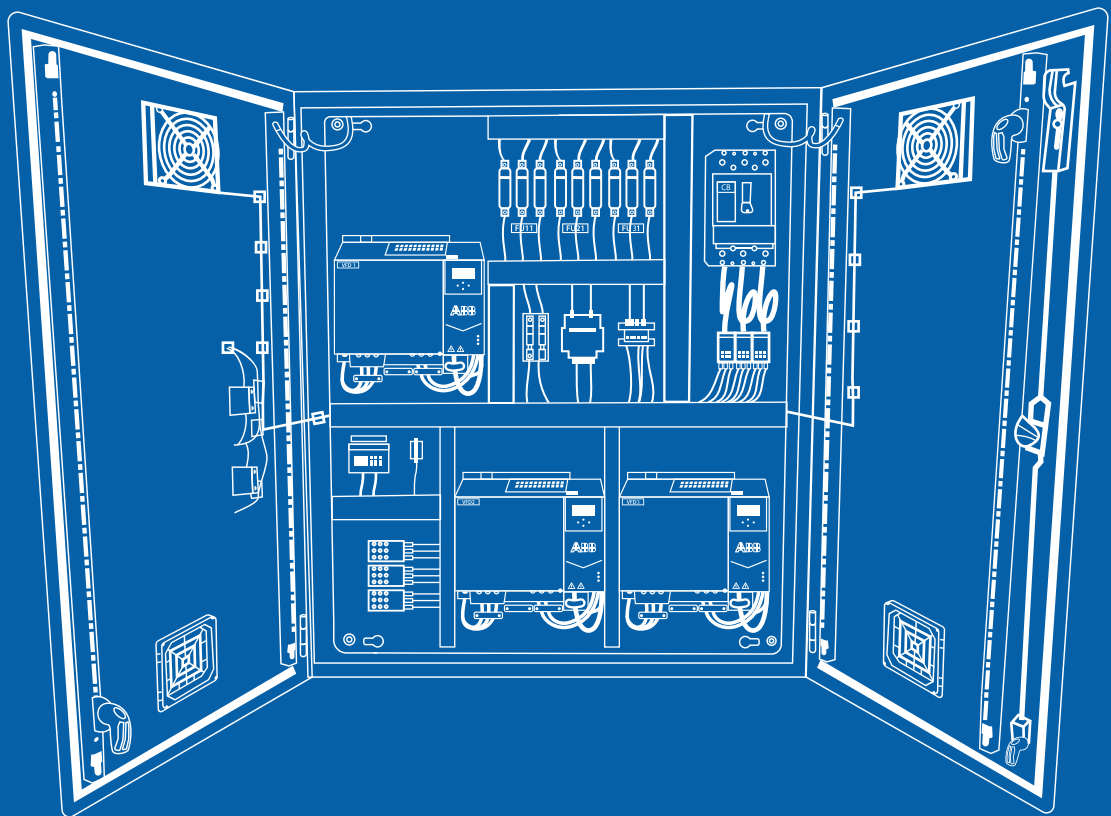



# VACUUMIQ

INTELLIGENT VACUUM CONTROLLER

## QUICK START GUIDE

ABB Variable Frequency Drive  
25/30HP X 3 460V



 **Sonny's CarWash  
Vacuums**  
by **AUTOMAC**

425-33072-ABB

# QUICK START GUIDE FOR VACUUM IQ USING THE ABB-ACS SERIES VFD

## OVERVIEW

This guide is to assist in the start up of the ABB ACS series variable frequency drive.

### In **Chapter 1:**

The installation of the Variable Frequency Drive will be covered.

### In **Chapter 2:**

The input power to the package, vacuum motor and pressure transducer connections will be shown.

### In **Chapter 3:**

The operation of the VFD display will be covered.

### In **Chapter 4:**

Will deal with electrical drawings for different package configuration (multiple motors).

### In **Chapter 5:**

Includes factory VFD parameters for different package configurations.

Please take time to review this guide before proceeding with the installation and testing.



# DANGER!

**LETHAL VOLTAGES ARE PRESENT** Before applying power to the variable frequency drive, ensure that all protective covers are on and all wiring connections are secure. After the power has been turned OFF, wait at least 5 minutes or until the display indicator extinguishes completely before touching any wiring, circuit boards or components.

# CHAPTER 1 - INSTALLATION AND WIRING

## Installation

- Please review and verify that the inverter was received free of damage and is the correct size for the motor being used.
- To ensure personal and personnel safety and to avoid equipment damage, follow standard precautions and the installation procedures for mounting, wiring, and operating environment.

## Wiring

- Be sure to follow all applicable codes in make electrical connections to the motor and input power terminals, as well as the control wiring.
- Transducer wiring should be run in a separate conduit and at least 18 inches from any high voltage conduit.
- Transducer wiring should be run in a separate trench other than high voltage wire trench if possible. Feedback errors may occur if transducer control wire is run in the same trench with high voltage.



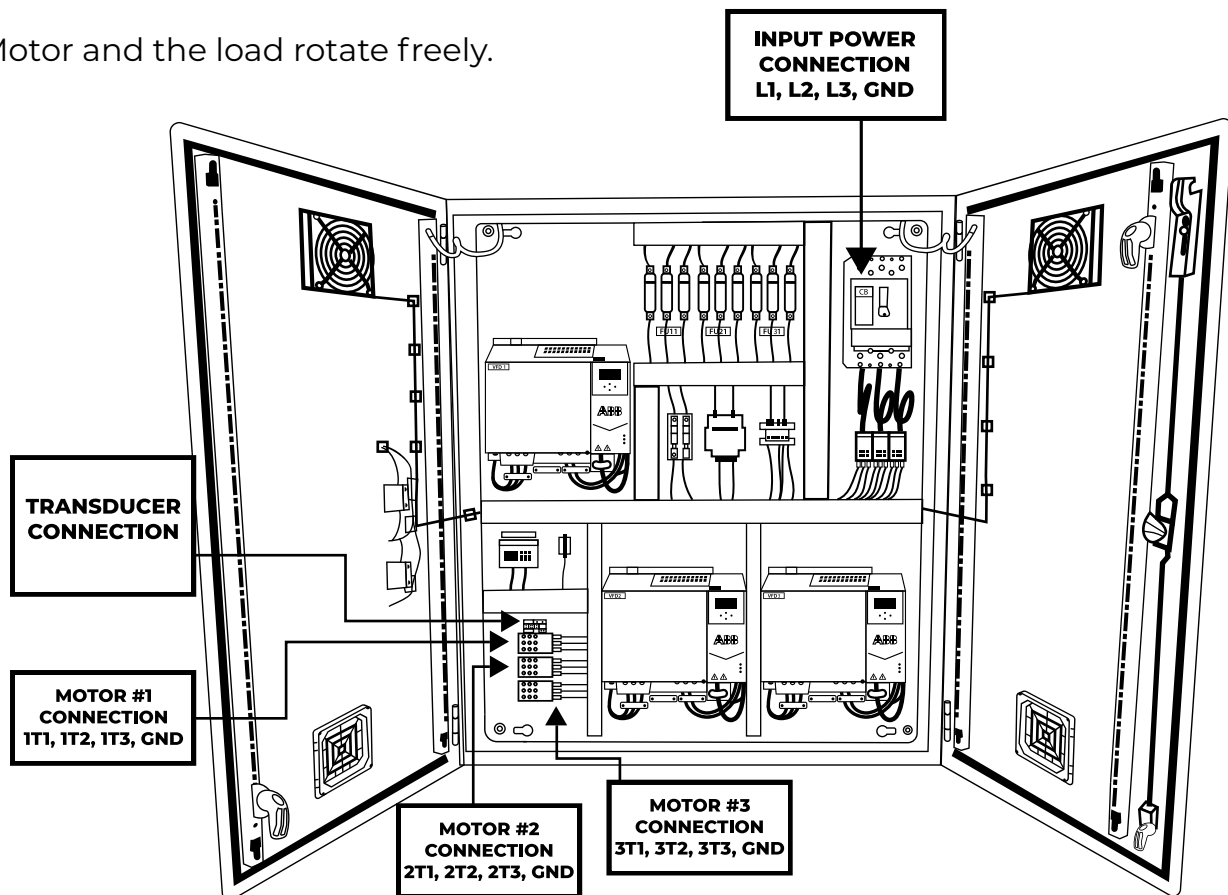
## NOTICE

**AutoVac** cannot be responsible for transducer feedback errors due to control wire being run in the same trench as the high voltage wire.

## CHAPTER 2 - INPUT POWER, MOTOR AND PRESSURE TRANSDUCER CONNECTIONS.

**With power OFF**, ensure the following mechanical and electrical conditions:

- Rated output current of the VFD is equal or greater than the motor FLA.
- Supply voltage, VFD rated voltage and motor voltage match.
- Power factor correction capacitors are **NOT** installed between the VFD and the motor.
- Power factor correction capacitors are **NOT** installed input to the VFD without a line reactor.
- Motor and the load rotate freely.



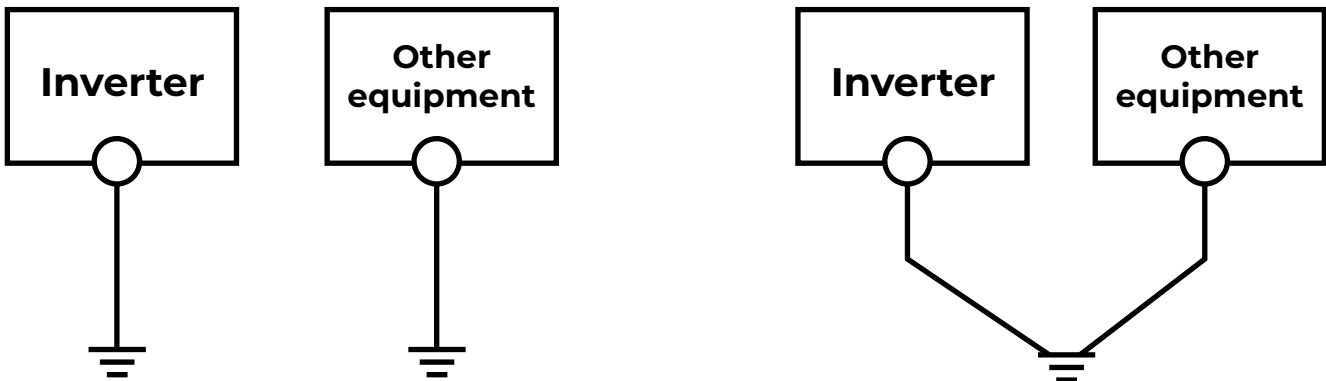
**To connect package to the power supply, motor and pressure transducer, please refer to picture below and Auto Cad drawings submitted in Chapter 4.**

 **NOTE**

For triple motor configuration, input power and transducer connections are the same. Motor connection terminals are labelled 1T1, 1T2 and 1T3 for the first motor. For second motor terminals are labelled 2T1, 2T2 and 2T3. For third motor terminals are labelled 3T1, 3T2 and 3T3.

 **CAUTION**

To prevent an electric shock, always ground the motor and VFD. Use independent grounding method for the VFD. If independent grounding is impossible, use common grounding as shown on the figure below.



# CHAPTER 3 - CONTROL PANEL



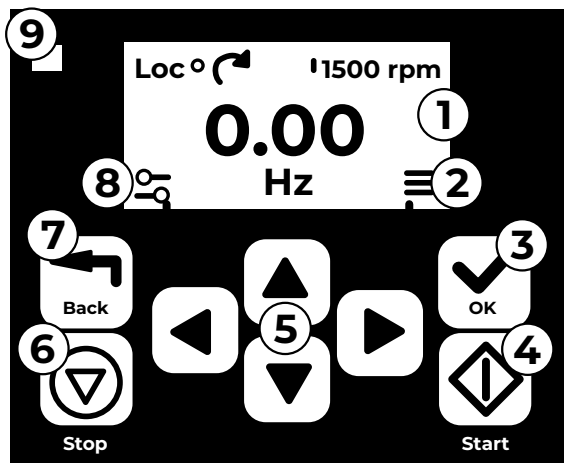
### IMPORTANT NOTICE:

The VFD already comes factory pre-programmed; the following instructions are ONLY for reference.



**Only a CERTIFIED TECHNICIAN can perform it.**

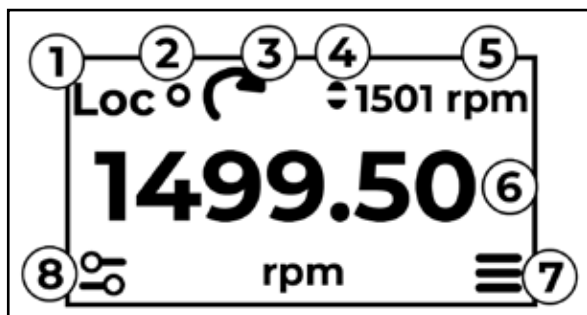
By default, ACS 380 has an integrated panel. If required, you can use external control panels such as an assistant control panel or a basic panel.



1. Display - Shows the Home view as default.
2. Main menu.
3. Ok button - Open the Main menu, select and save settings.
4. Start button - Start the drive.
5. Menu navigation buttons - Move in the menus and set values.
6. Stop button - Stop the drive.
7. Back button - Open the options menu and move back in the menu.
8. Options menu.
9. Status light - Green and red colors indicate the state and potential problems.

### Home view and Message view

The Home view is the main view. Open the Main menu and Options menu from the Home view.



1. Control selection - Local or remote.
2. Local start/stop control - Enable.
3. Rotation direction - Forward or reverse.
4. Local reference setting - Enabled.
5. Speed - Target.
6. Speed - Current.
7. Main menu - Menu list.
8. Options menu - Quick access menu.

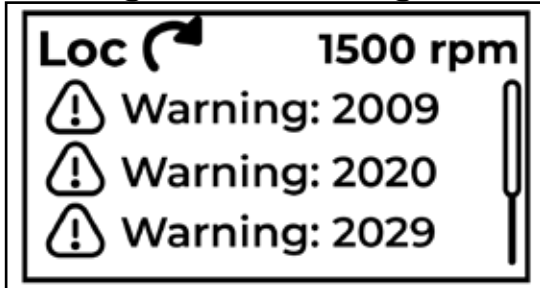
The Message view shows fault and warning messages. If there is an active fault or warning, the panel shows the Message view directly. You can open the Message view from the Options menu or Diagnostics submenu.

### Message view: Fault



Fault messages require your immediate attention.

### Message view: Warning

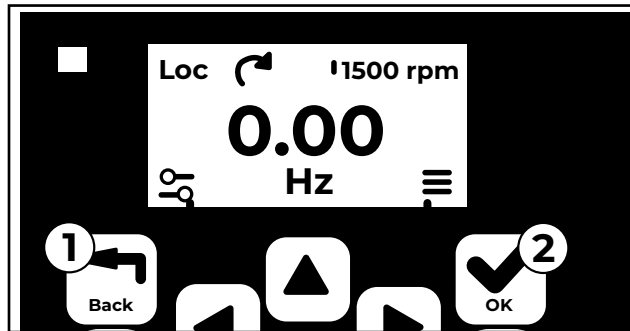


Warning messages show possible problems.

### Options menu and Main menu

#### Options menu

1. To open: press the Back button in the *Home* view.

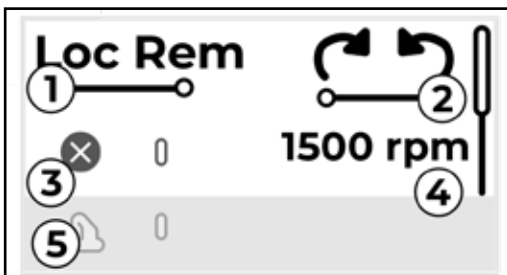


#### Main menu

1. To open: press the OK button in the *Home* view.

### Options menu

The Options menu is a quick access menu.



1. Control location - set to local or remote control.
2. Rotation direction - Set to forward or reverse.
3. Active faults - View possible faults.
4. Reference speed - Set the reference speed.
5. Active warnings - View possible warnings.

### Main menu

The Main menu is a scroll menu. The menu icons represent specific groups. The groups have submenus.

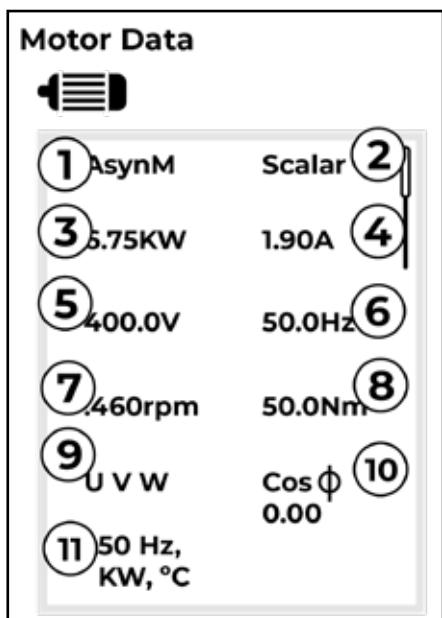
**Note:** You can define which Main menu items are visible.



1. Motor data - Motor parameters.
2. Motor control - Motor settings.
3. Control macros
4. Diagnostics - faults, warnings, fault log and connection status.
5. Energy efficiency - Energy savings.
6. Parameters - parameters.

### Submenus

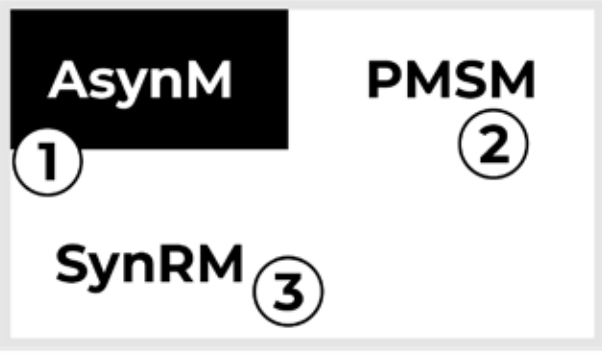
The Main menu items have submenus. Some submenus also have menus and/or option lists. The content of the submenus depend on the drive type.



1. Motor type - AsynM, PMSM, SynRM
2. Control mode - Scalar, Vector.
3. Nominal power.
4. Nominal current.
5. Nominal voltage.
6. Nominal frequency.
7. Nominal speed.
8. Nominal torque.
9. Phase order - U V W, U W V.
10. Nominal Cosphi.
11. Unit selection - SI or US units.

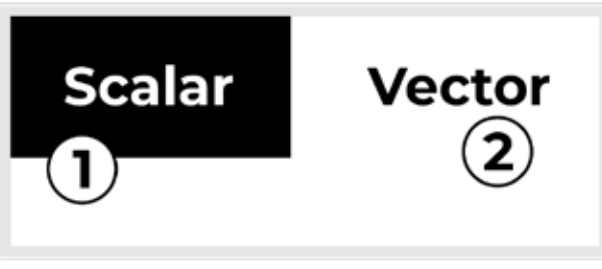


**Motor Data: Motor type**



- 1. AsynM
- 2. PMSM
- 3. SynRM

**Motor Data: Control mode**



- 1. Scalar
- 2. Vector

**Motor Data: Phase order**

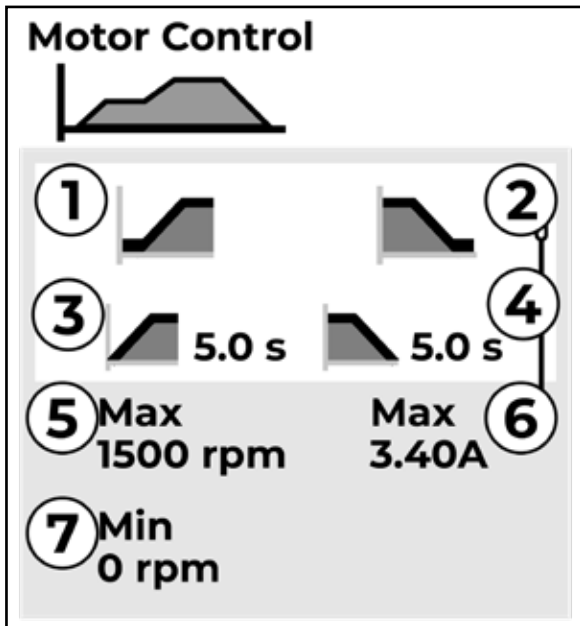


- 1. UVW
- 2. UWV

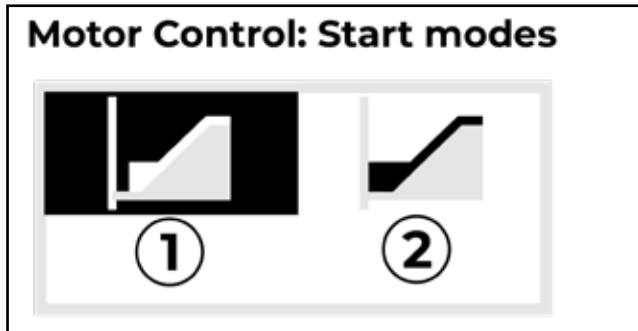
**Motor Data: Unit selection**



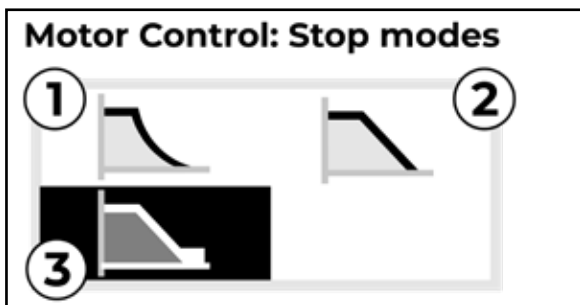
- 1. SI units
- 2. US units



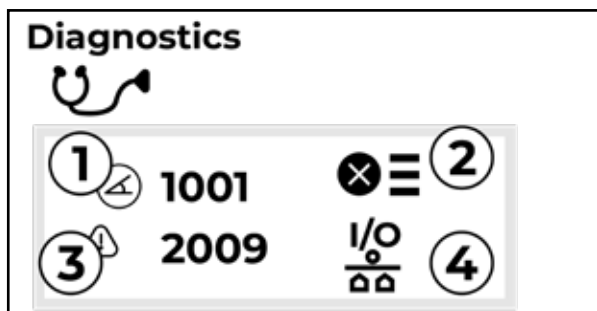
1. Start mode - Const time, Automatic
2. Stop mode - Coast, Ramp, DC hold
3. Acceleration time
4. Deceleration time
5. Maximum allowed speed
6. Maximum allowed current
7. Minimum allowed speed



1. Const time
2. Automatic




1. Coast
2. Ramp
3. DC Hold



1. Active Fault - Shows the fault code
2. Fault History - List of latest fault codes (Newest first)
3. Active Warnings - Shows the warning code
4. Connection Status - Fieldbus an I/O Signals.v

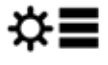
### Energy Efficiency






1 Saved ⚡ 645 ... KWh	Saved 2 12807
3 Saved ⚡ 65MWh 0/KWh	Saved 4 0 12K
5 0.20	

1. Saved energy in kWh
2. Saved money
3. Saved energy in MW
4. Saved money x 1000
5. Cost per kWh

### Parameters



1 	 2
3 	

1. Complete parameter list - groups menu with complete parameters and parameter levels
2. Modified parameter list
3. Parameter restore - reset to factory default parameters

## Programming the drive

1. Energize the drive.
2. Enter the Control macros view and select the applicable macro. For units with a fieldbus adapter connected: you can see the fieldbus in the Control macros view. There are certain parameters that you need to change.
3. Enter the Motor data view and select the units (international or US).
4. Set the motor type:

**AsynM:** Asynchronous motor

**PMSM:** Permanent magnet motor

**SynRM:** Synchronous reluctance motor

5. Set the motor control mode:

**Vector:** Speed reference. This is suitable for most cases. The drive does an automatic stand-still ID run.

**Scalar:** Frequency reference. Use this mode when:

- The number of motors can change.
- The nominal motor current is less than 20% of the nominal drive current. Scalar mode is not recommended for permanent magnet motors.

6. Set the nominal motor values:

- Nominal power
- Nominal current
- Nominal voltage
- Nominal frequency
- Nominal speed
- Nominal torque (optional)
- Nominal cos phi.

7. In the Motor control view, set the start and stop mode.

8. Set the acceleration time and the deceleration time.



**NOTE:**

The speed acceleration and deceleration ramp times are based on the value in parameter

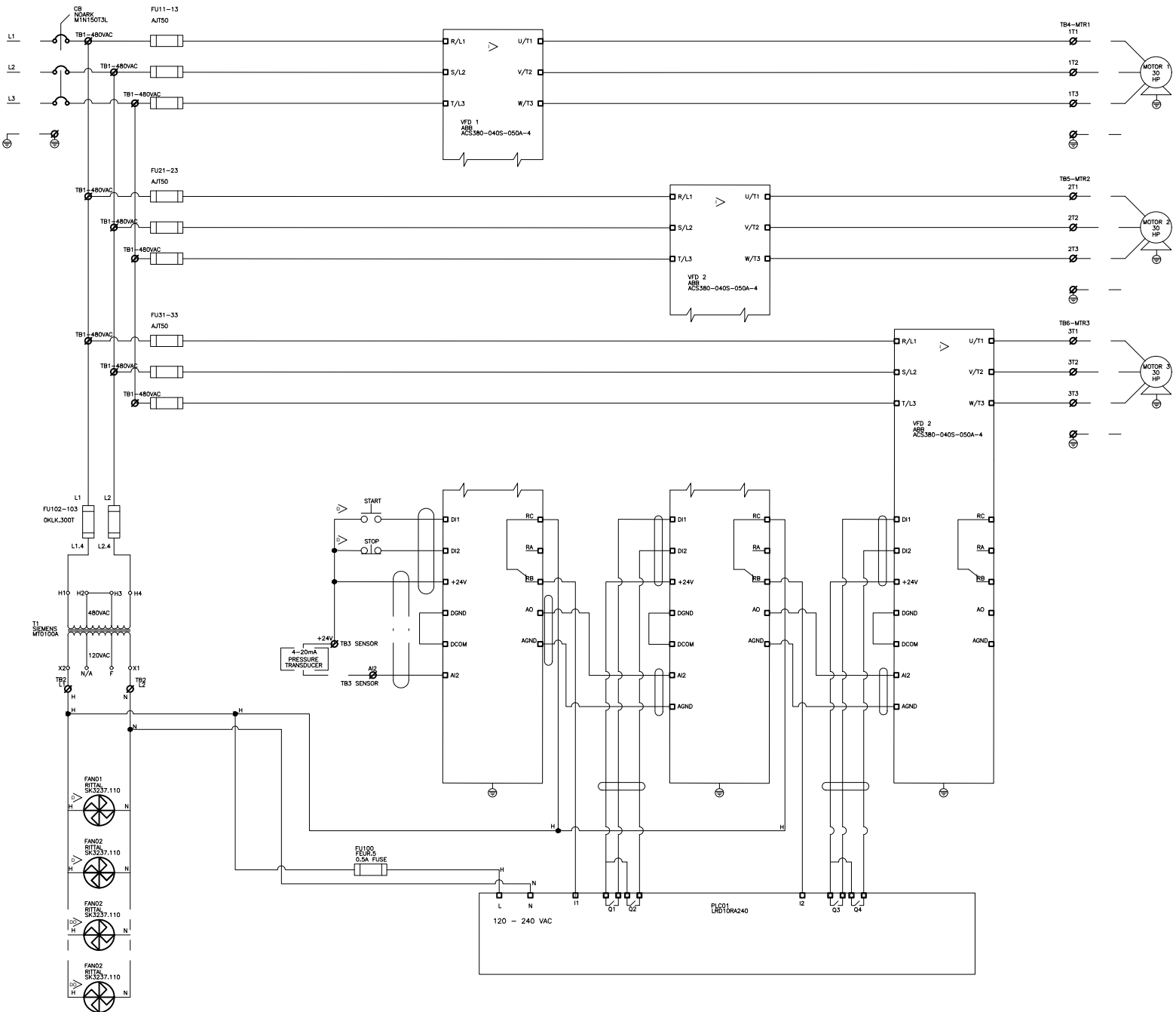
Name/Value	Description	
<b>Speed scaling</b>	Defines the maximum speed value used to define the acceleration ramp rate and the initial speed value used to define the deceleration ramp rate. The speed acceleration and deceleration ramp times are therefore related to this value (not to parameter) Also defines the 16-bit scaling of speed-related parameters. The value of this parameter corresponds to 20000 in eg. fieldbus communication.	3550.00 rpm
<b>0.10...30000.00 rpm</b>	Acceleration/deceleration terminal/initial speed.	1=1 rpm
<b>Frequency scaling</b>	Defines the maximum frequency value used to define the acceleration ramp rate and the initial frequency value used to define deceleration ramp rate. The frequency acceleration and deceleration ramp times are therefore related to this value (not to parameter) Also defines the 16-bit scaling of frequency-related parameters. The value of this parameter corresponds to 20000 in eg. fieldbus communication.	Default FbEq 16 60.00 Hz
<b>0.10...1000.00 Hz</b>	Acceleration/deceleration terminal/initial frequency.	10 = 1 Hz

9. Set the maximum and minimum speed or frequency.

10. Tune the drive parameters to the application. You can use the Assistant control panel (ACS-AP-x), or the Drive Composer PC tool with the drive.

# CHAPTER 4 - AutoCad DRAWINGS TERMINAL CONNECTION

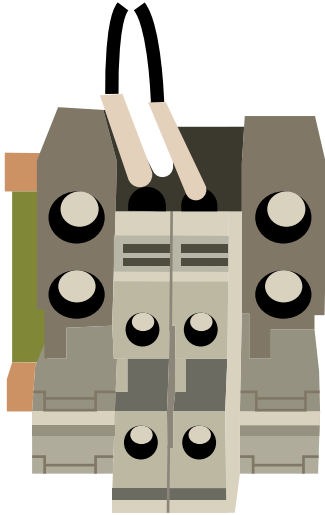
## Case 1 - Triple motor



## Transducer sensor wiring connections

In this page, you can view the wiring connections for the four possible options of pressure transducer sensor.

Please follow the pictures to ensure a proper connection.



### Terminal Block

The enclosure has a dedicated terminal block to wire the transducer sensor; please look up for the terminal block aside of the Motor Connection Terminal Block.

### ABB VFD Enclosure

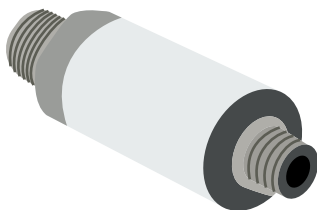
There are two wires: brown and white; brown is for the transducer power supply (**+24V**) and the white is the Analog Input to the VFD (**A12**).

## Cordset Wiring

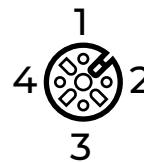
### Turck Sensor

**Brand:** Turck

**Part No.:** PT01VR-11-LI3-H1131



### Connector A



### Circuit Diagram VFD TERMINAL

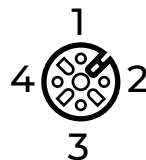
1 )	Brown	+24V
2 )	White	N.C.
3 )	Blue	A12
4 )	Black	N.C.

### Cordset Wiring

**Brand:** IFM  
**Part No.:** PA3029



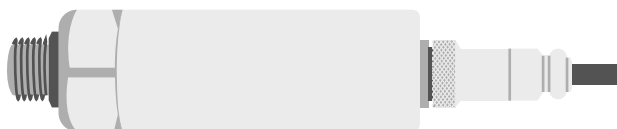
**Connector A**



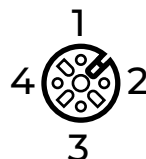
**Circuit Diagram VFD TERMINAL**

1 )	Brown	+24V
2 )	White	AI2
3 )	Blue	N.C.
4 )	Black	N.C.

**Brand:** LEFOO  
**Part No.:** LFT2010



**Connector A**



**Circuit Diagram VFD TERMINAL**

1 )	Brown	+24V
2 )	White	N.C.
3 )	Blue	AI2
4 )	Black	N.C.



## CHAPTER 5 - PARAMETER SETTINGS



### IMPORTANT NOTICE:

The VFD already comes factory pre-programmed; the following instructions are ONLY for reference.



**Only a CERTIFIED TECHNICIAN can perform it.**

### Check motor direction

Examine the actual direction of the motor:

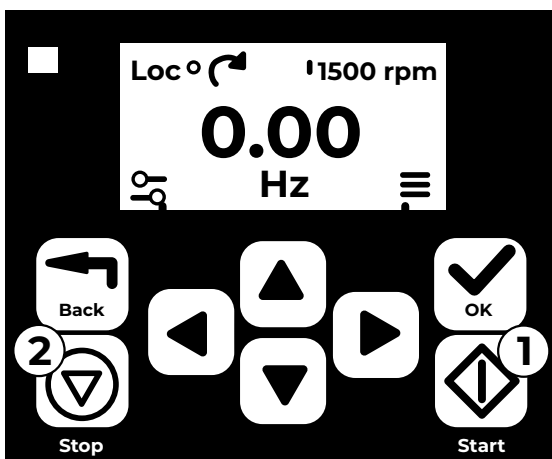
1. Go back to the Home view.
2. Adjust the motor reference to a small value.
3. Make sure that it is safe to start the motor in either direction.
4. Start the motor and examine the actual rotation direction of the motor axis. If it is necessary, change the motor direction with the Phase order setting in the Motor data view or change the phase order of the motor cable.



## WARNING!

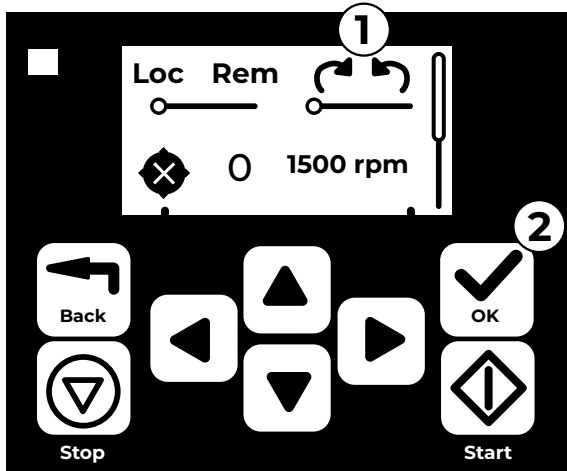
Changing the phase order of the motor cable is only allowed by an electrical professional. Before the operation, disconnect the power, wait for 5 minutes for discharging, and measure that there is no voltage.

### Start and stop the drive



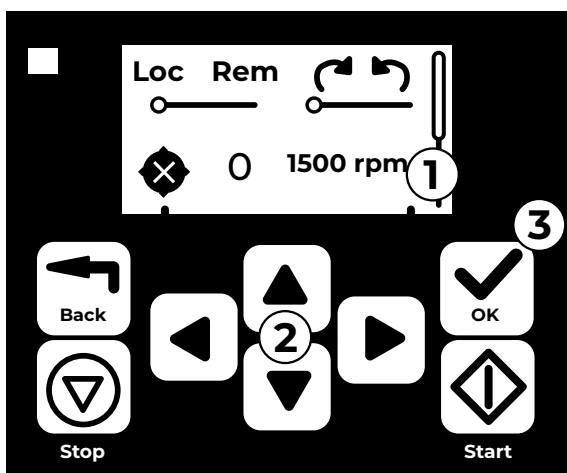
1. Press the Start button to start the drive.
2. Press the Stop button to stop the drive.

### Change the rotation direction



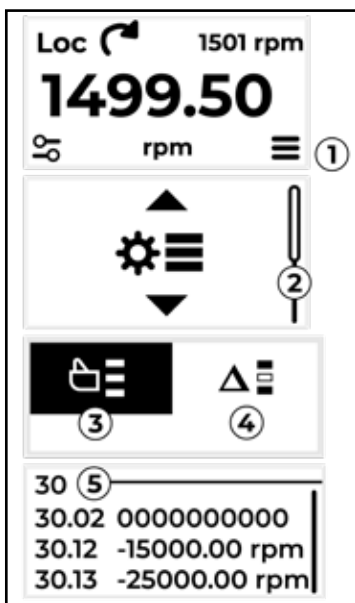
1. In the Options menu, move to the rotation direction item with the arrow buttons.
2. Press the OK button to change the rotation direction.

### Set the speed of frequency reference



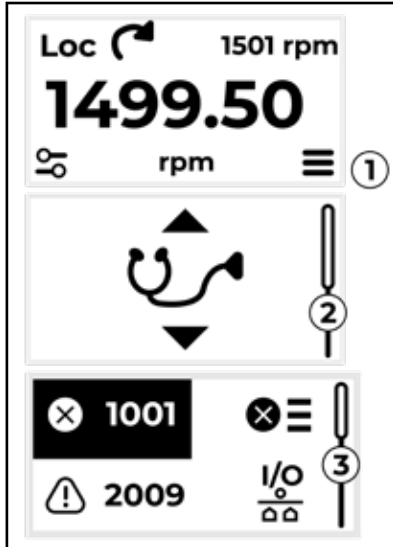
1. In the Options menu, move to the speed or frequency reference item and press OK.
2. Press the arrow buttons to edit the value.
3. Press the OK button to confirm the new value.

### Set the drive parameters



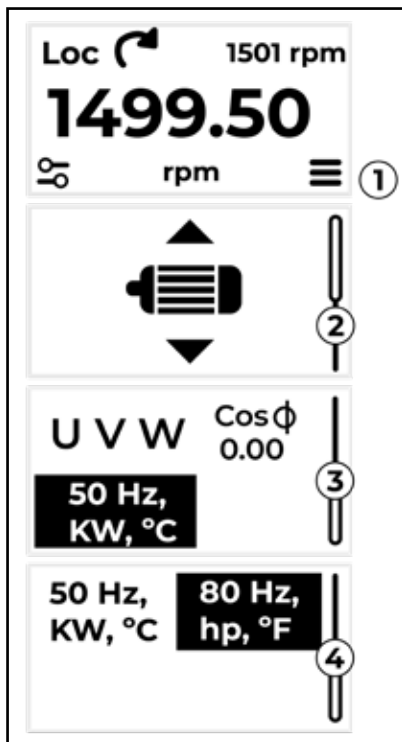
1. Select the Main menu from the Home view.
2. Scroll to Parameters and press the OK button to open the submenu.
3. Select the complete parameters list with the arrow button and press the OK button.
4. Select the modified parameters list with the arrow button and press the OK button.
5. Select the parameter and press the OK button. The parameters are shown in respective groups. The first two digits of the parameter number represent the parameter group. For example, parameters starting with 30 are in the Limits group.

### Open diagnostics



1. Select the Main menu from the Home view.
2. Scroll to Diagnostics and press the OK button to open the submenu.
3. Select the warning or fault with the arrow button and press the OK button.

### Open diagnostics



1. Select the Main menu from the Home view.
2. Scroll to Motor data and press the OK button to open the submenu. Scroll to the unit selection item and press the OK button.
3. Select the unit with the arrow button, then press the OK button. You can see the selected unit on the Home view.

5.1. - VFD Parameter Settings for Triple Motor Configuration

VFD #1		
<b>99</b>	<b>Motor data</b>	
6	motor nominal current	33.8
9	motor nominal speed	3550
10	motor nominal power	30
11	motor nominal cos phi	0.89
16	motor phase order	1
<b>20</b>	<b>Start/Stop/Direction</b>	
1	ext1 commands	0
6	ext2 commands	4
8	ext2 in 1 source	2
9	ext2 in 2 source	3
21	direction	1
<b>19</b>	<b>Operation mode</b>	
11	Ext1/Ext2 selection	1
<b>12</b>	<b>Standard AI</b>	1
3	AI supervision function	1
29	AI2 scaled at AI2 min	20
30	AI2 scaled at AI2 max	4
<b>10</b>	<b>Standard DI, RO</b>	
24	RO1 source	33
25	RO1 ON delay	0
26	RO1 OFF delay	0
<b>30</b>	<b>Limits</b>	
13	Minimum frequency	40
<b>23</b>	<b>Speed reference ramp</b>	
12	Acceleration time 1	10
13	Deceleration time 1	10

<b>49</b>	<b>Panel port communication</b>	
5	Communication loss action	2
<b>22</b>	<b>Speed reference selection</b>	
18	Ext2 speed ref1	2
<b>31</b>	<b>Fault functions</b>	
12	Autoreset selection	6
14	Number of trials	3
15	Total trials time	10
<b>32</b>	<b>Supervision</b>	
5	Supervision 1 function	7
9	Supervision 1 low	42
10	Supervision 1 high	55
<b>40</b>	<b>Process PID set 1</b>	
7	Process PID operation mode	1
8	Set 1 feedback 1 source	2
16	Set 1 setpoint1 source	2
21	Set 1 internal setpoint 1	35
26	Set 1 setpoint min	6.23
27	Set 1 setpoint max	60
32	Set 1 gain	1.5
33	Set 1 integration time	6
34	Set 1 derivation time	2
36	Set 1 output min	40
37	Set 1 output max	60
79	Set 1 units	4
<b>13</b>	<b>Standard AO</b>	
19	AO1 out at AO1 src min	4

<b>28</b>	<b>Frequency reference chain</b>	
15	Ext2 frequency ref1	16
16	Ext2 frequency ref2	16
72	Freq acceleration time 1	10
73	Freq deceleration time 1	10
74	Freq acceleration time 2	10
75	Freq deceleration time 2	10

<b>VFD #2</b>		
<b>99</b>	<b>Motor data</b>	
6	Motor nominal current	33.8
9	Motor nominal speed	3550
10	Motor nominal power	30
11	Motor nominal cos $\phi$	0.89
16	Motor phase order	1
<b>20</b>	<b>Start/Stop/Direction</b>	
1	ext1 commands	3
6	ext2 commands	0
8	ext2 in 1 source	0
9	ext2 in 2 source	0
21	direction	1
<b>19</b>	<b>Operation mode</b>	
11	Ext1/Ext2 selection	0
<b>22</b>	<b>Speed reference selection</b>	
18	Ext2 speed ref1	0
<b>12</b>	<b>Standard AI</b>	
3	AI supervision function	4
29	AI2 scaled at AI2 min	0
30	AI2 scaled at AI2 max	60

<b>30</b>	<b>Limits</b>	
13	Minimum frequency	40
<b>23</b>	<b>Speed reference ramp</b>	
12	Acceleration time 1	10
13	Deceleration time 1	10
<b>49</b>	<b>Panel port communication</b>	
5	Communication loss action	2
<b>31</b>	<b>Fault functions</b>	
12	Autoreset selection	6
14	Number of trials	3
15	Total trials time	10
<b>28</b>	<b>Frequency reference chain</b>	
11	Ext1 frequency ref1	2
15	Ext2 frequency ref1	2
71	Freq ramp set selection	0
72	Freq acceleration time 1	10
73	Freq deceleration time 1	10
74	Freq acceleration time 2	10
75	Freq deceleration time 2	10

<b>40</b>	<b>Process PID set 1</b>	
8	Set 1 feedback 1 source	2
9	Set 1 feedback 2 source	2
16	Set 1 setpoint 1 source	4
21	Set 1 internal setpoint 1	35
26	Set 1 setpoint min	30
27	Set 1 setpoint max	60
32	Set 1 gain	1.5
33	Set 1 integration time	6
34	Set 1 derivation time	2
35	Set 1 derivation filter time	2
50	Set 1 tracking ref selection	2
79	Set 1 units	4
<b>13</b>	<b>Standard AO</b>	
19	AO1 out at AO1 src min	0
<b>32</b>	<b>Supervision</b>	
5	Supervision 1 function	7
9	Supervision 1 low	44
10	Supervision 1 high	58
<b>43</b>	<b>Brake chopper</b>	
11	Brake resistor fault limit	150
<b>45</b>	<b>Energy efficiency</b>	
19	Comparison power	22.38
26	Hourly total energy (resettable)	1.13
<b>95</b>	<b>HW configuration</b>	
20	HW Options word 1	1
<b>97</b>	<b>Motor control</b>	
94	IR comp max frequency	80



<b>VFD #3</b>		
<b>99</b>	<b>Motor data</b>	
6	Motor nominal current	33.8
9	Motor nominal speed	3550
10	Motor nominal power	30
11	Motor nominal cos $\phi$	0.89
16	Motor phase order	1
<b>20</b>	<b>Start/Stop/Direction</b>	
1	ext1 commands	3
6	ext2 commands	0
8	ext2 in 1 source	0
9	ext2 in 2 source	0
21	direction	1
<b>22</b>	<b>Speed reference selection</b>	
18	Ext2 speed ref1	0
<b>12</b>	<b>Standard AI</b>	
3	AI supervision function	4
29	AI2 scaled at AI2 min	0
30	AI2 scaled at AI2 max	60
<b>30</b>	<b>Limits</b>	
13	Minimum frequency	40
<b>23</b>	<b>Speed reference ramp</b>	
12	Acceleration time 1	10
13	Deceleration time 1	10
<b>49</b>	<b>Panel port communication</b>	
5	Communication loss action	2

<b>31</b>	<b>Fault functions</b>	
12	Autoreset selection	6
14	Number of trials	3
15	Total trials time	10
<b>28</b>	<b>Frequency reference chain</b>	
11	Ext1 frequency ref1	2
15	Ext2 frequency ref1	2
71	Freq ramp set selection	0
72	Freq acceleration time 1	10
73	Freq deceleration time 1	10
74	Freq acceleration time 2	10
75	Freq deceleration time 2	10
<b>40</b>	<b>Process PID set 1</b>	
8	Set 1 feedback 1 source	2
9	Set 1 feedback 2 source	2
16	Set 1 setpoint 1 source	4
21	Set 1 internal setpoint 1	35
26	Set 1 setpoint min	30
27	Set 1 setpoint max	60
32	Set 1 gain	1.5
33	Set 1 integration time	6
34	Set 1 derivation time	2
35	Set 1 derivation filter time	2
50	Set 1 tracking ref selection	2
79	Set 1 units	4
<b>43</b>	<b>Brake chopper</b>	
11	Brake resistor fault limit	105

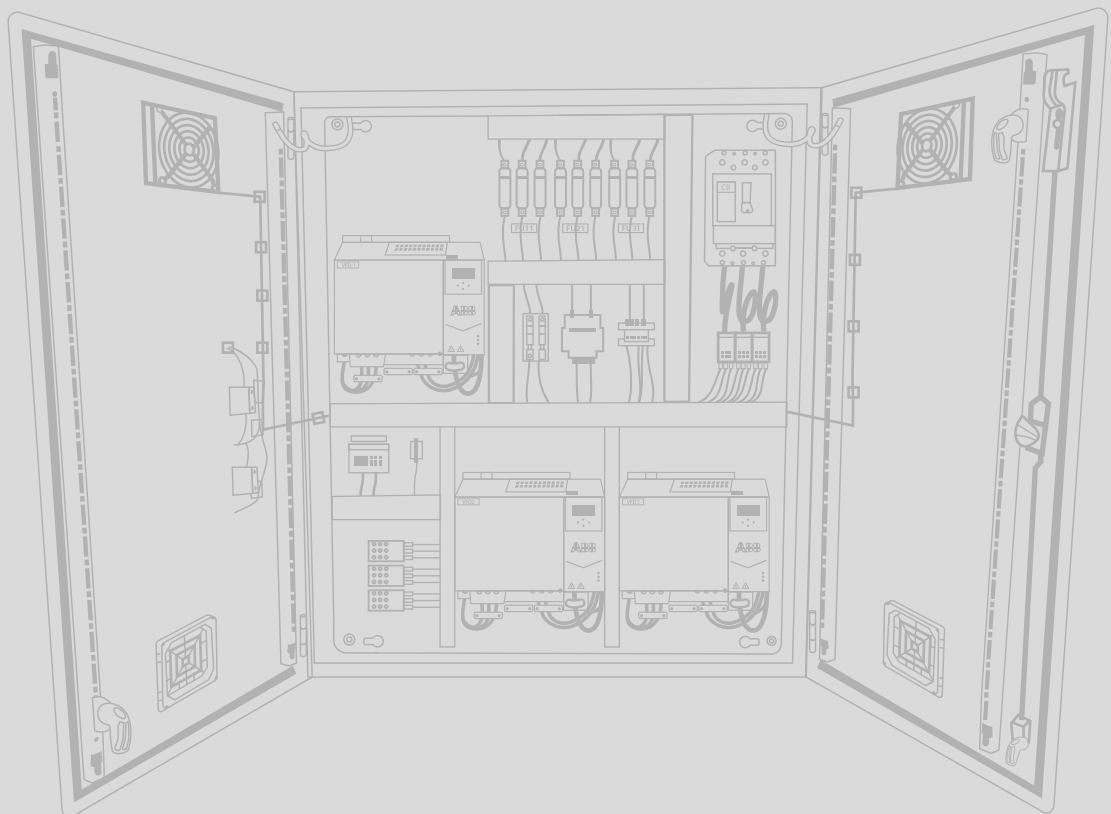
<b>45</b>	<b>Energy efficiency</b>	
19	Comparison power	22.38
26	Hourly total energy (resettable)	0.22
<b>95</b>	<b>HW configuration</b>	
20	HW Options word 1	1
<b>97</b>	<b>Motor control</b>	
94	IR comp max frequency	80

# VACUUM IQ

INTELLIGENT VACUUM CONTROLLER

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ABB Variable Frequency Drive  
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