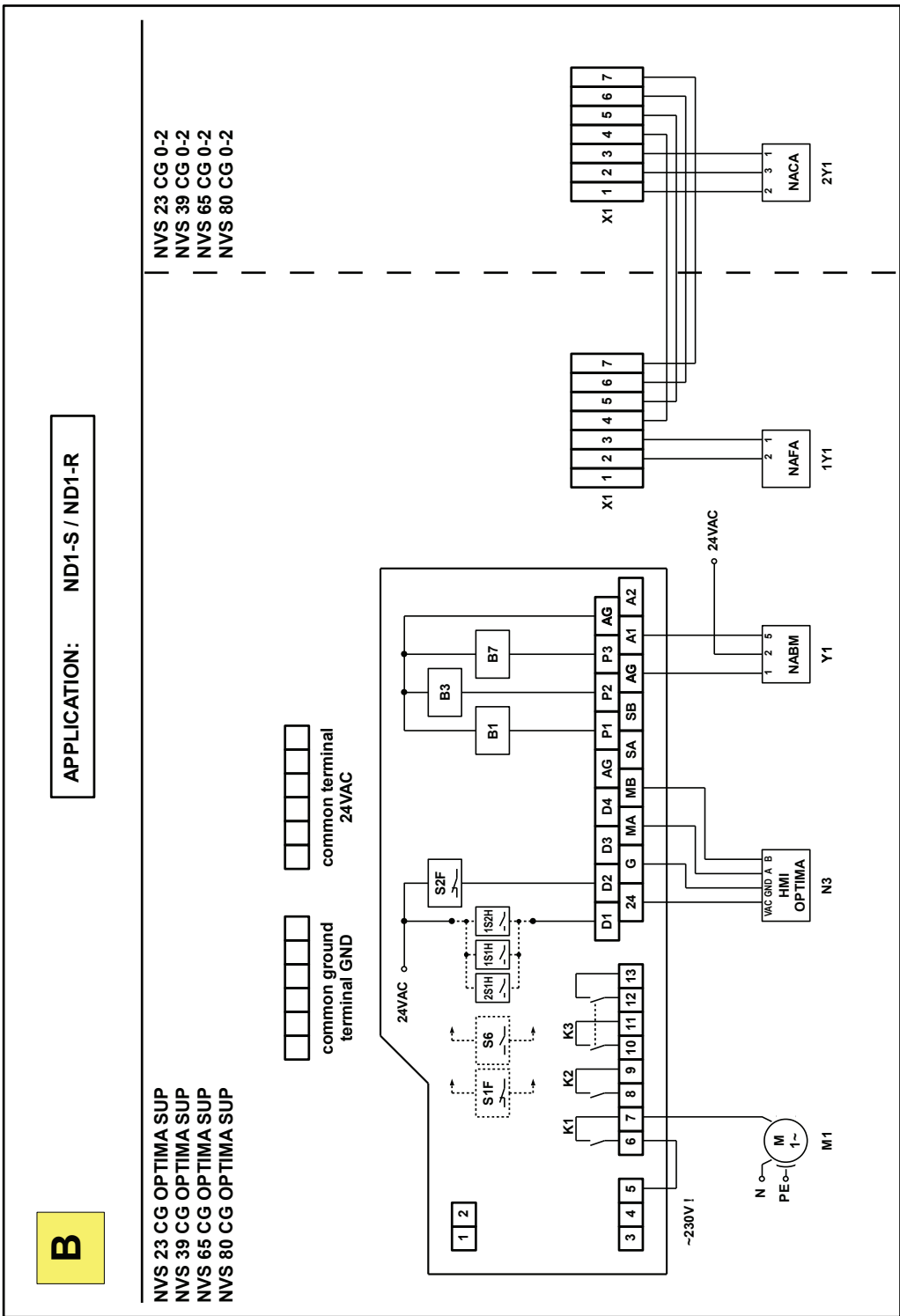
Motor rated parameters	Motor cable	Control box rated currents	Control box cable
[kW] / [V] / [A]		L1/L2/L3 [A]	
0.55 / 3~400 / 1.36	4×1mm ²	3,46 / 1,36 / 1,36	5×1mm ²
1.1 / 3~400 / 2.4	4×1.5mm ²	4,5 / 2,4 / 2,4	5×1.5mm ²
2.2 / 3~400 / 4.55	4×2.5mm ²	6,65 / 4,55 / 4,55	5×2.5mm ²
4.0 / 3~400 / 7.9	4×2.5mm ²	10 / 7,9 / 7,9	5×2.5mm ²

11. ELECTRICAL DIAGRAMS





12. APPLICATION DIAGRAMS

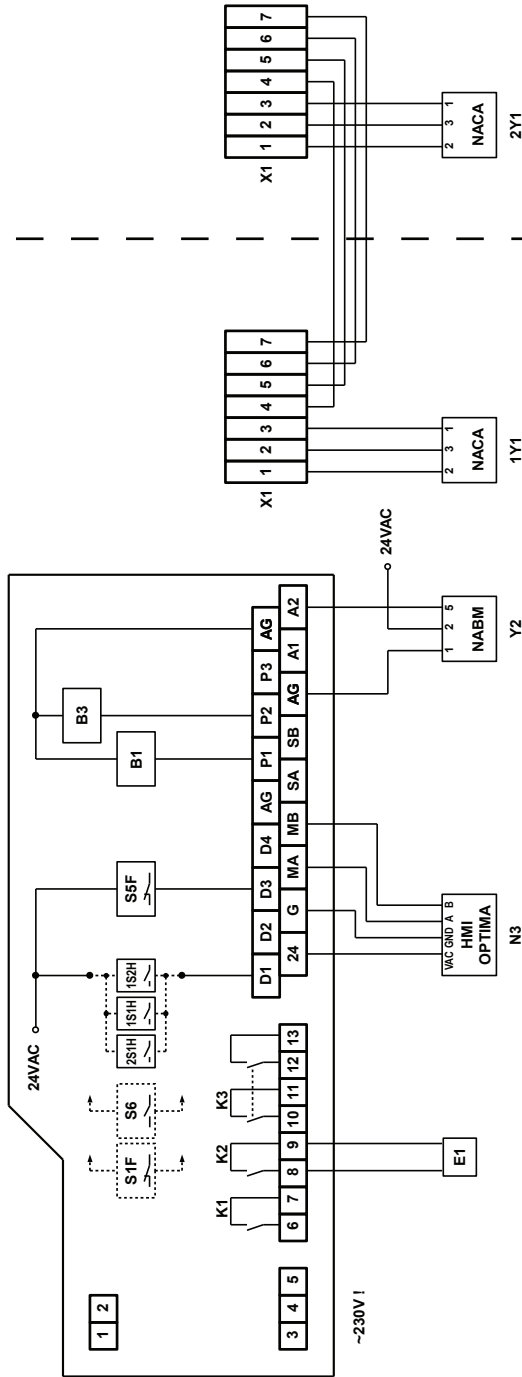
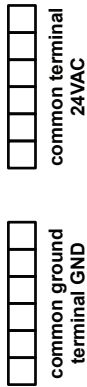


B

APPLICATION: ND4-S / ND4-R

NVS 23 CG OPTIMA SUP
NVS 39 CG OPTIMA SUP
NVS 65 CG OPTIMA SUP
NVS 80 CG OPTIMA SUP

NVS 23 CG 0-2
NVS 39 CG 0-2
NVS 65 CG 0-2
NVS 80 CG 0-2



B

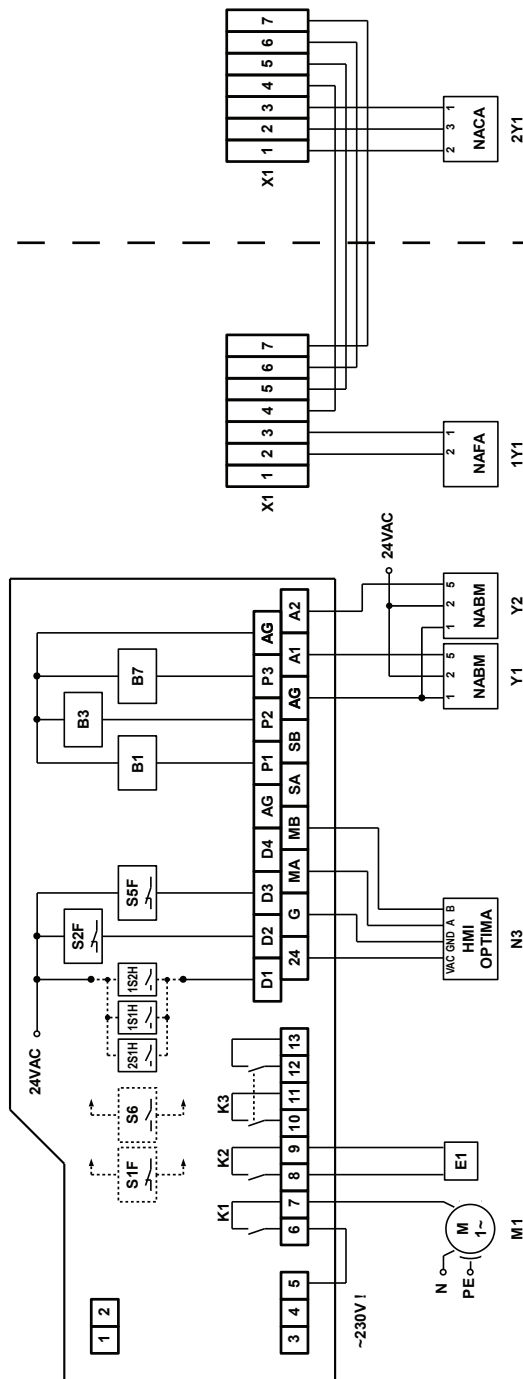
APPLICATION: ND5-S / ND5-R

NVS 23 CG OPTIMA SUP
NVS 39 CG OPTIMA SUP
NVS 65 CG OPTIMA SUP
NVS 80 CG OPTIMA SUP

NVS 23 CG 0-2
NVS 39 CG 0-2
NVS 65 CG 0-2
NVS 80 CG 0-2

common ground
terminal GND

common terminal
24VAC



B

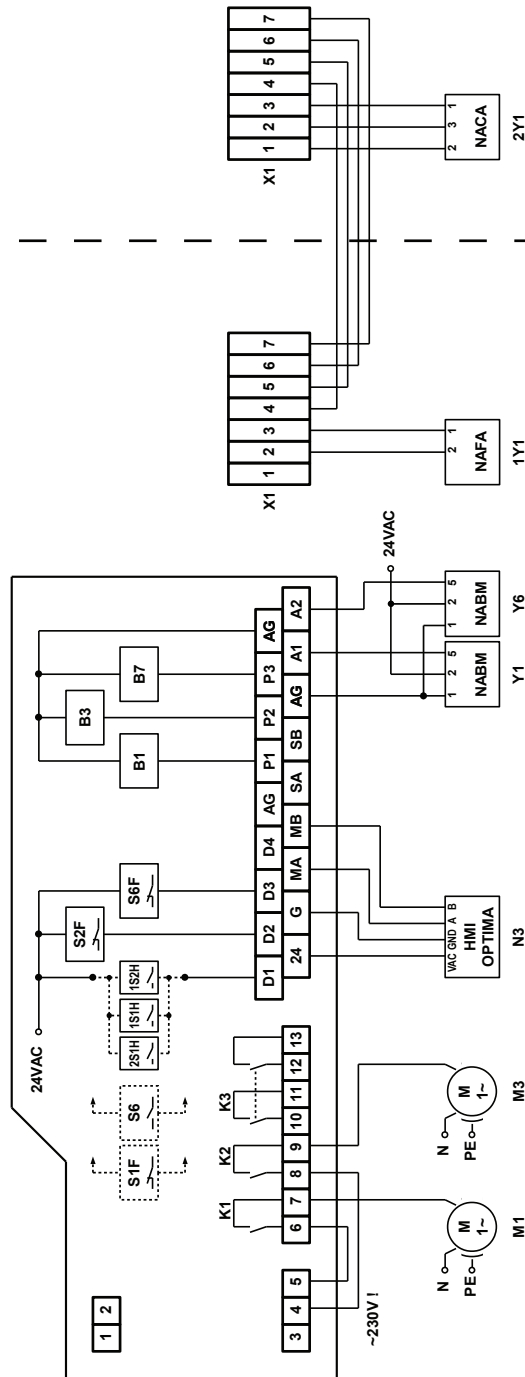
APPLICATION: ND257-S / ND257-R

NVS 23 CG OPTIMA SUP
NVS 39 CG OPTIMA SUP
NVS 65 CG OPTIMA SUP
NVS 80 CG OPTIMA SUP

NVS 23 CG 0-2
NVS 39 CG 0-2
NVS 65 CG 0-2
NVS 80 CG 0-2

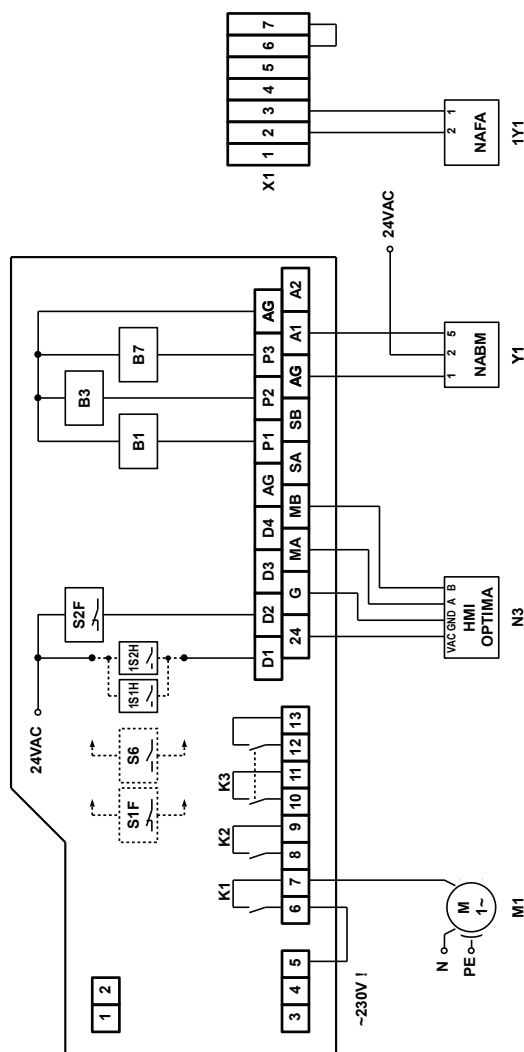
common ground
terminal GND

common terminal
24VAC



APPLICATION: NS1-S / NS1-R

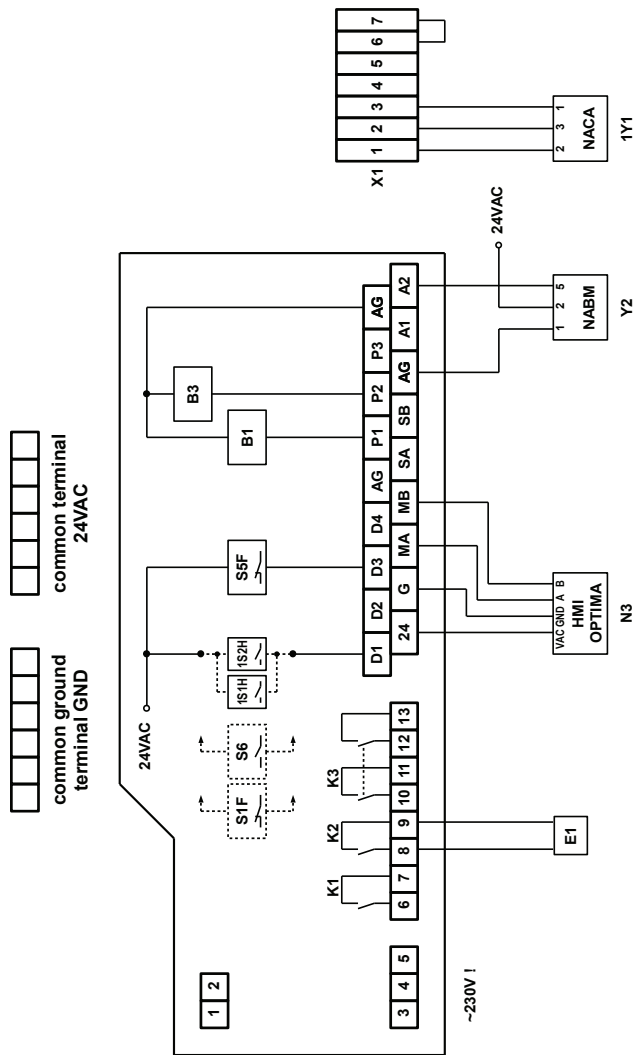
common ground terminal GND



B

APPLICATION: NS4-S / NS4-R

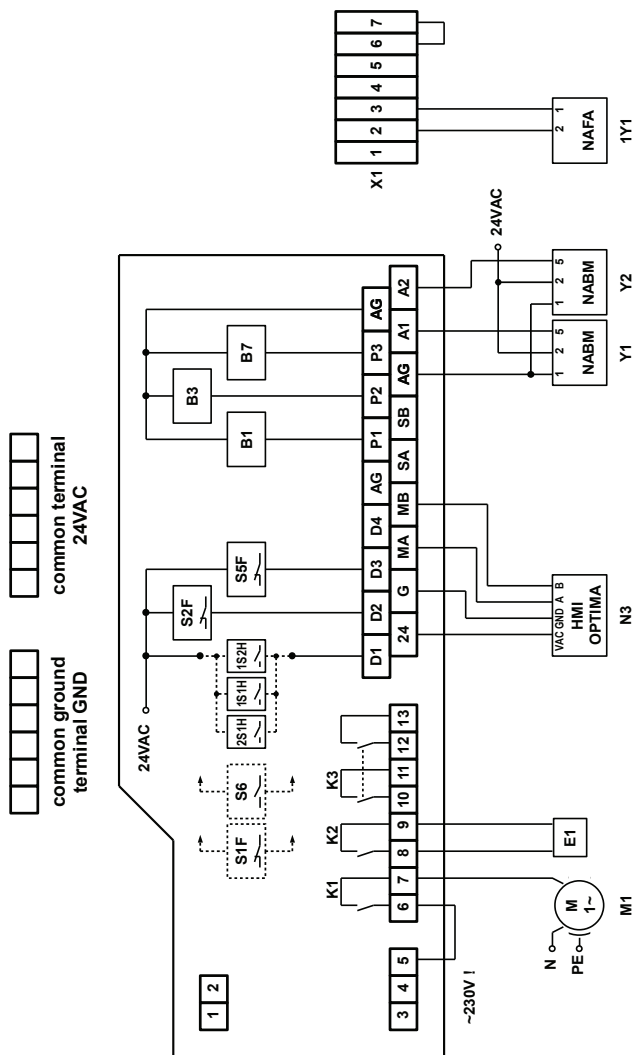
NVS 23 CG OPTIMA SUP
NVS 39 CG OPTIMA SUP
NVS 65 CG OPTIMA SUP
NVS 80 CG OPTIMA SUP



B

APPLICATION: NS5-S / NS5-R

NVS 23 CG OPTIMA SUP
NVS 39 CG OPTIMA SUP
NVS 65 CG OPTIMA SUP
NVS 80 CG OPTIMA SUP



B

APPLICATION: NS257-S / NS257-R

NVS 23 CG OPTIMA SUP
NVS 39 CG OPTIMA SUP
NVS 65 CG OPTIMA SUP
NVS 80 CG OPTIMA SUP

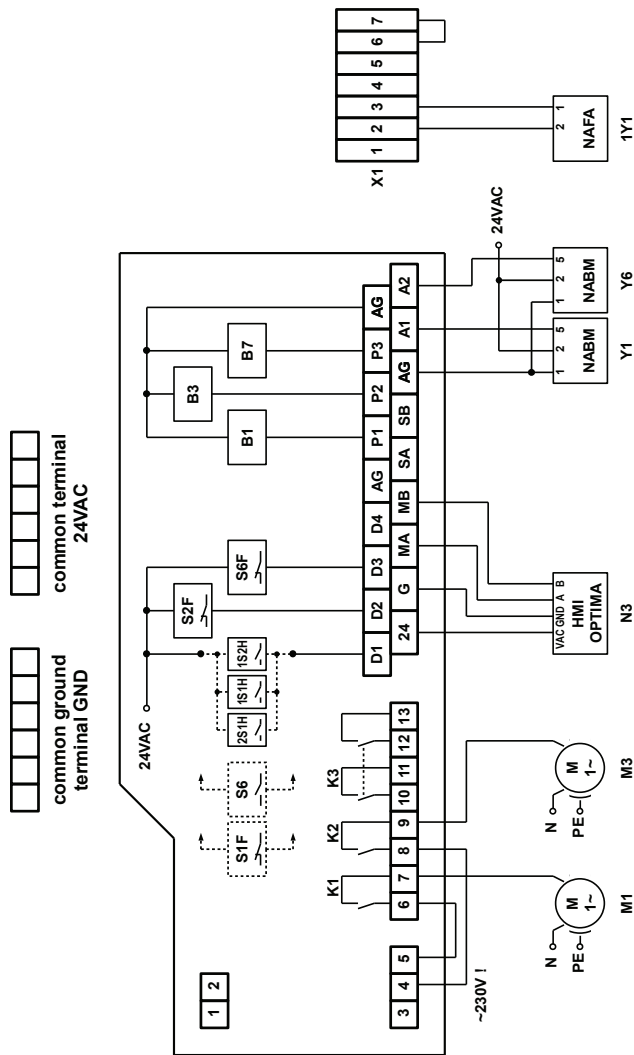


Схема управления NS 1

Схема установки

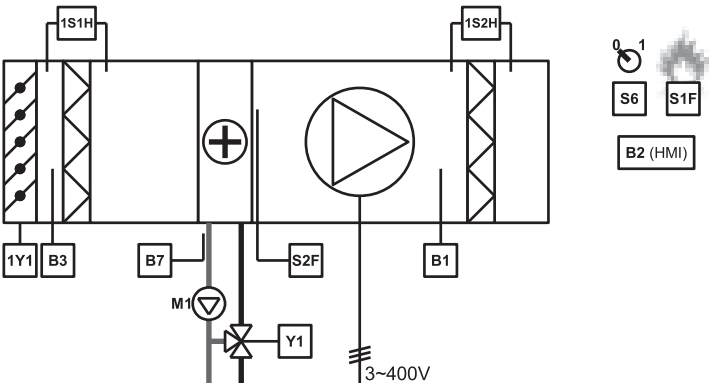


Схема управления NS 257

Схема установки

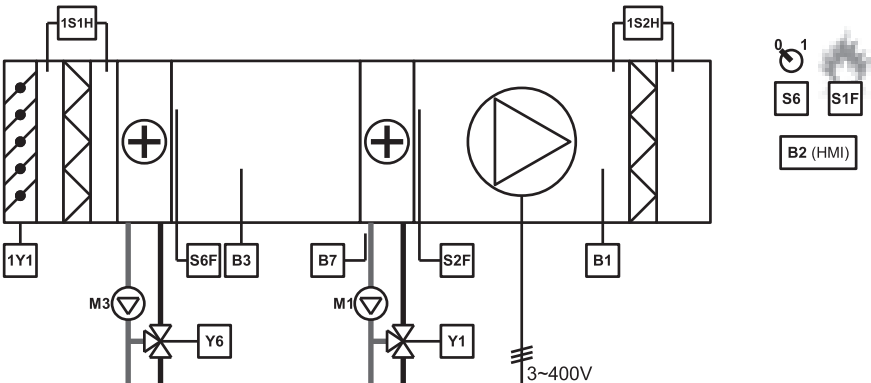


Схема управления NS 4

Схема установки

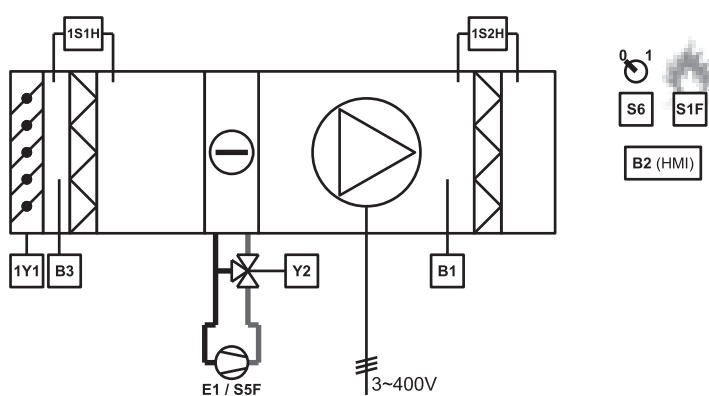


Схема управления NS 5

Схема установки

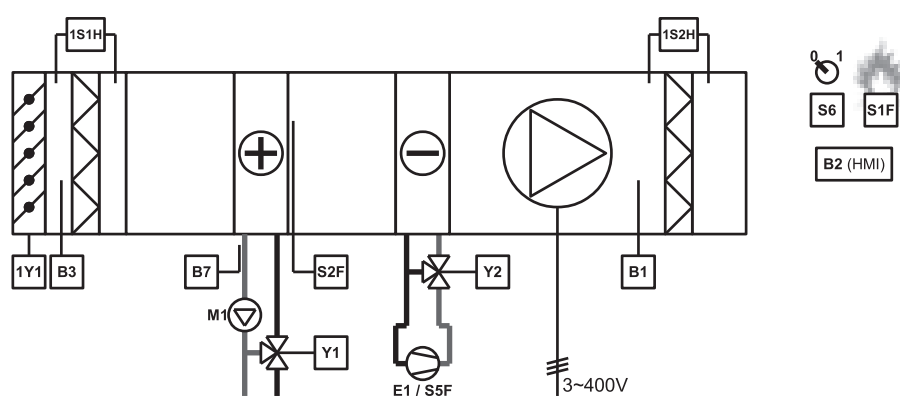


Схема управления ND 1 / 4 / 5 / 257

Схема установки

NS 1
NS 4
NS 5
NS 257

