

# SSR SERIAL SOFTSTARTER

# 1 Parameters

## 1.1 General

The main starting/stopping parameters of SSR softstarter can be set by the panel potentiometer. Other parameters have been setup at factory commissioning, users do not need to set them. Other parameters can be adjusted by RS485 communication.

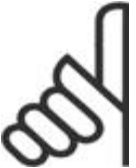
### 1.1.1 M ain parameter

Parameter	MODBUS address	Setting range	Default
Full Load Amps FLA	40002	1-100	Rated current of softstarter According to lectotype. Factory setting

### 1.1.2 Protection parameter

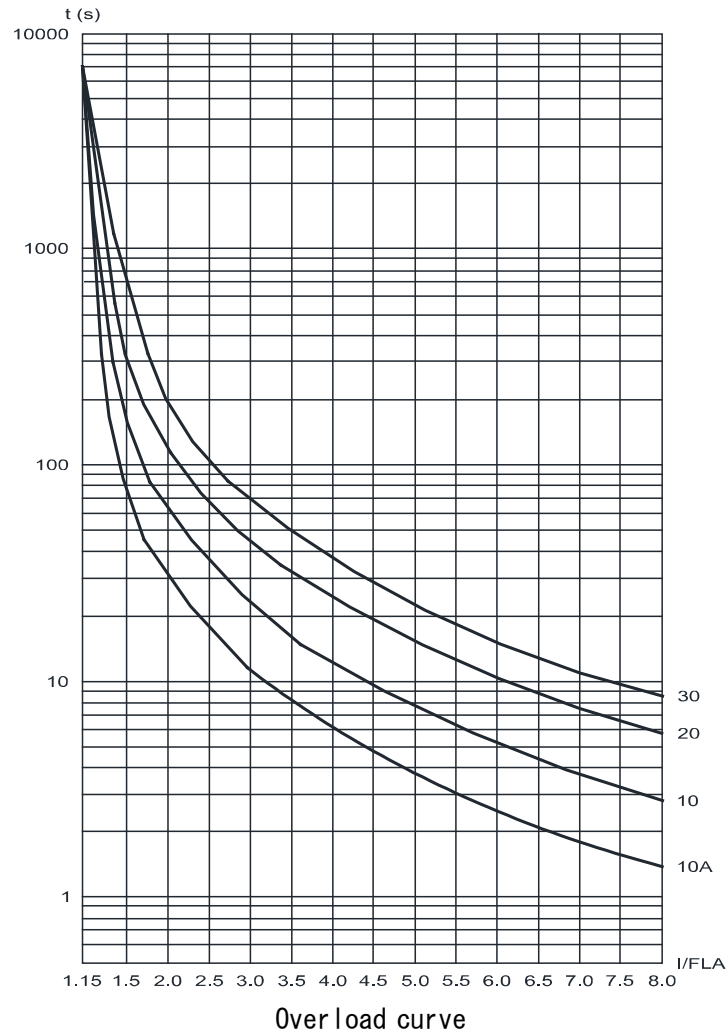
Parameter	MODBUS address	Setting range	Default
Over current protection value	40005	500-850%	500% Factory setting


Parameter	MODBUS address	Setting range	Default
Over current trip delay time	40006	0.1~1.0Sec.	0.1Sec. Factory setting

	<p><b>Caution</b> SSR has two different levels of over current breaking protection.</p> <ol style="list-style-type: none"> <li>When the current is greater than 850% softstarter rated current (FLC), the softstarter will trip immediately. Fault relay (K2) tripped</li> <li>When the output current is greater than the over current protection set value (the motor rated current FLA 200%~850%) the softstarter is delayed for a period of time ("overcurrent action delay time" specified time) then trip, the fault relay (K2) tripped</li> </ol>
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Parameter	MODBUS address	Settingrange	Default
Over load protection	40007	100~200%	110% Factorysetting


Parameter	MODBUS address	Settingrange	Default
Over load protection grade	40008	0-CLASS 10A 1-CLASS 10 2-CLASS 20 3-CLASS 30	0-CLASS 10A Factorysetting



	<p><b>Caution</b> Thermal protection of SSR. It is recommended that users set over load protection to (level 10A) , When the setting is less than "over load protection value", the soft start detects over load protection.</p>
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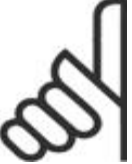
Parameter	MODBUS address	Settingrange	Default
Phase sequence protection	40015	0- OFF 1- ON	1-ON

The parameter setting protection functions not introduced above.

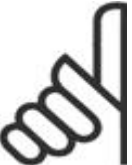
	<p><b>Caution</b> More protection of SSR</p> <ol style="list-style-type: none"> <li>1 Overtemp protection When the heatsink temperature is above 85 degrees, the soft start trip.</li> <li>2 When the soft starter input terminal/output terminal missing phase, the soft start trip.</li> <li>3 When The phase sequence of the soft starter line is abnormal, the soft starter is not allowed to start.</li> <li>4 When the power module is short circuited, soft start trip.</li> <li>5 when the three-phase current of the soft starter is unbalanced (three-phase current difference &gt; 20%FLA), soft start trip.</li> </ol>
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### 1.1.3 Start/stop parameters

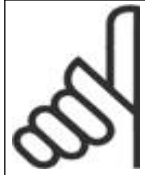
Parameter	MODBUS address	Settingrange	
Initial voltage	40010	30-70%	According to customer. Panel potentiometer setting

	<p><b>Caution</b> The Initial voltage is set through the panel, and the setting value can only be read through communication mode, but it can't be changed.</p>
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Parameter	MODBUS address	Settingrange	Default
Starting time	40011	1-30 Sec.	According to customer. Panel potentiometer setting

	<p><b>Caution</b> The starting time is set through the panel, and the setting value can only be read through communication mode, but it can't be changed.</p>
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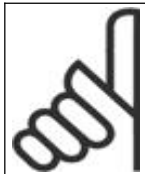
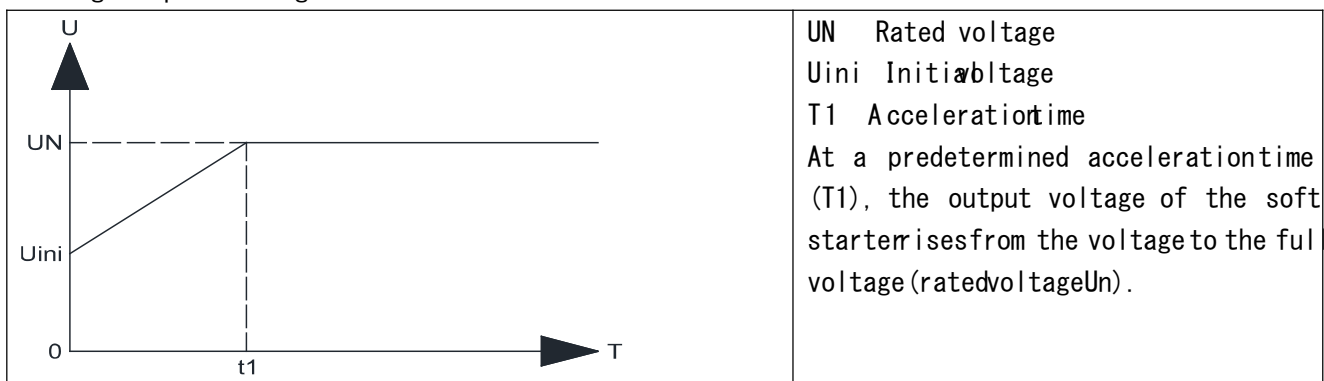
Parameter	MODBUS address	Settingrange	Default
Stop time	40012	0-30 Sec .	According to customer. Panel potentiometer setting



**Caution**

The stop time is set through the panel, and the setting value can only be read through communication mode, but it can't be changed.

**Voltage slope starting mode**

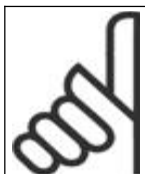


**Caution**

The motor can't start (Locked-Rotor) if the voltage is too low. It is suggested that set initial voltage from high to low or use the Recommended setting.

### 1.1.4 Relay parameters

Parameter	MODBUS address	Settingrange	Default
Bypass relay type	40014	0- Electric self holding relay 1- Magnet self holding relay	Depending on the specific model Factory setting



**Caution**


The type of bypass relay is not allowed to be changed !

## 1.1.5 Communication parameters

Parameter	MODBUS address	Settingrange	Default
Slavemachines address	40017	1~127	1 Factorysetting

Parameter	MODBUS address	Settingrange	Default
Baud rate	40018	0-1200BPS 1-2400BPS 2-4800BPS 3-9600BPS 4-19200BPS	3-9600BPS Factorysetting

Parameter	MODBUS address	Settingrange	Default
Paritycheck	40019	0-EVEN 1-ODD 2-NONE	0-ECC

	<p><b>Caution</b></p> <p>After setting up the communication parameters must restart the SSR softstarter. Incorrect settings cause communication fault, it could cause cannot setting again. SSR can not restore the default parameter, so please be careful when setting communication parameters.</p>
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## 1.2 Parameters table

Parameter	MODBUS address	Setting range	Factory setting
Full Load Amps (FLA)	40002	1...100A	According to product
Reserve	40003	0...1	0
Reserve	40004	65535...65535	
Over current protection value	40005	500%-850% FLA	500% FLA
Over current trip delay time	40006	0.1...1SEC	0.1 Sec.
Over load protection	40007	100-200% FLA	110% FLA
Over load protection grade	40008	0-CLASS 10A 1-CLASS 10 2-CLASS 20 3-CLASS 30	0-grade 10A
Reserve	40009		
Initial bludge	40010	0...15 (n*3+30)%	potentiometer setting
Starting time	40011	0...15 $T_{star} = n * 2$ (if n=0 $T_{star} = 1$ SEC)	potentiometer setting
Stop time	40012	0...15 $T_{stop} = n * 2$	potentiometer setting
Parameter Setting	40013	0-potentiometer setting 1-communication setting.	According to product
Bypass relay type	40014	0-Electrical self holding relay 1-Magnet self holding relay	According to product
Phase sequence protection	40015	0-OFF 1-ON	
Bypass mode	40016	0-Send pulse after bypass 1-Stop pulse after bypass	
Slave machines address	40017	0-127	1
Baud rate	40018	0-1200BPS 1-2400BPS 2-4800BPS 3-9600BPS 4-19200BPS	3-9600BPS
Parity check	40019	0-EVEN 1-ODD 2-NONE	0-ECC

## 2 Communication option

SSR use RS-485 line.

### 2.1 RS-485 technical characteristics

Asynchronous serial communication

Half duplex

Communication protocol Modbus RTU

#### 2.1.1 Baud rate

SSR supports 1200/2400/4800/9600/19200 BPS .

More detail 1.1.5 Communication parameters.

#### 2.1.2 Data bit

The data bit of SSR is 8.

#### 2.1.3 Parity bit

Parity bit can be set None /ECC /ODD.

More detail 1.1.5 Communication parameters.

#### 2.1.4 Stop bit

When Parity bit is none Stop bit is 2

When Parity bit is ECC or ODD, Stop bit is 1.

### 2.2 Response time

Normal response 4m Sec. response time 40mSec.

Long response response time 200mSec.

#### Notes

Frequent query will cause longer response time of SSR;

When set the parameter by communication, the interval time of query should be 1000mSec.

SSR doesn't support broadcast communication.

When SSR is communication bus terminal, 120 terminal resistance is recommended.

When SSR peer-to-peer communicate with PC, terminal resistance is not needed.

The maximum number of terminals connected with SSR is 32.

The transmission distance should <1.5KM (the relay is needed if distance >1.5KM).



## 2.3 MODBUS Message RTU Framing

Start	Slave Address 1Byte	Function Code 1Byte	Data 1	.....	Data n	CRC-Hi 1Byte	CRC-Lo 1Byte	Stop
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Start: Separated by a silent interval of at least 3.5 character times.

Slave Address: Slave Address from 1 to 127.

Function Code: Function Code SSR support function Code 1 2 3 4 5 6 8 15 16

Data 1...Data n: Data transmitted.

CRC-Hi: The CRC high order byte from slave address to Data n.

CRC-Lo: The CRC low order byte from slave address to Data n.

Stop: Separated by a silent interval of at least 3.5 character times.

### 2.3.1 Interval time

In RTU mode, message frames are separated by a silent interval of at least 3.5 character times. In the following sections, this time interval is called  $t_{3.5}$ .

$$\text{Interval time} = \frac{3.5 \times 11}{\text{Baud rate}} \text{ (???.)}$$

Example

When Baud rate is 9600BPS, the interval time =  $3.5 \times 11 / 9600 = 4 \text{m Sec}$ . So the interval time is 4mSec.

### 2.3.2 Slave Address

The number of slaves can be set from 1 to 127. (The default number is 1)

### 2.3.3 Function Code

Function Code	Modbus instruction	SSR function
01	read Coil Status	read instruction status
02	read Input Status	read Input/output status
03	read holding registers	read SSR parameter setting
04	read analog input registers	read SSR real-time data
05	force single coil	force instruction status
06	preset single register	preset single SSR parameter
08	diagnostic	check communication loop
15 0x0F	force multiple coils	force multiple instruction status
16 0x10	preset multiple registers	preset multiple SSR parameter

## 2.3. 4R egister

SSR	Registeraddress 4Digital	Number ofregister	Permission
Instruction	00001 ...00008	8	R/W
Input/outputStatus	10001 ...10008	8	R
real-time data	30001 ...30016	16	R
parameter setting	40001 ...40032	32	R/W

## 2.4 Instruction 00001...00008 coil

SSR have 8 coils

Address	SSR operation	illustration
00001	Start/Stop	=0 Stop =1 Start *1
00002	Reserve	
00003	Reserve	
00004	Reserve	
00005	Reserve	
00006	Reserve	
00007	Reserve	
00008	Reset Fault	=0 NONE =1 resetfault When thiscoilisset1, SSR wilresetthe faultifitisinthe statusof fault. Afterresetfaultthiscoiwillbe set0. *2

\*1 When start SSR by communication (00001 is set 1), the SSR can be stopped by communication (00001 is set 0) or cut off the control source power to force the SSR to stop.

\*2: Before reset the fault status (00008 is set 1), please cut off the Start/Stop signal to check the fault reason otherwise the SSR will start again as soon as the fault status is reset.

## 2.5 Input/output status 10001...10008

Address	SSR operation	illustration
10001	outside start/stop signal	=0 OFF =1 ON
10002	inside start/stop signal	=0 OFF =1 ON
10003	DIP switch1	=0 OFF =1 ON
10004	DIP switch2	=0 OFF =1 ON
10005	Reserve	
10006	Reserve	
10007	Reserve	
10008	Reserve	

## 2.6 Real-time data 30001 ...30032 input registers

Address	SSR operation	illustration
30001	A phase current	0...65535 unit %FLA
30002	B phase current	0...65535 unit %FLA
30003	C phase current	0...65535 unit %FLA
30004	Initial voltage	0...512 Initial voltage% =30 +int(5(12-n)/32)*3
30005	Start time	0...512 Start time= (512-n)/16
30006	Stop time	0...512 Stop time=(512-n)/16
30007	Average current	0 65535 unit %FLA
30008	Frequency	0 65535 unit Hz
30009	System status	
30010	Input status	
30011	Fault status	
30012	Accumulated running time	0 65535 unit hour
30013	Accumulated running time	0 65535 unit X0.1sec
30014	Times of start	0...65535
30015	Times of fault	0...65535
30016	Reserve	
30013	Faultcode-1	More detail please check the faultcode table
30014	Faultcode-2	More detail please check the faultcode table
30015	Faultcode-3	More detail please check the faultcode table
30016	Faultcode-4	More detail please check the faultcode table
30017	Faultcode-5	More detail please check the faultcode table
30018	Faultcode-6	More detail please check the faultcode table
30019	Faultcode-7	More detail please check the faultcode table
30020	Faultcode-8	More detail please check the faultcode table
30021	Faultcode-9	More detail please check the faultcode table
30022	Faultcode-10	More detail please check the faultcode table
30023 ...32	Reserve	

### Faultcode table

Code	Description	Notes
0	No fault	
1	Overtemp trip	The temperature of the heatsink is higher than temperature setting value
2	Missing phase/No voltage trip	Miss one phase or two phase voltage or no voltage input
3	Over current trip	Current value exceeds over current set value
4	Over load trip	Current value exceeds over loading set value
5	Unbalance current trip	The unbalance three-phase current is larger than the unbalance current set value
6	Phase sequence trip	The sequence of three phase voltage is wrong
7	E <sup>2</sup> PROM can not write trip	Can not write E <sup>2</sup> PROM
8	Other trip	

## 2.7 Parameter setting 40001 ...40063 holding registers

Parameter	MODBUS address	Settingrange	Factorysetting
Full Load Amps ( FLA)	40002	1...100A	According to product
Reserve	40003	0...1	0
Reserve	40004	65535 ...65535	
Over current protection value	40005	500%-850% FLA	500% FLA
Over current trip delay time	40006	0.1 ... 1SEC	0.1 Sec.
Over load protection	40007	100-200% FLA	110% FLA
Over load protection grade	40008	0-grade10A 1-grade10 2-grade20 3-grade30	0-grade10A
Reserve	40009		
Initial blage	40010	0..512 $30 + \text{int}(\frac{512-n}{32}) * 3$	potentiometer setting
Starting time	40011	0...512 $\text{int}(\frac{512-n}{16})$	potentiometer setting
Stop time	40012	0...512 $\text{int}(\frac{512-n}{16})$	potentiometer setting
Parameter Setting	40013	0-potentiometersetting 1-communication setting.	According to product
Bypass relay type	40014	0-Electriself holding relay 1-Magnet self holding relay	According to product
Phase sequence protection	40015	2- OFF 3- ON	
Bypass mode	40016	0-Send pulse after bypass 1-Stop pulse after bypass	
Slave machines address	40017	1-127	1
Baud rate	40018	0-1200BPS 1-2400BPS 2-4800BPS 3-9600BPS 4-19200BPS	3-9600BPS
Parity check	40019	0-ECC 1-ODD 2-NONE	0-ECC



### WARNING

The value set must in the parameter range acceptable. Wrong parameter setting will cause damage of softstarter.

## 2.8 Debugging

### 2.8.1 Instruction

Example 1 Reset fault

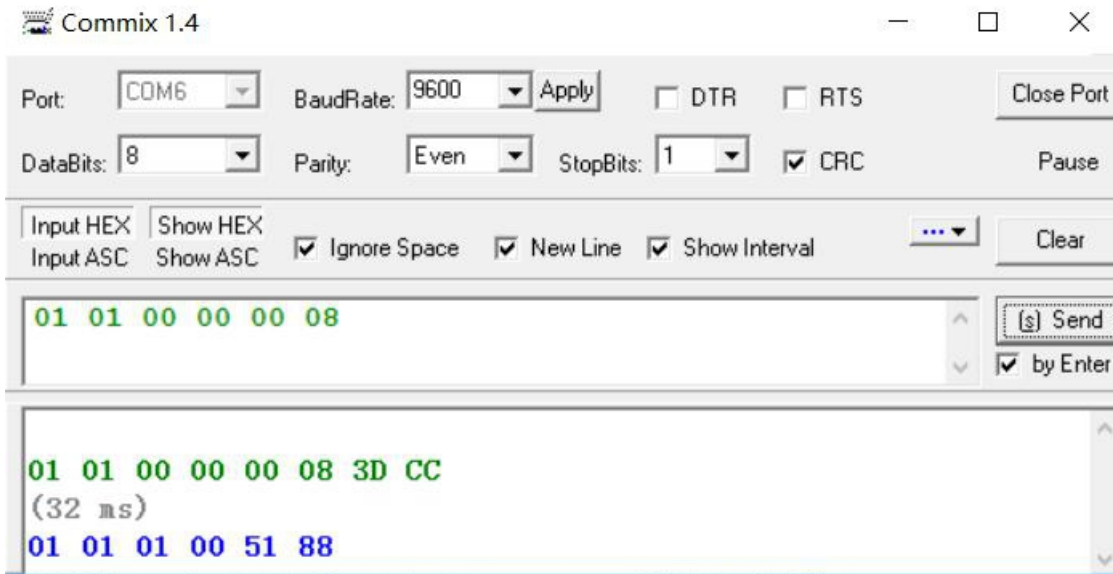
The coil address of reset fault is 00008 in 2.4 Instruction. Force single coil through function code '05' of Modbus RTU. Suppose the slave number is 1.



Caution:

1. The start address is 0, so the address of 00008 coil is 0x0007
2. The coil set 0, data is 0x0000
3. The coil set 1, data is 0xFF00
4. Returned data
  - 01 slave number
  - 05 function code
  - 0007 coil address
  - FF00 coil set 1
  - 3DFB CRC

Example 2 Read 0001~0008 coilstatus



Returned data

01 slavenumber  
 01 functioncode  
 01 number ofbytes  
 00 coi ldata  
 5188 CRC

Example 3 forcemultipleoils

Thisexample force00001 and 00002 coil.



Transmitteddata:

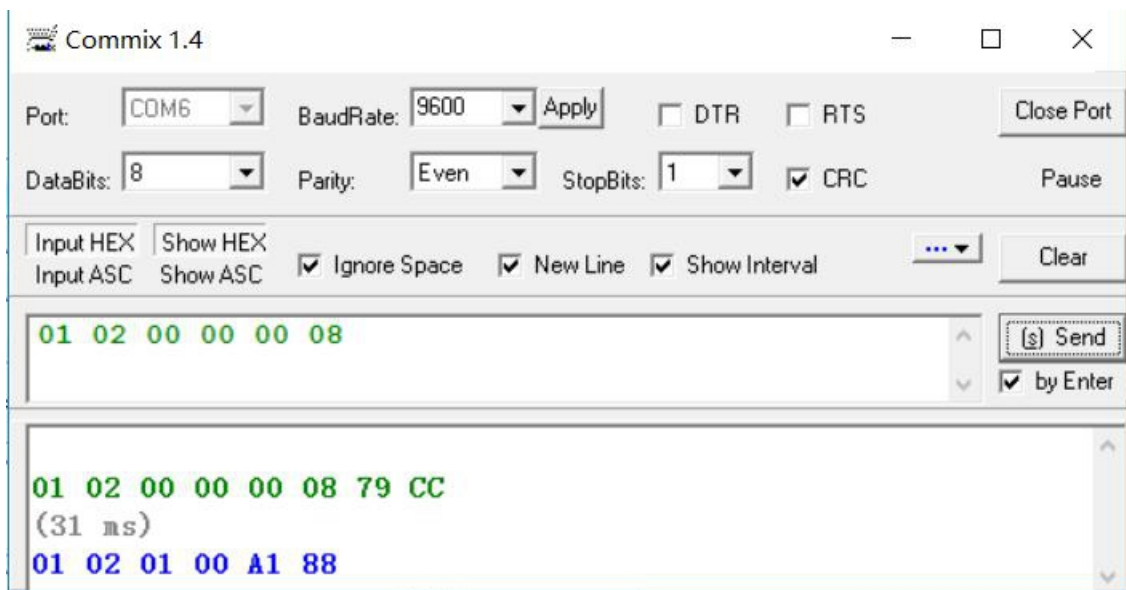
01 slavenumber

0F functioncode  
0000 startaddress of coil  
0002 number of forcedcoils  
01 number of bytes  
03 binarydata 0000 0011 means two coils set 1

Returned data  
01 slavenumber  
0F functioncode  
0000 startaddress of coil  
0002 number of forcedcoils

## 2.8.2 Read Input Status

Example 4 read input status of 10001~10008

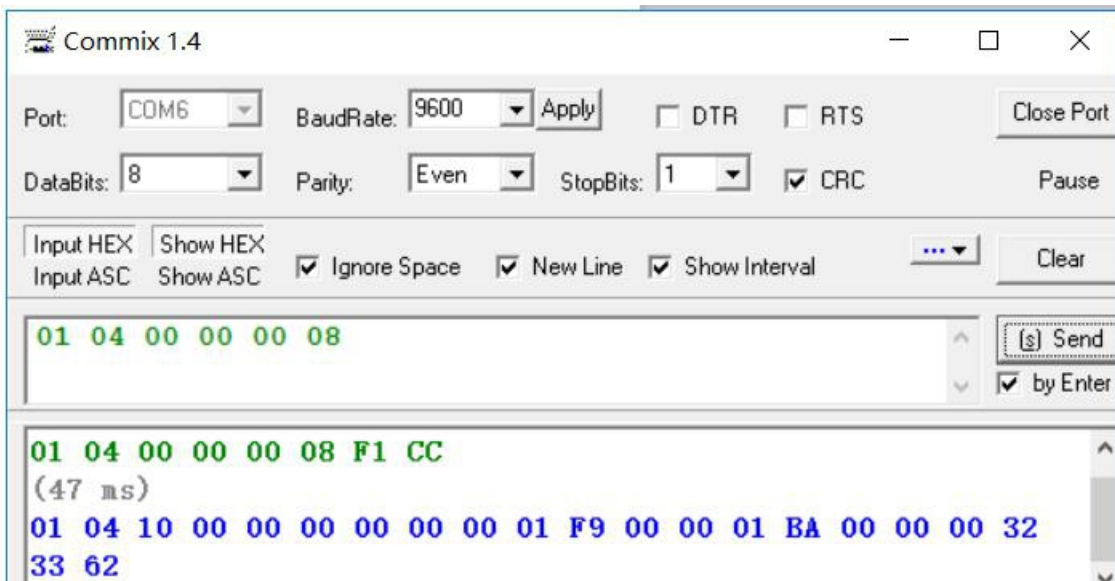


Transmitted data:  
01 slavenumber  
02 functioncode  
0000 startaddress of inputstatus  
0008 number of inputstatusread

Returned data  
01 slavenumber  
02 functioncode  
01 number of bytes returned  
00 the data of inputstatusreturned  
A188 CRC

## 2.8. 3Real-timedata

Example 5 read A/B/C phase current,Initial voltage,Starttime,Stop time,Average currentand frequency.



Transmitteddata:

01 slavenumber  
 04 functioncode  
 0000 startaddress  
 0008 number ofregisterread  
 F1CC CRC

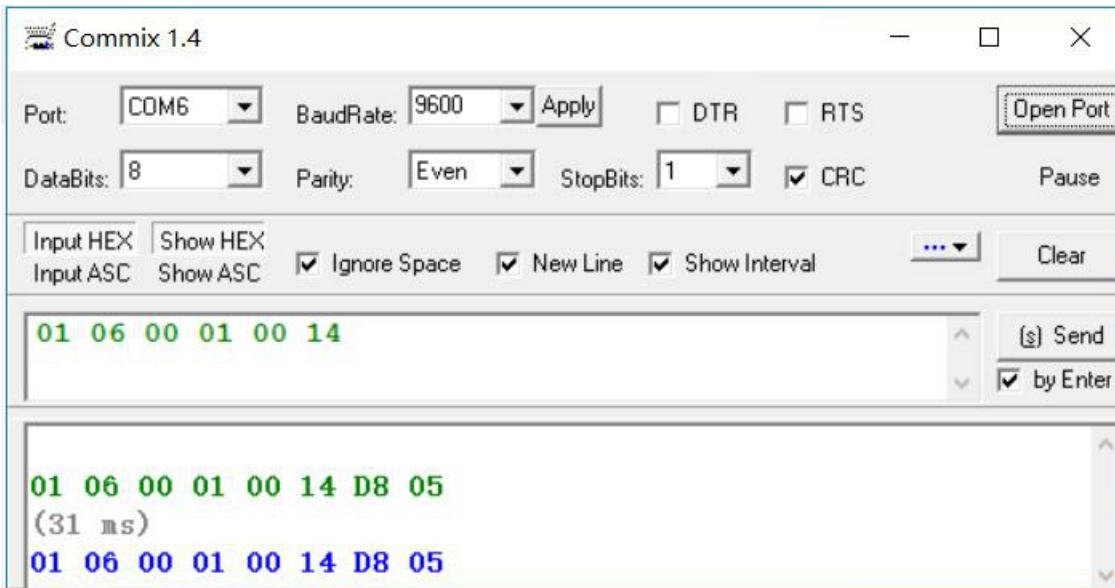
Returned data

01 slavenumber  
 04 functioncode  
 10 number ofbytes returned(16bytes)  
 0000 A phase current  
 0000 B phase current  
 001C C phase current  
 01F9 initialvoltage01F9=505 indecimal system. According tothe formula  $30 + \text{int}((512-505)/32) * 3 = 30\%$   
 0000 starttime 0000=0 indecimal system. According tothe formula  $\text{int}((512-0)/16) = 32\text{SEC}$   
 01BA stoptime01BA=442 indecimal system. According tothe formula  $\text{int}((512-442)/16) = 4\text{SEC}$   
 0009 average current  
 0032 frequency  
 3362 CRC



## 2.8.4 Parameter setting

Example 6 setFullLoad Amps (FLA)



Transmitted data:

01 slavenumber  
06 functioncode  
0001 address of register  
0014 data to set  
D805 CRC

Returned data:

01 slavenumber  
06 functioncode  
0001 address of register  
0014 data to set  
D805 CRC

## 2.8. 5D iagnostic

Example 7

