innovative air handling units

VTS

Control gear for Supply
and Exhaust Air Handling Units

EN

VS 10-15 CG ACX36-1;

VS 21-150 CG ACX36-2 SUP;

VS 21-150 CG ACX36-2 SUP-EXH

VS 180-300 CG ACX36-2 SUP-EXH
VS 400-650 CG ACX36-2 SUP-EXH

Operation and Maintenance Manual

ventus

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Table of Content

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I. USER'S MANUAL

1. DESCRIPTION OF CONTROLS

1.1. Introduction

Application:

Protection and control of supply and exhaust AHUs equipped with up to:

- ○ two fan sets (up to 8 fans in total) and two air dampers
- ○ cooler, heater and heat recovery system
- ○ three filtration sections

Range of operation:

VS 10-15 CG ACX36-1	VS 21-150 CG ACX36-2 SUP VS 21-150 CG ACX36-2 SUP-EXH VS 180-300 CG ACX36-2 SUP-EXH VS 400-650 CG ACX36-2 SUP-EXH
Systems equipped with one-phase motors with up to 1.75kW power output	Systems equipped with frequency converters and motors with up to 11kW power output

EN

1.2. Mains Switch

O - OFF   I - ON

Switched off   Switched on

O - OFF   I - ON

Switched off   Switched on

Function:
Switching-on the Control Gear.

1.3. Communication port

RJ45 socket, dependent on the casing type, is placed on the bottom or on the front of the control gear
Function:
Connecting the VS 00 HMI Advanced control panel to the controller

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1.4 Signalling controller status

In a right lower corner of the controller there is a LED indicating the controller's operation mode:

1. LED switched off – controller is not connected to power supply
2. Green light blinking – correct operation, controller controls AHU operation
3. Green and red light blinking - program stopped (see program „Scope")
4. Red light – controller error

!	1. All control boxes from the VS…CG ACX36 typeline need to be powered from the main switchgear equipped with appropriate protection of wires powering the control box.
	2. Connection and start-up of the control gear should by done by qualified staff only.
	Without additional elements the control gears can work inside a building. Assembly outside in a moderate climate is permissible if an additional heating module is assembled. The X0:4,N clamps are designed for this module. (230V, 6A)

1.5. Advanced control panel VS 00 HMI Advanced

EN

LCD display
Displaying available parameters and current values

Operation mode
Cyclic switching of the AHU operation:
- **Auto** (acc. to calendar)
- **ON** system switched on
- **OFF** system switched off
- **Stby** (stand-by) system switches on and off in cycles depending on the temperature difference

The fan status is also signalled with the green LED
- Constant lighting-up – system in ON mode
- LED switched off – system in OFF mode
- LED blinking – fans switched off or on, (Auto, Stby)

Back
Going back to master page or to the beginning of the displayed page

Main page
Going back to the main page regardless of a current display status

Navi buttons
Pushing a button allows swapping parameters - up and down

Confirmation
1. Moving to secondary pages.
2. Entering edit mode of selected parameter value

Information about alarms.
Pressing a key displays a window with codes of current alarms. Next pressing a key cancels the alarm. Alarms indicated are with LED's red light.

Edit buttons
Increasing or decreasing value of a selected parameter. Swapping parameters right, left

Magnetic bottom
It allows for simple installation of the panel on flat metal surface, e.g.: control gear door

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User's Manual

Functions:
- Controller operation and parameterization
- Selection of control application
- Access to operation parameters of the AHU subassemblies
- Time zones setting
- Displaying and cancelling alarm statuses

! *Parameters available in the LCD window depends on a AHU type and automatic control application. So in AHUs not equipped with heater, options related to the heating module will not be available.*

☞ *Optional element.*

1.6. Simplified control panel - VS 00 HMI Basic

Type of air handling
- Cooling
- Heating

Operation mode
- system switched off
- operation according to calendar
- by
- system switched on - 2/3 output power
- system switched on - full output power
- OFF system switched off
STAND-BY system switches on and

Changing operation mode buttons
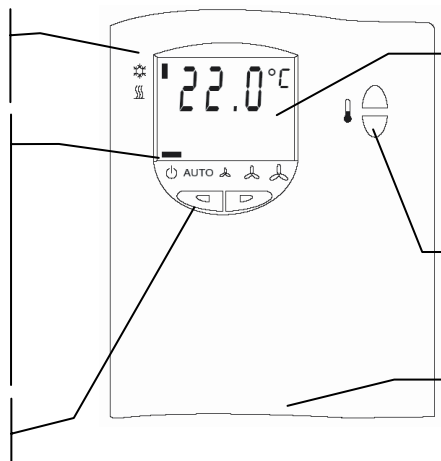
LCD display
- current temperature from leading sensor
- preset temperature
- operation mode
- alarm code

Edit buttons
Increasing or decreasing preset temperature

Temperature sensor
Built-in room temperature sensor.

Functions:
- Room temperature measurement
- Change and display of set temperature value
- Display temperature of the main control sensor
- Change of AHU operation mode
- Info on alarm status

☞ Optional element

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User's Manual

1.7. „SaphirScope" - diagnostic and control software
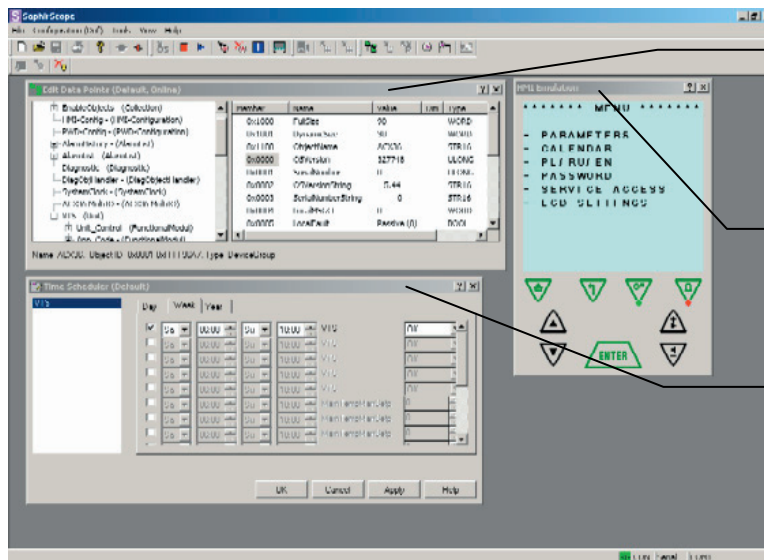
Program variables window
Access to all program variables.
Possibility of generating time-based charts of any variables

VS 00 HMI Advanced Emulator
Access to all program variables with virtual panel

Calendar
Convenient programming of AHU operation modes according to annual calendar

System requirements:
- Pentium II 400 MHz CPU,
- RS 232 serial port
- Windows NT 4.0 (Service Pack 5), XP.
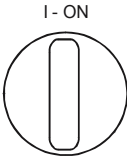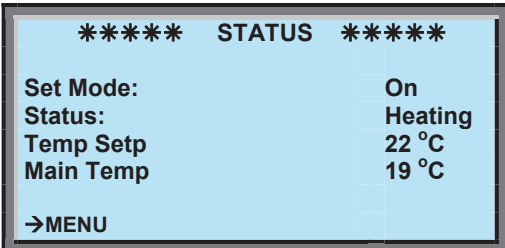
✍ *Information concerning program's operation and features are provided in a separate manual "SaphirScope - user's manual"*

2. SYSTEM START-UP
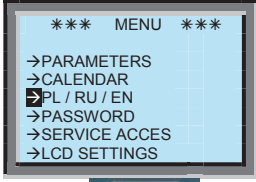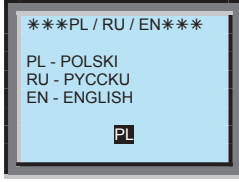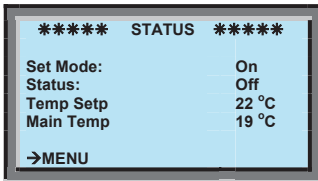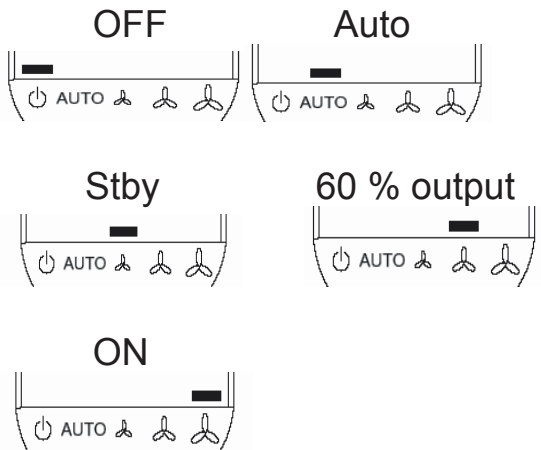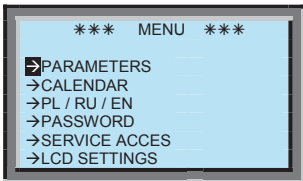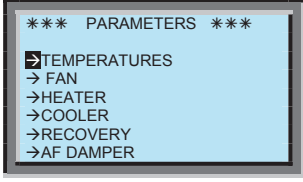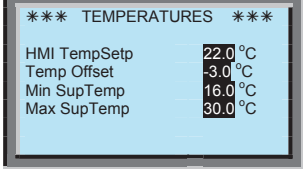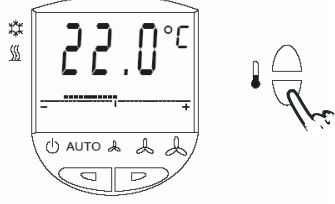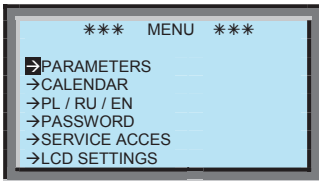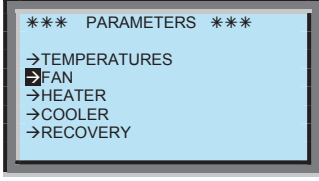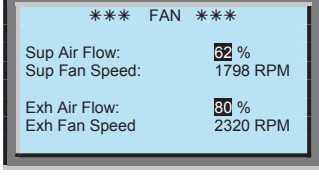
CAUTION!	
⚠ **!**	*Operation of the AHU is strictly arrested by the fire-protection alarm, activation of the thermal protection of fans' motors, threefold activation of the protection of electric heater and threefold activation of the anti-frost thermostat. Each of these events requires removing the cause of the alarm and then canceling it (see more details in „Advanced Manual" chapter).*

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Switching on power supply

```
*****    STATUS   *****

Set Mode:                    On
Status:                      Heating
Temp Setp                    22 °C
Main Temp                    19 °C

→MENU
```

I - ON

ON (SWITCHED ON)

Switching on power supply of the control gear with the mains switch (Q1M). Correct controller operation is indicated by blinking green LED in the right lower corner of the controller. If the LED is blinking in red or does not blink at all, contact the service center.

☞ The system is ready for operation after about 25 seconds from switching on.

VS 00 HMI Advanced

The number of the operating system is available in the advanced parameters.
Operation mode: On ■ Off ■ Auto ■ Stby
Info on selected AHU operation mode Description of available models is presented in the following sections of this manual.
Status: Vent ■ Off ■ Heating ■ Cooling ■ PreHeating
Info on current operation mode of the AHU.
Vent – AHU switched on (only fans are running)
Off – centrala wyłączona
Heating – AHU switched on, heating process activated
Cooling – AHU switched on, cooling process activated
Preliminary heating - this function is activated during AHU start-up and it prevents supply air with external temperature from blowing into the duct. This function is activated at external temperature below 8°C.
Temp Setp: 5...50°C
Info on preset air temperature. Upper and lower value of permissible preset temperature can be determined in the ADVANCED ⇨ TEMPERATURE tab
Main Temp: -64...64°C
Info on air temperature in the leading sensor area, which may be the room temperature sensor as well as supply or exhaust duct sensor. The leading sensor can be selected in the ADVANCED ⇨ UNIT COFIG
→MENU
Accessing the window with a list of available parameters and settings.

VS 00 HMI Basic

22.0°C

☼
⚒

⏻ AUTO ⚙ ⚙ ⚙

During first few seconds from switching on the device, the window displays 888 and E15 in sequence. In case of correct communication the window shows the temperature value from the leading temperature sensor.

☞ If the system did not start, check the F1 protection status

☞ 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 part II "Advanced manual"

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<table>
<tr><td>

Language selection

</td><td>

VS 00 HMI Advanced supports the following languages:
- EN English
- PL Polish
- RU Russian

English is set as a default language.

</td><td>

VS 00 HMI Advanced

</td><td>

```
***   MENU   ***

→PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

ENTER 👆

```
***PL / RU / EN***

PL - POLSKI
RU - PYCCKU
EN - ENGLISH

        PL
```

</td></tr>
</table>

Selection of operation mode

The AHU can operate in one of the following operation modes.

- **Auto** – AHU operates in line with defined time settings. Programming of time zones is described in I.4

- **ON** (switched in) – AHU operates in line with settings of the control panel

- **OFF** (switched off) – fans stopped, dampers and control valves closed All sensors and gauges are activated. Any possible alarms are indicated

- **Stby** (Stand-by) – system is activated if the preset temperature is 2°C higher than the measured one. In the same way the system is deactivated if the measured temperature is 2°C higher than the preset one. The measured temperature is get from the VS 00 HMI Basic, and if the module is not supported, from the main control sensor.

- **60% output** – this option is available in the VS 00 HMI Basic only. The system is switched on and fans speed is reduced to 60% of the value set in the VS 00 HMI Advanced.

VS 00 HMI Advanced

```
*****   STATUS   *****

Set Mode:          On
Status:            Off
Temp Setp          22 °C
Main Temp          19 °C

→MENU
```

1 sek..

VS 00 HMI Basic

OFF   Auto

Stby   60 % output

ON

👆 If both control panels are connected, any change entered in one of the panels updates automatically the data in the other panel and controller.

👆 In controller there is also a possibility to set temperature with a rheostat (see II Advanced manual, parameter: MultiFuncAnaIn)

EN

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3. SYSTEM OPERATION

Changing temperature parameters

MENU ⇨ PARAMETERS ⇨ TEMPERATURES ⇨ ...

HMI Temp Setp ◄.....►
preset temperature value from VS 00 HMI Advanced.

Temp Offset
preset temperature value after correction. The parameter can be changed only with VS 00 HMI Basic in range of +/- 4.5°C

Min SupTemp ◄.....►
minimal acceptable temperature value in the supply duct.

Max SupTemp ◄.....►
maximal acceptable temperature value in the supply duct.

Range of HMI Temp Setp MinSupTemp, MaxSupTemp, parameters acceptable for edition can be changed in advanced parameters.

VS 00 HMI Advanced

```
***   MENU   ***
▶PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
***  PARAMETERS  ***
▶TEMPERATURES
→ FAN
→HEATER
→COOLER
→RECOVERY
→AF DAMPER
```

```
***  TEMPERATURES  ***
HMI TempSetp      22.0 °C
Temp Offset       -3.0 °C
Min SupTemp       16.0 °C
Max SupTemp       30.0 °C
```

Temperature change is carried out with edit buttons in range of +/- 4.5°C around the temperature set in the controller with the VS 00 HMI Advanced or Scope program.

VS 00 HMI Basic

Changing AHU output

MENU ⇨ PARAMETERS ⇨ FAN ⇨ ...

Modification of AHU output can be carried out by changing voltage frequency feeding the fan motor. 100% output should correspond to the frequency at which the AHU reaches its rated output. (see MENU ⇨ ADVANCED ⇨ FAN SETTINGS ⇨ SUPPLY…, ... ⇨EXHAUST...

Sup Air Flow: ◄......►
Preset output on the supply side

Sup Fan Speed:
Preset speed of the supply fan. Uneditable parameter, calculated basing on the preset frequency and motor parameters.

Exh Air Flow: ◄......►
Preset output on the exhaust side

Exh Fan Speed:
Preset speed of the exhaust fan. Uneditable parameter, calculated basing on the preset frequency and motor parameters.

Range of **SupAirFlow** and **ExhAirFlow** parameters acceptable for edition can be changed in advanced parameters.

VS 00 HMI Advanced

```
***   MENU   ***
▶PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
***  PARAMETERS  ***
→TEMPERATURES
▶FAN
→HEATER
→COOLER
→RECOVERY
```

```
***   FAN   ***
Sup Air Flow:       62 %
Sup Fan Speed:    1798 RPM

Exh Air Flow:       80 %
Exh Fan Speed     2320 RPM
```

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MENU ⇨ PARAMETERS ⇨ HEATER ⇨ ...

Heating Rate: 0...100 %

Percentage value of setting water heater valve or heating level of the electric heater.

AirSideTherm.: OK ■ FLT

Info on the anti-frost thermostat status on the air side

OK – short contact, no alarm
FLT – open circuit, risk of freezing the water heater

WaterSideTherm: OK ■ FLT

Info on the anti-frost thermostat status on the water side

OK – short contact, no alarm
FLT – open contact, risk of freezing the water heater or/and hydraulic system

Pump: ON ■ OFF

Info on a signal controlling the pump operation
ON – short contact – signal switching on the pump Triggered if control percentage value of the heater is over 5%.
OFF – open contact – pump switched off

Pump 30sec/7days: ◀ON▶◀OFF▶

A parameter activating cyclic switch-on of the water heater for 30 seconds every 7 days.

ON – activated function
OFF – deactibvated function

PumpMinOutTemp: ◀ -30...10 ▶ °C
The temperature value below which the water pump operates in a continuous manner, regardless of heating requirements in the system.

Status: OK ■ FLT
Info on a status of the protections' thermostat of the electric heater

OK – short contact, no alarm
FLT – open contact, risk of electric heater overheating.

Heater's parameters

VS 00 HMI Advanced

```
***   MENU   ***
➡PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
***  PARAMETERS  ***
→TEMPERATURES
→FREQUENCY
➡HEATER
→COOLER
→RECOVERY
```

```
***   HEATER   ***
Heating Rate          10 %
AirSideTherm          OK
WaterSideTherm        OK
Pump                  ON
Pump Kick             OFF
PumpMinOutTemp        5.0 °C
```

```
***   HEATER   ***
Heating Rate          10 %
Status                OK
```

User's Manual
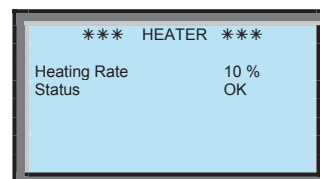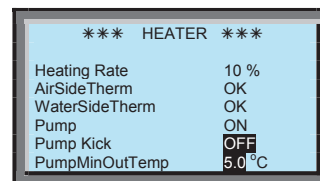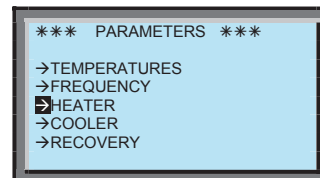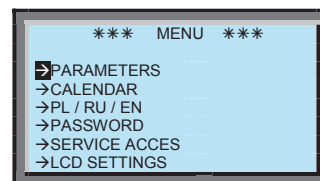
MENU ⇨ PARAMETERS ⇨ COOLER ⇨ ...

Cooling: 0...100 %

Control percentage of the water cooler valve

RefrigUnitState: ON ■ OFF

Info on a signal controlling operation of the cooling system

ON – short contact – signal switching on the pump Triggered if control percentage value of the cooler is over 5%.

OFF – open contact – cooling system switched off

RefrigUnit: OK ■ FLT

Info on the cooling system status

OK – short contact, no alarm

FLT – open contact, incorrect operation status of the cooling system

MinOutTemp: ◀ 0...40 ▶°C

The temperature value under which the cooling is blocked. Water valve is closed, refrigerator and compressors of freon cooler are switched off.

Stage 1: ON ■ OFF

Info on a signal controlling operation of the first level cooling system of the freon cooler

ON – short contact – signal switching on the system.

OFF – open contact – system switched off

Stage 2: ON ■ OFF

Info on a signal controlling operation of the second level cooling system of the freon cooler

ON – short contact – signal switching on the system.

OFF – open contact – system switched off

(sidebar: Cooler's parameters)

(sidebar: VS 00 HMI Advanced)

```
***   MENU   ***
➡PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
***   PARAMETERS   ***

→TEMPERATURES
→FAN
→HEATER
➡COOLER
→RECOVERY
```

```
***   COOLER   ***
Cooling Rate          10 %
RefrigUnitState       ON
RefrigUnit            OK

MinOutTemp            16 °C
```

```
***   COOLER   ***
Stage 1               ON
Stage 2               OFF

RefrigUnit            OK
MinOutTemp            16 °C
```
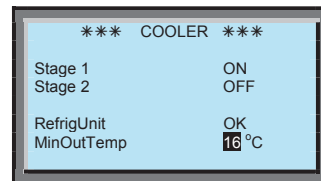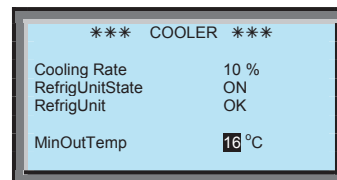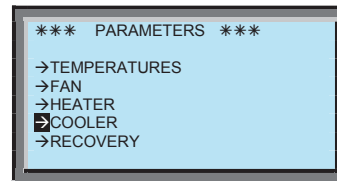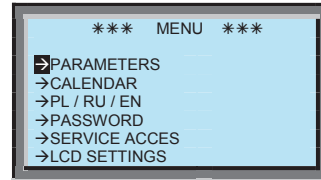
EN

MENU ⇨ PARAMETERS ⇨ RECOVERY ⇨ ...

Parameters of heat recovery

RecRate: 0...100 %
Percentage value of opening of cross-flow exchanger, recirculation damper, percentage value of the rotary exchanger's speed.

AfterRecTemp -64...+64 °C
Temperature value measured behind the heat recovery system on the exhaust side

TempLimit ◄ -10...20 ► °C (⌨ 0 °C)
Minimal acceptable temperature value measured behind the heat recovery system on the exhaust side. It is recommended to set temperature higher than 0 °C.

MaxRecRate ◄ 0...100 ► % (⌨ 70 %)
Limit of recirculation level The system controls automatically the recirculation damper, depending on requirements of heating or cooling, from 0 to the value set in this parameter.

ManMode: ◄ ON ►◄ OFF ► (⌨ OFF)
The parameter for switching on or off the recirculation damper on a constant level, set in the ManModeSetp parameter.

ON – manual mode switched on

OFF – manual mode switched off

☞ If the system is in a calendar mode, the mode change is carried out in the calendar assembly's window

MaxRecRate ◄ 0...100 ► % (⌨ 30 %)
Recirculation level in the manual mode of recirculation control.

MinFreq ◄ 10...20 ► Hz (⌨ 15 Hz)
Lower limit of the supply voltage frequency of the rotary exchanger motor.

MaxFreq ◄ 21...60 ► Hz (⌨ 53 Hz)
Upper limit of the supply voltage frequency of the rotary exchanger motor.

RRGFCStatus OK ■ FLT
Status of the rotary exchanger drive

OK – no alarm
FLT – incorrect drive operation status

RRGCom ■ FLT
Communication status with the rotary exchanger drive

OK – communication ok
FLT – no communication

☞ The **MaxFreq** i **MinFreq** parameter should be adjusted in accordance with documentation of the rotary exchanger drive.

VS 00 HMI Advanced

```
***  MENU  ***
▣PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
***  PARAMETERS  ***
→TEMPERATURES
→FAN
→HEATER
→COOLER
▣RECOVERY
```

```
***  RECOVERY  ***
RecRate          100 %
AfterRecTemp      16 °C
TempLimit          5 °C
```

```
***  RECOVERY  ***
RecRate          100 %
MaxRecRate        30 %

ManMode       Ma OFF
ManModeSetp       15 %
```

```
***  RECOVERY  ***
RecRate          100 %
AfterRecTemp      16 °C
TempLimit          5 °C
MinFreq           30 Hz
MaxFreq           10 Hz
RRGFCStatus       OK
RRGCom            OK
```

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User's Manual

Heat recovery parameters in one-phase systems

VS 00 HMI Advanced

MENU ⇨ PARAMETERS ⇨ AF DAMPER ⇨ ...

SupAirRate: 0...100 %
Percentage value of supply damper opening.

TempLimit ◄ -10...20 ►°C (⌂ 0 °C)
Minimal acceptable temperature value measured behind the heat recovery system on the exhaust side. It is recommended to set temperature higher than 0°C.

```
✳✳✳    MENU    ✳✳✳
➡PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
✳✳✳   PARAMETERS   ✳✳✳

→TEMPERATURES
→FAN
→HEATER
→COOLER
➡AF DAMPER
```

```
✳✳✳   AF DAMPER   ✳✳✳

SupAirRate          100 %
TempLimit           5 °C
```

Change of water exchanger's funfction

MENU ⇨ PARAMETRY ⇨ SEZON ⇨ ...

Operation Mode ◄ Summer ► ◄ Winter ►

Selecting functions of water exchanger in systems with one coil operating as a cooler or heater.

Change of operation mode is available by HMI Advanced or by external switch, after suitable configuration of universal digital input.

Summer – cooling function

Winter – heating function

```
✳✳✳    MENU    ✳✳✳
➡PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→ADVANCED
→DISPLAY
```

```
✳✳✳   PARAMETERS   ✳✳✳
→TEMPERATURES
→FAN
→HEATER
→COOLER
→RECOVERY RATE
→AIR SUP. DAMPER
➡SEASON
```

```
✳✳✳    SEASON    ✳✳✳

Operation mode        Summer
```

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4. TIME ZONES PROGRAMMING

The calendar is divided into three ranges with different priorities.

Range	Priority
Annual	1 highest
Weekly	2
Daily	3 highest

Priority idea

Settings			Actual AHU operation on 09.10.2005		
Range	Setting	Date	05:25 PM	08:30 PM	09:05 PM
Annual	Switched on	09.10.2005 07:00 AM-08:00 PM Sunday			
Weekly	Switched off	06:00 AM - 09:00 PM Sunday	Switched on	Switched off	Stand-by
Daily	Stand-by	06:00 AM - 10:00 PM			

EN

MENU ⇨ CALENDAR ⇨ ...

Calendar parameters

→ **MODE**
Setting AHU operation mode. Available modes:
Switched on, switched off, stand-by

→ **TEMPERATURES**
Setting preset operation temperature

→ **FAN SPEED**
Setting preset fan speed Setting range acceptable for edition is specified in the advanced parameters

→ **MAN MIX CMBR**
Setting the mixing chamber in automatic or manual mode.

→ **MAN MIX CMBR STP**
Setting recirculation level in manual operation mode of the mixing chamber.

→ **MAX REC RATE STP**
Setting maximal recirculation level in automatic operation mode of the mixing chamber.
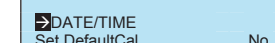
→ **DATE / TIME**
Setting current date and time.

Set DefaultCal
Back to factory setting described in the „Sample program/factory setting" section

VS 00 HMI Advanced

```
***   MENU   ***
→PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
***   CALENDAR   ***
→MODE
→TEMPERATURE
→FAN SPEED
→MAN MIX CMBR
→MAN MIX CMBR STP
→MAX REC RATE STP

→DATE/TIME
Set DefaultCal          No
```

VTS reserves the right to implement changes without prior notice

User's Manual

4.1 Setting current date and time

```
*** MENU ***

→PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
→SERVICE ACCES
→LCD SETTINGS
```

```
*** CALENDAR ***

→MODE
→TEMPERATURE
→FAN SPEED
→MIX CMBR
→MAN MIX CMBR STP
→MAX REC RATE STP

→DATE/TIME
Set DefaultCal          No
```

```
** DATE AND TIME **

Time
01:15:07

Date
09:12:2005
```

4.2 Sample program/factory setting

Date	Setting			
	Mode	Output	Temperature	Recirculation
Monday - Friday				
07:00 AM-05:00 PM	Switched on	100%	20ºC	70% Auto
05:00 PM-07:00 AM	Stand-by	100%	20ºC	100% Auto
Saturday – Sunday				
Saturday 07:00 AM- Saturday 03:00 PM	Switched on	80%	20 ºC	70% Auto
Saturday 03:00 PM - Monday 07:00 AM	Stand-by	80%	20 ºC	100% Auto
Holiday				
25.12.2005 07:00 AM - 27.12. 2005 07:00 AM	Stand-by	60%	16 ºC	95%Auto

Setting a mode

```
*** CALENDAR ***

→MODE
→TEMPERATURE
→FAN SPEED
→MIX CMBR
→MAN MIX CMBR STP
→MAX REC RATE STP

→DATE/TIME
Set DefaultCal          No
```
1

```
*** MODE ***

→ZONE 1
→ZONE 2
→ZONE 3
→ZONE 4
→ZONE 5
→ZONE 6

→WEEK 1
→WEEK 2
→WEEK 3
→WEEK 4
→WEEK 5
→YEAR 1
→YEAR 2
→YEAR 3
```
2

```
*** ZONE 1 ***

Time        07:00
State       ON
Active      Yes
```
3

```
*** ZONE 2 ***

Time        17:00
State       Stby
Active      Yes
```
4

```
*** WEEK 1 ***

Start       Sa, 07:00
End         Sa, 15:00
State       ON
Active      Yes
```
5

```
*** WEEK 2 ***

Start       Sa, 15:00
End         Su, 07:00
State       Stby
Active      Yes
```
6

```
*** YEAR ***

Start       25.12  7:00
End         27.12  7:00
State       Stby
Active      Yes
```
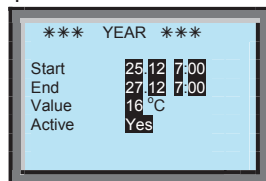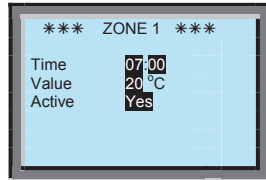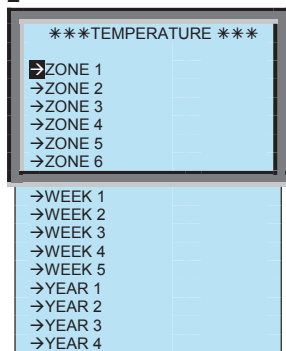7

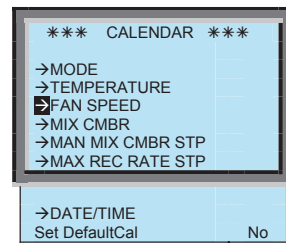☞ If all zones are inactive, the system set in the calendar mode will be stopped.
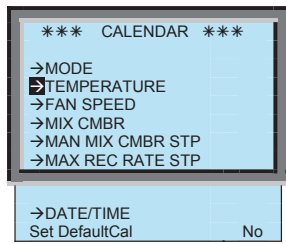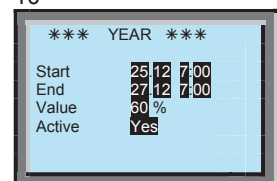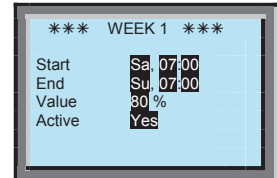
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Setting a temperature

1
```
***   CALENDAR   ***

→MODE
➡TEMPERATURE
→FAN SPEED
→MIX CMBR
→MAN MIX CMBR STP
→MAX REC RATE STP

→DATE/TIME
Set DefaultCal            No
```

2
```
***TEMPERATURE ***

➡ZONE 1
→ZONE 2
→ZONE 3
→ZONE 4
→ZONE 5
→ZONE 6

→WEEK 1
→WEEK 2
→WEEK 3
→WEEK 4
→WEEK 5
→YEAR 1
→YEAR 2
→YEAR 3
→YEAR 4
```

3
```
***   ZONE 1   ***

Time            07:00
Value           20 °C
Active          Yes
```

4
```
***   YEAR   ***

Start       25.12  7:00
End         27.12  7:00
Value       16 °C
Active      Yes
```
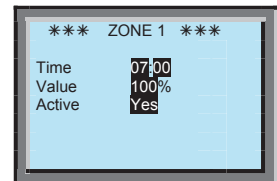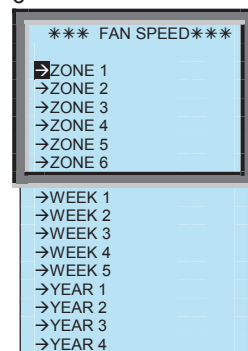
📖 If all zones are inactive and the system will be set in the calendar mode, changing the preset temperature will be possible with the VS HMI 00 Basic and VS HMI 00 Advanced

Setting air output

5
```
***   CALENDAR   ***

→MODE
→TEMPERATURE
➡FAN SPEED
→MIX CMBR
→MAN MIX CMBR STP
→MAX REC RATE STP

→DATE/TIME
Set DefaultCal            No
```

6
```
***  FAN SPEED ***

➡ZONE 1
→ZONE 2
→ZONE 3
→ZONE 4
→ZONE 5
→ZONE 6

→WEEK 1
→WEEK 2
→WEEK 3
→WEEK 4
→WEEK 5
→YEAR 1
→YEAR 2
→YEAR 3
→YEAR 4
```
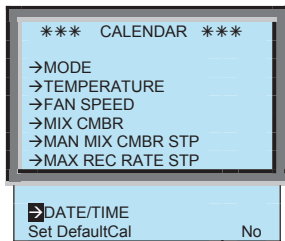
7
```
***   ZONE 1   ***

Time            07:00
Value           100 %
Active          Yes
```

8

9
```
***   WEEK 1   ***

Start       Sa. 07:00
End         Su. 07:00
Value       80 %
Active      Yes
```

10
```
***   YEAR   ***

Start       25.12  7:00
End         27.12  7:00
Value       60 %
Active      Yes
```

📖 If all zones are inactive and the system will be set in the calendar mode, changing the preset frequency will be possible with the VS HMI 00 Basic and VS HMI 00 Advanced
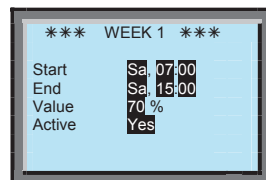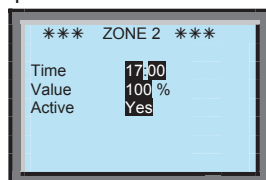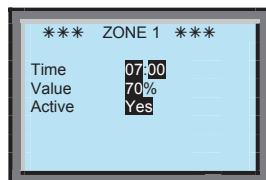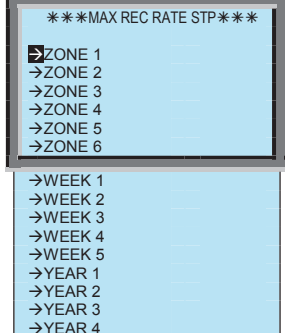
Setting the recirculation level

1
```
***   CALENDAR   ***

→MODE
→TEMPERATURE
→FAN SPEED
→MIX CMBR
→MAN MIX CMBR STP
→MAX REC RATE STP

➡DATE/TIME
Set DefaultCal            No
```
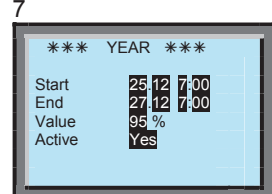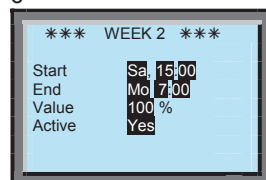
2
```
***MAX REC RATE STP***

➡ZONE 1
→ZONE 2
→ZONE 3
→ZONE 4
→ZONE 5
→ZONE 6

→WEEK 1
→WEEK 2
→WEEK 3
→WEEK 4
→WEEK 5
→YEAR 1
→YEAR 2
→YEAR 3
→YEAR 4
```

3
```
***   ZONE 1   ***

Time            07:00
Value           70 %
Active          Yes
```

4
```
***   ZONE 2   ***

Time            17:00
Value           100 %
Active          Yes
```

5
```
***   WEEK 1   ***

Start       Sa. 07:00
End         Sa. 15:00
Value       70 %
Active      Yes
```

6
```
***   WEEK 2   ***

Start       Sa. 15:00
End         Mo. 7:00
Value       100 %
Active      Yes
```

7
```
***   YEAR   ***

Start       25.12  7:00
End         27.12  7:00
Value       95 %
Active      Yes
```

📖 If all zones are inactive and the system will be set in the calendar mode, changing the preset frequency will be possible with the VS HMI 00 Advanced

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II. ADVANCED MANUAL

!	*All works inside the control gear must be performed with power of all external systems cooperating with the control gear switched off Even if the **Q1M**, mains switch is turned off, some external circuits control voltage may be present on the **terminal strip**.*

☝ Further part of the manual is designed for experienced users and service men, who made themselves acquainted with operation of the VS 00 HMI Advanced or/and use the SAPHIRScope application.

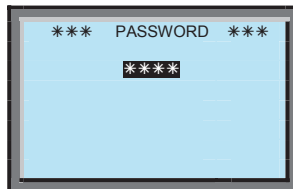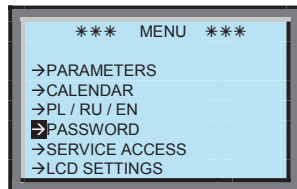## 5. ADVANCED PARAMETERS AND FEATURES OF THE CONTROLLER

!	*Pay utmost attention to selection of the automatic control application Inappropriate selection may result in improper AHU operation and significant loss of energy.*

5.1 Access to advanced parameters

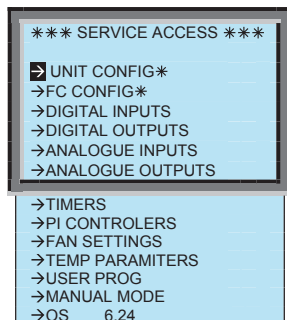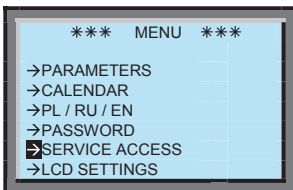| Access to lists of parameters: → SERVICE ACCESS →LCD SETTINGS and **alarms cancellation** is possible after providing the password. **Factory password: 8888**	✳✳✳ MENU ✳✳✳ →PARAMETERS →CALENDAR →PL / RU / EN ➡PASSWORD →SERVICE ACCESS →LCD SETTINGS	✳✳✳ PASSWORD ✳✳✳ ✳✳✳✳	✳✳✳✳	Enter
			8✳✳✳	▲ ▼ Enter
			✳**8**✳✳	▲ ▼ Enter
			✳✳**8**✳	▲ ▼ Enter
			✳✳✳**8**	▲ ▼ Enter
				Automatic return to the STATUS window

☝ Changing a password is possible with the SAPHIRScope program only. The password is available under the parameter: ACX36 / EnableObjects / PWD-Config / PasswordLevel8

5.2 Advanced parameters

✳✳✳ MENU ✳✳✳
→PARAMETERS
→CALENDAR
→PL / RU / EN
→PASSWORD
➡SERVICE ACCESS
→LCD SETTINGS

✳✳✳ SERVICE ACCESS ✳✳✳
➡UNIT CONFIG✳
→FC CONFIG✳
→DIGITAL INPUTS
→DIGITAL OUTPUTS
→ANALOGUE INPUTS
→ANALOGUE OUTPUTS

→TIMERS
→PI CONTROLERS
→FAN SETTINGS
→TEMP PARAMITERS
→USER PROG
→MANUAL MODE
→OS   6.24

☝ Access to some parameters depends on a selected code of the application.

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MENU ⇨ SERVICE ACCESS ⇨ UNIT CONFIG✳ ⇨ ...

Mode: ◄ Run ►◄ Conf ► (🏭 Conf)
Current system status.
Run - controller in normal operation mode, it controls the unit in line with set parameters.
Conf - controller is in configuration mode, system control is stopped, the executive device is switched off.
Only in this state this is possible to change parameters of control gear, controller and frequency converters.
Applies to windows:
→ UNIT CONFIG✳
→ FC PROG.✳

! After setting required parameters, go back to the Run mode. After confirming the status with the ENTER button, the STATUS window will appear on the display after a while (about 5 seconds). From that moment the system starts the configuration process and after next 25 seconds it is ready to start operation with new settings.

Type of control gear: ◄ 1 ►◄ 3 ► (🏭 1)
Selection of control gear type.
1 – one-phase control gear: VS 10-15 CG ACX36-1
3 – three-phase control gear: VS 21-150 CG ACX36-2

☝ One- and three-phase type of the control gear depending on a type of connected motor and not on the method of supplying power to the control gear.

Application type ◄ AS ►◄ AP ►◄ AR ►►◄ AD ► (🏭 AS)
Selection of application type. Type and code of the application are provided in the AHU technical data specification
AS – for supply AHUs
AP – for supply-exhaust AHUs with cross-flow exchanger
AR – for supply-exhaust AHUs with rotary exchanger
AD – for supply-exhaust AHUs without heat recovery or with recirculation damper

Application code ◄ 0 ►◄ 0 ►◄ 0 ► (🏭 000)
Selection of application code. Depending on selected application code the controller controls the freon cooler, water cooler, electric heater, water heater or heater-cooler combination. Type and code of the application are provided in the AHU technical data specification.

Code OK Yes ■ No
A parameter providing info on whether the selected application code matches the previously determined application type.

LeadingSensor ◄ Room ►◄ Exh ►◄ Sup ► (🏭 Sup)
Selection of a leading control sensor. (see point 2 „Temperature control").
Room – sensor located in the room. If the HMI basic parameter = Yes, the leading sensor is the one located in the VS 00 HMI Basic.
Exh – sensor located in the exhaust duct
Sup – sensor located in the supply duct.

☝ Room sensor and exhaust duct sensor are optional elements.

HMI basic ◄ Yes ►◄ No ► (🏭 No)
A parameter allowing for activation of the VS 00 HMI Basic panel in the system.
Yes – active panel
No – inactive panel.

☝ If the panel is active in the stand-by mode, regardless of the selected leading sensor, the system operation is based on the sensor located in the VS 00 HMI Basic. If the panel is inactive, the system operation is based on the leading sensor.

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SupSideFCType ◄ NoFC ►◄ iC5 ►◄ VL28 ►◄ MicD ►◄ iG5 ► (⌨ NoFC)

Selection of a type of frequency converter of the supply fan.

NoFC – no converter.

iC5 – converter made by LG typ iC5

VL28 – converter made by Danfoss, type: VLT 2800

MicD – converter made by Danfoss, type: Micro Drive

SupSide-MultiFans ◄ NO ►◄ 2 ►◄ 3 ►◄ 4 ► (⌨ NO)

NO means the selection of an AHU with a single supply fan set. Settings 2, 3 and 4 means the number of fans in MultiFans configuration and initiates communication of the control box with additional supply fan inverters.

ExhSideFCType ◄ NoFC ►◄ iC5 ►◄ VL28 ►◄ MicD ►◄ iG5 ► (⌨ NoFC)

Selection of a type of frequency converter of the exhaust fan.

ExhSide-MultiFans ◄ NO ►◄ 2 ►◄ 3 ►◄ 4 ► (⌨ NO)

NO means the selection of an AHU with a single exhaust fan set. Settings 2, 3 and 4 means the number of fans in MultiFans configuration

☝ Transferring start permission signal, alarm states as well as reading out parameters from frequency converters is carried out with the help of RS 485 communication bus.

☝ If a frequency converter is installed in the system but for any reasons it is controlled omitting the Modbus bus, then the converter's type should be set at the **NoFC.**

RRG FCType ◄ iC5 ►◄ MicD ► (⌨ iC5)

Selection of a type of rotary regenerator's frequency converter.

MultiFuncDigIn ◄ NoFu ►◄ SpNO ►◄ SpNC ►◄ FsNO ►◄ Wint ►◄ TeOc ►◄ CON ► (⌨ NoFu)

Selecting functions of the X1 (S6) multifunctional digital input

NoFu - signal sent to the input is ignored by the controller

SpNO - Permission to AHU start. Input configured for a normally open contact

SpNC - Permission to AHU start. Input configured for a normally short contact

FsNO - Forced AHU start. Input configured for a normally open contact

FsNC - Forced AHU start. Input configured for a normally short contact

Wint - Function for systems with one heat exchanger operating as a cooler or heater. Open contact is interpreted by the system as the Summer and blocks the AHU heating cycle, short contact is interpreted as the Winter and the cooling is blocked.

TeOc - Function forcing AHU operation in normal mode during one hour from the contact shorting connected at the universal input. The function is activated by the positive edge

CON - Input signal influences the user's controller only

☝ Except for the NoFu mode, you can use a current status of the universal input in the user's controller

MultiFuncAnaIn ◄ NoFu ►◄ TeSp ►◄ ReRt ►◄ FrSp ►◄ CON ► (⌨ NoFu)

Selecting functions of the X3 (B5) multifunctional analog input.

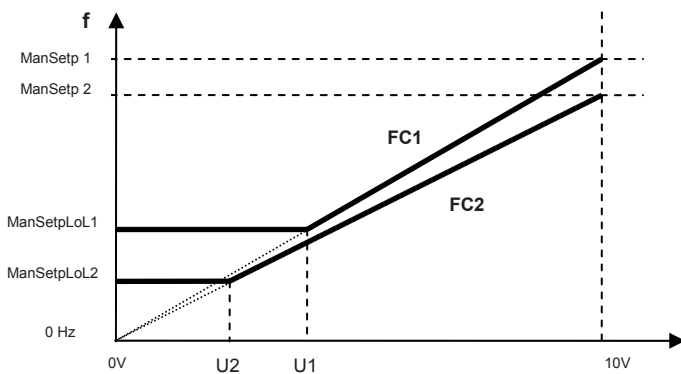**NoFu -** signal sent to the input is ignored by the controller

TeSp - input signal is interpreted by the system as the preset temperature value omitting settings of both control panels - VS 00 HMI Basic and VS 00 HMI Advanced. Input is adapted to operation with a passive resistance element scaled as the input of PT 1000 temperature sensors, i.e. 1000 Ohm = 0 $^{\circ}$C

ReRt - input signal is interpreted by the system as the preset recirculation level value omitting settings of the HMI Advanced

FrSp - input signal is interpreted as the preset frequency value. The input receives voltage signal 0-10VDC, where 0V = minimal frequency, 10V = rated frequency.
(see MENU ⇨ SERVICE ACCESS ⇨ FAN SETTINGS ⇨ SUPPLY... and ... ⇨ EXHAUST)

☝ If minimal frequency of supply and exhaust fan vary, then range of the proportional control is between nominal frequency and minimal frequency with higher value. Further lowering of the signal causes lowering of frequency only of the converter with lower minimal value of the preset frequency.

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EN

Programming frequency converters

ManSetp 1,2; rated converter frequency

MinFreq 1,2 minimal converter frequency

U1 = 10*MinFreq1 / Setvalue 1
U2 = 10*MinFreq2 / Setvalue 2

Range of frequency control of both converters is between U1 and 10V

CON - Input signal influences the user's controller only

☞ Except for the NoFu mode, you can use a current status of the universal input in the user's controller

MultiFuncRelay ◄ NoFu ►◄ StaC ►◄ HtgC ►◄ ClgC ►◄ Filt ►◄ CON ►   (⌨ NoFu)

Selection the function of the multifunctional converter Q6 (E5).
NoFu - inactive relay
StaC - confirmation of fans operation. The relay is short when both fans are switched on
HtgC - confirmation of heating mode. The relay is short when analog signal controlling the heater exceeds 5%
ClgC - confirmation of cooling mode. The relay is short when start signal for the cooling system is enabled
Filt - info on contaminated filters. The relay is short when at least one filter's pressure gauge is short
CON - the relay reacts to a signal from the user's controller

MENU ⇨ SERVICE ACCESS ⇨ FC CONFIG✳ ⇨ ...

Mode: ◄ Run ►◄ Conf ►   (⌨ Conf)
See: MENU ⇨ SERVICE ACCESS ⇨ UNIT CONFIG✳

Converter ◄ Sup ►◄ Exh ►◄ RRG ►◄ Sup2 ►◄ Sup3 ►◄ Sup4 ►◄ Exh2 ►◄ Exh3 ►◄ Exh4 ► (⌨ Sup)
Network address of each new converter equals 1. Depending on the fact if the converter operates on the supply, exhaust side or inside the rotary exchanger's drive, the converter's address in the network is changed during programming accordingly.

System element	Address in modbus network
Sup Converter on the supply side	2
Exh Converter on the exhaust side	3
RRG Converter of the rotary exchanger	4
Sup2 Second converter on the supply side	5
Sup3 Third inverter on the supply side	6
Sup4 Fourth inverter on the supply side	7
Exh2 Second converter on the exhaust side	8
Exh3 Third inverter on the exhaust side	9
Exh4 Fourth inverter on the exhaust side	10
ACX36 controller	0

SelectFCType   ◄ iC5 ►◄ VL28 ►◄ MicD ►◄ iG5 ►   (⌨ iC5)
Selection of the programmable frequency converter type
iC5 – converter made by LG, type: iC5
VL28 – converter made by Danfoss, type: VLT 2800
MicD – converter made by Danfoss, type: Micro Drive

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SelectMotor ◄ .... ►   (⌁ 0.09)

Selection of power of the motor operating with the programmable converter.

Parameter value = motor power [kW] rounded to one decimal place.

SelectPoles   ◄ 2 ► ◄ 4 ►   (⌁ 2)

Selection of motor poles number operation with the programmable converter.

2 - two-pole motors with 2800-2950 rpm rated speed.

**4** - four-pole motors with 1300-1490 rpm rated speed.

ActionStatus   ◄ Rdy ► ◄ Err ► ◄ Snd ►

Parameter initiating programming and providing information on programming process status

Rdy – Programming finished, last programming process successfully finished.

 Err – Programming finished, last programming process completed with error.

Snd – initialization of programming process, a message displayed till transferring data to the converter is finished.
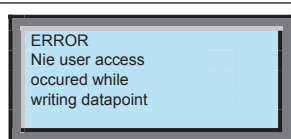
ERROR Nie user access occured while writing datapoint	If the **Rdy** or **Err** option is selected, the program selector displays a message about setting not acceptable program selector operation mode.

Programming instruction

Programming sequence of a converter

1. Connect a communication cable to the converter, switch on its power supply.
2. Set converter parameters in the MENU ⇨ SERVICE ACCESS ⇨ FC CONFIG✱
3. Initiate programming (**Snd**)

Programming two converters sequence

1. Connect a communication cable to one of the converters, switch on its power supply
2. Set converter parameters in the MENU ⇨ SERVICE ACCESS ⇨ FC CONFIG✱
3. Initiate programming (**Snd**)
4. Connect a communication cable to the other converter, switch on its power supply.
5. Set converter parameters in the MENU ⇨ SERVICE ACCESS ⇨ FC CONFIG✱
6. Initiate programming (**Snd**)
7. Repeat steps from 4 to 6

! In case of programming errors check the network connection quality and make sure that addresses of converters subject to programming equal 1

☞ Programming frequency converters

EN

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Status of digital inputs	MENU ⇨ SERVICE ACCESS ⇨ DIGITAL INPUTS ⇨ ... **On** – voltage signal are provided at the input **Off** – no voltage signal at the input **FireDetector On ■ Off** Input of anti-frost sensor **AirSideTherm On ■ Off** Input of anti-frost thermostat on the air side **WaterSideTherm On ■ Off** Input of anti-frost thermostat on the water side **ElectricHeater On ■ Off** Input of alarm signal of electric heater **RefrigUnit On ■ Off** Input of alarm signal of cooling signal (cooler) **FilterExh On ■ Off** Input of pressure gauge of the filter on the exhaust side (three-phase systems) **FilterSup On ■ Off** Input of pressure gauges of the filters on the supply side (three-phase systems) **Motor On ■ Off** Input of motor thermostats on the supply and exhaust side (one-phase systems) **Filters On ■ Off** Input of filters pressure gauges on the supply and exhaust side (one-phase systems) **MultiFuncDigIn On ■ Off** Universal input

EN

Status of digital outputs	MENU ⇨ SERVICE ACCESS ⇨ DIGITAL OUTPUTS ⇨ ... **Auto** – output status depends on a control algorithm and current conditions **Man** – output status set manually. **On** – **St1** switched on - first level of cooling system of the freon cooler is switched on **Off** – **St2** switched off - second level of cooling system of the freon cooler is switched on **Pump Auto ■ Man On ■ Off** Output that controls the operation of water heater pump **Damper Auto ■ Man On ■ Off** Output that controls operation of air damper **FAN Auto ■ Man On ■ Off** Output that controls fans operation (one-phase systems) **CoolerComp Auto ■ Man On ■ Off** Output enabling operation of the cooling system **HtgStatus Auto ■ Man On ■ Off** Output enabling operation of the heating system **Unit Auto ■ Man Off ■ St1 ■ St2** Output that controls operation of the cooling system **MFunRel Auto ■ Man On ■ Off** Universal output configured in the window: MENU ⇨ SERVICE ACCESS ⇨ UNIT CONFIG✴ ⇨ ... **AlarmRelay Auto ■ Man On ■ Off** Output that informs about the occurrence of alarm status

Values at analog inputs	MENU ⇨ SERVICE ACCESS ⇨ ANALOG INPUTS ⇨ ... **Outside Temp -64…64 °C** Value measured by external temperature sensor **Supply Temp -64…64 °C** Value measured by a duct sensor of supply temperature **Room/Exh Temp -64…64 °C** Value measured by the room temperature sensor or duct sensor of exhaust temperature **AfterReco Temp -64…64 °C** Value measured by the duct temperature sensor at the exhaust, behind the heat recovery system ✎ Sensors with passive gauge PT 1000 (0°C=1000Ohm) are used for measurements **MultiFuncAnaIn °C / %** Value measured by the universal analog input. Displayed units depend on the selected output function. oC unit appears when the input has been assigned temperature adjuster function. (0 °C = 1000 Ohm) ┄┄┄┄┄┄┄┄┄┄┄ ⋮ 0 °C = 1000 Ohm ⋮ ┄┄┄┄┄┄┄┄┄┄┄

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Advanced manual

Values at analog outputs

MENU ⇨ SERVICE ACCESS ⇨ ANALOG OUTPUTS ⇨ ...

Auto – output status depends on a control algorithm and current conditions
Man – output status set manually.

HtgStatus   Auto ■ Man   0…100%   Voltage signal value on the input that controls the valve actuator of the water heater

CoolerComp Auto ■ Man   0…100% Voltage signal value on the input that controls the valve actuator of the water cooler

RecRate   Auto ■ Man   0…100%   Voltage signal value on the input that controls:

0% = 0V
100% = 10V

1. cross-flow exchanger damper actuator or recirculation damper actuator. 3-phase systems
2. inlet damper (supply side) actuator. 1-phase systems with cross-flow exchanger

---

Time systems   Fans switch-on delay

MENU ⇨ SERVICE ACCESS ⇨ TIMERS ⇨ ...

StartDelay   ◀ 0...180 ▶ s (🕮 10 s)
AHU start delay - time between starting command and AHU start-up
PreHeating   ◀ 30...600 ▶ s (🕮 180 s)
Duration of initial heating of the water heater.
FanOnDelay   ◀ 0...180 ▶ s (🕮 20 s)
Fans switch-on delay - time between starting up the AHU and fans start-up. In this time heating or cooling systems may start operation, depending on conditions.
FanOffDelay   ◀ 0...120 ▶ s (🕮 10 s)
Fans switch-off delay - time between starting switching off the AHU and fans switch-off. During this time the electric heater may be chilled
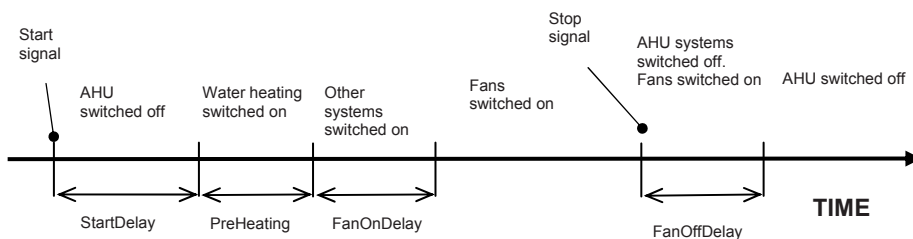
StageMinOn   ◀ 1...999 ▶ s (🕮 180 s)
Minimal acceptable operation time of the cooling system

StageMinOff ◀ 1...999 ▶ s (🕮 180 s)
Minimal acceptable standstill time of the cooling system

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MENU ⇨ SERVICE ACCESS ⇨ PI CONTROLLERS ⇨ ...

Kp - proportionality factor

Ti - integration time-constant

	Kp.	**Ti**		
PI1	◄ -30...30 ►	◄ 0...7200 ►	(⌛ 2 s)	(⌛ 1800 s)

Regulator		Input signal	Controlled element	Factory setting	
				Kp	Ti
PI 1	temperature control in heating mode	Tmain-Tset	water or electric heater	2	1800
PI 2	lower temperature limit in the supply duct in the heating mode	Tsup-Tmin		4	60
PI 3	upper temperature limit in the supply duct in the heating mode	Tsup-Tmax		-4	60
PI 4	temperature control in the heat recovery mode	Tmain-Tset	Cross-flow or rotary exchanger or recirculation damper	2	1800
PI 5	anti-frost protection of the heat recovery system	Trec - Tlim	Cross-flow or rotary exchanger	4	60
PI 6	temperature control in cooling mode	Tmain-Tset	Water and freon cooler	-2	1800
PI 7	lower temperature limit in the supply duct in the cooling mode	Tsup-Tmin		4	60
PI 8	anti-frost protection of the heat recovery system	Trec - Tlim	Damper on the supply side in the systems with cross-flow exchanger without by-pass damper	4	60
PI 9	lower temperature limit in the supply duct in the recovery mode	Tsup-Tmin	Cross-flow or rotary exchanger or recirculation damper	4	60
PI 10	upper temperature limit in the supply duct in the recovery mode	Tsup-Tmax		-4	60

Tset – preset temperature

Tmain – temperature measured by the leading sensor

Tsup – temperature in supply duct

Trec – temperature behind the heat regenerator

Tlim – limit value

Tmax – acceptable upper temperature in the supply duct

Tmin – acceptable lower temperature in the supply duct

PI controllers

EN

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MENU ⇨ SERVICE ACCESS ⇨ FAN SETTINGS ⇨ SUPPLY…

MENU ⇨ SERVICE ACCESS ⇨ FAN SETTINGS ⇨ EXHAUST…

✍ In systems equipped with many fans in the supply or exhaust section, given values (efficiency, limitation settings) are common and value readouts (e.g. current) are given separately for each frequency converter.

SupSideFCType NoFC ■ iC5 ■ VL28 ■ MicD

ExhSideFCType NoFC ■ iC5 ■ VL28 ■ MicD

Frequency converter mode

RampUpTime   ◄ 30...120 ► s   (🖩 30 s)

Length of accelerating time ramp – time from the start signal or increasing preset frequency signal up to reaching the preset speed.

RampDownTime   ◄ 30...120 ► s   (🖩 40 s)

Length of braking time ramp – time from decreasing speed signal up to reaching the preset speed.

✍ After AHU switch-off signal the fans stop by rundown. Length of the braking time ramp does not influence the rundown time.

ManSetpHiL ◄ 21...100 ► Hz (🖩 80 Hz)

Upper limit of the acceptable range of preset frequency. While specifying the limit you have to take into consideration rated parameters of the ventilation system and rated value of the motor current.

ManSetpHiL ◄ 10...20 ► Hz (🖩 20 Hz)

Lower limit of the acceptable range of preset frequency.

ManSetp ◄ … ► Hz (🖩 35 Hz)

Frequency value for which in user's settings (MENU ⇨ PARAMETERS ⇨ FAN...) will be assign value 100%. It should be frequency at which the AHU reaches its rated output.

Out Current …... A

Effective value of wire motor current

RPM ....rpm

Fan rotations. The value calculated from the current preset frequency taking into consideration rated motor slip.

FC Status: OK ■ FLT

Info on the fan drive status.

OK – no alarm

FLT – incorrect drive operation status

Comm Status: OK ■ FLT

Info on communication between the controller and fan drive converter.
In case of communication loss both drives are stopped after about 12 seconds from the moment of the communication loss and appropriate alarm code is displayed. Once the communication is restored the drives start up automatically.

OK – communication is ok

FLT – no communication

Frequency limitations

ventus

Temperature limitation

MENU ⇨ SERVICE ACCESS ⇨TEMP. PARAMETERS ⇨ ...

Min Sup Temp ◄ -10...20 ►°C (⌂ 16 °C)
Minimal acceptable temperature value in the supply duct.

Max Sup Temp ◄ 21...50 ►°C (⌂ 34 °C)
Maximal acceptable temperature value in the supply duct.

☝ Acceptable temperature of electric motors work under rated load is 40°C

MinOutTemp ◄ 0...40 ►°C (⌂ 16 °C)
The temperature value under which the cooling is blocked. Water valve is closed, cooler and compressors are switched off.

Min Temp Set ◄ 5...20 ►°C (⌂ 16 °C)
Lower limit of the temperature value preset in the VS 00 HMI Advanced in the MENU ⇨ PARAMETERS ⇨ TEMPERATURES window or via the universal input.

Max Temp Set ◄ 21...50 ►°C (⌂ 30 °C)
Upper limit of the temperature value preset in the VS 00 HMI Advanced in the MENU ⇨ PARAMETERS ⇨ TEMPERATURES window or via the universal input.

ExtTempSetp ◄ On ►◄ Off ► (⌂ Off)
Activation of temperature adjuster connected to the universal input.

On – value of preset temperature is read out from the analog universal input.
0°C=1000 Ohm. The MENU ⇨ PARAMETERS ⇨ TEMPERATURES ⇨ HMI Temp Setp parameter is inactive
Off – inactive input.

PumpMinOutTemp ◄ -30...10 ►°C (⌂ 5 °C)
The temperature value below which the water pump operates in a continuous manner, regardless of heating requirements in the system.

☞ **Configuration of the user controller**

MENU ⇨ SERVICE ACCESS ⇨USER PROG. ⇨ ...

Signal source
MFAI ► universal analog input (B5)
◄ B1 ► temp. sensor in supply duct
◄ B2 ► temp. sensor in room or exhaust duct
◄ B3 ► external temp. sensor
◄ B4 ► temp.sensor behind recovery system
◄ HtgR ► heating adjustment
◄ ClgR ► cooling adjustment
◄ RecR ► recovery adjustment

Comparator

Compare type
< ►
> ►
= ►
True ►
False ►

Hysteresis
◄ 0 ►

Binary Block
AND ►
◄ NAND ►
◄OR ►
◄ NOR ►
◄ XOR

output relay (E5)

Setpoint Source
MFAI ► universal analog input (B5)
◄ Cnst constant value

Constant value
◄ 0 ►

Binary source
MFDI ► universal digital output (S6)
◄ StaC ► AHU switched on
◄ Stby ► AHU in stand-by mode
◄ Htg ► AHU in heating mode
◄ Clg ► AHU in cooling mode
◄ Rec ► AHU in recovery mode
◄ FLT ► alarm
◄ True ► constant value 1
◄ False ► constant value 0

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Advanced manual

Example of setting the user's controller	Requirement: Switching on additional pump in the hydraulic system if the heating requirement is greater than 50%.	``` *** USER.PROG *** SetpointSource Cnst ConstatSetpoint 50 Hysteresis 2 CompareType > SignalSource HtgR BinaryBlock OR BinarySource False ```
		⌁ MENU ⇨ SERVICE ACCESS ⇨ UNIT CONFIG✳ ⇨ MultiFuncRealy parameter should be in CON mode
	Requirement: Switching on nozzle humidifier if the measured relative humidity is less then 30%. Switching off the nozzle humidifier should occur at humidity 34%. ⌁ In this example it is assumed that 0V = 0%, 10V = 100%	``` *** USER.PROG *** SetpointSource Cnst ConstatSetpoint 30 Hysteresis 1 CompareType > SignalSource MFAI BinaryBlock AND BinarySource StaC ```
		⌁ Parametr MENU ⇨ SERVICE ACCESS ⇨ UNIT CONFIG✳ ⇨ MultiFuncRealy and MultiFuncAnaIn parameter should be in CON mode

---

Manual mode

MENU ⇨ SERVICE ACCESS ⇨MANUAL MODE ⇨ ...

[!] Incompetent use of the manual mode can lead to damage of AHU subassemblies or/and cause significant energy loss.

→ **DIGITAL INPUTS**
Parameters as in the window: MENU ⇨ SERVICE ACCESS ⇨ DIGITAL INPUTS ⇨

→ **DIGITAL OUTPUTS**
Parameters as in the window: MENU ⇨ SERVICE ACCESS ⇨ DIGITAL OUTPUTS ⇨
In the window there is a possibility of setting any outputs in manual mode in switched on or off status.

Pump
◄ **Auto** ► ◄ **Man** ►   (⌨ Auto) ◄ **On** ► ◄ **Off** ►   (⌨ Off)   **On** ■ **Off**
.
.
.
Auto – output in a mode of automatic control in line with selected application
Man – output in manual mode Actual output status receives value preset in the field on the right
On – switch on the output in manual mode
Off – switch off the output in manual mode
On – current output status. Output switched on
Off – current output status. Output switched off

→ **ANALOGUE INPUTS**
Parameters as in the window: MENU ⇨ SERVICE ACCESS ⇨ ANALOGUE INPUTS ⇨

→ **ANALOGUE OUTPUTS**
Parameters as in the window: MENU ⇨ SERVICE ACCESS ⇨ ANALOGUE OUTPUTS ⇨
In the window there is a possibility of free setting the value of any analog output

Heating
◄ **Auto** ► ◄ **Man** ►   (⌨ Auto) ◄ **0...100** ► %   (⌨ 0%)   **0...100 %**
.
.
.
Auto – output in a mode of automatic control in line with selected application
Man – output in manual mode Actual output status receives value preset in the field on the right
0...100 % – setting output in manual mode
0...100 % – current output status

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Brightness and contrast settings

MENU ⇨ LCD SETTINGS ⇨ ...

Brightness ◄ 0...31 ► (🏭 20)
Display backlight intensity

Contrast ◄ 0...31 ► (🏭 20)
Intensity of text display on the display

Reset Time ◄ 3...30 ► (🏭 10)
Time measured from the last pushing the button after which the STATUS window appears again on the display.

Restoring factory settings

S1

OFF

ON

S1

OFF

ON
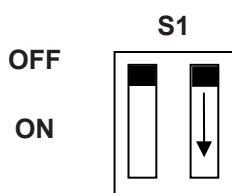
1. Stop the system (**Operation mode: OFF**)
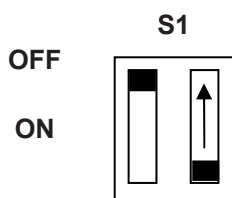
2. Right switch S1 (on the left of RJ 45, see 3.1.2) - turn ON

3. After 20 seconds turn the switch off (OFF) again.

6. DESCRIPTION OF CONTROL ALGORITHMS

Temperature control

Measurement elements
- Room sensor
- Sensor in the air-supply duct
- Sensor in the air-exhaust duct

✎ **VS 00 HMI** Basic control panel is equipped with temperature sensor

Condition	Heating	Cooling
Tset > Tmain	▲	▼
Tset<Tmain	▼	▲
Tset = Tmain	☑	☑
Fans switched on		

T_{set} – preset temperature
T_{main} – temperature measured by the **leading sensor**

The system never operate with heating and cooling status simultaneously.

$T_{set} = T_{main}$ – preset state the control system aims at. Heating or cooling level does not change, meeting accurately energetic requirements of a building.

Leading sensor – temperature sensor, which value influences the temperature control. Depending on the requirements, each of sensors listed aside can be the leading sensor.

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Protections — **Room**

Measurement elements

▪ Temperature sensor in the air-supply duct

▪ External temperature sensor

Protection of a room and people against too low or too high temperature of supply air.

Condition	Heating
Tmin>Tsup	▲
Tmax<Tsup	▼
Tmin<Tsup<Tmax	☑
Fans switched on	

Tsup – temperature in supply duct

Tmax – acceptable upper temperature in the supply duct

Tmin – acceptable lower temperature in the supply duct

Preliminary heating - this function is activated during AHU start-up and it prevents supply air with external temperature from blowing into the duct. The valve opening degree is calculated basing on the proportion

Condition	Water pomp	Water valve		Fans	Dampers
Tout< 8°C	☑	▲ X %	1	Stop	Closed
			2	Start	Open
AHU start-u					

The valve opening degree is calculated basing on the proportion

Tout ≥ 8 °C → X = 0%

Tout ≤ -15 °C → X = 100%

1. Duration is set in the window: MENU ⇨ SERVICE ACCESS ⇨ TIMERS ⇨ PreHeating
2. Duration: 1 min.

Tout – external temperature

Protections — **protection elements**

Measurement elements

Fire-protection control box

☝ Is not supplied with the automatic control set provided by VTS

Protection of a building and people against feeding fire.

Condition	Fans	Dampers	Heating/cooling
No signal on the X2 (S1F) controller input	Stopped	Closed	Switched off
Fans switched on			

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<table>
<tr><td colspan="2">External temperature sensor</td></tr>
</table>

Condition	Water pomp
Tout<Tlim	☑
Fans switched on or off	
Tout – external temperature	
Tlim – protection activation threshold	

Anti-frost thermostat on the air side				
Condition	Water pomp	Water valve	Fans	Dampers
Tsup<Tlim	☑	▲ 100%	Stop	Closed
Fans switched on or off				

Anti-frost thermostat on the water side and external temperature sensor		
Condition	Water pomp	Water valve
Tout<10C and Tx<Tlim	☑	▲ 100%
Fans switched off		
Tx return water temperature		

Pump protection

Cyclic starting the pump for 30 seconds every 7 days. The function can be blocked in the VS 00 HMI Advanced or Scope program.

! The protections are active if the mains switch is turned on and the control circuits are live.

Condition	Heating	Fans
Alarm from electric heater	blockage	Stop
Fans switched on		

Condition	Heating	Fans
Third alarm from the electric heater within an hour	blockage	Stop
Fans switched on		

Gauges are connected directly to the control module of the electric heater. The control system responds only to alarm signal from the electric heater module.

Measurement elements
- External temperature sensor
- Anti-frost thermostat on the air side
- Anti-frost thermostat on the water side

Water heater

Measurement elements
- Fan pressure gauge
- Electric heater thermostat

Electric Heater

Protections

EN

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EN

Protections

Water cooler system

Measurement elements

External temperature sensor

Condition	Cooling system start	Water valve
Tout<Tlim or cooling system alarm	blockage	0%
Fans switched on		

The cooling system should be equipped with normally closed (NC) alarm contact

☝ Threshold value of the protection activation also influences operation of the system in the „free cooling" mode.

Freon cooler system

Measurement elements

External temperature sensor

Condition	Compressor start	Compressor stop
Tout<Tlim or compressor alarm	blockage	-
$t_{wmin}>t_w$	-	blockage
$t_{pmin}>t_p$	blockage	-
Fans switched on		

t_{wmin} – minimal acceptable operation time of the cooling system

t_w – system operation time related to the temperature control

t_{pmin} – minimal acceptable break time in operation of the cooling system

t_w – system operation break time related to the temperature control

The cooling system should be equipped with normally closed (NC) alarm contact

☝ Threshold value of the protection activation also influences operation of the system in the „free cooling" mode.

Recovery system

Measurement elements

▪ Temperature sensor behind the recovery module

Condition	By-pass damper
Trec<Tlim	▲
Fans switched on	

Trec – temperature behind the heat regenerator

Protection is not activated in AHUs with the recirculation system

Filtration system

Measurement elements

▪ pressure gauge

Condition	Due to initiation of the pressure gauge in the system only information about filters contamination and their replacement notice are generated
ΔP<ΔPlim	

Heating cycle	**Measurement elements** ▪ Leading sensor ▪ External temperature sensor **Executive elements** ▪ Water valve or electric heater module ▪ By-pass actuator of the cross-flow exchanger or drive module of the rotary exchanger or recirculation damper actuator	**I heating level**	Carried out smoothly via energy regeneration system.

Carried out smoothly via energy regeneration system.

Cross-flow exchanger

Condition	By-pass damper
Heating requirement; Tout<Tmain-2°C	▼ 100…0%
Fans switched on	

Control signal 0…10V

Rotary exchanger

Condition	Rotor
Heating requirement; Tout<Tmain-2°C	▲ 0…~10 min^{-1}
Fans switched on	

Modbus control signal

Systems with recirculation

Condition	Recirculation damper
Heating requirement; Tout<Tmain-2°C	▲ 0…Max
Fans switched on, constant recirculation level switched off	

Control signal 0…10V

Tmain – temperature measured by the leading sensor
Tout – external temperature

II heating level

Condition	II heating level
Heating requirement; I heating level = max or Tout>Tmain	▲ 0…100%
Fans switched on	

Control signal 0…10V

In systems without heat regeneration, heat requirements are met only via the II heating level.

Carried out smoothly via energy regeneration system.

Cross-flow exchanger

Condition	By-pass damper
Cooling requirement Tout>Tmain+2°C	▼ 100…0%
Fans switched on	

Control signal 0…10V

Rotary exchanger

Condition	Rotor
Cooling requirement Tout>Tmain+2°C	▲ 0…~10 min⁻¹
Fans switched on	

Modus control signal

Systems with recirculation

Condition	Recirculation damper
Cooling requirement Tout>Tmain+2°C	▲ 0…Max
Fans switched on, constant recirculation level switched off	

Control signal 0…10V

> **!** The I cooling level can be activated only in AHUs adapted for heat recovery in cooling status.

Condition	II cooling level
Cooling requirement; I cooling level = max or Tout<Tmain	▲ 0…100%
Fans switched on	

Control signal: 0…10V for water valve; 2 relays for switching on the I and II section of the freon cooler.

In systems without heat regeneration, cooling requirements are met only via the II cooling level.

"Free cooling" – Function of saving energy. Blocking of the II level of cooling at appropriate parameters of external air.

Condition	II cooling level
Cooling requirement; Tout<Tlim	Blockage 0%
Fans switched on	

(left sidebar, rotated)

Cooling cycle

I cooling level

II cooling level

Measurement elements
- Main control sensor
- External temperature sensor

Executive elements
- Water valve or contact for switching on the I and II level of freon cooler
- By-pass actuator of the cross-flow exchanger or drive module of the rotary exchanger or recirculation damper actuator

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7. TECHNICAL DATA

7.1 Control gear

Construction

Casing with external mains switch and RJ 45 port for connecting the VS 00 HMI Advanced control panel

main internal elements	- short-circuit and overload protection assembly
	- connection units
	- ACX 36.04 controller

weight	**VS 10-15 CG ACX36–1**	**VS 21-150 CG ACX36-2 SUP** **VS 21-150 CG ACX36-2 SUP-EXH** **VS 180-300 CG ACX36-2 SUP-EXH**	**VS 400-650 CG ACX36-2 SUP-EXH**
	10kg	10kg	10kg
dimensions	450x460x170	450x460x170	450x640x170

Operation parameters

Parameter	**VS 10-15 CG ACX36–1**	**VS 21-150 CG ACX36-2 SUP** **VS 21-150 CG ACX36-2 SUP-EXH** **VS 180-300 CG ACX36-2 SUP-EXH** **VS 400-650 CG ACX36-2 SUP-EXH**
system	TN	
U3 rated power supply voltage	1x230V	3x400V
In control box rated current	21 A	56 A
Ui rated insulation voltage	400 V	
Uimp rated impulse withstand voltage	2.5 kV	
rated short-time withstand current Icw for respective circuits - effective value of alternating-current component withstood during 1 second, i.e.: short-circuit current expected at connecting voltage of	6 kA	
rated peak withstand current (ipk) at $\cos\varphi = 0.5$	10.2 kA	
rated short-circuit current	6 kA	
coincidence factor	0.9	
rated frequency	50 Hz ± 1Hz	
protection class	IP54	
acceptable operating temperature	0 ÷ 40 °C	
supply voltage of control circuits	24 V AC	
EMC environment	1	

Parameters of protection units

F1 (B6)	Protection of lighting circuit
F1M (C16)	Protection of power supply circuit of water heater pump and rotary exchanger (for VS 21-150 CG ACX36-2 SUP, VS 21-150 CG ACX36-2 SUP-EXH, VS 180-300 CG ACX36-2 SUP-EXH and VS 400-650 CG ACX36-2 SUP-EXH)
F1M (C10)	Protection of supply circuits of water heater pump (for VS 10-15 CG ACX36-1)
F2	Glass or ceramic fuse element of size 5x20mm, type T 0,63A

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7.2 ACX36.040 controller	
Resources	
Relay output Q1...Q6	AC12...250V, max 4A
Universal input/output IO1...IO8	Reference potential G0; Inputs DC 4...20mA, DC 0-10V, Pt 1000, Ni 1000, NTC Outputs, DC 0-10V (1mA)
Digital inputs DI1...DI5	DC 16V(5mA) max 50Hz
Analog output AO1, AO2	0...10V, max (2mA)
RS 485 communication port	Modbus protocol, 1200m
RS 232 communication port	RJ 45 standard connection, 8 pins, 15m
PPS2 communication port	Connection for QAX... (VS 00 HMI Basic) two-wire connection, DC12V (max 12mA), 50m
LON	Two-wire connection shielded galvanically, 1=CLA, 2=CLB
Operation parameters	
Power supply	24 VAC (± 10%), 50/60Hz, 20VA
Ambient temperature	operation: 0...+50°C, storage: -30...+70°C
Protection class	IP 20
Controller picture	

Block of analog outputs

Block of digital inputs

Controller's power supply port

LON port

Block of universal inputs/outputs

LED indicating controller status

LON network identification button (service pin)

Block of digital outputs (relay-type)

RS 485 port

VS 00 HMI Basic port

Factory settings recovery switch (right)

RJ45 serial communication port

ACX36		**PC (SubD)**
Pin1 (GND)	< >	Pin5 (GND)
Pin2 (RxD)	< <	Pin3 (TxD)
Pin3 (RTS)	> >	Pin8 (CTS)
Pin4 (TxD)	> >	Pin2 (RxD)
Pin5 (CTS)	< <	Pin7 (RTS)
Pin6,7 +12V		
Pin8 (GND)		

☝ Parameters of the control panels and executive elements are described in the VTS product catalogue

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8. CABLING
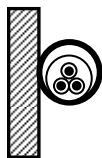
	Connect power leads of the control gear and frequency converter of the fan drive according to the Electric diagram. The wire cross-sections has been selected for long-term current capacity according to the Picture, for two load conductors. Due to the protection selectivity, length, cable placement method and short-circuit currents, revise the feeders' cross-sections in the table below.

Wire type	Wire picture	Wire description	Parameters
[1]		Control wires with copper cores with a shield. PCV isolation.	Nominal voltage: 300/500 V Ambient temperature: -30 to 80°C
[2]		Copper cores. PCV isolation.	Nominal voltage: 450/750V Ambient temperature: from -40 to 70°C
[3]		Copper cores with a shield. PCV isolation.	Nominal voltage: 150 V Ambient temperature; -20… 60°C¬
[4]		Flat communication cable without shield	Nominal voltage 150V Ambient temperature: -20… 60°C

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Name of element / connection point	1-faze control gear	3-faze control gear	Wire type	Section [mm²]
Control gear	VS 10-15 CG ACX36-1	VS 21-150 CG ACX36-2 SUP VS 21-150 CG ACX36-2 SUP-EXH VS 180-300 CG ACX36-2 SUP-EXH VS 400-650 CG ACX36-2 SUP-EXH	[2]	
controller	N1	N1	-	-
fire alarm switch	S1F	S1F	[2]	2x1
multi-function switch	S6	S6	[2]	2x1
supply air temperature sensor	B1	B1	[1], [2]	2x0,5
Room/ exhaust air temperature sensor	B2	B2	[1], [2]	2x0,5
external air temperature sensor	B3	B3	[1], [2]	2x0,5
After recovery air temperature sensor	B4	B4	[1], [2]	2x0,5
multi-function analog reference	B5	B5	[1], [2]	2x0,5
HW anti-frost water side thermostat	S3F	S3F	[2]	2x1
HE alarm switch	VTS-E-0005 ter. 07:09 AM	VTS-E-0005 ter. 07:09 AM	[2]	2x1
HW anti-frost air side thermostat	S2F	S2F	[2]	2x1
HW analog controlled valve	Y1	Y1	[2]	2Y1
HE power rate control input	VTS-E-0005 ter. 01:08 PM	VTS-E-0005 ter. 01:08 PM	[2]	2x1
HW circulating pump contactor	M1	M1	[2]	3x1.5
chiller / refrigerating unit / heat pump alarm switch	S5F	S5F	[2]	2x1
chiller start input	E1	E1	[2]	2x1
refrigerating unit start input - I stage	E2.1	E2.1	[2]	2x1
refrigerating unit start input - II stage	E2.2	E2.2	[2]	2x1
CW analog controlled valve	Y2	Y2	[2]	2Y1
RHE frequency converter	not supported	U1	[1]	3x1.5
RHE alarm switch	not supported	via Modbus comm.		
RHE start input	not supported	via Modbus comm.	[3]	2x2
RHE speed reference input	not supported	via Modbus comm.		
recirculation damper actuator	Y3	Y3	[2]	2Y1
cross-flow bypass actuator	Y4	Y4	[2]	2Y1
CWHW analog controlled valve	Y5	Y5	[2]	2Y1
CWHW "cooling" command	E3.1	E3.1	[2]	2x1
CWHW "heating" command	E3.2	E3.2	[2]	2x1
AHU alarm	E4	E4	[2]	2x1
AHU start confirmation	E5	E5	[2]	2x1
Room Unit – reduced function interface	N2	N2	[2]	2x0.5
HMI – full function interface	N3	N3	[4]	8x0.1
supply elements				
pressure control - primary filter, supply	1S1H	1S1H	[2]	2x1
pressure control - primary filter, supply	1S2H	1S2H	[2]	2x1
pressure control - compression monitoring for HE-Module	1S3H	1S3H	[2]	2x1
supply motor protective relay	1M1F	not supported	[2]	2x1
supply motor contactor	1M1	not supported	[2]	3x1.5
supply frequency converter	not supported	1U1	[3]	TAB A
second supply fan frequency converter	not supported	1U2	[3]	TAB A

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frequency converter of the third supply fan	not supported	1U3	[3]	TAB A
frequency converter of the fourth supply fan	not supported	1U4	[3]	TAB A
intake damper actuator	1Y1	1Y1	[2]	2Y1
exhaust elements				
pressure control - primary filter, exhaust	2S1H	2S1H	[2]	2x1
exhaust motor protective relay	2M1F	not supported	[2]	2x1
exhaust motor contactor	2M1	not supported	[2]	3x1.5
exhaust frequency converter	not supported	2U1	[1]	TAB A
second exhaust fan frequency converter	not supported	2U2	[3]	TAB A
frequency converter of the third exhaust fan	not supported	2U3	[3]	TAB A
frequency converter of the fourth exhaust fan	not supported	2U4	[3]	TAB A
outlet damper actuator	2Y1	2Y1	[2]	3x0.5

TABLE A

Motor/ converter power	Rated motor current	Converter protection		Converter feeder [2]	Motor feeder [1]	Control gear feeder [2]		Control gear rated current	
						Air supply	Air supply - air exhaust	Air supply	Air supply - air exhaust
[kW]	[A]	1x230V/50Hz		[mm2]	[mm2]	[mm2]		[A]	
Δ - 3x230V/50Hz		MicroDrv	VLT						
0,75	3	gG16/1		3x1,5	4x1,5	5x2,5		5 / 1,5 / 7	
1,1	4,5	gG16/1		3x1,5	4x1,5	5x2,5		7 / 1,5 / 7	
1,5	6	gG25/1		3x2,5	4x1,5	5x4		8 / 1,5 / 7	
2,2	8	gG25/1		3x2,5	4x1,5	5x4		11 / 1,5 / 7	
Δ – 3x400V/50Hz		3x400V/50Hz					5xTABELA C		TABELA B
3,0	6	gG16/3		4x2,5	4x2,5	5x4		8 / 7,5 / 13	
4,0	8	gG16/3		4x2,5	4x2,5	5x4		10 / 9,5 / 15	
5,5	11	gG20/3		4x2,5	4x2,5	5x4		13 / 12,5 / 18	
7,5	15	gG25/3		4x2,5	4x2,5	5x6		17 / 16,5 / 22	
11,0	21		gG35/3	4x4	4x4	5x6		23 / 22,5 / 28	
1x230V/50Hz									
1,3	6			-	*3x1,5/4x1,5	3x1,5	3xTABELA C	12	TABELA B
1,75	7,6			-	*3x1,5	3x2,5		13	

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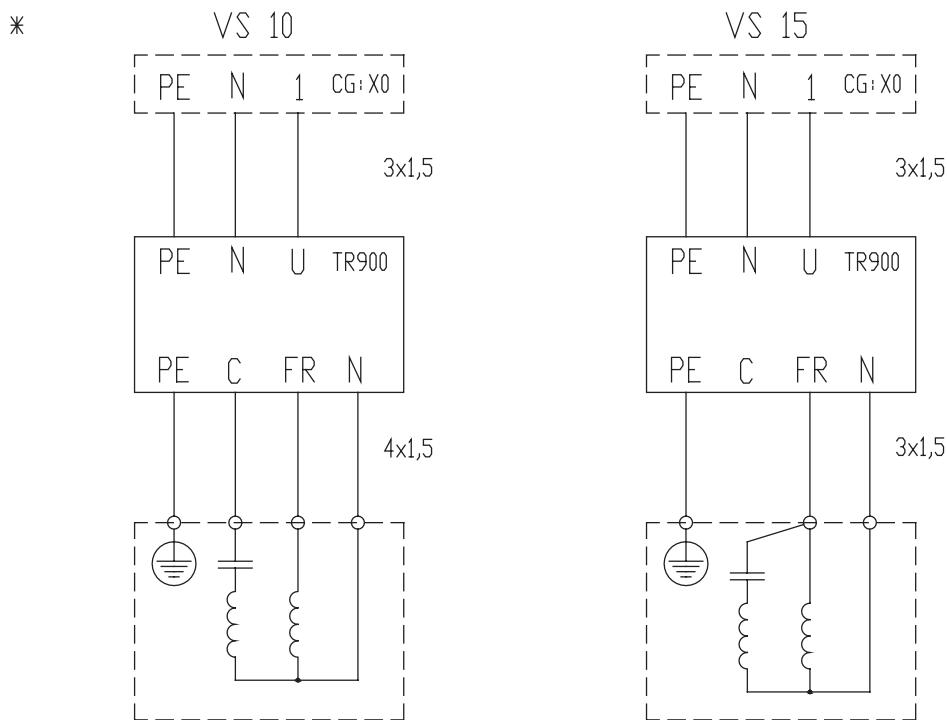
TABLE B

Motor power	0,75			1,1			1,5			2,2			3			4			5,5			7,5		
	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
0,75	6,5	7	7																					
1,1	6,5	11,5	7	8	8,5	7																		
1,5	6,5	13	7	8	10	7	9,5	10	7															
2,2	6,5	15	7	8	12	7	9,5	12	7	11,5	14	7												
3	12,5	10	13	14	10	13	15,5	10	13	17,5	10	13	15,5	16	19									
4	14,5	12	15	16	12	15	18,5	12	15	19,5	12	15	17,5	18	21	19,5	20	23						
5,5	17,5	15	18	19	15	18	20,2	15	18	22,5	15	18	20,5	21	24	22,5	23	26	25,5	26	29			
7,5	21,5	19	22	23	19	22	24,5	19	22	26,5	19	22	24,5	25	28	26,5	27	30	29,5	30	33	33,5	34	37
11	27,5	25	28	29	25	28	30,5	25	28	32,5	25	28	30,5	31	34	32,5	33	36	35,5	36	39	39,5	40	43
2x 7,5													38	37,5	43	40	39,5	45	43	42,5	48	47	46,5	52
2x 11													50	49,5	55	52	51,5	57	55	54,5	60	59	58,5	64
3x7,5																								
3x11																								
4x7,5																								
4x11																								
1,3																								
1,75																								

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Motor power	11			2x 7,5			2x 11			3x7,5			3x11			4x7,5			4x11			1,3	1,75
	L1	L2	L3	L1	L2	L3	L1	L2	L3													L	L
0,75																							
1,1																							
1,5																							
2,2																							
3																							
4																							
5,5																							
7,5																							
11	45,5	46	49																				
2x 7,5	53	52,5	58	63,5	64	67																	
2x 11	65	64,5	70	75,5	76	79	87,5	88	91														
3x7,5										96,5	94	97											
3x11										114,5	112	115	132,5	130	133								
4x7,5										111,5	109	112	129,5	127	130	126,5	124	127					
4x11										135,5	133	136	153,5	151	154	150,5	148	153	174,5	172	175		
1,3																						20	
1,75																						21	22

TABELA C

Motor power	0,75	1,1	1,5	2,2	3	4	5,5	7,5	11	2x 7,5	2x 11	3x7,5	3x11	4x7,5	4x11	1,3	1,75
0,75	4																
1,1	4	4															
1,5	4	4	4														
2,2	6	6	6	6													
3	6	6	6	6	6												
4	6	6	6	6	6	6											
5,5	6	6	6	10	10	10	10										
7,5	10	10	10	10	10	10	10	10									
11	10	10	10	10	10	10	16	16	16								
2x 7,5				16	16	16	25	25	35								
2x 11				16	25	25	25	35	35	35							
3x7,5												2x25					
3x11												2x25	2x25				
4x7,5												2x35	2x35	2x35			
4x11												1x25,1x35	1x25, 1x35	2x35	2x35		
1,3																4	4
1,75																4	4

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Appendix 1 DESCRIPTION OF ALARM STATUSES 1 / 2

✋ Requires manual cancellation ✋ Does not require manual cancellation	☒ Fans stop ☑ Fans do not stop	3 Only in 3-phase systems 1 Only in 1-phase systems

Alarm code		Description	Input	Comment
VS 00 HMI Advanced	**VS 00 HMI Basic**			
Fire detector	90.01	Fire alarm	X3	✋ ☒
Air Side Thermostat		Risk of freezing the water heater	D1	✋ ☒ Requires manual cancellation, if the faulty status was generated three times within an hour. After the third time the code of the breakdown takes the 80.04 value.
Electric Heater	60.01	Risk of electric heater overheating or lack of fan pile-up		✋ ☑ Requires manual cancellation, if the faulty status was generated three times within an hour. After the third time the code of the breakdown takes the 80.05 value. Check information on a display of the heater control module.
Water Side Thermostat	60.02	Low temperature of heating medium	D2	✋ ☑
RefrigUnit		Incorrect operation status of the water cooler refrigerator	D3	✋ ☑
	60.03	Incorrect operation status of the freon cooler system		
		Incorrect operation status of the cooler operating as a heater		
Motor	80.01	Overheating of 1-phase motor on the supply and/or exhaust side	D4	1 ✋ ☒
SupSideFCAlr		Incorrect operation status of the motor on the supply side	RS 485	3 ✋ ☒ Check information on a display of the frequency converter
SupSideComm	80.02	No communication with the converter on the supply side		3 ✋ ☒ If the communication is established again, the system starts up automatically.
ExhSideFCAlr		Incorrect operation status of the motor on the exhaust side		3 ✋ ☒ Check information on a display of the frequency converter
ExhSideComm	80.03	No communication with the converter on the exhaust side		3 ✋ ☒ If the communication is established again, the system starts up automatically.
Filters	30.01	Limit contamination of the filter on the supply and/or exhaust side	D5	1 ✋ ☑
FilterSup	30.02	Limit contamination of one of the filters on the supply side	D4	3 ✋ ☑
FilterExh	30.03	Limit contamination of the filter on the exhaust side	D5	
RRGFCStatus		Incorrect operation status of the drive motor of rotary exchanger	RS 485	3 ✋ ☑ Check information on a display of the frequency converter
RRGComm	50.01	No communication with the rotary exchanger's converter.		3 ✋ ☑ If the communication is established again, the system starts up automatically
HMI Basic	70.04	Error while measuring temperature at the HMI Basic	PPS2	✋ ☒
Main Temp	70.06	Leading sensor faulty or not connected	-	✋ ☒

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AfterRecTemp	70.01	Temperature sensor faulty or not connected	X7	
Outside Temp	70.02		X6	
Room/Exh Temp	70.03		X5	
Supply Temp	70.05		X4	

	VS 00 HMI Basic	
The alarm is displayed as a code, where temperature is indicated. 30.01, 30.02 and 30.03 alarms are displayed alternately with the temperature value from the main control sensor. The panel does not support cancellation of alarm statuses. An alarm can be cancelled using VS 00 HMI Advanced or by switching off and on again power supply of the control gear.		**30:0**
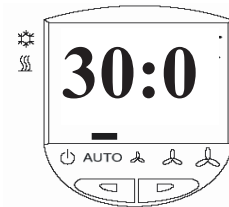
Access to list of current alarms is available from each panel's window by pressing the key with a bell.

Cancelling alarm status
1. Enter password in the tab:
   MENU ⇨ PASSWORD ⇨ ...
2. Go to the Alarm list window
3. Press the key with a bell

or

1. Turn off power supply of the control gear for about 30 seconds
2. Turn on the power again

Status of alarm LED
1. Off – no alarm
2. Blinking – new alarm has appeared
3. Steady light – attempting cancelling alarm, which cause has not disappeared

VS 00 HMI Advanced

```
***    ALARM LIST    ***
AlarmList Entries          1
Alarm history
+ 13.01      20:19: 38
  Motor
```

```
*** ALARM HISTORY ***
AlarmHistoryEntries       15
- 13.01      20:30: 15
  Motor
+ 13.01      20:19: 38
  Motor
```

- Number of current alarms
- Date and time of failure
- Alarm description or determining faulty
- Number of alarms stored in the controller's memory
- Information about cancelled alarm or abating incorrect status, which does not require cancellation

! In a sequence of alarm cancellation with power supply, turning power again on should be done no sooner than the frequency converters displays are cleared - about 30 seconds from switching off.

! Switching on the system again after cancelling motor alarm can be done as soon as the motors are cold, i.e.: 10 minutes after the alarm occurred.

Alarm LED is blinking also in case of alarm status, which appeared and abated and which does not require cancellation. Turning off the LED in such a case is carried out with alarm cancellation procedure.
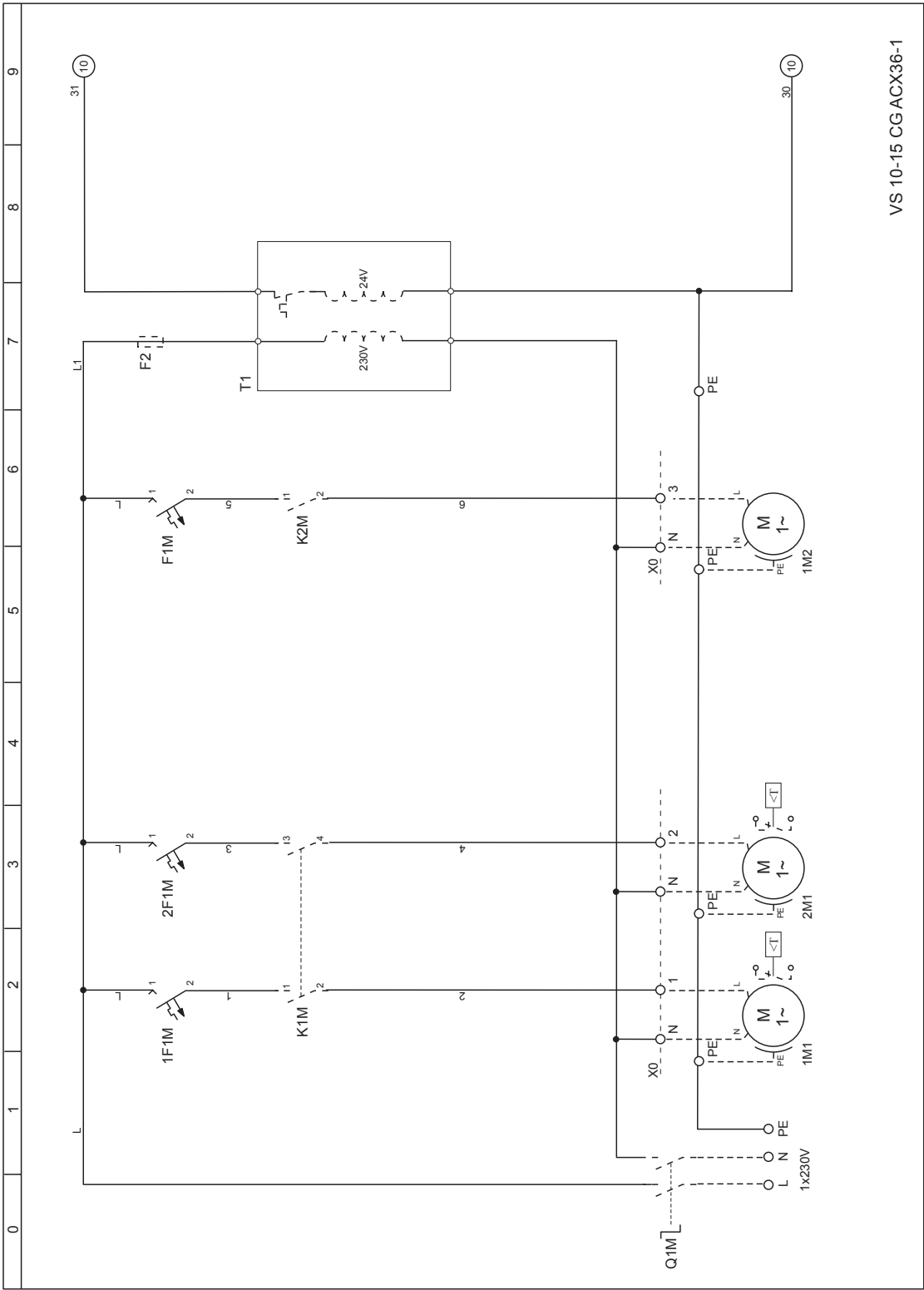
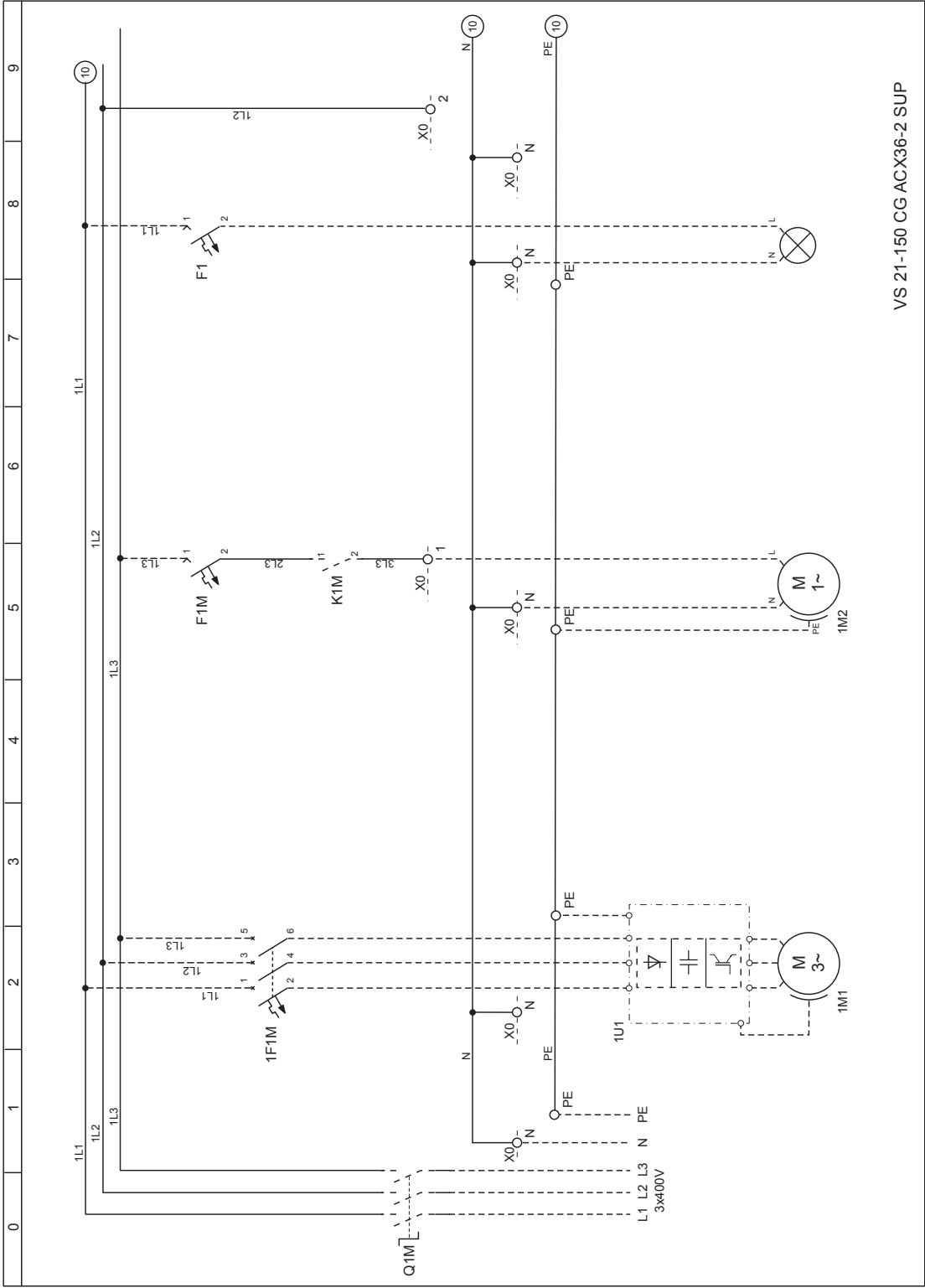*VTS reserves the right to implement changes without prior notice*
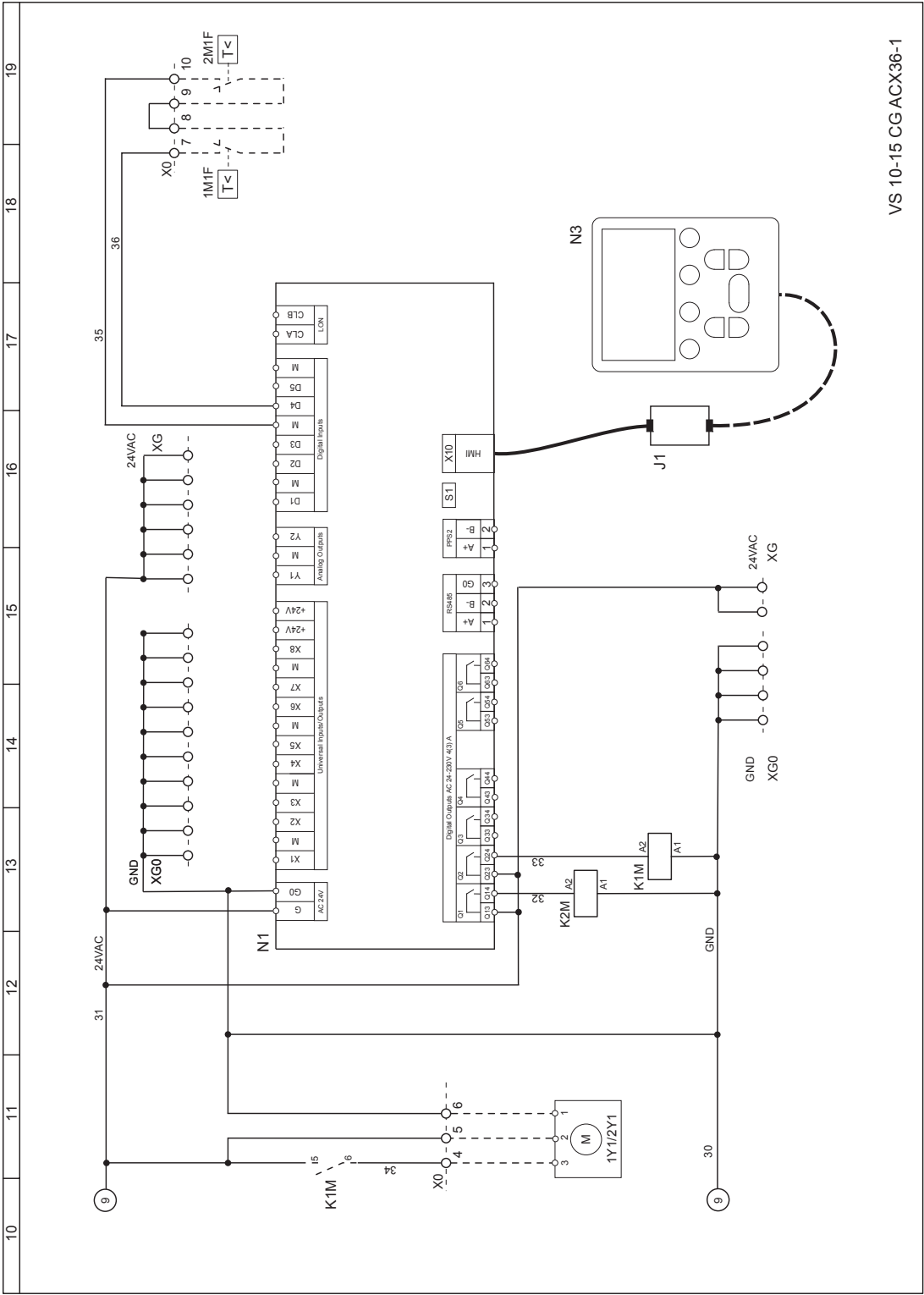
VS 10-15 CG ACX36-1

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VS 10-15 CG ACX36-1

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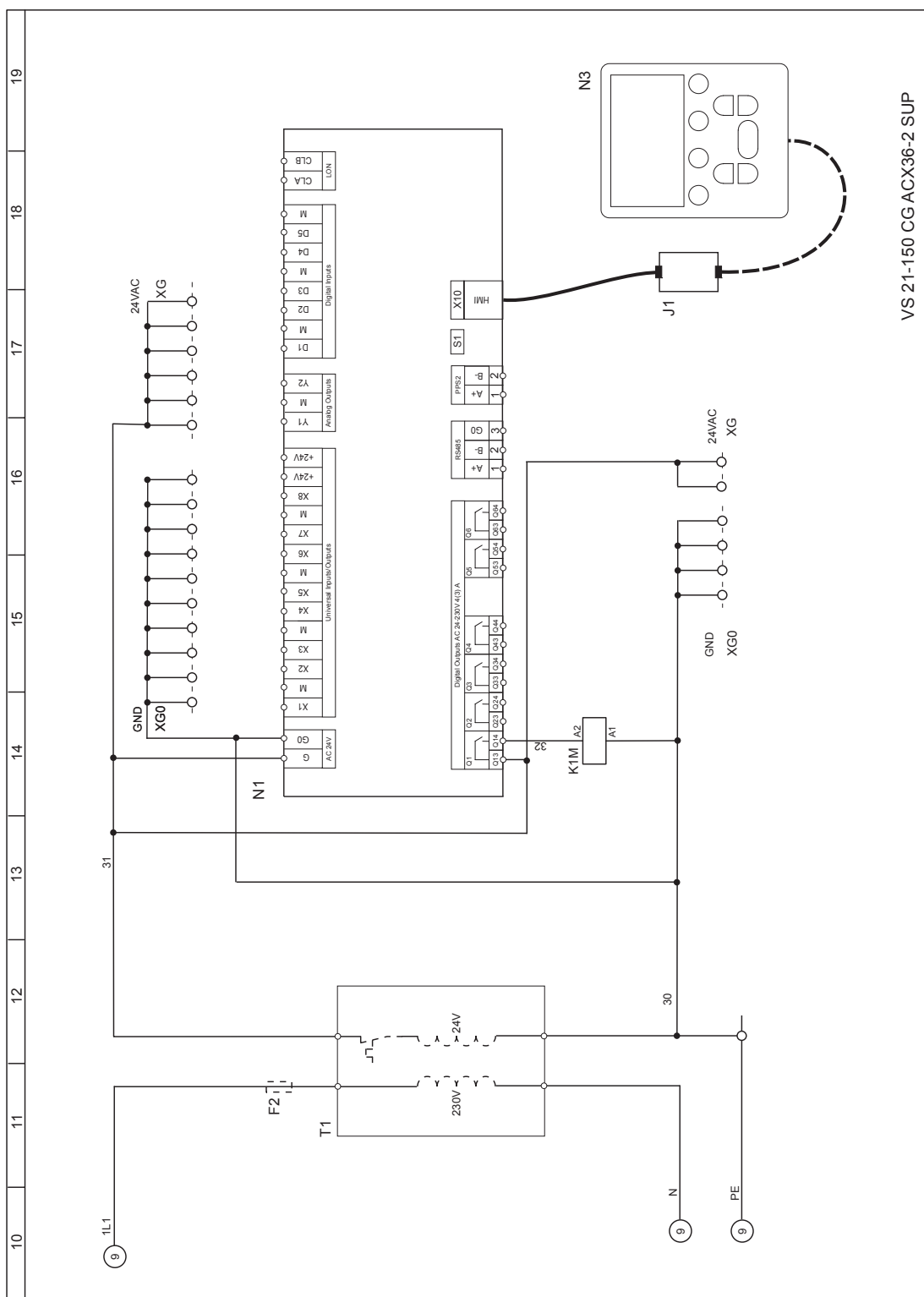*VTS reserves the right to implement changes without prior notice*
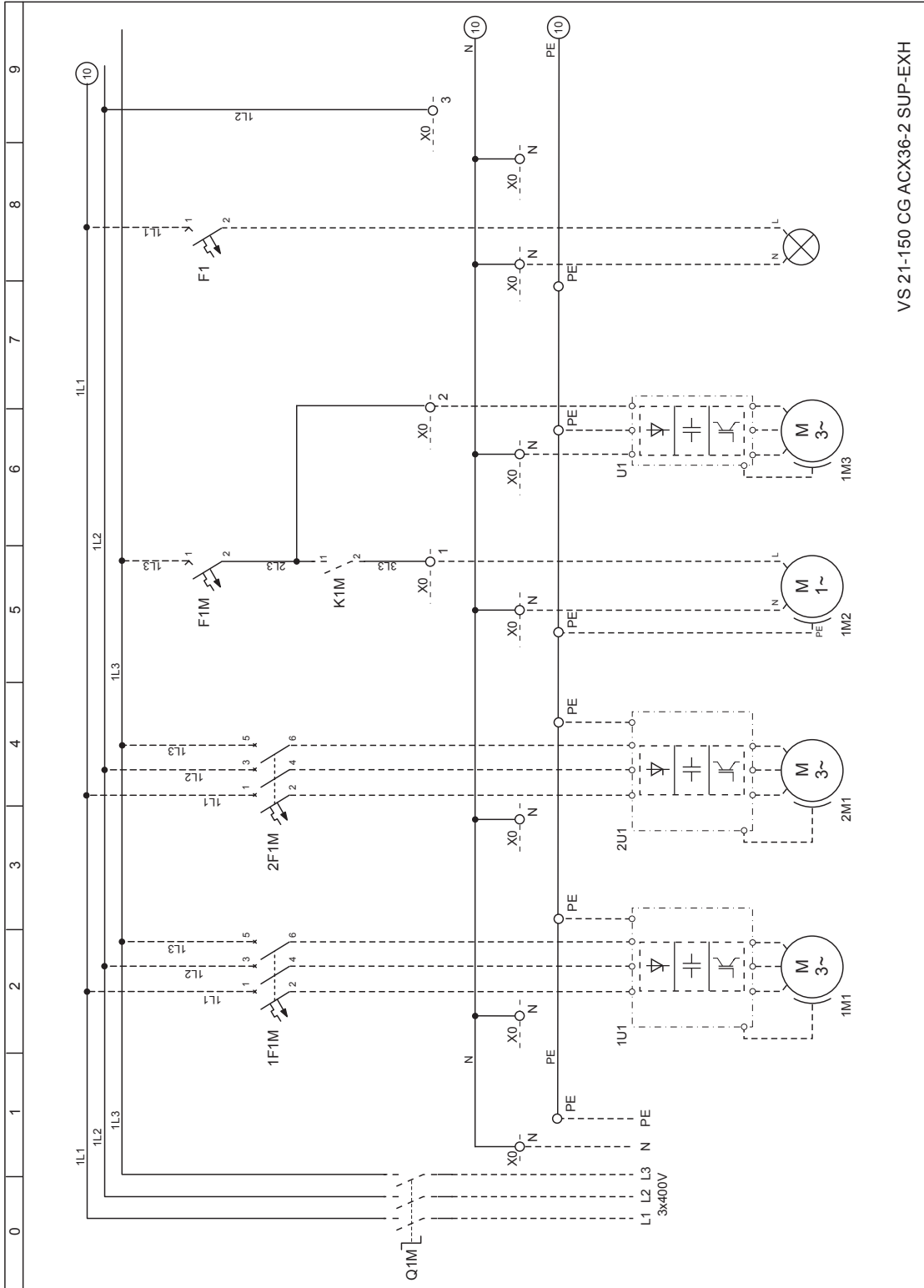
VS 21-150 CG ACX36-2 SUP

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VS 21-150 CG ACX36-2 SUP-EXH

VS 21-150 CG ACX36-2 SUP-EXH

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VS 180-300 CG ACX36-2 SUP-EXH

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VS 180-300 CG ACX36-2 SUP-EXH

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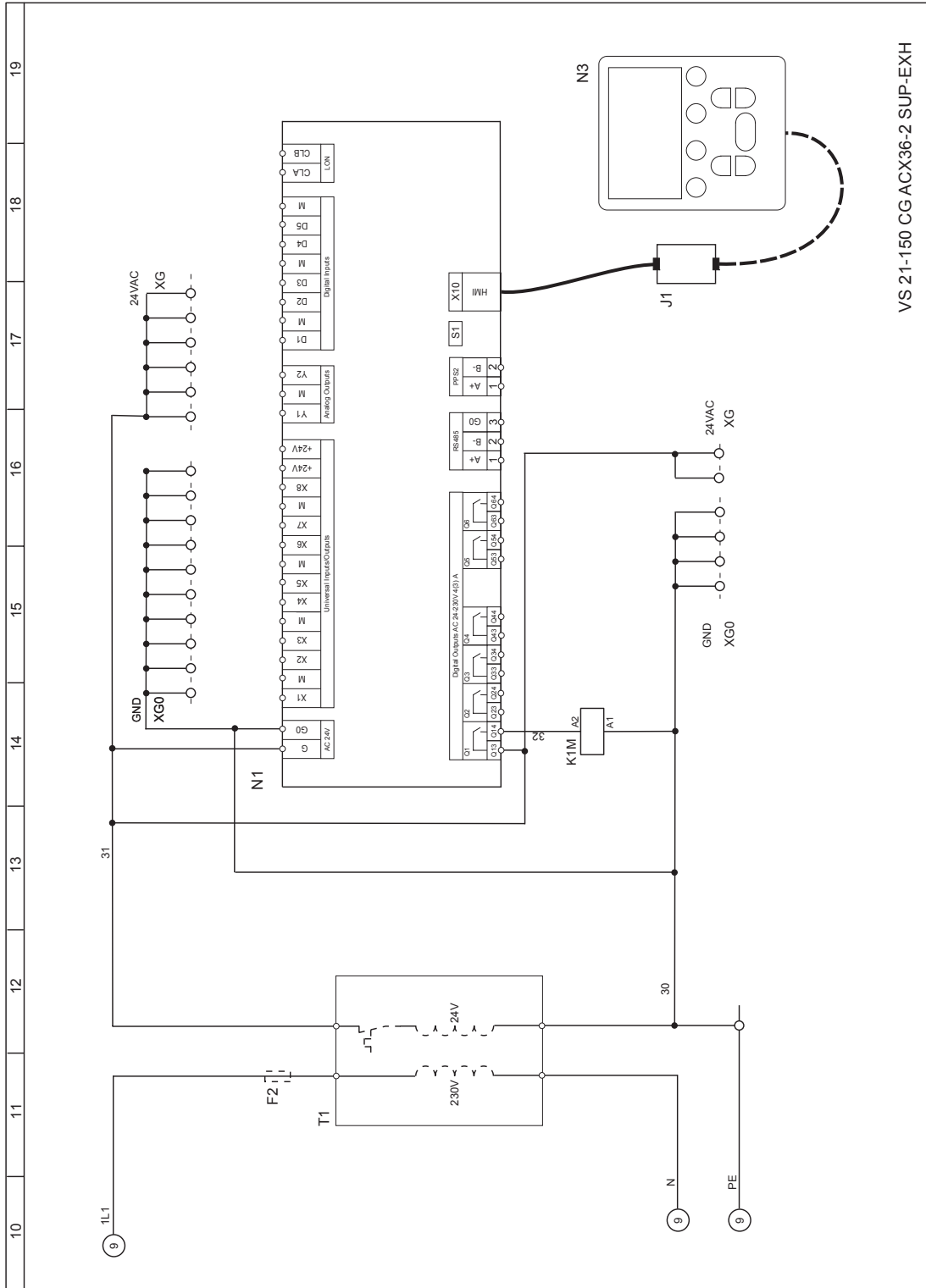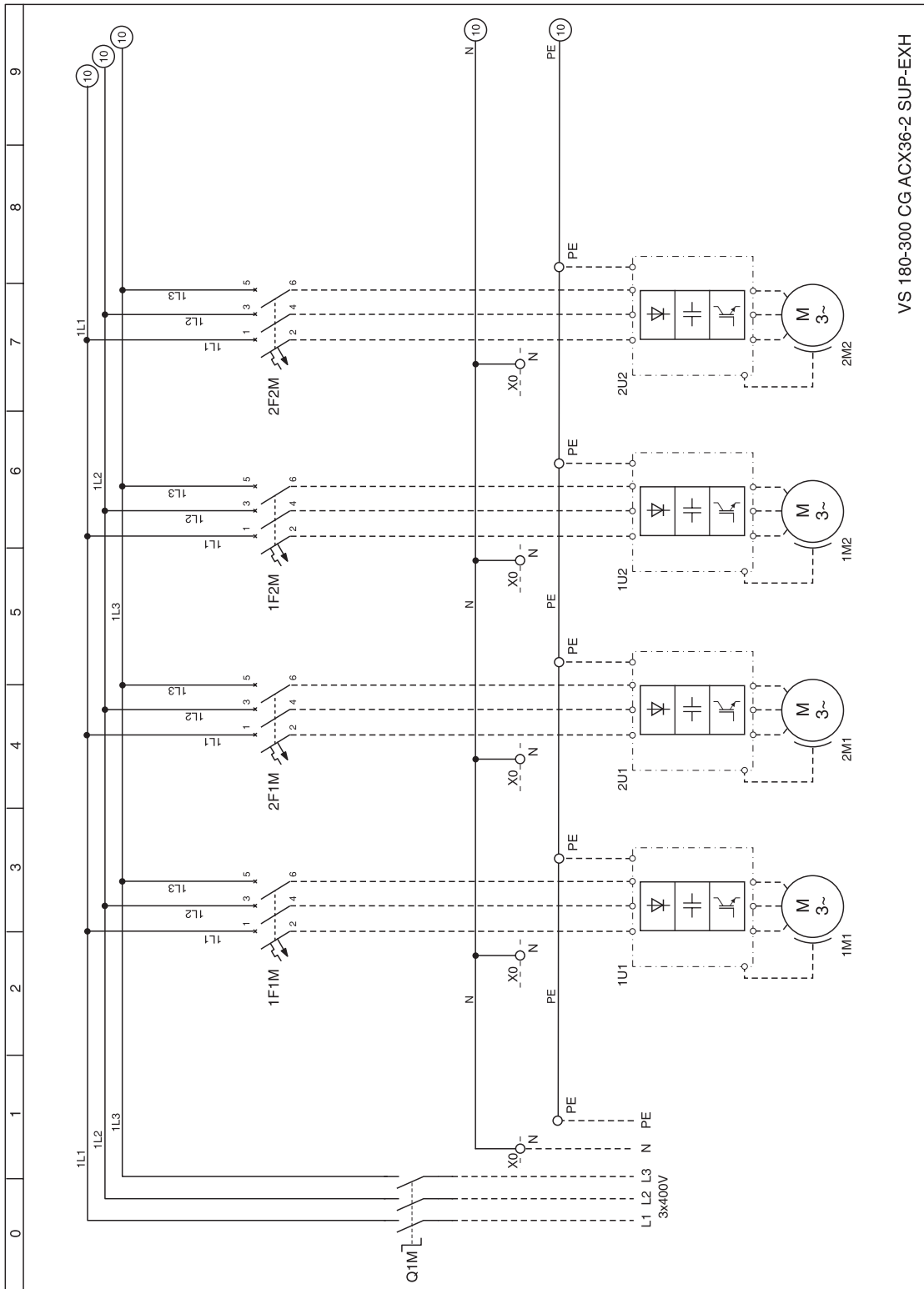
VS 180-300 CG ACX36-2 SUP-EXH

EN

EN

Appendix 6 Circuit diagram of VS 400-650 CG ACX-2 SUP-EXH

VS 400-650 CG ACX36-2 SUP-EXH

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Appendix 6 Circuit diagram of VS 400-650 CG ACX-2 SUP-EXH

VS 400-650 CG ACX36-2 SUP-EXH

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VENTUS

EN

VS 400-650 CG ACX36-2 SUP-EXH

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Appendix 6 Circuit diagram of VS 400-650 CG ACX-2 SUP-EXH
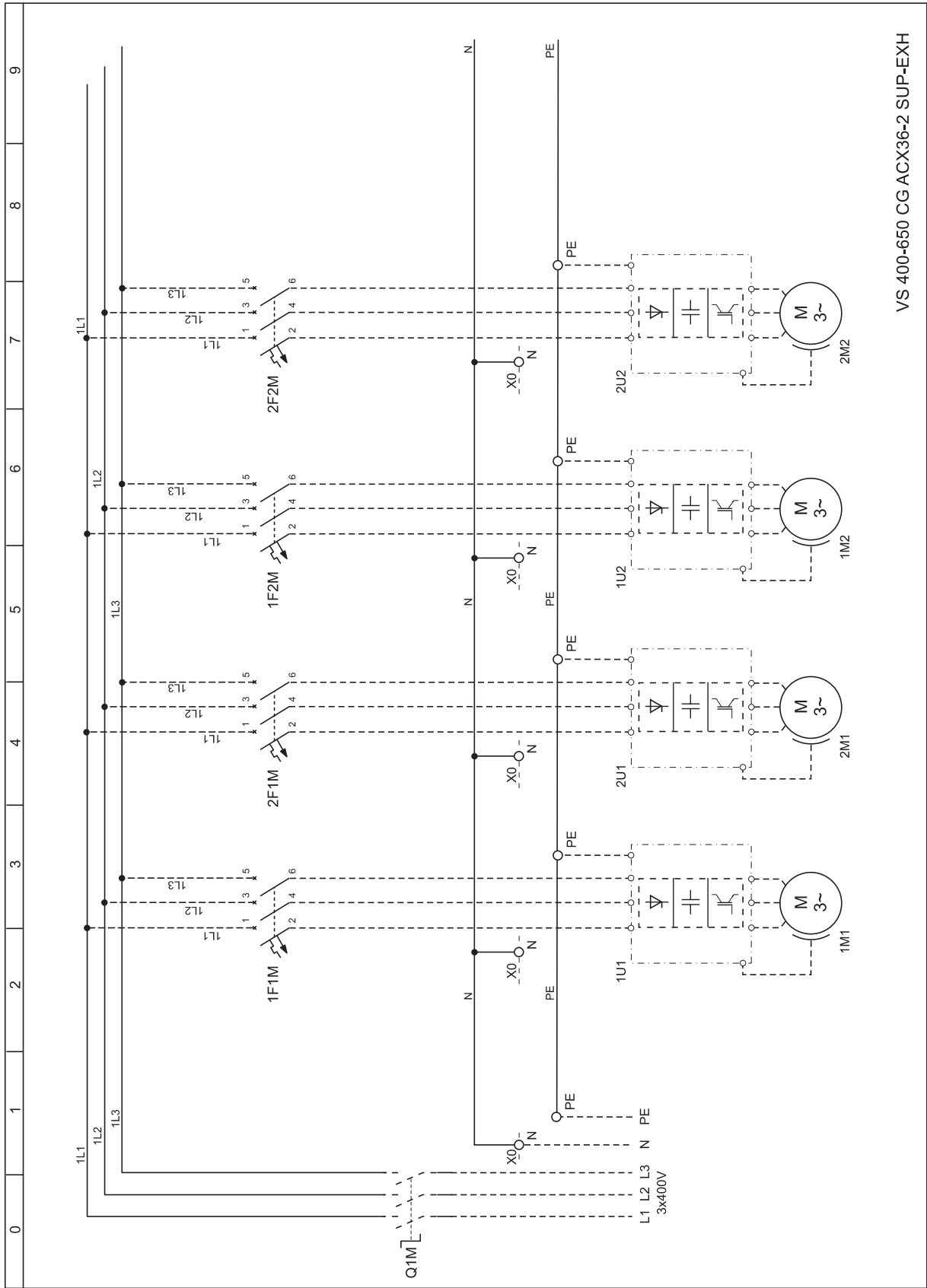

VS 400-650 CG ACX36-2 SUP-EXH

EN
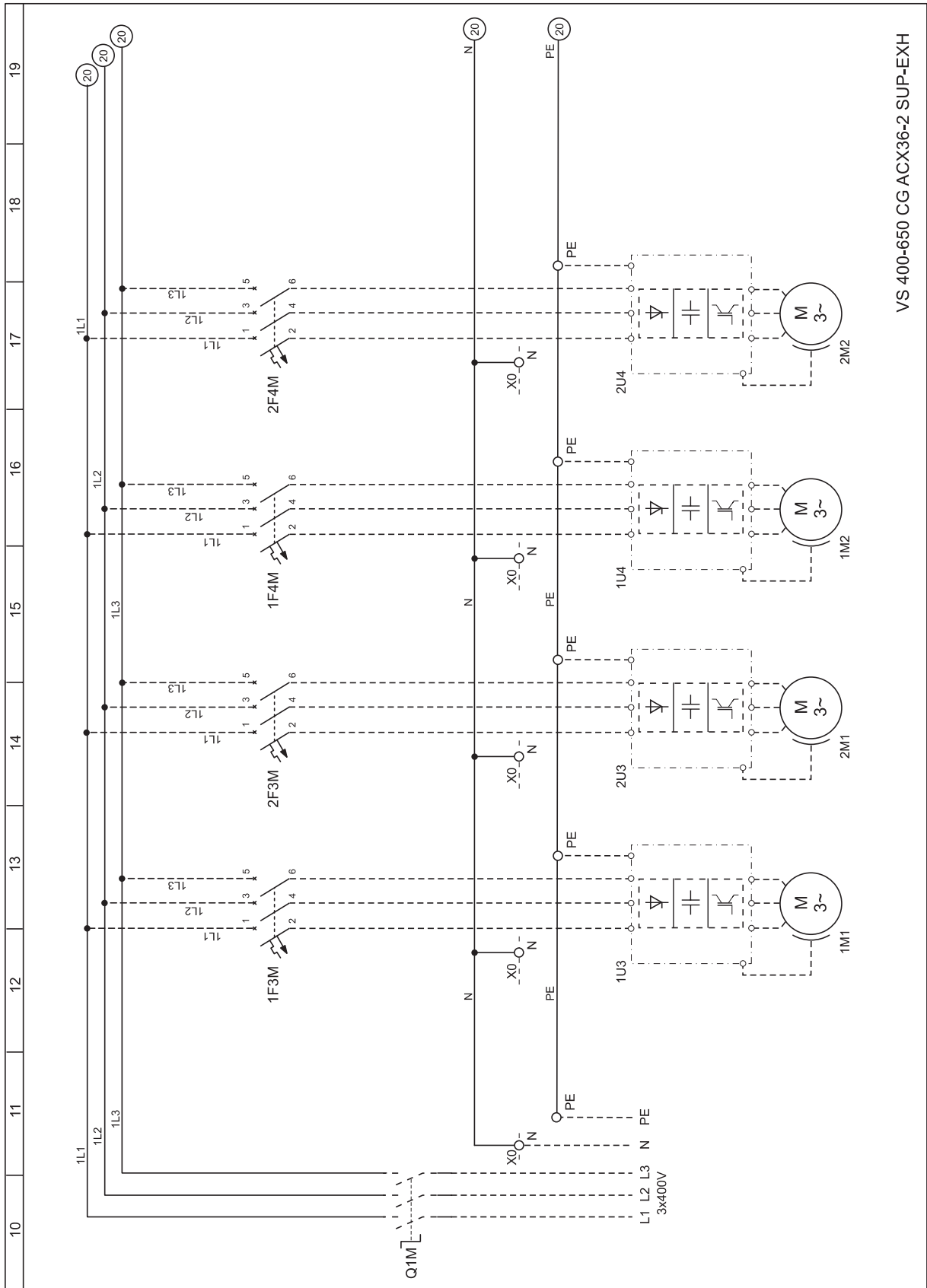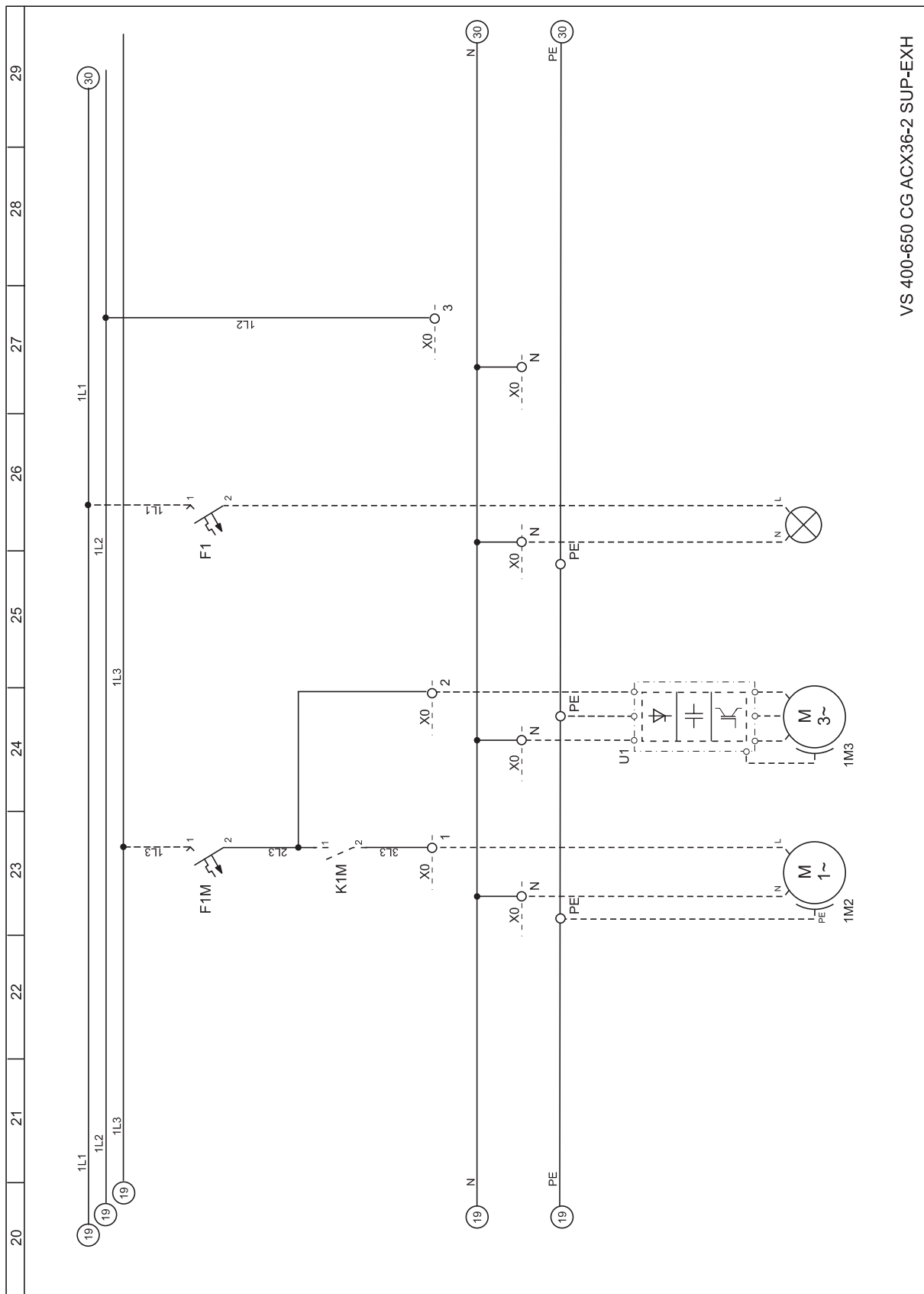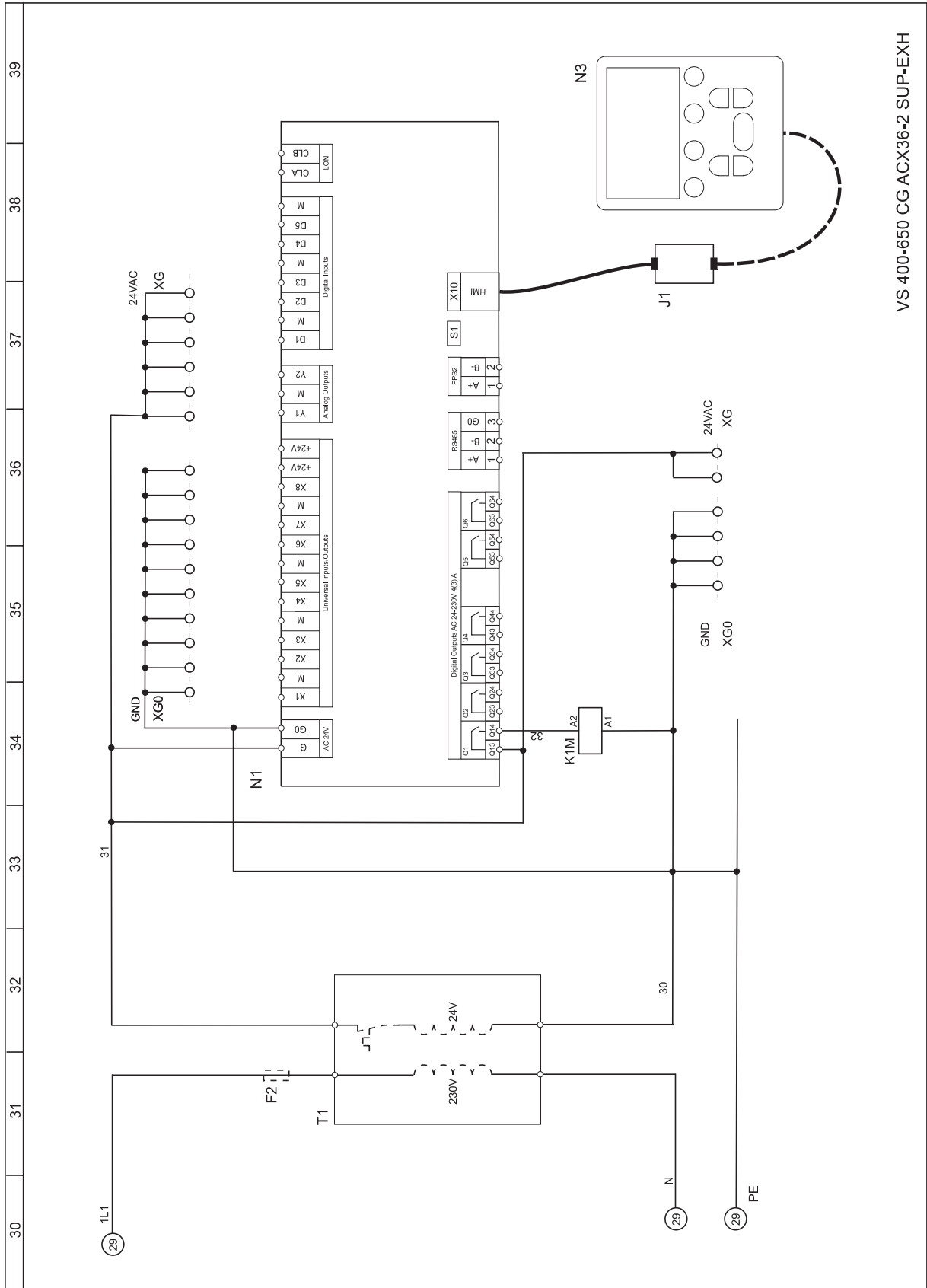
Appendix 7 Circuit diagram of power and motor connection for VS 10-15 CG ACX-1 SUP and SUP-EXH control gears

VS 10-15 CG ACX36-1 SUP

Q1M

L1 L2 L3

PE

L   N

PE

1x230V

POWER

X0

1 | N | PE | 2 | | PE | 3 | N | PE

L   N   PE   L   N   PE

1M1
1~

1M2
1~

VS 10-15 CG ACX36-1 SUP-EXH

Q1M

L1 L2 L3

PE

L   N

PE

1x230V

POWER

X0

1 | N | PE | 2 | N | PE | 3 | N | PE

L   N   PE   L   N   PE   L   N   PE

1M1
1~

2M1
1~

1M2
1~
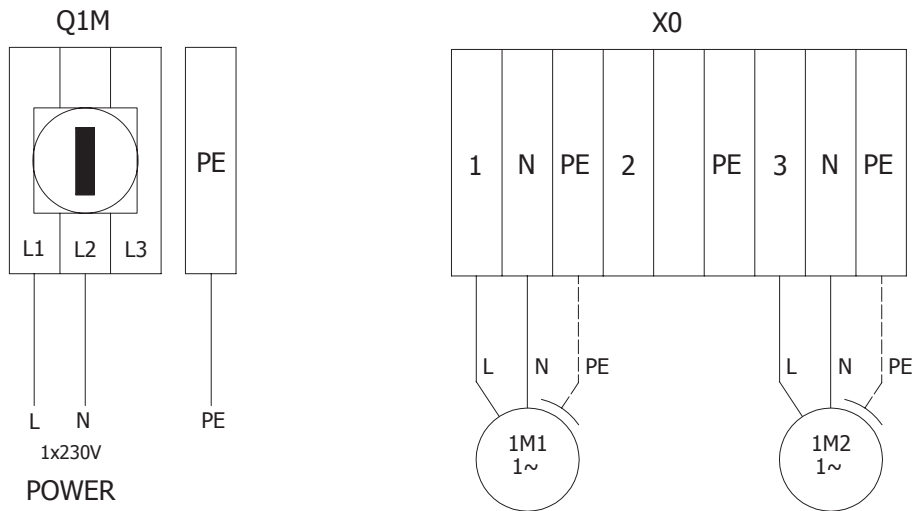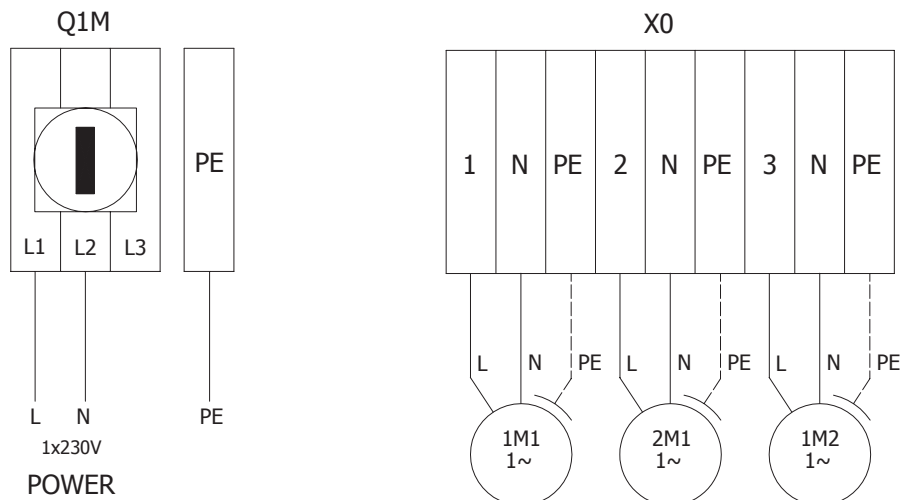
Appendix 8 Circuit diagram of power and motor connection for VS 21-150 CG ACX36-2 SUP control gear

1x230V power supply, frequency converter with 1×230V supply
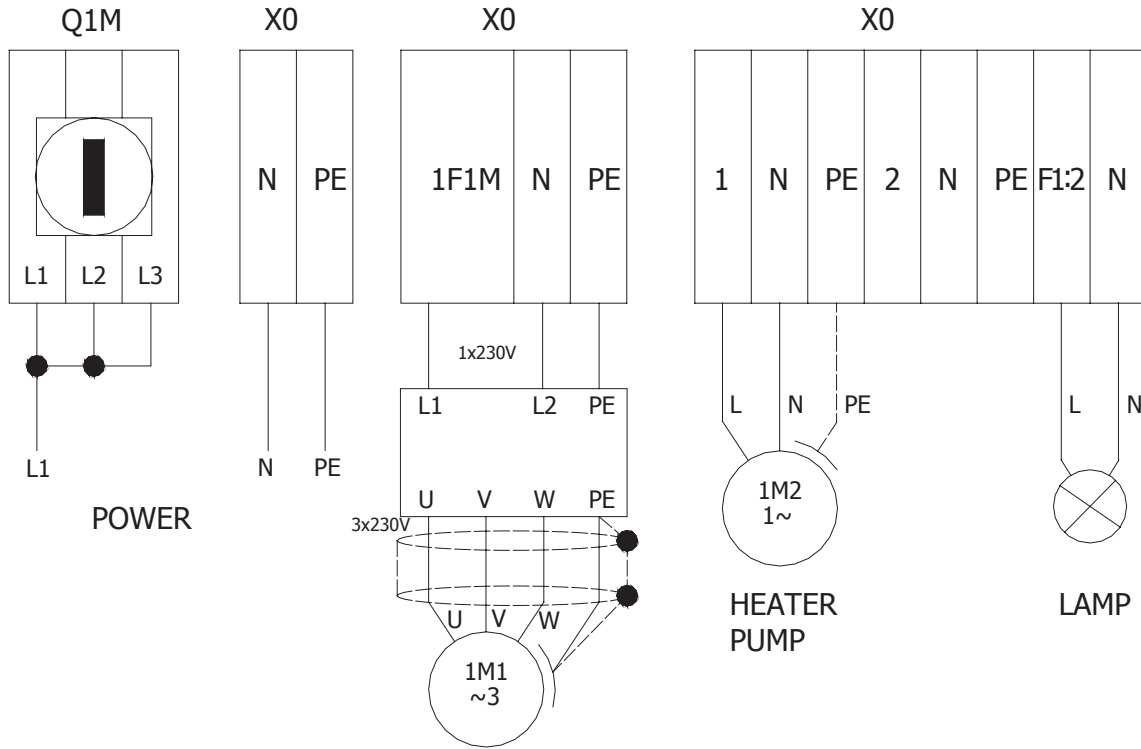
3x400V power supply, frequency converter with 1×230V or 3x400V supply

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1x230V power supply, frequency converter with 1×230V supply

3x400V power supply, frequency converter with 1×230V or 3x400V supply

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Appendix 10 Circuit diagram of power and motor connection for VS 180-300 CG ACX-2 SUP-EXH control gear (used also for VS 400-650 supply)

3x400V power supply, frequency converter with 1×230V or 3×400V supply

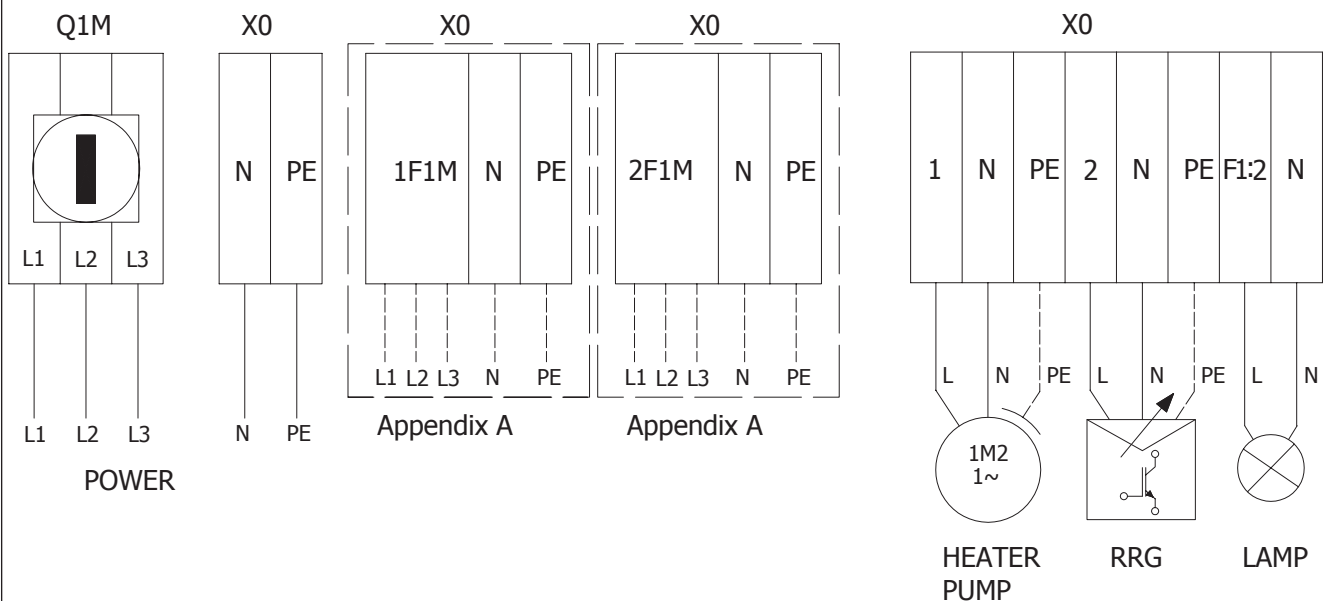*VTS reserves the right to implement changes without prior notice*

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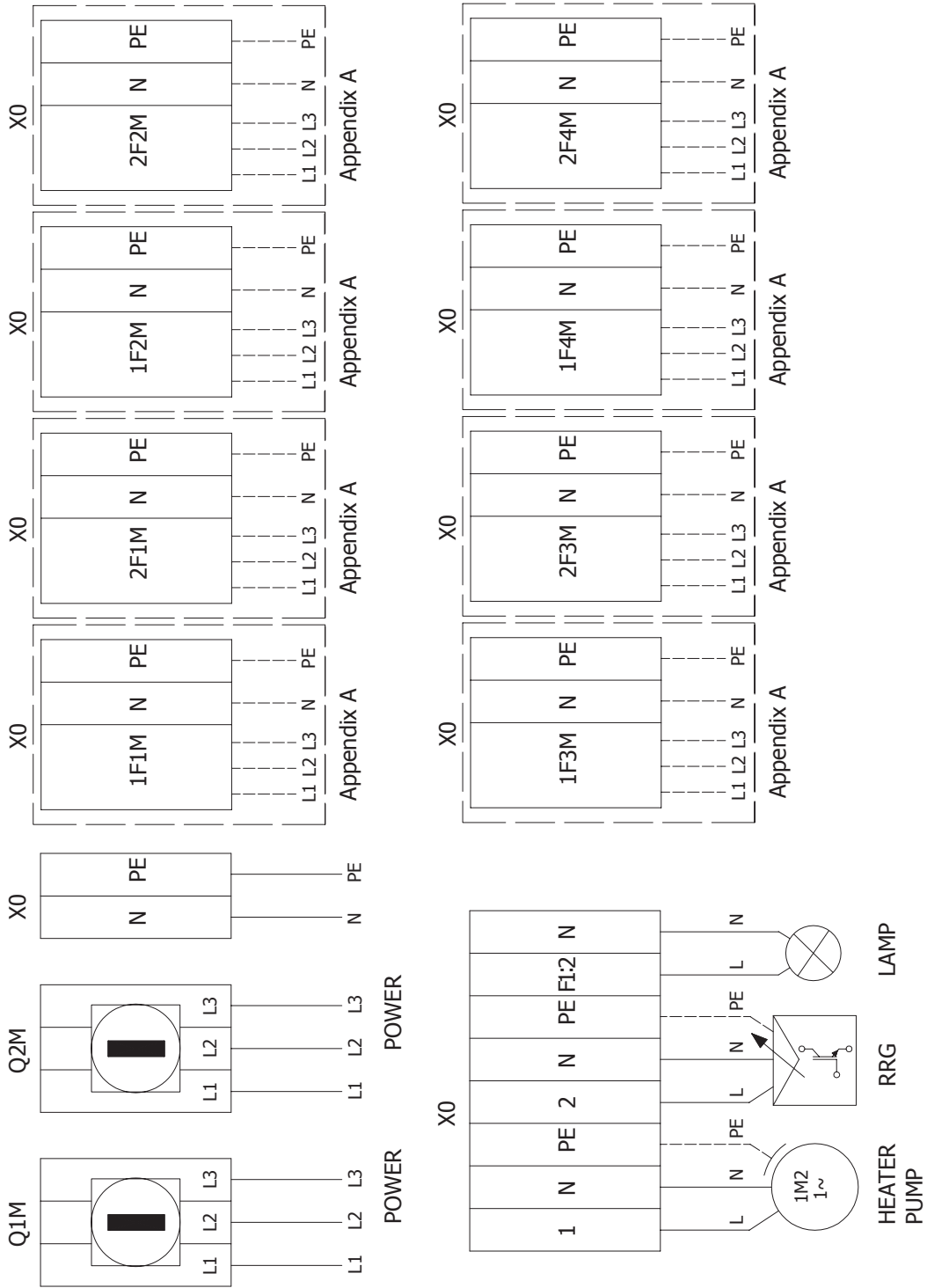
Appendix A Circuit diagram of motor connection depending on the type of the frequency converter

Frequency converters with 1×230V supply or with 3x400 supply

X0   X0

| xFyM | N | PE | | xFxM | N | PE |

1x230V   3x400V

OR

| L1 | | L2 | PE | | R | S | T | | PE |

| U | V | W | PE | | U | V | W | PE |

3x230V   3x400V

| U | V | W | | U | V | W |

xMy   xMy
~3   ~3
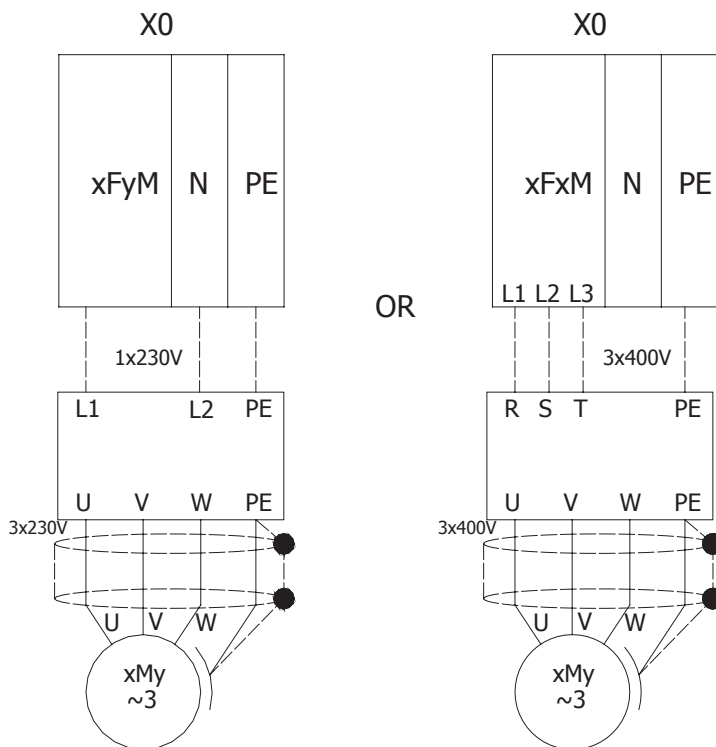
y = 1 or 2; 1 - for supply, 2 – for exhaust (according to the table D)

x = 1…4 - the next noumber of motor in AHU(according to the table D)

TABLE D

	1F1M	2F1M	1F2M	2F2M	1F3M	2F3M	1F4M	2F4M
VS 21-150 CG ACX-2 SUP	1M1							
VS 21-150 CG ACX-2 SUP-EXH	1M1	2M1						
VS 21-150 CG ACX-2 SUP-EXH (sup for VS 180-300)	1M1	1M2						
VS 180-300 CG ACX-2 SUP-EXH	1M1	2M1	1M2	2M2				
VS 180-300 CG ACX-2 SUP-EXH (sup for VS 400-650)	1M1	1M3	1M2	1M4				
VS 400-650 CG ACX-2 SUP-EXH	1M1	2M1	1M2	2M2	1M3	2M3	1M4	2M4

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Appendix 12 The application control schemes

The control schemes for separate application are on the CD plate delivered with AHUs.

In order to print the proper application scheme as the first one should find the application code on the AHU's technical data, next select „Control Aplication" from menu „AUTOMATICS" of CD plate and next choose suitable code and leading sensor.

Operation mode presetting	Type: Structure 2 Bytes Fixed-Point Scalar unsigned short	Range value: 0..100 state: -1,0,1	Resolution: value: 0,5 state: 1	Unit -
A parameter from VS 00 HMI Advanced		Network variable		Parameter description
Set Mode		nviSwitch00 (0:off, 1: Auto, 2: Stby, 3:On)		AHU operation mode (only presetting)
no present		nviSwitch00.state always value 1		

Operation mode confirmation	Type: Bitfield		Range: 0..65565	
A parameter from VS 00 HMI Advanced		Network variable	Parameter description	
not present		nviUniState2:0	Operation mode change is executed when bit changes from 1 to 0	

AHU status	Type: Fixed-Point Scalar unsigned short	Range 0...100	Resolution: 0,5	Unit -
A parameter from VS 00 HMI Advanced		Network variable		Parameter description
Status		nvoOpMode (0:VENT, 1: Heating, 2: Cooling 3:PreHeating, 4: OFF)		Current AHU status

Flow	Type: Fixed-Point Scalar signed long	Range 0...65535	Resolution: 0,01	Unit -
A parameter from VS 00 HMI Advanced		Network variable		Parameter description
SupAirFlow		nviPerc00		Supply fan speed [%]
SupFanSpeed		nviFlow00		Supply fan speed [Hz]
ExhAirFlow		nviPerc01		Exhaust fan speed [%]
ExhFanSpeed		nviFlow01		Exhaust fan speed [Hz]

Limits and settings	Type: Fixed-Point Scalar signed long	Range -273,13...327,66,	Resolution: 0,01	Unit ºC
A parameter from VS 00 HMI Advanced		Network variable		Parameter description
Min Sup Temp		nviTemp00		Minimal acceptable temperature in supply duct
Max Sup Temp		nviTemp01		Maximal acceptable temperature in supply duct
MinOutTemp		nviTemp02		Limit temperature of AHU operating in cooling mode
PumpMinOutTemp		nviTemp03		Temperature under which water heater pump operates apart from AHU operation status
HMI Temp Setp		nviTemp04		Preset temperature
Temp Setp		nvoTemp05		Preset temperature making allowance for a correction from the VS 00 HMI Basic adjuster

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Digital inputs	Type: Bitfield		Range 0...18446744073709551615		
A parameter from VS 00 HMI Advanced			Network variable		Parameter description
FireDetector			nvoAlarm:0		Fire protection unit
AirSideTherm/ElectricHeater			nvoAlarm:1		Anti-frost thermostat/ overheating thermostat
WaterSideTherm			nvoAlarm:2		Anti-frost thermostat on the water side
ChillerStatus/RefrigUnit/CWHW_AL			nvoAlarm:3		Status of cooling system
Motor			nvoAlarm:4		Status of 1-phase motor
Filters			nvoAlarm:5		Status of filters (1-phase systems)
FilterSup			nvoAlarm:6		Status of supply filters
FilterExh			nvoAlarm:7		Status of exhaust filters
MultiFunDigIn			nvoUniState1:6		Status of universal input (range and type as follows)
Digital outputs	Type: Bitfield		Range 0...65565		
A parameter from VS 00 HMI Advanced			Network variable		Parameter description
Pump			nvoUniState1:0		Water heater pump
Fan/Damper			nvoUniState1:1		Air damper
CoolerComp/Chiller/St1			nvoUniState1:2		Cooling system
HtgStatus/St2			nvoUniState1:3		AHU in heating mode/Second operation level of the cooling system
AlarmRelay			nvoUniState1:4		Alarm relay
MultiFunRelay			nvoUniState1:5		Universla relay
Analog inputs	Type: Fixed-Point Scalar signed long	Range -273,13...327,66,	Resolution: 0,01	Unit ºC	
A parameter from VS 00 HMI Advanced			Network variable		Parameter description
Supply Temp			nvoTemp00		Temperature in supply duct
Room/Exh Temp			nvoTemp01		Room temperature
Outside Temp			nvoTemp02		External temperature
AfterReco Temp			nvoTemp03		Temperature behind the recovery system on the exhaust side
MultiFunAnaIn			nvoTemp04		Universal input
not present			nvoTemp06		Temperature measured by the HMI Basic

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Advanced manual

Analog output	Type: Fixed-Point Scalar unsigned short	Range 0...100	Resolution: 0,5	Unit %
A parameter from VS 00 HMI Advanced	Network variable		Parameter description	
HeatingRate	nvoPerc00		Heating rate	
CoolingRate	nvoPerc01		Cooling rate	
RecoveryRate	nvoPerc02		Recovery rate	
SupAirRate	nvoPerc03		Opening rate of supply damper in systems with cross-flow exchanger without by-pass damper	

Alarm statuses	Type: Bitfield		Range 0...18446744073709551615	
A parameter from VS 00 HMI Advanced	Network variable		Parameter description	
SupFCStatus	nvoAlarm:8		Status of frequency converter on the supply side	
ExhFCStatus	nvoAlarm:9		Status of frequency converter on the exhaust side	
FCRRGStatus	nvoAlarm:10		Status of frequency converter of the rotary exchanger	
SupplyTempErr	nvoAlarm:11		Failure of temperature sensor on the supply side	
Room/ExhTempErr	nvoAlarm:12		Failure of temperature sensor in a room	
OutsideTempErr	nvoAlarm:13		Failure of external temperature sensor	
AfterRecoTempErr	nvoAlarm:14		Failure of temperature sensor behind the recovery system	
RoomUnitErr	nvoAlarm:15		Failure of the VS 00 HMI Basic panel	

Time synchronization	Type:		Range	
	Year:	Fixed-Point Scalar signed long	0...3000	
	Month:		0...12	
	Day:		0...31	
	Hour	Fixed-Point Scalar unsigned short	0...23	
	Minutes		0...59	
	Seconds		0...59	
A parameter from VS 00 HMI Advanced	Network variable		Parameter description	
Date/Time	nviActTime		Current date and time	

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