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## **08 High-speed pulse output**

last modified by Stone Stone

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# ZRN/DZRN/Origin return

## ZRN/DZRN

This instruction is to use the specified pulse speed and pulse output port to make the actuator move to the origin of action (DOG) when the PLC and the servo drive work together, until the origin signal meets the conditions.

-[ZRN/DZRN (s1) (s2) (s3) (d)]

### Content, range and data type

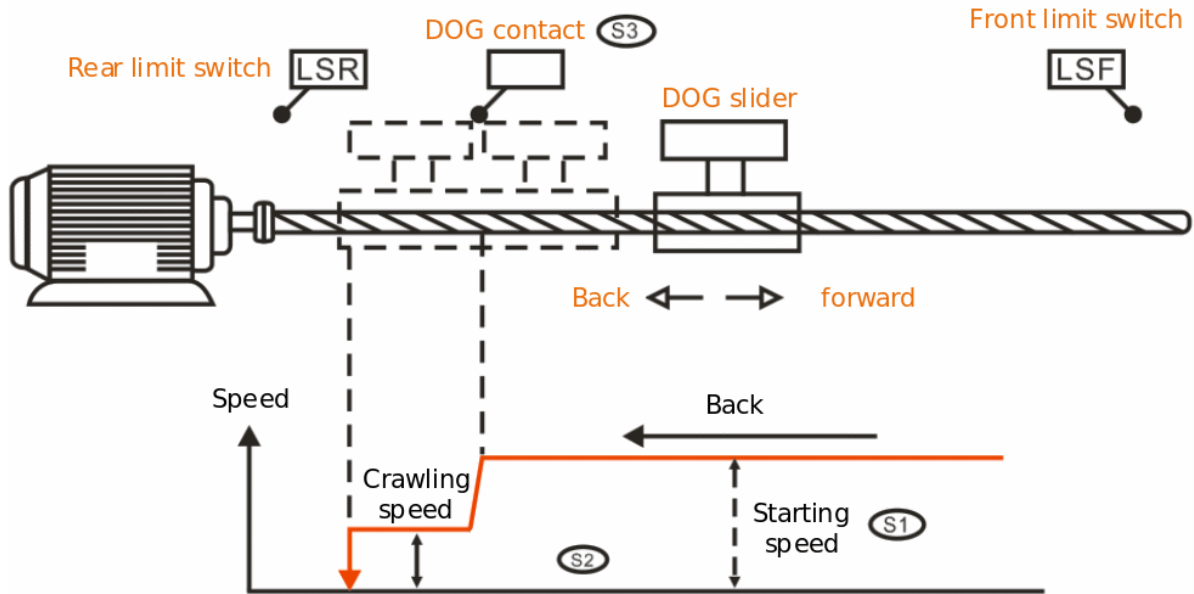
Parameter	Range
(S1) speed when the origin return starts	1 to 32767
(S2) speed	1 to 200000
(S3) speed	1 to 32767
(S4) speed	1 to 200000
(D1) device number of the input number of the near-point signal (DOG) to be input.	-
(D2) device number (Y) that outputs pulse	-

### Device used

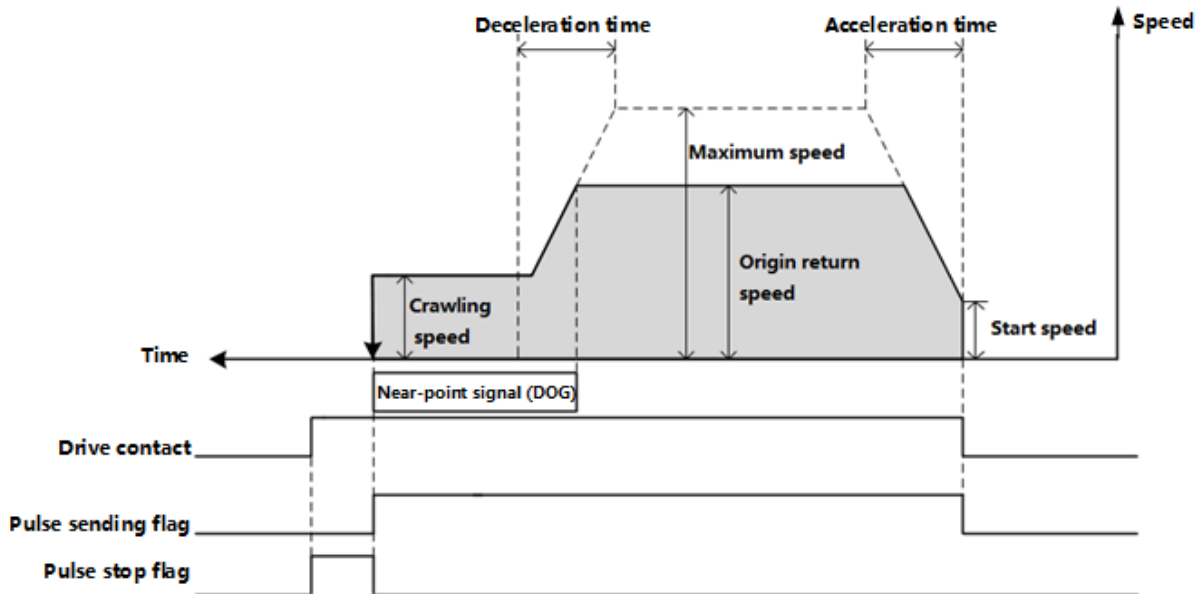
Instruction	Parameter	Devices						
		X	Y	M	S	KnX	KnY	KnM
ZRN	Parameter 1					●	●	●
	Parameter 2					●	●	●
	Parameter 3	●	●	●	●			
	Parameter 4		●					

### Features

This instruction is to use the specified pulse speed and pulse output port to make the actuator move to the origin of action (DOG) when the PLC and the servo drive work together, until the origin signal meets the conditions.



- Specify the speed at the start of origin return in (s1). (It should be in the range of 1 to 200,000)
- Specify the crawling speed in (s2). (It should be in the range of 1 to 200,000)
- Specify the device number of the input number of the near-point signal (DOG) to be input in (s3).
- Specify the device that outputs pulses in (d). Only Y devices with positioning parameters could be specified.
- After the DOG contact signal of this instruction disappears, the pulse stops immediately.
- The pulse frequency could be modified during operation.

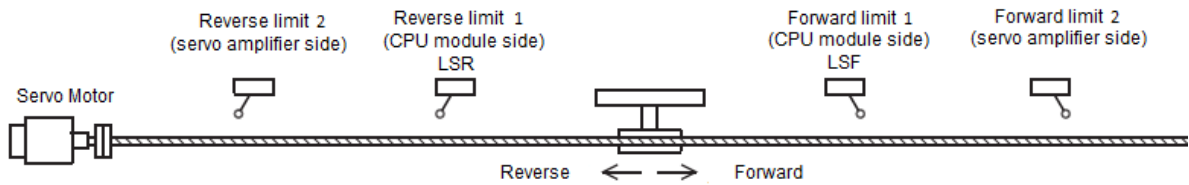


**#Note:**

Please do not duplicate soft components used for other controls.

When designing the near-point DOG, please consider that there is enough time to be ON to fully decelerate to the crawl speed.

Please set the near-point DOG between the reverse limit 1 (LSR) and the forward limit 1 (LSF). When near-point DOG, reverse limit 1 (LSR), forward limit 1 (LSF) do not form the relationship shown in the figure below, the action may not be performed.



Please make the crawling speed slow enough. Since it does not decelerate to stop, if the crawling speed is too fast, the stop position will shift due to inertia.

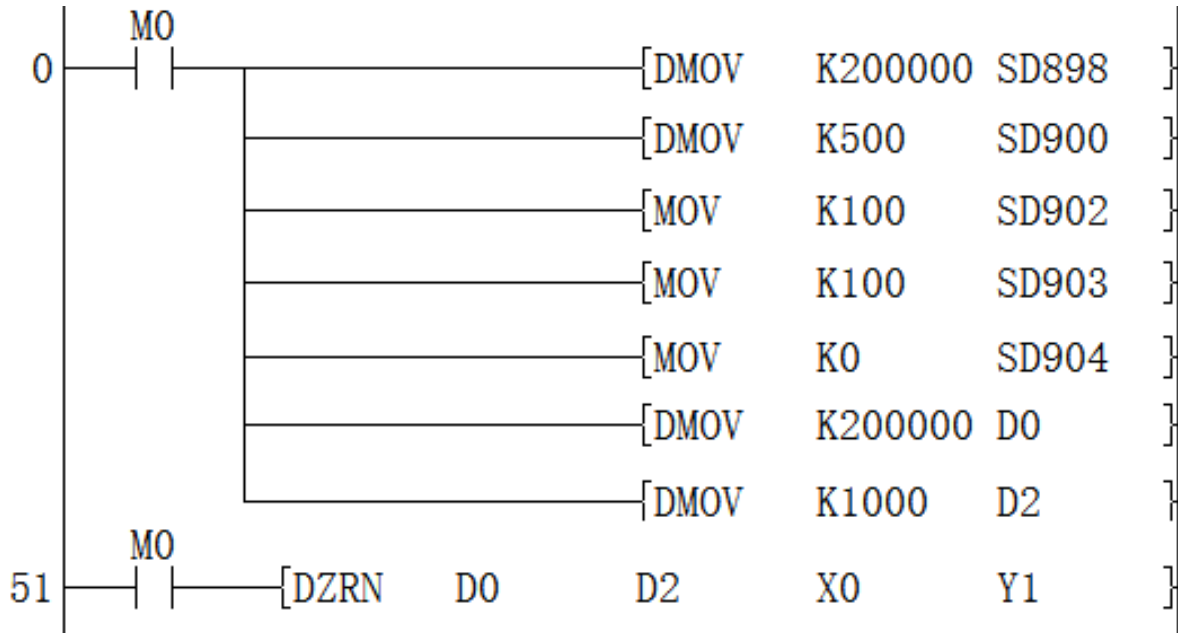
**Error code**

Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (s3) and (d) exceed the device range

4088H

The same pulse output axis (d) is used and has been started.

**Example**



Set Y1 as the output axis at a maximum speed of 200K, a offset speed of 500, and a acceleration/deceleration time of 100ms. Origin return is performed at the frequency of 200Khz, and it runs at a crawling speed after receiving the origin signal X0, and it stops after the X0 signal is reset.

## DSZR/DDSZR/Origin return

### DSZR/DDSZR

The instruction is that when the PLC works with the servo drive, it uses the specified pulse speed and pulse output port and the specified direction axis to move the actuator to the origin of the action (DOG) until the origin signal meets the conditions.

-[DSZR/DDSZR (s1) (s2) (s3) (d)]

#### Content, range and data type

**Parameter**

(S1) speed when the origin return starts

(S2) crawling speed

(S3) device number of the input number of the near-point signal (DOG) to be input.

(d) device number (Y) that outputs pulse

(d) operation direction output port or bit variable

**Range**

1 to 32767

1 to 200000

1 to 32767

1 to 200000

-

-

#### Device used

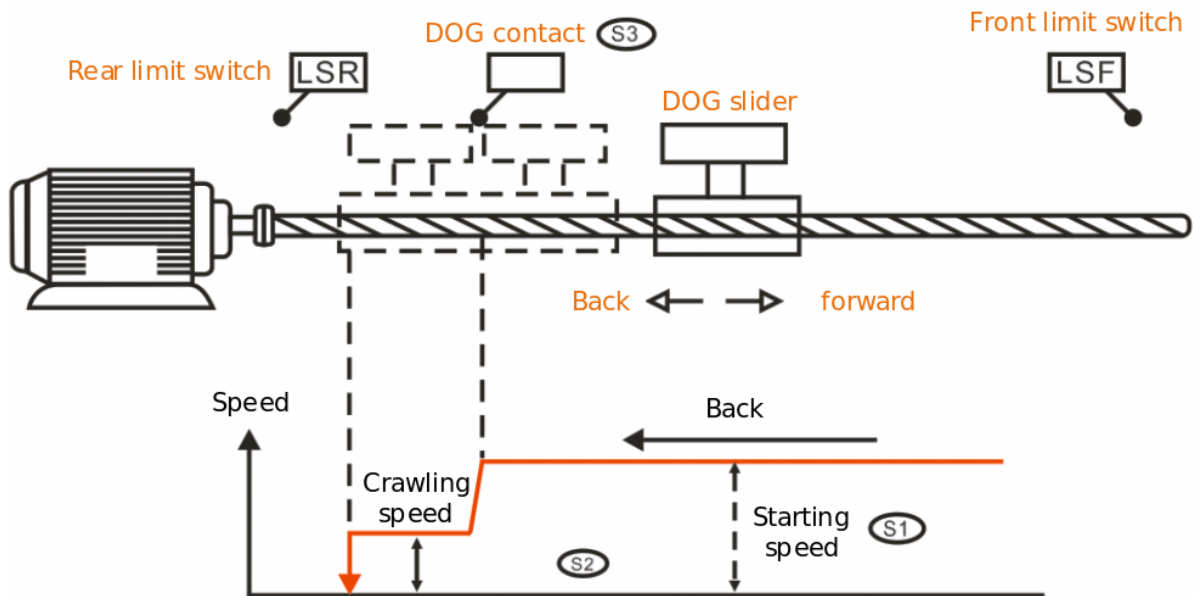
Instruction Parameter

Devices

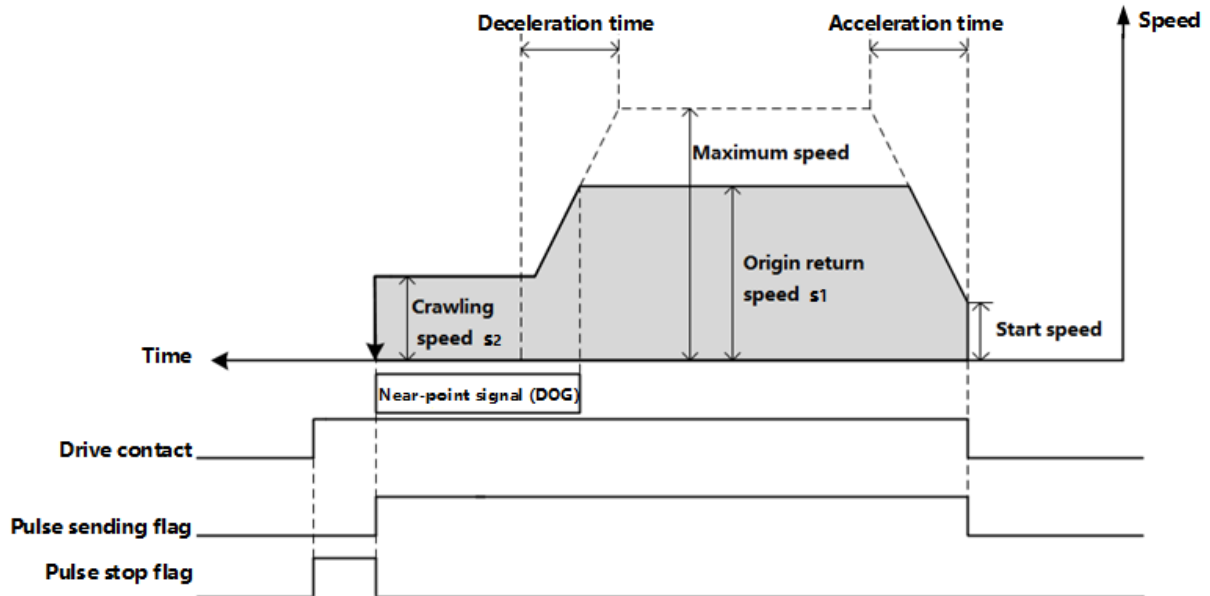
		X	Y	M	S	D.b	KnX	KnY	KnM
DSZR	Parameter 1						●	●	●
	Parameter 2						●	●	●
	Parameter 3	●	●	●	●				
	Parameter 4		●						
	Parameter 5		●	●	●	●			

**Features**

The instruction is that when the PLC works with the servo drive, it uses the specified pulse speed and pulse output port and the specified direction axis to move the actuator to the origin of the action (DOG) until the origin signal meets the conditions.



- Specify the speed at the start of origin return in (s1). (It should be in the range of 1 to 200000)
- Specify the crawling speed in (s2). (It should be in the range of 1 to 200000)
- Specify the device number of the input number of the near-point signal (DOG) to be input in (s3).
- Specify the device that outputs pulses in (d1). Only Y devices with positioning parameters could be specified.
- Specify the bit device that specify the pulse output direction signal in (d2). Only the device specified in parameters and universal output could be specified.
- After the DOG contact signal of this instruction disappears, the pulse stops immediately.
- The pulse frequency could be modified during operation.

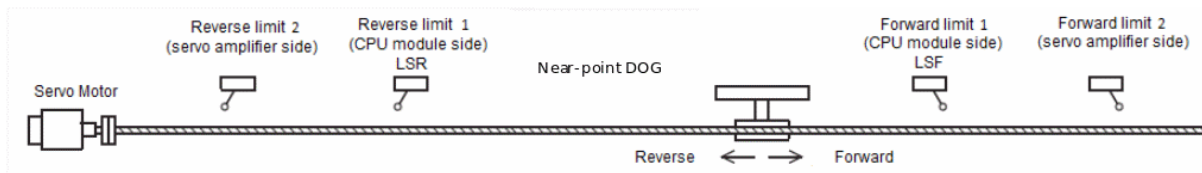


**#Note:**

Please do not duplicate soft components used for other controls.

When designing the near-point DOG, please consider that there is enough time to be ON to fully decelerate to the crawl speed.

Please set the near-point DOG between the reverse limit 1 (LSR) and the forward limit 1 (LSF). When near-point DOG, reverse limit 1 (LSR), forward limit 1 (LSF) do not form the relationship shown in the figure below, the action may not be performed.



Please make the crawling speed slow enough. Since it does not decelerate to stop, if the crawling speed is too fast, the stop position will shift due to inertia.

**Error code**

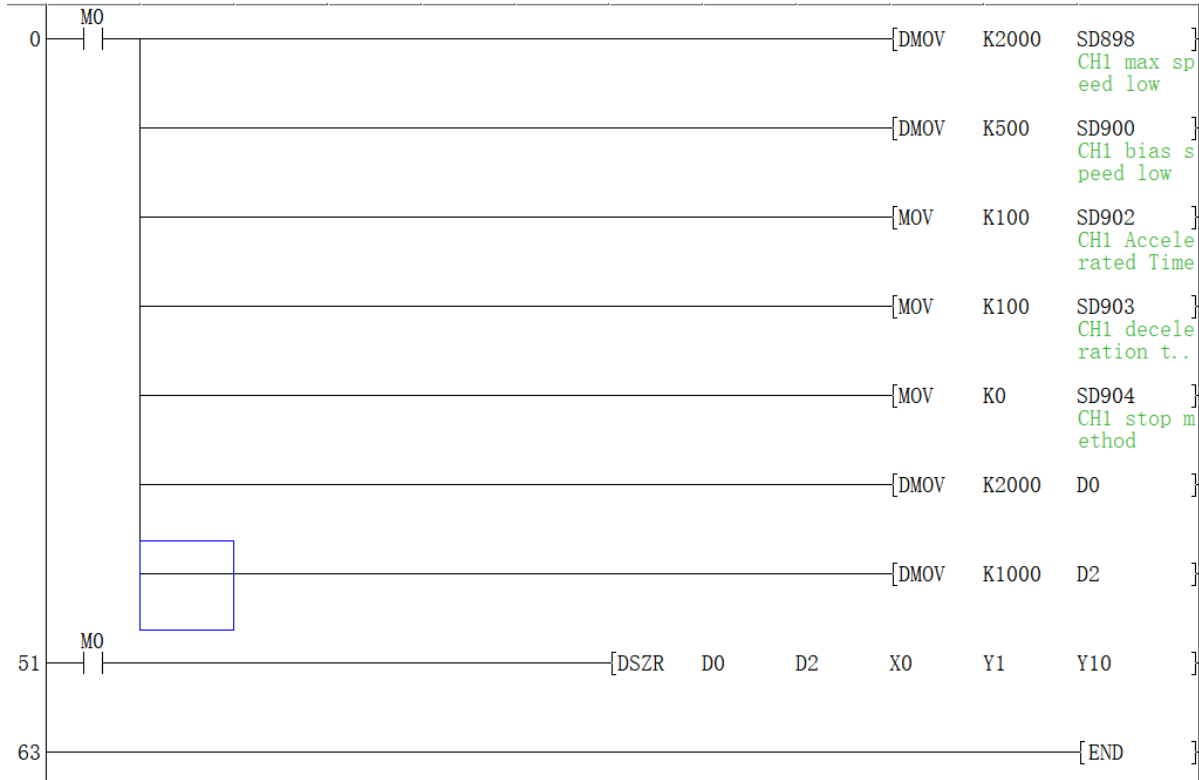
Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (s3), (d1) and (d2) exceed the device range



4088H

The same pulse output axis (d1) is used and has been started.

**Example**



Set Y1 as the output axis and Y10 as the direction axis at a maximum speed of 200K, a offset speed of 500, and a acceleration/deceleration time of 100ms. Origin return is performed at the frequency of 200Khz, and it runs at a crawling speed after receiving the origin signal X0, and it stops after the X0 signal is reset.

## DVIT/DDVIT/16-bit data relative positioning

### DVIT/DDVIT

This instruction outputs the specified number of pulses according to the specified port, frequency and running direction. When an interrupt signal is received, it will stop after sending the specified number of pulses.

-[DVIT/DDVIT (s1) (s2) (d1) (d2) (d3)]

**Content, range and data type**

Parameter	Content	Range	Data type	Data type (label)
(s1)	Specify the number of output pulses	-32768 to +32767 -2147483648 to 2147483647	Signed BIN16/ Signed BIN32	ANY16_S/ANY32_S
(s2)	Specify the frequency of output pulse	1 to 32767 1 to 200000	Signed BIN16/ Signed BIN32	ANY16_S/ANY32_S
(d1)	Specify output pulse port	-	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL
(d3)	Interrupt signal	-	Bit	ANY_BOOL

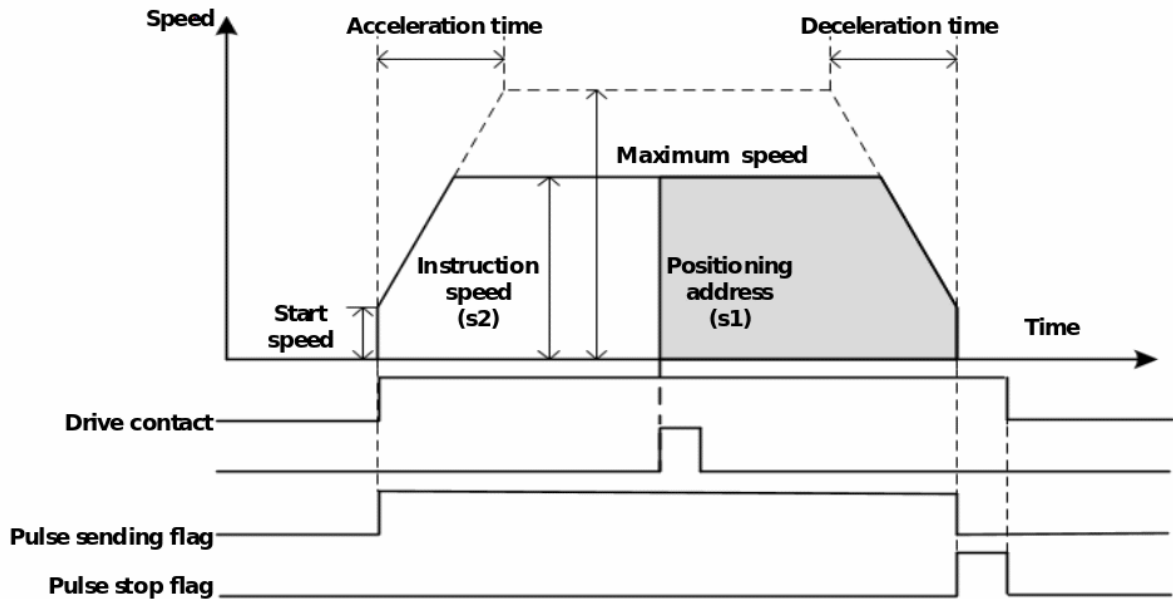
**Device used**

Instruction	Parameter	Devices	Offset modification	Pulse extension XXP
DV	Parameter 1	X Y M S	D. b Kn Kn Kn Mn S C D R K H [D]	
	Parameter 2		• • • • • • • • • • • • • •	
	Parameter 3	•		
	Parameter 4	• • • •		
	Parameter 5	• • •		

**Features**

This instruction uses relative drive to perform 1st gear positioning. The specified positioning address adopts incremental mode, and positioning is performed by specifying the moving direction and the moving amount (relative address) from the current position.

- Specify the number of output pulses in (s1). (It should be in the range of -2,147,483,647 to +2,147,483,647)
- Specify the instruction speed of user units in (s2). (It should be in the range of 1 to 200,000)
- Specify the device that outputs pulses in (d1). Only Y devices with positioning parameters can be specified.
- Specify the bit device of the pulse output direction signal in (d2). Only the devices and general outputs specified in the parameters could be specified.
- Specify the bit device of the interrupt signal in (d3). Only the devices and general outputs specified in the parameters could be specified.



**#Note:**

Please do not duplicate device used for other controls.

If the positioning address (s1) is 0 when the instruction is started, it will end abnormally and report 4084H error.

Before the interrupt input signal 1 is detected, if the positioning address (s1) is changed to 0, the positioning operation will continue, and the pulse output will stop after the input interruption, and it will end normally.

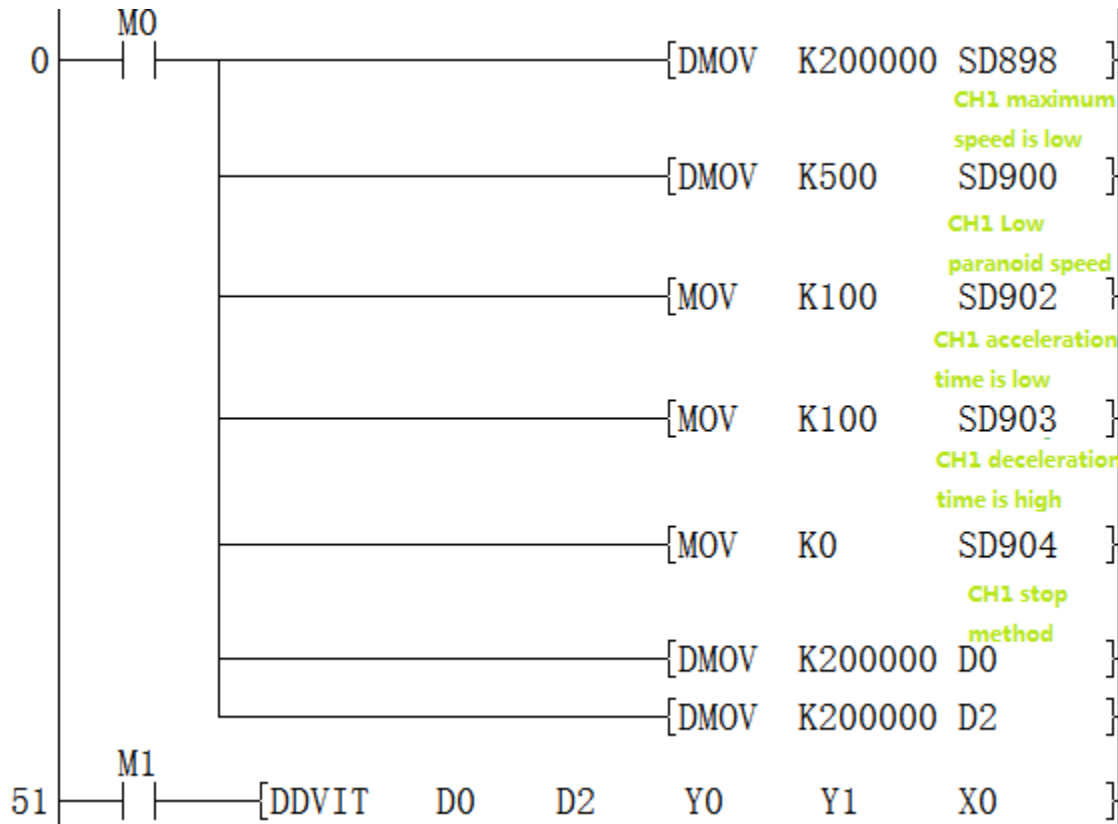
After the interrupt input signal 1 is detected, when the positioning address (s1) is changed to 0, it will decelerate to a stop, reverse the output direction, and continue to operate until the positioning address of the interrupt is input, and end normally.

When the number of pulses is less than the number required for deceleration and stop, it stops immediately when the positioning address is reached.

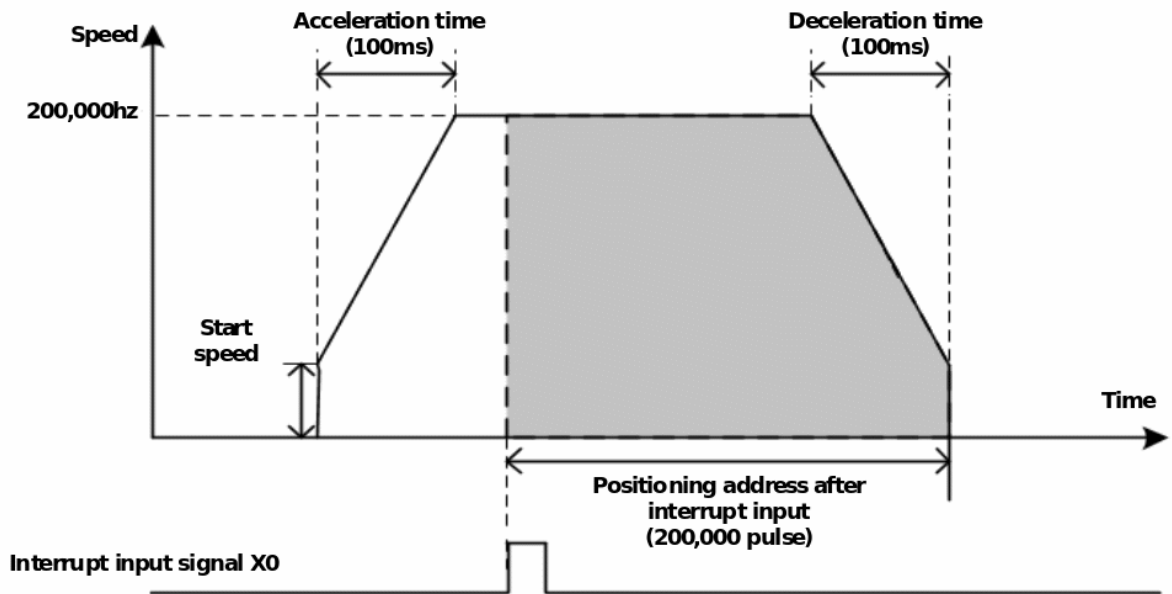
**Error code**

Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (d1), (d2) and (d3) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.

**Example**



Set Y0 as the output axis and Y1 as the direction axis with the maximum speed of 200K, the offset speed of 500, and the acceleration/deceleration time of 100ms, and run at a frequency of 200,000, and send 200,000 pulses after receiving the X0 signal.



## DRVI/DDRVI/Relative positioning

### DRVI/DDRVI

Execute single-speed positioning instructions in relative drive mode. The method of specifying the movement distance from the current position with positive/negative signs is also called incremental (relative) drive mode.

-[DRVI/DDRVI (s1) (s2) (d1) (d2)]

#### Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Specify the number of output pulses (relative address)	-32768 to 32767 -2147483648 to +2147483647	Signed BIN16/ Signed BIN32	ANY16_S/ ANY32_S
(s2)	Specify the frequency of output pulse	1 to 32,767 1 to 200,000	Signed BIN16/ Signed BIN32	ANY16_S/ ANY32_S
(d1)	Specify the device number of output pulse	-	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

#### Device used

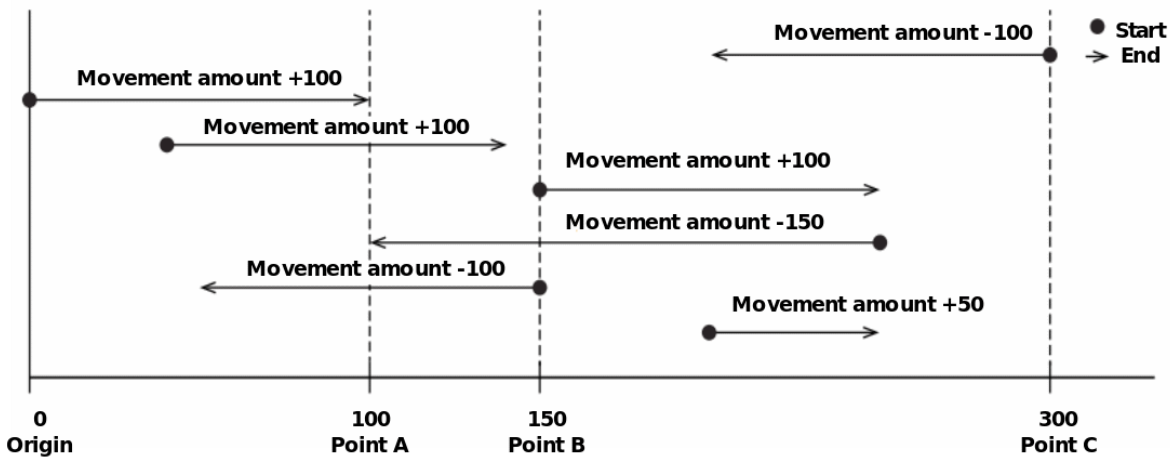
Instruction	Parameter	Devices
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DRVI	Parameter 1	Y	M	S	D.b	KnX	KnY	KnM
	Parameter 1					●	●	●
	Parameter 2					●	●	●
	Parameter 3	●						
	Parameter 4	●	●	●	●			

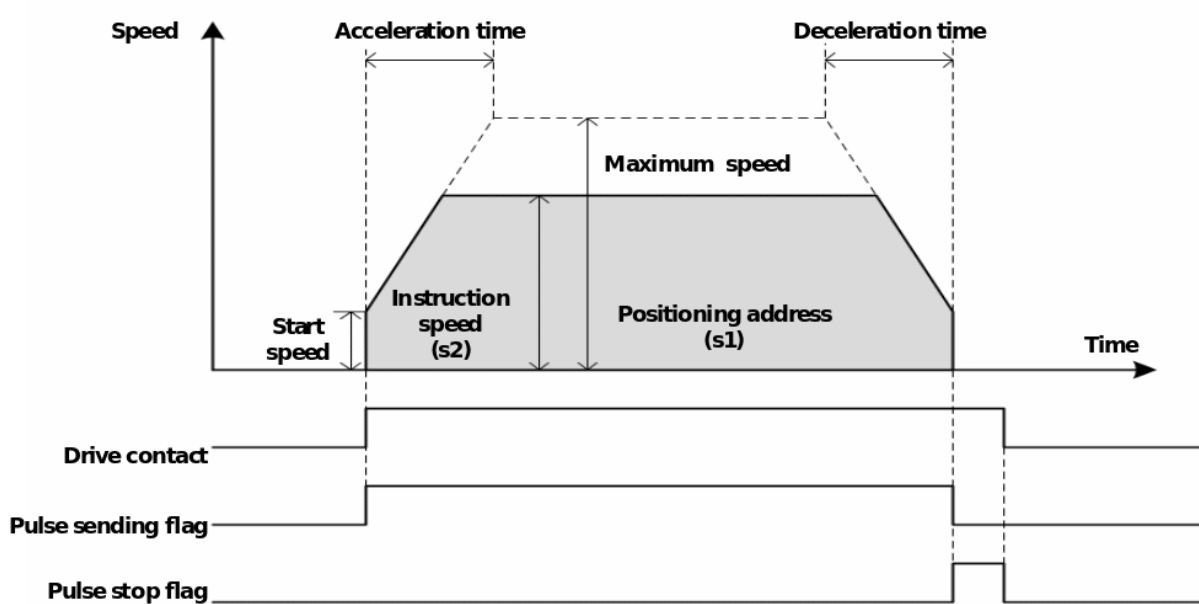
**Features**

This instruction uses incremental mode (specified by position of relative address) to perform single-speed positioning.

With the current stop position as the starting point, specify the movement direction and movement amount (relative address) for positioning.



- Specify the positioning address of the user unit with a relative address in (s1). (It should be in the range of -2147483647 to +2147483647)
- Specify the instruction speed of user unit in (s2). (It should be in the range of 1 to 200,000)
- Specify the device that outputs pulses in (d1). Only Y devices with positioning parameters could be specified.
- Specify the bit device of the output direction signal in (d2). Only the devices and general outputs specified in the parameters could be specified.
- The pulse frequency and pulse position could be modified during the operation of this instruction.



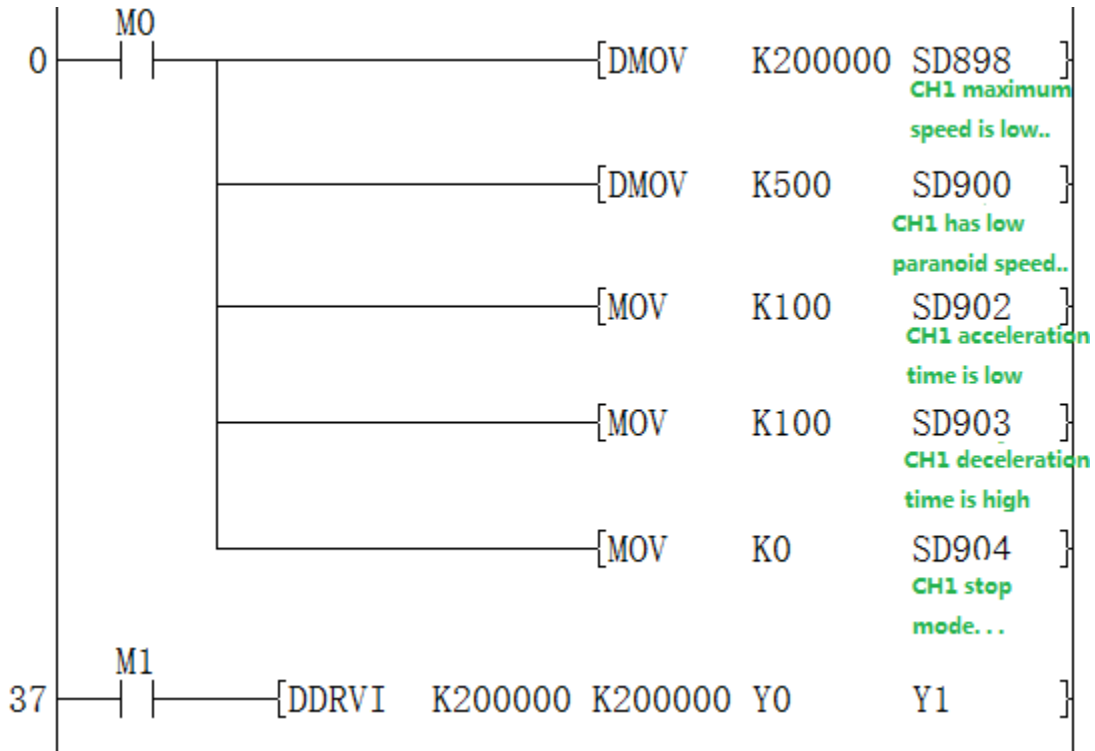
**#Note:**

Please do not duplicate device used for other controls.

**Error code**

Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.

**Example**



Set Y0 as the output axis, and Y1 as the direction axis with the maximum speed in 200K, and the offset speed in 500, and the acceleration/deceleration time in 100ms. Send a high-speed pulse with acceleration and deceleration at a frequency of 200KHZ, and a pulse number of 200K.

## DRVA/DDRVA/Absolute positioning

### DRVA/DDRVA

Execute single-speed positioning instructions in absolute drive mode. The method of specifying the movement distance from the origin (zero) is also called the absolute drive method.

-[DRVA/DDRVA (s1) (s2) (d1) (d2)]

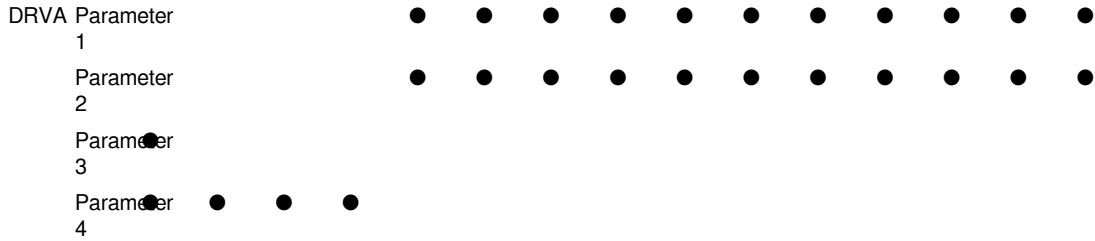
#### Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Specify the number of output pulses (absolute address)	-32768 to 32767	Signed BIN16	ANY16_S
		-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Specify the frequency of output pulse	1 to 32767	Signed BIN16	ANY16_S
		1 to 200000	Signed BIN32	ANY32_S
(d1)	Specify the device number of output pulse	-	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

#### Device used

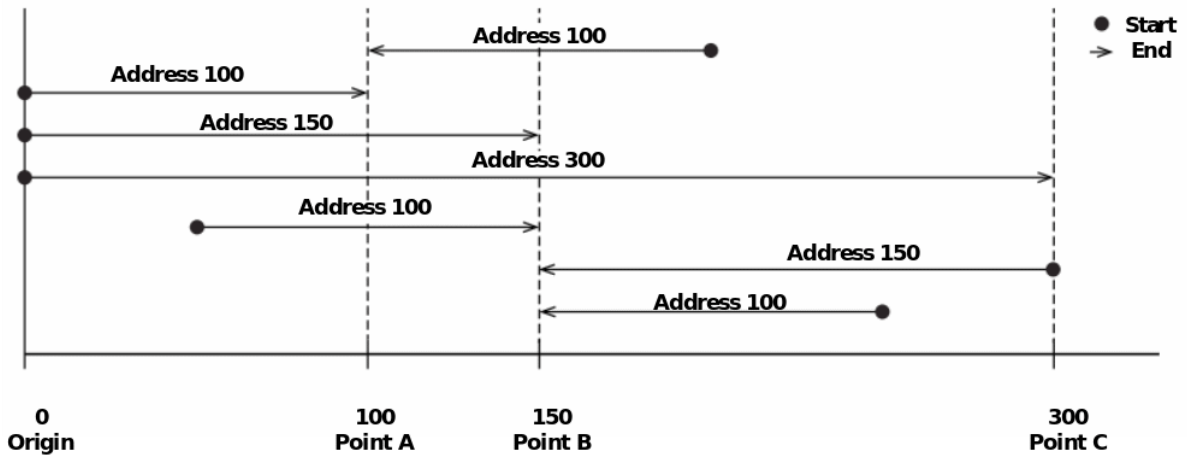
#### Instruction Parameters

Y	M	S	D.b	KnX	KnY	KnM	KnS	T	C	D	R	K	H	[D]	Offset Pulse modification extension
															XXP



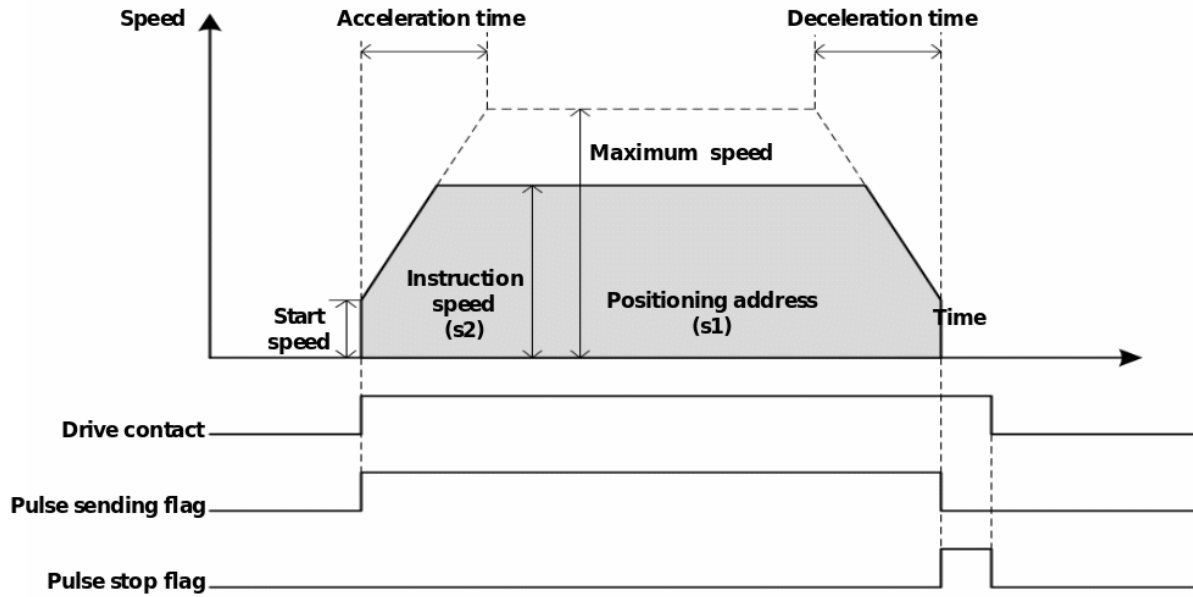
**Features**

This instruction uses absolute drive to perform single-speed positioning. The specified positioning address adopts the absolute method, and the specified position (absolute address) is used for positioning based on the origin.



- Specify the positioning address of user unit with a absolute address in (s1). (It should be in the range of -2,147,483,647 to +2,147,483,647)
- Specify the instruction speed of user unit in (s2). (It should be in the range of 1 to 200,000)
- Specify the device that outputs pulses in (d1). Only Y devices with positioning parameters could be specified.
- Specify the bit device of the output direction signal in (d2). Only the devices and general outputs specified in the parameters could be specified.
- The pulse frequency and pulse position could be modified during the operation of this instruction.





**#Note:**

Please do not duplicate device used for other controls.

**Error code**

**Error code**

4084H

**Content**

The data input in the application instruction (s1) and (s2) exceed the specified range

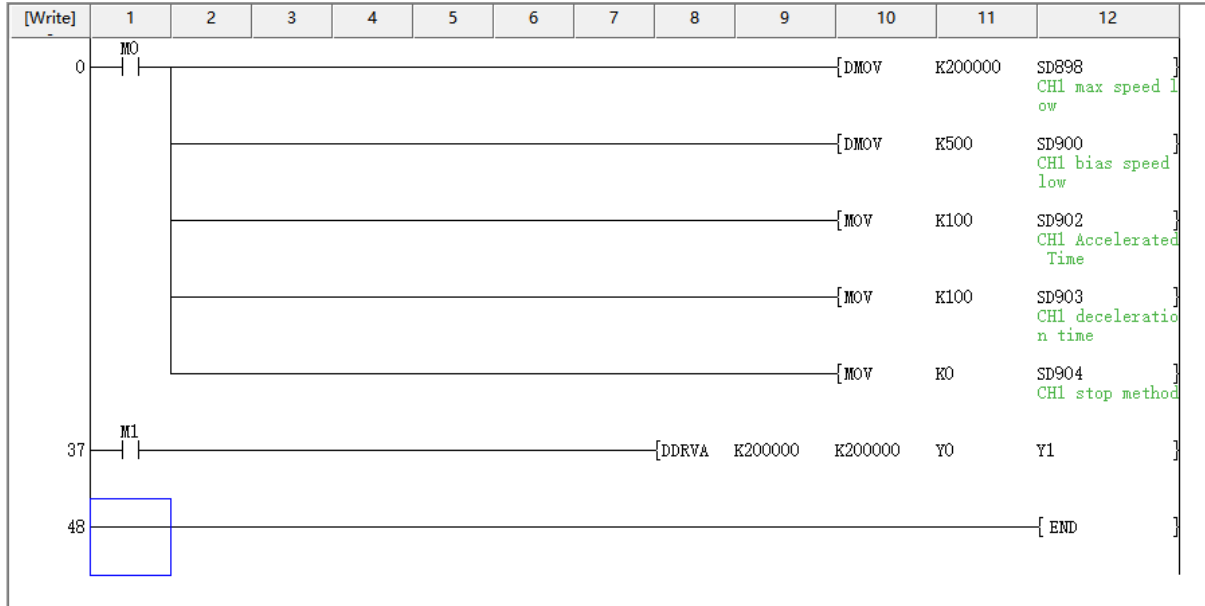
4085H

The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range

4088H

The same pulse output axis (d1) is used and has been started.

**Example**



Set Y0 as the output axis, and Y1 as the direction axis with the maximum speed in 200K, and the offset speed in 500, and the acceleration/deceleration time in 100ms. Send a high-speed pulse with acceleration and deceleration at a frequency of 200KHZ, starting at the origin position and ending at 200,000

## PLSR/DPLSR/Pulse output with acceleration and deceleration

### PLSR/DPLSR

Pulse output instruction with acceleration and deceleration function.

-[PLSR/DPLSR (s1) (s2) (s3) (d)]

#### Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Specify the frequency of output pulse	(1 to 32767) (1 to +200000)	Signed BIN16/ Signed BIN32	ANY16_S/ ANY32_S
(s2)	Specify the number of output pulse	(0 to 32767) (0 to +2147483647)	Signed BIN16/ Signed BIN32	ANY16_S/ ANY32_S
(s3)	Save acceleration and deceleration time (ms) data	(50 to 32000) (0: No acceleration or deceleration)	Signed BIN16/ Signed BIN32	ANY16_S/ ANY32_S
(d)	The device number of output pulse	-	Bit	ANY_BOOL

#### Device used

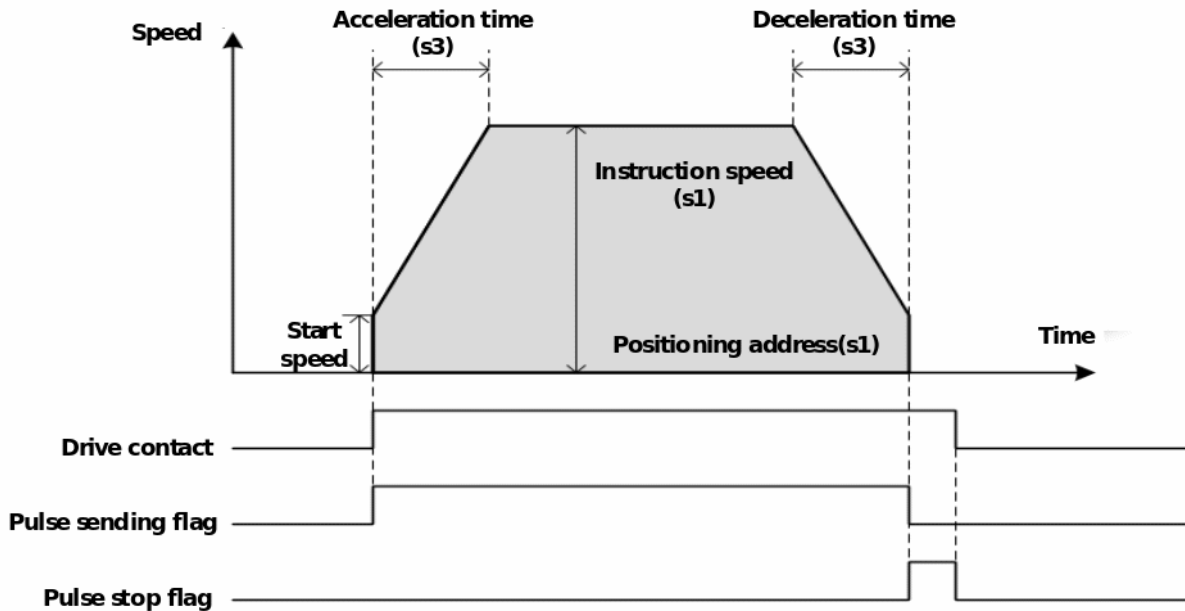
Instruction	Parameter	Devices	Offset modification	Pulse extension
		Y KnX KnY KnM KnS T C D R K H [D]		XXP
PLSR	Parameter 1	● ● ● ● ● ● ● ● ● ● ● ●	●	

Parameter 2	●	●	●	●	●	●	●	●	●	●	●
Parameter 3	●	●	●	●	●	●	●	●	●	●	●
Parameter 4	●										

**Features**

Pulse output instruction with acceleration and deceleration function.

- Specify the output instruction speed in (s1). (It should be in the range of 1 to 200,000)
- Specify the number of output pulses in (s2). (It should be in the range of 0 to +2,147,483,647)
- Specify the acceleration/deceleration time (ms) in (s3). (It should be in the range of 50 to 32,000. If set to 0, no acceleration or deceleration will be performed)
- Specify the device that outputs pulses in (d). Only output devices (Y) with positioning parameters could be specified.



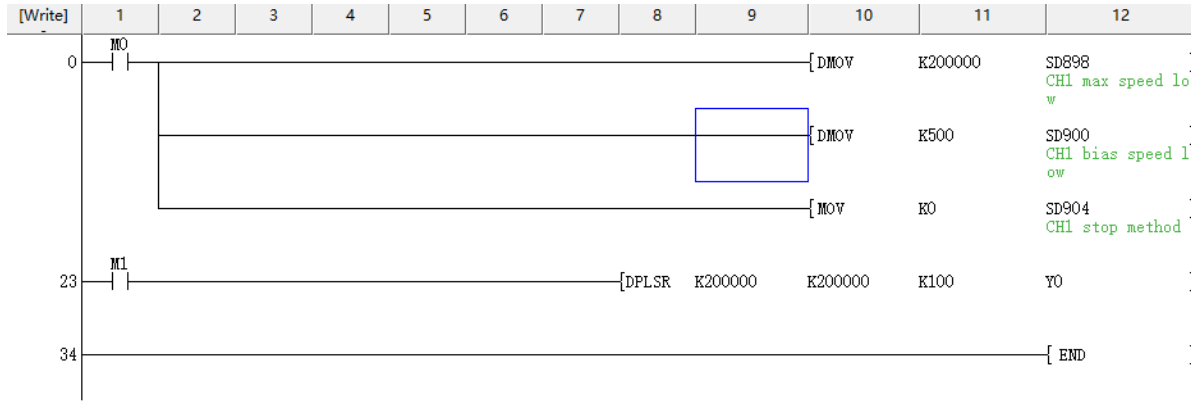
**#Note:**

Please do not duplicate device used for other controls.

**Error code**

Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (s3) and (d) exceed the device range
4088H	The same pulse output axis (d) is used and has been started.

**Example**



Set Y0 as the output axis at a maximum speed of 200K, and a offset speed of 500, and a acceleration/ deceleration time of 100ms. Send a high-speed pulse with acceleration and deceleration at a frequency of 200KHZ, a pulse number of 200K.

## PLSR2/Multi-speed positioning

### PLSR2

The PLSR2 instruction sets parameters in the form of a table, and generates relative and absolute position pulse instructions according to the specified port, frequency, running direction and acceleration/deceleration time in segments, so that the servo actuator could make a given offset based on the current position.

-[PLSR2 (s) (d1) (d2)]

#### Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The parameter address is an area with Dn as the starting address	-	Signed BIN16/ Signed BIN32	ANY16_S/ ANY32_S
(d1)	The device (Y) number of output pulse	-	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

#### Device used

Instruction	Parameter	Devices					Offset modification	Pulse extension
		Y	M	S	D.b	D		
PLSR2	Parameter 1					●	●	●
	Parameter 2	●						
	Parameter 3	●	●	●	●			

#### Features

The PLSR2 instruction sets parameters in the form of a table, and generates relative and absolute position pulse instructions according to the specified port, frequency, running direction and acceleration/deceleration time in segments, so that the servo actuator could make a given offset based on the current position.

- Specify the parameter address in (s), which is an area with Dn as the starting address.
- Specify the device that outputs pulses in (d1). Only Y devices with positioning parameters could be specified.
- Specify the bit device of the output direction signal in (d2). Only the devices and general outputs specified in the parameters could be specified.
- During the operation of this instruction, only the pulse frequency and pulse position of the last segment could be modified. If the value exceeds the parameter range, it will stop with an error.
- The number of pulse segments could not be modified while the instruction is running. If the number of segments is modified, the error will stop.
- When the instruction has a waiting condition or the reverse operation need to stop to restart, use the same start frequency and end frequency as the first segment.

Instruction parameter configuration table:

Address offset (s)	Content	Instruction
(S) + 0	The number of pulse segments	(1-n)
(S) + 1	Form identification	Reserved
(S) + 2	The first segment pulse frequency	1HZ to 200,000HZ
(S) + 3		
(S) + 4	The number of pulses in the first segment	None
(S) + 5		
(S) + 6	The first segment waiting condition	0: Pulse sending completed 1: Waiting time 2: Waiting signal (ON valid) 3: Waiting signal (OFF is effective) 4: Trigger signal (rising edge) 5: Trigger signal (falling edge) (Use with [Waiting Condition] and [Waiting Register])
(S) + 7	The first segment waiting register type	Correspondence between waiting conditions and waiting register types: Pulse sending completed: none Waiting time: =0: D register; =1: constant; Waiting signal: =0: X-bit register; =1: M-bit register; =2: S-bit register; =3: Y-bit register; Trigger signal: =0: X-bit register; =1: M-bit register; =2: S-bit register; =3: Y-bit register
(S) + 8	The first segment constant value/waiting register number	None
(S) + 9		
(S) + 10	The first segment operation mode	0: Relative mode; 1: Absolute mode
(S) + 11	Reserved	Reserved

...	...	...
(S)+2+(n-1)*10	The Nth segment pulse frequency	1HZ to 200,000HZ
(S)+3+(n-1)*10		

**Parameter Description**

**(1) Number of pulse segments:**

(s) + 0 is used to set the number of pulse segments (single word), and the number of segments needs to be greater than 0 segment, Pay attention to whether the table range exceeds the maximum usable device value.

**(2) Form ID:**

(s) +1: reserved.

**(3) Pulse mode:**

(s) +(n-1)\*10+10 (single word) is the pulse mode of the nth segment. When it is set to 0, it is relative mode, that is, the number of pulses and the current position register are relative positions. When it is set to 1, it is absolute mode, that is, the pulse number and current position register are absolute positions.

**(4) Waiting conditions:**

(s) +(n-1)\*10+6 (single word) is the waiting condition of the nth segment, (s) +(n-1)\*10+7 (single word) is the waiting register type, (s) + (n-1)\*10+8 (double word) is the waiting register number or constant value.

Waiting condition = 0 means no waiting condition, = 1 means waiting time, = 2 means waiting signal (high level), = 3 means waiting signal (low level), = 4 means trigger signal (rising edge)), = 5means trigger signal (falling edge).

The waiting condition is used in conjunction with the waiting register and the waiting register number/constant value.

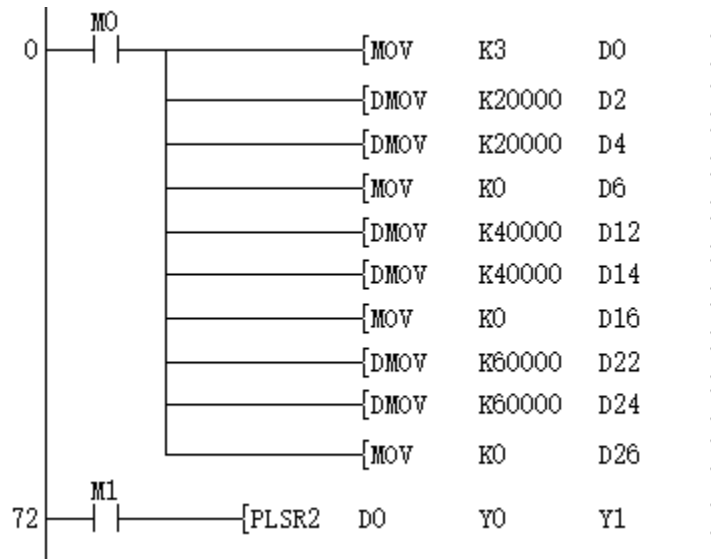
1) No waiting conditions

When (s) +(n-1)\*10+6=0, it is no waiting condition, that is, after the number of pulses set in this segment is executed, it will immediately jump to the pulse segment specified later.

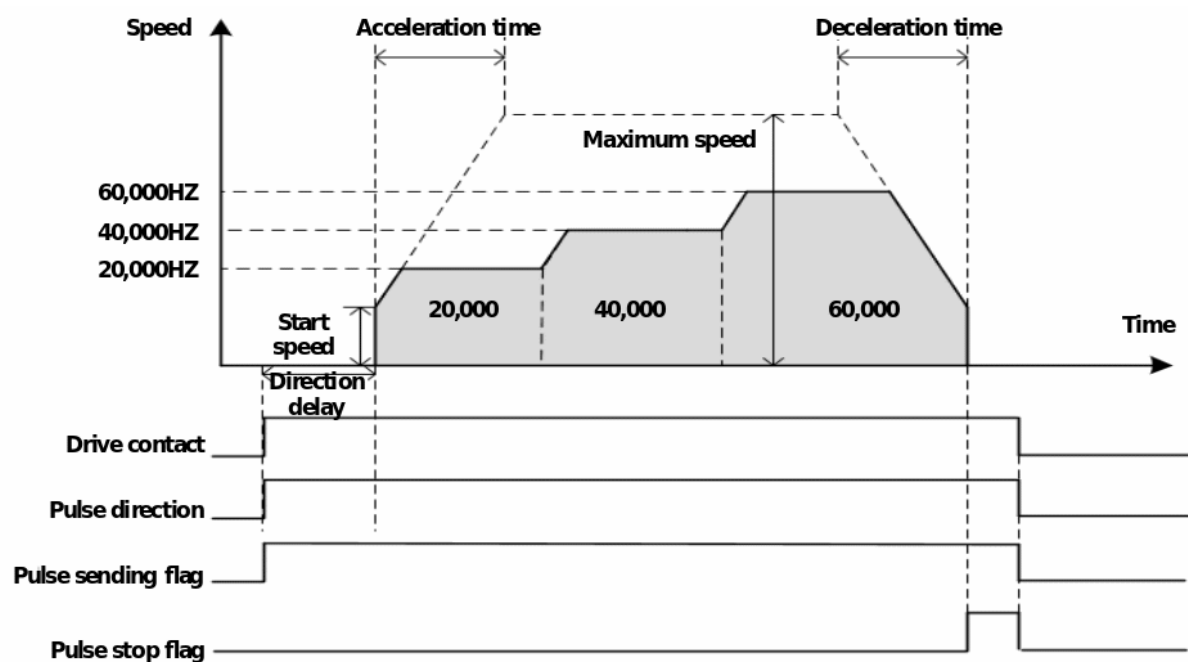
Example one: Three pulses are needed now. The pulse frequency of the first segment is 2,000Hz, and the number of pulses is 2,000; The pulse frequency of the second segment is 4,000Hz, and the number of pulses is 4,000; The pulse frequency of the third segment is 6,000 with no waiting conditions.

The number of segments	Pulse frequency	The number of pulses	Waiting mode	Condition
1	20,000	20,000	No waiting conditions	K0
2	40,000	40,000	No waiting conditions	K0
3	60,000	60,000	No waiting conditions	K0

The ladder program parameter settings are as follows:



The waveform diagram is as follows:



## 2) Waiting time

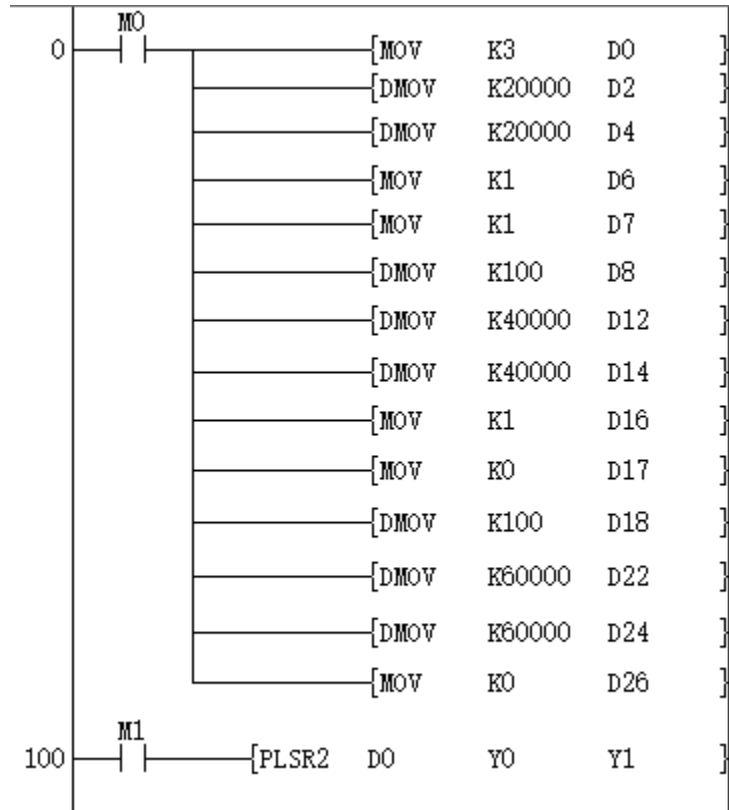
When  $(s) + (n-1) \cdot 10 + 6 = 1$ , it is the waiting time. When  $(s) + (n-1) \cdot 10 + 7 = 0$ , it is waiting D register, when  $= 1$ , it is waiting constant.

After the pulse output of the current segment is completed, start timing. When the timing time is up, it will immediately jump to the specified pulse segment; the timing time could be constant or specified by register D, unit: ms (range: 1-65,535ms).

Example 2: Three pulses are needed now. The pulse frequency of the first segment is 20,000Hz, and the number of pulses is 20,000, and the waiting time is K100ms. The pulse frequency of the second segment is 40,000Hz, and the number of pulses is 40,000; and the waiting time is K100ms. The pulse frequency of the third segment is 60,000, and the number of pulses is 60,000 with no waiting conditions.

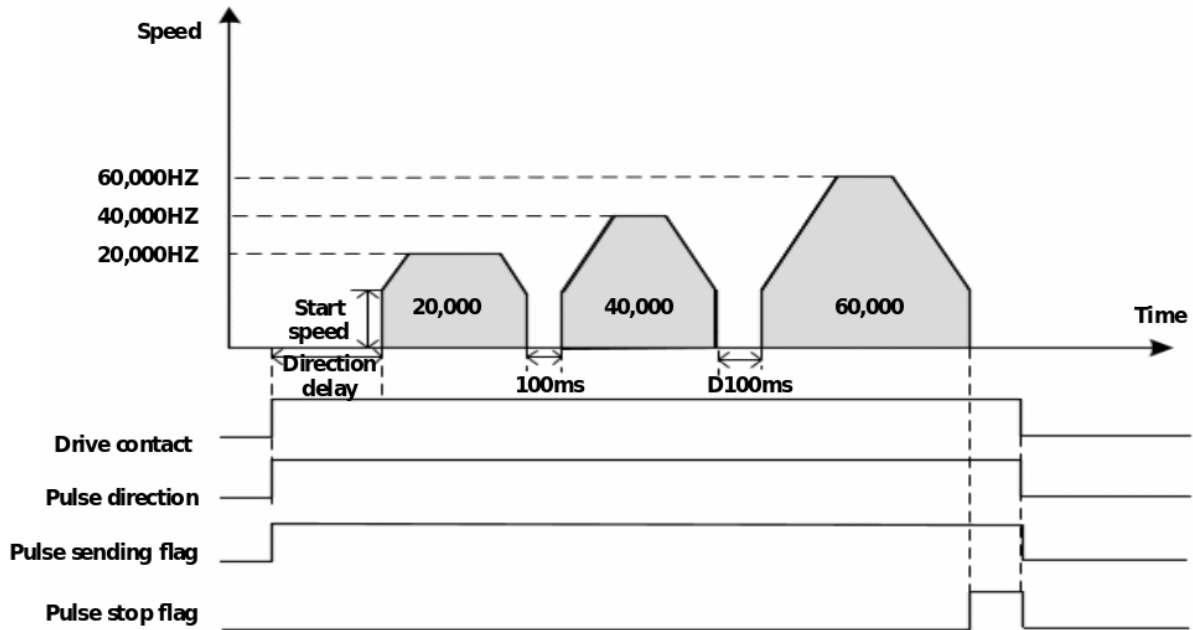
The number of segments	Pulse frequency	The number of pulses	Waiting mode	Condition
1	20,000	20,000	waiting time	K100
2	40,000	40,000	waiting time	D100
3	60,000	60,000	No waiting conditions	K0

The ladder program parameter settings are as follows:



The waveform diagram is as follows:





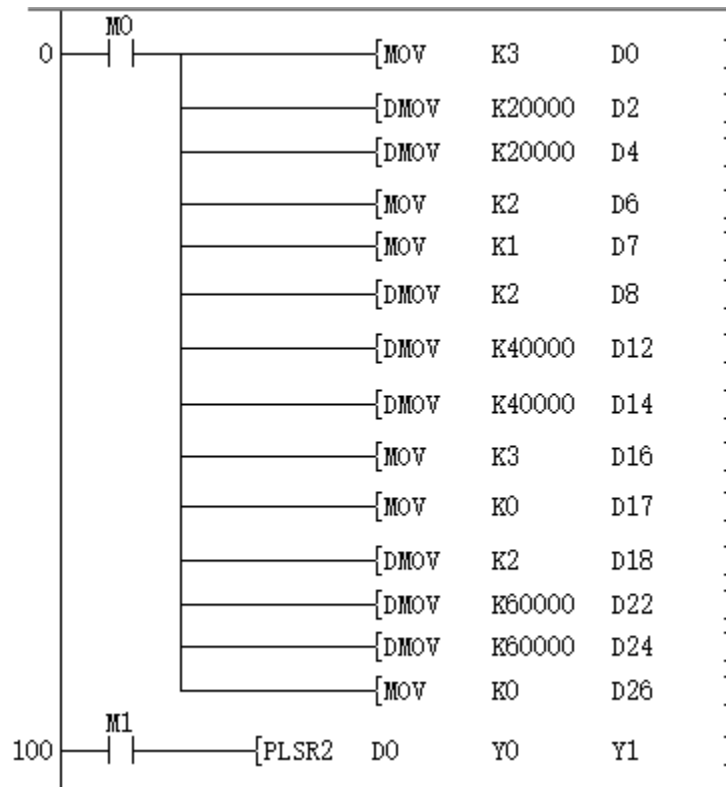
### 3) Waiting signal

When  $(s) + (n-1) \cdot 10 + 6 = 2$ , it is waiting signal high level (ON status). When  $(s) + (n-1) \cdot 10 + 6 = 3$ , it is waiting signal low level (OFF status). When  $(s) + (n-1) \cdot 10 + 7 = 0$ , it means waiting for X signal, and  $= 1$  means waiting for M signal,  $= 2$  means waiting for S signal,  $= 3$  means waiting for Y signal.

Example 3: Three pulses are needed now. The pulse frequency of the first segment is 20,000Hz, and the number of pulses is 20,000, and the waiting signal is M2. The pulse frequency of the second segment is 40,000Hz, and the number of pulses is 40,000; and the waiting signal is X2. The pulse frequency of the third segment is 60,000, and the number of pulses is 60,000 with no waiting conditions.

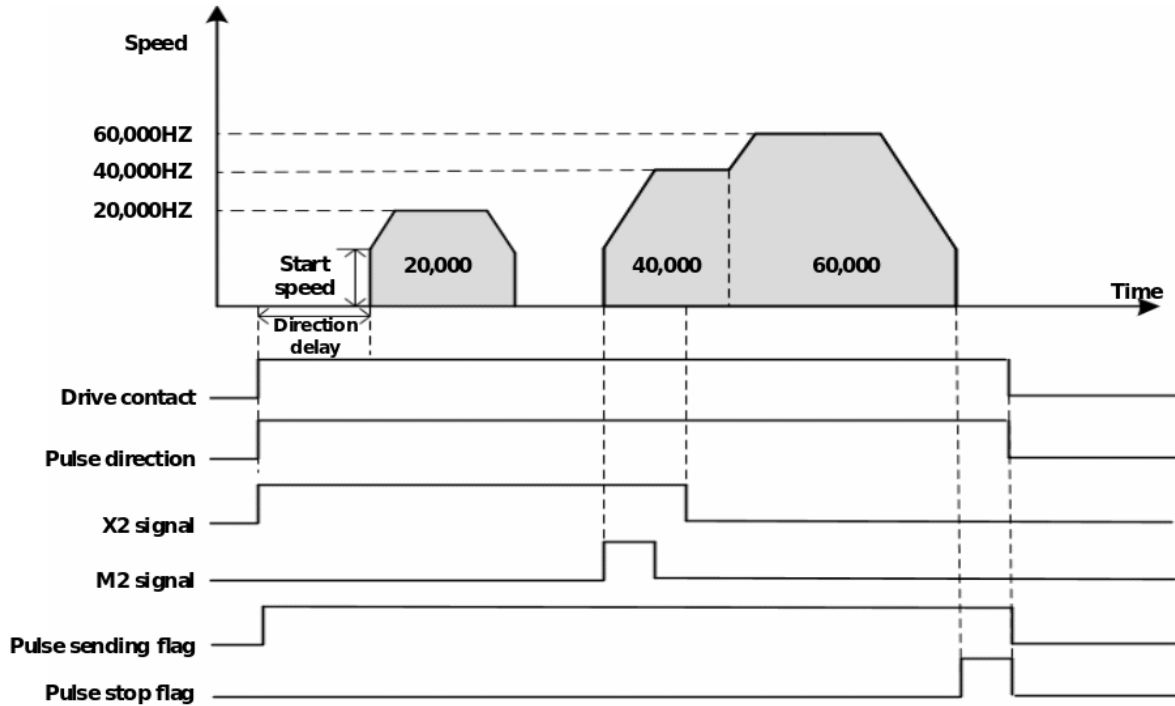
The number of segments	Pulse frequency	The number of pulses	Waiting mode	Condition
1	20,000	20,000	Waiting signal high level	M2
2	40,000	40,000	Waiting signal low level	X2
3	60,000	60,000	No waiting conditions	K0

The ladder program parameter settings are as follows:



The waveform diagram is as follows:

If the signal is received in advance, it will not decelerate to stop, but directly accelerate/decelerate to the specified speed of the next segment. (X2 low level is received during operation)



4) Trigger signal

When  $(s) + (n-1) \cdot 10 + 6 = 4$ , it is the rising edge of trigger signal. When  $(s) + (n-1) \cdot 10 + 6 = 5$ , it is the falling edge of trigger signal.

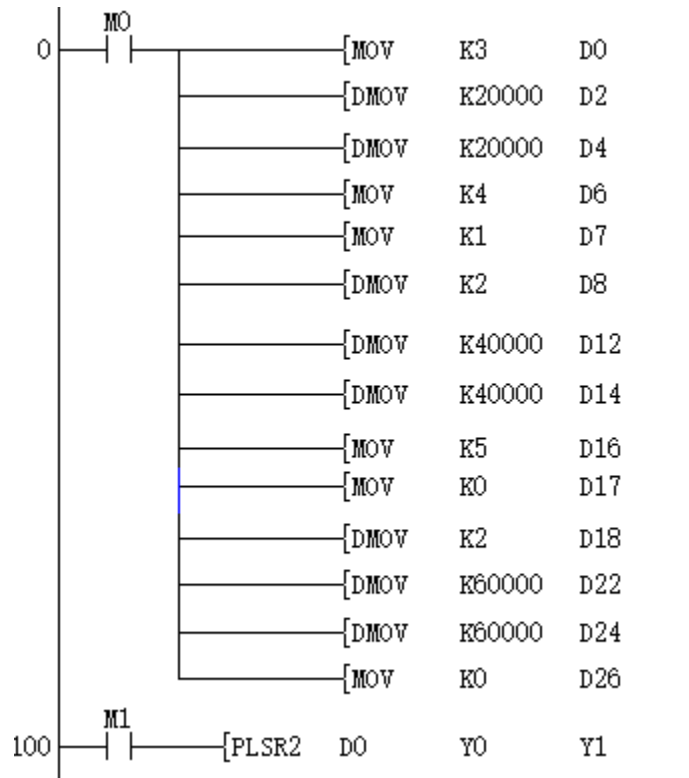
$(s) + (n-1) \cdot 10 + 7 = 0$  means waiting for X signal, =1 means waiting for M signal, =2 means waiting for S signal, =3 means waiting for Y signal.

After the current pulse segment starts to send pulses, if the external bit signal triggers operates (ON state) before the current number of pulses are sent, the next pulse is sent immediately. At the end of the pulse transmission of the current segment, if the signal is not triggered (OFF state), the next pulse will continue to be sent (that is, the configured pulse segment will be pulsed in a mode without waiting conditions. But if the current pulse is receiving a trigger signal during the process, it will directly accelerate and decelerate to the next pulse).

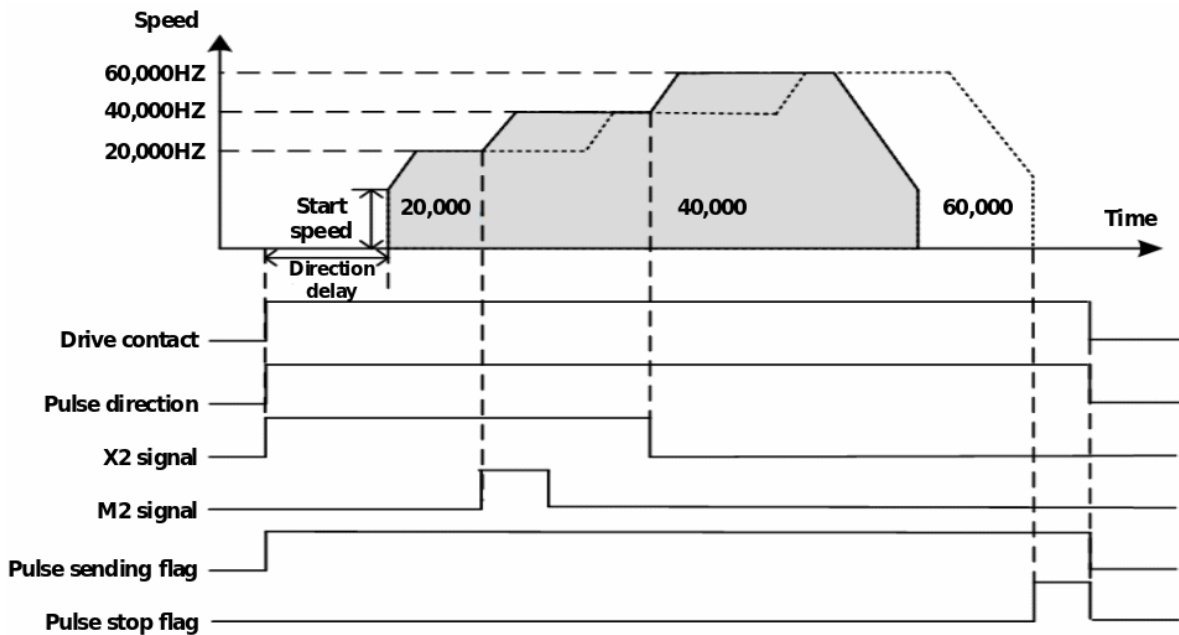
Example 4: Three pulses are needed now. The pulse frequency of the first segment is 20,000Hz, and the number of pulses is 20,000, and the waiting signal is M2. The pulse frequency of the second segment is 40,000Hz, and the number of pulses is 40,000; and the waiting signal is X2. The pulse frequency of the third segment is 60,000, and the number of pulses is 60,000 with no waiting conditions.

The number of segments	Pulse frequency	The number of pulses	of	Waiting mode	Condition
1	20,000	20,000		Trigger signal rising edge	M2
2	40,000	40,000		Trigger signal falling edge	X2
3	60,000	60,000		No waiting conditions	K0

The ladder program parameter settings are as follows:



The pulse waveform diagram is as follows:



If a signal is received in the acceleration section (deceleration section), it will directly accelerate (decelerate) in the current section to the next pulse frequency.

**#Note:** Please do not duplicate device used for other controls.

**Error code**

Error code	Content
4084H	The table parameter input data that exceeds the specified range
4085H	The table parameter with the first address in the read application instruction (s) exceeds the device range, and the
4088H	The same pulse output axis (d1) is used and has been started.

## PLSV/DPLSV/Variable speed operation

### PLSV/DPLSV

Output variable speed pulse instruction with rotation direction. This instruction could change the speed with acceleration and deceleration.

-[PLSV (s) (d1) (d2)]

**Content, range and data type**

Parameter	Content	Range	Data type	Data type (label)
(s)	Specify output pulse frequency	-	Signed BIN16/Signed BIN32	ANY16_S/ANY32_S
(d1)	Specify the number of output pulse	-	Bit	ANY_BOOL
(d2)	The device (Y) number of output pulse	-	Bit	ANY_BOOL

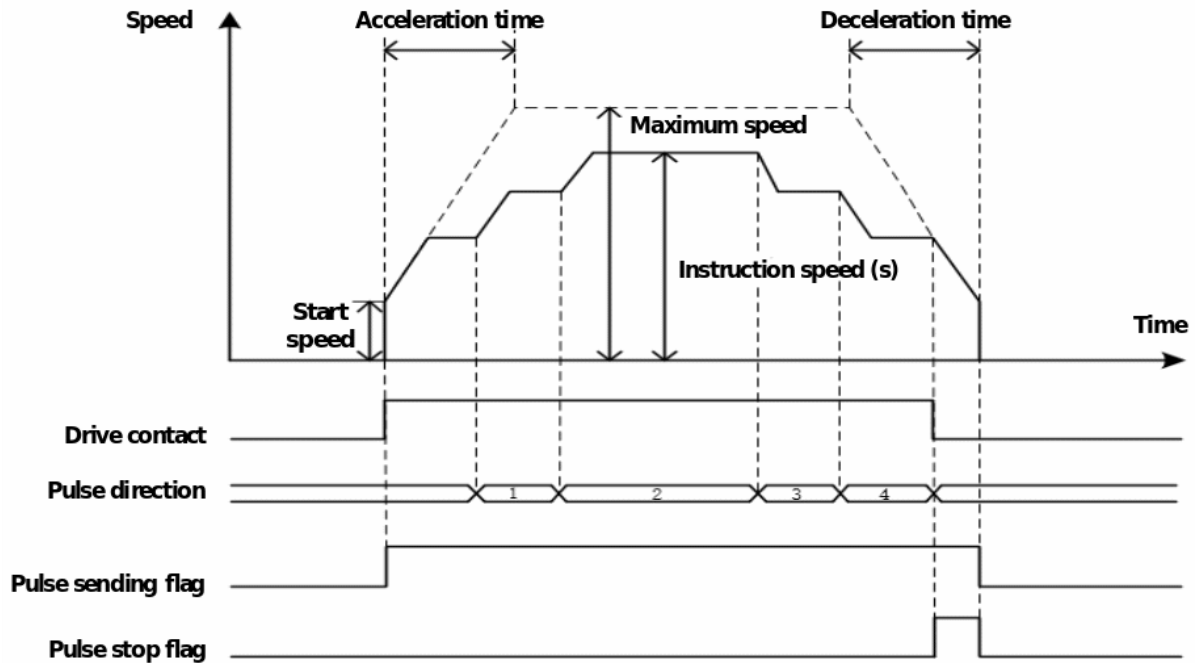
**Device used**

Instruction	Devices															Offset modification [D]	Pulse extension XXP	
	Y	M	S	D.b	KnX	KnY	KnM	KnS	T	C	D	R	K	H				
PLSV	●				●	●	●	●	●	●	●	●	●	●	●	●		
Parameter 1	●																	
Parameter 2	●																	
Parameter 3		●	●	●														

**Features**

This instruction is used to output variable speed pulse with rotation direction output.

- Specify the instruction speed of user units in (s). (It should be in the range of -200,000 to 200,000. When it is 0, stop sending pulse)
- Specify the device that outputs pulses in (d1). Only Y devices with positioning parameters could be specified.
- Specify the bit device of the output direction signal in (d2). Only the devices and general outputs specified in the parameters could be specified.
- The pulse frequency could be modified while the instruction is running.



**#Note:**

Please do not duplicate device used for other controls.

If the acceleration time is 0, no acceleration action will be performed, and the speed is changed to the instruction speed immediately.

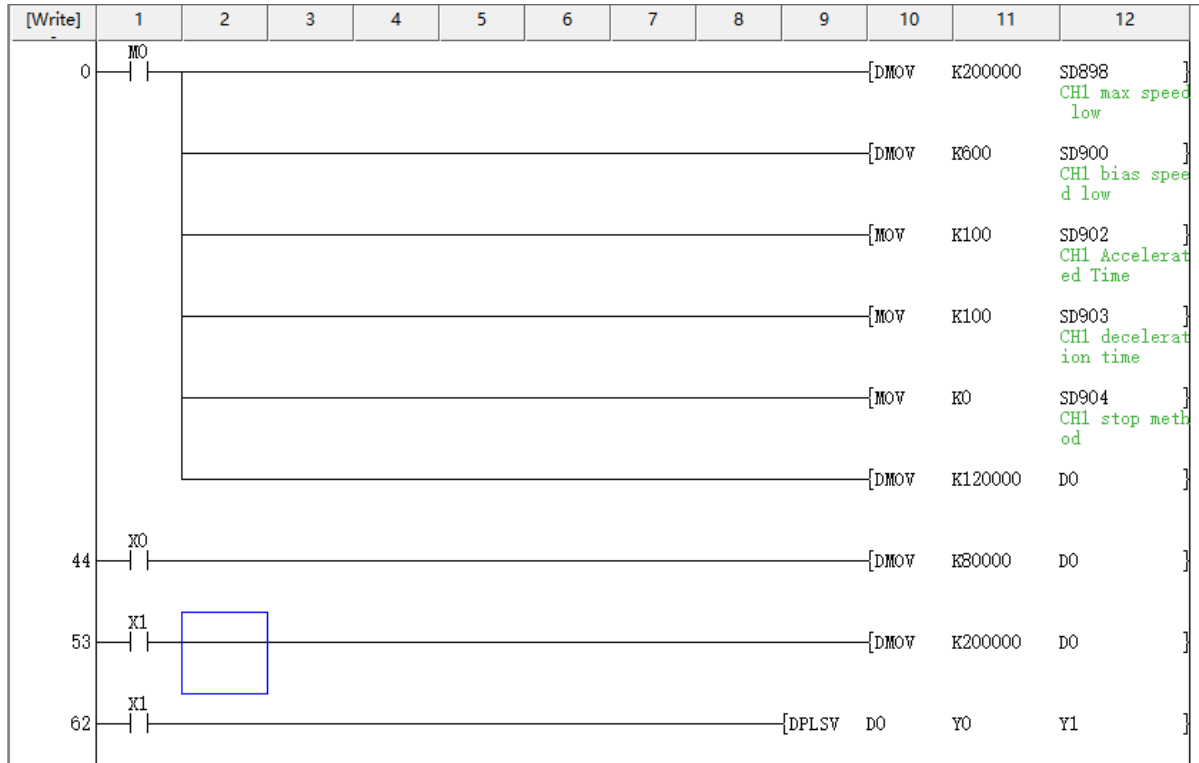
If the deceleration time is 0, no deceleration action will be performed, and it will stop immediately when the drive contact is OFF.

**Error code**

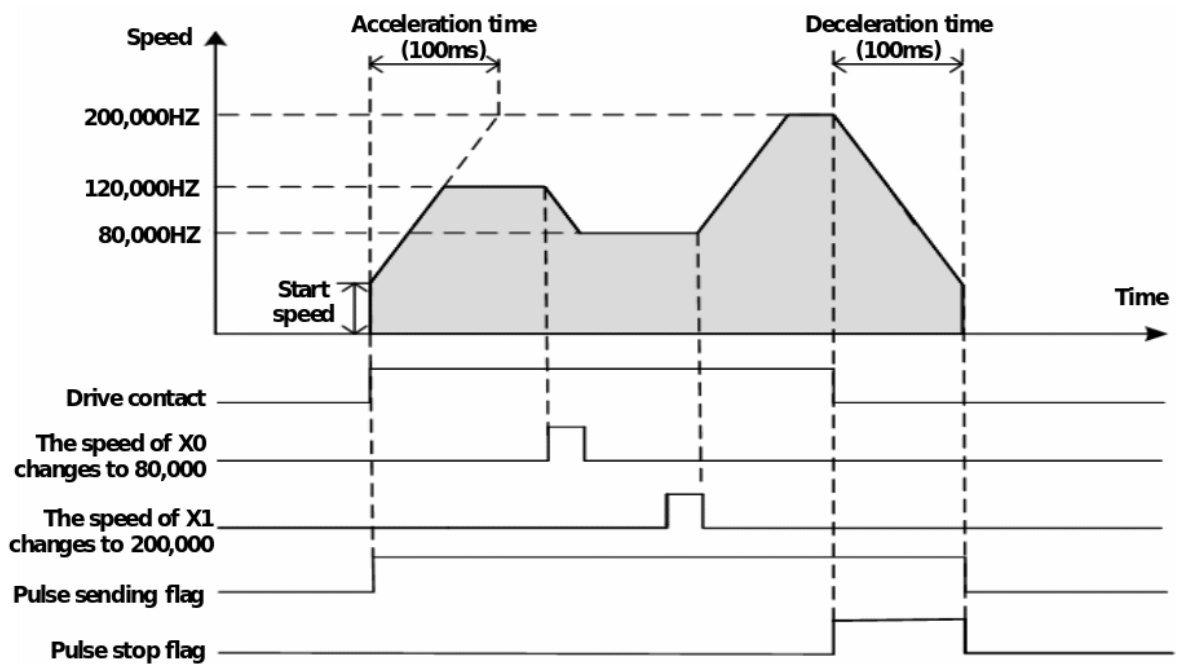
Error code	Content
4084H	The data input in the application instruction (s1) exceeds the specified range
4085H	The result output in the read application instruction (s1), (d1) and (d2) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.

**Example**

Set the highest frequency to 200,000K, the offset speed to 500, and the acceleration/deceleration time to 100ms.




The sending pulse is as follows:



# PLSY/DPLSY/Pulse output

## PLSY/DPLSY

The pulse specified in the instruction speed (s) is output from the device specified in the output (d) to the pulse specified pulse in the positioning address .

-[PLSY/DPLSY (s)  (d)]



### Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Specify output pulse frequency	-	Signed BIN16/Signed BIN32	ANY16_S/ANY32_S
	Specify the number of output pulse	-	Bit	ANY_BOOL
(d)	The device (Y) number of output pulse	-	Bit	ANY_BOOL

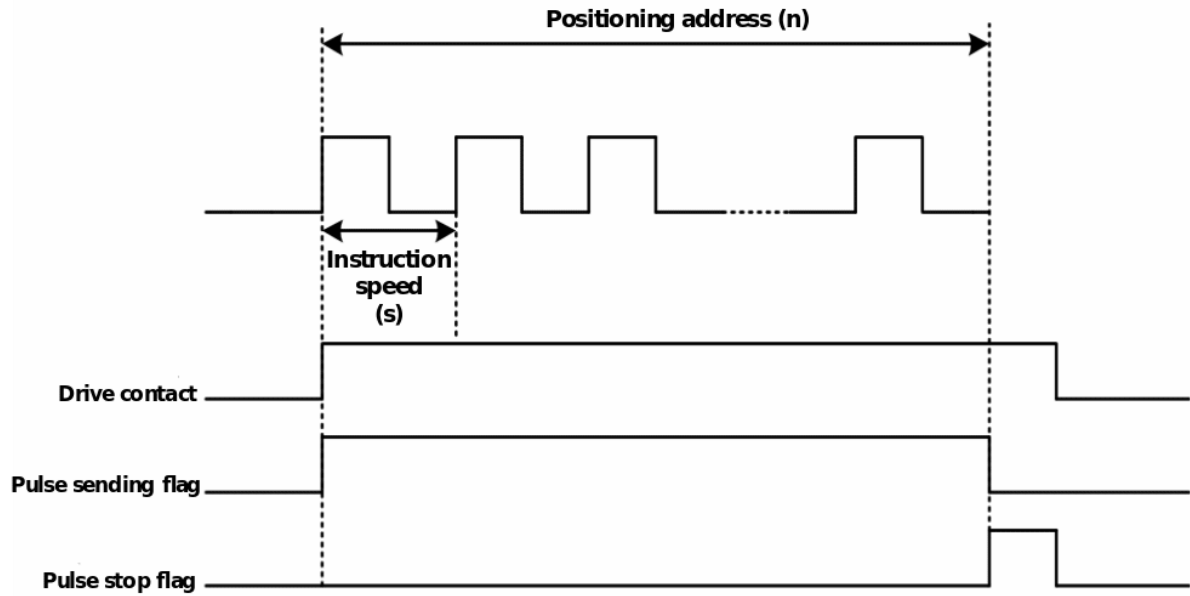
### Device used

Instruction	Parameter	Devices										Offset modification [D]	Pulse extension XXP	
		Y	KnX	KnY	KnM	KnS	T	C	D	R	K			H
PLSY	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 3	●												

### Features

- The pulse specified in the instruction speed (s) is output from the device specified in the output (d) to the pulse specified pulse in the positioning address .
- Specify the instruction speed of user unit in (s). (It should be in the range of 1 to 200,000)
- Specify the positioning address of user unit with a relative address in . (It should be in the range of 0 to 2,147,483,647)
- Specify the device that outputs pulses in (d). Only Y devices with positioning parameters could be specified.
- The instruction pulse output has no acceleration/deceleration process.







**#Note:**

Please do not duplicate device used for other controls. Since this instruction has no direction, the direction polarity is invalid, and it always increases with the current address.

When the reverse limit is used, it will act as the forward limit.

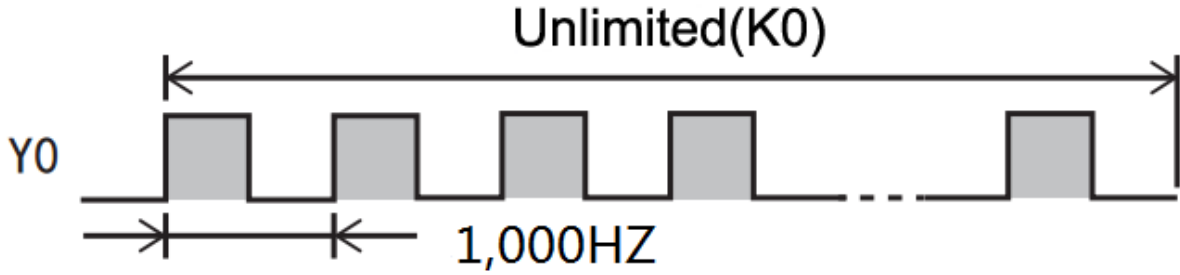
**Error code**


Error code	Content
4084H	The data input in the application instruction (s) and  exceed the specified range
4085H	The result output in the read application instruction (s),  and (d) exceed the device range
4088H	The same pulse output axis (d) is used and has been started.

**Example**

(1) Unlimited pulse output: positioning address (operand ) = 0

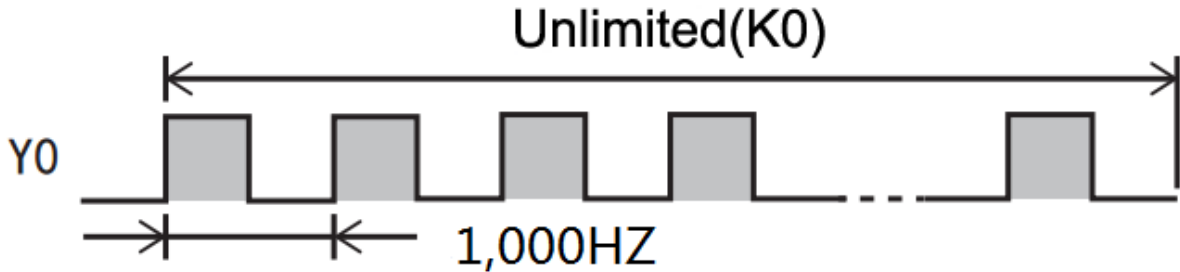




(2) Pulse output: positioning address (operand ) > 0

```

0 | M0 | [ PLSY | K1000 | K500 | Y0 | ]
    
```



## PWM/BIN 16-bit pulse output

### PWM

Output the ON time (16-bit data unit) specified in (s1) and the cycle pulse (16-bit data unit) specified in (s2) to the output destination specified in (d).

-[PWM (s1) (s2) (d)]

### Content, range and data type

#### Parameter

(S1) ON time or the device number storing the ON time

(S2) Cycle or the device number storing the cycle

(D) Channel number and device number that pulse outputs

### Device used

#### Instruction Parameters

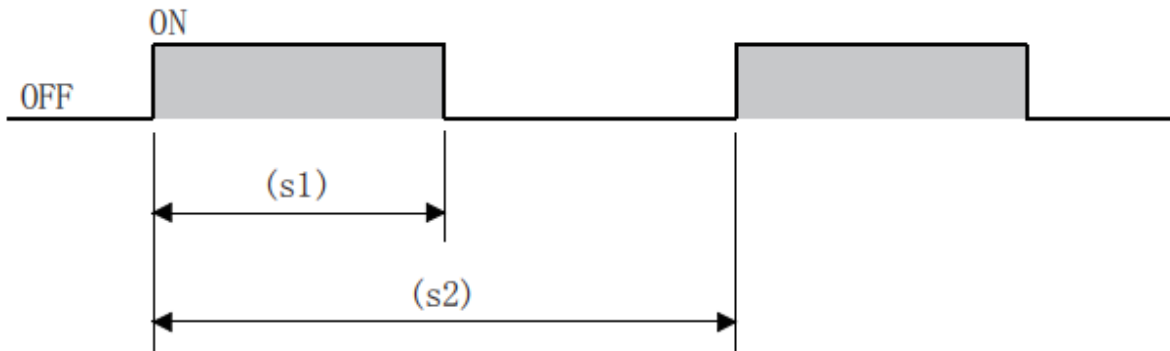
Instruction	Parameter	Devices											Offset modification	Pulse extension	
		Y	KnX	KnY	KnM	KnS	T	C	D	R	K	H			[D]
PWM	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●		
	Parameter 2		●	●	●	●	●	●	●	●	●	●	●		

Parameter  
3

**Features**

Normal mode

- Output the ON time specified in (s1) and the cycle pulse specified in (s2) to the output destination specified in (d).
- Specify the output pulse width in (s1). (The setting range is 0 to 32,767ms)
- Specify the output pulse period in (s2). (The setting range is 1 to 32,767ms)
- Specify the device that outputs pulses in (d). Only Y devices with positioning parameters can be specified.
- The pulse width and pulse period can be modified during pulse sending.



**#Note:**

1. Please do not duplicate device used for other controls.
2. Set pulse width and cycle time. Please set the value of pulse width (s1) and period (s2) as  $(s1) \leq (s2)$ .
3. About pulse output: This instruction is executed in interrupt mode. When the instruction power flow is OFF, the output stops, and (s1) and (s2) could be modified when the PWM instruction is executed. If it is modified to an incorrect parameter, the sending of PWM pulse will be stopped.

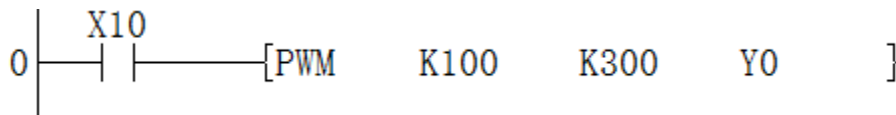
**Related device**

Output shaft	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Percentage mode sign	SM897	SM957	SM1017	SM1077	SM1137	SM1197	SM1257	SM1317

**Error code**

Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range or $(s1) > (s2)$
4085H	The result output in the read application instruction (s1), (s2) and (d) exceed the device range
4088H	The same pulse output axis (d) is used and has been started.

**Example**



The waveform diagram is shown as right.

## PWM/PWM perimeter mode

### PWM

The period parameter (s2), the average equal division is 1000 equal divisions, (s1) is the pulse duty ratio, and the setting of the millimetric ratio mode is used to output to the output target specified in (d).

-[PWM (s1) (s2) (d)]

#### Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Set output pulse duty cycle	0 to 1000	Signed BIN16	ANY16_S
(s2)	Set pulse output cycle	1 to 32767	Signed BIN16	ANY16_S
(d)	Pulse output channel number, device number	-	Bit	ANY_BOOL

#### Device used

Instruction	Parameter	Devices										Offset modification [D]	Pulse extension XXP	
		Y	KnX	KnY	KnM	KnS	T	C	D	R	K			H
PWM	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 3	●												

#### Features

The period parameter (s2), the average equal division is 1000 equal divisions, (s1) is the pulse duty ratio, and the setting of the millimetric ratio mode is used to output to the output target specified in (d).

It is necessary to turn on the millimetric ratio mode of the PWM instruction, and the corresponding related device:

Output shaft	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Percentage Mode Sign	SM897	SM957	SM1017	SM1077	SM1137	SM1197	SM1257	SM1317

Specify the output pulse duty ratio in (s1). (The setting range is 0 to 1000)

Specify the output pulse period in (s2). (The setting range is 1 to 32,767ms)

Specify the device that outputs the pulse in (d). Only Y devices with positioning parameters can be specified.

The calculation formula is:  $t \text{ (ms)} = T0 \text{ (ms)} * K / 1000$

High level time (ms) = set cycle time (ms) x duty cycle / 1000

Low level time (ms) = period (ms)-high level time (ms)

That is, the period is set to 100ms, if the duty cycle is set to 500, the output is high for 50ms and low for 50ms; if the duty cycle is set to 100, the output is high for 10ms and low for 90ms; If it is set to 900, the output will be high for 90ms and low for 10ms. The fractional part of the calculated pulse output time is output by rounding.

The period and duty cycle can be modified during pulse sending.

**#Note:**

1. Please be careful not to overlap with other control devices.
2. About pulse output

This instruction is executed in interrupt mode. When the instruction power flow is OFF, the output stops. (s1) and (s2) can be changed when the PWM instruction is executed. If it is modified to an incorrect parameter, the sending of PWM pulse will be stopped.

**Related device**

- Percentage mode flag

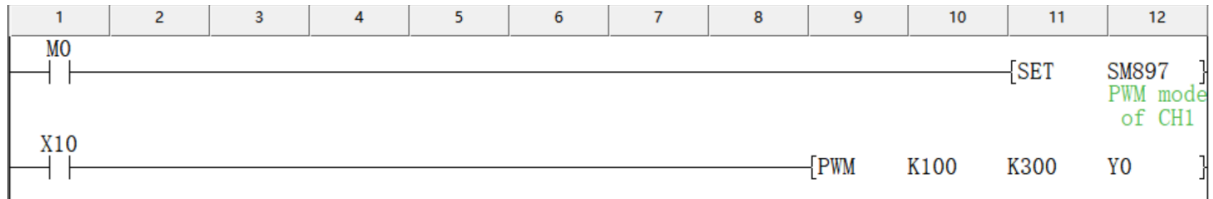
Output shaft	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Percentage Mode Sign	SM897	SM957	SM1017	SM1077	SM1137	SM1197	SM1257	SM1317

**Error code**

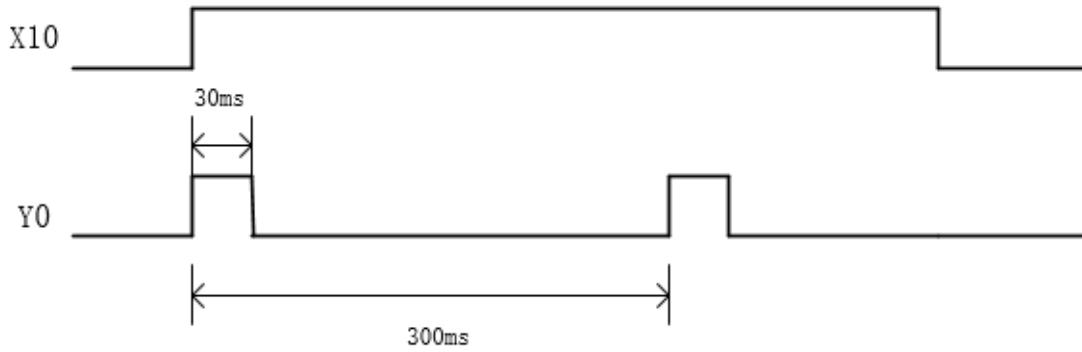
Error code	Content
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2) and (d) exceed the device range
4088H	The same pulse output axis (d) is used and has been started.

**Example**

The period is set to 100ms, if the duty cycle is set to 500, the output is high for 50ms and low for 50ms; if the duty cycle is set to 100, the output is high for 10ms and low for 90ms; duty cycle If it is set to 900, then the output is high for 90ms and low for 10ms;



The waveform diagram is as follows, the period is 300ms, the duty cycle is 100, and the output is 30ms high level and 270ms low level:



## G90G01 Absolute position line interpolation instruction

### G90G01

Execute 2 axis/3 axis line interpolation instruction in absolute drive mode. The method of specifying the movement distance from the origin point(zero point) is also called absolute drive mode.

-[G90G01 (s1) (s2) (d1) (d2) ]

#### Content, range and data type

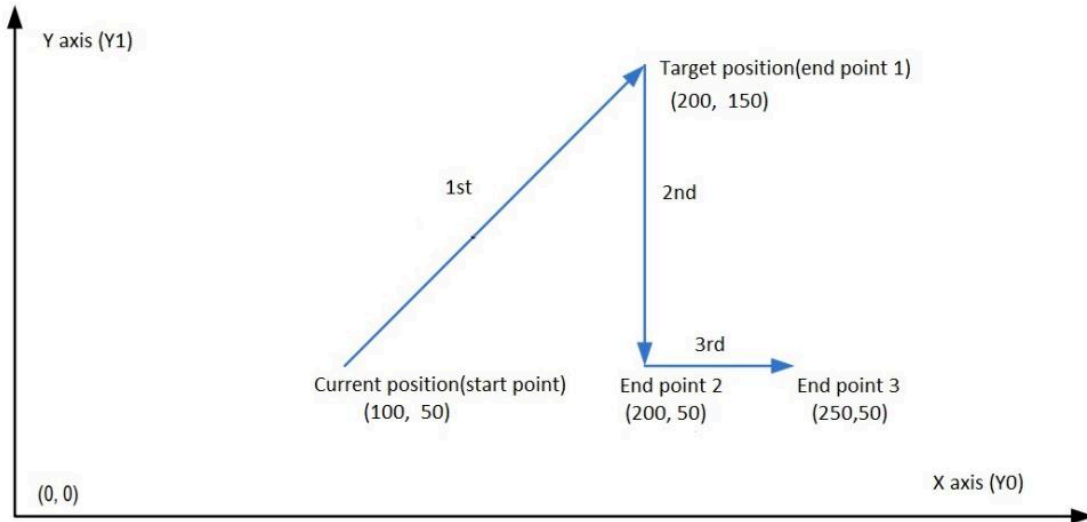
Parameters	Content	Range	Data type	Data type tag
(s1)	Specify the target position (absolute address)	-2147483648 to +2147483647	Signed BIN32	ANY32_S
(s2)	Specify the synthetic output frequency	1 to 141421	Signed BIN32	ANY32_S
(d1)	Device (Y) number of output pulse	Y0/Y2	Bit	ANY_BOOL
(d2)	Running direction output - port or bit variable		Bit	ANY_BOOL

#### Device used

Instruction	Parameters	Device						Offset modification [D]	Pulse extension XXP
		Y	M	D	R	K	H		
G90G01	Parameter 1			●	●				
	Parameter 2			●	●	●	●		
	Parameter 3	●							
	Parameter 4	●	●						

#### Features

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 2-axis/3-axis line interpolation, and servo actuator runs to the target position according to the line interpolation.



- (s1) is the starting address, and occupies 6 consecutive addresses. s1 is the target position (absolute positioning) of X axis , s1+2 is the target position (absolute positioning) of Y axis, and s1+4 is the target position (absolute positioning) of Z axis. The range is -2147483648 to +2147483647.
- Specify the synthetic output frequency in (s2) . The range is 1 to 141421.
- Specify the device of output pulse in (s2) ,only Y0/Y2 could be specified, and consecutive addresses (Y0, Y1, Y2, Y3) are occupied .

SM345: Set the mode of switching line interpolation. When SM345=0, it is two-axis line interpolation mode. When SM345=1, it is three-axis line interpolation mode.

If d1 specifies Y0 and SM345=0, Y0 and Y1 are occupied. If SM345=1, Y0, Y1 and Y2 are occupied;

If d1 specifies Y2 and SM345=0, Y2 and Y3 are occupied. If SM345=1, the software reports an error.

- Specify the bit device of output direction signal in d2 and occupy 3 consecutive addresses, which indicate the directions of the X, Y, and Z axes in turn.

**#Note:**

1. Please do not duplicate devices that used for other controls.
2. When using interpolation instructions, the parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.
3. Only trapezoidal acceleration and deceleration are supported.
4. The actual synthetic frequency S (the minimum frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

**Error Codes**

**Error Codes**

4084H

4085H

4088H

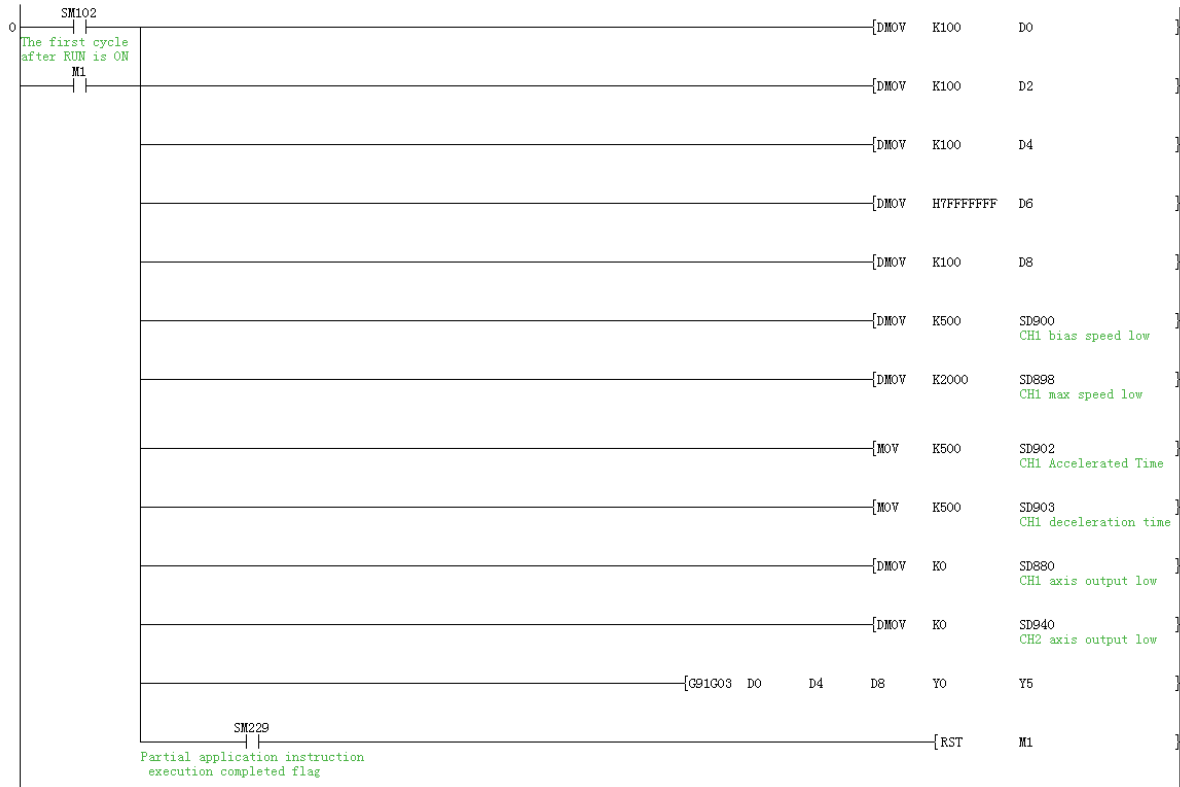
**Contents**

The data input in the application instruction (s1) and (s2) exceed the specified range

The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range

The same pulse output axis (d1) is used and has been started.

**Example**



Set Y0 as the interpolation starting axis, Y5 as the direction starting axis, and the maximum speed is 2000, the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a absolute position line interpolation output based on the original position which is with acceleration and deceleration, and the end position is X (Y0) axis 100, Y (Y1) axis 100, and the pulse synthesis frequency is 1000.

## G91G01 Relative position line interpolation instruction

### G91G01

Execute 2 axis/3 axis line interpolation instruction in relative drive mode. The method of specifying the movement distance from the current position is also called incremental(relative) drive mode.

-[G91G01 (s1) (s2) (d1) (d2) ]

**Content, range and data type**

Parameters	Content	Range	Data type	Data type tag
(s1)	Specify the target position (relative address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S



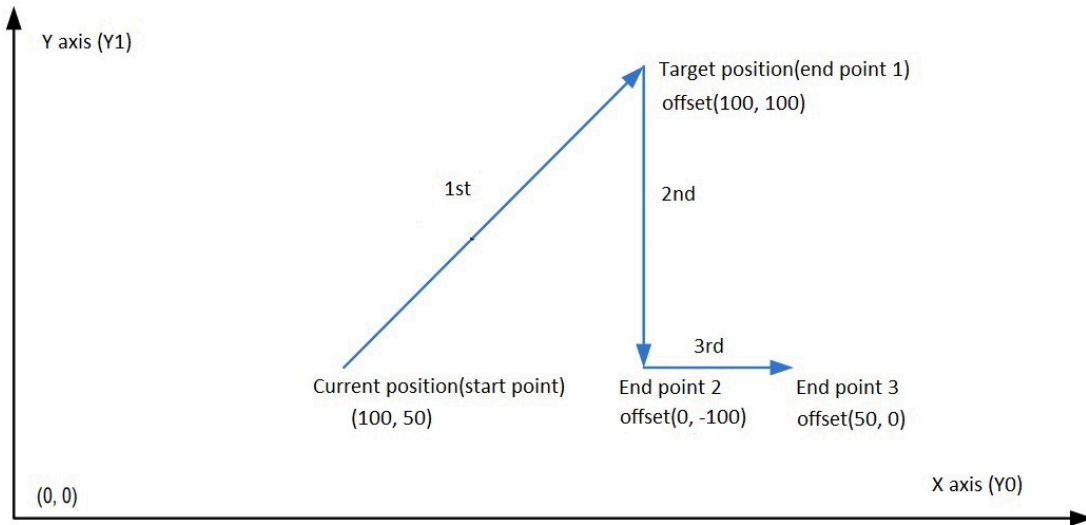
(s2)	Specify the synthetic output frequency	1 to 141421	Signed BIN32	ANY32_S
(d1)	Device (Y) number of output pulse	Y0/Y2	Bit	ANY_BOOL
(d2)	Running direction output - port or bit variable		Bit	ANY_BOOL

**Device used**

Instruction	Parameters	Device						Offset	Pulse
		Y	M	D	R	K	H	[D]	extension
G91G01	Parameter 1			●	●				
	Parameter 2			●	●	●	●		
	Parameter 3	●							
	Parameter 4	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 2-axis line interpolation, and servo actuator performs 2-axis line interpolation with a given offset based on the current position.



- (s1) is the starting address, and occupies 6 consecutive addresses. s1 is the target position (relative positioning) of X axis , s1+2 is the target position (relative positioning) of Y axis, and s1+4 is the target position (relative positioning) of Z axis. The range is -2147483648 to +2147483647.
- Specify the synthetic output frequency in (s2) . The range is 1 to 141421.

- Specify the device of output pulse in (s2), only Y0/Y2 could be specified, and consecutive addresses (Y0, Y1, Y2, Y3) are occupied .

SM345: Set the mode of switching line interpolation. When SM345=0, it is two-axis line interpolation mode. When SM345=1, it is three-axis line interpolation mode.

If d1 specifies Y0 and SM345=0, Y0 and Y1 are occupied. If SM345=1, Y0, Y1 and Y2 are occupied;

If d1 specifies Y2 and SM345=0, Y2 and Y3 are occupied. If SM345=1, the software reports an error.

- Specify the bit device of output direction signal in d2 and occupy 3 consecutive addresses, which indicate the directions of the X, Y, and Z axes in turn.

**#Note:**

1. Please do not duplicate device that used for other controls.
2. When using interpolation instructions, the parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.
3. Only trapezoidal acceleration and deceleration are supported.
4. The actual synthetic frequency S (the minimum frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequenc}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequenc}}{2 \times \text{deceleration time} \div 1000}}$$

**Error Codes**

**Error Codes**

4084H

4085H

4088H

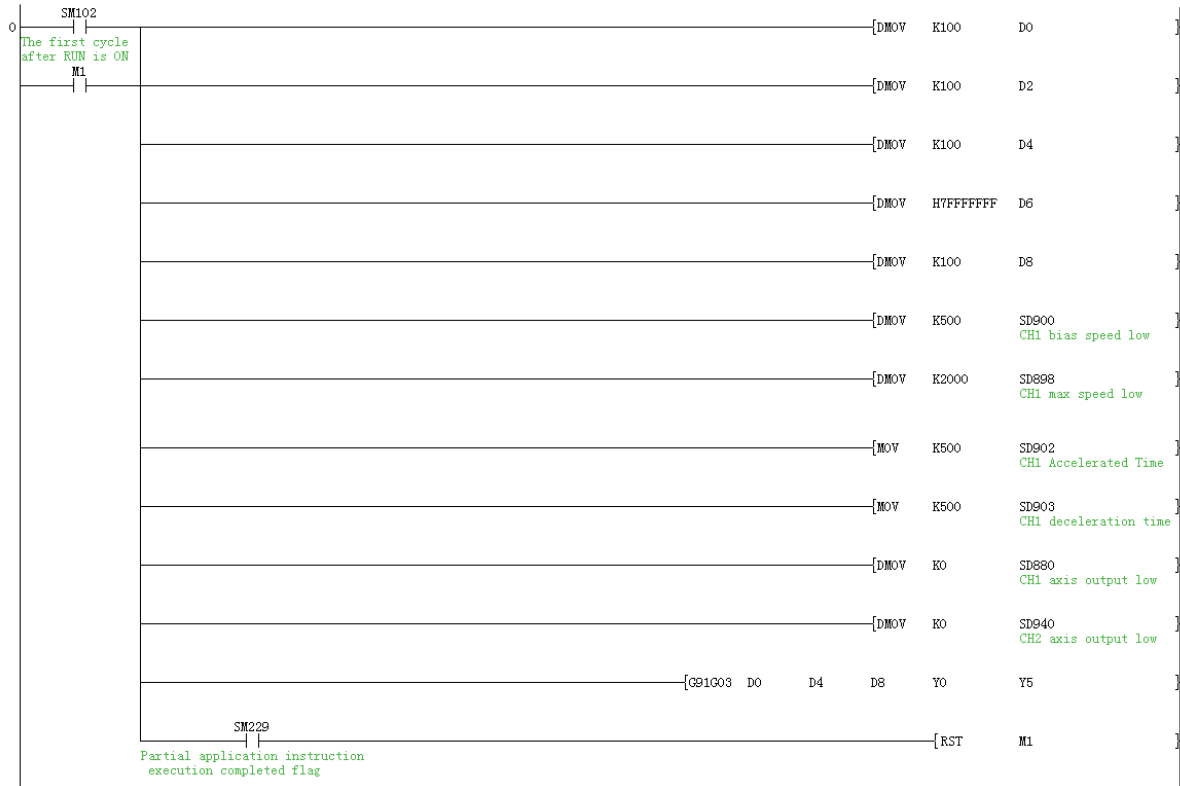
**Contents**

The data input in the application instruction (s1) and (s2) exceed the specified range

The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range

The same pulse output axis (d1) is used and has been started.

**Example**



Set Y0 as the interpolation starting axis, Y5 as the direction starting axis, and the maximum speed is 2000, and the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a relative position line interpolation output based on the relative position which is with acceleration and deceleration , and the incremental position is X (Y0) axis 100, Y (Y1) axis 100, and the pulse synthesis frequency is 1000.

## G90G02 Absolute position clockwise circular interpolation instruction

### G90G02

Execute 2 axis clockwise circular interpolation instruction in absolute drive mode. The method of specifying the movement distance from the origin point(zero point) is also called absolute drive mode.

-[G90G02 (s1) (s2) (s3) (d1) (d2) ]

#### Content, range and data type

Parameters	Content	Range	Data type	Data type tag
(s1)	Specify the target position (absolute address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Radius/Center mode	-	Signed BIN32	ANY32_S
(s3)	Specify the synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Device(Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

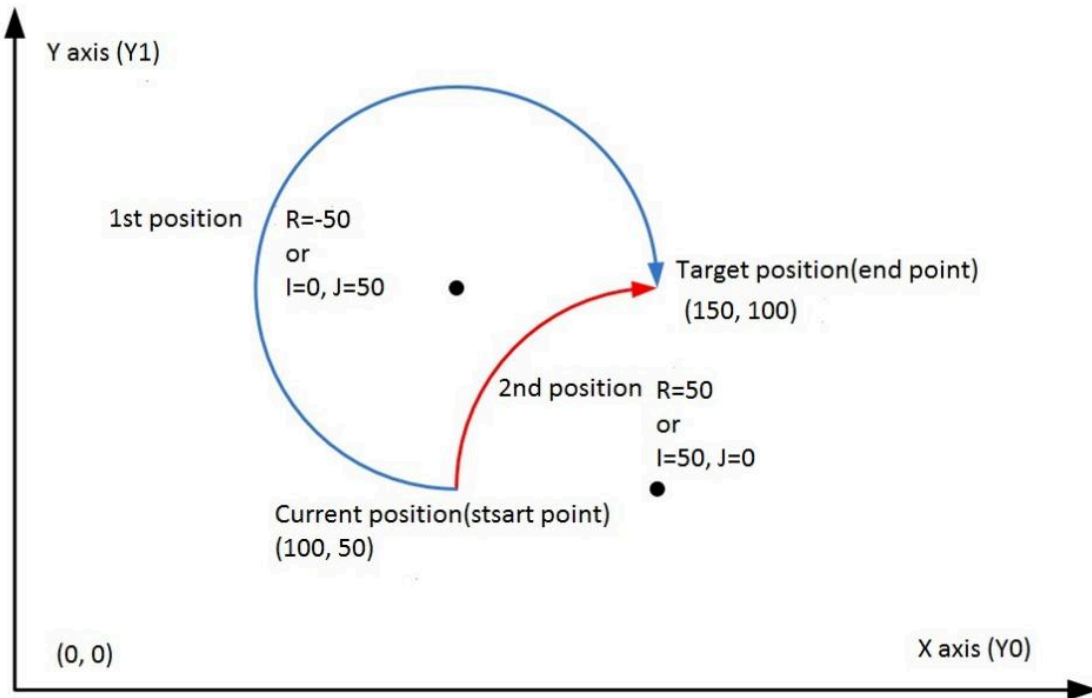
#### Soft components

**Instruction Parameters**

		Y	M	D	R	K	H	Offset modification [D]	Pulse extension XXP
G90G02	Parameter 1			●	●				
	Parameter 2			●	●				
	Parameter 3			●	●	●	●		
	Parameter 4	●							
	Parameter 5	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 2-axis clockwise circular interpolation, and servo actuator performs clockwise circular interpolation to run to the target position point.



- (s1) is the starting address, and occupies 6 consecutive addresses. s1 is the target position (absolute positioning) of X axis, s1+2 is the target position (absolute positioning) of Y axis, and s1+4 is the target position (absolute positioning) of Z axis. The range is -2147483648 to +2147483647.

- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The center coordinate of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The center coordinate of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3) . The range is 1 to 100000.
- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 2 consecutive addresses, which indicate the directions of the X and Y axes in turn.

#### #Note

1. Please do not duplicate device that used for other controls.
2. When using interpolation instruction, the parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.
3. The maximum radius supported by circular interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.
4. There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).
5. IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only expressed as the difference of the pulse output number between the coordinates of the center of the circle on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.
6. R mode (radius mode): When the value of R is greater than 0, it indicates that it is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that it is an arc greater than or equal to 180 degrees. A full circle cannot be generated In R mode because there are infinite solutions.
7. When s1 indicates the relative position of the target position, a reasonable target position needs to be set to ensure that the target arc path can be generated correctly. When s1+0=0 and s1+2=0, it means that a full circle is generated.
8. When using the interpolation instruction, parameter settings (such as celebration/deceleration time and so on) are subject to the X axis (Y0);
9. The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

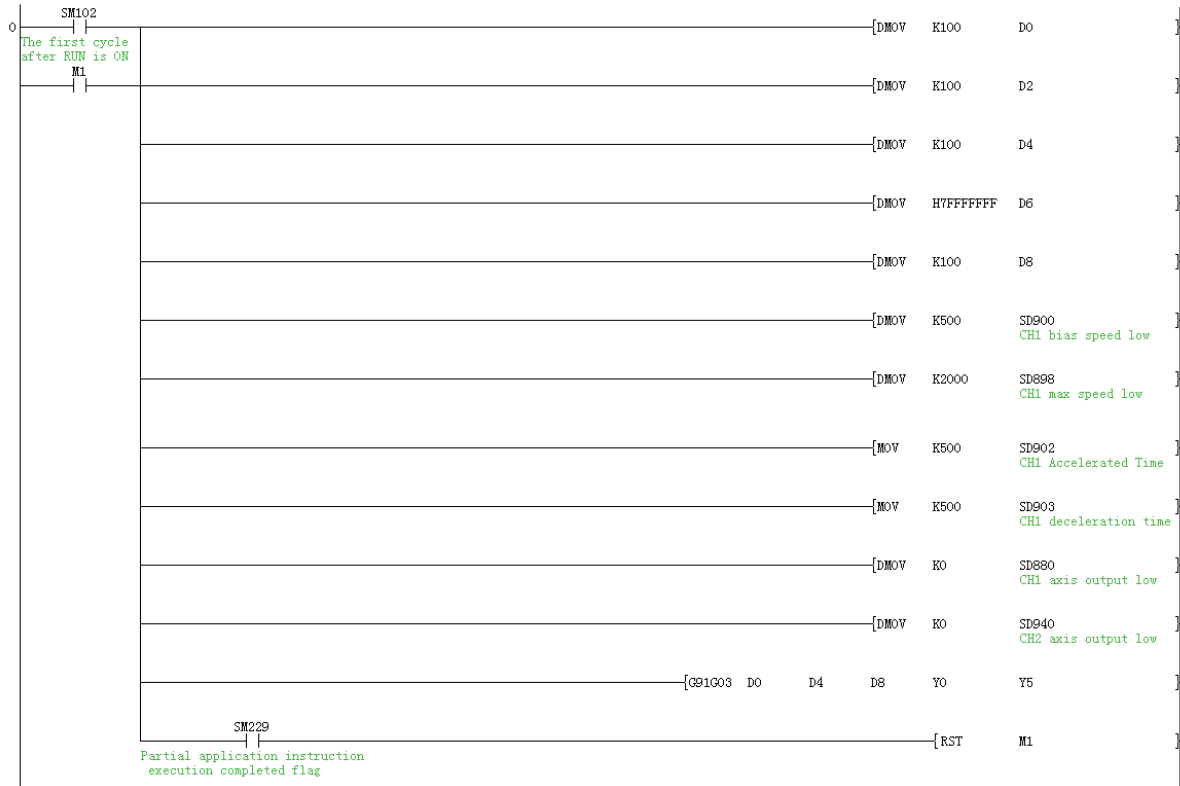
#### Error Codes

##### Error Codes

##### Contents

4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.
4F90H	In radius mode, the radius is not in the range.
4F92H	In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordi
4F93H	In radius mode, the chord length is greater than the diameter.
4F95H	In center mode, the distance between the circle center and the starting point, and the distance between the circ
4F96H	In radius mode, when the absolute/relative mode calculates that the starting point is the same as the target posi
4F97H	In center mode, the calculated radius distance is greater than the maximum radius range, which is positive or n

**Example**



Set Y0 as the interpolation starting axis, Y5 as the direction starting axis, and the maximum speed is 2000, and the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a absolute position clockwise circular interpolation output based on the absolute position with acceleration and deceleration, and the target position is X (Y0) axis 100, Y (Y1) axis 100, and the the radius is 1000 pulse in radius mode, and the pulse synthesis frequency is 1000.

## G91G02 Relative position clockwise circular interpolation instruction

### G91G02

Execute 2 axis clockwise circular interpolation instruction in relative drive mode. The method of specifying the movement distance from the current position is also called incremental(relative) drive mode.

-[G91G02 (s1) (s2) (s3) (d1) (d2) ]

#### Content, range and data type

Parameters	Content	Range	Data type	Data type tag
(s1)	Specify the target position (relative address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Radius/center mode	-	Signed BIN32	ANY32_S
(s3)	Specify the synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Device (Y) number for output pulse	Y0	Bit	ANY_BOOL

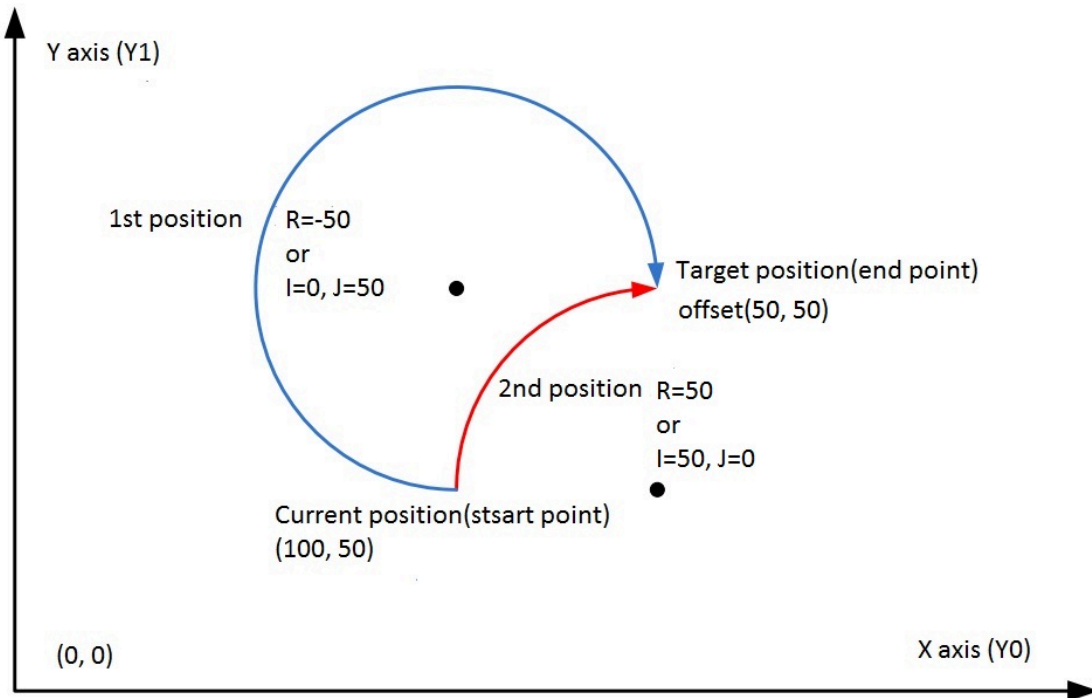
(d2) Running direction output - port or bit variable Bit ANY\_BOOL

**Device used**

Instruction Parameters		Device					Offset modification [D]	Pulse extension XXP
		Y	M	D	R	K	H	
G91G02	Parameter 1			●	●			
	Parameter 2			●	●			
	Parameter 3			●	●	●	●	
	Parameter 4	●						
	Parameter 5	●	●					

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, performs 2-axis clockwise circular interpolation, and servo actuator performs 2-axis clockwise circular interpolation with a given offset based in current position.



- s1 is the starting address, and occupies 4 consecutive addresses. s1 is the target position of X axis (relative positioning), s1+2 is the target position of Y axis (relative positioning). The range is -2147483648 to +2147483647.
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The center coordinate of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The center coordinate of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3) . The range is 1 to 100000.
- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 2 consecutive addresses, which indicate the directions of the X and Y axes in turn.

**#Note:**

1. Please do not duplicate device that used for other controls.
2. When using interpolation instruction, the parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.
3. The maximum radius supported by circular interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.
4. There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).
5. IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only expressed as the difference of the pulse output number between the coordinates of the center of the circle on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.
6. R mode (radius mode): When the value of R is greater than 0, it indicates that it is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that it is an arc greater than or equal to 180 degrees. A full circle cannot be generated In R mode because there are infinite solutions.
7. When s1 indicates the relative position of target position, a reasonable target position needs to be set to ensure that the target arc path can be generated correctly. When s1+0=0 and s1+2=0, it means that a full circle is generated.
8. When using the interpolation instruction, parameter settings (such as celebration/deceleration time and so on) are subject to the X axis (Y0);
9. The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

**Error Codes****Error Codes****Contents**

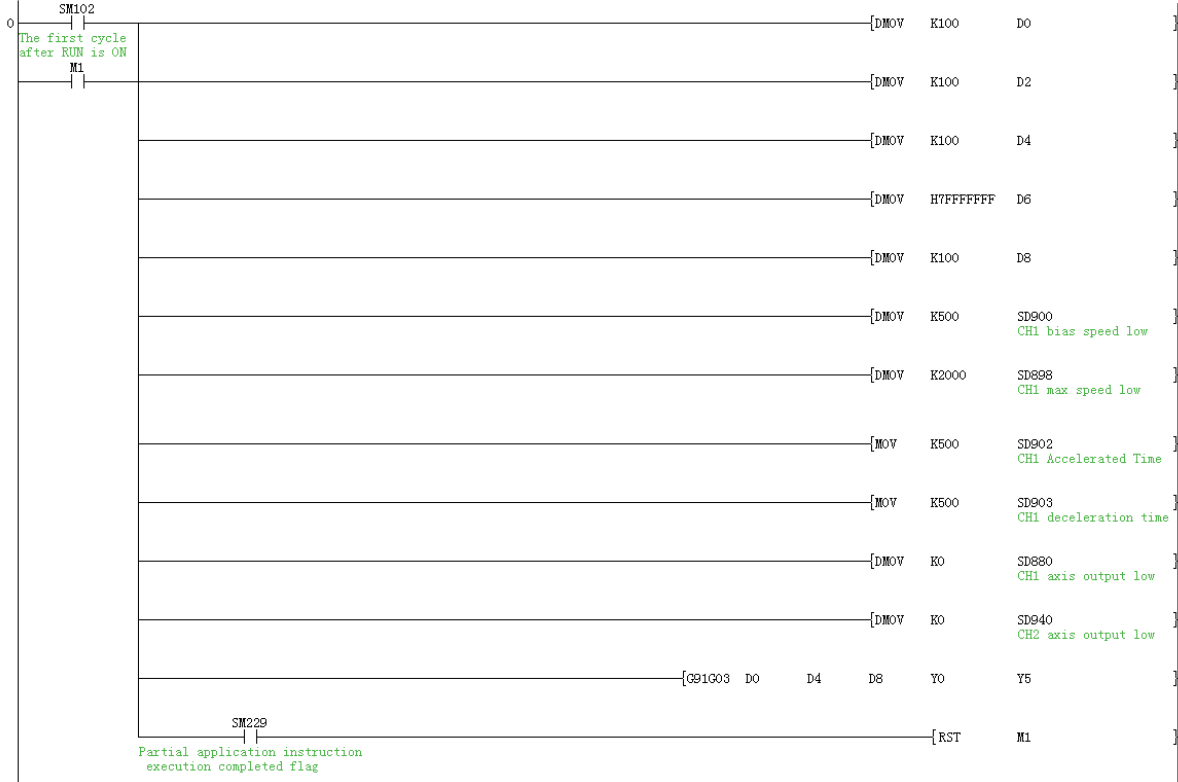
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.
4F90H	In radius mode, the radius is not in the range.
4F92H	In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordi
4F93H	In radius mode, the chord length is greater than the diameter.



4F95H  
 4F96H  
 4F97H

In center mode, the distance between the circle center and the starting point, and the distance between the circle center and the target point.  
 In radius mode, when the absolute/relative mode calculates that the starting point is the same as the target point.  
 In center mode, the calculated radius distance is greater than the maximum radius range, which is plus or minus the maximum radius range.

**Example**



Set Y0 as the interpolation starting axis, Y5 as the direction starting axis, and the maximum speed is 2000, and the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a relative position clockwise circular interpolation output based on relative position with acceleration and deceleration, and the incremental position is X (Y0) axis 100, Y (Y1) axis 100, and the the radius is 1000 pulse in radius mode, and the pulse synthesis frequency is 1000.

## G90G03 Absolute position counterclockwise circular interpolation instruction

G90G03

Execute 2 axis counterclockwise circular interpolation instruction in absolute drive mode. The method of specifying the movement distance from the origin (zero point) is also called absolute drive method.

-[G90G03 (s1) (s2) (s3) (d1) (d2) ]

**Content, range and data type**

Parameters	Content	Range	Data type	Data type tag
(s1)	Specify the target position (absolute address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(S2)	Radius/center mode	-	Signed BIN32	ANY32_S

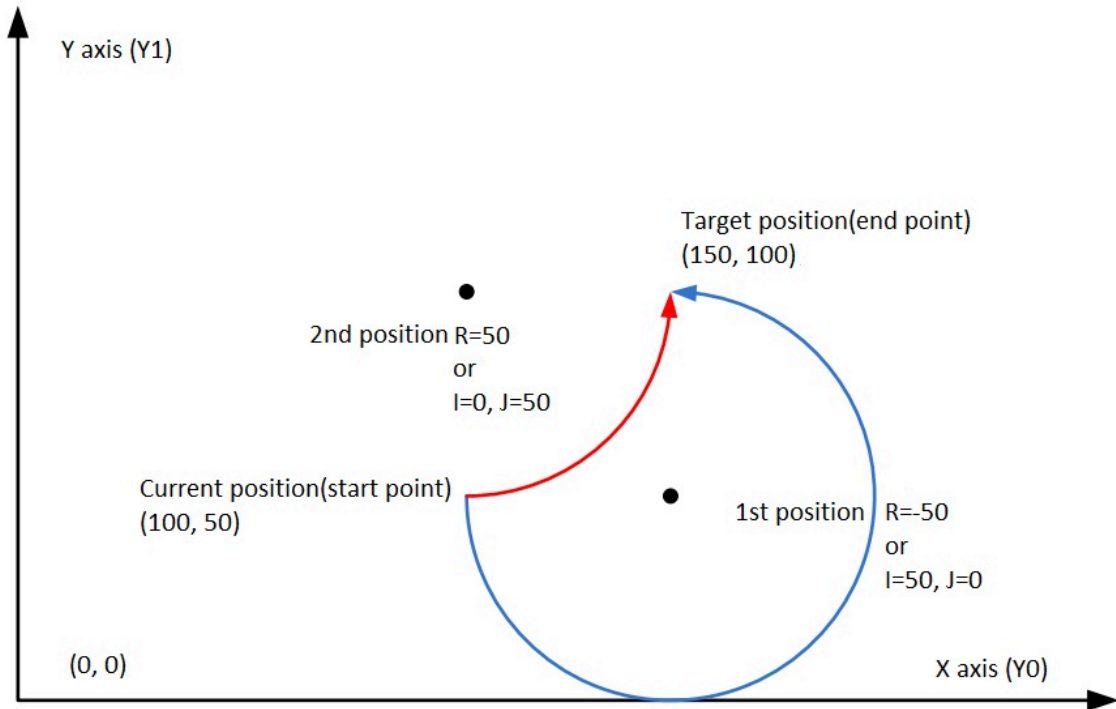
(s3)	Specify the synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Device (Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output - port or bit variable		Bit	ANY_BOOL

**Device used**

Instruction	Parameters	Device						Offset	Pulse
		Y	M	D	R	K	H	[D]	extension
G90G03	Parameter 1			●	●				
	Parameter 2			●	●				
	Parameter 3			●	●	●	●		
	Parameter 4	●							
	Parameter 5	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, performs 2-axis counterclockwise circular interpolation, and the servo actuator performs counterclockwise circular interpolation to run to the target position point.



- s1 is the starting address, and occupies 4 consecutive addresses. s1 is the target position of X axis (absolute positioning), s1+2 is the target position of Y axis (absolute positioning). The range is -2147483648 to +2147483647.
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The center coordinate of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The center coordinate of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3) . The range is 1 to 100000.
- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 2 consecutive addresses, which indicate the directions of the X and Y axes in turn.

**#Note:**

1. Please do not duplicate device that used for other controls.
2. When using interpolation instruction, the parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.
3. The maximum radius supported by circular interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.
4. There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).

5. IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only as the difference of the pulse output number between the coordinates of the center of the circle on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.
6. R mode (radius mode): When the value of R is greater than 0, it indicates that it is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that it is an arc greater than or equal to 180 degrees. A full circle cannot be generated In R mode because there are infinite solutions.
7. When s1 indicates the relative position of target position, a reasonable target position needs to be set to ensure that the target arc path can be generated correctly. When s1+0=0 and s1+2=0, it means that a full circle is generated.
8. When using the interpolation instruction, parameter settings (such as celebration/deceleration time and so on) are subject to the X axis (Y0);
9. The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

## Error Codes

### Error Codes

4084H

### Contents

The data input in the application instruction (s1) and (s2) exceed the specified range

4085H

The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range

4088H

The same pulse output axis (d1) is used and has been started.

4F90H

In radius mode, the radius is not in the range.

4F92H

In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordinate

4F93H

In radius mode, the chord length is greater than the diameter.

4F95H

In center mode, the distance between the circle center and the starting point, and the distance between the circle center

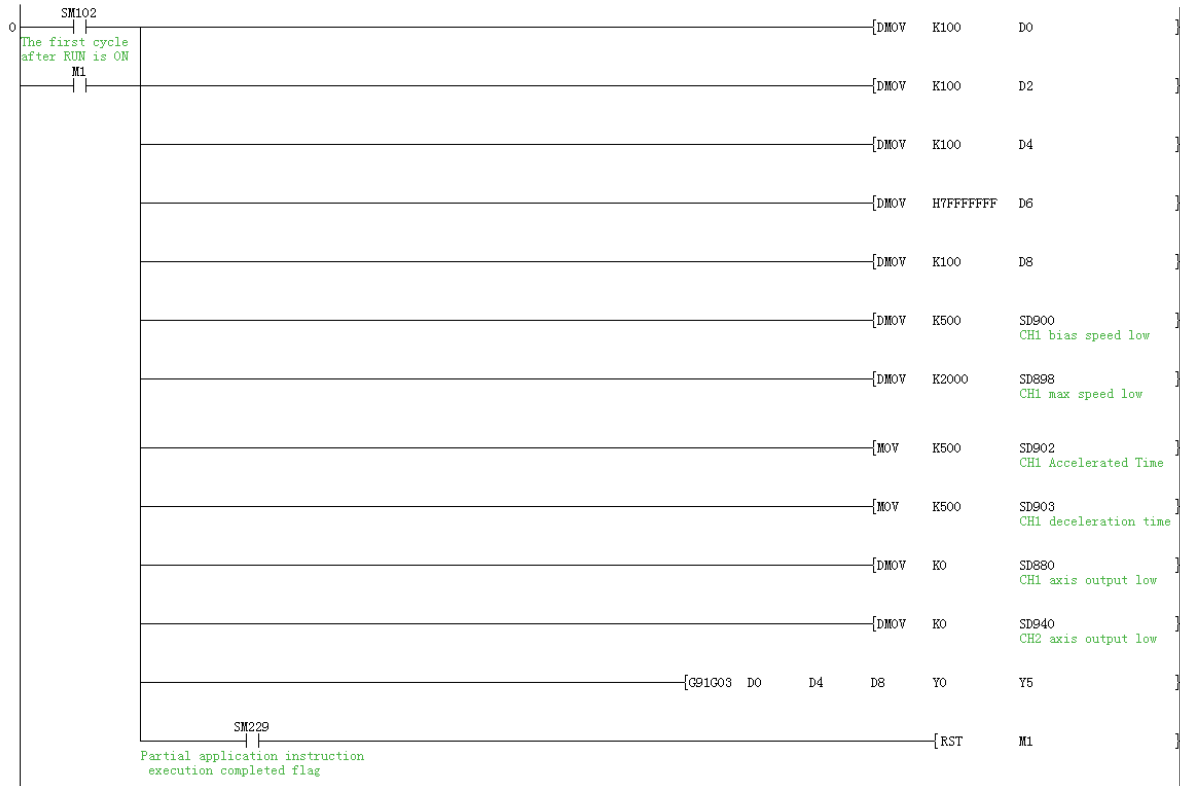
4F96H

In radius mode, when the absolute/relative mode calculates that the starting point is the same as the target position,

4F97H

In center mode, the calculated radius distance is greater than the maximum radius range, which is plus or minus 800

## Example



Set Y0 as the interpolation starting axis, Y5 as the direction starting axis, the maximum speed is 2000, the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a absolute position counterclockwise circular interpolation output based on relative position with acceleration and deceleration, and the target position is X (Y0) axis 100, Y (Y1) axis 100, and the the radius is 1000 pulse in radius mode, and the pulse synthesis frequency is 1000.

## G91G03 Relative position counterclockwise circular interpolation instruction

### G91G03

Execute 2 axis reverse circular interpolation instruction in relative drive mode. The method of specifying the movement distance from the current position is also called relative (incremental)drive method.

-[G91G03 (s1) (s2) (s3) (d1) (d2) ]

#### Content, range and data type

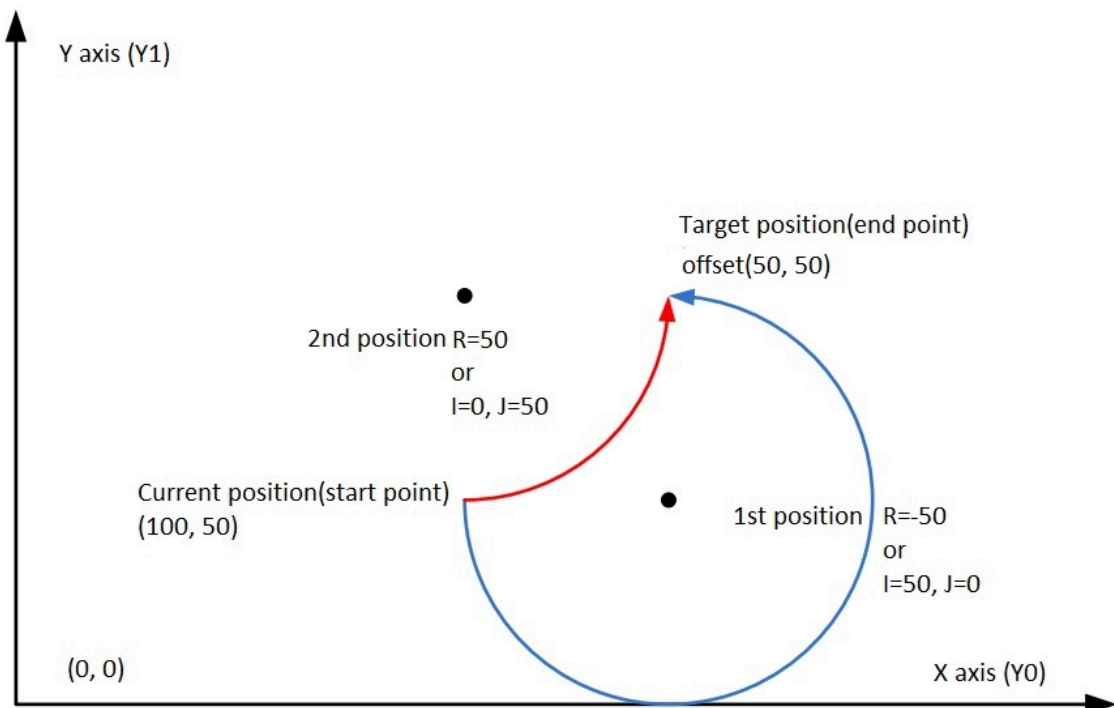
Parameters	Content	Range	Data type	Data type
(s1)	Specify the target position (relative address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Radius/center mode	-	Signed BIN32	ANY32_S
(s3)	Specify the synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Soft component (Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output - port or bit variable	-	Bit	ANY_BOOL

**Device used**

Instruction	Parameters	Device						Offset [D]	Pulse extension XXP
		Y	M	D	R	K	H		
G91G03	Parameter 1			●	●				
	Parameter 2			●	●				
	Parameter 3			●	●	●	●		
	Parameter 4	●							
	Parameter 5	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, performs 2-axis counterclockwise circular interpolation, and servo actuator performs a 2-axis counterclockwise circular interpolation with a given offset based in current position.



- s1 is the starting address, and occupies 4 consecutive addresses. s1 is the target position of X axis (absolute positioning), s1+2 is the target position of Y axis (absolute positioning). The range is -2147483648 to +2147483647.
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The center coordinate of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The center coordinate of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3) . The range is 1 to 100000.
- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 2 consecutive addresses, which indicate the directions of the X and Y axes in turn.

**#Note:**

1. Please do not duplicate device that used for other controls.
2. When using interpolation instruction, the parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.
3. The maximum radius supported by circular interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.
4. There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).
5. IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only as the difference of the pulse output number between the coordinates of the center of the circle on the XY axis (Y0/ Y1) relative to the current position, and both are in the offset value.
6. R mode (radius mode): When the value of R is greater than 0, it indicates that it is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that it is an arc greater than or equal to 180 degrees. A full circle cannot be generated In R mode because there are infinite solutions.
7. When s1 indicates the relative position of target position, a reasonable target position needs to be set to ensure that the target arc path can be generated correctly. When s1+0=0 and s1+2=0, it means that a full circle is generated.
8. When using the interpolation instruction, parameter settings (such as celebration/deceleration time and so on) are subject to the X axis (Y0);
9. The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

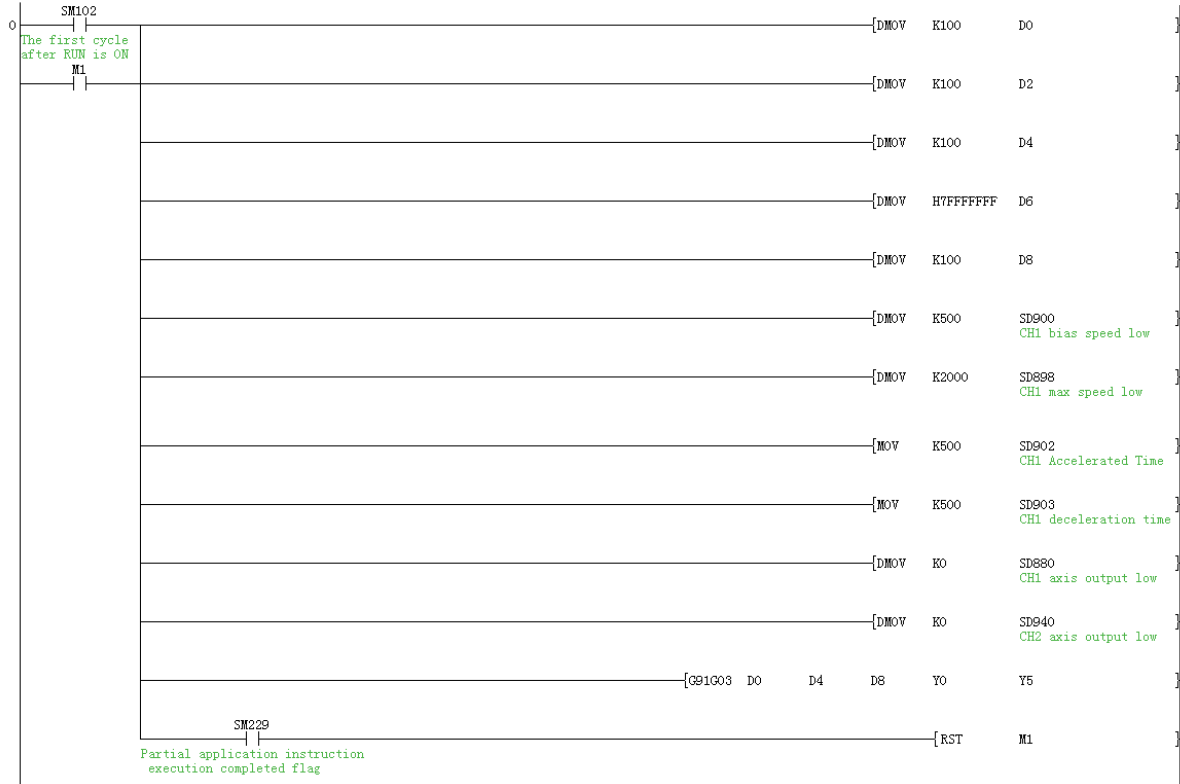
$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

**Error Codes**

Error Codes	Contents
4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.
4F90H	In radius mode, the radius is not in the range.
4F92H	In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordin
4F93H	In radius mode, the chord length is greater than the diameter.

- 4F95H In center mode, the distance between the circle center and the starting point, and the distance between the circle center and the target position.
- 4F96H In radius mode, when the absolute/relative mode calculates that the starting point is the same as the target position, the radius is 0.
- 4F97H In center mode, the calculated radius distance is greater than the maximum radius range, which is plus or minus the maximum radius range.

**Example**



Set Y0 as the interpolation starting axis, Y5 as the direction starting axis, the maximum speed is 2000, the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a relative position reverse circular interpolation output based on relative position with acceleration and deceleration, and the incremental position is X (Y0) axis 100, Y (Y1) axis 100, and the the radius is 1000 pulse in radius mode, and the pulse synthesis frequency is 1000.

## G90G02H Absolute position clockwise circular helical interpolation instruction

### G90G02H

Execute 3 axis clockwise circular interpolation instruction in absolute drive mode. The method of specifying the movement distance from the origin point(zero point) is also called absolute drive mode.

-[G90G02H (s1) (s2) (s3) (d1) (d2) ]

**Content, range and data type**

Parameters	Content	Range	Data type	Data type
(s1)	Specify the target position (absolute address)	-2147483648 to +2147483647	Signed BIN32	ANY32_S
(s2)	Radius/Center mode	-	Signed BIN32	ANY32_S
(s3)	Specify synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S



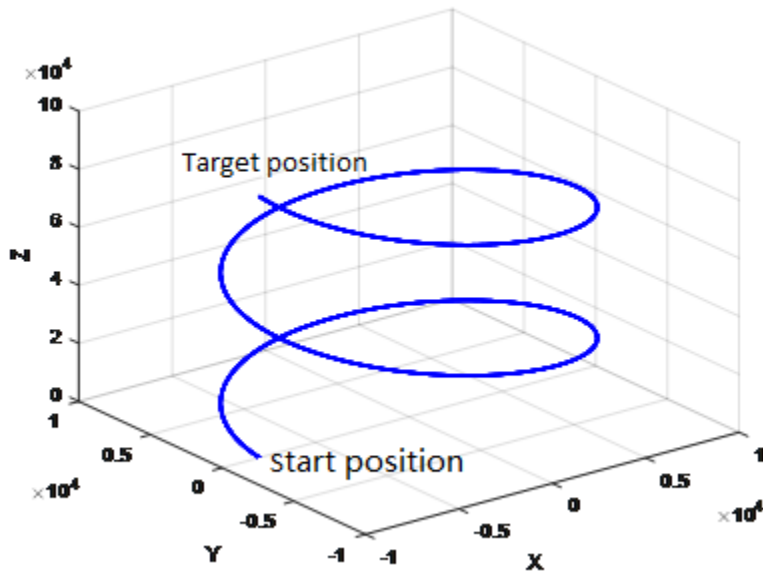
(d1)	Device(Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output - port or bit variable		Bit	ANY_BOOL

**Device used**

Instruction Parameters		Device					Offset modification [D]	Pulse extension XXP
		Y	M	D	R	K	H	
G90G02H	Parameter 1			●	●			
	Parameter 2			●	●			
	Parameter 3			●	●	●	●	
	Parameter 4	●						
	Parameter 5	●	●					

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 3-axis clockwise circular helical interpolation, and servo actuator performs clockwise helical interpolation to run to the target position point.



- (s1) is the starting address, and occupies 8 consecutive addresses. s1 is the target position (absolute positioning) of X axis , s1+2 is the target position (absolute positioning) of Y axis, and s1+4 is the target position (absolute positioning) of Z axis, and s1+6 is the lead range of Z axis. The lead range is  $0 < K \leq 4\sqrt{2}R$  .(The range is -2147483648 to +2147483647.)
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The coordinate of circle center of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The coordinate of circle center of s2+2 is in the difference value of

the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.

- Specify the synthetic output frequency in (s3) . The range is 1 to 100000. Helical interpolation can switch the synthetic frequency by setting SM901. 0 means default, and the synthetic frequency is the frequency of the linear velocity of helix. 1 means that the synthetic frequency is the frequency of the linear velocity of the arc of arc plane, that is, the actual synthetic frequency is greater than the setting synthetic frequency.
- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1,Y2) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 3 consecutive addresses, which indicates the directions of the X, Y and Z axes in turn. It is recommended to specify direction signal in (Y00-Y07).

**#Note:**

(1) Please do not duplicate device that used for other controls.

(2) When using interpolation instruction, parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.

(3) The maximum radius supported by helical interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.

(4) There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).

(5) IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only expressed as the difference of the pulse output number between the coordinates of circle center on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.

(6) In helical interpolation R mode (radius mode): When the value of R is greater than 0, it indicates that from the starting point coordinate to the set end point coordinate in the circular plane of XY is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that from the starting point coordinate to the set end point coordinate in the circular plane of XY is an arc greater than or equal to 180 degrees, and the actual passing angle is

$$\theta = \frac{Ze}{K} * 2\pi$$

determined by the endpoint of Z axis and the lead K. ( If Ze=75, lead K=50, and the actual radian

(7) When using the interpolation instruction, parameter settings (such as acceleration/deceleration time and so on) are subject to the X axis (Y0);

(8) The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

(9) Exact match pitch of screws (lead) K and  $Ze$ .

The starting point coordinate of helical interpolation is  $(0,0,0)$ , set the end point coordinate to  $(Xe, Ye, Ze)$ , the number of turns of helical interpolation  $n$  is determined by formula (1), and recalculate the end point coordinates of X axis and Y axis according to the number of turns of interpolation.

The final interpolation result is: make sure that lead is equal to  $K$ , and the end point of Z axis is equal to  $Z_e$ . The actual end point position of X and Y axes  $(X_e', Y_e')$  may not be equal to the set  $(X_e, Y_e)$ , but it must pass through the set point  $(X_e, Y_e)$  in the whole circle.

$$n = \frac{|Z_e - Z_s|}{K} \quad (1)$$

(10) In helical interpolation radius mode, the center distribution table of whole circle is as below. (For example: the starting point coordinate  $(0,0,0)$ , the end point coordinate  $(0,0,Z_e)$ ).

Helical interpolation direction	Radius value R	Coordinate of circle center	Helical interpolation direction	Radius value R	Coordinate of circle center
Clockwise circular	$R > 0$	$(0, R)$	Counterclockwise circular	$R > 0$	$(0, -R)$
	$-R < 0$	$(0, -R)$		$-R < 0$	$(0, R)$

### Error Codes

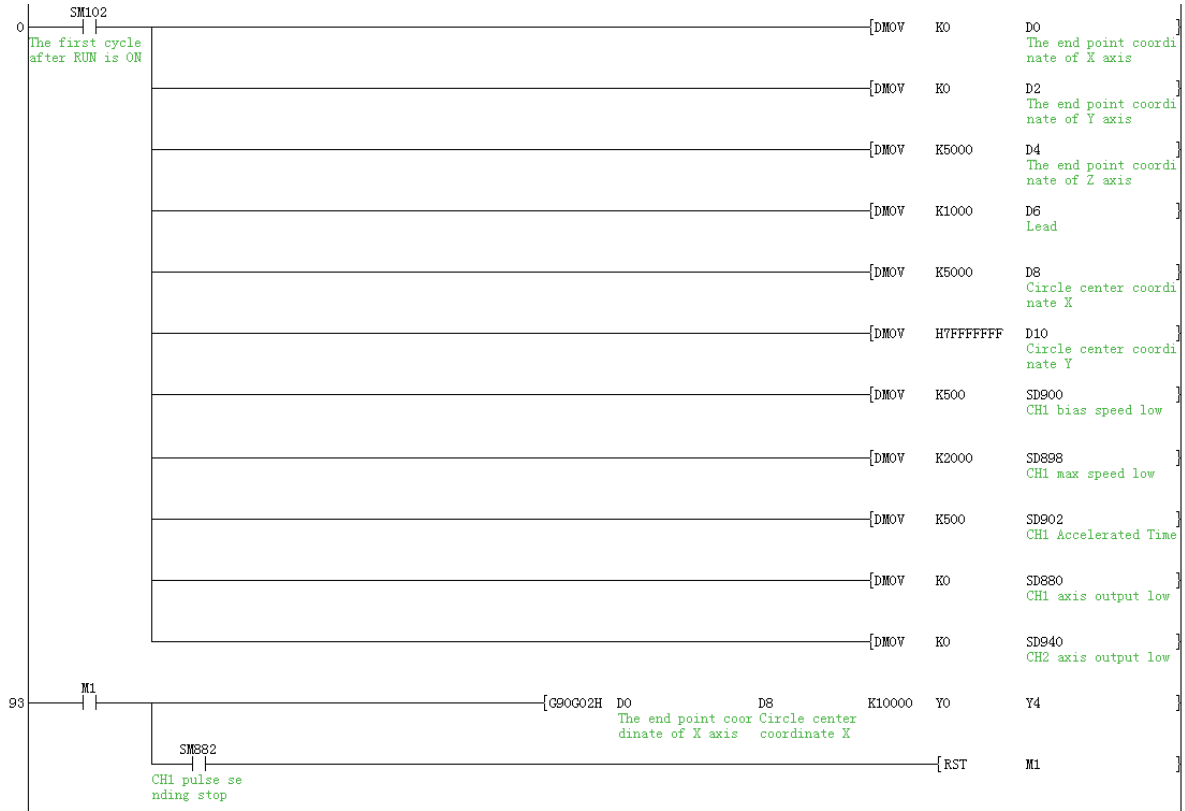
#### Error Codes

4084H  
4085H  
4088H  
4F90H  
4F92H  
4F93H  
4F95H  
4F97H  
4F98H  
4F99H  
4F9BH

#### Contents

The data input in the application instruction (s1) and (s2) exceed the specified range  
The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range  
The same pulse output axis (d1) is used and has been started.  
In radius mode, the radius is not in the range.  
In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordinate and the circle center.  
In radius mode, the chord length is greater than the diameter.  
In center mode, the distance between the circle center and the starting point, and the distance between the circle center and the end point exceed the maximum radius range.  
In center mode, the calculated radius distance is greater than the maximum radius range, which is positive or negative.  
Helical interpolation error, Z axis is the main axis. (The coordinate of Z axis is greater than the number of of interpolation)  
Helical interpolation error, Z axis is 0.  
Lead setting exceeds the range. (Lead  $K \leq 0$ )

### Example



Set Y0 as the interpolation starting axis, Y4 as the direction starting axis, and the maximum speed is 2000, and the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a absolute position clockwise circular helical interpolation output based on the absolute position with acceleration and deceleration, and the target position is X (Y0) axis 0, Y (Y1) axis 0 and Z (Y2) axis 5000, and the lead is 5000, and the radius is 5000 pulse in radius mode, and the synthesis frequency is 1000.

## G91G02H Relative position clockwise circular helical interpolation instruction

### G91G02H

Execute 3 axis clockwise circular interpolation instruction in relative drive mode. The method of specifying the movement distance from current point is also called incremental (relative) drive mode.

-[G91G02H (s1) (s2) (s3) (d1) (d2) ]

#### Content, range and data type

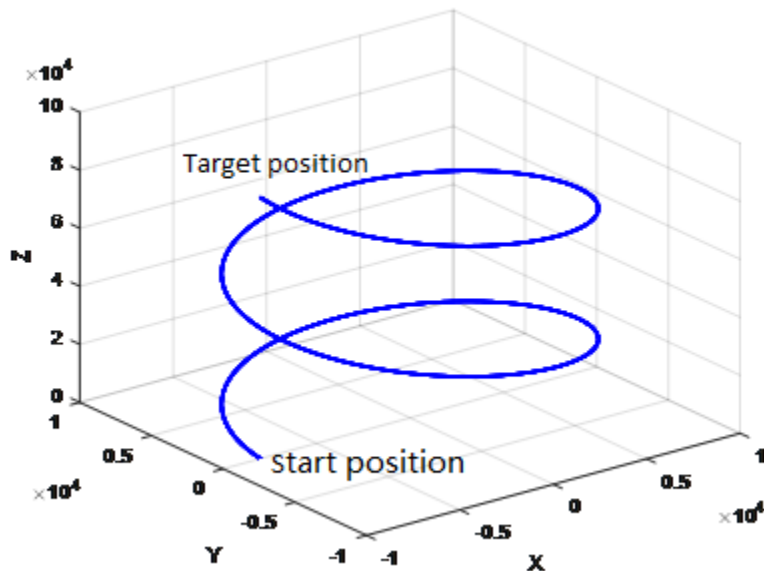
Parameters	Content	Range	Data type	Data type
(s1)	Specify the target position (relative address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Radius/Center mode	-	Signed BIN32	ANY32_S
(s3)	Specify synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Device(Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

**Device used**

Instruction	Parameters	Device						Offset	Pulse
		Y	M	D	R	K	H	modification [D]	extension XXP
G91G02H	Parameter 1			●	●				
	Parameter 2			●	●				
	Parameter 3			●	●	●	●		
	Parameter 4	●							
	Parameter 5	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 3-axis clockwise circular helical interpolation, and servo actuator performs clockwise helical interpolation to run to the target position point.



- (s1) is the starting address, and occupies 8 consecutive addresses. s1 is the target position (relative positioning) of X axis , s1+2 is the target position (relative positioning) of Y axis, and s1+4 is the target position (relative positioning) of Z axis, and s1+6 is the lead range of Z axis. The lead range is  $0 < K \leq 4\sqrt{2}R$ . (The range is -2147483648 to +2147483647.)
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The coordinate of circle center of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The coordinate of circle center of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3). The range is 1 to 100000. Helical interpolation can switch the synthetic frequency by setting SM901. 0 means default, and the synthetic frequency is the frequency of the

linear velocity of helix. 1 means that the synthetic frequency is the frequency of the linear velocity of the arc of arc plane, that is, the actual synthetic frequency is greater than the setting synthetic frequency.

- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1, Y2) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 3 consecutive addresses, which indicates the directions of the X, Y and Z axes in turn. It is recommended to specify direction signal in (Y00-Y07).

**#Note:**

(1) Please do not duplicate device that used for other controls.

(2) When using interpolation instruction, parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.

(3) The maximum radius supported by helical interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.

(4) There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).

(5) IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only expressed as the difference of the pulse output number between the coordinates of the circle center on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.

(6) In helical interpolation R mode (radius mode) : When the value of R is greater than 0, it indicates that from starting point coordinate to the setting end point coordinate in the circular plane of XY is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that from starting point coordinate to the setting end point coordinate in the circular plane of XY is an arc greater than or equal to 180 degrees, and the actual passing angle is determined by the endpoint of Z axis and the lead K. ( If Ze=75, lead K=50, and the actual radian

$$\theta = \frac{Z_e}{K} * 2\pi$$

(7) When using interpolation instruction, parameter settings (such as acceleration/deceleration time and so on) are subject to the X axis (Y0);

(8) The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$f_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

(9) Exact match pitch of screws (lead) K and  $Z_e$ .

The starting point coordinate of helical interpolation is  $(0,0,0)$ , set the end point coordinate to  $(X_e, Y_e, Z_e)$ , the number of turns of helical interpolation  $n$  is determined by formula (1), and recalculate the end point coordinates of X axis and Y axis according to the number of turns of interpolation.

The final interpolation result is: make sure that lead is equal to  $K$ , and the end point of Z axis is equal to  $Z_E$ . The actual end point position of X and Y axes  $(X_E, Y_E)$  may not be equal to the set  $(X_E, Y_E)$ , but it must pass through the set point  $(X_E, Y_E)$  in the whole circle.

$$n = \frac{|Z_e - Z_s|}{K} \quad (1)$$

(10) In helical interpolation radius mode, the center distribution table of whole circle is as below. (For example: the starting point coordinate  $(0,0,0)$ , the end point coordinate  $(0,0,Z_E)$ ).

Helical interpolation direction	Radius value R	Coordinate of circle center	Helical interpolation direction	Radius value R	Coordinate of circle center
Clockwise circular	$R > 0$	$(0, R)$	Counterclockwise circular	$R > 0$	$(0, -R)$
	$-R < 0$	$(0, -R)$		$-R < 0$	$(0, R)$

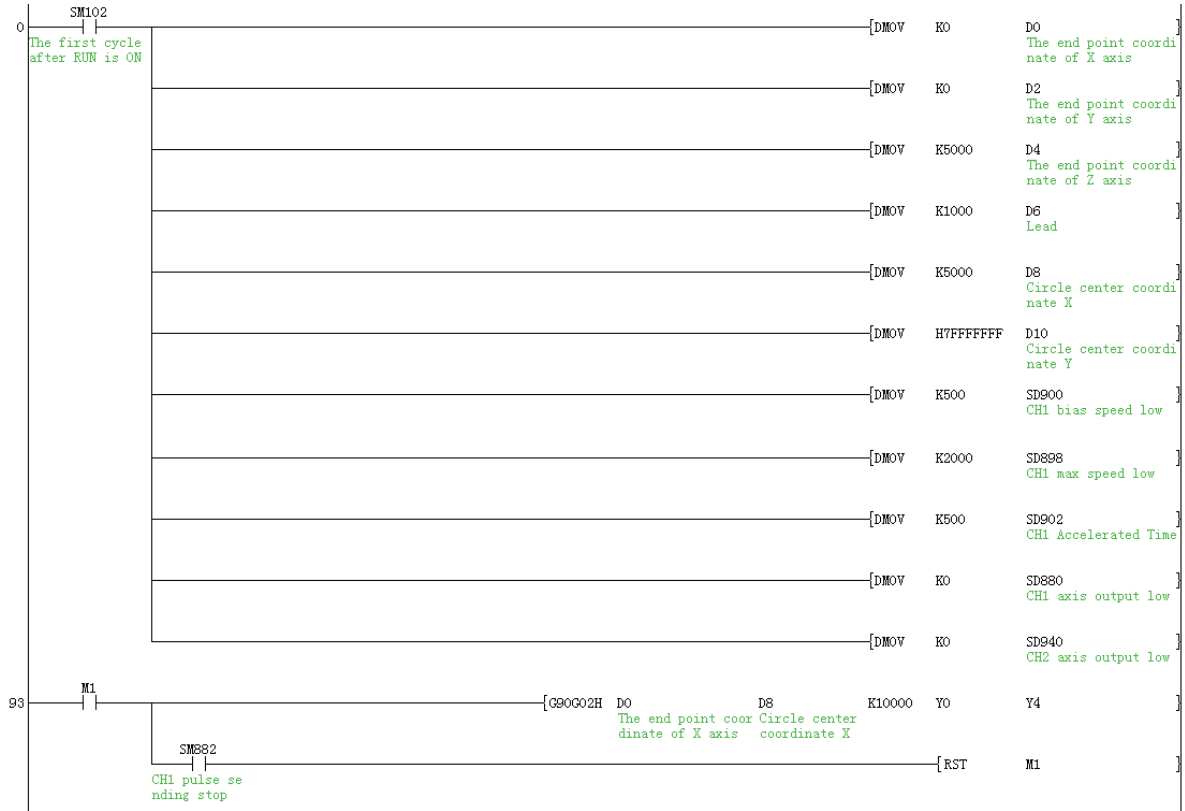
### Error Codes

#### Error Codes

#### Contents

4084H	The data input in the application instruction (s1) and (s2) exceed the specified range
4085H	The result output in the read application instruction (s1), (s2), (d1) and (d2) exceed the device range
4088H	The same pulse output axis (d1) is used and has been started.
4F90H	In radius mode, the radius is not in the range.
4F92H	In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordinate and the circle center.
4F93H	In radius mode, the chord length is greater than the diameter.
4F95H	In center mode, the distance between the circle center and the starting point, and the distance between the circle center and the end point are greater than the maximum radius range.
4F97H	In center mode, the calculated radius distance is greater than the maximum radius range, which is positive or negative.
4F98H	Helical interpolation error, Z axis is the main axis. (The coordinate of Z axis is greater than the number of of virtual axis.)
4F99H	Helical interpolation error, Z axis is 0.
4F9BH	Lead setting exceeds the range. (Lead $K \leq 0$ )

### Example



Set Y0 as the interpolation starting axis, Y4 as the direction start axis, and the maximum speed is 2000, and the offset speed is 500, and the acceleration/deceleration time is 500ms. Send a relative position clockwise circular helical interpolation output based on the relative position with acceleration and deceleration, and the target position is X (Y0) axis 0, Y (Y1) axis 0 and Z (Y2) axis 5000, and the lead is 5000, and the radius is 5000 pulse in radius mode, and the synthesis frequency is 1000.

## G90G03H Absolute position counterclockwise circular helical interpolation instruction

### G90G03H

Execute 3 axis counterclockwise circular interpolation instruction in absolute drive mode. The method of specifying the movement distance from the origin point(zero point) is also called absolute drive mode.

-[G90G03H (s1) (s2) (s3) (d1) (d2) ]

#### Content, range and data type

Parameters	Content	Range	Data type	Data type
(s1)	Specify the target position (absolute address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Radius/Center mode	-	Signed BIN32	ANY32_S
(s3)	Specify synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Device(Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

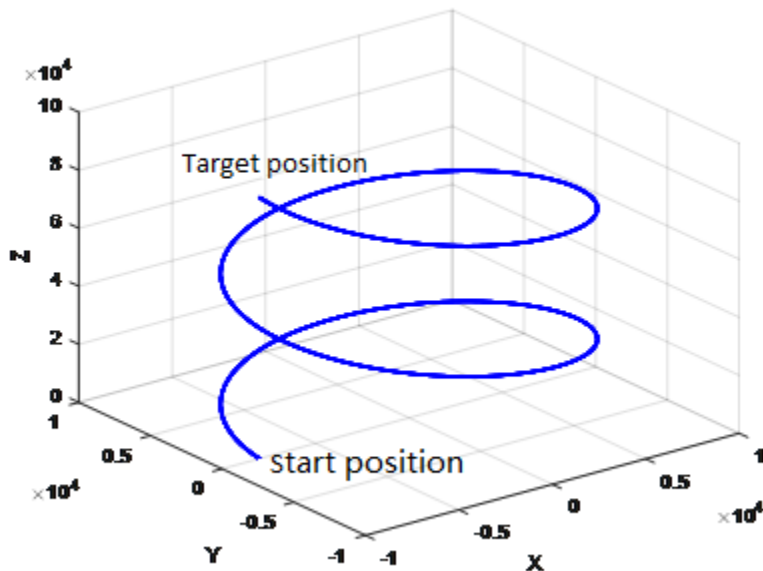


**Device used**

Instruction	Parameters	Device						Offset [D]	Pulse modification extension XXP
		Y	M	D	R	K	H		
G90G03H	Parameter 1			●	●				
	Parameter 2			●	●				
	Parameter 3			●	●	●	●		
	Parameter 4	●							
	Parameter 5	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 3-axis counterclockwise circular helical interpolation, and servo actuator performs counterclockwise helical interpolation to run to the target position point.



- (s1) is the starting address, and occupies 8 consecutive addresses. s1 is the target position (absolute positioning) of X axis, s1+2 is the target position (absolute positioning) of Y axis, and s1+4 is the target position (absolute positioning) of Z axis, and s1+6 is the lead range of Z axis. The lead range is  $0 < K \leq 4\sqrt{2}R$ . (The range is -2147483648 to +2147483647.)
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The coordinate of circle center of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The coordinate of circle center of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3). The range is 1 to 100000. Helical interpolation can switch the synthetic frequency by setting SM901. 0 means default, and the synthetic frequency is the frequency of the

linear velocity of helix. 1 means that the synthetic frequency is the frequency of the linear velocity of the arc of arc plane, that is, the actual synthetic frequency is greater than the setting synthetic frequency.

- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1, Y2) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 3 consecutive addresses, which indicates the directions of the X, Y and Z axes in turn. It is recommended to specify direction signal in (Y00-Y07).

**#Note:**

(1) Please do not duplicate device that used for other controls.

(2) When using interpolation instruction, parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.

(3) The maximum radius supported by helical interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.

(4) There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).

(5) IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only expressed as the difference of the pulse output number between the coordinates of the center of the circle on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.

(6) In helical interpolation R mode (radius mode): When the value of R is greater than 0, it indicates that from starting point coordinate to the setting end point coordinate in the circular plane of XY is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that from starting point coordinate to the setting end point coordinate in the circular plane of XY is an arc greater than or equal to 180 degrees, and the actual passing angle is determined by the endpoint of Z axis and the lead K. ( If Ze=75, lead K=50, and the actual radian

$$\theta = \frac{Z_e}{K} * 2\pi$$

(7) When using the interpolation instruction, parameter settings (such as acceleration/deceleration time and so on) are subject to the X axis (Y0);

(8) The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$V_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$V_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

(9) Exact match pitch of screws (lead) K and  $Z_e$ .

The starting point coordinate of helical interpolation is  $(0,0,0)$ , set the end point coordinate to  $(X_e, Y_e, Z_e)$ , the number of turns of helical interpolation  $n$  is determined by formula (1), and recalculate the end point coordinates of X axis and Y axis according to the number of turns of interpolation.

The final interpolation result is: make sure that lead is equal to  $K$ , and the end point of Z axis is equal to  $Z_e$ . The actual end point position of X and Y axes  $(X_e', Y_e')$  may not be equal to the set  $(X_e, Y_e)$ , but it must pass through the set point  $(X_e, Y_e)$  in the whole circle.

$$n = \frac{|Z_e - Z_s|}{K} \quad (1)$$

(10) In helical interpolation radius mode, the center distribution table of whole circle is as below. (For example: the starting point coordinate  $(0,0,0)$ , the end point coordinate  $(0,0,Z_e)$ ).

Helical interpolation direction	Radius value R	Coordinate of circle center	Helical interpolation direction	Radius value R	Coordinate of circle center
Clockwise circular	$R > 0$	$(0, R)$	Counterclockwise circular	$R > 0$	$(0, -R)$
	$-R < 0$	$(0, -R)$		$-R < 0$	$(0, R)$

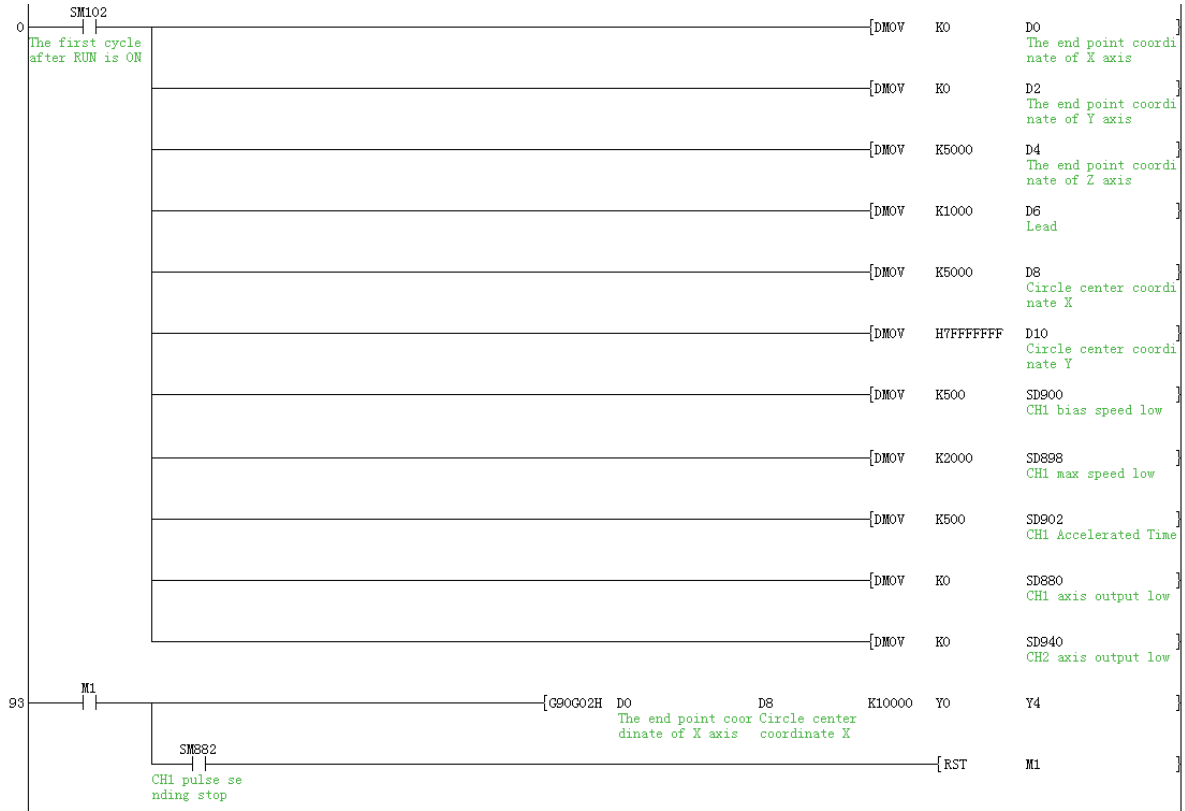
### Error Codes

#### Error Codes

#### Contents

4084H	(S1) (s2) input data that exceeds the specified range in application instruction.
4085H	The output result of (s1)(s2)(d1)(d2) in the read application instruction exceeds the device range.
4088H	The same pulse output axis (d1) is used and has been started.
4F90H	In radius mode, the radius is not in the range.
4F92H	In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordinate and the center.
4F93H	In radius mode, the chord length is greater than the diameter.
4F95H	In center mode, the distance between the circle center and the starting point, and the distance between the circle center and the end point are not in the range.
4F97H	In center mode, the calculated radius distance is greater than the maximum radius range, which is positive or negative.
4F98H	Helical interpolation error, Z axis is the main axis. (The coordinate of Z axis is greater than the number of of virtual axes.)
4F99H	Helical interpolation error, Z axis is 0.
4F9BH	Lead setting exceeds the range. (Lead $K \leq 0$ )

### Example



Set Y0 as the interpolation starting axis, Y4 as the direction starting axis, and the maximum speed is 2000, and the offset speed is 500, and the acceleration/deceleration time is 500ms. Send an absolute position counterclockwise circular helical interpolation output based on the absolute position with acceleration and deceleration, and the target position is X (Y0) axis 0, Y (Y1) axis 0 and Z (Y2) axis 5000, and the lead is 5000, and the radius is 5000 pulse in radius mode, and the synthesis frequency is 1000.

## G91G03H Relative position counterclockwise circular helical interpolation instruction

### G91G03H

Execute 3 axis counterclockwise circular interpolation instruction in relative drive mode. The method of specifying the movement distance from current point is also called incremental (relative) drive mode.

-[G91G03H (s1) (s2) (s3) (d1) (d2) ]

#### Content, range and data type

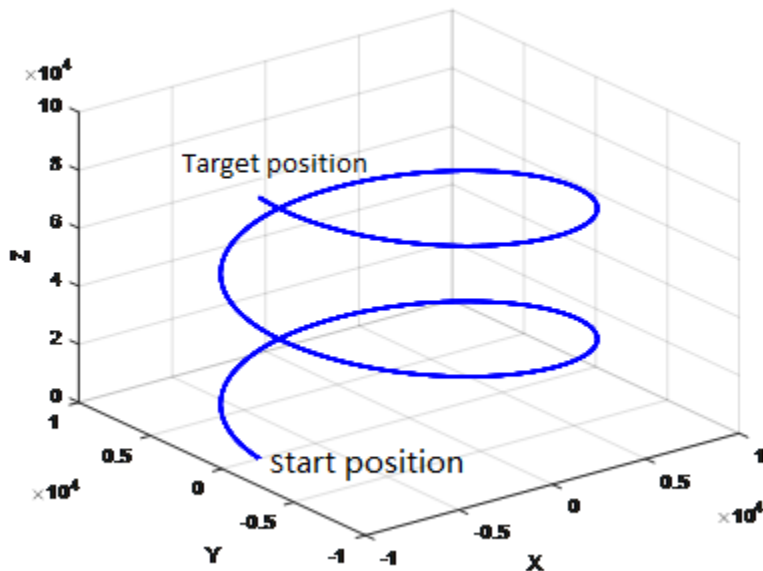
Parameters	Content	Range	Data type	Data type
(s1)	Specify the target position (relative address)	-2147483648 to 2147483647	Signed BIN32	ANY32_S
(s2)	Radius/Center mode	-	Signed BIN32	ANY32_S
(s3)	Specify synthetic output frequency	1 to 100000	Signed BIN32	ANY32_S
(d1)	Device(Y) number for output pulse	Y0	Bit	ANY_BOOL
(d2)	Running direction output port or bit variable	-	Bit	ANY_BOOL

**Device used**

Instruction	Parameters	Device						Offset	Pulse
		Y	M	D	R	K	H	modification [D]	extension XXP
G91G03H	Parameter 1			●	●				
	Parameter 2			●	●				
	Parameter 3			●	●	●	●		
	Parameter 4	●							
	Parameter 5	●	●						

**Features**

This instruction outputs pulses according to the specified port, frequency and running direction, and performs 3-axis counterclockwise circular helical interpolation, and servo actuator performs counterclockwise helical interpolation to run to the target position point.



- (s1) is the starting address, and occupies 8 consecutive addresses. s1 is the target position (relative positioning) of X axis , s1+2 is the target position (relative positioning) of Y axis, and s1+4 is the target position (relative positioning) of Z axis, and s1+6 is the lead range of Z axis. The lead range is  $0 < K \leq 4\sqrt{2}R$ . (The range is -2147483648 to +2147483647.)
- Specify radius or center mode in (s2), and occupy 4 consecutive addresses. The coordinate of circle center of s2+0 is in the difference value of the number of pulse output of X axis relative to the current position, or the number of the pulse of radius R. The coordinate of circle center of s2+2 is in the difference value of the number of pulse output of Y axis relative to the current position. When using radius, the value must be 0X7FFF FFFF. The range is 1 to 141421.
- Specify the synthetic output frequency in (s3). The range is 1 to 100000. Helical interpolation can switch the synthetic frequency by setting SM901. 0 means default, and the synthetic frequency is the frequency of the

linear velocity of helix. 1 means that the synthetic frequency is the frequency of the linear velocity of the arc of arc plane, that is, the actual synthetic frequency is greater than the setting synthetic frequency.

- Specify the device of output pulse in (d1), only Y0 could be specified, and consecutive addresses (Y0, Y1, Y2) are occupied .
- Specify the bit device of output direction signal in (d2), and occupy 3 consecutive addresses, which indicates the directions of the X, Y and Z axes in turn. It is recommended to specify direction signal in (Y00-Y07).

**#Note:**

(1) Please do not duplicate device that used for other controls.

(2) When using interpolation instruction, parameter settings (such as acceleration/deceleration time and other parameters) are subject to the starting axis specified by d1.

(3) The maximum radius supported by helical interpolation is plus or minus 800,000 pulses, and the radius cannot be zero.

(4) There are two modes for setting s2: IJ mode (circle center coordinate mode) and R mode (radius mode). When the value of s2+2 is set to 0x7FFF FFFF, it is R mode (radius mode), otherwise it is IJ mode (circle center coordinate mode).

(5) IJ mode: Regardless of absolute position interpolation or relative position interpolation, s2 is only expressed as the difference of the pulse output number between the coordinates of the circle center on the XY axis (Y0/Y1) relative to the current position, and both are in the offset value.

(6) In helical interpolation R mode (radius mode) : When the value of R is greater than 0, it indicates that from starting point coordinate to the setting end point coordinate in the circular plane of XY is an arc less than or equal to 180 degrees. When the value of R is less than 0, it indicates that from starting point coordinate to the setting end point coordinate in the circular plane of XY is an arc greater than or equal to 180 degrees, and the actual passing angle is determined by the endpoint of Z axis and the lead K. ( If Ze=75, lead K=50, and the actual radian

$$\theta = \frac{Z_e}{K} * 2\pi$$

(7) When using interpolation instruction, parameter settings (such as acceleration/deceleration time and so on) are subject to the X axis (Y0);

(8) The actual synthetic frequency S (the lowest frequency value) is the lowest base frequency of the output synthetic frequency. The calculation modes are as follows:

$$V_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{acceleration time} \div 1000}}$$

$$V_{min} = \sqrt{\frac{\text{Maximum running frequency}}{2 \times \text{deceleration time} \div 1000}}$$

(9) Exact match pitch of screws (lead) K and  $Z_e$ .

The start point coordinate of helical interpolation is  $(0,0,0)$ , set the end point coordinate to  $(X_e, Y_e, Z_e)$ , the number of turns of helical interpolation  $n$  is determined by formula (1), and recalculate the end point coordinates of X axis and Y axis according to the number of turns of interpolation.

The final interpolation result is: make sure that lead is equal to  $K$ , and the end point of Z axis is equal to  $Z_e$ . The actual end point position of X and Y axes  $(X_e', Y_e')$  may not be equal to the set  $(X_e, Y_e)$ , but it must pass through the set point  $(X_e, Y_e)$  in the whole circle.

$$n = \frac{|Z_e - Z_s|}{K} \quad (1)$$

(10) In helical interpolation radius mode, the center distribution table of whole circle is as below. (For example: the start point coordinate  $(0,0,0)$ , the end point coordinate  $(0,0,Z_e)$ ).

Helical interpolation direction	Radius value R	Coordinate of circle center	Helical interpolation direction	Radius value R	Coordinate of circle center
Clockwise circular	$R > 0$	$(0, R)$	Counterclockwise circular	$R > 0$	$(0, -R)$
	$-R < 0$	$(0, -R)$		$-R < 0$	$(0, R)$

### Error Codes

#### Error Codes

#### Contents

4084H	(S1) (s2) input data that exceeds the specified range in application instruction.
4085H	The output result of (s1)(s2)(d1)(d2) in the read application instruction exceeds the device range.
4088H	The same pulse output axis (d1) is used and has been started.
4F90H	In radius mode, the radius is not in the range.
4F92H	In center/radius mode, the error of quadrant calculation is caused by the large deviation between the set coordinate of
4F93H	In radius mode, the chord length is greater than the diameter.
4F95H	In center mode, the distance between the circle center and the starting point, and the distance between the circle center
4F97H	In center mode, the calculated radius distance is greater than the maximum radius range, which is positive or negative
4F98H	Helical interpolation error, Z axis is the main axis.(The coordinate of Z axis is greater than the number of of virtual main
4F99H	Helical interpolation error, Z axis is 0.
4F9BH	Lead setting exceeds the range.(Lead $K \leq 0$ )

### Example





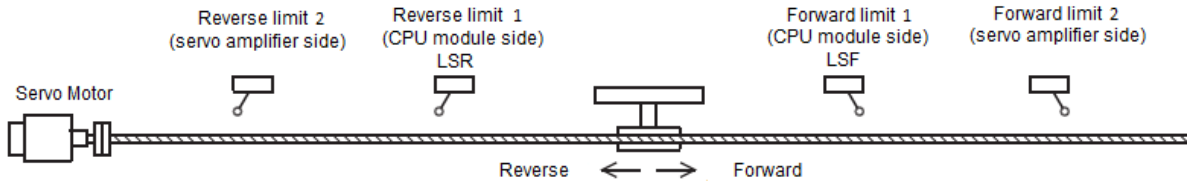
Pulse sending SM882 SM942 SM1002 SM1062 SM1122 SM1182 SM1242 SM1302

During process of pulse sending, if the forward rotation limit, the reverse rotation limit, and the output stop (SM34) signal are encountered, the flag bit will be ON after stopping the pulse.

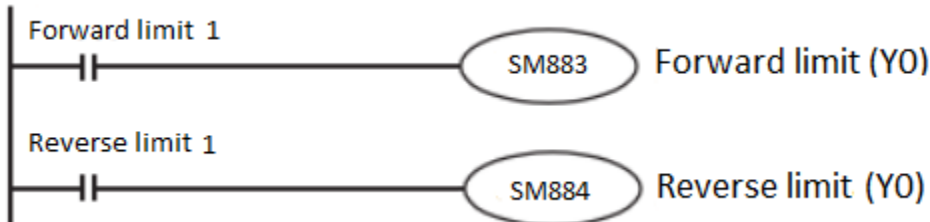
If the contact is closed directly, this flag bit will not be set after deceleration stop.(Except for PLSV)

**(3) Forward limit and reverse limit**

When using a servo motor, you can set the forward rotation limit or reverse rotation limit on the servo amplifier.



When positioning instruction action, such as the limit switch of forward limit or reverse limit, acts, please set and connect forward limit 1 (LSF) and reverse limit 1 (LSR) on the CPU module if you want to use CPU for retreat, and these two limits should act before the forward limit 2 or the reverse limit 2 of the servo amplifier.



**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Forward limit	SM883	SM943	SM1003	SM1063	SM1123	SM1183	SM1243	SM1303
Reverse limit	SM884	SM944	SM1004	SM1064	SM1124	SM1184	SM1244	SM1304

If forward limit 1 (LSF) and reverse limit 1 (LSR) are not set, servo motor will stop automatically even if the forward limit 2 or the reverse limit 2 is in action. But the positioning instruction in action can't identify this situation, it will output pulses until the instruction ends.

When forward limit or reverse limit acts, it will stop according the set stop method (deceleration stop, immediate stop).

If the instruction has no direction, then both the forward limit and the reverse limit are valid for the instruction.

**(4) Direction polarity**

When [0: increase current address by forward pulse output] is selected, the current address increases when the forward pulse is output, and decreases when the reverse pulse is output.

When [1: Increase current address by reverse pulse output] is selected, the current address is increased during reverse pulse output and decreased during forward pulse output.

The default is 0: increase the current address through forward pulse output.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Direction polarity	SM885	SM945	SM1005	SM1065	SM1125	SM1185	SM1245	SM1305

**(5) Origin return correlation (ZRN)**

Origin return enable [default is 1: enable the origin return function]

Select [0: turn off origin return function], that is, the origin return instruction is disabled and cannot be used.

Select [1: turn on origin return function], that is, the origin return instruction is enabled and can be used normally.

Origin return direction [default is 0: the direction of origin return is negative]

Select [0: the direction of origin return is negative], that is, the pulse output count is negative.

Select [1: the direction of origin return is positive], that is, the pulse output count is positive.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Origin return enable	SM886	SM946	SM1006	SM1066	SM1126	SM1186	SM1246	SM1306
Origin return direction	SM887	SM947	SM1007	SM1067	SM1127	SM1187	SM1247	SM1307

**(6) External signal correlation**

External signal start [default is 0: turn off the external signal start function]

Select [0: turn off external signal start function], that is, the external signal start function is not used.

Select [1: turn on external signal start function], that is, when an external signal is received, the pulse will be sent.

External signal logic [default is 0: OFF signal]

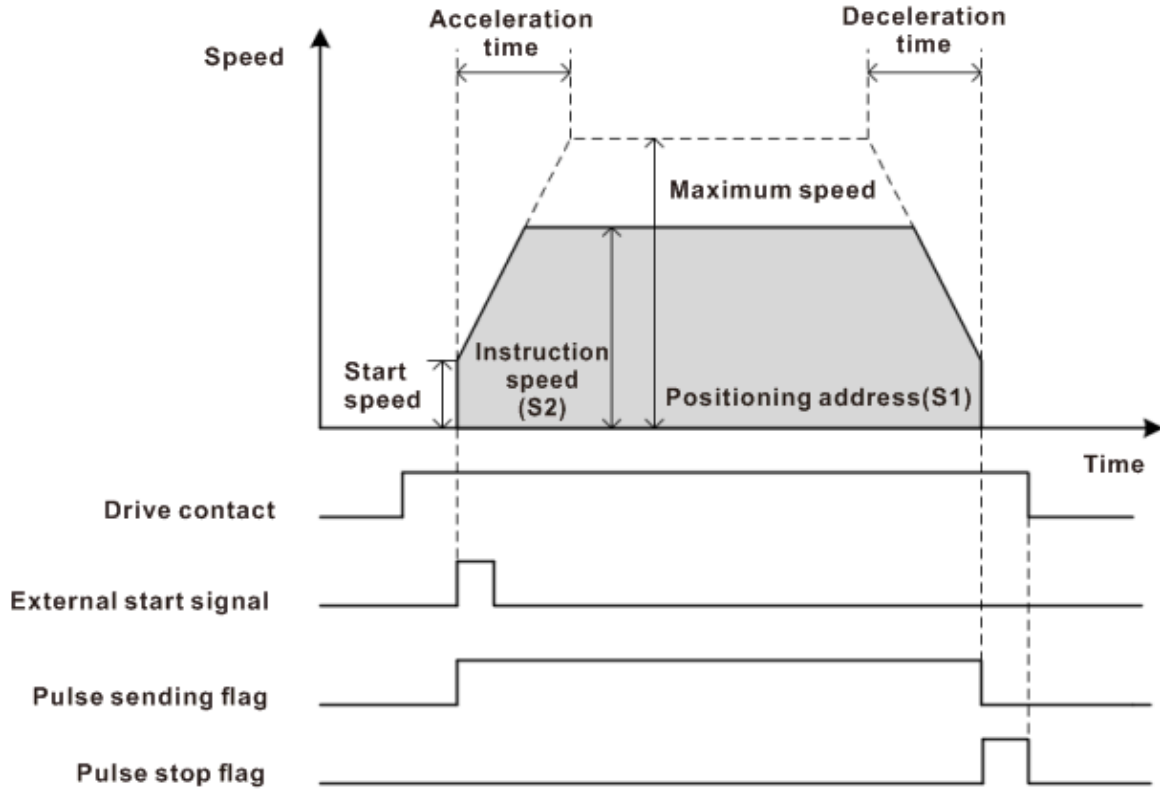
Select [0:OFF signal], that is, when the signal is OFF, it means the signal is received.

Select [1: ON signal], that is, when the signal is ON, it means the signal is received.

For the specific external signal, refer to the external signal of the word Devices. The external signal is affected by the scan cycle and is judged in the instruction. If the X signal is used as an external signal, the signal is affected by the X point filtering.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
External signal start	SM892	SM952	SM1012	SM1072	SM1132	SM1192	SM1252	SM1312
External signal logic	SM893	SM953	SM1013	SM1073	SM1133	SM1193	SM1253	SM1313



**(7) Interrupt signal correlation (DVIT)**

Interrupt positioning enable [default is 1: enable interrupt positioning function]:

Select [0: Disable interrupt positioning function]: interrupt positioning instruction is disabled and cannot be used.

Select [1: enable interrupt positioning function]: interrupt positioning instruction is enabled and can be used normally. [The default is on]

Interrupt signal logic [default is 0: ON signal]:

Select [0: ON signal], that is, when the signal is ON, it means the signal is received.

Select [1: OFF signal], that is, when the signal is OFF, it means the signal is received.

**Special device:**

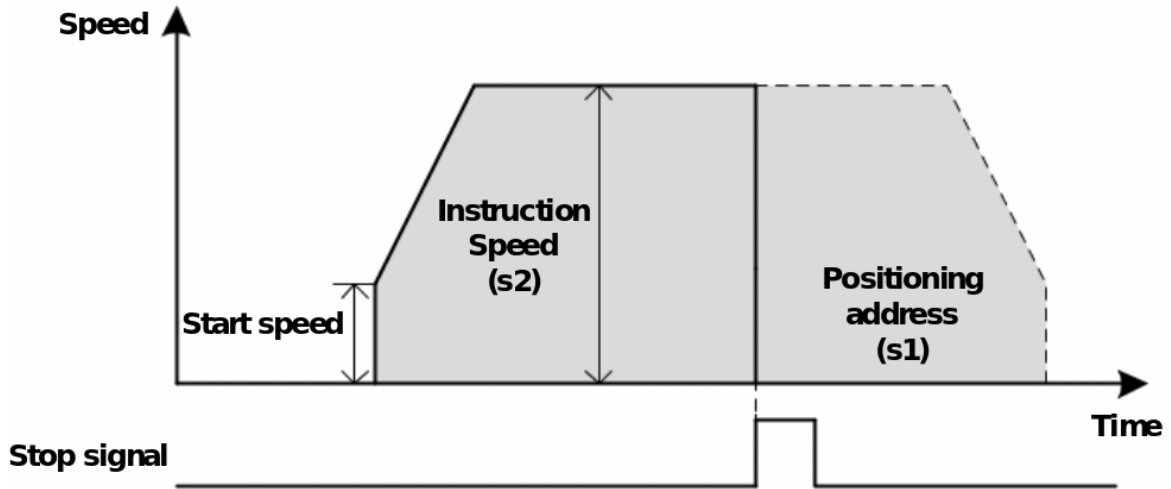
Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Interrupt signal enable	SM894	SM954	SM1014	SM1074	SM1134	SM1194	SM1254	SM1314
Interrupt signal logic	SM895	SM955	SM1015	SM1075	SM1135	SM1195	SM1255	SM1315

**(8) Stop immediately flag bit**

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Pulse stops immediately	SM898	SM958	SM1018	SM1078	SM1138	SM1198	SM1258	SM1318

When the flag bit is [1: pulse sending stop immediately], that is, pulse sending stops immediately without acceleration or deceleration. This flag is not affected by the scan cycle.



**(9) Not scanned**

When the flag bit is [0: continue to send pulse], if the instruction is not scanned in the current scan cycle (such as called in the event interrupt subroutine), then continue to send pulse. At this time, it should be noted that if the instruction is scanned after the pulse sending is stopped, the pulse sending will continue.

When the flag bit is [1: stop sending pulse], if the instruction is not scanned in the current scan cycle (such as called in the event interrupt subroutine), then it will decelerate and stop.

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Not scanned	SM899	SM959	SM1019	SM1079	SM1139	SM1199	SM1259	SM1319

**(10) The description of start speed**

A. Start speed = (Maximum speed - bias speed) / acceleration time

But the starting speed will be the following value according to the relationship between the instruction speed and the base speed.

- Bias speed < start speed < instruction speed: start speed = start speed. (It will be the value of above calculation)
- Bias speed <= instruction speed < start speed: start speed = instruction speed.
- Start speed < bias speed, or instruction speed < bias speed: start speed = bias speed.
- Maximum speed < bias speed: start speed = maximum speed.

**Related word devices**

**(1) Location address**

Store the current address operated positioning instruction. Store the absolute address in the current address and increase or decrease according to the pulse direction. This parameter is saved when power off.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Location address	[SD881, SD880]	[SD941, SD940]	[SD1001, SD1000]	[SD1061, SD1060]	[SD1121, SD1120]	[SD1181, SD1180]	[SD1241, SD1240]	[SD1301, SD1300]

**(2) Current frequency**

Store the real-time running frequency operated by the positioning instruction.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Current frequency	[SD885, SD884]	[SD945, SD944]	[SD1005, SD1004]	[SD1065, SD1064]	[SD1125, SD1124]	[SD1185, SD1184]	[SD1245, SD1244]	[SD1305, SD1304]

**(3) Maximum speed**

Set the upper limit (maximum speed) of instruction speed, origin return speed, and crawl speed. The range is: (1 to 200K), and calculate according to the boundary value if it exceeds the range.

Even if it is within the setting range, please set the relationship of bias speed  $\leq$  instruction speed  $\leq$  maximum speed.

If bias speed  $>$  maximum speed, then use the lower frequency to send, that is, the highest frequency.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Maximum speed	[SD899, SD898]	[SD959, SD958]	[SD1019, SD1018]	[SD1079, SD1078]	[SD1139, SD1138]	[SD1199, SD1198]	[SD1259, SD1258]	[SD1319, SD1318]

**(4) Bias speed**

Set the lower limit value (offset speed) of the instruction speed, home return speed, and crawl speed.

The setting range is: (1 to 200K), and the over range is calculated according to the boundary value.

Even if it is within the setting range, please set the relationship of bias speed  $\leq$  instruction speed  $\leq$  maximum speed.

If the bias speed  $>$  maximum speed, then use the lower frequency to send, that is, the highest frequency.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Bias speed	[SD901, SD900]	[SD961, SD960]	[SD1021, SD1020]	[SD1081, SD1080]	[SD1141, SD1140]	[SD1201, SD1200]	[SD1261, SD1260]	[SD1321, SD1320]

**(5) Acceleration time**

Set the acceleration time from the bias speed to the maximum speed.

The acceleration time can be set in the range of 15 to 32767ms. If it exceeds the range, it will be modified to the value closest to the range.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Accelerated Time	SD902	SD962	SD1022	SD1082	SD1142	SD1202	SD1262	SD1322

**#Note:** When the acceleration time is set to 0, there is no acceleration process.

**(6) Deceleration time**

Set the deceleration time from the maximum speed to the bias speed.

The deceleration time can be set in the range of 15 to 32767ms. If it exceeds the range, it will be modified to the value closest to the range.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Deceleration time	SD903	SD963	SD1023	SD1083	SD1143	SD1203	SD1263	SD1323

**#Note:** When the acceleration time is set to 0, there is no deceleration process.

**(7) Stop method**

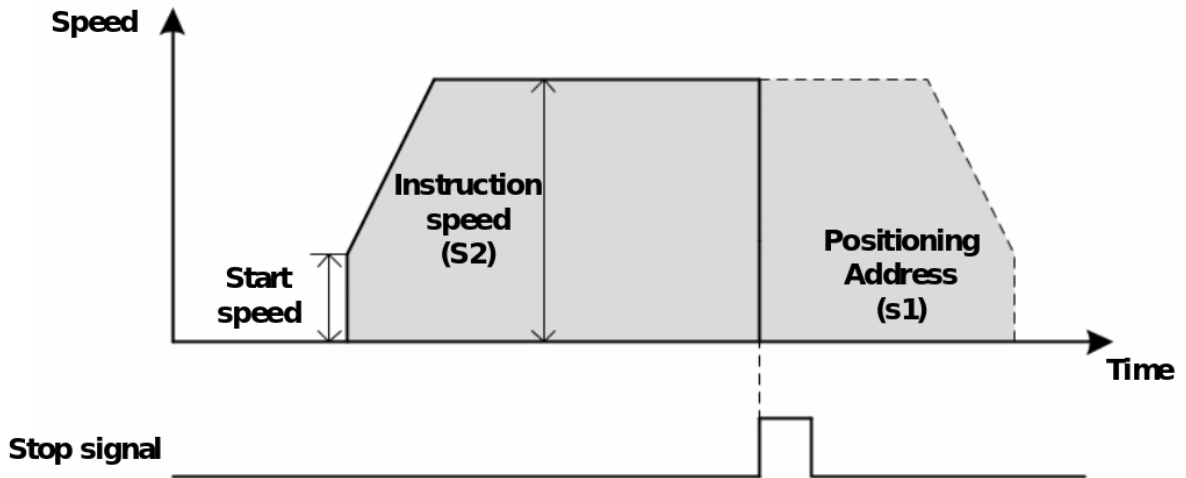
Set the stop mode of high-speed pulse: turn off the instruction halfway or the instruction encounters a limit situation [default is 0: decelerate to stop].

Set [0: Decelerate to stop]: When the pulse stops halfway, the pulse decelerates and stops.

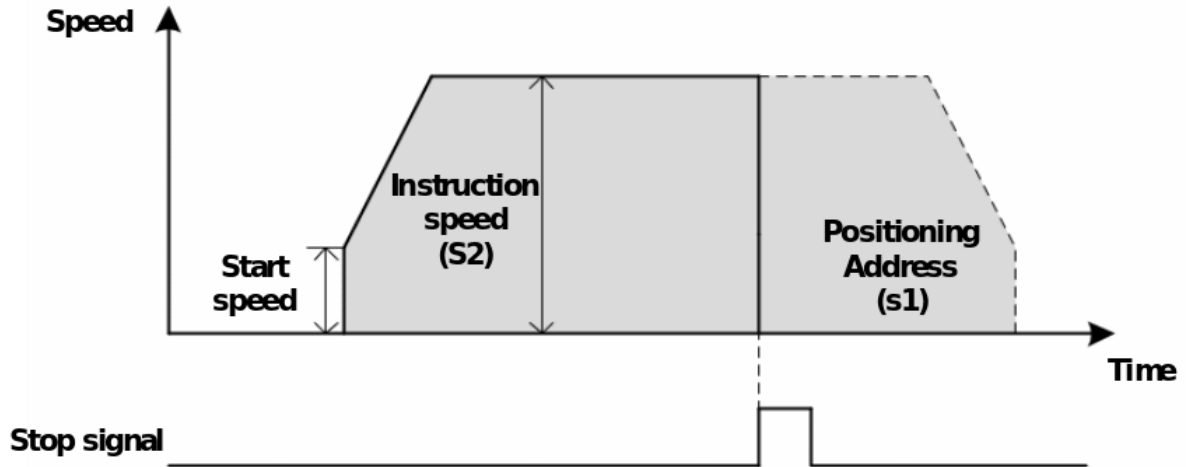
Set [1: Stop immediately]: when the pulse stops halfway, the pulse stops immediately without deceleration.

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Stop method	SD904	SD964	SD1024	SD1084	SD1144	SD1204	SD1264	SD1324

[0: Decelerate to stop]: Decelerate to stop after receiving the stop signal.



[1: Stop immediately]: Stop immediately after receiving the stop signal without decelerating movement.

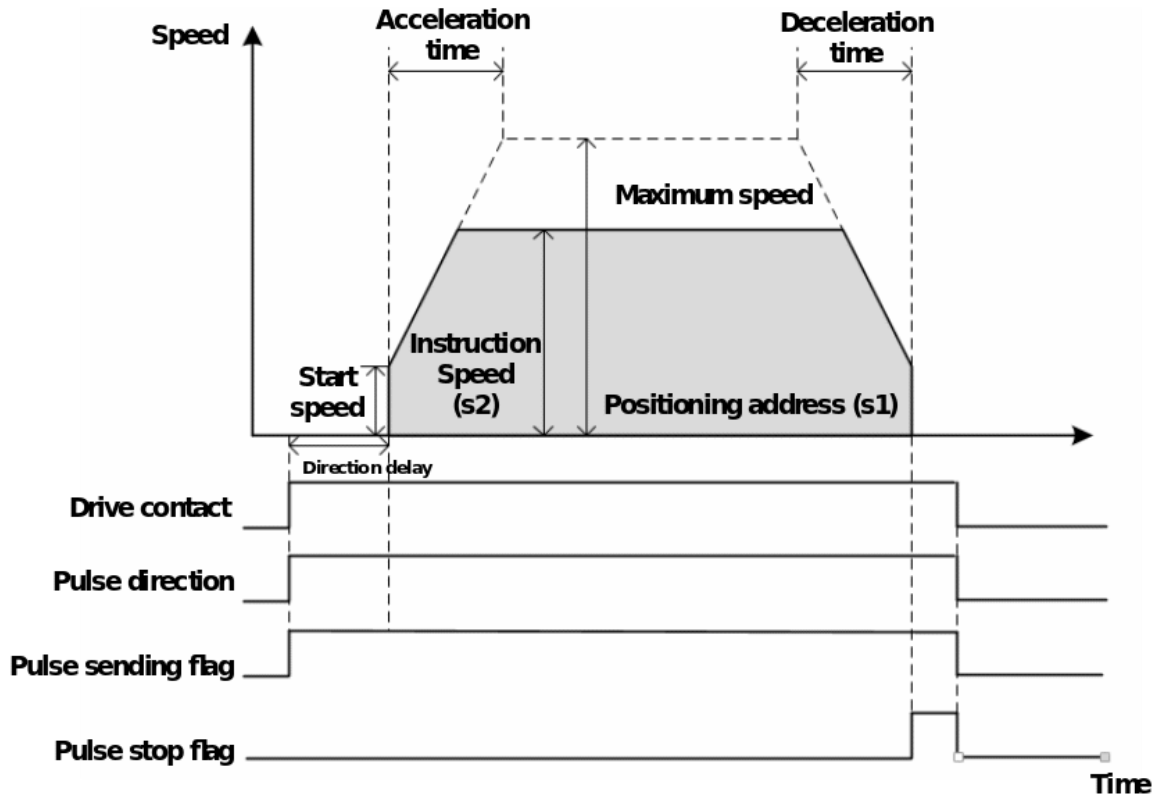


**(8) Direction delay**

Set the delay time between the direction and the pulse, which is only applicable to instructions with direction, and the range is 0-32767ms.

**#Note:** The error of direction delay is within one scan period.

Output shaft	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Direction delay	SD905	SD965	SD1025	SD1085	SD1145	SD1205	SD1265	SD1325



**(9) External start signal**

Set the device number (X device) of external start signal. If it is set to X0, the value is 0. It is necessary to set the existing external input point, otherwise the function will not take effect.

The external signal is affected by the scan cycle and is judged when executing instruction.

**Special device:**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
External start signal	SD906	SD966	SD1026	SD1086	SD1146	SD1206	SD1266	SD1326

**(10) The description of start speed**

$$\text{Start speed} = (\text{maximum speed} - \text{bias speed}) / \text{acceleration time}$$

But the starting speed will be the following value according to the relationship between the instruction speed and the base speed.

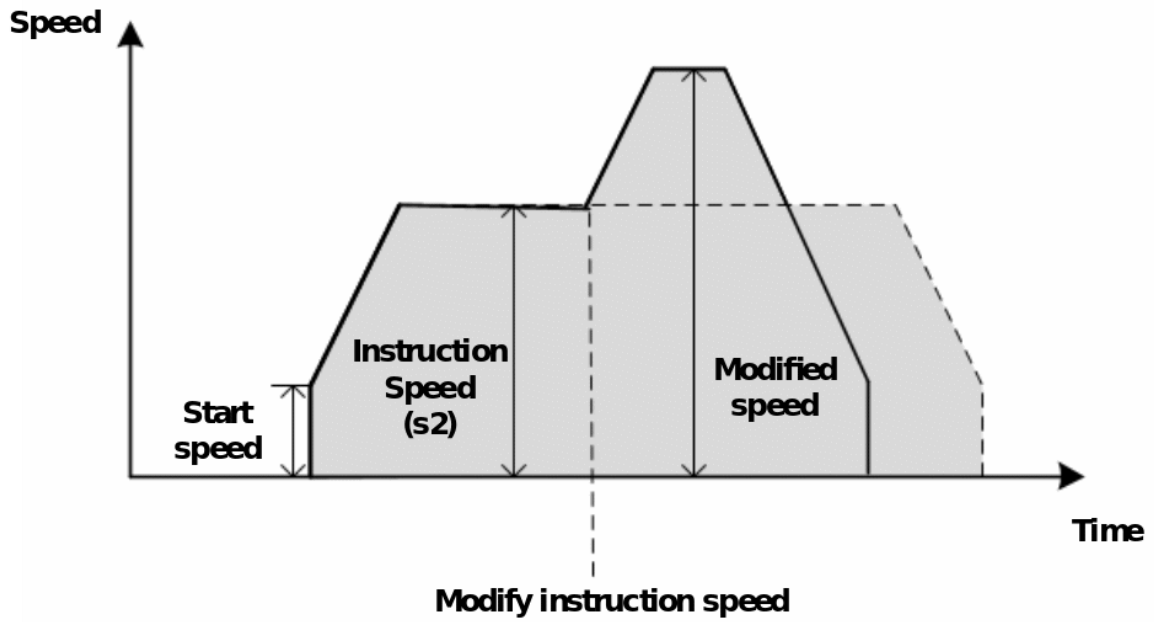
- Bias speed < start speed < instruction speed: start speed = start speed.(It will be the value of above calculation)
- Bias speed <= instruction speed < start speed: start speed = instruction speed
- Start speed < bias speed, or instruction speed < bias speed: start speed = bias speed
- Maximum speed < bias speed: start speed = maximum speed

**(11) Pulse number and frequency modification**

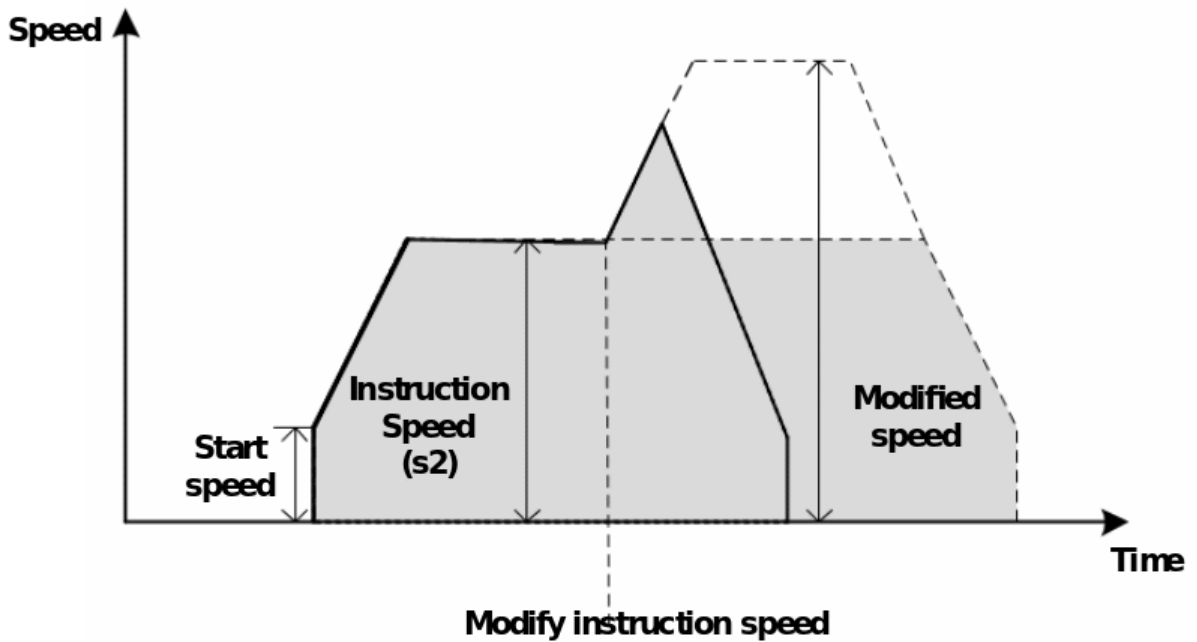
- 1) Modify frequency



① Reachable frequency

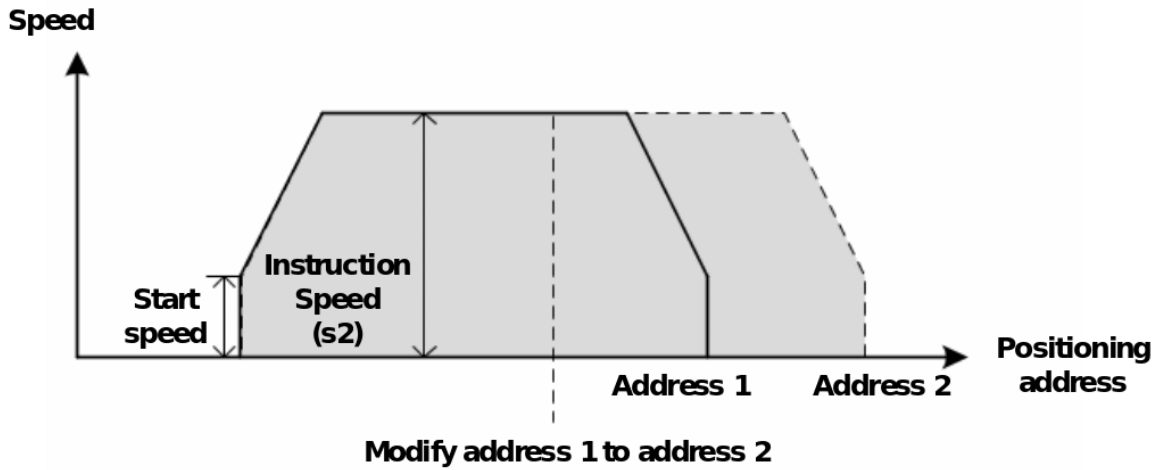


② Unreachable frequency

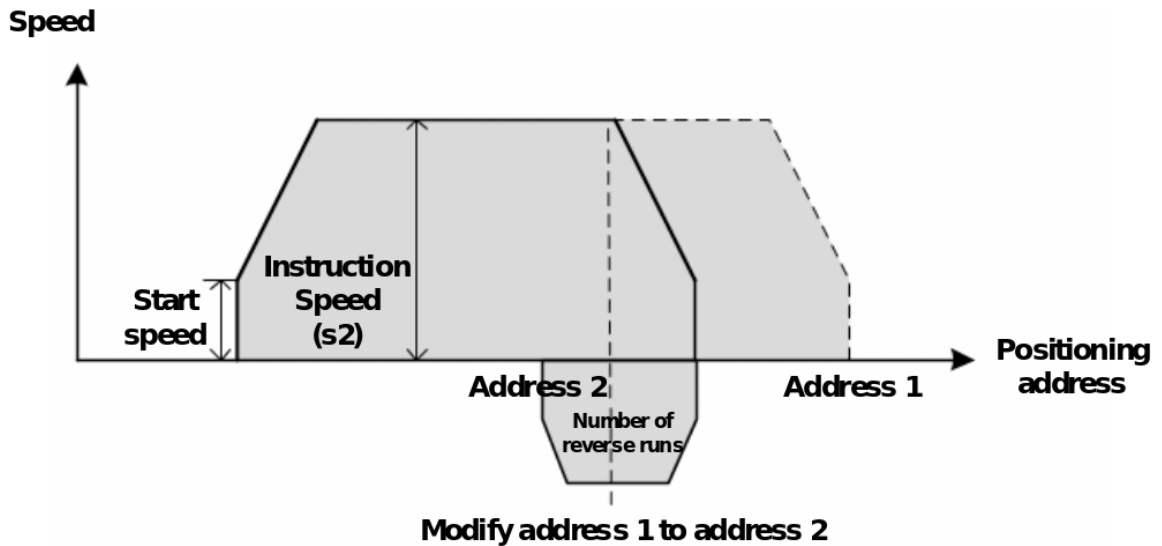


2) Modify the number of pulses:

① Modify to the number of reachable pulses



② Modify to the number of unreachable pulses (only support instructions with direction. If there is no direction, stop pulse sending)



**(12) The number of sent pulses is out of range**

When the number of pulses to be sent exceeds the range represented by the number of pulses (32 bits) (-2147483648 to +2147483647), it will run to the target position in the opposite direction to the expected. For example:

The current position is 1, when you want to run to the target position -2147483648, you should send 2147483647 pulses in the forward direction instead of sending 2147483649 pulses in the reverse direction;

The current position is -1, when you want to run to the target position 2147483647, you should send 2147483648 pulses in the reverse direction instead of sending 2147483648 pulses in the forward direction.

**(13) Acceleration and deceleration mode**

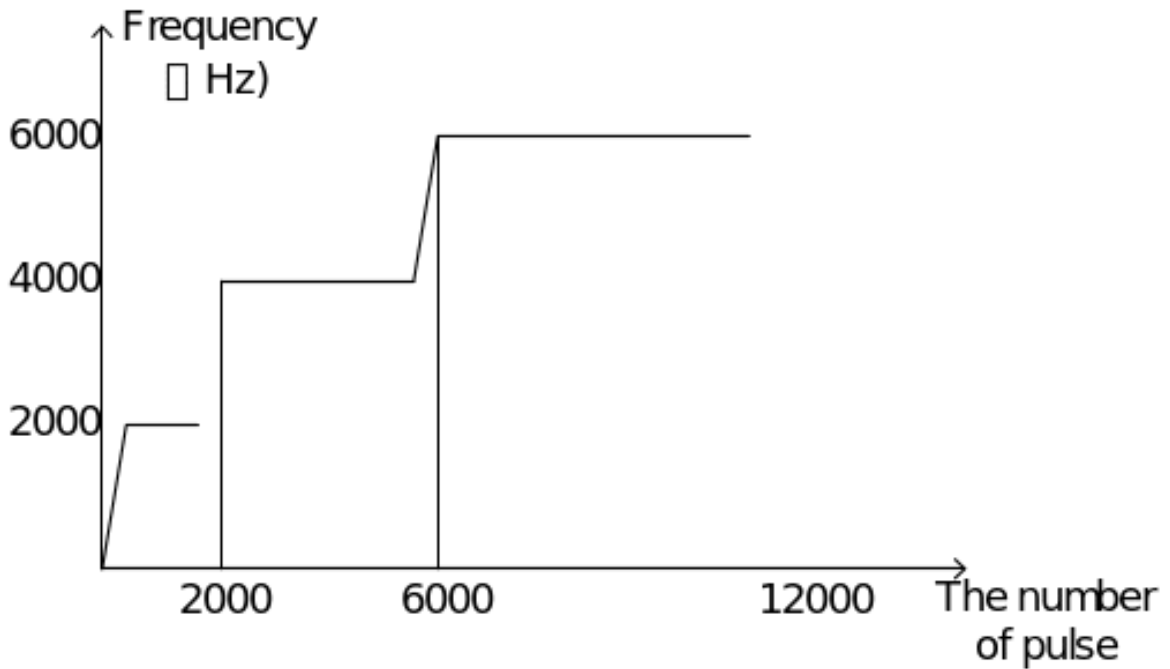
Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Acceleration and deceleration mode	SD907	SD967	SD1027	SD1087	SD1147	SD1207	SD1267	SD1327

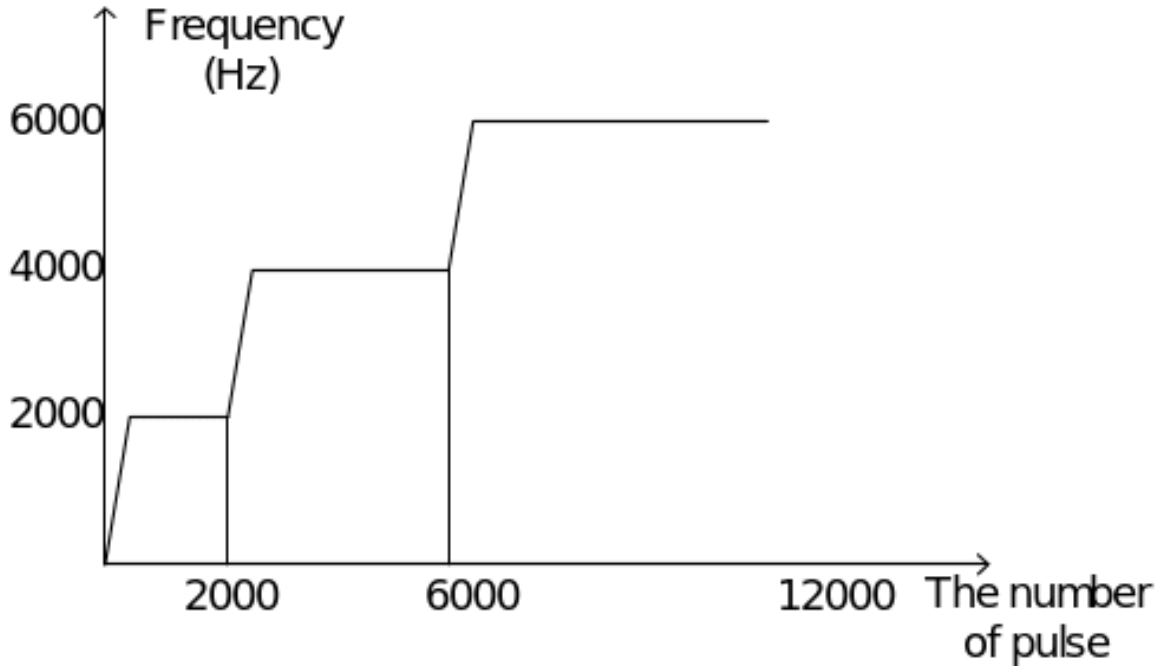
**A.**When the parameter is 0, post acceleration and deceleration mode is adopted.

**B.**When the parameter is 1, forward acceleration and deceleration mode is adopted.(Accelerate to the next segment in advance)

For example, three pulses are needed. The pulse frequency of the 1st segment is 2000Hz, the number of pulse is 2000; the pulse frequency of the 2nd segment is 4000Hz, the number of pulse is 4000; the pulse frequency of the 3rd segment is 6000Hz, the number of pulse is 6000;

Forward acceleration and deceleration mode oscillogram Post acceleration and deceleration mode oscillogram





**(14) High-speed pulse acceleration and deceleration mode selection**

Acceleration and deceleration mode selection

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Acceleration and deceleration mode	SD911	SD971	SD1031	SD1091	SD1151	SD1211	SD1271	SD1331

C. When the parameter is 0, Ladder acceleration and deceleration (calculate the pulse frequency one by one) mode is adopted.

D. When the parameter is 1, Time-minute ladder acceleration and deceleration is adopted.

E. When the parameter is 2, Time-minute s-type acceleration and deceleration is adopted.

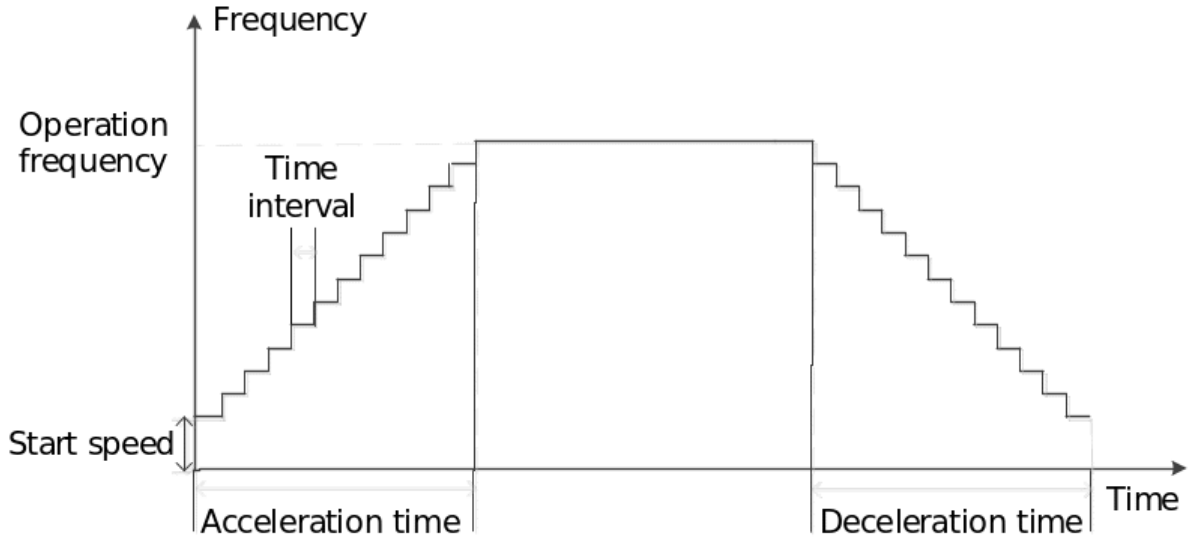
**(15) Time-minute acceleration and deceleration parameter**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Time-minute intervals	SD912	SD972	SD1032	SD1092	SD1152	SD1212	SD1272	SD1332

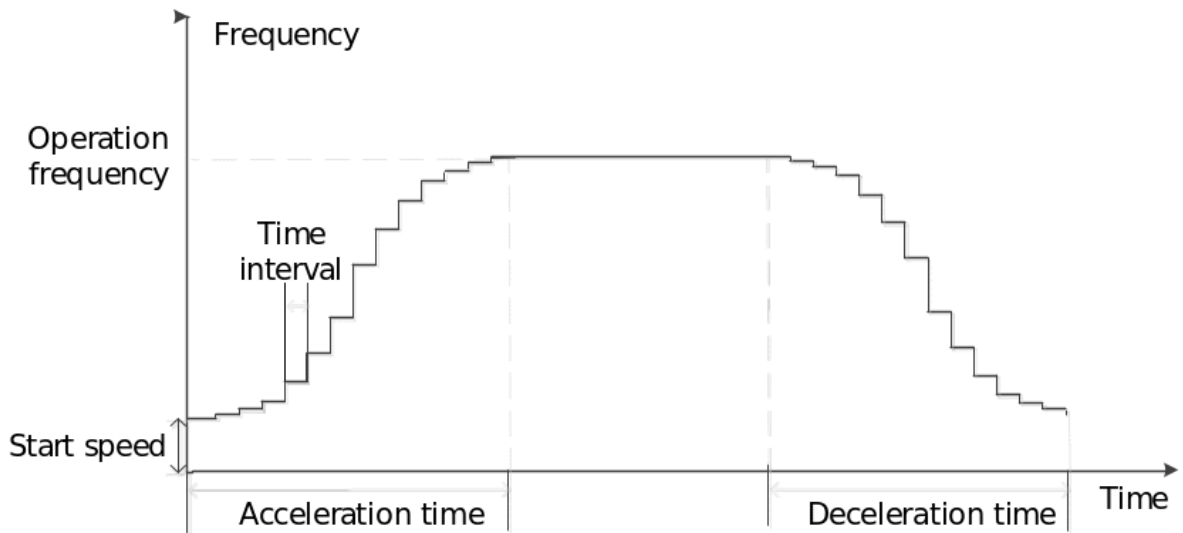
Time-minute intervals:

This parameter is time interval of time-minute acceleration and deceleration. The unit is 100us. The value range is 10 to 1000. When the value is less than 10, the value is 10. When the value is greater than 1000, the value is 1000.

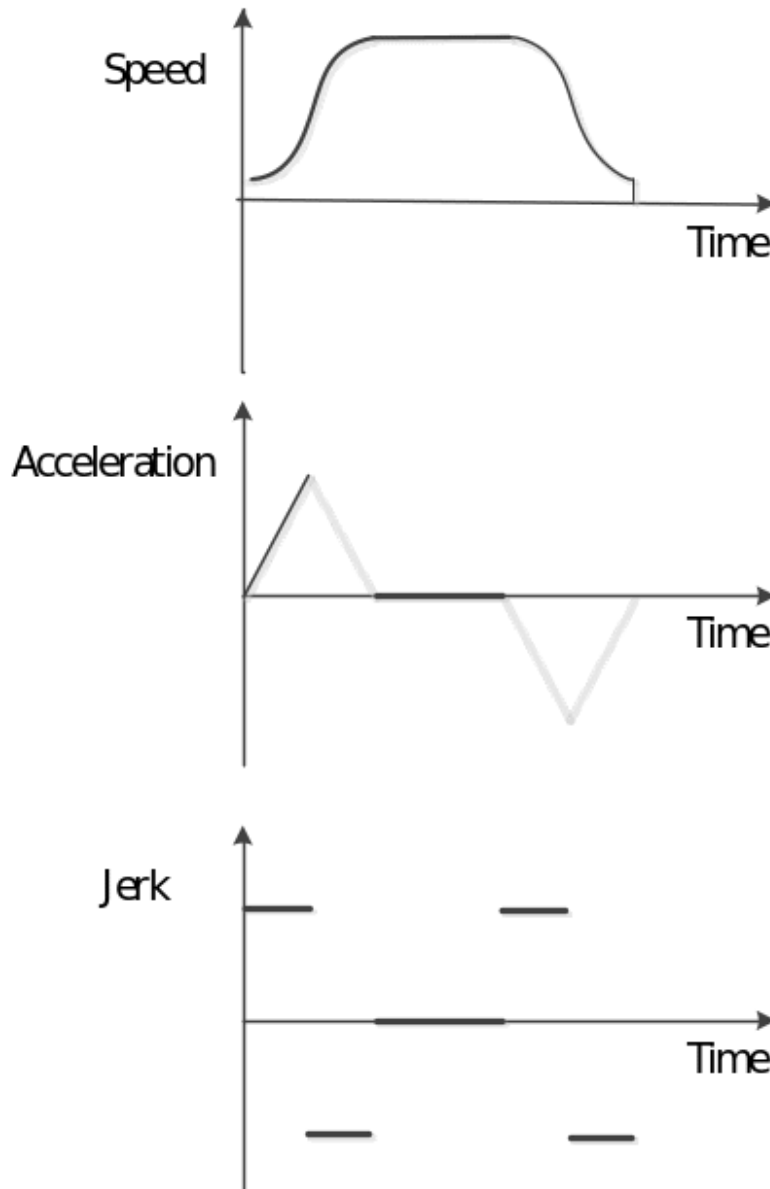
Time-minute ladder acceleration and deceleration



Time-minute S-type acceleration and deceleration



The following figure shows the changes of each parameter

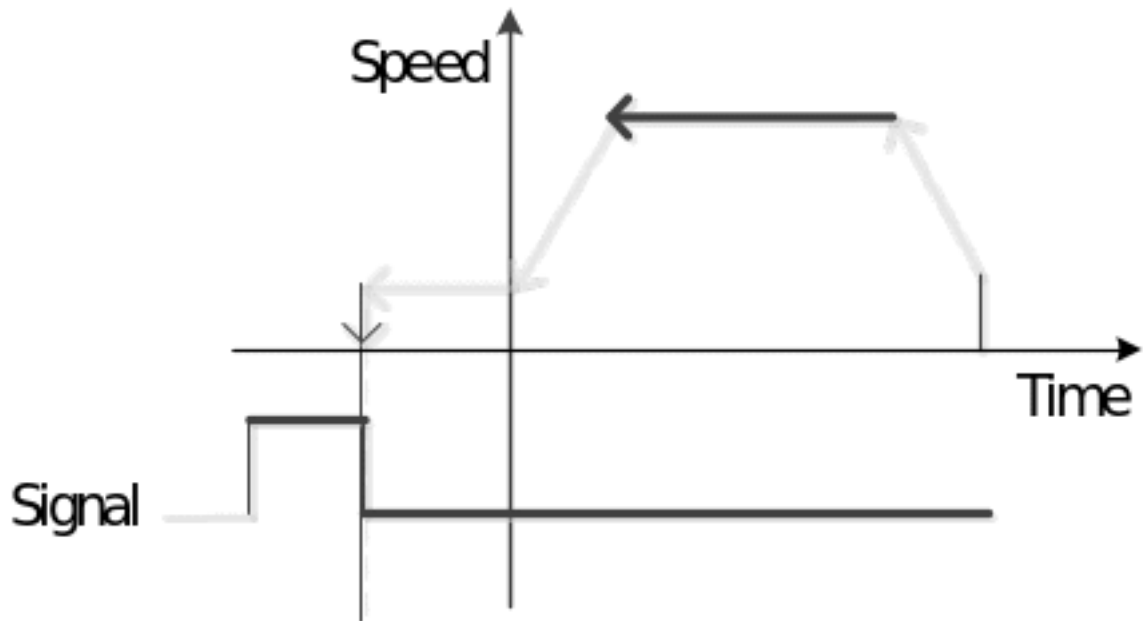


**#Note:** When the frequency is modified during the operation, acceleration would accelerate again from zero. There will be discontinuous acceleration.

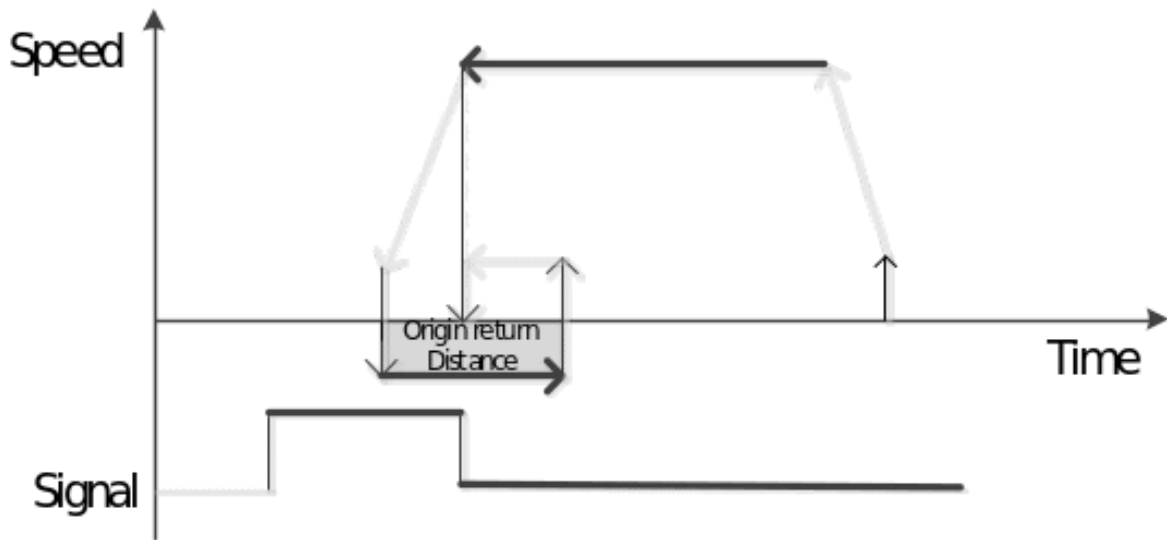
**(16) Oringin return mode**

Output axis	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Origin return mode	SD914	SD974	SD1034	SD1094	SD1154	SD1214	SD1274	SD1334
Origin return distance	[SD919, SD918]	[SD979, SD978]	[SD1039, SD1038]	[SD1099, SD1098]	[SD1159, SD1158]	[SD1219, SD1218]	[SD1279, SD1278]	[SD1339, SD1338]

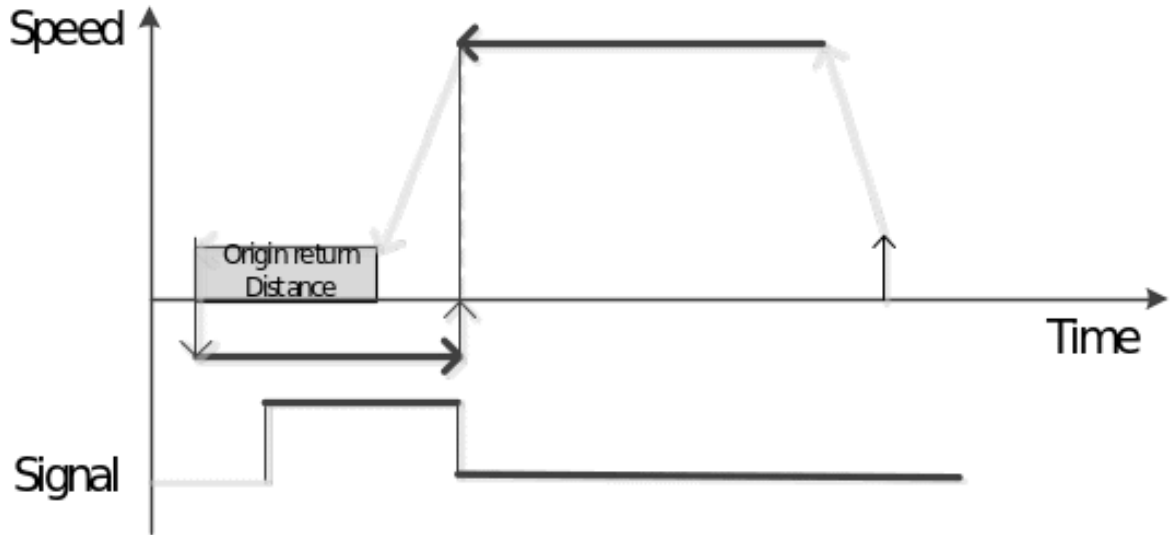
Origin return mode 0:



Origin return mode 1: When the signal is received, go backward to the specified origin return distance and then search for the origin at crawling speed.



Origin return mode 2: When the signal is received, go to the specified origin return distance and then search for the origin 0 at crawling speed.



Origin return mode 2: Start running toward zero based on the current position, and search for the origin at crawling speed after reaching zero.

