

Data Format: The data format is 10 bits: 1 start bit, 8 data bits, no parity bit, and 1 stop bit.

Baud rate: 9600 bps.

Communication address: Default 01, set by parameter ADD.

1. All commands sent and received by the torque meter are ASCII codes. The ASCII codes of common symbols are shown in the ASCII table of the appendix.

2. The torque meter will automatically recognize whether the command has a check code. If the command sent by the host has a check code, the meter is also returned a command with check code. It is recommended that all the data transmitted with check code to prevent receiving wrong data and improve the overall stability of the system.

3. Check code

- Features:

The check code helps detect command errors from the computer to the meter and detects incorrect answers from the meter to the computer. The check code function only adds 2 characters to the command and response string, so it won't affect the transfer rate.

- Settings:

Torque meter will automatically recognize whether the command has a check code. So it no needs to set whether using a check code.

- Format:

The check code range is from 00 to FFH, and is represented by two digit 40H~4FH ASCII codes. It sends before the command or answer terminator "↵" (0D). If the check code in the command sent by the computer is incorrect, the meter will not answer.

- Calculation:

a) The check code of the command is equal to the sum of the ASCII values (hexadecimal) of all commands. The remainder is retained when the range is exceeded.

b) The check code of the answer is equal to the sum of all the ASCII values (hexadecimal) of the reply plus the ASCII value of the meter's address. The remainder is retained when the range is exceeded.

4. Read measured value command format:

1 2 3 4 5

(start character) + ADD + channel number + check code + carriage return

Command explanation:

- ★ ADD (decimal): Communication address of torque meter.
- ★ Channel number (decimal): When the meter has multiple signals for measurement, here indicates which channel's measured value to read. When the meter is in single-channel measurement, the measured value can be read when the channel number is 00 or 01.
- ★ Check code: All characters from the command start character (including the start character) to check code before, are converted to ASCII hexadecimal, and then do hexadecimal addition operation. Overflow round down and only 1-byte remainder is retained, and then this byte remainder is converted to a 2-byte ASCII code of 40H ~ 4FH. For example, if the sum value is C2H, it is converted to 4C 42.
- ★ Carriage return: Terminator of the command.

5. Torque meter answer command format:

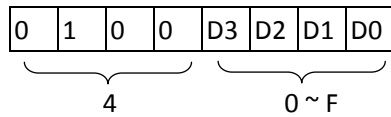
1 2 3 4 5 6

= +/- DATA Output state of alarm switch check code carriage return

- ★ "=": The answer starts with symbol "=".
- ★ "+/-": According to the actual measured value of the meter, positive value is "+", negative value is "-".
- ★ Data: It is the data area of the meter. The number of digits in the data area is generally 6 or 9 digits. Usually it's 6 digits, five digits number plus one decimal point, and the position of the decimal point is sent according to the display of the meter, such as "12.345". 9 digits of data is generally a flow integrating instrument or digital counter. It has eight digits number and one decimal point.
- ★ The calculation method of the check code is the same as the one before. It is worth noting that the meter address is included in the check code of the meter answer.

All characters from the command start character (including the start character) to check code before, are converted to ASCII hexadecimal, and then do hexadecimal addition operation. Overflow round down and only 1-byte remainder is retained, and then this byte remainder is converted to a 2-byte ASCII code of 40H ~ 4FH. For example, if the sum value is B2H, it is converted to 4B 42.

- ★ Output status of alarm switch: It occupies one character. The alarm status byte range is 40 ~ 4FH, and the lower 4 bits D0 to D3 indicate the status of the first to fourth alarm points respectively. "1" means in alarm state, the upper four bits are fixed at 0100.



★ Carriage return: The terminator of the command.

Examples

1. The example illustrates: The sending and receiving formats and the calculation method of the check code. (Suppose the meter communication address is 01.)

Command: # 0101NE ✓

(Send hexadecimal to the meter: 23 30 31 30 31 4E 45 0D)

Answer: = + 123.45ACG ✓

(The meter issues hexadecimal: 3D 2B 31 32 33 2E 34 35 41 43 47 0D)

2. The check code of the sending command string is calculated as follows:

Check code = 23H + 30H + 31H + 30H + 31H = E5H

The ASCII codes of #, 0, 1, 0, 1 are 23H, 30H, 31H, 30H, 31H. The sum of these ASCII codes is E6H, and the two ASCII codes of 40 ~ 4FH are expressed as 4EH, 45H, that is N, E. Finally, be sure to add the carriage return (0D) as the end character and send it to the meter. The meter receives the 23H as a valid read start character. After receiving the end character (0D), the command is judged for legality. If the end character (0D) is not received, the meter will consider it to be an invalid command.

3. The check code of the answer string is calculated as follows:

Check code = 3DH + 2BH + 31H + 32H + 33H + 2EH + 34H, 35H + 41H + 30H + 31H

= 237

The ASCII codes of =, +, 1, 2, 3, ., 4, 5, A are 3DH, 2BH, 31H, 32H, 33H, 2EH, 34, 35, 41, and the sum of these ASCII codes plus the meter address ASCII code 30H, 31H is 237H. And the remainder is 37H. Use the two-byte ASCII code of 40 ~ 4FH is expressed as 43H, 47H, that is, C and G.

4. Commands:

4.1 Read torque command: # 0101 (check code) ✓

(Answers begin with "=" and end with a carriage return)

4.2 Read speed command: # 0102 (check code) ✓

(Answers begin with "=" and end with a carriage return)

4.3 Read power command: # 0103 (check code) ✓

(Answers begin with "=" and end with a carriage return)

All command characters are transmitted in ASCII code.

4.4 Read the total command of torque, speed and power: # 0104 (check code) ✓

After the meter receives this command, it will transmit the three values at once. The transmission format is the same as that of each channel.

Appendix: Common ASCII Codes in Communication

Hexadecimal	ASCII	Hexadecimal	ASCII	Hexadecimal	ASCII
20	Space	37	7	49	I
21	!	38	8	4A	J
22	"	39	9	4B	K
23	#	3A	:	4C	L
24	\$	3B	;	4D	M
25	%	3C	<	4E	N
26	&	3D	=	4F	O
27	'	3E	>	50	P
2B	+	3F	?	51	Q
2D	-	40	@	52	R
2E	•	41	A	53	S
30	0	42	B	54	T
31	1	43	C	55	U
32	2	44	D	56	V
33	3	45	E	57	W
34	4	46	F	58	X
35	5	47	G	59	Y
36	6	48	H	5A	Z