Zenith Vector Drive Quickstart Manual

Related Manuals and Safety

The steps contained in this guide are required to get your Zenith Vector Drive (ZVD) setup and running. For further information including safety, detailed installation, advanced programming and hardware/firmware information please see the following ABB manuals. Copies of these manuals can be found on the included USB flash drive, downloaded from the ABB website or requested directly from Circor.

3AXD50000029274 – ACS380 Drives Hardware Manual
3AXD50000029275 – ACS380 Machinery Control Program Firmware Manual
3AXD50000018553 – ACS380 Drive Quick Installation and Start-up Guide
3AUA0000085685 – Acx-AP-x Assistant Control Panels Manual

NOTE! The installation, start-up and operation of this equipment requires detailed instructions. Read the safety instructions in ACS380 Hardware manual (3AXD50000029274).

WARNING! Obey the safety instructions in the ACS380 Hardware manual (3AXD50000029274). If you ignore them, injury or death, or damage to the equipment can occur.

WARNING! Obey the safety instructions in the ACS380 Hardware manual (3AXD50000029274). If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrician, do not do electrical installation or maintenance work.
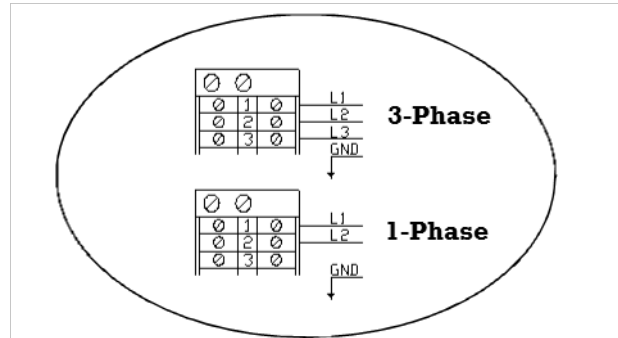
1. Connect Input Power
(Do NOT turn on AC Power at this time)

Warning!
Damage will occur if input AC power does not match ZVD's input power rating!

Supplied Input AC Power Requirements

| 230 VAC ZVD 1 Phase	230 VAC ZVD 3 Phase	460 VAC ZVD 3 Phase
200 ~ 240 VAC	200 ~ 240 VAC	380 ~ 480 VAC
1 Phase (only for ≤ 3Hp)	3 Phase	3 Phase
47 ~ 63 Hz	47 ~ 63 Hz	47 ~ 63 Hz

2. Connect AC Motor Cable

WARNING:
1. Connect motor thermostat wires P1 and P2 to the ZVD terminals 10 and 11.
2. Always refer to the pump drawing for correct pump rotation. To change output shaft rotation, swap either two of three motor power input cables.

230 VAC 3 Phase AC Motors	460 VAC 3-Phase AC Motors

![CIRCOR | ZENITH® PUMPS logo]
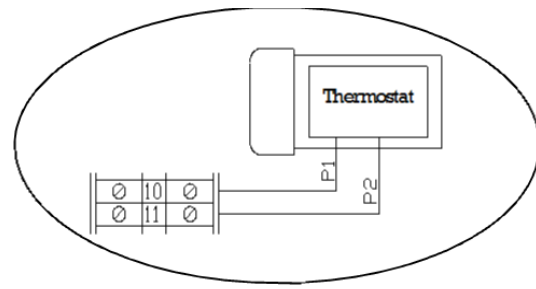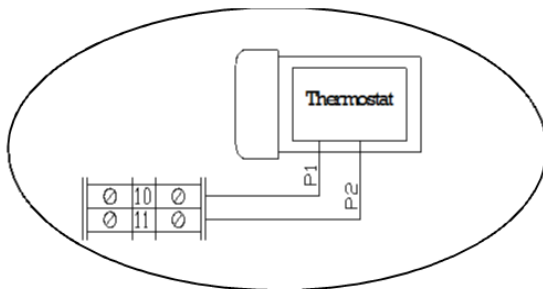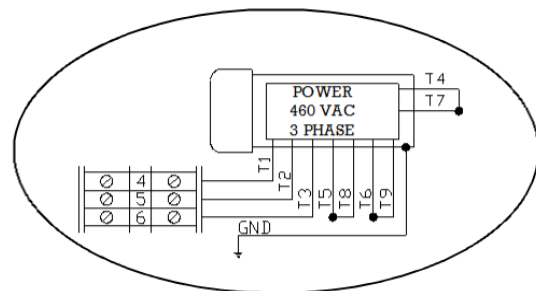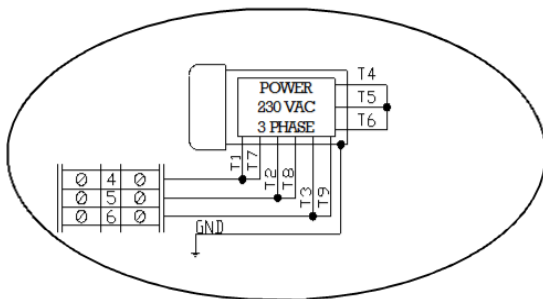
3. Connect Feedback Signal Cable

⚡ **WARNING:**
1. When using an encoder in a hazardous atmosphere, an intrinsically safe barrier must be used.

Encoder
(Non-Explosion Proof Area)
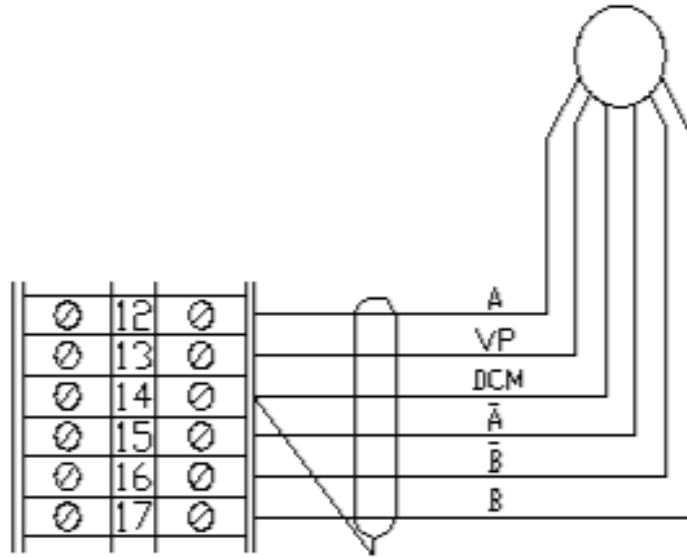
Wire Color	Function	Connect To
	VP – Input Power	13
	DCM – Signal Common	12
Depends on Sensor	**A+** – Signal A+	14
	A- – Signal A-	15
	B+ – Signal B+	17
	B- – Signal B-	16
	Shielding	14

4. Disconnect Coupling from Pump

⚠️ **WARNING!** Never run pump dry or operate in reverse.
Always refer to the pump drawing for correct pump rotation.
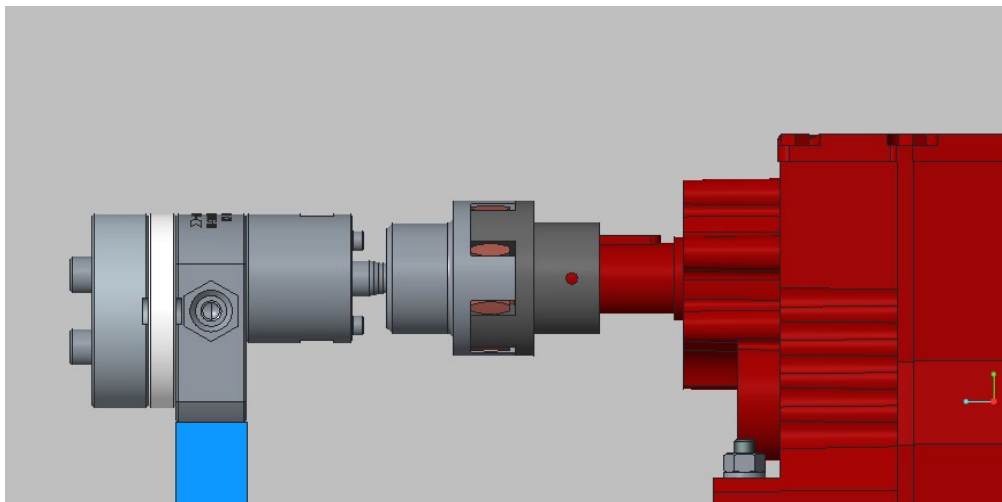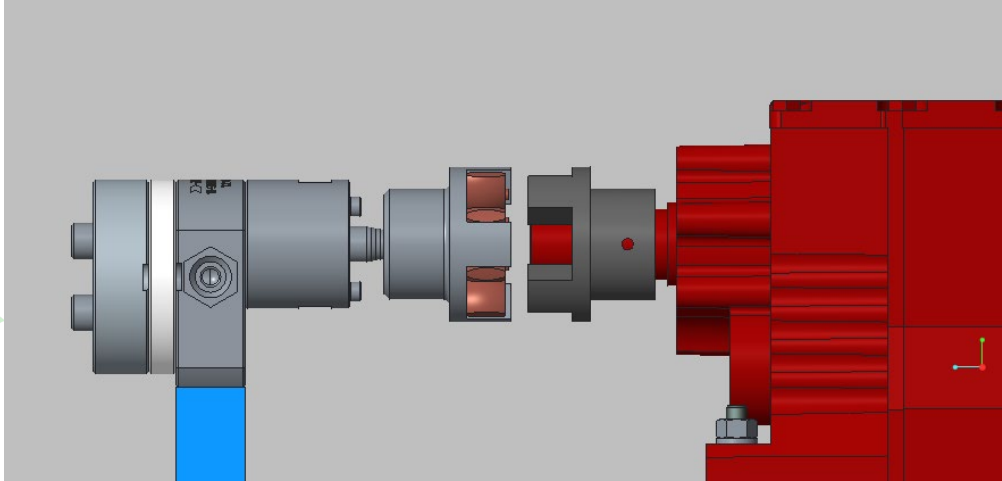
5. Turn AC Power On and Get Familiar with Control Panel

WARNING! Obey the safety instructions in the ACS380 Hardware manual (3AXD50000029274). If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrician, do not do electrical installation or maintenance work.

5.1.1 Turn on AC power.
5.1.2 The basic layout of the Control Panel is shown below. For detailed information and operating instructions refer to 3AUA0000085685 user manual.
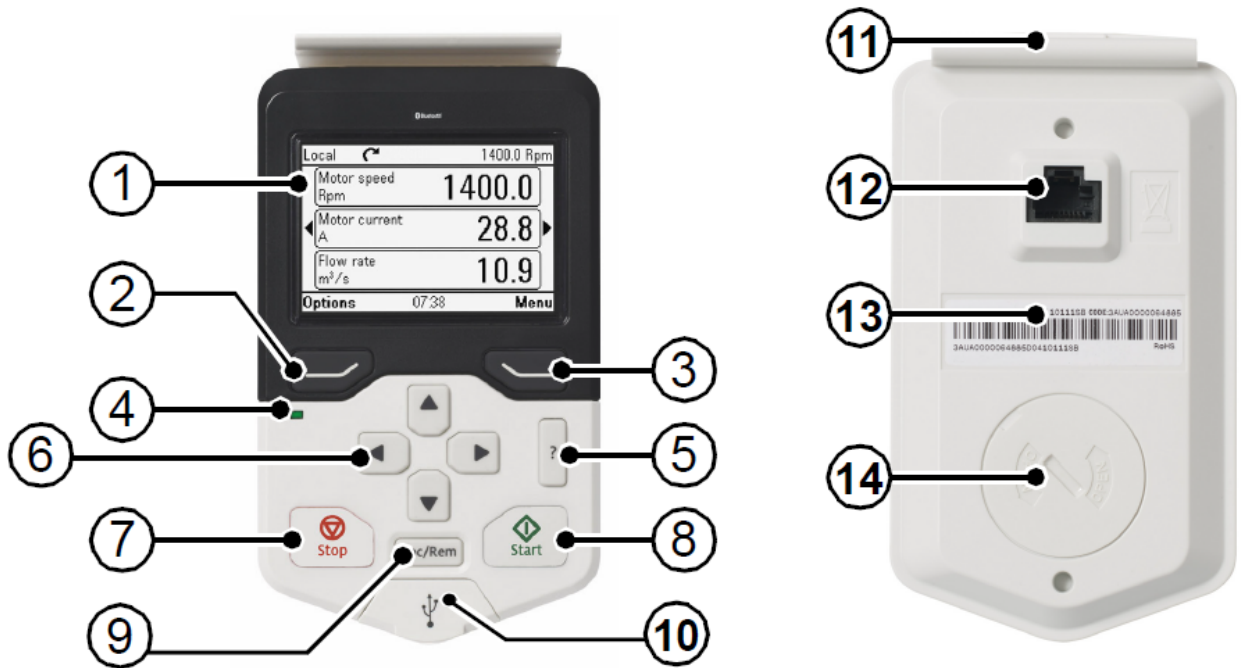
1	Home Screen
2	Left softkey
3	Right softkey
4	Status LED
5	Help
6	Arrow keys
7	Stop
8	Start
9	Local/Remote
10	USB connector
11	Clip
12	RJ-45 connector
13	Type code label
14	Battery cover

5.1.3 Control panel navigation – Use the arrow keys and softkeys for navigation. Follow the choices on the screen.
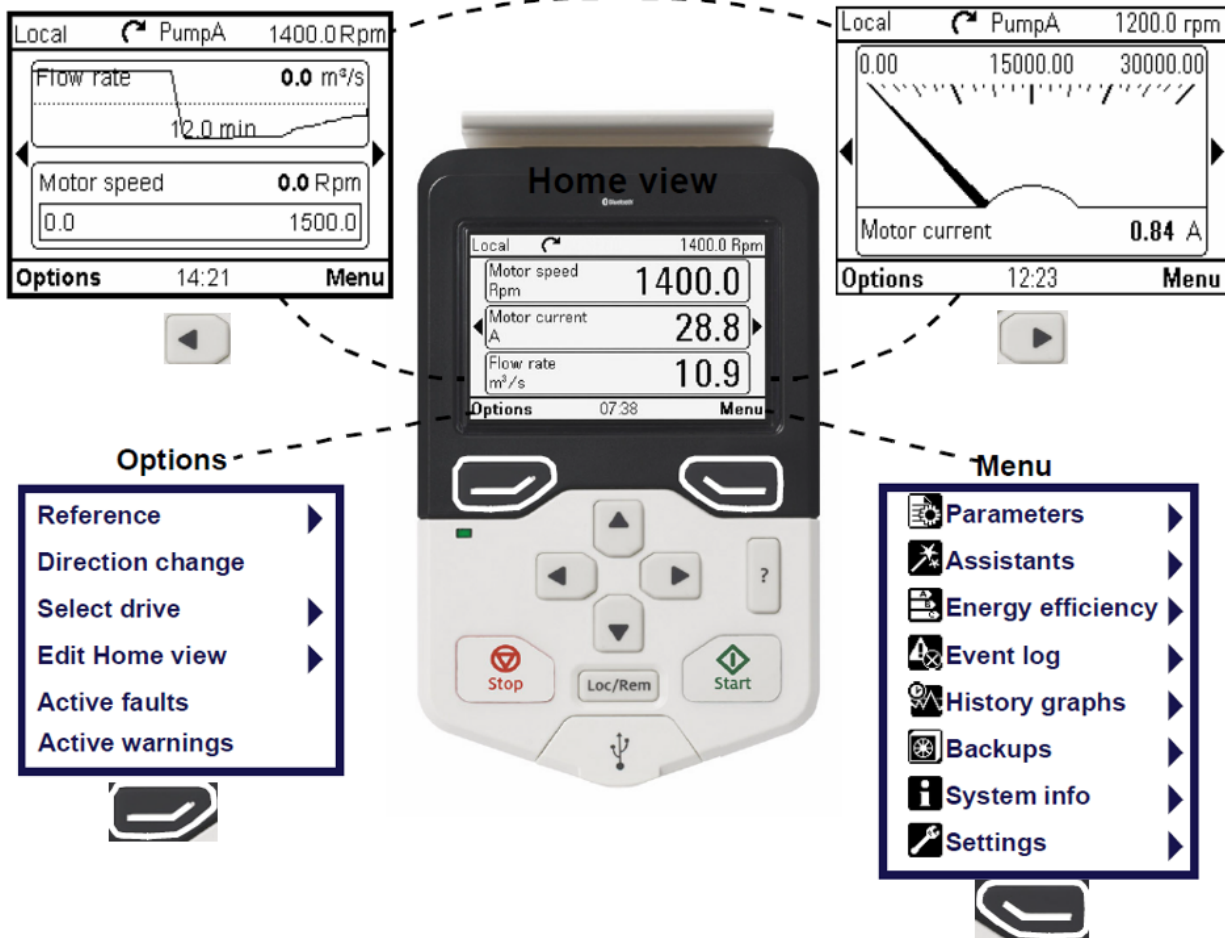
6. Configure ZVD
6.1 Setting Motor Parameters
The ZVD must be configured for the specific motor being used. This can be done by using the First Start Assistant or by manually editing parameters. To configure the ZVD using the First Start Assistant perform the following steps. To manually edit parameters refer to the appendix A.

6.1.1 On the home screen press the **Menu** key.
6.1.2 On the **Menu** screen arrow down to **Assistants** and press the **Select** key.
6.1.3 On the **Assistants** screen make sure **First Start Assistant** is highlighted and press the **Select** key.
6.1.4 Select your **Language** and press the **Next** key. The ZVD may pause to load the selected language.
6.1.5 Select the desired **Units** and press the **Next** key.
6.1.6 Change the **Display units** if needed and press the **Next** key.
6.1.7 Enter the current **Date & time** if needed and press the **Next** key.
6.1.8 Rename the drive if needed and press the **Next** key.
6.1.9 Change the **Motor nominal values** to the values on the **motor nameplate**. Use the **Down** and **Right** arrow keys to select and access the motor values. Once all motor values match the motor nameplate press the **Next** key.
       Type: Asynchronous motor
       Current: See Motor Nameplate
       Voltage: See Motor Nameplate and verify source
       Frequency: See Motor Nameplate and verify source
       Speed: See Motor Nameplate
       Power: See Motor Nameplate
       Cos φ (optional): Enter this value if known but it is not required.
       Torque (optional): Enter this value if known but it is not required.
       Control mode: Vector
6.1.10 On the **Direction Test?** screen arrow down to **Spin the motor** and press the **Next** key.
6.1.11 On the **Press Start** screen press the **Start** key. A **Drive is in remote control** message may appear, if it does press the **Loc/Rem** key and then press the **Start** key again.
6.1.12 On the **Is this forward?** screen verify that the output shaft is rotating. If the output shaft is not rotating press the **Back** key and repeat step 10. If the output shaft is rotating but not in the correct direction power down and swap either two of three motor leads then repeat steps 1-12. Highlight **Yes, motor is spinning forward** and press the **Next** key.
6.1.13 On the **Make backup?** screen highlight **Not now** and press the **Next** key.
6.1.14 On the **First start complete** screen press the **Done** key.
6.1.15 On the **Assistants** screen press the **Back** key.
6.1.16 On the **Menu** screen press the **Exit** key.
6.1.17 The **Home** screen should now be displayed and a green status LED should be blinking. Press the **Start** key and the ZVD will perform a **Standstill ID run**. The **Motor current** value should change and an audible sound may be heard coming from the motor. When the blinking LED turns solid the ID Run is complete.

The ZVD is now configured for basic operation with the **Reference** speed in motor rpm.

6.2 Setting Encoder Parameters

If the ZVD is going to operate in closed loop control with an encoder it must be configured for the specific encoder count (pulses/rev) being used. To configure the ZVD for a specific encoder perform the following steps.

6.2.1 On the home screen press the **Menu** key.

6.2.2 On the **Menu** screen highlight **Parameters** and press the **Select** key.

6.2.3 On the **Parameters** screen highlight **Complete list** and press the **Select** key.

6.2.4 On the **Complete list** screen arrow up to **90 Feedback selection** and press the **Select** key.

6.2.5 On the **90 Feedback selection** screen arrow down to **90.41 Motor feedback sel** and press the **Edit** key.

6.2.6 On the **90.41 Motor feedback sel** screen arrow down to **[1] Encoder 1** and press the **Save** key.

6.2.7 On the **90 Feedback selection** screen press the **Back** key.

6.2.8 On the **Complete list** screen arrow down to **92 Encoder 1 configuration** and press the **Select** key.

6.2.9 On the **92 Encoder 1 configuration** screen arrow down to **92.10 Pulses/rev** and press the **Edit** key.

6.2.10 On the **92.10 Pulses/rev** screen use the arrow keys to enter the encoder pulses/rev value and then press the **Save** key.

6.2.11 On the **92 Encoder 1** configuration screen press the **Back** key.

6.2.12 On the **Complete list** screen arrow up to **91 Encoder module settings** and press the **Select** key.

6.2.13 On the **91 Encoder module settings** screen make sure **91.10 Enc par refresh** is highlighted and press the **Edit** key.

6.2.14 On the **91.10 Enc par refresh** screen arrow down to **[1] Configure** and press the **Save** key. This parameter must be saved anytime an encoder related parameter is changed.

6.2.15 On the **91 Enc par refresh** screen hold down the **Back** key until the **Home** screen is displayed.

The ZVD is now configured for basic operation with encoder feedback. To check proper encoder communication select the parameter **01.04 Encoder 1 speed filtered.** This value should change in real time as the output shaft rotates. The value will be dependent upon the location of the encoder.

6.3 Setting the Reference speed

The **Reference** speed is the user input speed value that the ZVD drive holds during operation. It is displayed in the top right-hand corner of the ZVD screen. This speed can be increased or decreased by the up/down arrow keys on the **Home** screen or set numerically by the following steps. By default the **Reference** speed is the motor shaft speed. It is possible to scale the **Reference** speed to display other values. This is useful if a gearbox or outer drive gear is being used to drive the pump. See section **6.4** for more information on scaling the **Reference** speed.

6.3.1   On the **Home** screen press the **Options** key.

6.3.2   On the **Options** screen arrow down to **References** and press the **Select** key.

6.3.3   On the **Reference** screen use the arrow keys to set the **Reference** speed and press the **Save** key.

6.3.4   On the **Options** screen press the **Exit** key to return to the **Home** screen.

6.3.5   For users who do not wish to scale the **Reference** speed sections **6.4** and **6.5** may be skipped.

6.4 Scaling the Reference speed

Most Zenith systems utilize a gearbox between the pump and motor. This results in the actual pump shaft speed being the motor speed divided by the gearbox reduction ratio. By default the **Reference** speed is the motor shaft speed displayed in rpm. In order to display the **Reference** speed in pump rpm it must be scaled by the actual gearbox ratio. To scale the **Reference** speed perform the steps shown below.

6.4.1   On the **Home** screen press the **Menu** key.

6.4.2   On the **Menu** screen highlight **Parameters** and press the **Select** key.

6.4.3   On the **Parameters** screen highlight **Complete list** and press the **Select** key.

6.4.4   On the **Complete list** screen arrow down to **20 Start/stop/direction** and press the **Select** key.

6.4.5   On the **20 Start/stop/direction** screen highlight **20.01 Ext1 commands** and press the **Edit** key.

6.4.6   On the **20.01 Ext1 commands** screen arrow down to **[11] Control panel** and press the **Save** key.

6.4.7   On the **20 Start/stop/direction** screen press the **Back** key.

6.4.8   On the **Complete list** screen arrow down to **22 Speed reference selection** and press the **Select** key.

6.4.9   On the **22 Speed reference selection** screen arrow down to **22.11 Ext1 speed ref1** and press the **Edit** key.

6.4.10 On the **22.11 Ext1 speed ref1** screen arrow down to **[18] Control panel (ref saved)** and press the **Save** key.

6.4.11 On the **22 Speed reference selection** screen arrow down to **22.12 Ext speed ref2** and press the **Edit** key.

6.4.12 On the **22.12 Ext speed ref2** screen arrow down to **Other** and arrow **Right**. Arrow down to **47 Data storage** and press the **Select** key. Highlight **47.01 Data storage 1 real32** and press the **Save** key.

6.4.13 On the **22 Speed reference selection** screen arrow down to **22.13 Ext1 speed function** and press the **Edit** key.

6.4.14 On the **22.13 Ext1 speed function** screen arrow down to **[3] Mul (ref1 x ref2)** and press the **Save** key.

6.4.15 On the **22 Speed reference selection** screen press the **Back** key.

6.4.16 On the **Complete list** screen arrow down to **47 Data storage** and press the **Select** key.

6.4.17 On the **47 Data storage** screen select **47.01 Data storage 1 real32** and press the **Edit** key.

6.4.18 On the **47.01 Data storage 1 real32** screen use the arrow keys to enter the total gearing ratio that may be present between the motor and pump shaft and press the **Save** key. EXAMPLE 1: A gearbox with a ratio of 11.55:1 is used between the pump and motor, then enter 11.55.

6.4.19 On the **47 Data storage** screen hold down the **Back** key until the Home screen is shown.

6.4.20 On the **Home** screen verify the drive is in **Remote** mode. If the drive is in **Local** mode press the **Loc/Rem** key.

The ZVD is now configured for basic operation with the **Reference** speed in pump rpm.

6.5 Configure the Home screen

The Home screen of the ZVD can be configured to display a number of different predefined and user defined values across four different pages. In the following steps Display slot one of page one of the Home screen will be configured to display Pump Speed in rpm.

6.5.1   On the **Home** screen press the **Options** key.

6.5.2   On the **Options** screen arrow down to **Edit Home view** and press the Select key. Display slot 1 of page 1 should be blinking, press the **Edit** key.

6.5.3   On the **Display slot** screen highlight **Parameter** and press the **Edit** key.

6.5.4   On the **Parameter** screen arrow down to **Other** and press the **Select** key.

6.5.5   On the **Parameter** screen highlight **01 Actual values** and press the **Select** key.

6.5.6   On the **Parameter** screen arrow down to the **01.04 Encoder 1 speed filtered** and press the **Select** key.

6.5.7   On the **Display slot** screen arrow down to **Display name** and press the **Edit** key.

6.5.8   On the **Display name** screen use the arrow keys to change the name to **Pump Speed** and press the **Save** key.

6.5.9   On the **Display slot** screen arrow down to **Min:** and press the **Edit** key.

6.5.10 On the **Min** screen use the arrow keys to set the value to **0** and press the **Save** key.

6.5.11 On the **Display slot** screen arrow down to **Max:** and press the **Edit** key.

6.5.12 On the **Max** screen use the arrow keys to set the value to the Motor nameplate speed and then press the **Save** key.

6.5.13 On the **Display slot** screen arrow down to **Scale value range** and press the **Select** key if a gearbox is being used between the pump and motor and the **Unselect** key if no gearbox is being used. Continue to step 15 if a gearbox is being used otherwise press the **Done** key.

6.5.14 On the **Display slot** screen arrow down to **Display min as:** and press the **Edit** key.

6.5.15 On the **Display min as** screen use the arrow keys to set the value to **0** and press the **Save** key.

6.5.16 On the **Display slot** screen arrow down to the **Display max as:** and press the **Edit** key.

6.5.17 On the **Display max as** screen use the arrow keys to set the value to the Motor nameplate speed divided by the Gearbox ratio and press the **Save** key.

6.5.18 On the **Display slot** screen press the **Done** key.

6.5.19 On the **Home** screen press the **Done** key.

Display slot one of page one of the Home screen should now display Pump Speed with units of rpm. The displayed value should match the Reference speed value shown in the top right corner of the display screen.

6.6 Advanced ID Run

For the best possible control accuracy an **Advanced ID run** can be performed on the motor. In order to complete an **Advanced ID run** the motor must be completely de-coupled from the pump and/or gearbox. If it is not possible to de-couple the motor from the pump and/or gearbox then the **Standstill ID run** previously performed in section 6.1 will be adequate for most applications. To perform an **Advanced ID run** perform the following steps.

6.6.1 Make sure the motor is de-coupled from the gearbox and/or pump.

6.6.2 On the **Home** screen press the **Menu** key.

6.6.3 On the **Menu** screen highlight **Parameters** and press the **Select** key.

6.6.4 On the **Parameters** screen highlight **Complete** list and press the **Select** key.

6.6.5 On the **Complete list** screen arrow up to **99 Motor data** and press the **Select** key.

6.6.6 On the **99 Motor data** screen arrow down to **99.13 ID run requested** and press the **Edit** key.

6.6.7 On the **99.13 ID run requested** screen arrow down to **[6] Advanced** and press the **Save** key.

6.6.8 Warning **AFF6** will appear on the screen and the green status LED will blink. Press the **Hide** key.

6.6.9 On the **99 Motor data screen** hold the **Back** key to return to the **Home** screen.

6.6.10 On the **Home** screen press the **Start** key to perform the Advanced ID run. The **Motor current** value should change and the motor shaft will rotate. When the blinking LED turns solid the ID Run is complete.

Appendix A – List of Zenith Parameters

Parameter	Value
20.01 Ext1 Commands	[11] Control Panel
22.11 Ext1 Speed Ref1	[18] Control Panel (ref saved)
22.12 Ext1 Spreed Ref2	Other, 47 Data Storage, 47.01 Data Storage 1
22.13 Ext1 Speed Function	[3] Mul(ref1 x ref2)
47.01 Data Storage 1	Total gearing ratio between motor & pump
90.41 Motor Feedback sel	[1] Encoder 1
92.10 Pulses/Rev	Encoder pulses/rev
91.10 Enc par refresh	[1] Configure
99.04 Motor Control mode	[0] Vector
99.06 Motor nominal current	Motor nameplate current
99.07 Motor nominal voltage	Motor nameplate voltage
99.08 Motor nominal frequency	Motor nameplate frequency
99.09 Motor nominal speed	Motor nameplate speed
99.10 Motor nominal power	Motor nameplate power