XINJE

DP-7022P step driver

Users manual

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NO. DC14 20120224 1.0

Content

1. Summary

DP-7022P subdivision stepper driver, 220VAC input voltage, 7.0A output current, can apply to all kinds of three-phase hybrid stepper motor with rated current below 7.0A. It is based on digital control and sine wave current control technology, which makes the motor run smoothly with low noise and little interference. So this type product is especially suitable for high resolution equipments, such as laser marking machine, CNC machine etc.

1-1. Features

- Digital control technology, high anti-interference capacity
- Low noise on motor running
- Power supply up to 220VAC
- Effective value of current up to 7.0A
- Dynamic and selectable subdivision
- Optically isolated input signal
- Current set easy, any level selectable
- Over-voltage and over-current protection
- Built-in braking resistor

1-2. Application

DP-7022P can apply to all kinds of medium and small automatic devices and instruments, such as aerodynamic marking machine, labeling machine, cutting machine laser type machine, small carving tool, CNC machine etc., especially having a perfect performance on the devices with the requirement of low noise and vibration with high precision and speed.

1-3. Electrical features

Item	Min	Typical	Max
Power supply（VDC）	200	220	240
Output current virtual value（A）	0	—	7.0
Logical input current（mA）	4	7	16
Stepper pulse frequency（KHz）	0	—	200
Insulation resistor（MΩ）	500	—	—
Ambient temperature	0℃～50℃		
Max working temperature	60℃		
Humidity	40%～90% RH（no condensation）		
Vibration	5.9m/s^2 Max		
Storage temperature	－20℃～65℃		

2. Operation Guide

Please read the following suggestion carefully before you install the driver.

2-1. Safety

- The driver is authorized to be installed and operated by the professional staff.
- Don't turn on the power before connecting to the motor.
- Make sure that the input signal meets the technical requirements.
- Don't make the setting or measure operations on the motor and driver during power on.
- Please do the wiring, installation and parameter setting after power is off for more than 3 minutes.
- Ensure the connection operation is absolutely correct and fixable before you turn on the power, including the power wire, motor cable and signal cable.
- Avoid electromagnetic interference.

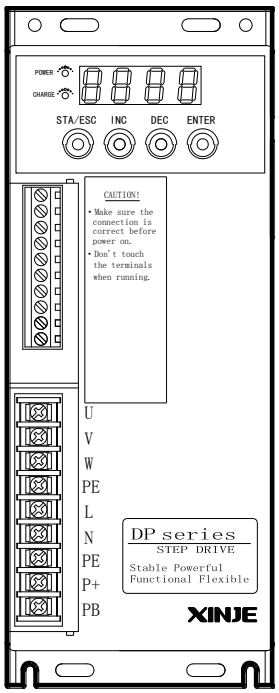
2-2. Attention

- Please use shield cable for signal input, and leave each other for distance. The further the distance, the better the interference is avoided.
- Please connect the motor cover to the GND terminal.
- Don't operate the output terminal when power on, otherwise the driver will be damaged.

2-3. Installation

- Don't install the driver next to the heat source.
- Don't expose the driver to the dusty, corrosive gas, moist environment, and work in low vibration place.
- For perfect conducting, please ensure the fixation between earth wire of host computer, driver, motor and ground.

3. Interface and function



3-1. Control signal interface

3-1-1. Function

Signal	Function	Explanation
A	Communication terminal	RS485 communication ; A: RS485+, B:RS485-
B		
PUL+	Pulse signal	The motor moves one step at the rising edge of the signal. PUL－ high voltage 4～5V, low voltage 0～0.5V.
PUL-		
DIR+	Direction signal	High/low voltage effective. Change the direction of the motor, the original direction of the motor is decided by the wiring, exchanging any phase can change the motor direction.
DIR-		
ENA+	Enable signal	To release the motor. When ENA＋ connects to 5V and ENA－ connects to low voltage, the driver will cut all phase current and be in free state, stepper pulse will not be responded. Please let the terminals vacant if out of use.
ENA-		
ERRO	Error signal	Output over-voltage, over-current signal.
COM		

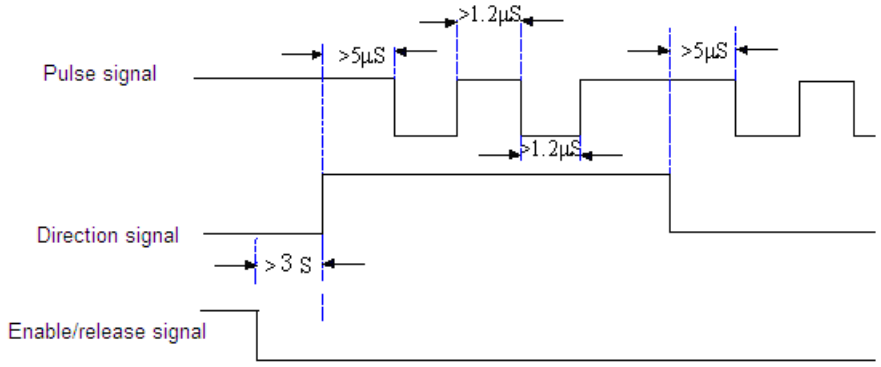
3-1-2. Sequence chart of control signals

In order to ensure the system response reliability, the control signals should meet the following requirements:

- The signal effective high voltage is 24V; effective low voltage is less than 0.5V.
- ENA (enable signal) should change to low voltage 3μs before DIR (direction signal).

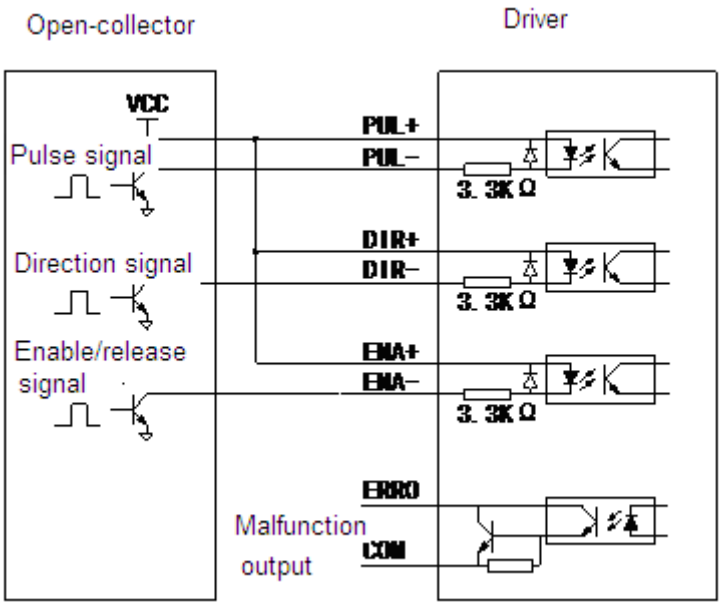
- Build the DIR (direction signal) 5μs before the PUL (pulse signal) falling edge.
- Pulse width should be more than 1.2μs.
- Pulse low voltage duration should be more than 1.2μs.

Sequence chart:



3-1-3. Input circuit

Common positive connection of input circuit:



Input requirements:

- All the input signals go through the photo-electric isolation please provide at least 8mA control signal to ensure the conduction of built-in high-speed optical coupler.
- The photo-electric has installed current limiting resistor, all the control signals connect to +24V.

3-2. Power terminals

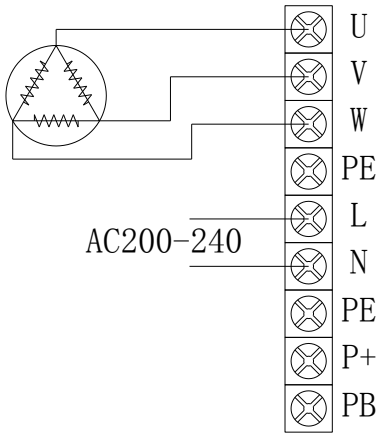
3-2-1. Function

Interface	Function	Explanation
U	Motor phase U	Motor phase U input
V	Motor phase V	Motor phase V input
W	Motor phase W	Motor phase W input
PE	Ground	Power supply ground
L、N	Power supply	Power supply input, 200~240VAC
PE	Ground	Power supply ground
P+、PB	Braking resistor	Braking resistor terminal

3-2-2. Power supply requirements

- To keep the normal working of drive, please ensure the power supply in the range of 200~240VAC.

3-2-3. Wiring



Notes:

The power supply voltage of driver determines the motor high speed performance (the larger the voltage, the higher the high-speed torque, can avoid loss of synchronism), set current determines the motor output torque (the bigger the current, the higher the output torque).

However, when the power supply voltage is large, the vibration is large at low-speed; if set current is large, the driver and motor heat is very serious.
For actual applications, users can select suitable current to achieve well effect.

3-3. Mode setting

The driver set the subdivision and current by parameters through panel. For more details, please refer to chapter 4-2.

3-3-1. Current setting

Parameter P0.00 can set any current level in the range of 0~7.0A. Parameter P0.01can set the half current and full current state.

3-3-2. Subdivision setting

Parameter P0.02 can set the subdivision resolution. For more details, please refer to chapter 4-2.

4. Panel Operation

This chapter mainly introduces the operation of digital manipulator and its application. The digital manipulator can set parameters and run the motor. We suggset users use the digital manipulator when reading this chapter.

4-1. Basic operation

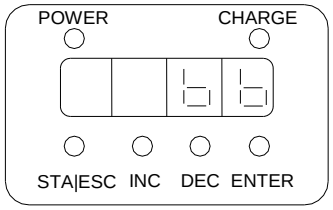
This section mainly introduces some basic operation about how to set running condition.

4-1-1. Panel function

The panel can set parameters, such as display, run and status.

- 4 bit digital display: display status and parameters of driver, alerting signal.
- POWER indicator: lights when control circuit power on
- CHARGE indicator: lights when main circuit power on. As main circuit capacitor remains charge after cutting off the power, the capacitor still shine and do not touch driver wiring at this time.

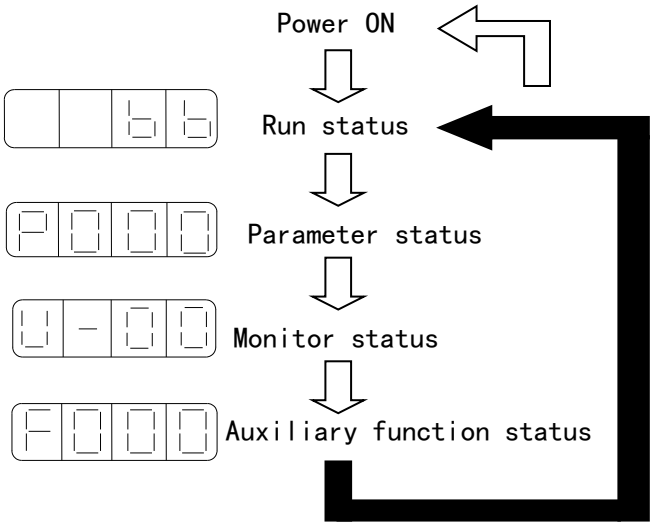
Take the initial status of the panel as example:



Key	Function
STA|ESC	Short press: status switch, status return
INC	Short press: increase displaying data; Long press: increase displaying data continuously
DEC	Short press: decrease displaying data; Long press: decrease displaying data continuously
ENTER	Short press: shift bit; Long press: enter data set and check

4-1-2. Switch between basic status

Basic status includes display status, monitor status, auxiliary function status, parameter set status and alarm status (visible only when error occurs). After clicking STA|ESC, the following statuses switch in proper order:



Display method:

- Set parameters status PX.XX: the first X represents group number, the latter two X represent parameter number in this group;
- Monitor status U－XX: XX represent monitor parameter number;
- Auxiliary function status FX.XX: the first X represents group number, the latter two X represent parameter number in this group;
- Alarm status E－XX: XX represents alarm number.

Run status:

	Driver is closed Driver is in enabled OFF status (panel force enable OFF)
	Running Driver is in enabled ON status

4-2. Parameter setting

We can select and adjust function by setting parameter. Table 1 is the parameter information.

Modbus address: 0x000～0x005

Table 1 Driver parameters

P0	Name	Unit	Factory value	Range	Note
P0.00	Set phase current(effective value)	0.1A	10	0～70	
P0.01	Half current enable		0	0～1	0: half current 1 full current
P0.02	Pulse quantity per cycle		16	2～655	Actual value= set value ×100
P0.03	Modbus number		1	1～255	
P0.04	Serial port parameters		2206	0～2209	See table 2
P0.05	Select built-in/out pulse		0	0～1	0: outside pulse 1: built-in pulse

Table 2 Serial Port Parameters

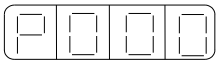
	Function	Factory value	Range
P0.04.0	Baud rate	6	0～9 0：300 1：600 2：1200 3：2400 4：4800 5：9600 6：19200 7：38400 8：57600 9：115200
P0.04.1	Data bit	0	0：8
P0.04.2	Stop bit	2	0：2 bit 2：1 bit
P0.04.3	Parity bit	2	0～2 0: none 1: odd parity 2: even parity

Parameter modification steps:

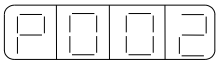
The parameter schedule contains the modification range.

The following are the steps about how to change value in P0.02 from 16 to 32:

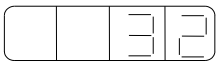
1. Press STA|ESC key and switch the status to parameter status, and press ‘ENTER’ to enter this status.



2. The second digital tube from the left side will shine, and short press ‘ENTER’ key to confirm; then the right two digital tubes will shine, and press INC, DEC or ‘ENTER’ key to select number 2, and long press ‘ENTER’ to confirm.



3. Then, data in P0.02 will be displayed, and the lowest bit ‘0’ shines, short press ENTER, its left bit shines. Press INC, DEC or ENTER and change the value to 32, long press ENTER to confirm the modification.



So far, user parameter in P0.02 has changed from 16 to 32.

If you want to change the parameter again, just repeat the step 2 and 3.

4. Press STA|ESC key to return to other status.

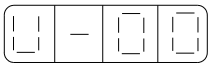
4-3. Monitor status

The function can realize step driver's instruction value and inside status monitor. Even though the motor is running, we can change the monitor status.

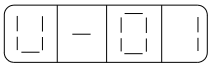
■ **The method to use monitor status**

Take the monitor code U-01 for example:

1. Press STA|ESC to switch to monitor status.



2. Press INC or DEC, and select the code U-01 you want to monitor, and then long press ENTER.



3. It will display the data in U-01, the module temperature.
4. Press INC/DEC key, monitor code will increase/decrease 1.
5. Press STA|ESC to switch monitor number.

■ **Content of monitor status**

Monitor code	Content	Unit
U-00	Monitor speed	rpm
U-01	Module temperature	0.1 °
U-02	Busbar voltage	V
U-03	Coil current	0.1A

4-4. Auxiliary function operation

Under auxiliary function status, we can operate by panel.

Function code	Content
F0.**	System information,including inforamtion number and data
F1.**	Alarm information, including alarm code and motor status when alarming
F2.00	Recover to factory parameters
F3.00	Extenal communication monitor
F4.00	Force to enable

4-4-1. System information

Press STA|ESC to switch to auxiliary function status, set group number 0 to enter system information. Then use INC/DEC key to change information code and long press ENTER to see the corresponding information. Press STA/ESC back.

Information code and description:

Function code	Description	Function code	Description
F0.00	Driver serial number	F0.01	Type
F0.02	Data of production: year	F0.03	Data of production: month, day
F0.04	Data of production: day	F0.05	Software version
F0.06	Hardware version		

4-4-2．Alarm information

Under auxiliary function status, set group number 1 to check alarm information. The following are the steps:

1. Press STA|ESC to select auxiliary function status.
2. Press INC/DEC, set group number 1, short press ENTER to confirm.
3. Press INC, DEC or ENTER to change information code.
4. Press ENTER, you can see the corresponding alarm information.

Function code	Content	unit	Modbus address
F1.00	Current alarm code ※1		0x0305
F1.01	Current warning code ※2		0x0306
F1.02	Alarm/warning code 1 when alarming		0x0307
F1.03	U phase current when alarming	A	0x0308
F1.04	V phase current when alarming	A	0x0309
F1.05	Effective current when alarming	A	0x030A
F1.06	DC busbar voltage when alarming	V	0x030B
F1.07	Module temperature	℃	0x030C
F1.08	Motor speed when alarming	rpm	0x030D
F1.09	Alarm/warning code 2 when alarming		0x030E
F1.10	Alarm/warning code 3 when alarming		0x030F
F1.11	Alarm/warning code 4 when alarming		0x0310
F1.12	Alarm/warning code 5 when alarming		0x0311
F1.13	Alarm/warning code 6 when alarming		0x0312
F1.14	Alarm/warning code 7 when alarming		0x0313

※1: when F1.00＝0, no alarm status.

※2: when F1.01＝0, no warning status.

4-4-3．Recover to factory parameters

Operation Steps:

1. Press STA|ESC to enter auxiliary function status.
2. Press INC or DEC and set the group number 2, and short press ENTER to confirm.
3. Long press ENTER, ‘0’ will be displayed and shine.
4. Set value 1, and long press ENTER to confirm.
5. Power on again, all parameters will recover to factory value.

4-4-4．External monitor

Under auxiliary function status mode, select parameter F3.00. Hint Cout means it is in external monitor status now and serial port 1 (COM1) works, panel monitor out of use. Users can debug the driver by host PC.

Press STA or ESC back and quit Cout, recover panel monitor.

4-4-5．Force enabled

Under auxiliary function status, set group number F4.00, long press ENTER to set F4.00 parameters, meantime modify parameters by INC and DEC key, long press ENTER to confirm modification.

0: Cancel enabled

1: Force enabled

4-5．Fault alarm operation

When fault occurs, alarm and fault code will jump out automatically; no fault, no alarm. System fault 'E－XX', panel communication default 'EEEE'. Under alarm status, part of default alarms can be reset by pressing ENTER.

Note: Please eliminate the alarming reasons at first, then clear the alarm when alarming.

Alarm information:

Alarm code	Description	Possible cause	Solution	Note
E-01	Program damaged	Program self-check do not pass	Download program again; contact agent or manufacturer	●
E-02	Paramters damaged	Parameters self-check do not pass	Power on again can recover the parameters to the default value; if problens repeat, please contact the agent or manufacturer	●
E-03	Busbar over voltage	Power voltage too high	Check power voltage and fluctuation	△
E-04	Busbur under voltage	Power voltage too low	Check power voltage and fluctuation	△
E-05	Module temperature too high	Running too long time with big current leads to module temperature too high; environment temperature too high	Reduce current, enhance ventilation , check if the fan is working; lower ambient temperature	△
E-06	Over current	Motor output by driver short out; motor fault	Change bad motor, check motor wiring	●
E-07	System initialization fail	System chip damaged	Please contact agent or manufacturer	●

● Represent the alarm cannot be cleared by panel, only by power off and on.

△ Represent the alarm can be cleared by panel after eliminating the default.

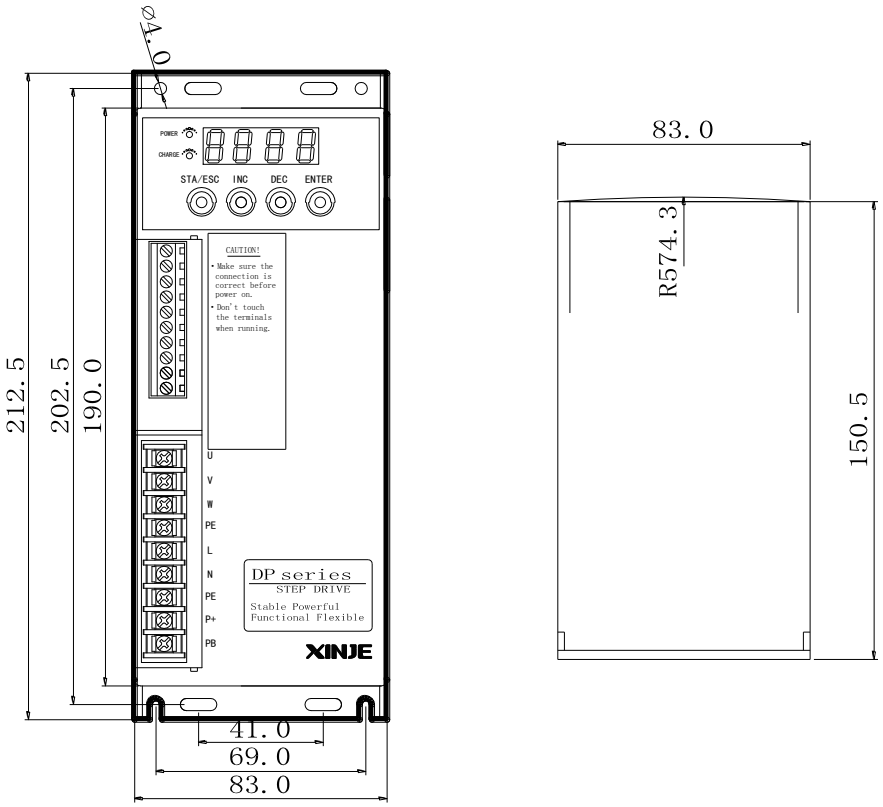
Warning information:

Warning code	Content	note
1	Busbar voltage too high	
2	Busbar voltage too low	
3	Module temperature too high	
4	Temperature abnormal	
5	Busbar voltage abnormal	

5. Dimension, Installation and Wiring

5-1. Dimension

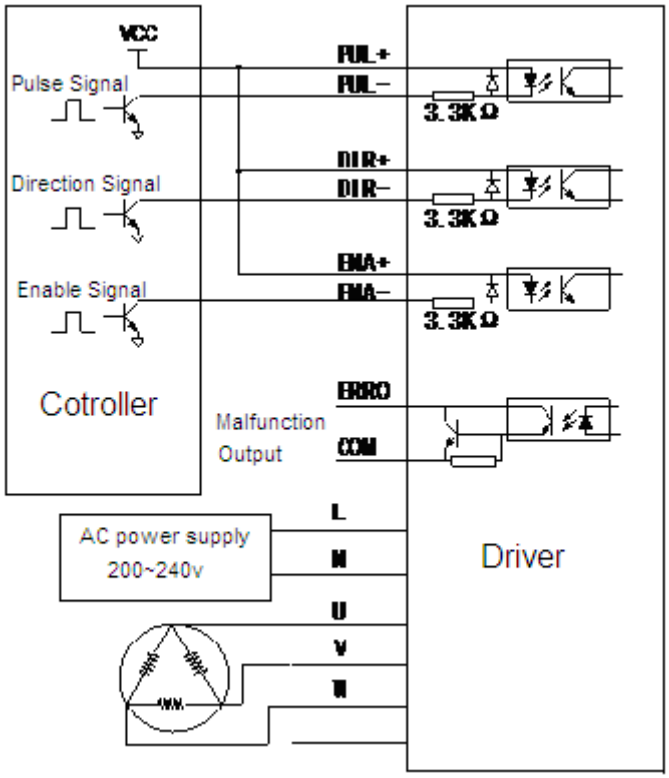
Unit: mm



5-2. Installation

The driver must be installed in the proper electric cabinet and keep draughty. Regularly check if the fan works properly. To keep good heat dissipation, please leave at least 10cm installation space. Do not let the dust or scrap fall into the driver when installing.

5-3. Typical Wiring



Note：Please separate the power cables (motor and power supply cables) and weak electricity cable (signal cables) to avoid interference.

6.Problem and solution

Problem	Reason	Solution
PWR LED is OFF	Something wrong with the power supply system	Check the power supply system
	Power supply voltage is low	Increase the power supply voltage
Motor does not run	Set the current too small	Reset the current
	The subdivision is too small	Reset the subdivision
	Protection circuit works	Power on again
	Release signal is low	Disconnect this signal
	Power off	Power on again
	Motor wiring is error	Check the motor wiring
	No pulse input	Adjust pulse width and voltage
Motor direction is wrong	Motor phase is opposite	Exchange any phase cable
	Circuit is cut off	Check the circuit
ALM LED is ON	Motor wiring is wrong	Connect the wire again
	Over-voltage or under-voltage	Adjust the voltage
	Motor or driver is broken	Check motor and driver
Motor torque is small	Acceleration is too fast	Decrease the acceleration
	The motor does not match with the driver	Change the driver

7. Motor Selection

DP-7022P is suitable for 3/6-wire 3-phase hybrid stepper motor. Generally speaking, select the motor according to the torque and rated current. The torque depends on the motor dimension. Big dimension motor has big torque. The current depends on the resistor. Small resistor has large current and the motor will have good performance at high speed.

For certain wiring motor, the bigger the working current, the larger the output torque, the serious motor heating. The higher the drive power voltage, the bigger the motor high-speed torque. The motor high-speed torque is smaller than low-speed torque.

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