

AN18091801

User Manual of parameters setting

This Manual is to describe the meaning and range of all the parameters that are changeable.

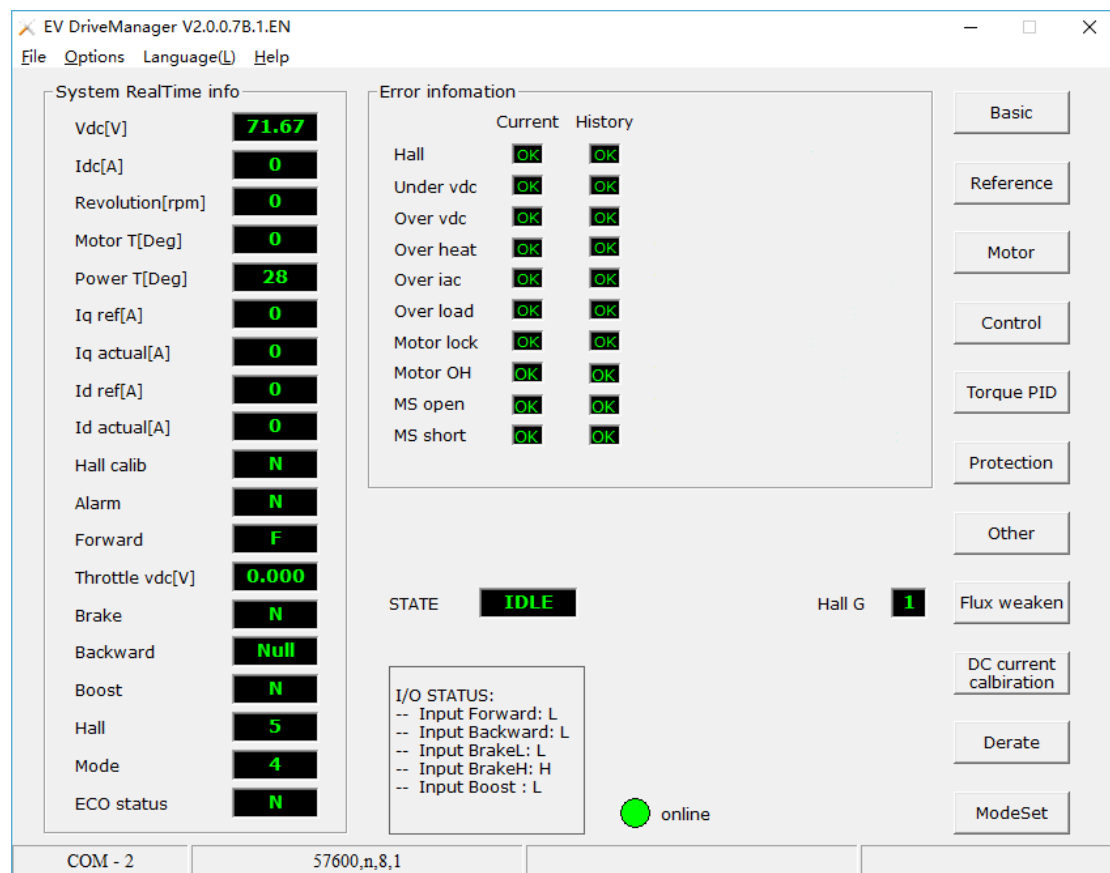


Fig 1. Main window of the DriveManager

The parameters manual will be detailed described in the following page.

The screenshot shows a 'Basic setting' window with two columns of parameters. Each parameter has a text label and a numeric input field. At the bottom, there are 'read' and 'write' buttons.

Parameter	Value
Max Iac pk[A]	600
Max speed[rpm]	2000
Back speed[rpm]	-150
MOS pk I 0[A]	1176
MOS pk I 1[A]	836
Temp at I0[Deg]	75
Temp at I1[Deg]	75
Acc of Id	10
Dec of Id	10
Dec 1 of Id	10
Speed of Id0[rpm]	800
Acc of Iq	2000
Dec of Iq	750
Acc of iq at reg	750
Dec of iq at reg	450

Buttons: read, write

Fig 1 Mask of Basic

Name	Meaning	range	unit	comments
Max Iac pk	The Max motor current	0 ~ 600	A	A curve table will be showed later
Max speed	The max rot speed of motor at boost mode	< 2500	RPM	It shows the step of speed: Max speed / 13
Back speed	Reverse speed limit		RPM	
MOS pk I 0	Hardware fixed		A	not changeable
MOS pk I 1			A	
Temp at I 0			Degree	
Temp at I 1			Degree	
Acc of Id	related to IPMSM			not available to in-wheel motor
Dec of Id				
Dec 1 of Id				
Speed of Id0			RPM	
Acc of Iq	Acceleration of current when driving forward	< 20000		
Dec of Iq	Deceleration of current when driving forward	< 20000		
Acc of iq at reg	Acceleration of current when driving backward	< 20000		
Dec of Iq at reg	Deceleration of current when driving backward	< 20000		

table 1 Basic parameters

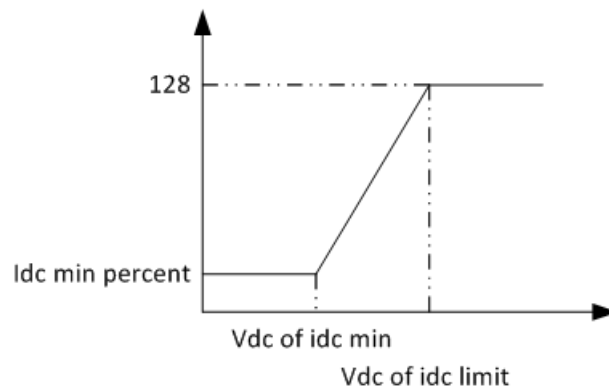
Reference			
Over vdc[V]	140	Vdc of idc limit[V]	70
Over vdc recover[V]	139	Vdc of idc min[V]	63
Under vdc[V]	63	Idc min percent[%]	20
Under vdc recover[V]	64.8	Hall steps for 60 switch t	6
Highest vdc for reg[V]	110	Start speed forecast	100
vdc of full reg[V]	100	Square start step	6
Reg comp to vdc[%]	128	Square step DDP	5
BW iqref step 0[A]	600	ECO iqref step12[A]	120
BW iqref step 12[A]	120	ECO iqref step13[A]	0
BW iqref step 13[A]	0		
<div>read</div> <div>write</div>			

Fig 2. Mask of Reference

Name	Meaning	range	unit	comments
Over vdc	Highest voltage the controller can endurance	< 140	V	
Over vdc recover	Over voltage error will be clear when voltage lower than this value	<140	V	
Under vdc	Lowest voltage the controller can work	<140	V	
Under vdc recover	Under voltage error will be clear when voltage higher than this value	<140	V	
Highest vdc for reg	when regeneration enable, when voltage higher than this value, regeneration will be set to 0 automatically	<140	V	
vdc of full reg	when regeneration enable, when voltage lower than this value, regeneration will be set to	<140	V	

	set value automatically			
Reg comp to vdc	related to IPMSM			not available to in-wheel motor
BW iqref step 0	related to backward torque	<600	A	detailed illustration will be in the following
BW iqref step 12				
BW iqref step 13				
Vdc of idc limit	related to reduce output capability based on battery status	< 140	V	see curve 1
Vdc of idc min		< 140	V	
Idc min percent		0-128		
Hall steps for 60 switch to 360	related to start stability			
start speed forecast	related to start stability			
Square start step	related to start stability			
Square step DDP	related to start stability			
ECO iqref step 12	de-activated in in-wheel motor application	<600	A	not available
ECO iqref step 13				

table 2.Reference parameters



curve 1. reduce load parameters

Motor parameter

Pole pairs num

Hall A 1 remap[Deg]

Hall B 1 remap[Deg]

Forward angle offset[Deg]

Hall A 2 remap[Deg]

Hall B 2 remap[Deg]

Backward angle offset[Deg]

Hall A 3 remap[Deg]

Hall B 3 remap[Deg]

Square angle offset[Deg]

Hall A 4 remap[Deg]

Hall B 4 remap[Deg]

Motor over heat[Deg]

Hall A 5 remap[Deg]

Hall B 5 remap[Deg]

Motor HighT mode[Deg]

Hall A 6 remap[Deg]

Hall B 6 remap[Deg]

Motor OH quit[Deg]

Hall noisy pulses

Hall group

Hall B

MotorT hystersitic[Deg]

Iqref of hallC[A]

Motor switch T[Deg]

Acc of iq at HallC

Motor Tsensor type

KTY83

Dec of iq at HallC

read

write

fig 3. Mask of Motor

Name	Meaning	range	unit	comments
Pole pairs num	pole pairs num of motor			
Forward angle offset	Angle offset	-180~179	Degree	related to motor
Backward angle offset	Angle offset	-180~179	Degree	
Square angle offset		30	Degree	do not modify
Motor over heat	temperature of motor over heat	<180	Degree	
Motor HighT mode	when temperature higher than this value, reduce output to half	<180	Degree	
Motor OH quit	temperature of recover to normal	<180	Degree	
MotorT hystersitc	reserved			
Motor switch T	reserved			
Motor Tsensor type	type of thermistor of motor			
Hall A 1 remap	related to the hall sensor position of motor			do no modify
Hall A 2 remap				
Hall A 3 remap				
Hall A 4 remap				
Hall A 5 remap				
Hall A 6 remap				
Hall B 1 remap				

Hall B 2 remap				
Hall B 3 remap				
Hall B 4 remap				
Hall B 5 remap				
Hall B 6 remap				
Hall noise pulses	reserved			do no modify
Iqref of hallC	reserved			do no modify
Acc of iq at HallC	reserved			do no modify
Dec of iq at HallC	reserved			do no modify
hall group	current group of hall sensor			switch to normal one auto matically

Table 3. parameters of Motor

Protection

Heavy load timeout[s]

250

Iqref 1[A]

600

Motor lock timeout[0.1s]

20

Iqref 2[A]

520

heavy load Iac[%]

50

Iqref 3[A]

480

Motor lock Iac[%]

28

Iqref 4[A]

400

Ref iac level[%]

70

Iqref 5[A]

350

Iac limit level[%]

100

Iqref 6[A]

280

Power oh[Deg]

110

Iqref 7[A]

255

Power highT mode[Deg]

100

Iqref 8[A]

240

Power OH recover[Deg]

90

Iqref 9[A]

210

Power turn point[Deg]

5

Iqref 10[A]

190

Iqref 12[A]

120

Iqref 11[A]

170

Iqref 13[A]

0

read

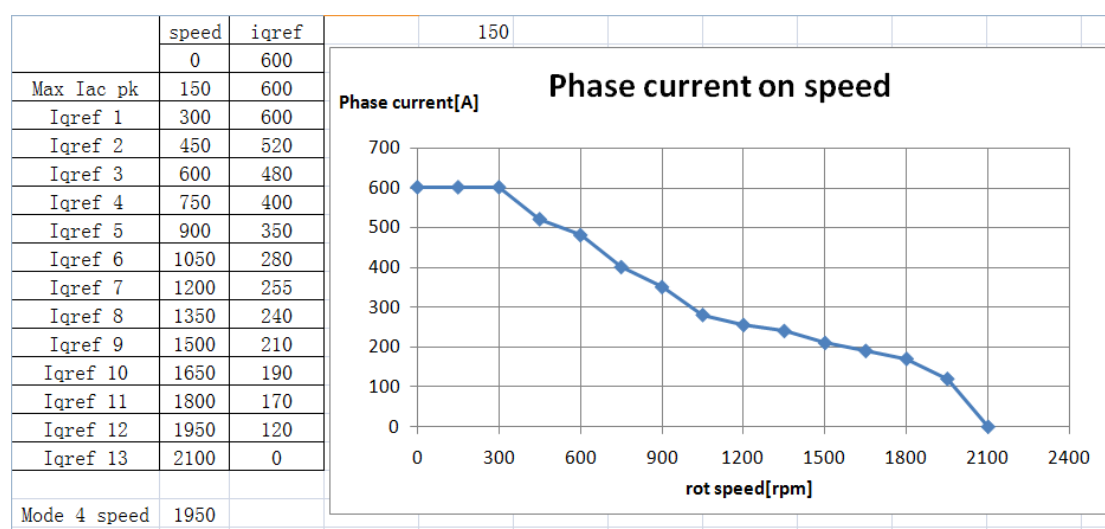
write

Fig 4. Mask of Protection

Name	Meaning	range	unit	comments
Heavy load timeout	time with heavy load		s	
Motor lock timeout	Time when motor lock		s	
Heavy load Iac	The percent of heavy		%	

	load based on current			
Motor lock lac	The percent of motorlock based on current		%	
Ref lac level	related to Hardware		%	
lac limit Level	related to Hardware		%	
Power OH	temperature of controller over heat error occurs		Degree	
Power HighT mode	temperature of controller reduce output to half		Degree	
Power OH recover	temperature controller will recover to normal		Degree	
Power turn point	related to Hardware		Degree	

Curve 2 shows the relationship of Iqref and speed.



Curve 2. phase current on different speed

In Curve 2, horizontal axis stands for motor speed, there are 14 speed points in step, and the speed step(150) comes from "Mode 4 speed" in Fig 8 in following equation:

$$\text{speed step} = \text{Mode 4 speed} / 13 = 1950 / 13 = 150(\text{default})$$

Vertical axis stands for phase current reference, there are 14 phase current points in speed step, the 14 points come from: Max Iac pk(Fig 1), and from Iqref 1 to Iqref 13 in Fig 6.

Other

Percentage in mid tref[%]
60

Percentage in mid tref2[%]
78

Tref mid vary delay[s]
1

Tref mid vary speed[rpm]
4000

Throttle low[V]
1.000

Throttle high[V]
3.900

Throttle mid[V]
2.400

BW iqref step 9[A]
210

☐ Forward enable

☒ Backward enable

☒ Brake drive stop enable

☒ Motor protectin enable

☒ Boost enable

☐ Eco enable

BW iqref step 1[A]
600

BW iqref step 2[A]
520

BW iqref step 3[A]
480

BW iqref step 4[A]
400

BW iqref step 5[A]
350

BW iqref step 6[A]
280

BW iqref step 7[A]
255

BW iqref step 8[A]
240

BW iqref step10[A]
190

BW iqref step 11[A]
170

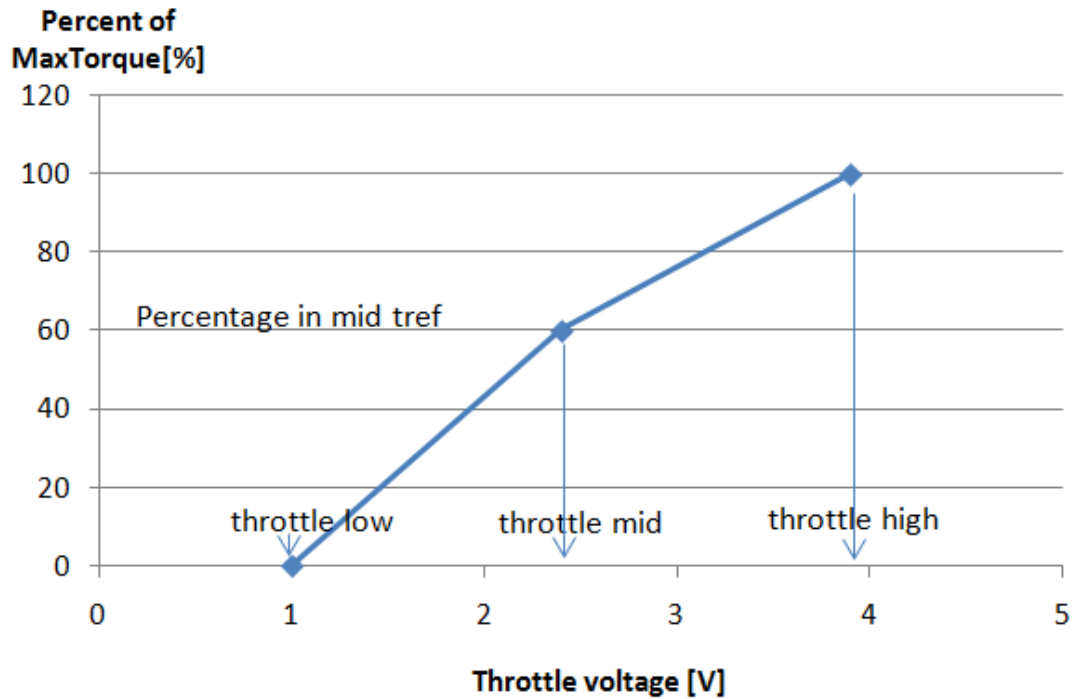
read
write

Fig 5. Mask of Other

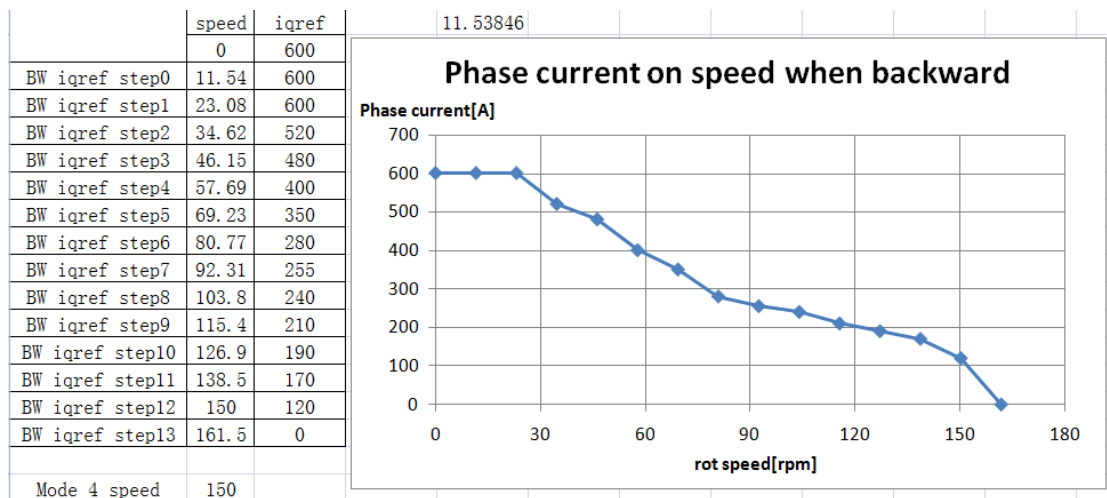
Name	Meaning	range	unit	comments
Percentage in mid tref	output percentage at Throttle mid	0- 100	%	see curve 3
Percentage in mid tref2	reserved	0-100	%	
Tref mid vary delay	reserved			
Tref mid vary speed	reserved			
Throttle low	low threshold of pedal	0 - 5	V	see curve 3
Throttle high	high threshold of pedal	0 - 5	V	
Throttle mid	mid value of pedal	0 - 5	V	
Forward enable				
Backward enable				
Brake drive stop enable	used for charging or brake input			
Motor protection enable	for motor temperature protecion			
Boost enable				
Eco enable				
BW iqref step1 ~ BW iqref step 11	phase current settings at backward mode			see curve 4

Table 6. Parameters of Other

Pedal settings



curve 3. Pedal settings



Curve 4. Phase current setting when backward

This part of phase current settings is similar to forward phase current settings.

FluxWeaken Reference

×

Idref 2[A]	0	Flux sign	-1
Idref 3[A]	0	Startup speed min	4864
Idref 4[A]	0	Startup speed low	9984
Idref 5[A]	0	Startup speed high	11776
Idref 6[A]	0	Idref 0[A]	0
Idref 7[A]	0	Idref 1[A]	0
Idref 8[A]	0		
Idref 9[A]	0	Idref H 9[A]	0
Idref 10[A]	0	Idref H 10[A]	0
Idref 11[A]	0	Idref H 11[A]	0
Idref 12[A]	0	Idref H 12[A]	0
Idref 13[A]	0	Idref H 13[A]	0
Printf period[5ms]	19	PrintfSwitcher	1

read

write

Fig 6. Mask of FluxWeaken Reference

In the mask of FluxWeaken Reference, only parameters from Idref0 to Idref13 is in usage. the speed step is the same as forward phase current settings. for In-wheel motor, we can ignore this fluxweaken part.

Idc calibration

Idc gain: 1547 Idc ave factor: 1

Idc D2 power: 10 Subproject num: 75

Iac ADC value 128A: 4235

Flux period[ms]: 20

Speed pulses/cycle: 0 Reference period[ms]: 10

Hall connection: H3: B->G->Y Phase connection: D3: B->G->Y

Forward level: H ☐ PC Online ☐ Unlock

Backward level: H Brake high level: L ☒ B H A

Reserve level: H Brake low level: H ☒ B L A

Serial Num: 1002 — 13 — 27 — 1 — 26

read write

Fig 7. Mask of DC current calibration

Name	Meaning	range	unit	comments
Idc gain	reserved			
Idc D2 power				
Iac ADC value 128A				
Flux period	reserved			
Speed pulses/cycle	Controller output pulse according to motor speed			
Idc ave factor	reserved			
subproject num	Hardware related			
Reference period	not changeable			
Hall connection	Hall connection way	H3, H1		
Phase connection	Phase connection way	D3,D1		
Forward level	Hardware related			
Backward level	Hardware related			
Brake high level	Hardware related			
Brake low level	Hardware related			
BHA	Brake High Active			
BLA	Brake Low Active			

Table 6. parameters of DC current calibration

Parameter	Value
Mode 1 idc[A]	120
Mode 2 idc[A]	120
Mode 3 idc[A]	150
Mode 4 idc[A]	150
Mode 5 idc[A]	180
Speed fall delay[s]	4
Min reg speed[rpm]	100
Acc of regenerate	700
Mode 1 speed[rpm]	340
Mode 2 speed[rpm]	500
Mode 3 speed[rpm]	600
Mode 4 speed[rpm]	1900
Boost ratio Iac[%]	120
Boost active sec[s]	3
Max reg Q	-2500
Dec of regenerate	1000
Max slip reg Q	-2000

read write

Fig 8. Mask of ModeSet

Name	Meaning	range	unit	comments
Speed fall delay	transient time between mode change		s	
Min reg speed	The min speed for regeneration active	≥ 0	RPM	
Acc of regenerate	Acceleration of Iq when regenerating			
Mode 1 speed	Speed limit at mode 1	< 20000	RPM	
Mode 2 speed	Speed limit at mode 2	< 20000	RPM	
Mode 3 speed	Speed limit at mode 3	< 20000	RPM	
Mode 4 speed	Speed limit at mode 4	< 20000	RPM	
Boost ratio Iac	at boost mode, phase current will be this value multiplied by iqref[7]...[13]	$1 \sim 1.5$		
Boost active sec	the time for boost function active			
Max reg Q	max reg equivalent Iq when brake active	$-32768 \sim 0$		
Dec of regenerate	Deceleration of Iq when regenerating			
Max slip reg Q	max reg equivalent Iq when release pedal	$-32768 \sim 0$		

Table 7. parameters of ModeSet

Record

Version	comments	date	Maker
V1.1	The initial version of parameters setting based on in-wheel motor	2018-9-18	Yang Rong