

# TBC-6020A

Magnetic Brake Controller

## Operating manual



**HANMI TECHWIN**

TEL: +82-31-498-9270

FAX: +82-31-498-9275

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## 1. INTRODUCTION

The digital magnet operated brake controller developed by HANMI TECHWIN, is widely applicable mechanical brake for motor as main driving power such as cranes, etc. and is installed with motor controller.

TBC-6020A controls power thyristor under digitalized methods not by rectifying AC power but by selecting most up-to-date MCU and either monitor basic motion of brakes or monitor & protects coil for electromagnet and provides optimum operating condition.

## 2. FEATHURES

- ◆ Selection of current or voltage control to meet Magnet brake operation  
Possible to set each starting Current and holding Current
- ◆ Optimum control by the feedback of output current & voltage
- ◆ Reduced trip time by holding current regeneration.
- ◆ Abnormal status sensing for brake coil(disconnection, short circuit)
- ◆ Over voltage protection & braking caused by high temperature resistor
- ◆ Prevention of overheat for brake Coil to automatically switch to current control
- ◆ Output terminal status monitoring(Element Protection)
- ◆ Safety circuit to protect element from power shut down
- ◆ Overheat Protection for each control element
- ◆ Wide operating range setting(Voltage : 5~300V, Current : 0.1-45A, Starting current time : 0-10 Sec.)
- ◆ Switch for operation test

## 3. APPLICATION

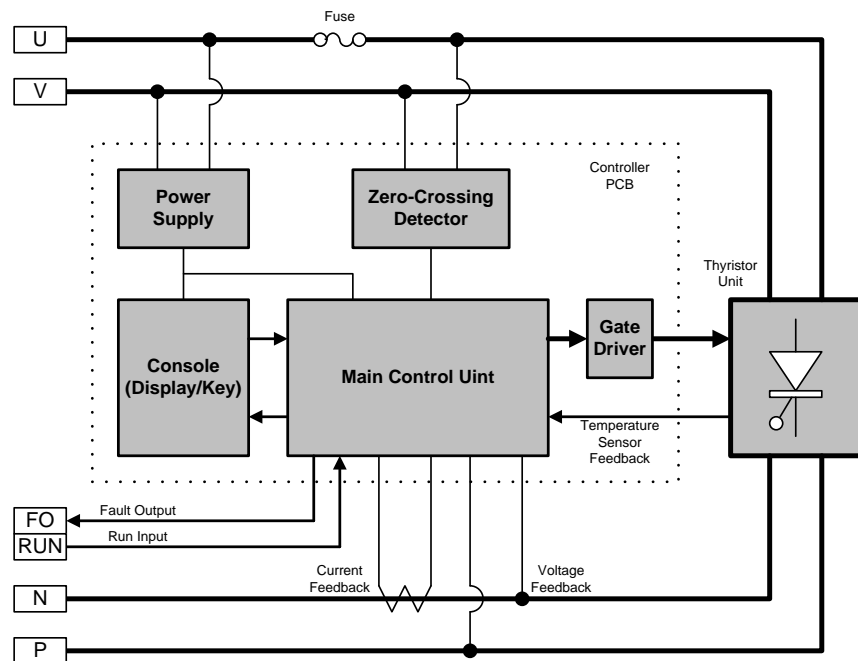
- ◆ Magnet type motor brake control system
- ◆ Machinerics adopts electromagnets

**4. SPECIFICATION**

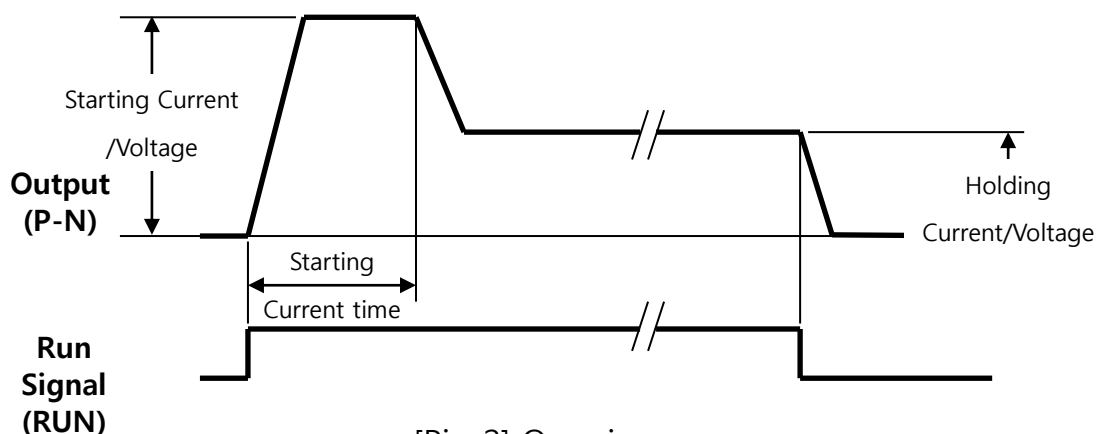
- ◆ Input power : AC 200~460[V](free voltage), 50/60[Hz](dual)
- ◆ Output Current Control Range : DC 0~45[A]  
(Starting, Holding Current Common)
- ◆ Output Voltage Setting Range : DC 10 ~ 250[V]  
(To follow usage voltage for maximum voltage)
- ◆ Starting Current Time Setting Range : 0~10(Sec.)
- ◆ Operation Signal Input : RUN INPUT (Contact)
- ◆ Output Fault signal : FAULT OUTPUT  
(Mechanical contact : AC250V/DC30V, 5A)
- ◆ Fuse rating : WEBE E165SA gG30A or equivalent
- ◆ Operating temperature : -20~85[°C]

## 5. OVERVIEW

Internal of TBC-6020A is shown as Pic. 1. Main control device "MCU" controls output from operator set value, and power control module "Thyristor" operates switch motivated by current cycle. In addition, output current and voltage compose feedback itself to perceive full load operating condition in real time.



Block Diagram



[Pic. 2] Overview

### 1) Operating Starting Current

- ① When operation signal turns on, set starting current or starting voltage start to output. At the point, current control mode should be

outputted voltage more than rated voltage temporally due to characteristic of brake coil which the current should not be changed quickly.

- ② During the starting current, SC lamp flickers.

## 2) Operating Holding Current

- ① If set starting time passed, it automatically outputs holding current or holding voltage. At the point, current control mode should be outputted voltage less than rated voltage temporally due to characteristic of brake coil.
- ② Output voltage and current are in stable during holding current, it could display dynamic resistance and temperature of coil etc. with using buttons from referring to voltage and current.(Refer to No. 6).
- ③ HC Lamp flicks during holding current.

## 3) Regeneration of exciting current

- ① When TBC-6020A turns off, exciting current of coil extinct quickly to deliver it to power side. In other word, if using a disconnection circuit for current route, please late close situation could be occur due to blocking revival motion.(Refer to No. 8)
- ② SC and HC lamp flicks during revival motion.

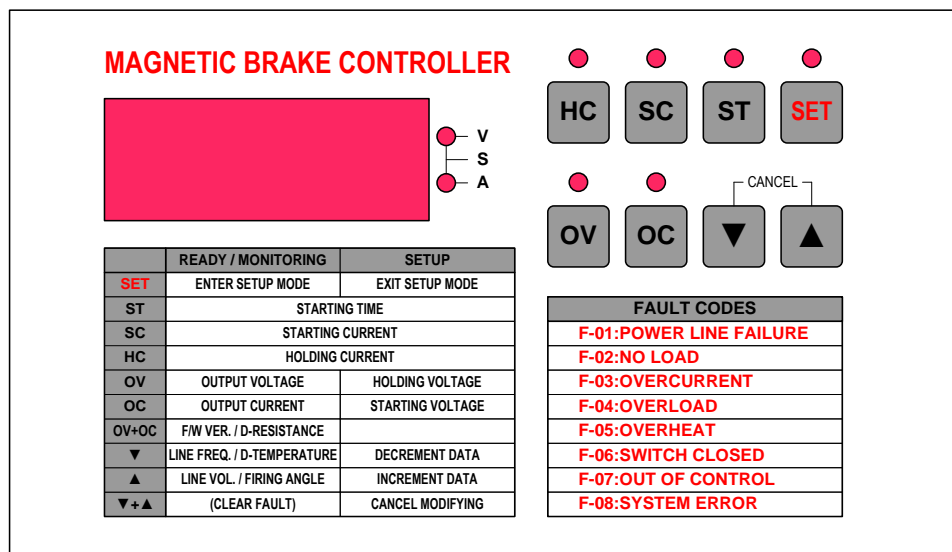
## 4) Completion of operation

When TBC-6020A completes revival motion, all flicking lamp will be turned off.

## 5) Noted item

- ① If operating signal turns off during starting current, it enter into revival motion of exciting current directly.
- ② When TBC-6020A turn on during the revival motion of exciting current, it enter into starting current stage. (Exclude 0.0 of starting current time).
- ③ When starting current time sets 0.0 sec, equal current or voltage outputs because operation enters holding current stage directly.
- ④ Brake coil temperature should be increased if starting current operates frequency due to high duty cycle of brake. For reducing this situation, TBC-6020A will be automatically changed to voltage control mode when 143% of rating coil voltage(130°C of coil temperature) for reducing above situation(for operating holding current). Therefore, current could be output less than setting value. If setting value could not meet 61% of setting value(coil temperature approximately less than 180°C), fault will occurs [**F-07**](OUT OF CONTROL).
- ⑤ Displayed number flicks during the voltage control mode.

## 6. OPERATING CONSOLE AND DISPLAYED CONTENTS













[Pic. 4] Console

### 6-1 Function of button (standby/monitoring mode)

	Stand-by	Operating
<b>SET</b>	Press & hold to enter set-up mode Press to show brake type.	-
<b>ST</b>	Display starting current time of output at present.	
<b>SC</b>	Display starting current value of output at present.	
<b>HC</b>	Display holding current value of output at present.	
<b>OV</b>	Display voltage value of output at present.	
<b>OC</b>	Display current value of output at present.	
<b>OV OC</b>	Display version of firmware	Display dynamic resistance of brake coil
<b>▼</b>	Display frequency of input power source	Display dynamic temperature of brake coil
<b>▲</b>	Display voltage of input power source	Display firing angle for control (~180.0)
<b>▼ ▲</b>	Return to standby mode after reset, when fault occurs.	-

## 6-2 Function of Button (Set-up mode)

	Basic setting	Extension setting
	Press and hold SET button(more than 1 sec) to enter set-up mode Press SET button to exit standby mode.	Press SET button to exit set-up mode
	Using ▼, ▲ button to set starting time(0~10[sec])	Select brake type <sup>1)</sup> (※Only HANMI TECHWIN standard brake.)
	Using ▼, ▲ button to set starting current (0.1~45[A])	Select starting control mode (CC : current control, CV : voltage control)
	Using ▼, ▲ button to set holding current (0.1~45[A])	Select holding control mode (CC : current control, CV : voltage control)
	Using ▼, ▲ button to set holding voltage (5~300[V])	Set P value(kp) of PI control(0~20) <sup>2)</sup> (default value : 10)
	Using ▼, ▲ button to set starting voltage (5~300[V])	Set P value(kp) of PI control(0~20) <sup>2)</sup> (default value : 10)
	Using ▼, ▲ button / Changed Relay Output <b>F On</b> : Relay On - fault <b>P rn</b> : Relay On - Power On Relay Off - fault	Using ▼, ▲ button to set Fault Light on the top of Display(FND) set fault Light on the bottom of Display(FND) cancel fault
	Decrease Selected value at present.	
	Increase Selected value at present.	
	Reset value of display(cancel setting)	









1) It displayed four(4) digit number, first digit number show as follow; [1]:AN type AC100V, [2]:AN type AC200V, [3]:DN type DC110V, [4]:DN type DC220V, left three(3) digit number indicates brake frame number.(ex: [2400] → AC200V AN400). If it sets parameter beside HANMI TECHWIN's standard, it displays as [---].  
Please refer to appendix for more details.

2) It could control the characteristic of output voltage and current control. If kp value is bigger, quick response are better. However, if kp value is too big, could be caused of occurring the vibration.

3) It could control the characteristic of output voltage and current control. However, if ki value is bigger, it could meet control target value. If it is too big, vibration could be occurred. In addition, smaller value are stable with vibration, too small value could be occurred controlled deviation.



### 6-3 Explanation of Fault

Display	Causes and Solutions
	<b>POWER LINE FAILURE</b> Instability of power or disconnected fuse. ☞ Please check power cable or fuse.
	<b>NO LOAD</b> Don't flow output current.(disconnected coil or omission of wiring) ☞ Check wiring of loaded side.
	<b>OVERCURRENT</b> Over flow current(disconnected output terminal) ☞ To Check loaded side wiring connects correctly.
	<b>OVERLOAD</b> Output voltage is blow than 75% of rated voltage. (overload, partial disconnection) ☞ Please check status of brake coil.
	<b>OVERHEAT</b> Temperature of heatproof plate is more than 85°C(celcius)(device overheating) ☞ When temperature declined, it automatically returns to work.
	<b>SWITCH CLOSED</b> Input power while the switch turned on. ☞ Please turn off the switch before input power.
	<b>OUT OF CONTROL</b> ① Could not control with setting current.(Overdrive) <sup>1)</sup> ② Rating of output current is blow 61%(overheated coil) <sup>2)</sup>
	<b>SYSTEM ERROR</b> Reset due to abnormal operating. ☞ Please check power source whether it is bad.

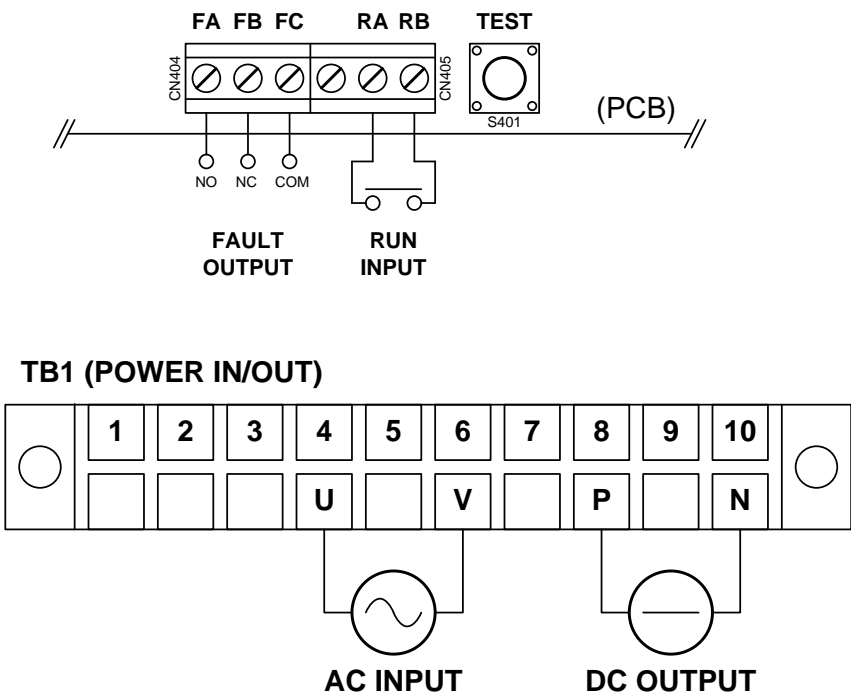
1) It does not work till output current reaches setting value even though the maximum voltage outputs. Please check electrical specification such as power source or voltage.

2) When brake coil reaches 180°C, resistance will increase 163% than 20°C of brake coil. TCB-6020A will stop preventing damage of brake coil. If TBC-6020A is already working to meet above condition (output current), the fault signal will occur after operating signal turned off.

※ When temperature of coil is more than 130°C, constant rating voltage outputs; therefore, the temperature keep rising output current is reduced.

7. CONNECTION TERMINAL BLOCK

7-1 Exterior of Terminal Block

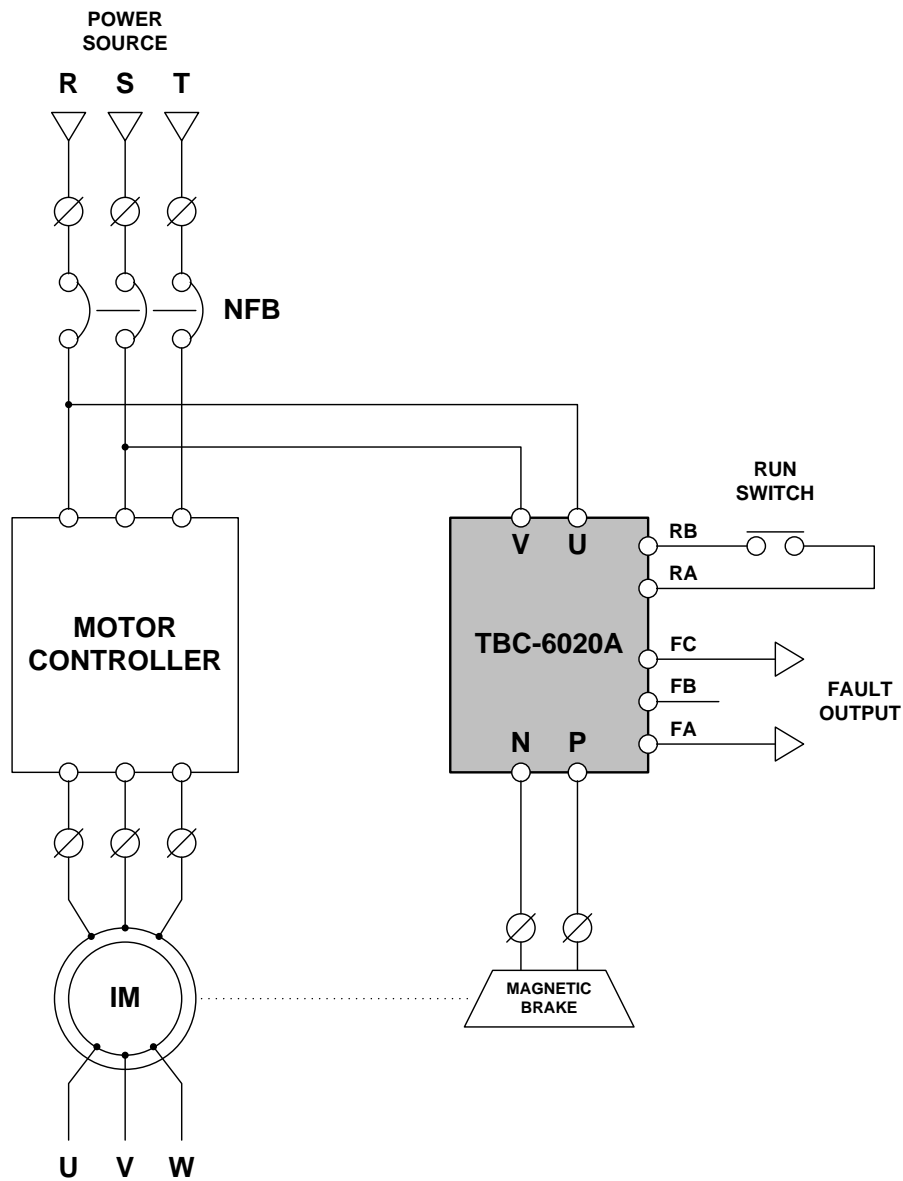


7-2 Explanation of terminals

Terminal		Symbol	Name	Function	Rating
CN 404	1	FA	NORMAL OPEN	FAULT OUTPUT Operating when the fault occurs.	AC250V/ DC30V,5A
	2	FB	NORMAL CLOSE		
	3	FC	COMMON		
CN 405	2	RA	RUN-A	RUN INPUT Operating Input Signal	
	3	RB	RUN-B		
TB1	1				
	2				
	3				
	4	U	AC INPUT	Single phrase AC input power	
	5				
	6	V	AC INPUT	Single phrase AC input power	
	7				
	8	P	DC OUTPUT (+)	Brake Coil (+)	
	9				
	10	N	DC OUTPUT (-)	Brake Coil (-)	

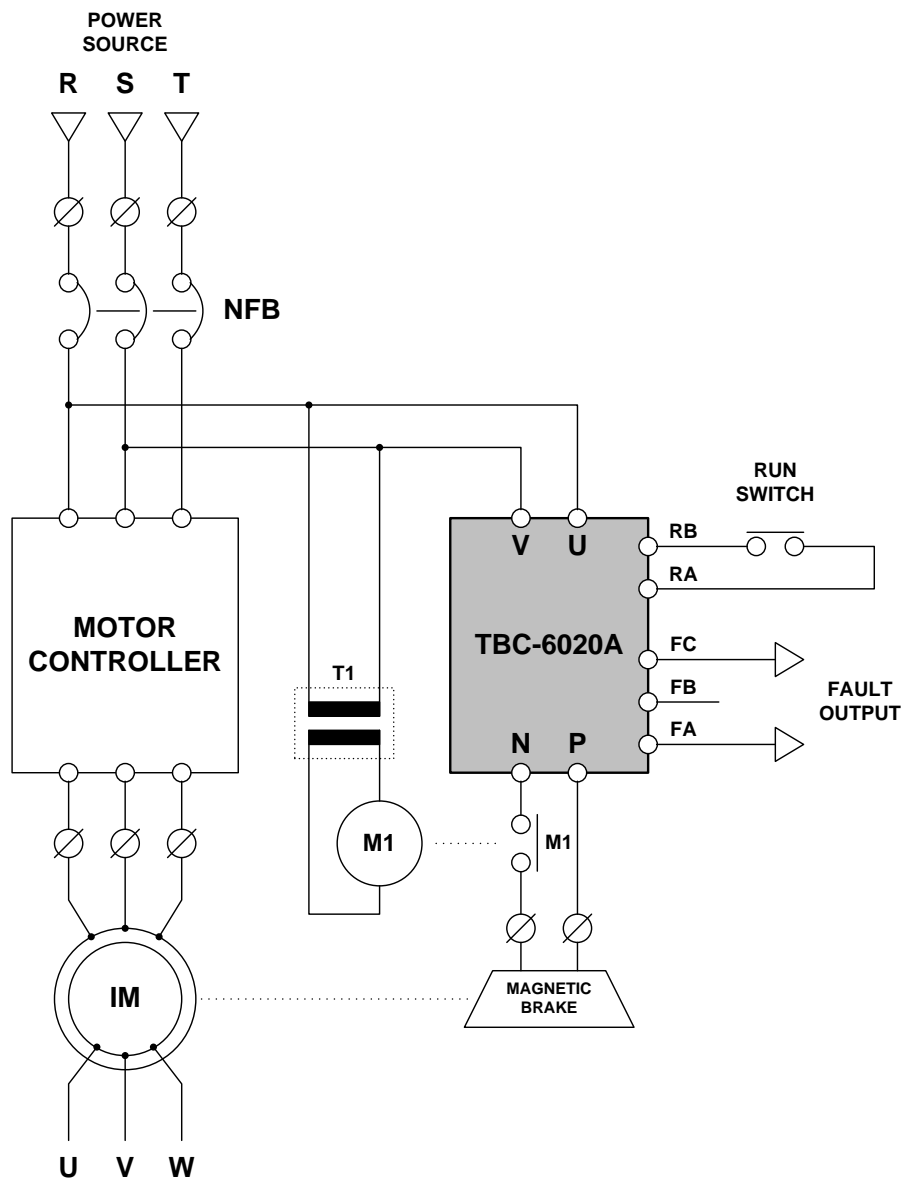
## 8. ELECTRIC WIRING DIAGRAM

### 8-1 Basic wiring



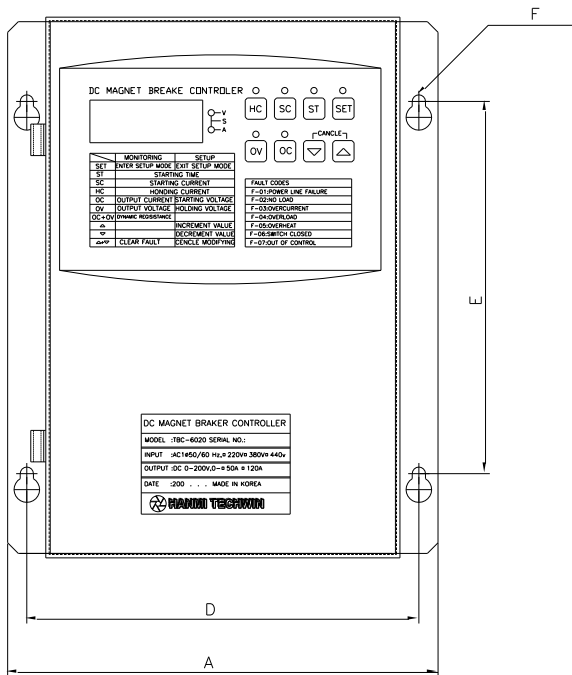
- ① This wiring method use only for small capacity of brake which extinct exciting current quickly and close brake quickly when electrical failure occurs.
- ② Applicable HANMI TECHWIN magnetic brake  
TB-AN132, 160, 180, 200, 225, 250, 280  
TB-DN178, 213, 250

## 8-2 Extended wiring

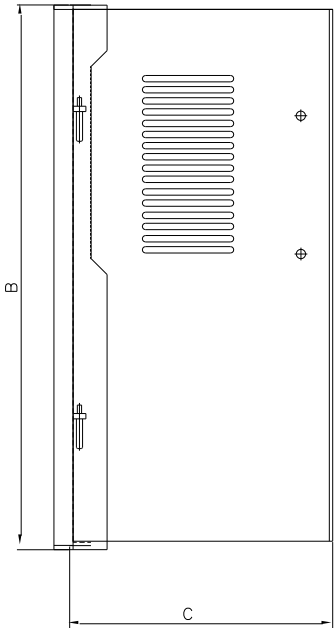


- ① This wiring method use only for big capacity of brake which extinct exciting current slowly and close brake slowly when electrical failure occurs.
- ② Additional Magnet Contactor(M1 for above drawing) or relay use appropriate condition. In addition, if power source is not applicable, it recommended to use step-down transformer(T1).
- ③ Applicable HANMI TECHWIN magnetic brake  
TB-AN315, 355, 400, 527  
TB-DN308, 336, 403

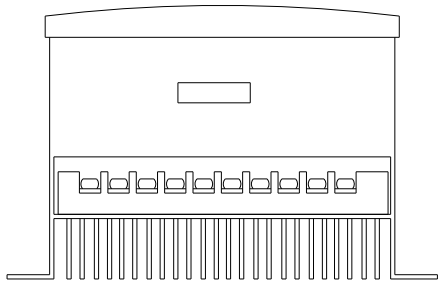
# 9. DIMENSION



TOP VIEW



R.SIDE VIEW



FRONT VIEW

	Measure [mm]
A	202
B	254
C	124
D	184
E	175
F	4- $\phi 6$

※ It can be changed to enhance the product without notice.

**10. CAUTION FOR OPERATION**

- ◆ TBC-6020A has sensitive electronic components inside. Don't open TBC-6020A don't attempt to repair by yourself. It may cause injury and serious damage.
- ◆ Please install TBC-6020A with normal circuit. Especially, brake operates with actuation signal, and TBC-6020A could not operate while operating switch turned off.
- ◆ Installation of TBC-6020A choose appropriate circuit(basic circuit or extended circuit) refer to electrical specification of magnetic brake.
- ◆ TBC-6020A design to bear noise and surge from the power source; however, excessive noise and surge could be caused abnormal operation, so that use stable power source.
- ◆ Please caution for wiring if input terminal of operating switch intermixes for either leakage of voltage stray voltage it causes malfunction of TBC-6020A.
- ◆ Please supply stable power source even if TBC-6020A prepare stable operation when electrical failure occurs. TBC-6020A stops its operation with fault signal if unstable power source supplies more than 1 sec.
- ◆ MCU could be reset after abnormal operation if power source is unstable. Display shows [**F-08**].
- ◆ TBC-6020A scans it short circuit when the operational switch turns on; if the short circuit occurs, it does not work(displaying [**F-03**]). However, output terminal occurs the short circuit during outputting current, fuse could be blocked(displaying [**F-01**](POWER LINE FAILURE)).
- ◆ When fault occurs, please solve causes of fault then return to operate. Push ▼+▲ button after clearing fault return to stand-by mode.
- ◆ Please caution for setting value of unsuitableness specification before operating brake to check electrical specification of TBC-6020A. Especially, check the input power voltage is enough to operating coil.
- ◆ Please use rated products for fuse to protect device.

## 11. CAUTION FOR USING NON STAANDARD ENVIRONMENT

### ◆ When TBC-6020A control two or more brakes,

TBC-6020A grantees to control one brake to maximize performance. If two brakes connect to one TBC-6020, it is difficult to expect normal performance due to its characteristics. Please refer to be aware of list blow when you are obliged to use one TBC-6020A to two brakes.

- ① Please use brakes with same specification and uses brake of characteristic of electrically, and mechanically.
- ② Electrical wiring between brakes if current control should be connected in series but voltage control should be connected in parallel for improving its characteristic of control.
- ③ In Series connection, rated voltage is that should add all brake rated voltage. In this case, value of all brake current must be same. This value sets rated output current.
- ④ In parallel connection, rated current is that should add all brake rated current. In this case, value of all brake voltage must be same. This value sets rated output voltage.
- ⑤ If plural number of brakes operates, selects efficiency control method(current control or voltage control). In any cases, voltage and current must not be exceeded its maximum rating.

### ◆ When brake coil is easy to overheat it operate with low current.

TBC-6020A prevents overheat of coil easily, and it automatically switches to voltage control mode(control output voltage regularly). However, it is difficult to effect for excessive work. Please check as well as blow method.

- ① Do not set starting current time and starting current more than required. Please set starting current time and starting current approximately value after several test.
- ② If holding current operate to set lower current than rating, voltage set proportionable lower value as current to prevent overload fault. When brake coil is completely in cold shape(temperature coil is approximately 20°C.), set rated voltage to get accurate control after TBC-6020A operates with lower current.
- ③ Do not set lower value of current so that magneto-motive force is not enough when coil is in high temperature.

**Appendix) Standard specification of HANMI TECHWIN's magnetic brake(60%ED)**

Model No.	DC 100V / DC 110V					DC 200V / DC 220V				
	Starting Current		Holding Current		Resistance [Ω]	Starting Current		Holding Current		Resistance [Ω]
	Voltage [V]	Current [A]	Voltage [V]	Current [A]		Voltage [V]	Current [A]	Voltage [V]	Current [A]	
TB-AN132	100	6.9	15	1.0	14.5	200	3.4	30	0.5	58.1
TB-AN160	100	10.7	15	1.6	9.3	200	5.4	30	0.8	37.1
TB-AN180	100	9.4	15	1.4	10.6	200	4.7	30	0.7	42.6
TB-AN200	100	15.8	15	2.4	6.3	200	7.9	30	1.2	25.2
TB-AN225	100	15.8	15	2.4	6.3	200	7.9	30	1.2	25.2
TB-AN250	100	14.7	15	2.2	6.8	200	7.4	30	1.1	27.1
TB-AN280	100	23.5	15	3.5	4.3	200	11.8	30	1.8	17.0
TB-AN315	100	25.6	15	3.8	3.9	200	12.7	30	1.9	15.7
TB-AN355	100	37.0	15	5.6	2.7	200	18.3	30	2.8	10.9
TB-AN400	100	33.3	15	5.0	3.0	200	16.7	30	2.5	12.0
TB-AN527	100	34.7	15	5.2	2.9	200	17.4	30	2.6	11.5
TB-DN178	110	7.6	15	1.0	14.5	220	3.8	30	0.5	58.1
TB-DN213	110	17.4	15	2.4	6.3	220	8.7	30	1.2	25.2
TB-DN250	110	25.6	15	3.5	4.3	220	12.9	30	1.8	17.0
TB-DN308	110	28.2	15	3.8	3.9	220	14.0	30	1.9	15.7
TB-DN336	110	40.7	15	5.6	2.7	220	20.2	30	2.8	10.9
TB-DN403	110	36.7	15	5.0	3.0	220	18.3	30	2.5	12.0

※ TB-AN527B2 could not be applied for TBC-6020A.

※ Please sets starting current time due to status of brake operation.

(👉 Initial value setting is 0.2 sec to 0.5 sec.)