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# ***Operative Modes*** **Manual**

**ver.1 rev.12/'08**

## **Enclosures to Service Manuals of:**

- **McbNET Digital™**
- **Magnum400™**
- **MiniMagnum400™**
- **FastBack™**

# Summary

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| Release          | Notes  |
|------------------|--|
| ver.1 rev.06/'07 | Preliminary first edition.                           |
| ver.1 rev.11/'07 | Extension to FastBack.                               |
| ver.1 rev.12/'08 | Figure pag.12 corrected.<br>Figure pag.16 corrected. |

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This manual has been carefully checked. However, Axor does not assume liability for errors or inaccuracies.



**THIS MANUAL IS EXCLUSIVELY ADDRESSED TO TECHNICAL PERSONNEL WITH  
AN APPROPRIATE TECHNICAL KNOWLEDGE ON SERVODRIVE.  
BEFORE USING THIS MANUAL READ DRIVE'S SERVICE MANUAL.**

# 1 Operative Modes

Axor digital drives support the followings operative modes:

| CONTROL                          | DESCRIPTION  | PAGE                              |
|----------------------------------|--|-----------------------------------|
| <b>DIGITAL SPEED CONTROL</b>     | It is <b>speed piloting</b> utilising a digital reference.   | pag. 4                            |
| <b>ANALOG SPEED CONTROL</b>      | It is <b>speed piloting</b> utilising an analogue reference (differential or common mode).<br>FastBack does not manage it.   | pag. 5 and 8                      |
| <b>DIGITAL TORQUE CONTROL</b>    | It is <b>torque piloting</b> utilising a digital reference.  | pag. 10                           |
| <b>ANALOG TORQUE CONTROL</b>     | It is <b>torque piloting</b> utilising an analogue reference.<br>FastBack does not manage it.  | pag. 11                           |
| <b>POSITION CONTROL</b>          | <p>The positioner can be managed via hardware (by using the digital inputs) or via RS232 (by using the Axor's <i>Speeder One</i> interface or another ModBus Master). It supports 32 <i>programmable position profiles</i>; a <i>single task</i> or a <i>sequence of tasks</i> are permitted.</p> <p>The <b>Homing Procedure</b> is implemented. It uses the signal coming from the <i>homing sensor</i> and eventually the <i>zero signal</i> of the encoder.</p> | see enclosure "Positioner Manual" |
| <b>ELECTRICAL AXIS (GEARING)</b> | It is possible to pilot the drive with the quadrature signals of an emulated encoder from a Master drive or with the quadrature signals of an incremental encoder from a Master motor ( <b>Electrical Axis</b> or Gearing).<br>FastBack does not manage it.  | pag. 12                           |
| <b>PULSE/DIRECTION</b>           | It is possible to connect the drive to a <b>stepper-motor controller</b> , piloting it with the +/-Pulse and +/-Dir signals (Pulse/Dir Mode).<br>FastBack does not manage it.  | pag. 16                           |
| <b>MULTIDROP RS232</b>           | It can work in <b>Multidrop</b> , where the first drive, connected via RS232 to the Master PC, is piloted with <i>ModBus communication</i> , while the other drives are piloted with the duplication of commands using the <i>CanBus interface</i> .   | pag. 19                           |
| <b>RS485 INTERFACE</b>           | It is possible to communicate with two or more drives by using the <b>RS485 interface</b> .  | AVAILABLE SOON                    |
| <b>CANBUS</b>                    | It can be configured and controlled using <b>CanBus</b> . It supports the following <b>Can Open</b> protocols: <ul style="list-style-type: none"><li>• part of the <b>DS301-V4.02</b></li><li>• part of the <b>DSP402-V2.0</b></li></ul>   | pag. 21                           |

**Note for FastBack:** FastBack has not the keypad, so any reference to keypad use in the following pages is to be ignored.

## 2 Digital Speed

Axor digital drives can control a motor by using a **speed digital reference**.

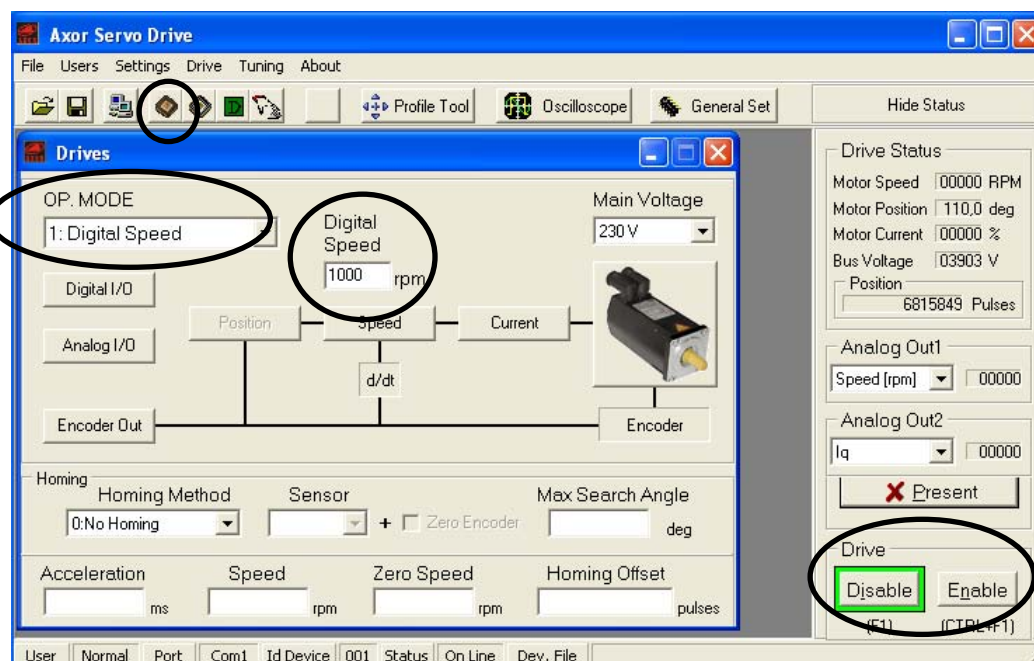
The procedure is the following:

1- Perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual;

2- Enable digital speed control via **Speeder One interface** or **via keypad**:

- **via Speeder One interface:**

- a- set the operative mode **1: Digital Speed**;
- b- insert the desired speed reference [in rpm];
- c- save settings by clicking on icon **"Save data to Eeprom"**;
- d- enable/disable the drive by using the **Enable/Disable** buttons.



- **via keypad:**

| Parameter                                   | Menu (Indirizzo) | Inserted value |
|---|------------------|----------------|
| Set operative mode "1: Digital Speed"       | F10 ⇒ U6 (71)    | 1              |
| Set digital speed reference "Digital Speed" | F11 ⇒ H6 (80)    | (*)            |
| Save settings on Eeprom                     | F10 ⇒ U4 (69)    | 2              |
| Enable DGT-IN1 (ENABLE)                     | F10 ⇒ U8 (73)    | 1              |
| Disable DGT-IN1 (ENABLE)                    | F10 ⇒ U9 (74)    | 1              |

(\*) Insert the desired speed reference normalized reference "Speed Limit" parameter set in the "Speed" window.

$$\frac{\text{SpeedReference} \times 2^{15}}{\text{SpeedLimit}}$$

Example: Suppose we want to insert a speed reference equal to 1500rpm, having as max speed 3000rpm  
 ⇒ at address F11 → H6 insert this value 16384, in fact  $(1500 \times 2^{15}) / 3000 = 16384$ .

3- If the turning is irregular or noisy, it should be necessary to *adjust the gains of the speed loop* by using an adequate procedure (see enclosure " Procedure Manual" available on request contacting Axor).

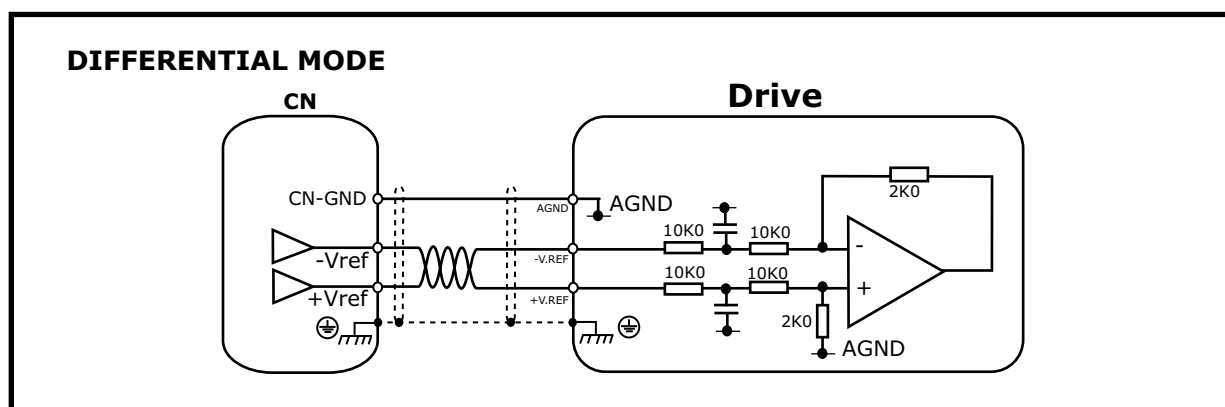
### 3 Analog Speed

Axor digital drives can control a motor by using a **differential or common mode analog speed reference from the CN or PLC**.

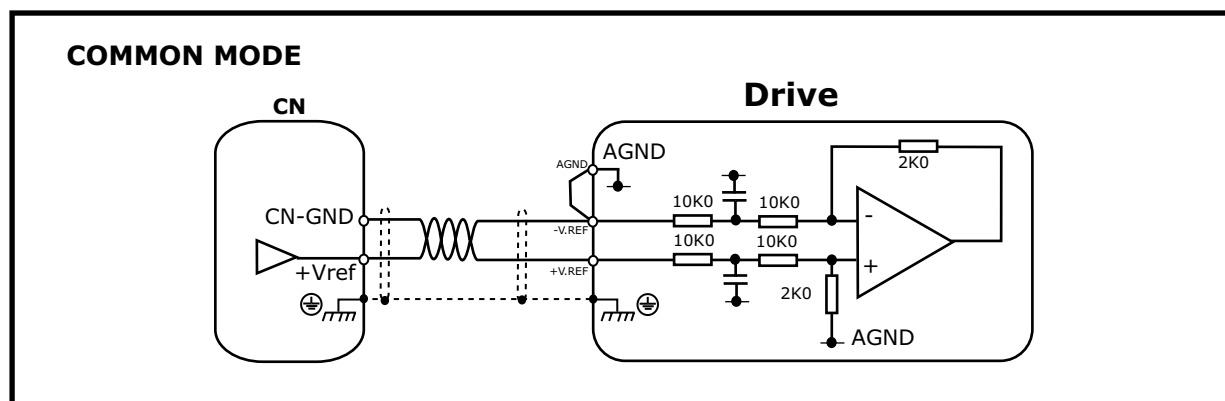
The procedure is the following:

- 1- Perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual;
- 2- Use pins **+Vref**, **-Vref** and **AGND** to *apply the desired speed reference* ⇒ the axis card used in the Numerical Control or PLC can have two different types of analog reference outputs:

- **differential analog output**, in this case connect the positive speed reference to **+VREF** and the negative speed reference to **-VREF**.



- **common mode reference analog output**, in this case connect the control's analogue output either to the **+Vref** terminal or to the **-Vref** terminal, depending upon the required rotational direction. Then connect the **AGND** to the reference input terminal that is NOT used.



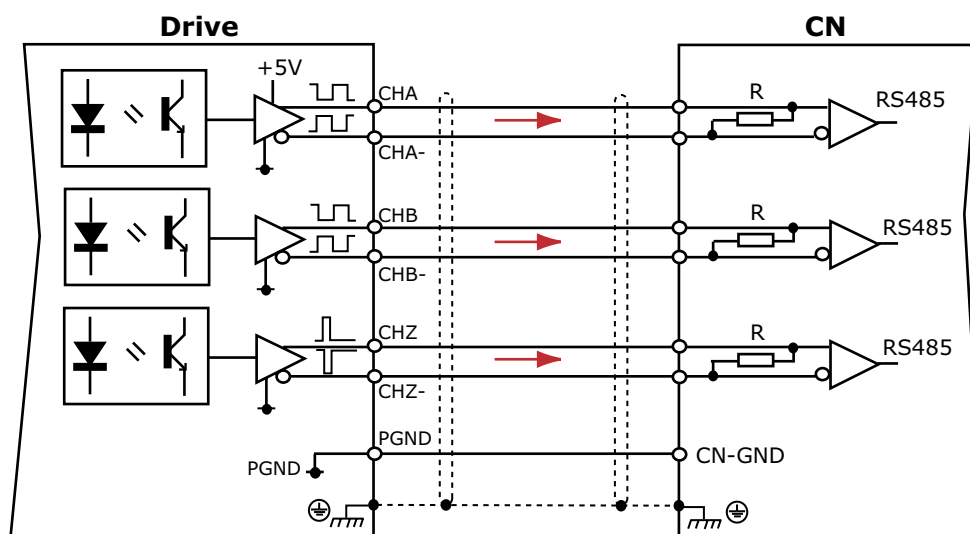
#### Notes:

- ✓ To change the sense of rotation apply the positive voltage reference to **-Vref**, or change the **Rotary Direction** parameter in the **Speed** window (from **Positive** to **Negative**).
- ✓ We suggest to connect the shield on both sides (drive side follow the indications illustrated on service manual of the drive).

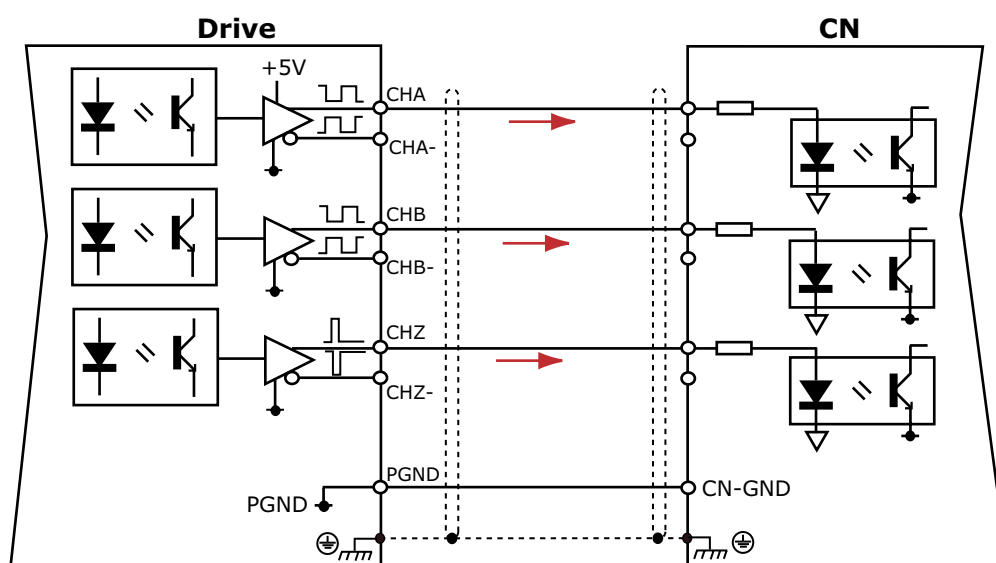
### 3 Analog Speed

3- Connect the emulated encoder outputs of the drive to the CN  $\Rightarrow$

- if the CN has **LINE RECEIVER** inputs, follow these connections:



- if the CN has **COMMON MODE** inputs, follow these connections:

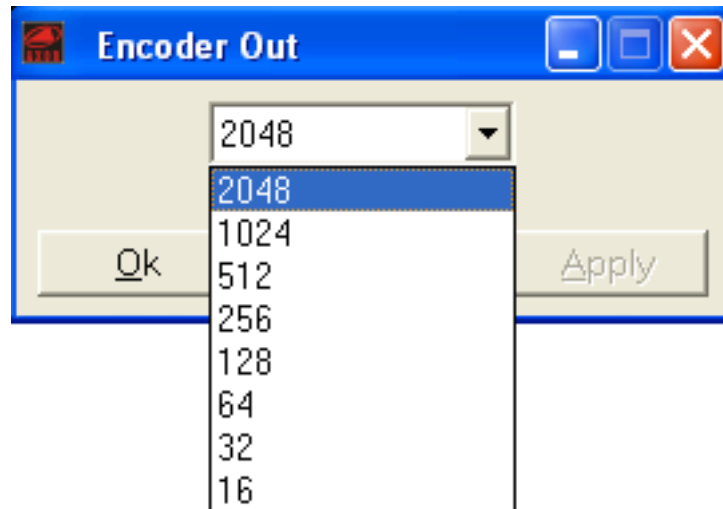


**Note:** We suggest connecting the shield on both sides (drive side follow the indications illustrated on service manual of the drive).

### 3 Analog Speed

4- Set the desired pulses per turn on emulated encoder outputs by **Speeder One interface** or **by keypad**:

- **by Speeder One interface**: open the "**Encoder Out**" window and select the desired pulses per turn:



**Note:** If the **2 pole resolver feedback** is used, the max resolution of the emulated encoder will be **1024 pulses per turn**, so the setable values are: 1024, 512, 256, 128, 64, 32, 16 and 8.

- **by keypad**: insert the pulses per turn desired on emulated encoder outputs on address **F10** ⇒ **U3**.

5- Execute the settings of the offset of the velocity analog input reference **via Speeder One interface** or **via keypad**:

- **via Speeder One interface**: open the "**Analog I/O**" window and click on the **Analog 1** icon.
- **via keypad**: insert value **8** at address **F10** ⇒ **U4**.

6- Enable analog speed control via **Speeder One interface** or **via keypad**:

- **via Speeder One interface**:
  - a- set the operative mode **0: Analog Speed** and keep the **Torque Sat.** box to **OFF**;
  - b- save settings by clicking on icon "**Save data to Eeprom**";
  - c- enable/disable the drive by using the **Enable/Disable** buttons.

- **via keypad**:

| Parameter                            | Menu (Indirizzo) | Inserted value |
|--------------------------------------|------------------|----------------|
| Set operative mode "0: Analog Speed" | F10 ⇒ U6 (71)    | 0              |
| Save settings on Eeprom              | F10 ⇒ U4 (69)    | 2              |
| Enable DGT-IN1 (ENABLE)              | F10 ⇒ U8 (73)    | 1              |
| Disable DGT-IN1 (ENABLE)             | F10 ⇒ U9 (74)    | 1              |

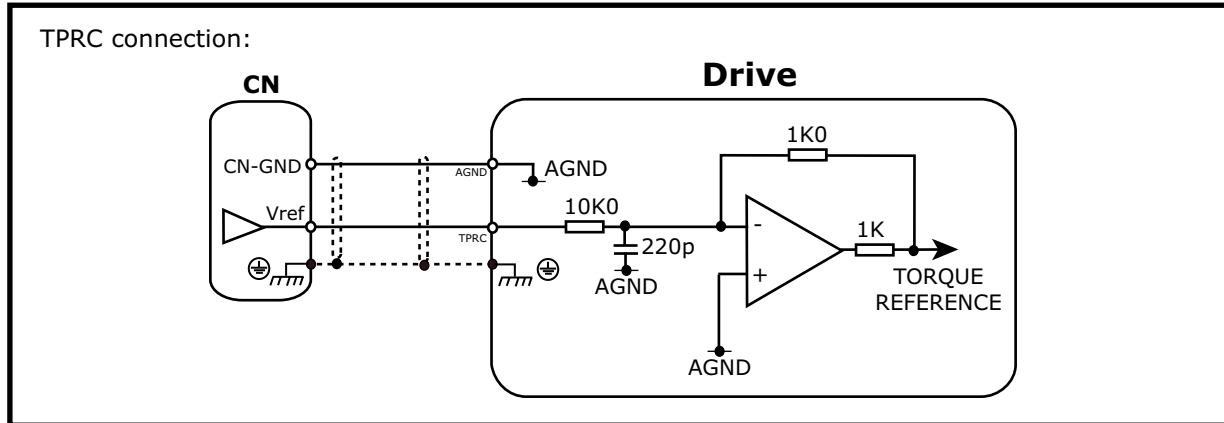
7- If the rotation is irregular or noisy, it should be necessary to *adjust the gains of the speed loop* by using an adequate procedure (see enclosure " Procedure Manual" available on request contacting Axor).

## 4 Analog speed control and Torque Limitation

Axor digital drives have another **common mode analog input, TPRC**, which can be used to **control the current delivered by the drive during the analog speed control**.

The procedure is the following:

- 1- Perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual;
- 2- Use pins **+Vref**, **-Vref** and **AGND** to *apply the desired speed reference (differential or common mode)*.
- 3- Use pin **TPRC** to *control the current delivered* from zero up to peak value, applying a voltage between 0V and +10V. The ground return is **AGND**.



The formula for determining the voltage value to be applied in TPRC in order to obtain the necessary current is as follows:

$$V_{TPRC} = \frac{10 * I_{desired}}{I_{peak}}$$

Example: Suppose we have a drive size: 7/14A, and we want to limit the converter's current to 5A. The voltage value to be applied in TPRC is 3,6V:

$$\frac{10 * 5}{14} = 3,6V$$

- 4- *Connect the emulated encoder outputs* of the drive to the CN (see point 3 in the previous paragraph).
- 5- Set the desired pulses per turn on the emulated encoder outputs via Speeder One interface or via keypad (see point 4 in the previous paragraph).
- 6- Execute the *setting of the offset of the velocity analog input reference* via Speeder One interface or via keypad (see point 5 in the previous paragraph).
- 7- Execute the *setting of the torque offset* **via Speeder One interface** or **via keypad**:
  - **via Speeder One interface**: open the "Analog I/O" window and click on icon **Analog 2**.
  - **via keypad**: insert value **256** on address **F10** ⇒ **U4**.

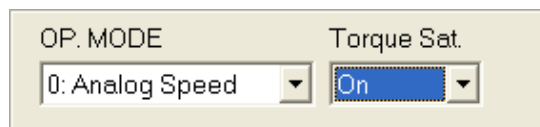


## 4 Analog speed control and Torque Limitation

8- Enable the control via **Speeder One interface** or **via keypad**:

- **via Speeder One interface:**

a- Select "**0:Analog Speed**" on the OP.MODE window and select "**On**" on the "**Torque Sat.**" window:



OP. MODE      Torque Sat.

0: Analog Speed      On

b- save settings by clicking on icon "**Save data to Eeprom**";

c- enable/disable the drive by using the **Enable/Disable** buttons.

- **via keypad:**

| Parameter                            | Menu (Indirizzo)                     | Inserted value |
|--------------------------------------|--------------------------------------|----------------|
| Set operative mode "0: Analog Speed" | F10 ⇔ U6 (71)                        | 0              |
| Torque Sat. Enable                   | Only by use of Speeder One Interface |                |
| Save settings on Eeprom              | F10 ⇔ U4 (69)                        | 2              |
| Enable DGT-IN1 (ENABLE)              | F10 ⇔ U8 (73)                        | 1              |
| Disable DGT-IN1 (ENABLE)             | F10 ⇔ U9 (74)                        | 1              |

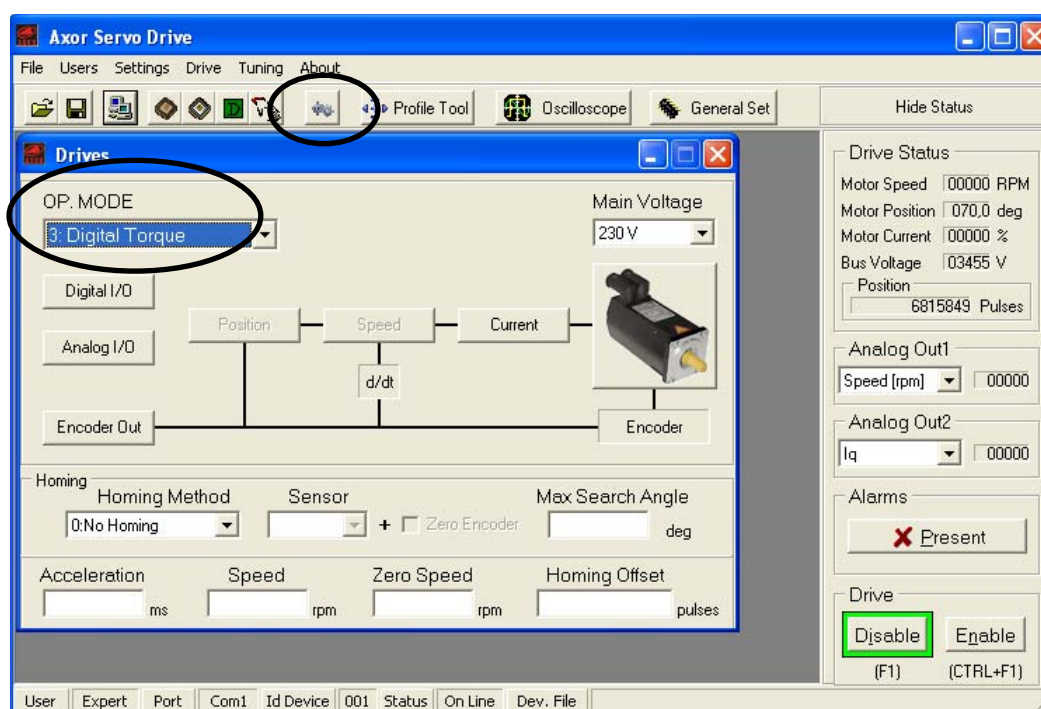
9- If the rotation is irregular or noisy, it should be necessary to *adjust the gains of the speed loop* by using an adequate procedure (see enclosure " Procedure Manual" available on request contacting Axor).

## 5 Digital Torque

Axor digital drives can control a motor by using a **digital torque reference**.

The procedure is the following:

- 1- perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual;
- 2- enable the control via **Speeder One interface** or **via keypad**:
  - **via Speeder One interface**:
    - a- set the operative mode **3: Digital Torque**;
    - b- insert the desired torque reference (\*) in parameter 79 of the Diagnostic window (to enable Diagnostic window follow this procedure: open menu Users ⇒ click on Change ⇒ insert password "cfg" ⇒ click OK ⇒ in the main window a new icon appears that allows you to open Diagnostic window);
    - c- save all settings by clicking on icon "**Save data to Eeprom**";
    - d- enable/disable the drive by using the **Enable/Disable** buttons.



- **via keypad**:

| Parameter                              | Menu (Indirizzo) | Inserted value |
|--|------------------|----------------|
| Set Operative mode "1: Digital Torque" | F10 ⇒ U6 (71)    | 3              |
| Set torque reference                   | F11 ⇒ H5 (79)    | (*)            |
| Save settings on Eeprom                | F10 ⇒ U4 (69)    | 2              |
| Enable DGT-IN1 (ENABLE)                | F10 ⇒ U8 (73)    | 1              |
| Disable DGT-IN1 (ENABLE)               | F10 ⇒ U9 (73)    | 1              |

(\*) Insert the calculate torque reference using this formula:

$$\frac{I_{desired} \times 8192}{I_{peak}}$$

**Example:** Suppose we want to set a digital torque reference equal to 5A, having a drive size of 10/20 (10A=rated current, 20A=peak current) ⇒ at address F11 → H5 insert the value 2048, in fact  $(5 \times 8192) / 20 = 2048$ .

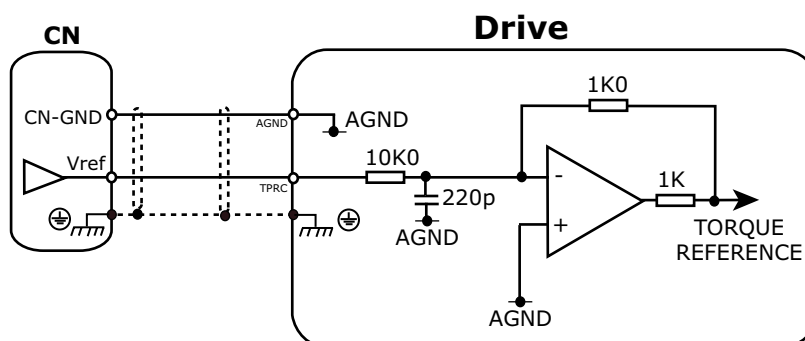
## 6 Analog Torque

Axor digital drives can control a motor by using an **analog torque reference**.

The procedure is the following:

- 1- Perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual;
- 2- use pins **TPRC** and **AGND** to apply the desired torque reference (using a common mode signal equal to **+/-10V**):

Connection scheme:



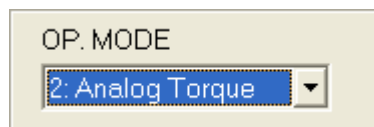
The formula for determining the voltage value to be applied in TPRC in order to obtain the necessary current is as follows:

$$V_{TPRC} = 10 * (+/-) \frac{I_{desired}}{I_{peak}}$$

- 3- enable the control via **Speeder One interface** or **via keypad**:

- **via Speeder One interface**:

- a- Set operative mode "**2:Analogue Torque**":



- b- save settings by clicking on icon "**Save data to Eeprom**";
- c- enable/disable the drive by using the **Enable/Disable** buttons.

- **via keypad**:

| Parameter                             | Menu (Indirizzo) | Inserted value |
|---------------------------------------|------------------|----------------|
| Set operative mode "2: Analog Torque" | F10 ⇨ U6 (71)    | 2              |
| Save settings on Eeprom               | F10 ⇨ U4 (69)    | 2              |
| Enable DGT-IN1 (ENABLE)               | F10 ⇨ U8 (73)    | 1              |
| Disable DGT-IN1 (ENABLE)              | F10 ⇨ U9 (74)    | 1              |

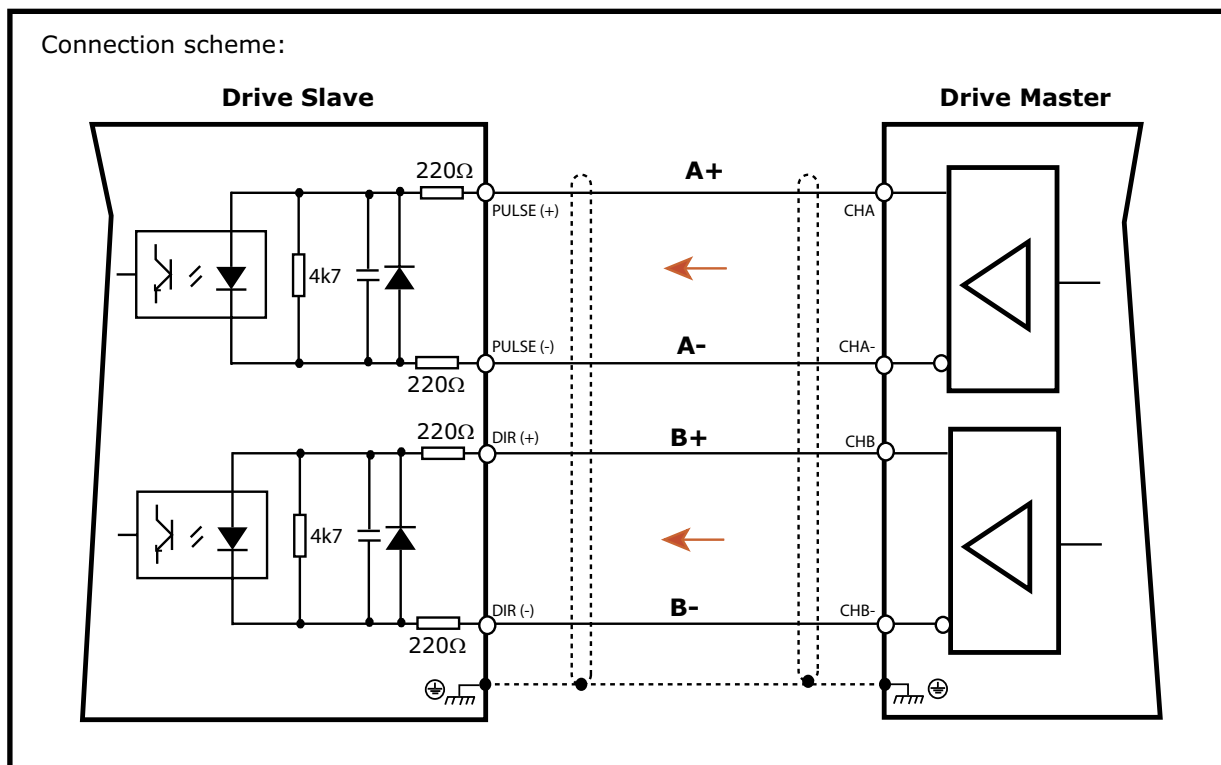
## 7 Electrical Axis (Gearing)

The operative mode **Gearing** allows you to connect together two drives: the first drive will be set as **Master**, the second as **Slave**. The Slave will be controlled by the **emulation encoder outputs** from the Master drive.

The procedure is the following:

- 1- Perform the *basic installation procedure* and the motor tests illustrated in the Service Manual of the drive.
- 2- Execute hardware connections between the Master and the Slave drive:

Connection scheme:



**Note:** We suggest connecting the shield on both sides (drive side follow the indications illustrated on service manual of the drive).

**Note:** If you want to connect together more than two drives contact Axor.

## 7 Electrical Axis (Gearing)

3- Set the Master and the Slave drives by using the *Speeder One* interface:

### Setting Master drive

a- Select one of the possible operating modes (You may select any of the available operating modes, with the exception of "5: Gearing").

b- Select the number of pulses in the "**Encoder Out**" window, which must be sent to the Slave drive.

### Setting Slave drive

a- Select the "**5:Gearing**" operating mode.

b- Select the ratio between the pulses from the Master drive and the desired pulses/rev on the Slave drive, setting the "**Pulses per Turn**" and "**Gear Ratio**" parameters in the "**Position**" window:

#### Pulses per turn

Insert into this field the number of pulses per turn of the emulated encoder from the Master drive.

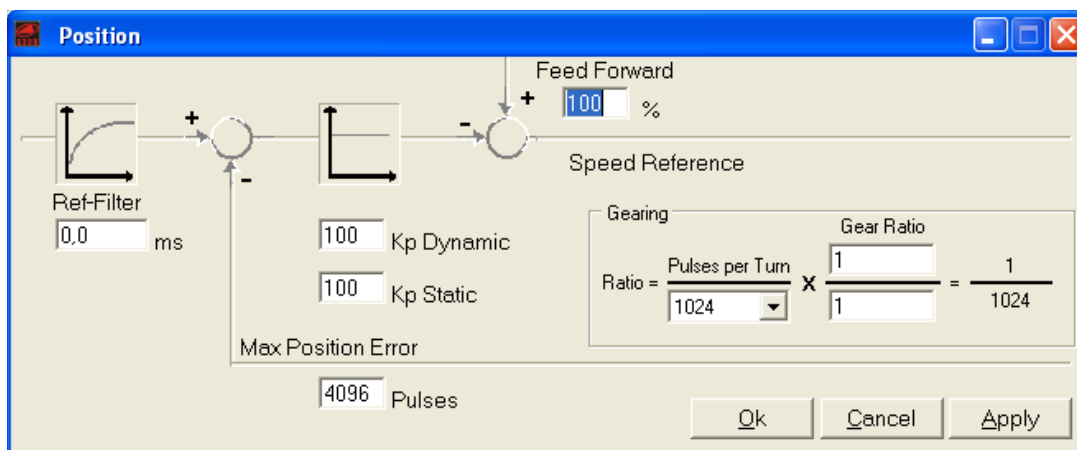
#### Gear Ratio

Insert into the numerator and denominator, the ratio that allows you to obtain the desired Slave speed in regards to the Master.

Example: Inserting the value **-1** at numerator and **2** at denominator in the "**Gear Ratio**", SLAVE motor will rotate at half that of the MASTER's speed.

4- In **Position** window set:

- ✓ **FeedForward**: set to 100;
- ✓ **Kp Dynamic** e **Kp Static**;
- ✓ **Max Position Error**: set to 4096.



5- Open the "**Digital I/O**" window and select the "**Ref-On**" function on the **DGT-IN2** digital input (**Attention: It is necessary to use the DGT-IN2 digital input to set the Ref-On function**).

6- Save all settings by clicking on icon "**Save data to Eeprom**".

## 7 Electrical Axis (Gearing)

7- For enabling the Electrical Axis follow this procedure:

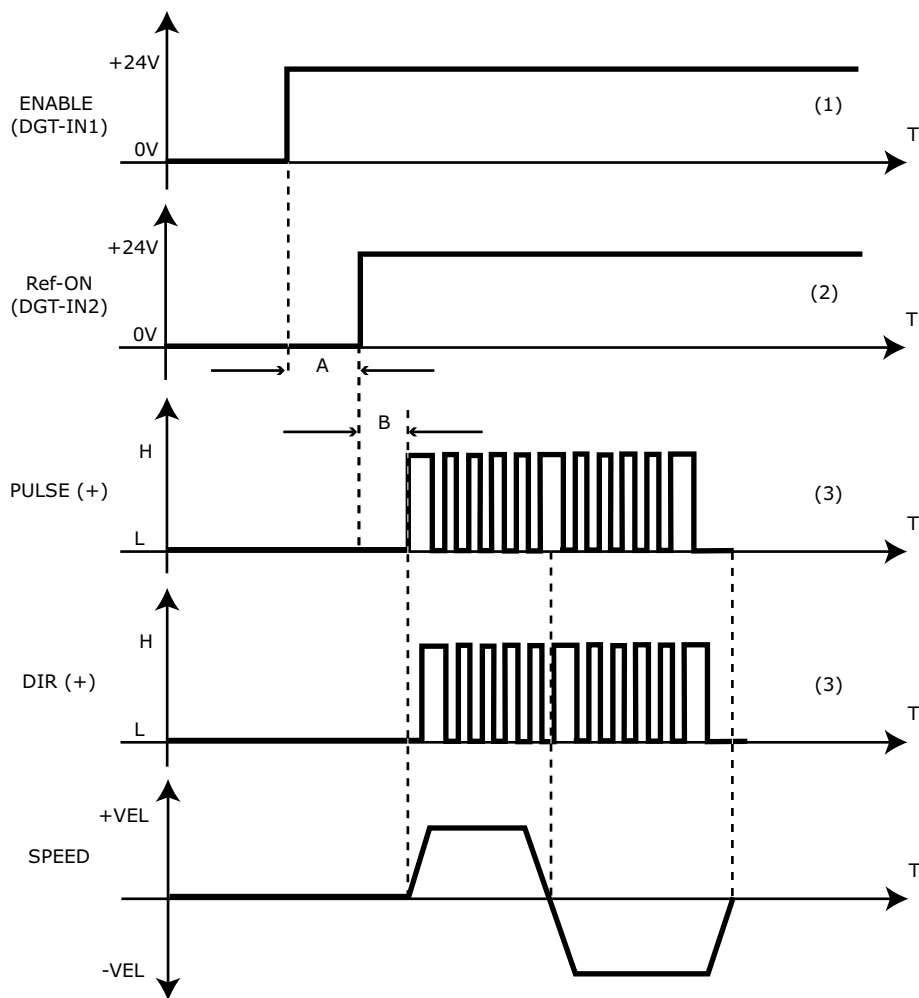
a- Enable the Master giving +24V to the DGT-IN1 (ENABLE) input. The motor will start move following the operating mode set for the Master.

b- Enable the Slave giving +24V to the ENABLE input. The motor will remain blocked in torque with the position loop inserted and waiting to move. See (1)

c- Bring the input **DGT-IN2**, set with "Ref-On" function, high to enable the motor movement in the GEARING function. See (2)

d- When the pulses's arrive at the **Pulse(+/-)** and **Dir(+/-)** inputs the motor will move. See (3)

*Electrical Axis sequence:*



**Note:** If required by the application, at anytime it is possible to execute a **homing procedure**. This operation must take place inside the **A** zone; therefore, after the enable-input, but before the DGT-IN2 signal's.

**See enclosure "Positioner Manual" to find a detailed description about Homing procedures.**

## 7 Electrical Axis (Gearing)

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It is possible to control the Slave by using the **increasing channels of an external encoder** or the **emulated encoder signals from a CN**, in this case:

- 1- Use the **Pulse(+/-)** and **Dir(+/-)** pins to connect encoder signals (+/-CHA and +/-CHB).
- 2- Set the operative mode "**5:Gearing**" in the OP. MODE menu.
- 3- Insert into the **Pulse per Turn** field the number of pulses per turn of the external encoder.
- 4- Insert into the numerator and denominator of the **Gear Ratio**, the ratio that allows you to obtain the desired Slave speed in regards to the encoder.
- 5- In the **Digital I/O** window set the "**Ref-On**" function on the **DGT-IN2** digital input.
- 6- Enable the drive giving +24V to the **DGT-IN1 (ENABLE)** input. The motor will remain blocked in torque with the position loop inserted and waiting to move.
- 7- Bring the input **DGT-IN2**, set with "**Ref-On**" function, high to enable the motor movement in the GEARING function.
- 8- When the pulses's arrive at the **Pulse(+/-)** and **Dir(+/-)** inputs the motor will move.

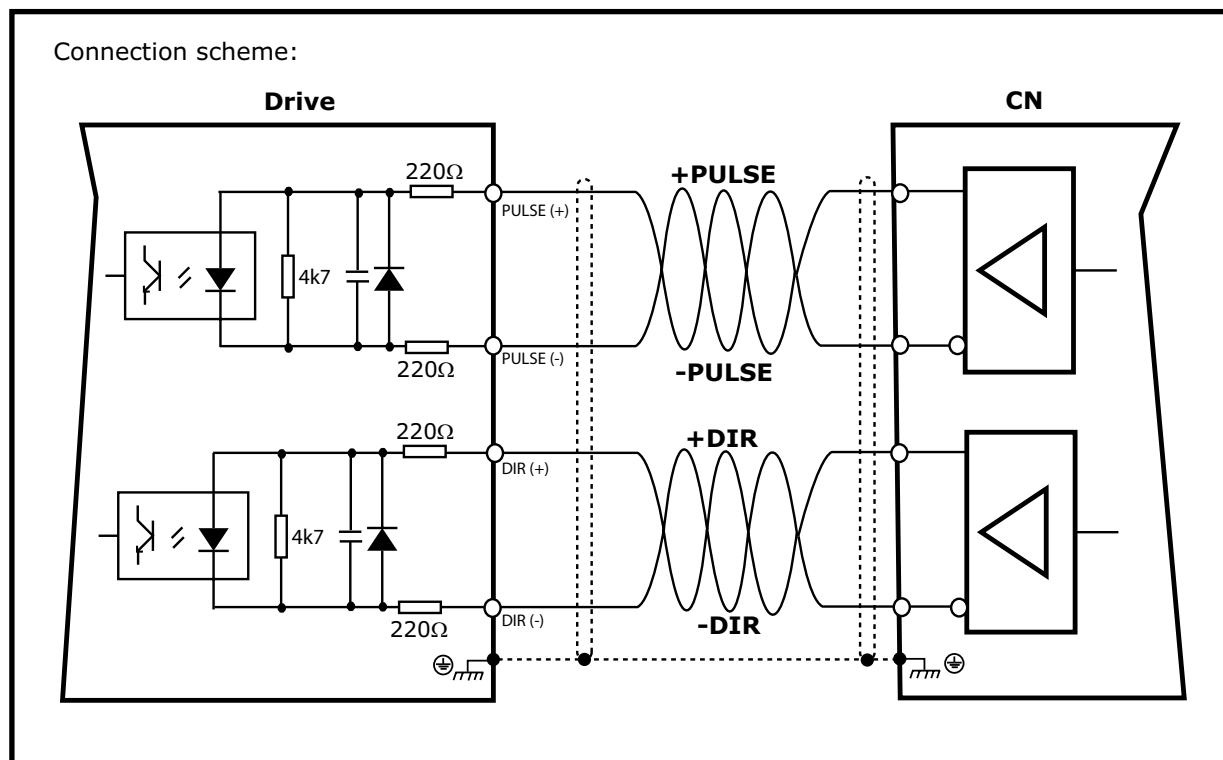
**ATTENTION:** If the rotation is irregular or noisy, it should be necessary to *adjust the gains of the speed loop or of the position loop* by using an adequate procedure (see enclosure "**Procedure Manual**" available on request contacting Axor).

## 8 Pulse/Dir Mode

The **Pulse/Dir Mode** allows you to connect the drive to a **stepper-motor controller**.

The procedure is the following:

- 1- Perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual.
- 2- Execute hardware connections between drive and CN:



### Note:

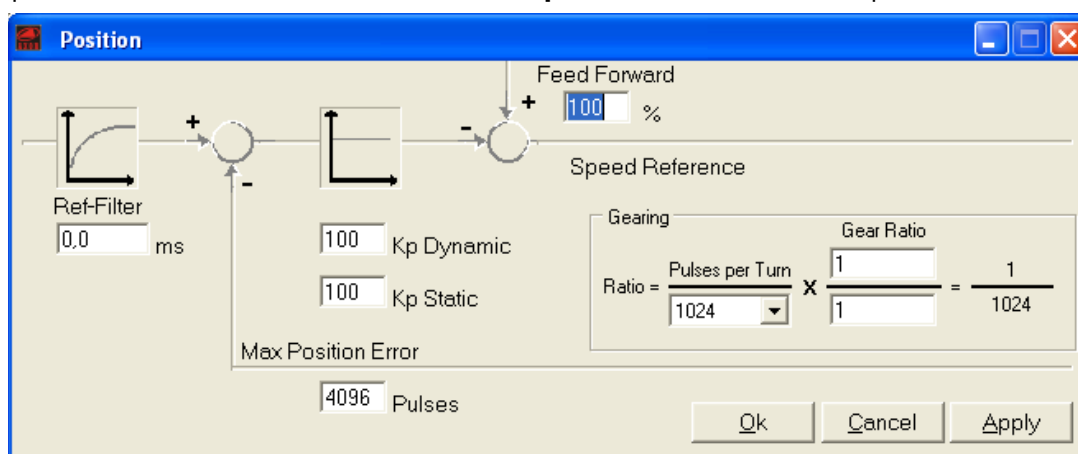
- We suggest connecting the shield on both sides (drive side follow the indications illustrated on service manual of the drive).
- If the CN supplies a logical signal equal to **0/+24V open collector NPN**, follow connections illustrated on drive's service manual.



## 8 Pulse/Dir Mode

3- Set the drive by using the *Speeder One* interface:

- set the operative mode "**6:Pulse/Dir Mode**" in the OP. MODE window;
- open the "**Position**" window and set **Pulses per Turn** and **Gear Ratio** parameters:



### Pulses per turn

This is the number of pulses that must be given to the **PULSE** input in order to have a motor's mechanical turn.

Insert in this field one of the given values (256...16384).

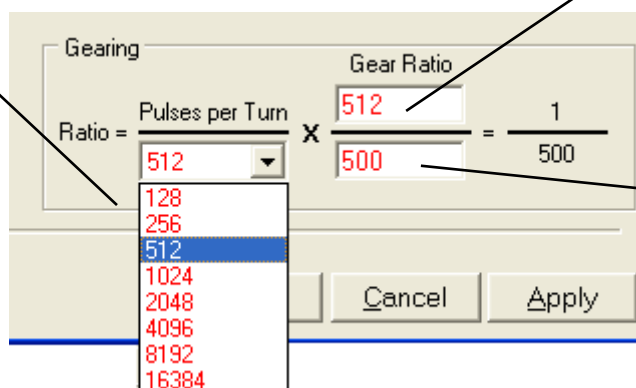
**Example:** Putting the value at 2048, the motor will complete a mechanical turn with 2048 pulses present on the PULSE input.

### Gear Ratio

If the number of the desired pulses is not present on the Pulses per Turn menu adjust it by using the Gear Ratio factor in the  $1/64 < |\text{ratio}| < 64$  range. Therefore:

1) Select in the Pulses per Turn menu the value that is closest to the desired value;

2) put in the Gear Ratio's numerator the value set on the Pulses per Turn menu;



3) put in the Gear Ratio's denominator the desired value.

4- Open the "**Digital I/O**" window and select the "**Ref-On**" function on the **DGT-IN2** digital input (**Attention: It is necessary to use the DGT-IN2 digital input to set the Ref-On function**).

5- Save all settings by clicking on icon "**Save data to Eeprom**".

## 8 Pulse/Dir Mode

6- For enabling the Pulse/Dir Mode follow this procedure:

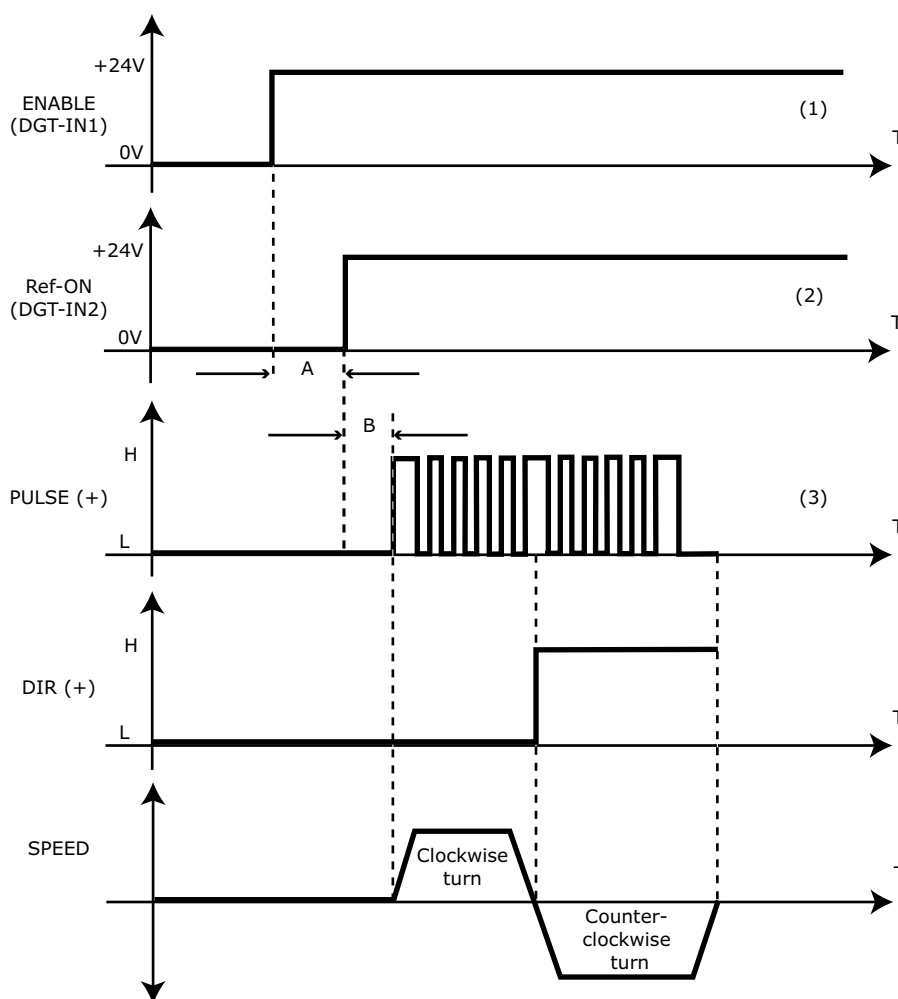
a- Enable the drive giving +24V to the ENABLE input (DGT-IN1). The motor will remain locked in torque with the position loop inserted and waiting to move. See (1)

b- Bring the input DGT-IN2, set with "Ref-On" function, high to enable the motor movement in the Pulse/DIR function. See (2)

c- When the pulses arrive at the input PULSE (+/-) the motor will move. See (3)

The **DIR** logic signal determines the motor's direction: with the signal **DIR = L** the motor turns clockwise (**CW**); with the signal **DIR = H**, the motor turns counter-clockwise (**CCW**).

*Pulse/Dir sequence:*



**Note:** If required by the application, at anytime it is possible to execute a **homing procedure**. This operation must take place inside the **A** zone, so after the enable-input's arrival, but before the DGT-IN2 signal's arrival.

**See enclosure "Positioner Manual" to find a detailed description about Homing procedures.**

**ATTENTION:** If the rotation is irregular or noisy, it should be necessary to **adjust the gains of the speed loop or of the position loop** by using an adequate procedure (see enclosure "Procedure Manual" available on request contacting Axor).

## 9 Multidrop

It is possible to connect more than one Axor drive simultaneously with the "**Multi Drop connection**". This connection must take place between a PC ("**MASTER**") and the first drive in **RS232** using the **MODBUS communication protocol**, while between the first drive and the other drives the communication will be copied utilizing **CAN BUS interface**.

The procedure is the following:

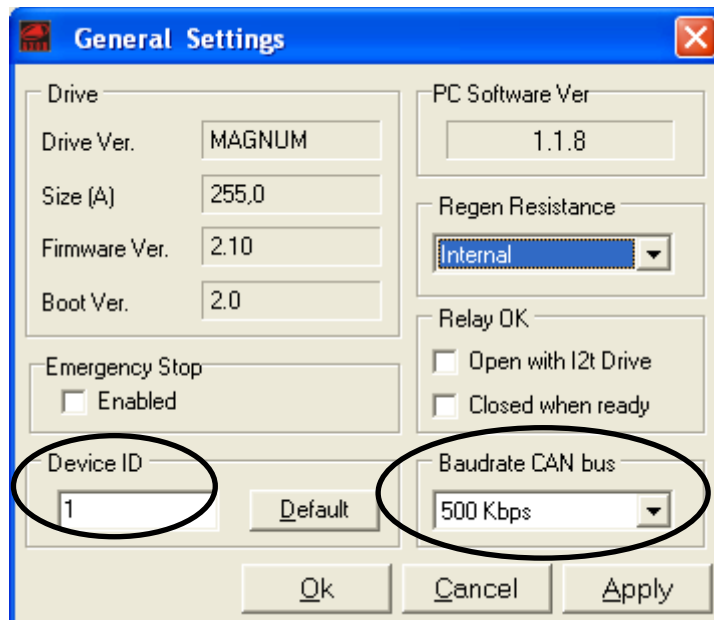
1- For each drive perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual.

2- Connect to one drive at a time, by using the RS232 interface, then in the "**General Settings**" window of each drive set:

✓ **500 kbps** into the **Baudrate CAN bus** parameter;

✓ the **Device ID** parameter. Each converter must have its *Device ID* parameter; it is convenient to set for the first drive connected to the PC in RS232 the identification of **1**, while for the other drives it is convenient to set identifications in an incremental order.

To make these settings operative save them onto the EEPROM and then disable and enable the drive.



3- Connect the first drive to the **Master PC** using the RS232 cable.

4- Connect each drive with the preceding and the following using the Can Bus cables.

5- Connect a **RESISTOR (120 ohm, 1/4W)** between pins **CAN H** and **CAN L** of the first drive and another resistor between pins **CAN H** and **CAN L** of the last drive.

6- At this point for communicating with each drive it is necessary to insert the **Device Id** parameter, set at point 2, in the **Select Driver** window ⇒ for each drive set the desired operative mode.

## 9 Multidrop

Example of **Multidrop** connection with **Magnum400™**:



You can find more information in the enclosure "*ModBus Manual*" available on CD provided with the drive.

# 10 CanBus

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Axor digital drives can be controlled in **CanBus**.

The procedure is the following:

- 1- for each drive perform the *basic installation procedure* and the *motor tests* illustrated in the Drive's Service Manual;
- 2- In the "**General Settings**" window of each drive set:
  - ✓ set the **baud rate** parameter (in the "**General Settings**" window on the Speeder One interface), to define the communication speed and so the performance of the system.
  - ✓ set the **DEVICE-ID** for each drive.

All drives connected to the network must have the same baud rate, and two or more drives cannot have the same DEVICE-ID.

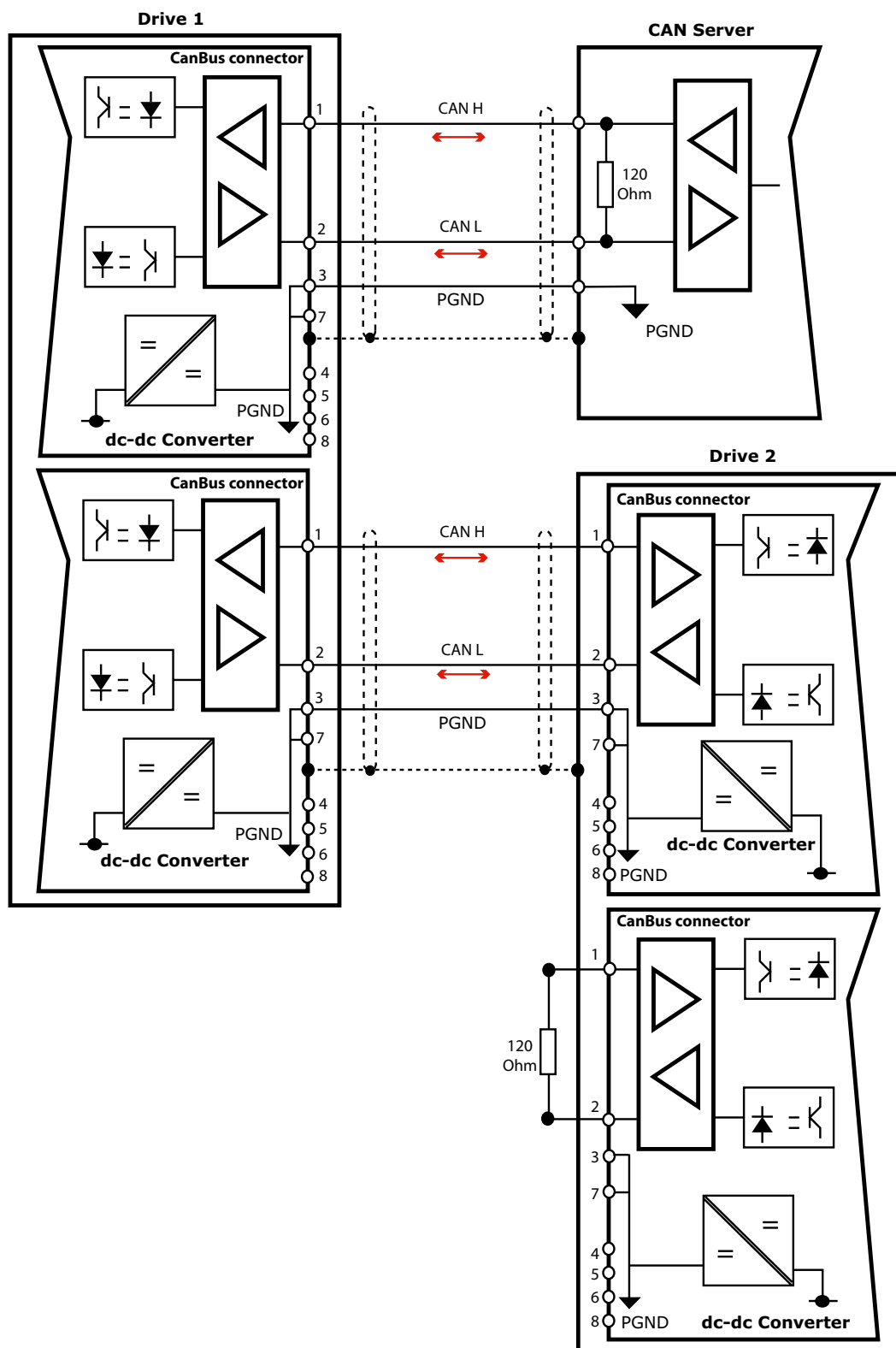
- 3-For each drive set the operative mode "**7: Can Open**".
- 4- Connect the first drive to the CAN MASTER by using a CanBus cable.
- 5- Connect each drive to the preceding and the following by using a CanBus cable.
- 6- Connect a **RESISTOR** (120 ohm, 1/4W) between pins **CAN H** and **CAN L** of the last drive of the network.

## Notes:

- The integrated software is based upon the **CAN open DS301** communication protocol and on profile **DSP402**.
- The interface is isolated by opto-isolators and a dc-dc power converter is present which powers all of the circuitry of this interface. It is therefore not necessary to connect any external power supply to the drive.

## 10 CanBus

Example:



You can find more information on enclosure "*CanOpen Reference Manual*" available on CD provided with the drive.

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