

# 5 相步进电机微步驱动器 KR-A55MC

## 使用说明书



感谢您购买高技术驱动器产品。  
使用前请务必参阅《安全注意事项》，并按照警告、注意事项正确使用本产品。

※出于产品改良的目的，有可能在没有事先预告的情况下变更本使用手册中记载的规格、外形尺寸等参数，敬请谅解。

### 安全注意事项

※为了安全和正确使用本产品，并预防对顾客和他人造成危害及财产受损，请遵守使用说明书上的注意事项。  
※注意事项分为“警告”和“注意”。

- 警告** 表示若违反了指示事项，有可能造成人员伤亡或重伤。
- 注意** 表示若违反了指示事项，有可能造成轻伤或产品受损。

※产品和使用手册中的符号所表示的含义如下。

- 警告** 此符号表示由于在特定条件下有可能发生危险，因此务必加以注意（含警告）。

### 警告

- 用于危及生命和财产安全的机器（核能控制、医疗机器、车辆、铁路、航空、燃烧装置、娱乐机器、安全装置等）时，请务必采取双重的安全措施。否则有可能引起火灾、人身事故、财产受损。
- 应由具备专业知识的人员来实施设置、连接、运行、操作、检查、故障诊断作业。否则有可能引起火灾、触电、受伤。
- 对于直流电源输入规格的产品请使用 1 次侧和 2 次侧的强化绝缘的直流电源。否则有可能引起触电。
- 设置产品时应采取停电措施。  
Holding torque 的降低有可能引起受伤、装置受损。
- 禁止在有爆炸的危险、腐蚀的危险、有水的场所、易燃气体、可燃物附近、振动较多的场所及室外使用。否则有可能引起火灾、触电、受伤。
- 禁止分解和改造产品。检查或修理时敬请咨询。否则有可能引起火灾、触电、产品受损。

### 注意

- 请务必遵守电源输入电压的额定范围，并使用超过 AWGNo.18(0.75mm<sup>2</sup>) 的线材。否则有可能引起火灾、触电。
- 应按照连接图进行连接，投入电源之前请务必确认是否正确连接。否则有可能引起火灾、触电、产品受损。
- 停电时应立即切断电源。  
从停电状态恢复时产品会突然启动，从而有可能引起装置受损、受伤。
- 运行中或停止后的一段时间内接触产品时应多加注意。  
产品表面温度较高，有可能造成烫伤。
- 运行中应时常处于能够紧急停止的状态。否则有可能引起装置受损、受伤。
- 投入电源时，应先确认产品的控制输入信号后再去投入。  
电源投入的同时输入信号会启动工作，因此有可能造成受伤、装置受损。
- 保持垂直方向的位置时，禁止将 HOLD OFF 信号输入为 ON。  
由于降低保持力度，从而发生落下现象，因此有可能引起受伤、装置受损。
- 电源输入为 OFF 后需要维持垂直方向的位置时，请另行设置安全装置。  
由于降低保持力度，从而发生落下现象，因此有可能引起受伤、装置受损。
- 用手启动电机的转动轴时（手动位置设定等），请先确认 HOLD OFF 信号输入后实施。  
因产品的突然工作有可能引起受伤。
- 发生异常时应立即紧急停止。否则有可能引起火灾、受伤。
- 测定绝缘电阻或实施绝缘耐压测试时，禁止接触端子。否则有可能引起触电。
- 使用时禁止超出产品的规格 / 额定范围。否则有可能引起触电、受伤、装置受损。
- 维护保养时禁止使用水或溶剂，而使用干燥的毛巾。否则有可能引起触电、火灾。
- 产品废弃时应作为工业废弃物处理。

### 特征

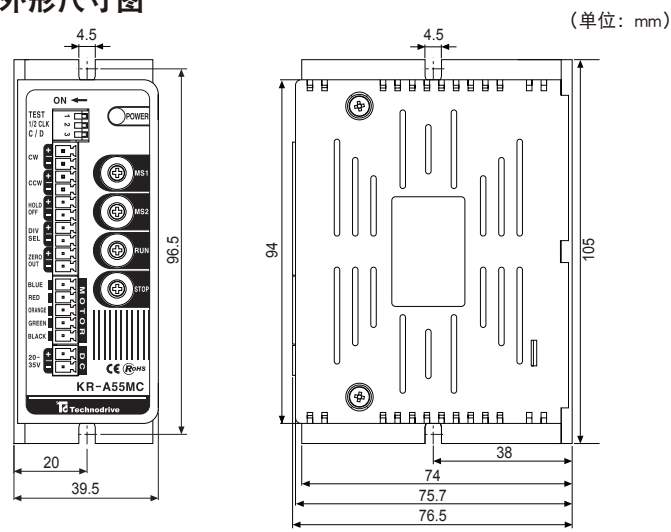
- 安装了 DC24V 电源输入型外壳类型的实现了低振动、低噪音的微步驱动器。
- 根据切换信号可自由灵活地使用步进角度。
- 可设定 16 种步进角度，最大分割数为 250 分割，可实现 12500 脉冲 / 转动。
- 内置了自动降低电流功能、自我诊断功能电路等多种功能。
- 通过 Custom IC 和表面实装电路实现了小型、轻便、高质量。
- 采用了最低限度的抑制光电耦合器的外部噪音的电路方式。

### 规格

品名	KR-A55MC	
输入电源	20-35VDC 3A(MAX.)(-10%, +20%)	
驱动电流	0.4 ~ 1.4A/phase	
驱动方式	五角形接线双极定电流驱动方式	
分辨率	1,2,4,5,8,10,16,20,25,40,50,80,100,125,200,250,分割	
CW/CCW 输入脉冲	脉冲幅度	高于 0.25 μs
	脉冲间隔	高于 0.25 μs
	上升下降时间	低于 1 μs
	频率	低于 500kpps
	电压	High: 4 ~ 8VDC Low: 0 ~ 0.5VDC
电	流	10 ~ 20mA
使用周围温度	0 ~ 40°C (但不能有冻结)	
使用周围湿度	35 ~ 85%RH (但不能有结露)	
本体质量	约 220g	

※不包含包装的重量  
※根据输入的电源电压出现扭矩差。

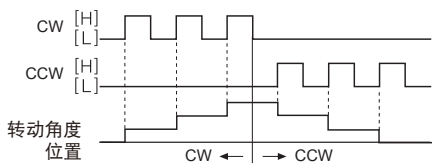
### 外形尺寸图



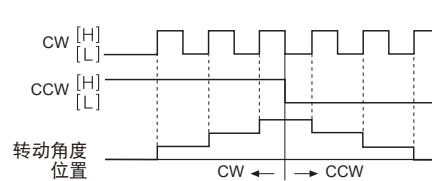
### 时间图 (Time Chart)

◎CW 及 CCW 输入 (CW: 从正面看电机轴时顺时针方向)

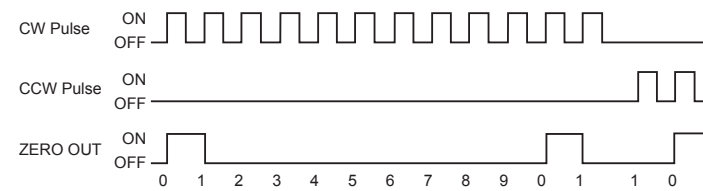
●2 脉冲输入方式



●1 脉冲输入方式

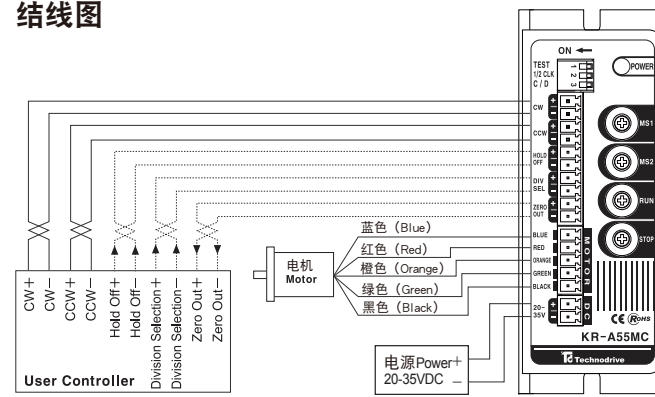


◎ZERO OUT 输出

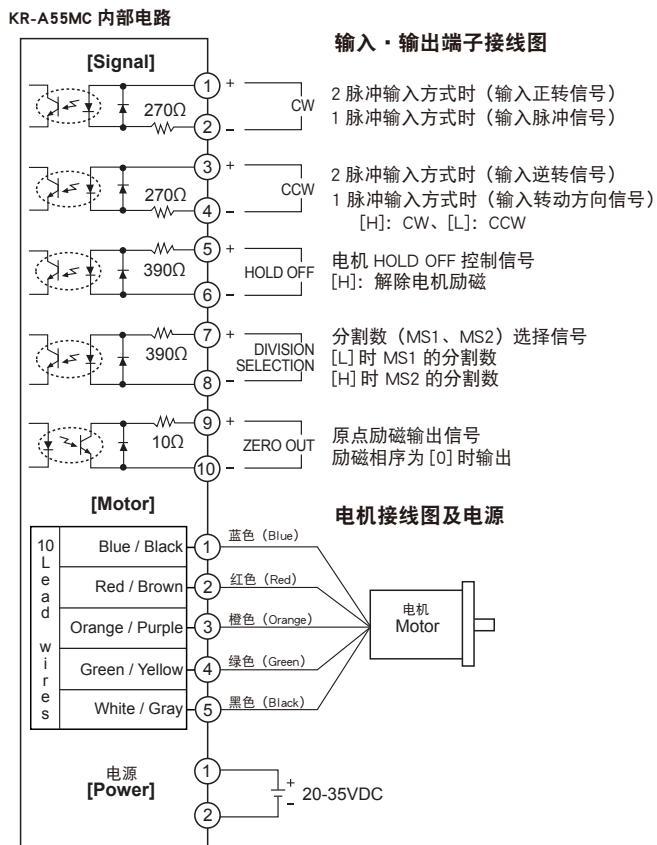


注) ZERO OUT (原点励磁) 是励磁序列处于步进 [0] 是为 ON。0.72° 的 5 相电机时，每 7.2° 进行输出。电机 1 次旋转输出 50 次。20 分割时每 200 脉冲输出 1 次。

### 接线图



### 信号输入输出电路及接线图



注) 若输入信号电压大于 +5VDC，请在外部安装电流控制电阻后使用。

### 功能说明

◎切换功能开关

No	铭版表示	功能	开关位置	
			ON	OFF
1	TEST	自我诊断功能	以 250POS 转动	通常
2	1/2 CLK	脉冲输入方式	1 脉冲输入方式	2 脉冲输入方式
3	C/D	自动降低电流功能	不设定	设定

- TEST  
※在基本步进 (FULL STEP) 中以约 250[pps] 转动，并设定分割数来改变转动速度。  
※1 脉冲输入方式中以 CCW 来转动；2 脉冲输入方式中以 CW 来转动
- 1/2CLK  
※选择脉冲输入方式  
※1 脉冲方式：CW 为电机驱动脉冲信号输入；CCW 为电机转动方向信号输入 [L] 时 CCW 将转动，[H] 时 CW 将转动  
※2 脉冲方式：CW 为脉冲输入时电机向着 CW 方向转动 CCW 为脉冲输入时电机向着 CCW 方向转动
- C/D (CURRENT DOWN)  
※电机停止时为了减少发热而自动减少停止电流的功能。  
※输入最终脉冲且过了约 500MS 后，停止电流设定值 (STOP) 的电流开始减少。

◎驱动电流设定 (RUN)

Switch No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
电流值 (A/Phase)	0.4	0.5	0.57	0.63	0.71	0.77	0.84	0.9	0.96	1.02	1.09	1.15	1.22	1.27	1.33	1.4

- 驱动电流是可向 5 相步进电机供应的相 (Phase) 电流。
- 驱动电流设定值因驱动电机的驱动频率而有所不同。
- 驱动电流设定值应低于电机的额定电流。设定值超过额定电流时出现过热，会导致失步及扭矩下降。
- 魔博 (MoBo) 要设定：0.75A / 相 (Switch No.5)

◎设定停止电流 (STOP)

Switch No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
%	27	31	36	40	45	50	54	58	62	66	70	74	78	82	86	90

- 停止电流是 5 相步进电机停止时获得供应的相 (Phase) 电流。
- 停止电流开关设定值是针对驱动电流开关设定值的比率 (%)。
- 根据电机卷线的阻抗停止电流可能会产生误差。
- 此项功能是在 CURRENT DOWN 开关为 OFF 时工作。该开关为 ON 时，即便电机旋转 / 停止均向电机供应在 RUN CURRENT 所设定的电流量。

◎原点励磁输出信号 (ZERO OUT)

告知电机的励磁位置处于初始状态的输出。利用这个能确认电机轴的旋转位置。(所设定的从原点的旋转位置)

◎HOLD OFF

- HOLD OFF 输入为 [H] 时，解除电机的励磁。
- HOLD OFF 输入为 [L] 时，恢复正常的电机励磁状态。
- 手动摆正电机轴位置时使用。
- [H]/[L] 将本体电路内的光电耦合器设定为 ON/OFF。

◎微步进 (Micro-step)

Switch No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
分割数	1	2	4	5	8	10	16	20	25	40	50	80	100	125	200	250

●设定分割数 (MS1, MS2)

※将 5 相步进电机的基本角度 (0.72°) 用设定值分割后驱动电机。  
※被分割的步进角度将通过以下公式计算。

$$\text{电机 1 步进角度} = \frac{\text{基本角度 (0.72°)}}{\text{分割数}}$$

※若驱动过程中改变分割数，电机有发生失控的危险

●改变分割数 (DIV/SEL)

※DIV/SEL 利用输入功能可以改变设定于 M1/M2 的分解能。  
※DIV/SEL 信号为 [L] 时，会以设定于 MS1 的分割数转动。  
※DIV/SEL 信号为 [H] 时，会以设定于 MS2 的分割数转动。  
※应在电机停止状态下改变分割数。  
※若驱动过程中改变分割数，电机有发生失控的危险。  
※[H]/[L] 将本体电路内的光电耦合器设定为 ON/OFF。

### 使用时的注意事项

1. 信号输入时的注意事项

- ① 2 脉冲输入方式时禁止同时输入 CW、CCW。有可能出现运行错误。  
CW、CCW 任意信号处于 [H] 时，若输入其他方向信号，也有可能无法正常运行。
- ② 当信号输入电压大于规定使用的电压时，必须从外部连接追加电阻后使用。

2. 驱动电源的注意事项

- ① 请使用能够充分供应电机驱动电流的输入电源。
- ② 电源输入的电流值是驱动的最大消耗电流值。
- ③ 驱动电机之前，请确认电源的极性。

3. 接线上的注意事项

- ① 信号线应使用 2 米以内的双绞线 (超过 0.2 mm<sup>2</sup>)。
- ② 延长电机线时，请使用比电机引线粗的线材。

4. 安装时的注意事项

- ① 为了提高散热板的散热效率，最好把散热板贴近金属面后安装在通风良好处。
- ② 根据使用状况驱动的发热量会很大。设置时散热板的温度不能超过 80°C。  
(超过 80°C 时，需要对散热板进行强制冷却。)

5. 使用功能选择 SW 时的注意事项

- ① 接通电源之前务必确认自我诊断功能开关是否设定为 [OFF]。  
如果在设定为 [ON] 的状态下接通电源及投入信号，电机可能会急速旋转，敬请注意。
- ② 在 1 个脉冲输入方式中，如果在驱动过程中输入信号方式选择开关切换到 2 个脉冲输入方式，电机的旋转方向就会突然反转。禁止在电机驱动中改变输入信号。

6. 本产品可在以下环境条件下使用。

- ① 室内使用
- ② 低于 2000m 高度下使用
- ③ 污染等级 2
- ④ 设置范畴 2

※若不遵守上述“使用时的注意事项”，有可能导致产品的故障。  
请务必遵守所记载的内容，并安全使用。



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**Motor Driver(5-Phase microstepping driver)**

**KR-A55MC**

**M A N U A L**



Thank you very much for selecting Technodrive products.  
For your safety, please read the following before using.

**Caution for your safety**

- ※Please keep these instructions and review them before using this unit.
- ※Please observe the cautions that follow;
- Warning** Serious injury may result if instructions are not followed.
- Caution** Product may be damaged, or injury may result if instructions are not followed.
- ※The following is an explanation of the symbols used in the operation manual.
- ⚠caution: Injury or danger may occur under special conditions.

**Warning**

- In case of using this unit with machinery(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is required to install fail-safe device, or contact us for information on type required.**  
It may cause serious human injury or a fire, property.
- Installation, connection, operation, control, maintenance should be carried out by person who has been qualified.**  
It may cause a fire, human injury or give an electric shock.
- Please use DC power with reinforced insulating the primary and secondary part for the DC power product.**  
It may give an electric shock.
- Please install this unit after consider countplan against power failure.**  
It may cause human injury or damage to product by releasing holding torque of motor.
- Do not use this unit outdoors or place where there are explosiveness, flammable, corrosive gas, water and frequent vibration etc.**  
It may cause a fire or give an electric shock.
- Do not disassemble or modify this unit. Please contact us if it required.**  
It may cause a fire, give an electric shock or damage to product.

**Caution**

- Power input voltage must be used within rating specification and power line should be over than AWG NO. 18(0.75mm<sup>2</sup>).**  
It may cause a fire or give an electric shock.
- Please check the connection before power.**  
It may cause a fire or give an electric shock.
- Please turn off when power failure occurred.**  
It may cause human injury or damage to product due to sudden movement by recovering from power failure.
- Do not touch during the operation or after a while of operation.**  
It may cause a burn due to high temperature in surface.
- The emergency stop should be enabled during the operation.**  
It may cause human injury or damage to product.
- Please apply power after checking control input signal.**  
It may cause human injury or damage to product by sudden movement.
- Do not turn on the HOLD OFF signal input while it is maintaining vertical position.**  
It may cause human injury or damage to product by releasing holding torque of motor.
- Please install a safety device when need to remain the vertical position after turn off the power.**  
It may cause human injury or damage to product by releasing holding torque of motor.
- Please check if HOLD OFF signal input is ON when need to set the output manually.**  
It may cause human injury by sudden movement.
- Please stop this unit when mechanical problem is occurred.**  
It may cause a fire or human injury.
- Do not touch the terminal when during the insulation dielectric strength test or insulation resistance measurement.**  
It may give an electric shock.
- Please observe rating specification.**  
It may cause a fire, give an electric shock or damage to product.
- In cleaning the unit, do not use water or an oil-based detergent.**  
It may cause a fire or give an electric shock.
- Please separate as industrial waste when disuse this unit.**

※ The above specifications are changeable at anytime without notice.

**Features**

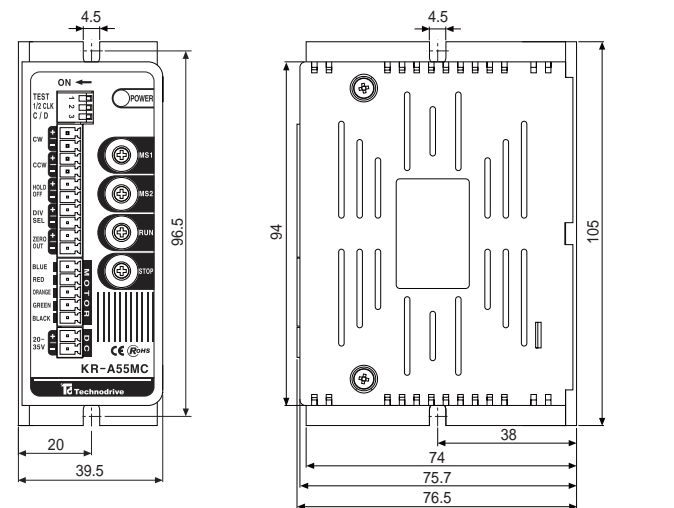
- Microstep operation for silent and low vibration of rotation.
- Wide range of step angle can be applied by switching signal.
- It can be divided up to 250 of microstep and 5-phase stepping motor with 0.72° of basic step is rotated as 0.00288° per 1 pulse and it is required to input 125,000 pulse for 1 rotation of motor.
- Includes auto current down, self-diagnosis function.
- Small, light weight and advanced quality by custom IC and surface mounted circuit.
- Photocoupler input insulation method to minimize the effects from external noise.

**Specifications**

Model	<b>KR - A55MC</b>	
Power supply	20 - 35VDC 3A[Max.]( -10%, +20%)	
RUN current	0.4 - 1.4A/Phase	
Drive method	Bipolar constant current pentagon drive	
Resolution(Rotating angle)	1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 125, 200, 250 division	
CW/CCW Input pulse	Pulse width	Min. 0.25μs
	Pulse interval	Min. 0.25μs
	Rising/Falling time	Max. 1μs
	Frequency	Max. 500kpps
Voltage	High: 4 - 8VDC, Low: 0 - 0.5VDC	
	Current	10 - 20mA
Ambient temperature	0 - 40°C(at non-freezing status)	
Ambient humidity	35 - 85%RH(at non-dew status)	
Unit weight	Approx. 220g	

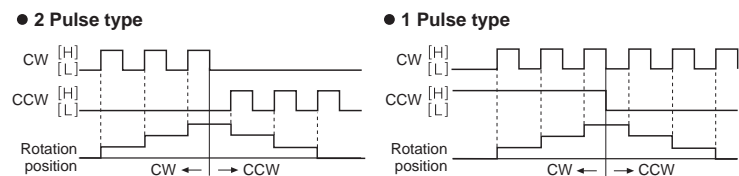
※ There is torque difference by input power.

**Dimensions**

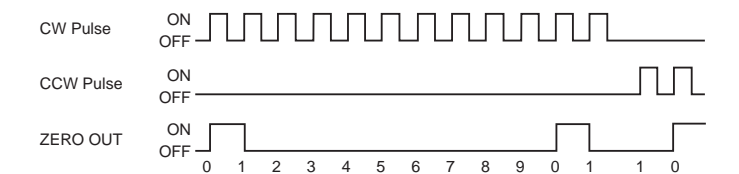


**Time charts**

**CW / CCW Input(CW : Clockwise direction from the front view of shaft)**

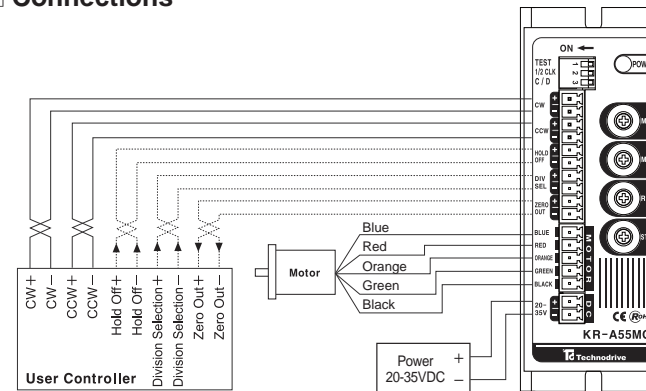


**ZERO OUT output**

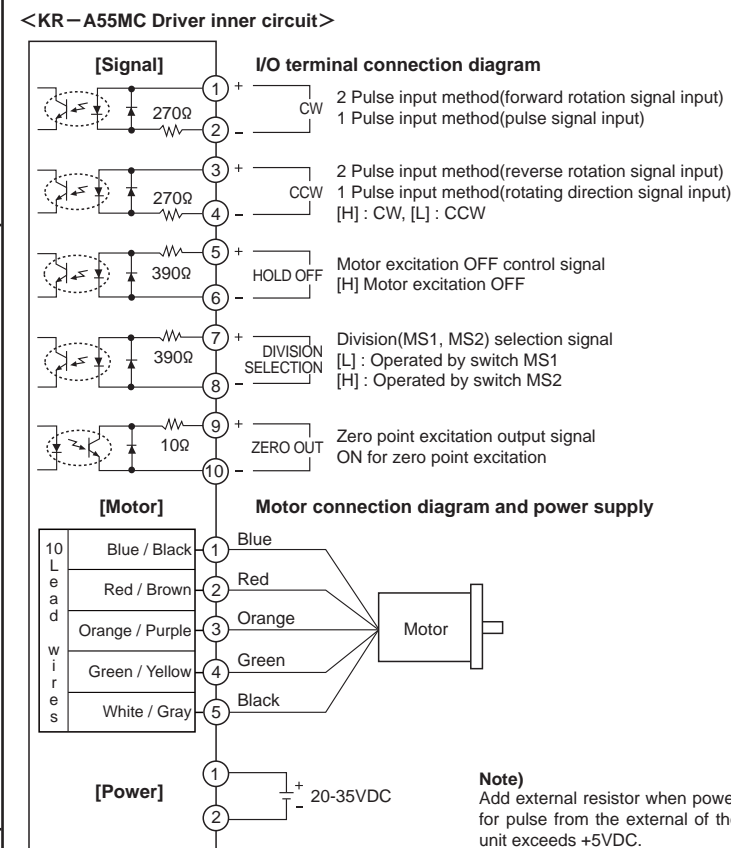


※ ZERO OUT means the initial status of motor excitation (STEP 0), it outputs per 7.2° of rotation in Full Step. (It outputs 50times per 1 rotation of motor.)  
Ex) Full step : It outputs one time when input 10 pulse.  
20 division : It outputs one time when input 200 pulse.

**Connections**



**Input-Output diagram**



**Function**

**Selectable function switch**

No	Name	Function	Switch position	
			ON	OFF
1	TEST	Self diagnosis function	250pps rotation	Normal
2	1/2 CLK	Pulse input method	1 Pulse input	2 Pulse input
3	C/D	Auto Current Down	No use	Use

- **TEST**  
※ It rotates at a speed of 250pps in Full Step and it is changed depending on resolution.  
※ It rotates to CCW in 1 Pulse input method and CW in 2 Pulse input method.
- **1/2 CLK**  
※ Pulse input method selection  
※ 1 Pulse method : Input pulse signal input in CW and rotating direction signal in CCW. It rotates to CCW when [L] and CW for [H].  
※ 2 Pulse method : Motor is rotated to CW when input pulse in CW and to CCW when input pulse in CCW.
- **C/D(CURRENT DOWN)**  
※ It is to reduce RUN current according to the setting rate of STOP current switch when motor stops in order to reduce motor's heat generation.  
※ Current is reduced from approx.500[ms] after the last pulse input.

**Setting RUN current**

Switch No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Current (A/Phase)	0.4	0.5	0.57	0.63	0.71	0.77	0.84	0.9	0.96	1.02	1.09	1.15	1.22	1.27	1.33	1.4

- RUN current is phase current for 5 phase stepping motor.
- There can be an error in RUN current setting value by driving frequency.
- RUN current should be used within the rated current of motor, or it may cause overheating, step-out and loss of torque.

**Setting STOP current**

Switch No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
%	27	31	36	40	45	50	54	58	62	66	70	74	78	82	86	90

- STOP current is phase current provided to 5-phase of stepping motor to be stopped.
- The switch setting value of STOP current is a percentage of RUN current switch setting current value.
- There can be an error in STOP current by coil impedance of motor.
- This function shall be operated when CURRENT DOWN switch is set to OFF. In case CURRENT DOWN switch is set to ON, RUN CURRENT shall be provided both when a motor stops and when a motor runs.

**Zero point excitation output signal(ZERO OUT)**

It indicates the initial step of excitation status of stepping motor and rotation position of motor axis from previously set zero.

**HOLD OFF function**

- HOLD OFF is [H], the excitation is released, because current provided to each phase is cut off.
- HOLD OFF is [L], the excitation is in a normal status.
- It rotates motor axis by external force or is used for manual positioning.
- Input H/L means ON/OFF of photocoupler in a circuit.

**Setting micro step(Microstep:Resolution)**

Switch No	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Resolution	1	2	4	5	8	10	16	20	25	40	50	80	100	125	200	250

**Setting resolution(Same for MS1, MS2)**

- It drives a motor dividing basic step angle(0.72°) by setting value of resolution.
- The calculation formula of divided step angle is as below.  
1 step angle of 5-phase stepping motor =  $\frac{\text{Basic step angle}(0.72^\circ)}{\text{Resolution}}$
- When resolution is changed during the operation of motor, it may cause a step-out of motor.

**Selectable resolution(Selectable Step angle)**

- Change into the resolution in MS1/MS2 by DIVISION SELECTION input.
- Motor is rotated by resolution in MS1 when DIVISION SELECTION signal is [L] and MS2 for [H].
- Change the resolution after motor is stopped or, it may cause a step-out of motor.
- Input H/L means ON/OFF of photocoupler in a circuit.

**Caution for using**

- Caution for signal input
    - Do not input CW, CCW signal at the same time in 2 Pulse input method. It may not work properly if another signal is supplied when one of them is ON.
    - In case, the signal input supply is higher than rated supply expressed on the specification, please connect the additional resistor to external part.
  - Caution for supplying power
    - Use the power enough to supply the run current when turn on the power.
    - The current value indicated on power supply is the max. input of driver.
    - Please check the polarity of power before using.**
  - Caution for wiring
    - Use Twist pair(Over 0.2mm<sup>2</sup>) for the signal wire should be shorter than 2m.
    - Please use an electric wire is thicker than the motor lead when product the motor wire connection.
  - Caution for installation
    - In order to increase heat protection efficiency, keep the heat sink as close as possible to metal panel and keep it well-ventilated.
    - Excessive heat generation may occur on Driver. Keep the heat sink under 80°C when installing the unit.(In case it is over 80°C, forcible cooling shall be required.)
  - Caution for using function switches
    - Check the position of self-diagnosis switch before turn on the power. It may be dangerous if turn on the power in [ON] status, due to motor is worked instantly or cause a malfunction.
    - When the selection switch of input signal method is changed to 2 Pulse input method during the operation with 1 Pulse input method, it may be danger as the revolution way of the motor is changed conversely. Please do not change the input signal method during the operation.
  - Installation environment
    - It shall be used indoor
    - Altitude Max. 2000m
    - Pollution Degree 2
    - Installation Category II
- ※ It may cause malfunction if above instructions are not followed.

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