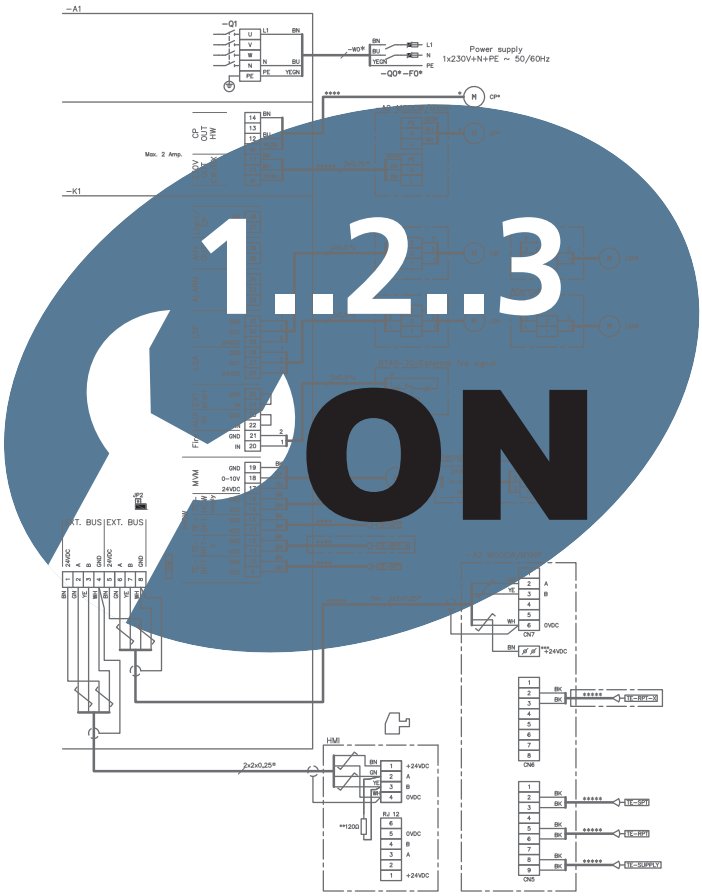
GB

Electrical installation guide

VEX310T-320T-330T-340T-350T
EXact2 control system

VEX300 RANGE
COUNTER FLOW HEAT EXCHANGER



Original instructions

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Symbols, concepts and warnings

1. Connection in automatic switchboard

2. Installation of the VEX unit

Symbols, concepts and warnings

Symbols, terms and warnings

Prohibition symbol

Failure to observe instructions marked with a prohibition symbol may result in serious or fatal injury.

Danger symbol

Failure to observe instructions marked with a danger symbol may result in personal injury and/or damage to the unit.

Scope of the instruction manual

This instruction manual is for use with EXHAUSTO AHUs, hereafter named as the VEX unit. This instruction manual deals with the electrical installation. Please refer to the product instructions regarding accessories and extra equipment.

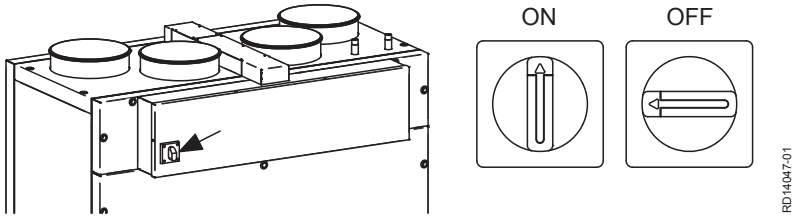
The instructions must be fully observed to ensure personal safety and the safety of others, and to protect equipment and ensure the correct operation of the VEX unit. EXHAUSTO A/S accepts no liability for accidents caused by a failure to use the product in accordance with the manual's instructions and specifications.

Warning

The work must be performed by an authorised electrician, in accordance with locally applicable regulations and legislation.

Opening the air handling unit

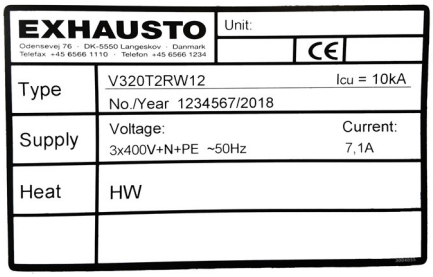
Do not remove the detachable doors/panels until the supply voltage has been disconnected at the isolation switch (arrow) and the fans have stopped. The isolation switch is positioned on the front of the connection box on top of the VEX unit.



Information plate

The information plate is positioned to the left of the control system box
The VEX unit information plate shows:

- the VEX variant designation
- unit production order no./year



NB: **Always have the production order number ready when contacting EXHAUSTO A/S.**

1. Connection in automatic switchboard

1.1 Explanation electrical diagrams

Wiring diagram

The following wiring diagrams illustrate the connection of the power supply, HMI panels and various accessories that must be connected to the control system panel.

1.1.1 Designations used and key to wiring diagram

Designation	Key	Supplied by
+A1	Control system panel	EXHAUSTO
+A2	VEX unit	EXHAUSTO
+A3	Connection box for heating coil/cooling unit	EXHAUSTO
-F0	Distribution board fuses	Customer
-Q0	Distribution board group switch	Customer
-F1	Control fuse in control system box	EXHAUSTO
-Q1	Isolation switch in control system box	EXHAUSTO
-K1	EXact2 AHUC PCB	EXHAUSTO

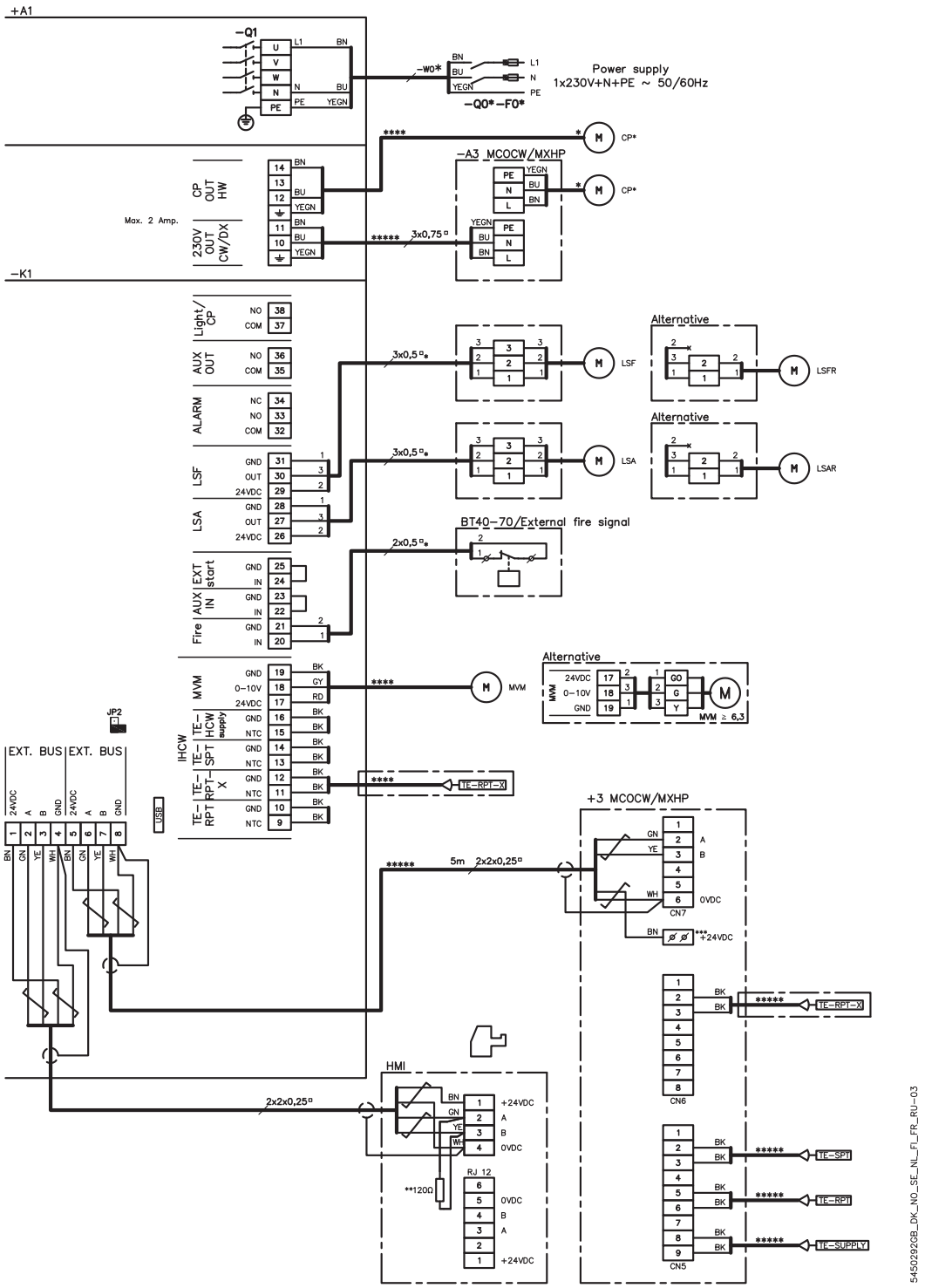
Accessories

See instructions for the relevant accessories:

- MXHP module for external cooling/heat pump unit in connection with internal DX coil
- MXCU module for external cooling unit in connection with internal DX coil
- MCOCW module for internal cooling/heating coil (water)
- MCCW module for internal cooling coil (water)

1.2 Electrical diagrams

1.2.1 Connection diagram - 1-phase



* Not EXHAUSTO delivery
** 120 Ω resistance for end termination
*** Crown sleeve for continuation of 24 VDC
**** Only if HW (water)
***** Only if MCOCW / MXHP
Accessories

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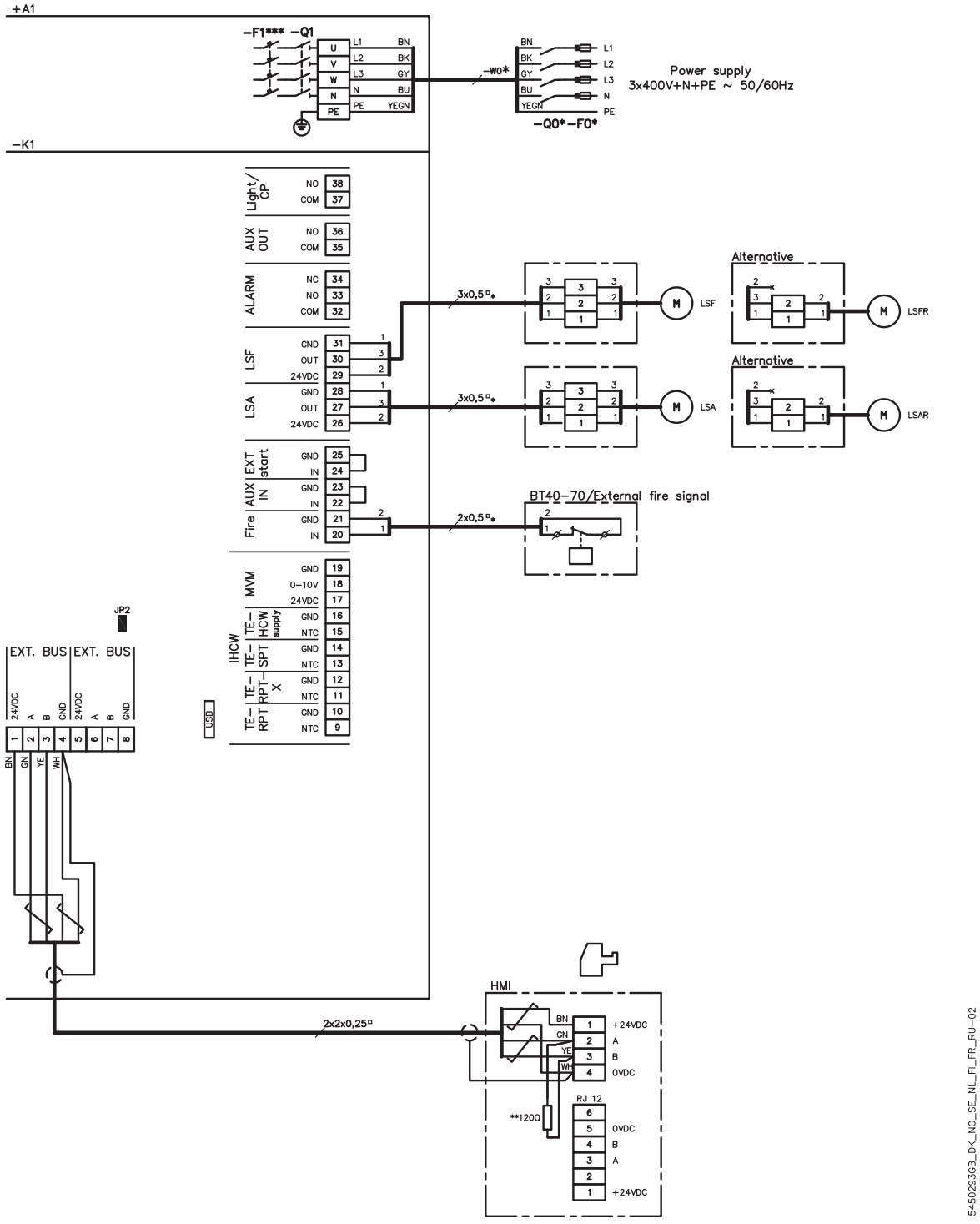
1.2.2 Connection diagram - 3-phase - Electric heating surface



* Not EXHAUSTO delivery
** 120 Ω resistance for end termination
*** -F1 Automatic fuse. Only by:

- VEX330T HE2 10.41 kW
- VEX340T HE2 14.96 kW
- VEX350T HE1 12.65 kW
- VEX350T HE2 22.76 kW

Accessories

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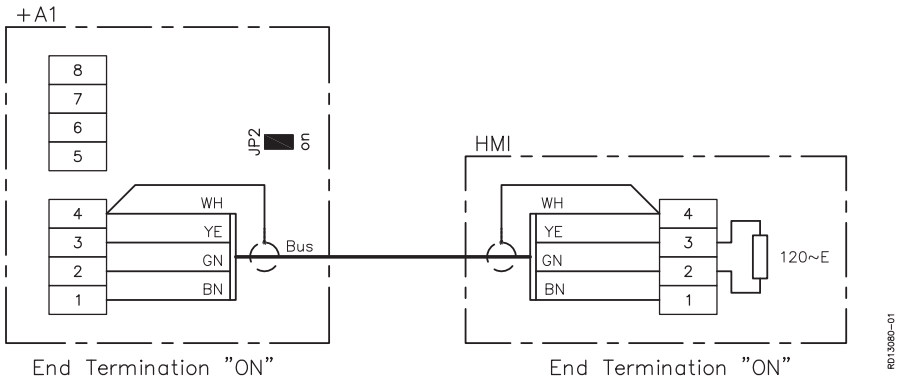
1.2.3 Termination

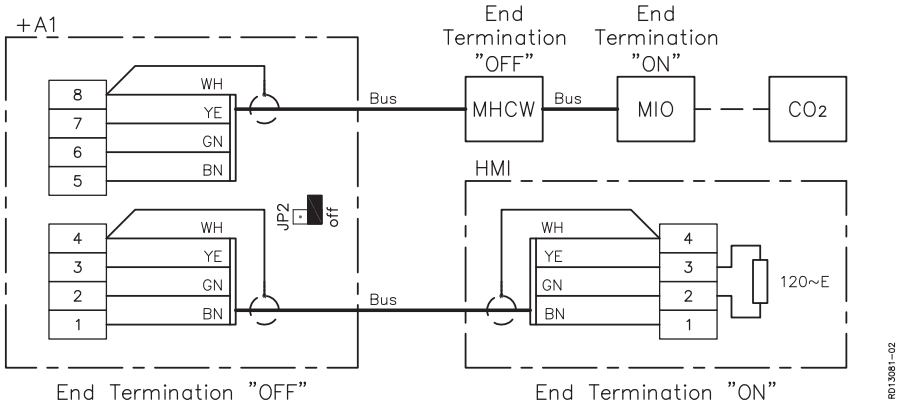
The first and last device on the bus must be terminated. The diagrams below show two termination examples. See position of jumper JP2 on EXact2 Main Board in section “Terminal board on EXact2 Main Board”.

If	then	See diagram no.
HMI is the only device on the bus (bus connector optional)	the jumper must be fitted in JP2. This connects a 120 Ω resistor.	1
If both buses are used	the jumper must not be fitted	2
If the bus connector is not used	the jumper must be fitted in JP2. This connects a 120 Ω resistor.	1

1.



2.



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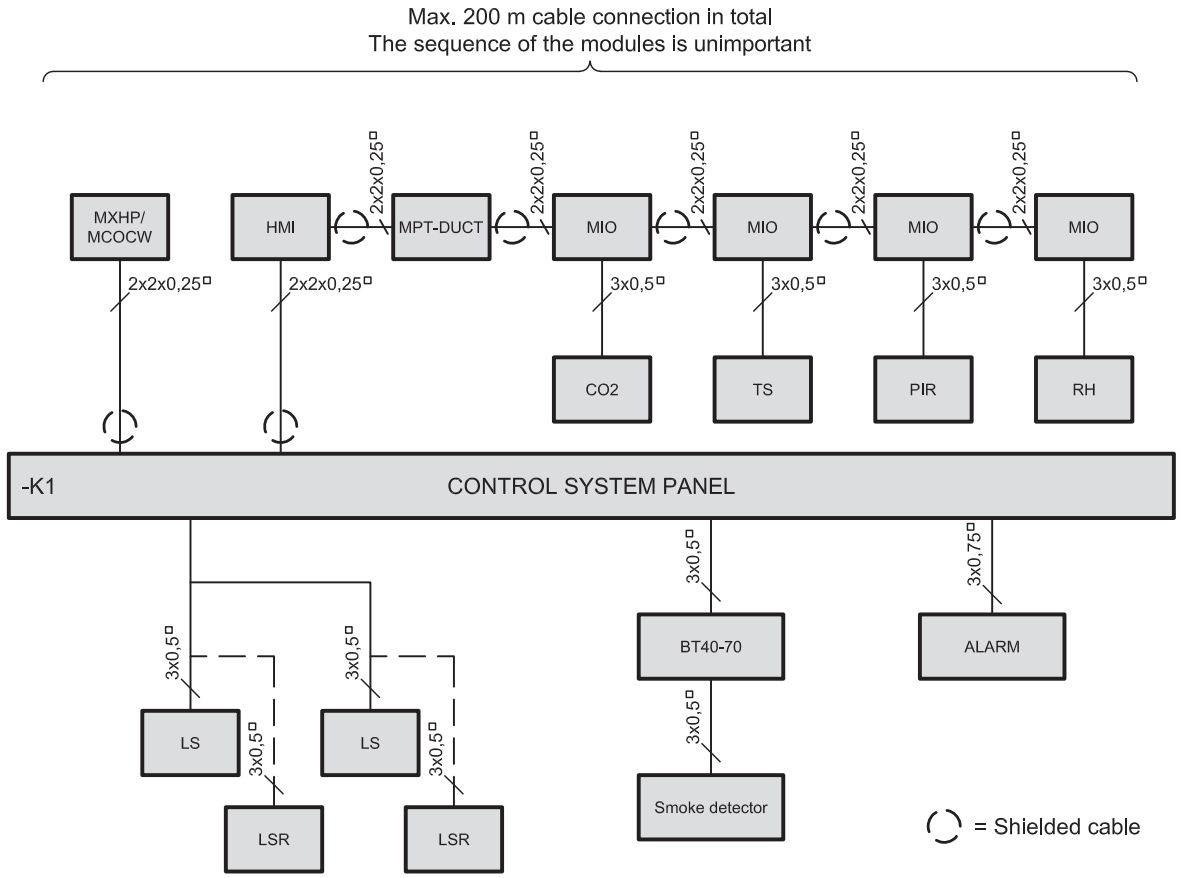
1.3 Electrical diagrams - Cable plan

The cable plan below shows the accessories that can be connected to the control system panel.



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1.4 Internal cable and wiring

1.4.1 Wiring diagrams

The following wiring diagrams show internal connections

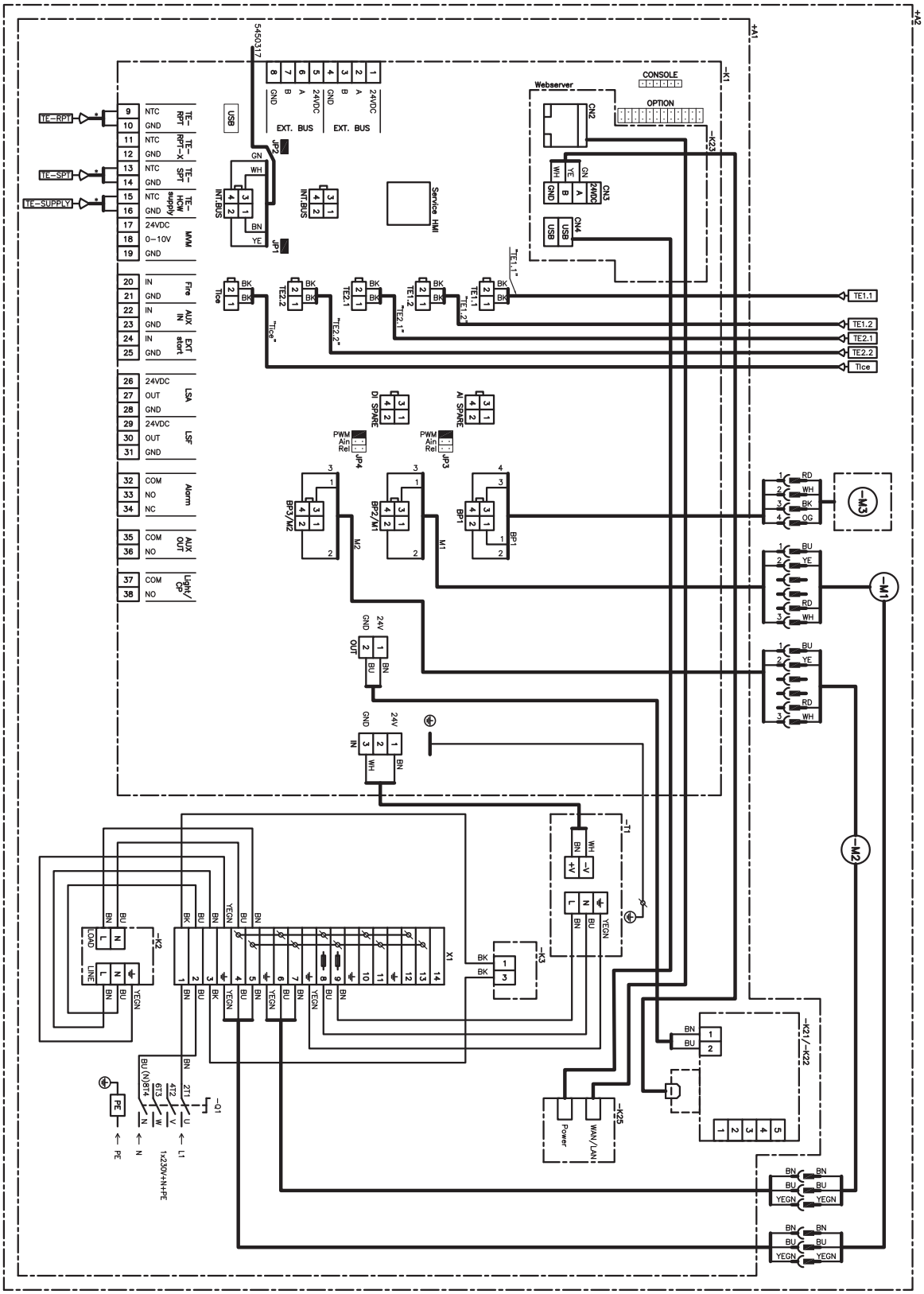
1.4.2 Designation and key to wiring diagram

Accessories are a direct customer choice, and the options may be generated from several factors.

Designation	Key	Standard	Accesso-ries	Option
+A1	Control system panel	X		
+A2	VEX unit	X		
-B20	Automatic overheating switch 50°C outdoors			X
-B21	Manual overheating switch 80°C in electric heating coil			X
-E2	electric heating coil (HE1/ HE2) in supply air chamber		X	
-F1	Control fuse			X
-K1	EXact2 AHUC PCB	X		
-K2	EMC filter	X		
-K3	Passive motor filter			X
-K12	Contactor for starting elec-tric heating coil			X
-K14	0–10 VDC solid state relay for electric heating coil (HE1/HE2)			X
-K21	MLON module		X	
-K22	MTCP module		X	
-K23	Web server PCB		X	
-K24	Option 9 PCB (IHCE control of electric heating coil)			X
-K25	Wireless Access Point		X	
-M1	Extract air fan	X		
-M2	Supply air fan	X		
-M3	Bypass motor damper	X		
-Q1	Isolation switch	X		
-T1	Power supply 24 VDC	X		
-T1.1	Extract air temperature sen-sor	X		
-T1.2	Exhaust air temperature sensor	X		
-T2.1	Outdoor air temperature sensor	X		
-T2.2	Supply air temperature sen-sor	X		
-T-Ice	De-icing temperature sen-sor	X		
-T-RPT	Return water temperature sensor in cooling/heating coil			X
-T-SPT	Supply air temperature sen-sor in cooling/heating coil			X
-T-SUPPLY	Supply air temperature sen-sor after			X

Designation	Key	Standard	Accesso-ries	Option
-X	Terminal row 2,5□	X		

1.4.3 Internal connections VEX310T - single phase



*Only for HW (water)

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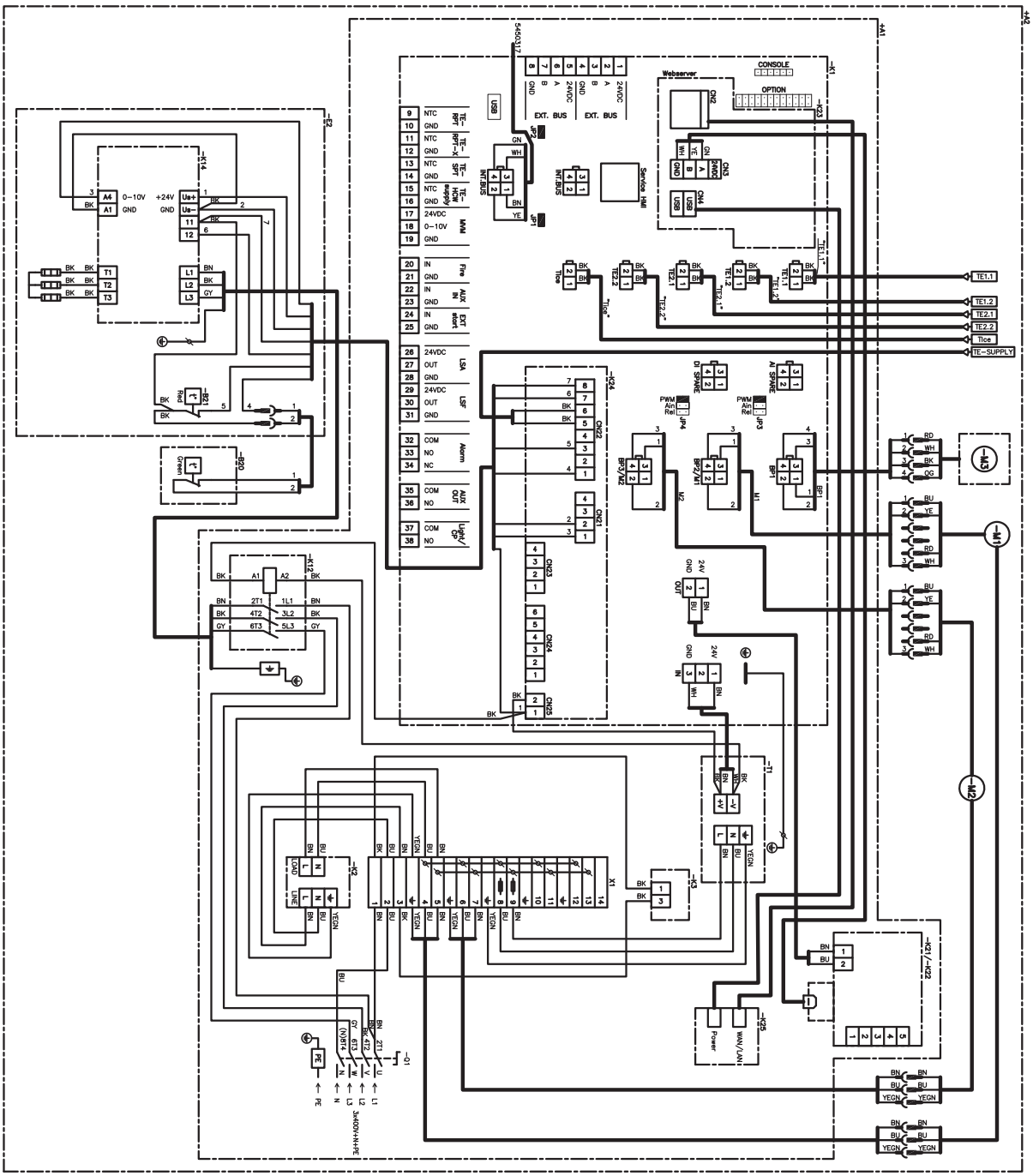
1.4.4 Internal connections VEX310T - 3-phase



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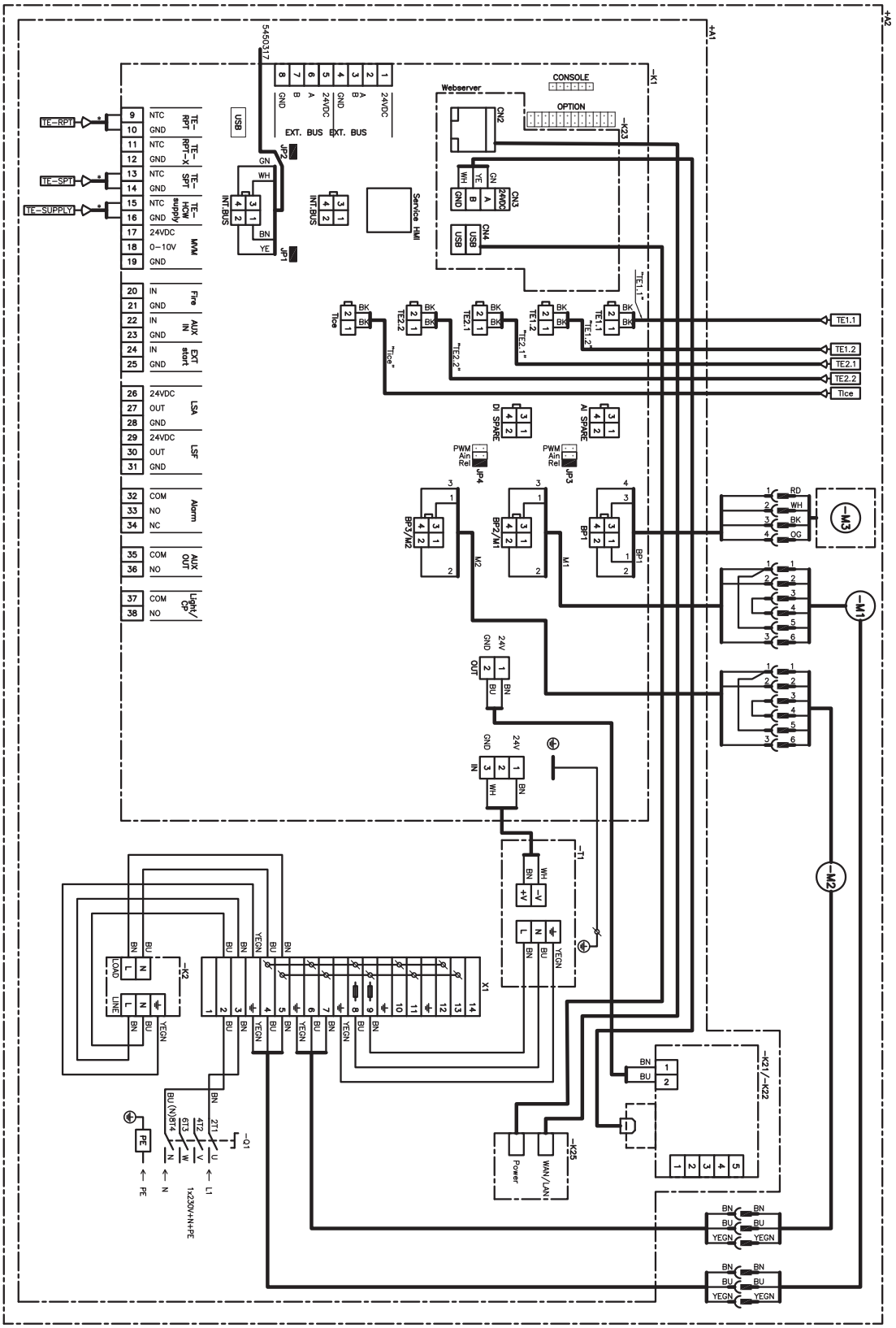
1.4.5 Internal connections VEX320T-350T - single phase



*Only for HW (water)

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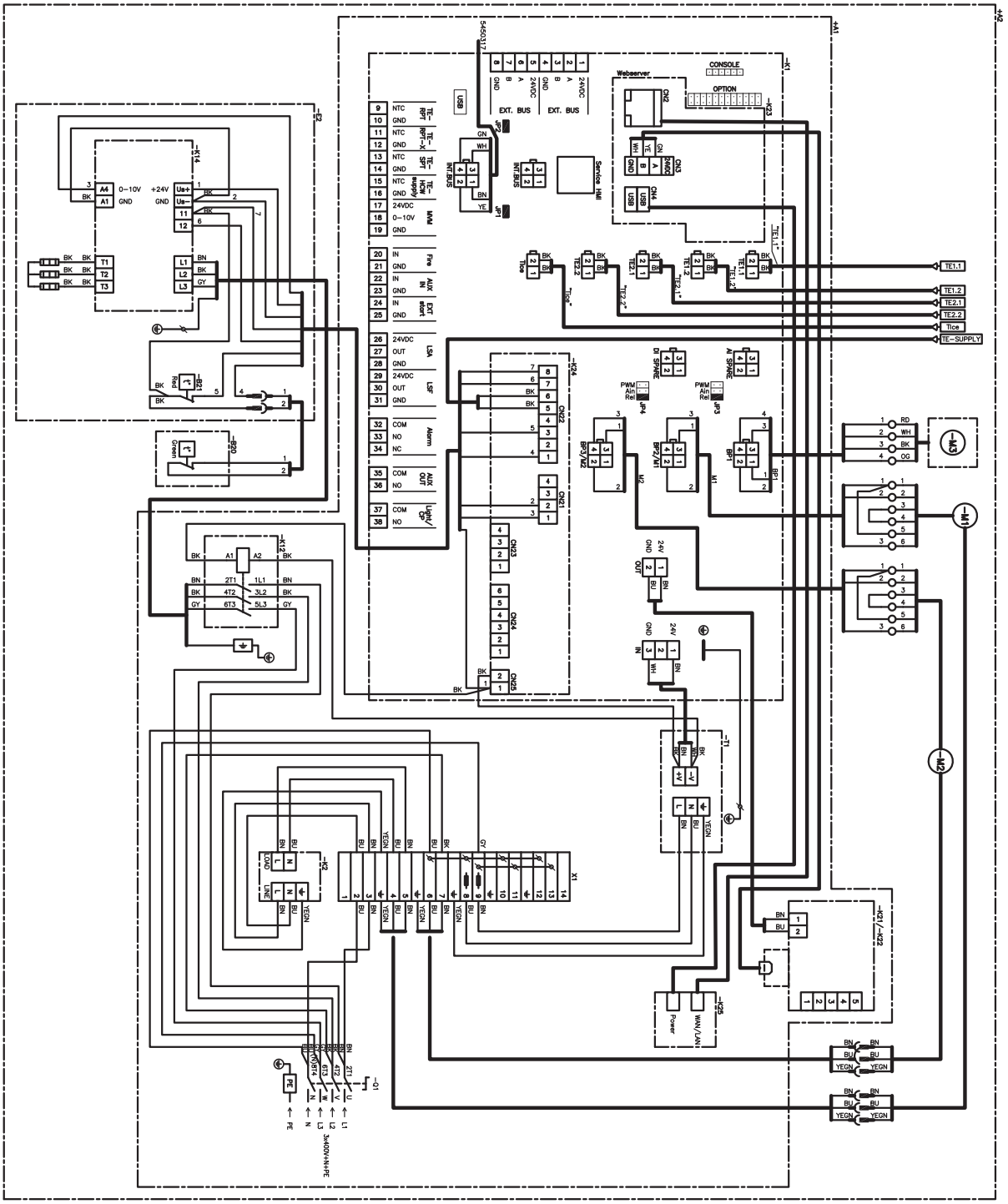
1.4.6 Internal connections VEX320-340T - 3-phase without control fuse



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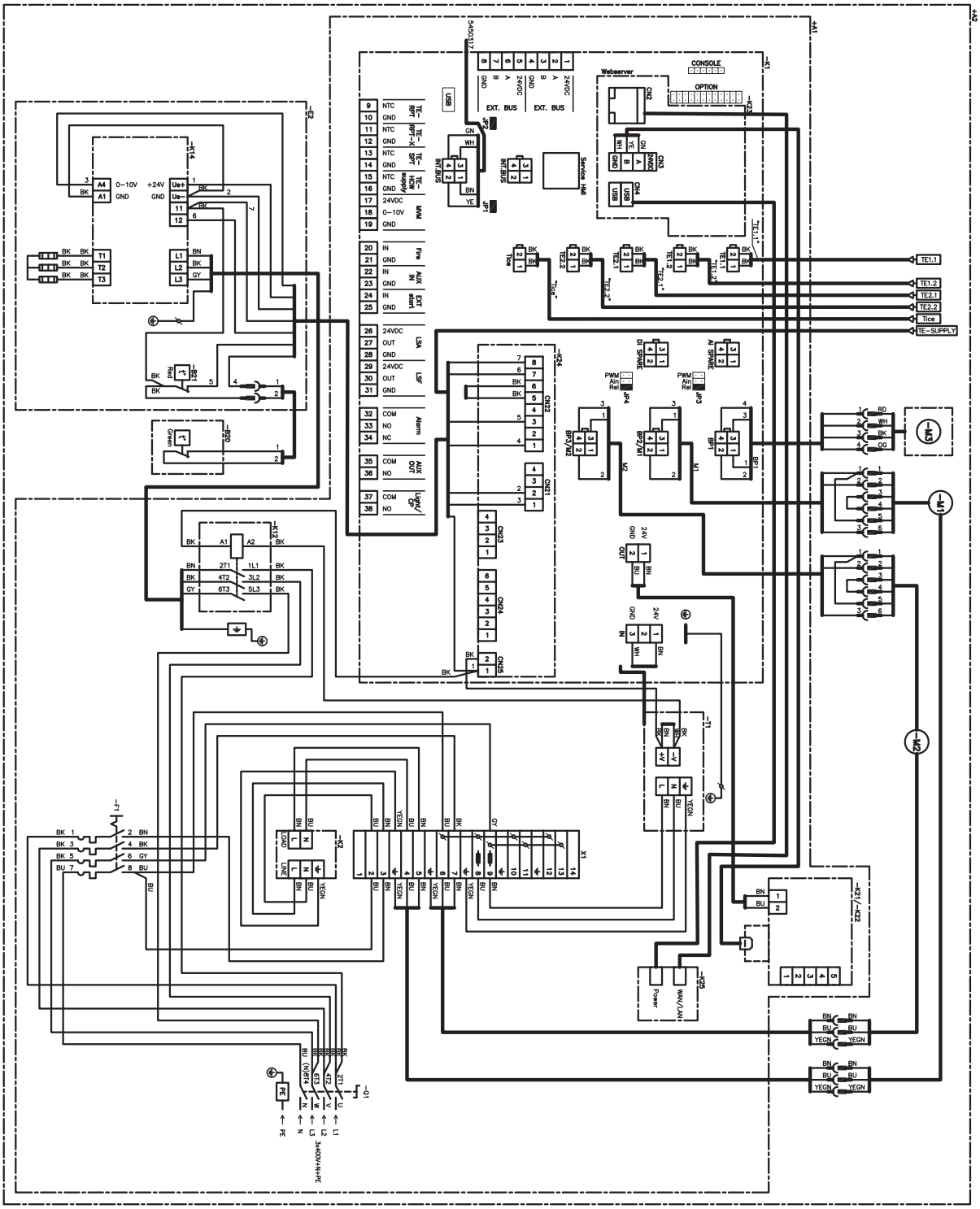
1.4.7 Internal connections VEX330-350T - 3-phase with control fuse



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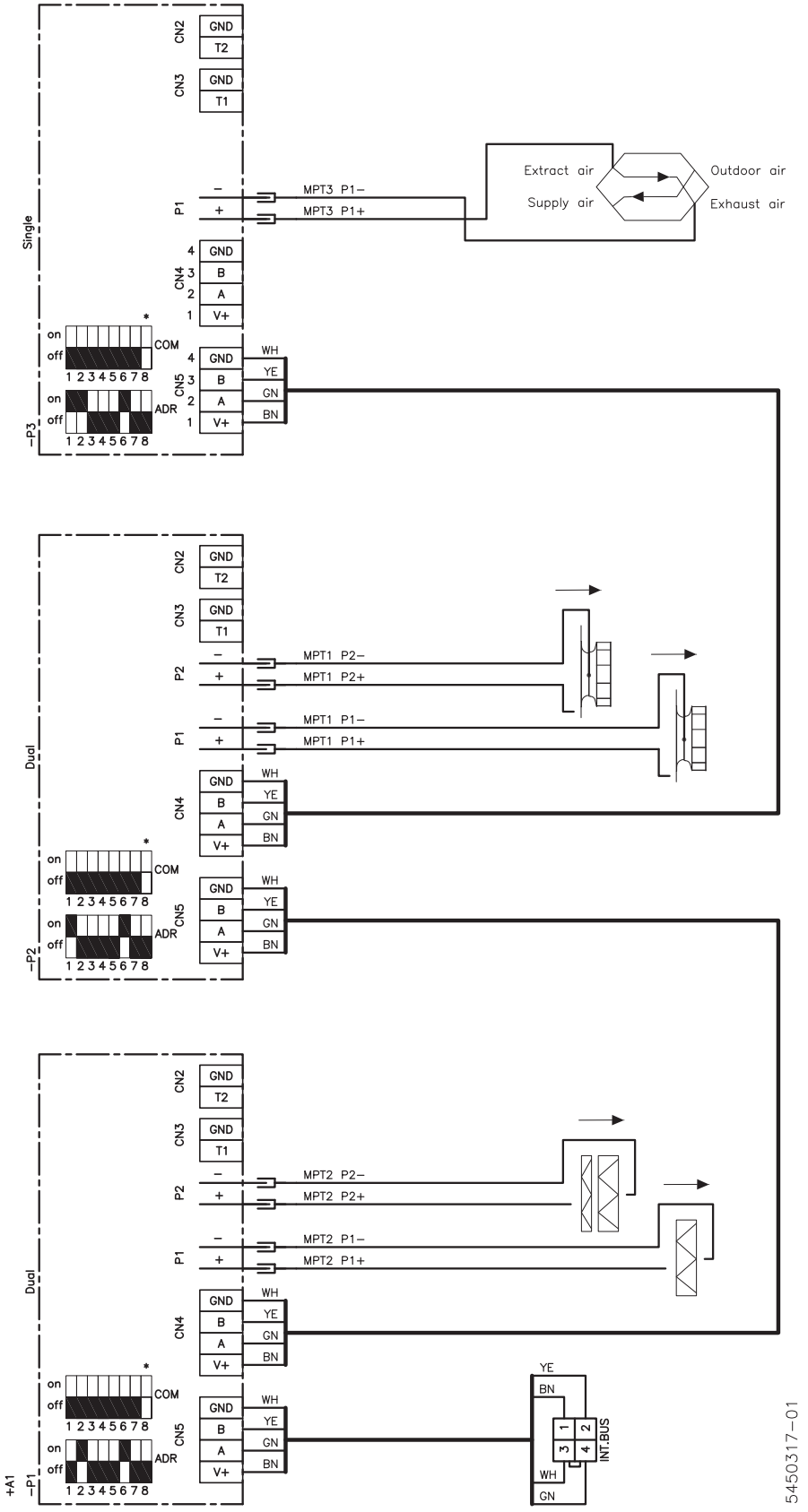
1.4.8 Internal wiring and hoses



* Set termination to ON (DIP switch 8) on the last of up to three MPT's. The number of configured MPT's may be from one to three (-P1, -P2 and -P3)

2. Installation of the VEX unit

2.1 Scope of installation

2.1.1 Connections in the control system panel

See following table for possible connections to the terminal block on the EXact2 circuit board.

Possible connections	See section
Supply voltage	2.2 Dimensioning and installation
HMI control panel, via modbus	1.2 Connection diagram
MODBUS components, via MODBUS	1.2 Termination See also the applicable component's instructions
External start, Fire and AUX IN*	1.2 Connection diagram and below
Closing damper, exhaust air LSA/LSAR	1.2 Connection diagram
Outdoor air closing damper LSF/LSFR	1.2 Connection diagram
Control of internal CW coil - MCOCW/ MCCW module	1.2 Termination See also the module's instructions.
Control for internal DX coil - MXHP/ MXCU module	1.2 Termination See also the module's instructions.
Fire thermostat BT40-70	1.2 Connection diagram
TE-RPT-X	1.2 Connection diagram

*** External start, Fire and AUX IN**

Note following jumper settings for EXact2 main board

If	then
Fire is used	the jumper between terminals 20 and 21 **must be removed.**
AUX IN is used	the jumper between terminals 22 and 23 **must be removed.**
EXT start is used	the jumper between terminals 24 and 25 **must be removed.**

2.2 Dimensioning and installation

- **The supply cable must be dimensioned and installed in accordance with applicable rules and regulations.**
- **The earth terminal (PE) must always be connected.**

Diagram

The supply voltage must be connected to the isolation switch as shown in the diagram in section 1.

2.2.1 Installation requirements and recommendations

Isolation switch and control fuse

The control system panel has a built-in isolation switch.

The inclusion of a built-in control fuse depends on the size of the VEX unit and the size of the VEX unit's internal electric heating coils (HE1/HE2).
See the overview below to see when the VEX unit has a built-in control fuse.

- YES = Built-in control fuse 4-pole, C-10A
- NO = no control fuse

VEX size	With electric heating coil HE1*	With electric heating coil HE2*	Without electric heating coil
310T	NO	NO	NO
320T	NO	NO	NO
330T	NO	YES	NO
340T	NO	YES	NO
350T	YES	YES	NO

*See table **"Outputs of electric heating coils in VEX300T"** further down in the section.

For additional information about the electric heating coil's technical data, see the VEX instructions **Assembly and installation**.

Fuse

The fuse must be suitable for:
- Short-circuit protection of the VEX unit.
- Short-circuit protection of supply cable
- Overload protection of supply cable

Maximum fuse rating

VEX size	With electric heating coil HE1 or HE2*	Without electric heating coil
310T	C-10A	C-10A
320T	C-16A	C-16A
330T	C-25A	C-16A
340T	C-32A	C-16A
350T	C-50A	C-16A

NB:

*See table **"Power of electric heating coils in VEX300T"** further down in the section.

For a VEX unit with short-circuit protection, the fuse rating must not be greater rating than stated in the table above.

Power cable

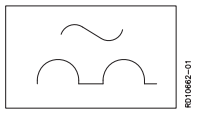
When dimensioning the power cable, the conditions at the installation site, including temperature, cable layout and voltage drop must be taken into consideration.

RCCB

- **The unit must have protection against indirect contact.**

<u>If RCCBs are fitted in the installation, they must be of a type that meets the following requirements:</u>

- **PFI type A breaker in accordance with EN 61008 that breaks the circuit on registering a vagrant current with DC content (pulsating DC)**
- **The RCCBs must be marked with the following symbol:**



- **Disconnection time may be max. 0.3 s.**
- **Leak current may be max. 300 mA.**

Current leakage A leak current of up to 100 mA can be generated in the VEX unit.

2.2.2 Power of electric heating coil in VEX300T

VEX size	Electric heating coil HE1, supply air [kW]	Electric heating coil HE2, supply air [kW]
310T	1.68	3.90
320T	3.37	7.81
330T	5.61	10.41
340T	7.49	14.96
350T	12.65	22.76

2.2.3 Electrical connection/data

With electric heating coil HE1 (supply air)

VEX size	Supply voltage (nominal)	Max. phase current [A]	
		Composite	Aluminium
310T	3 x 400 V+N+PE ~ 50/60 Hz	6.3	-
320T	3 x 400 V+N+PE ~ 50/60 Hz	9.6	-
330T	3 x 400 V+N+PE ~ 50/60 Hz	16.0	12.8
340T	3 x 400 V+N+PE ~ 50/60 Hz	18.3	
350T	3 x 400 V+N+PE ~ 50/60 Hz	30.6	30.2

With electric heating coil HE2 (supply air)

VEX size	Supply voltage (nominal)	Max. phase current [A]	
		Composite	Aluminium
310T	3 x 400 V+N+PE ~ 50/60 Hz	9.5	-
320T	3x400V+N+PE ~ 50/60Hz	16	-
330T	3 x 400 V+N+PE ~ 50/60 Hz	22.9	19.7
340T	3 x 400 V+N+PE ~ 50/60 Hz	29.1	
350T	3 x 400 V+N+PE ~ 50/60 Hz	45.2	44.8

With HW or CW coil (supply air)

VEX size	Supply voltage (nominal)	Max. phase current [A]	
		Composite	Aluminium
310T	1x230V+N+PE ~ 50/60Hz	5.9	-
320T	1x230V+N+PE ~ 50/60Hz	6.7	-
330T	1x230V+N+PE ~ 50/60Hz	9.9	6.7
340T	1x230V+N+PE ~ 50/60Hz	9.5	
350T	1x230V+N+PE ~ 50/60Hz	14.3	13.9

2.0A for circulation pump is included.

With DX coil (supply air), or without integral coil (supply air)

VEX size	Supply voltage (nominal)	Max. phase current [A]	
		Composite	Aluminium
310T	1x230V+N+PE ~ 50/60Hz	3.9	-
320T	1x230V+N+PE ~ 50/60Hz	4.7	-
330T	1x230V+N+PE ~ 50/60Hz	7.9	4.7
340T	1x230V+N+PE ~ 50/60Hz	7.5	
350T	1x230V+N+PE ~ 50/60Hz	12.3	11.9

Short-circuit current

Maximum short-circuit current $I_{K,max}$ according to EN60947.2 is 10 kA

Minimum short-circuit current $I_{K,min}$ with control fuse, see table.

VEX size	With electric heating coil HE1 or HE2 [kA]	Without electric heating coil [kA]
310T	0.15	0.15
320T	0.24	0.24
330T	0.38	0.24
340T	0.48	0.24
350T	0.75	0.24

Accessory

Accessory types MXHP/MCCW/MXCU and MCOCW module can be directly connected to the VEX unit's control system panel. Supply and modbus cable are included in the module.

Terminals (10, 11)

... may only be used for the above-stated accessories and a maximum of one module may be connected.

Circulation pump

If the VEX unit is equipped with an internal HW coil, the circulation pump can be connected to terminal block -X1 (terminals 12 and 14). The circulation pump may not draw more than 2.0 A, and its cable must be dimensioned in accordance with the VEX unit's fuse. See section **Fuses**

2.2.4 Isolation switch, internal in control system panel

Isolation switch, internal in control system panel

Connect supply voltage here!	
Fit the cover after connecting.	

A VEX unit equipped with an electric heating coil is three-phase.

Terminal	Labelling	Power cable
1L1	U	Phase conductor 1
3L2	V	Phase conductor 2
5L3	W	Phase conductor 3
(N)7L4	N	Neutral conductor

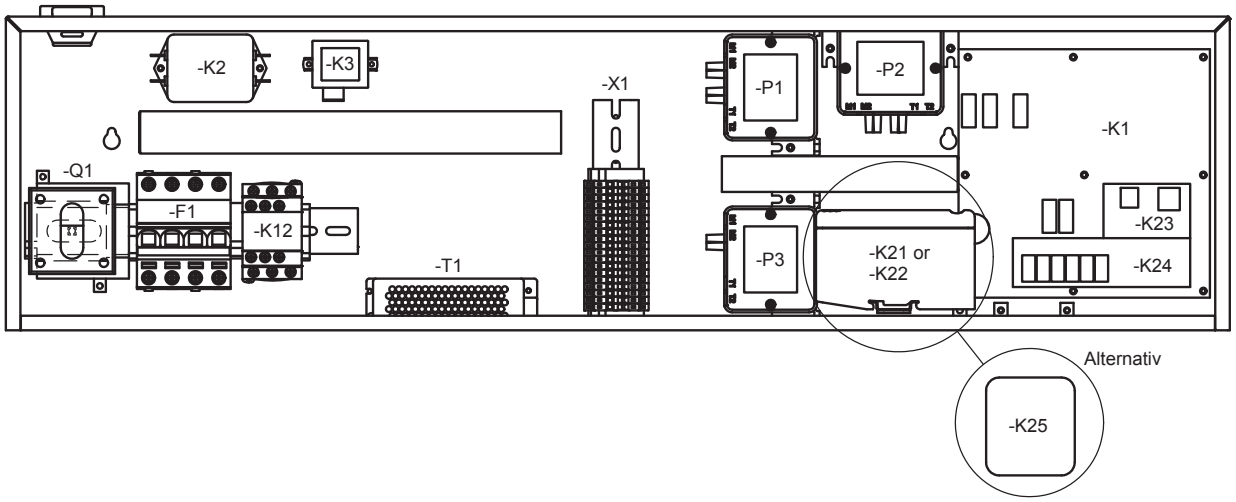
A VEX unit equipped without an electric heating coil is always single phase.

Terminal	Labelling	Power cable
1L1	U	Phase conductor
(N)7L4	N	Neutral conductor

2.3 Electrical components

2.3.1 Control system panel

The illustration below shows the electrical components' positioning in the control system panel:



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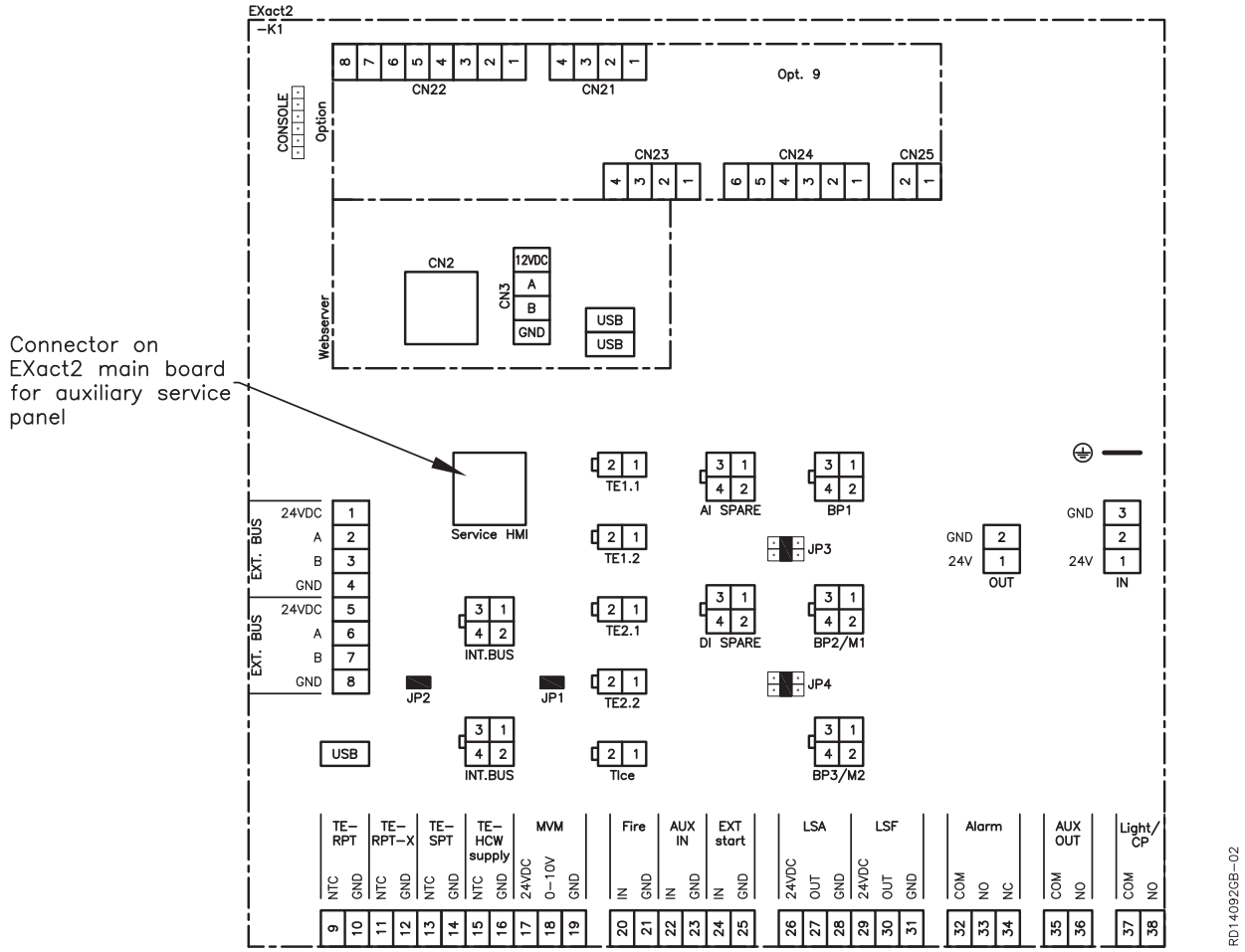
Component list

Code	Electrical component	Qty.
-F1	Control fuse	1
-K1	EXact2 AHUC PCB	1
-K2	EMC filter	1
-K3	Passive motor filter (only in VEX310T)	1
-K12	Contactor	1
-K21	MLON module	1
-K22	MTCP module	1
-K23	Web server PCB	1
-K24	OPTION 9 PCB (IHCE)	1
-K25	Wireless Access Point	1
-P1	Dual MPT MPTF (filter monitoring)	1
-P2	Dual MPT AFC (airflow control)	1
-P3	Single MPT DEP (pressure de-icing)	1
-Q1	Isolation switch	1
-T1	Power supply 24 VDC	1
-X1	Terminal row 2,5□	5 (yellow/green) 5 (blue) 9 (grey)

For positioning of electrical components in the VEX unit, see the VEX instructions. **Assembly and installation**.

2.3.2 Terminal block on the EXact2 printed circuit board

The drawing and diagram below show which components (standard + accessories) can be connected to the terminal block terminal block.



Designation	Terminal block no.	Connection of the following components
BUS	1 - 4	Bus for external topics
BUS	5 - 8	Bus for external topics
TE ... + MVM	9 - 19	Temperature sensors and motor valve. The clamps are used to control the HW surface.
Fire	20 - 21	BT40-70 Smoke detector or other fire alarm switch
AUX IN	22 - 23	Same function as Fire
EXT start	24 - 25	If it is closed, the unit can be started If it breaks, the unit stops
LSA	26 - 28	Shutter return LSA Closing damper return with spring-return LSA
LSF	29 - 31	Shut-off damper outdoor air LSF Shutter damper outdoor air with spring-return LSF
Alarm	32 - 34	Sumalarm

Designation	Terminal block no.	Connection of the following components
AUX OUT	35 - 36	Fire alarm for controlling smoke evacuation damper or fire gas fan.
Light/CP	37 - 38	Light / circulation pump. Light is not a possible option on the VEX350T, but if VEX units are equipped with HW drums, the circulation pump (CP function) is activated.
USB	USB	For service use
DI SPARE		TIMERBUTTON2/TIMERBUTTONEU2
AI SPARE		CO2B/RHB
OUT		24 V supply for MLON / MTCP
Service HMI	Service HMI	Connector for connection of additional HMI panel, see section "Service - connection of additional HMI control panel"
Jumper		
JP1		Possibility of final termination, internal BUS. Is set to ON (closed position) from the factory.
JP2		Possibility of final termination, external BUS, see section 1.2.3
JP3	BP2/M1	Configuration BP2 / M1 (VEX310T: PWM, VEX320-350T: REL). Is set from factory.
JP4	BP3/M2	Configuration BP3 / M2 (VEX310T: PWM, VEX320-350T: REL). Is set from factory.
Opt. 9 (print for internal electric heating control, IHCE)		
OPTION9	CN21-25	Additional inputs and outputs for connecting the IHCE
Web server (optional)		
Web server	CN2	Ethernet or Wireless access point
Web server	CN3	Connection of BMS
Web server	USB	Supply to Wireless Access Point

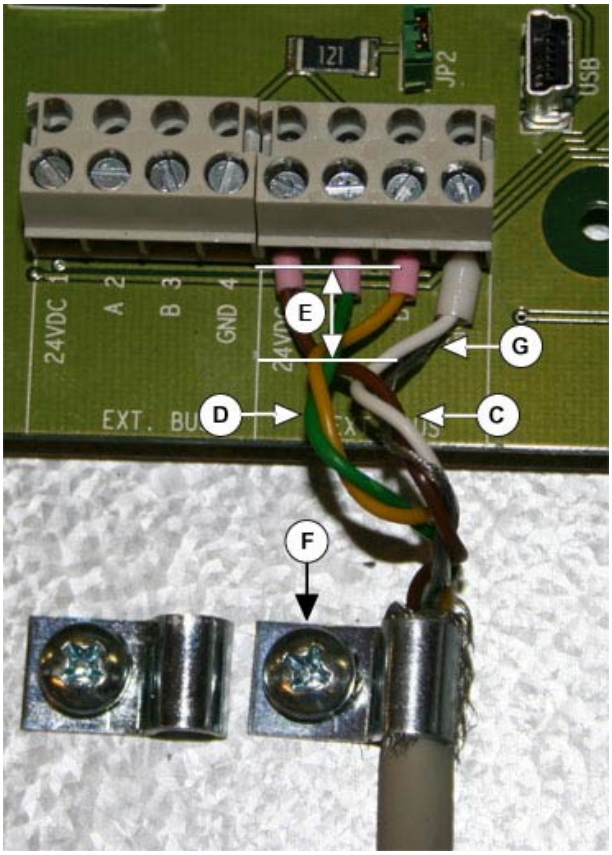
2.3.3 Connecting shielded cable to MODBUS

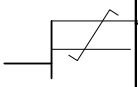
Cable type

MODBUS requires shielded cable of type 2 x 2 x 0.25 □ twinned pair conductors.

Connection

Wires and screen must be connected as shown in the table below



Wires	Step	Action	See
Conductors **Symbol: Twinned pair conductors** 	1	Strip minimum amount of insulation from conductors and ensure they are not damaged/ snapped	
	2	Twist 0V conductor and 24V conductor together	C
	3	Twist conductor A and conductor B together	D
	The conductors must be twisted as far down towards the terminals as possible. Max. distance from twists to terminal board: 1.5 cm.		E
Screen	1	Strip insulation from screen from point ahead of cable clamp (F)	
	2	Mount the clamp to enclose the screen and hold the cable in place	F
	3	Take some of the cable screen and run it into the terminal board together with the 0V conductor	G

2.3.4 Service – connection of additional HMI control panel

An additional HMI control panel connected during servicing overrides the HMI panel connected to the unit. Refer to the EXact basic instructions for further information.

Scan code and go to addresses at
www.exhausto.com

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