PREFACE

TOP GIN TG100.
is a small and simple inverter; as easy as using a contactor. This instruction manual describes installation, maintenance and inspection, troubleshooting, and specifications of the TG100. Read this instruction manual thoroughly before operation.

General Precautions

- Some drawings in this manual are shown with the protective cover or shields removed, in order to describe detail with more clarity. Make sure all covers and shields are replaced before operating this product.
- This manual may be modified when necessary because of improvement of the product, modification, or changes in specifications.
  Such modifications are denoted by a revised manual No.
- To order a copy of this manual, if your copy has been damaged or lost, contact your TOP GIN representative.
- TOP GIN is not responsible for any modification of the product made by the user, since that will void your guarantee.

NOTES FOR SAFE OPERATION

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the TG100. In this manual, NOTES FOR SAFE OPERATION are classified as "WARNING" or "CAUTION."

$$\boxed{\triangle\,!\quad \text{WARNING}}$$

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

$$\boxed{\triangle\,!\quad \text{CAUTION}}$$

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

Even items described in $\boxed{\triangle\,!\ \text{CAUTION}}$ may result in a vital accident in some situations. In either case, follow these important notes.

NOTE : These are steps to be taken to insure proper operation.

WARNINGS FOR UL/cUL MARKING

- Do not connect or disconnect wiring, or perform signal checks while the power supply is turned ON.
- The Inverter internal capacitor is still charged even after the power supply is turnd OFF. To prevent electric shock, disconnect all power before servicing the Inverter. Then wait at least one minute after the power supply is disconnected and all indecators are OFF.
- Do not perform a withstand voltage test on any part of the Inverter. This electronic equipment uses semiconductors and is vulnerable to high voltage.
- Do not remove the Digital Operator or the blank cover unless the power supply is turned OFF. Never touch the printed control board (PCB) while the power supply is turned ON.
- This Inverter is not suitable for use on a circuit capable of delivering more than 18,000 RMS symmetrical amperes, 250volts maximum (220V class units) or 18,000 RMS symmetrical amperes, 480volts maximum (440Vclass units).

⚠ CAUTION

Use 75°C copper wires or equivalent.
Low voltage wires shall be wired with Class I Wiring.

WARNINGS FOR CE MARKINGS

- Only basic insulation to meet the requirements of protection class 1 and overvoltage category II is provided with control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements.
- For 440 V class Inverters, make sure to ground the supply neutral to conform to CE requirements.
- For conformance to EMC directives, refer to the relevant manuals for the requirements.

RECEIVING

⚠ CAUTION
(Ref. page)
• Do not install or operate any inverter which is damaged or has missing parts. Failure to observe this caution may result in personal injury or equipment damage.   13

MOUNTING

⚠ CAUTION
(Ref. page)
• Lift the cabinet by the heatsink. When moving the unit, never lift by the plastic case or the terminal covers. Otherwise, the main unit may be dropped causing damage to the unit.   14
• Mount the inverter on nonflammable material (i.e. metal). Failure to observe this caution can result in a fire.   14
• The TG100 generates heat. For effective cooling, mount it vertically.

WIRING

⚠ WARNING

- For 440V class, make sure to ground the supply neutral.
  Failure to observe this warning can result in an electric shock
  or a fire.   15
- Make sure to ground the ground terminal ⏚ according to the
  local grounding code.
  Failure to observe this warning can result in an electric shock
  or a fire.   15

⚠ CAUTION

- Verify that the inverter rated voltage coincides with the
  AC power supply voltage.
  Failure to observe this caution can result in personal injury
  or a fire.
- Do not perform a withstand voltage test of the inverter.
  It may cause semi-conductor elements to be damaged.
- Do not connect or disconnect wires or connectors
  while power is applied to the circuit.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.

OPERATION

⚠ WARNING	

(Ref. page)

- Only turn ON the input power supply after replacing the front cover.
  Do not remove the covers while current is flowing.
  Failure to observe this warning can result in an electric shock.
- Never operate the digital operator or dip the switches when your hand is wet.
  Failure to observe this warning can result in an electric shock.
- Never touch the terminals while current is flowing, even during inverter stopping.
  Failure to observe this warning can result in an electric shock.
- When the fault retry function is selected, stand clear of the inverter or the load, since it may restart suddenly after being stopped.
  (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.   44
- When continuous operation after power recovery is selected, stand clear of the inverter or the load, since it may restart suddenly after being stopped.
  (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.   39
- Since the digital operator stop button can be disabled by a function setting, install a separate emergency stop switch.
  Failure to observe this warning can result in personal injury.
- If an alarm is reset with the operation signal ON, the inverter restarts automatically. Only reset the alarm after verifying that the operation signal is OFF.
  Failure to observe this warning can result in personal injury.   17

MAINTENANCE AND INSPECTION

⚠ WARNING

- Never touch high-voltage terminals in the inverter.
  Failure to observe this warning can result in an electric shock.
- Disconnect all power before performing maintenance or inspection.
  Then wait at least one minute after the power supply is disconnected
  and all LEDs and CHARGE LED are extinguished.
  The capacitors are still charged and can be dangerous.

$\triangle$ WARNING
• Do not perform withstand voltage test on any part of the TG100. This electronic equipment uses semiconductors and is vulnerable to high voltage.

$\triangle$ CAUTION
• The control PC board employs CMOS ICs. Do not touch the CMOS elements. They are easily damaged by static electricity.

Others

$\triangle$ WARNING
• Never modify the product. Failure to observe this warning can result in an electric shock or personal injury and will invalidate the guarantee.

CONTENTS

1. RECEIVING

After unpacking the TG100, check the following :

▫ Verify that the part numbers match your purchase order or packing slip.

▫ Check the unit for physical damage that may have occurred during shipping.

If any part of TG100 is missing or damaged, call for service immediately.

● Checking the name Plate

	INVERTER MODE
TG 100 L10	INPUT SPEC
SOURCE 220V 50/60 HZ	
CAPACITY 2.0 KVA	
VOLTS 220V 0.75KW 5.5A	OUTPUT SPEC
SERIAL NO.	
TOP GIN MADE IN TAIWAN	SERIAL NO.

MODEL

INVERTER TG100 :

TG 100 L 10 A 2 T 1

TOP GIN
IGBT INVERTER
VOLTAGE L：220V
        H：440V
MAXIMUM MOTOR (1HP)
回生剎車回路 A：NO
        B：YES

0:IEC IPOO
1:NEMAI
T:Standard
E:CE mark
U:UL
操作器:1:空白板
        2:數位操作器+可變電阻(VR)

2. MOUNTING

● Choosing a Location to Mount the Inverter

Be sure the inverter is protected from the following conditions :

- Extreme cold and heat. Use only within the ambient temperature range :-10 to +50ºC (14 to 122ºF)
- Rain, moisture
- Oil sprays, splashes
- Salt spray
- Direct sunlight. (Avoid using outdoors)
- Corrosive gases (e.g. sulfurized gas) or liquids
- Dust or metallic particles in the air.
- Physical shock, vibration.
- Magnetic noise. (Example : welding machines, power devices, etc.)
- High humidity.
- Radioactive substances.
- Combustibles : thinner, solvents, etc.

3. WIRING
● Wiring the Main Circuit

L1 L2 L3

MCCB or leakage breaker

R S T U V W B1 B2

Example of 3-phase 220v class,1.5kw inverters

・ Main circuit input power supply
Always connect the power supply line to input terminals R/L1, S/L2, and T/L3 [R/L1, T/L3 for single-phase inverters]. Never connect them to terminal U/T1,V/T2,W/T3, B1, B2, − . Otherwise the inverter may be damaged.

NOTE For single-phase inverters, always use terminals R/L1 and T/L3.

・ Grounding (Use ground terminal ⊕)
Make sure to ground the ground terminal ⊕ according to the local grounding code. Never ground the TG100 in common with welding machines, motors, or other electrical equipment.
When several TG100 units are used side by side, ground each unit as shown in examples. Do not loop the ground wires.

GOOD   GOOD   POOR

・ Braking resistor connection (optional)
To connect the braking resistor, cut the protector on terminals B1 and B2.
To protect the braking resistor from overheating, install a thermal overload relay between the braking resistor and the inverter. This provides a sequence which shuts off the power supply, by a thermal relay trip contact.
Use this same procedure when connecting a braking resistor unit.

・ Inverter output
Connect the motor terminals to U/T1, V/T2, W/T3.
Wiring the main circuit terminals
Pass the cables through wiring hole and connect. Be sure to mount the cover in its original position.

Connect with a Phillips (plus) screwdriver.

□Wiring the Control Circuit

Only basic insulation is provided for the control circuit terminals   .
Additional insulation may be necessary in the end product   .

· Control circuit terminals
  Wiring the control circuit terminals
  Pass the cable through wiring hole and connect   Be sure to mount the
  covers on its original position

SW7

ON   [ ] [ ] [ ]   OFF
      [ ] [ ] [ ]

SW8

| MA | MB | MC | | S1 | S2 | S3 | S4 | S5 | SC | FS | FR | FC | AM | AC |

* SW 1   can be changed according to sequence input signal   (S 1 to
S 5) polarity .
0 V common   : NPN side (factory setting   )
+ 24 common : PNP side

□ Wiring Inspection

After completing wiring, check the following :
. Wiring is proper.
. Wire clippings or screws are not left in the unit.
. Screws are securely tightened.
. Bare wire in the terminal does not contact other terminals.

NOTE

If the FWD (REV) run command is given during the operation reference selection (H02=1) from the control circuit terminal, the motor will start automatically after the main circuit input power supply is turned ON.

4. OPERATING THE INVERTER

■ Test Run

The inverter operates by setting the frequency (speed).
There are three types of operation modes for the TG100 :
1 Run command from the digital operator (potentiometer/digital setting).
2 Run command from the control circuit terminal.
3 Run command from communications (MEMOBUS communications)
Prior to shipping, the drive is set up to receive run command and frequency reference from the operator. Below are instructions for running the TG100 using the digital operator (with potentiometer). For instructions on operation.

Operation reference or frequency reference constants can be selected separately as shown below.

Name	Constant
Run Command Selection	H02 = 0 --- Enables operator RUN, STOP/RESET = 1 --- Enables control circuit terminal run/stop = 2 --- Enables communications (MEMOBUS communications)
Frequency Reference Selection	H03 = 0 --- Enables operator volume = 1 --- Enables frequency reference 1 (constant H21) = 2 --- Enables voltage reference (0 to 10V) of control circuit terminal = 3 --- Enables current reference (4 to 20mA) of control circuit terminal = 4 --- Enables current reference (0 to 20mA) of control circuit terminal = 6 --- Enables communications (MEMOBUS communications)

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
1. Turn the potentiometer fully to the left before turning the power ON. 2. F/R blinks. Select FWD/REV run using keys. **NOTE** Never select REV when reverse run is prohibited. 3. Press DSPL to blink FREF. Then press RUN. 4. Operates the motor by turning the potentiometer to the right. (Frequency reference corresponds to the potentiometer **NOTE** If the potentiometer is switched rapidly, the motor also accelerates or decelerate rapidly corresponding to the potentiometer movement. Pay attention to load status and switch the potentiometer with the speed not to affect motor movement.	0.0 *For* (Forward) or *rEu* (Reverse) 0.0 0.0 to 60.0 Minimum output frequency is 1.5Hz	FREF F/R FREF FREF	RUN ALARM (RUN blinking, ALARM off) RUN ALARM (RUN blinking, ALARM off) RUN ALARM (RUN on, ALARM off) RUN ALARM (RUN on, ALARM off)

Status indicator lamp ☀ : ON   ☼ : Blinking   ● : OFF

Operation Check Points
▫ Motor rotates smoothly.
▫ Motor rotates in the correct direction.
▫ Motor does not have abnormal vibration or noise.
▫ Acceleration or deceleration is smooth.
▫ Current matching the load flows.
▫ Status indicator LEDs and digital operator display are correct.

● Operating the Digital Operator

All functions of the TG100 are set by the digital operator. Below are descriptions of the display and keypad sections.

Function display LEDs (Color in parenthesis indicates the color of LED.)

FREF Frequency reference setting/monitoring (GREEN)	FOUT Output frequency monitor (GREEN)	IOUT Output current monitor (GREEN)	MNTR Multi-function monitor (GREEN)
F/R Operator RUN command FWD/REV selection (GREEN)		LO/RE LOCAL/REMOTE Selection (RED)	PRGM Constant no./data (RED)

Description of Status Indicator LEDs

There are two LEDs on the middle right section of the face of the VS mini. The inverter status is indicated by various combinations of ON, BLINKING and OFF LEDs. RUN indicator and status indicator on the ⌈ RUN ⌉ button have the same function

☀ : ON   ☼ : BLINKING (Long Blinking)○ : BLINKING   ● : OFF

RUN ALARM	Operation Ready (During Stop)	Ramp to Stop	Normal Operation
○　　　　○	RUN　ALARM	RUN　ALARM	RUN　ALARM
(Green)　　(Red)	☼　　●	☼　　●	☀　　●

For details on how the status indicator LEDs function at inverter faults, refer to Section 8 "FAULT DIAGNOSIS AND CORRECTIVE ACTIONS". If a fault occurs, the ALARM LED lights.

NOTE

The fault can be reset by turning ON the fault reset signal (or pressing ⌈ stop reset ⌉ key on the digital operator) with the operation signal OFF or by turning OFF the power supply. If the operation signal is ON, the fault cannot be reset by the fault reset signal.

□LED Description

By pressing [DSPL] on the digital operator, each of the function LEDs can be selected.

The following flowchart describes each function LED.

```
                 ( Power ON )
                      │
                      ▼
┌──────────────────────────────────────────────┐
│  \ | /   Frequency reference setting/monitor  │
│ ─FREF─   (Hz)                                 │
│  / | \   Sets TG100 operation speed.          │
└──────────────────────────────────────────────┘
                      │        ┌────────┐
                      │        │ DSPL   │
                      ▼        └────────┘
┌──────────────────────────────────────────────┐
│  \ | /   Output frequency monitor (Hz)        │
│ ─FOUT─   Displays frequency that TG100 is     │
│  / | \   currently outputting.                │
│          Setting disabled.                    │
└──────────────────────────────────────────────┘
                      │        ┌────────┐
                      │        │ DSPL   │
                      ▼        └────────┘
┌──────────────────────────────────────────────┐
│  \ | /   Output current monitor (A)           │
│ ─IOUT─   Displays current that TG100 is       │
│  / | \   currently outputting.                │
│          Setting disabled.                    │
└──────────────────────────────────────────────┘
                      │        ┌────────┐
                      │        │ DSPL   │
                      ▼        └────────┘
┌──────────────────────────────────────────────┐
│  \ | /   Multi-function monitor               │
│ ─MNTR─   Description of the selected monitor  │
│  / | \   is displayed.                        │
└──────────────────────────────────────────────┘
                      │        ┌────────┐
                      │        │ DSPL   │
                      ▼        └────────┘
┌──────────────────────────────────────────────┐
│  \ | /   FWD/REV run selection                │
│ ─F/R─    Sets the motor rotation direction    │
│  / | \   when run command is given by the     │
│          digital operator.                    │
│          Setting can be changed by [∧] or [∨] │
│          key.                                 │
│          For (forward run) ⇆ rEu (reverse run)│
└──────────────────────────────────────────────┘
                      │        ┌────────┐
                      │        │ DSPL   │
                      ▼        └────────┘
```
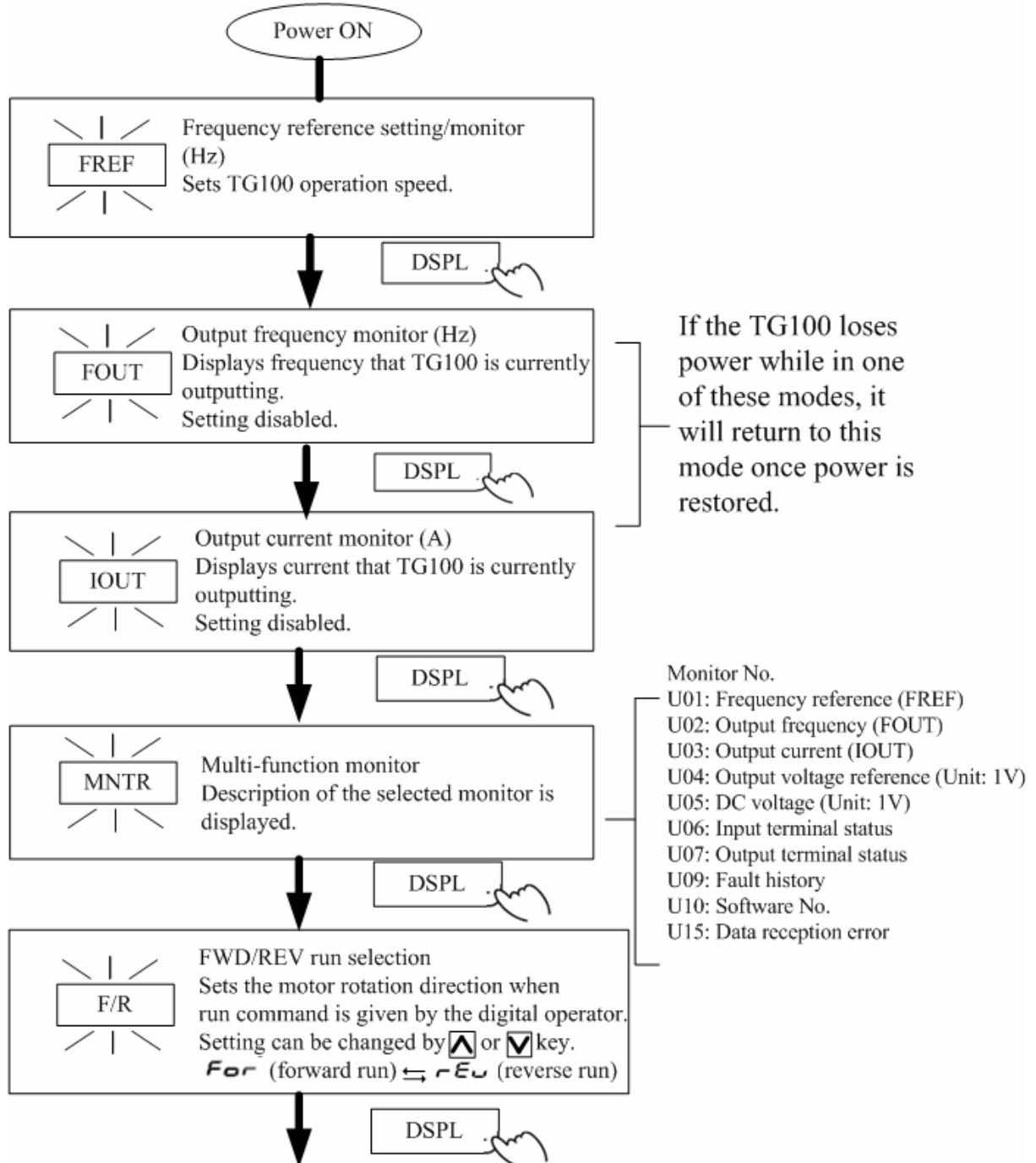
If the TG100 loses power while in one of these modes, it will return to this mode once power is restored.

Monitor No.
- U01: Frequency reference (FREF)
- U02: Output frequency (FOUT)
- U03: Output current (IOUT)
- U04: Output voltage reference (Unit: 1V)
- U05: DC voltage (Unit: 1V)
- U06: Input terminal status
- U07: Output terminal status
- U09: Fault history
- U10: Software No.
- U15: Data reception error

↓

LOCAL / REMOTE
Selection

LO/RE — This function switches the operation; operation using the digital operator including frequency setting with potentiometer, or that using the input terminals or through communications

Setting can be changed by ⋀ or ⋁ key.

$L\,o$ (Local) ⇄ $r\,E$ (Remote)

DSPL

↓

PRGM — Constant No. / data
Sets and changes data using constant No.

DSPL

↓

Return to [FREF]

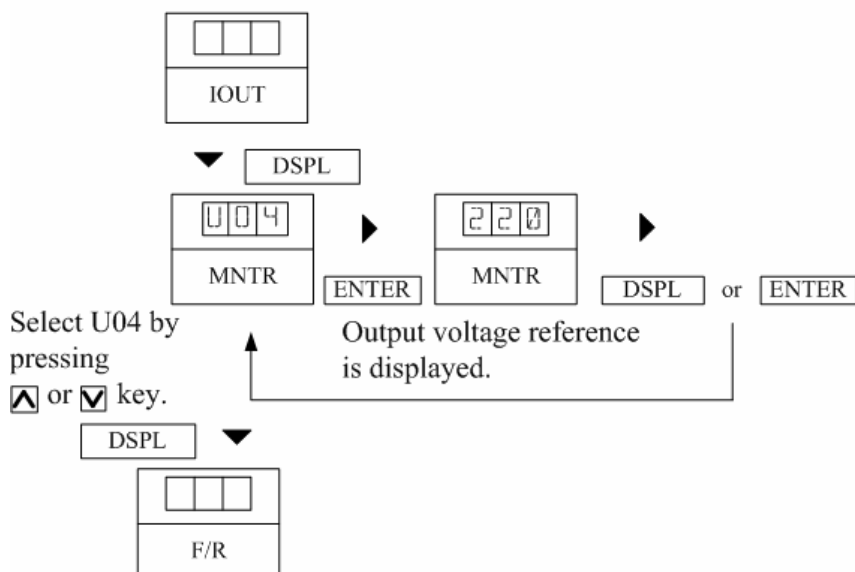MNTR   **Multi-Function monitor**

· Selecting monitor

Press DSPL key. When MNTR is ON, data can be displayed by selecting monitor No.
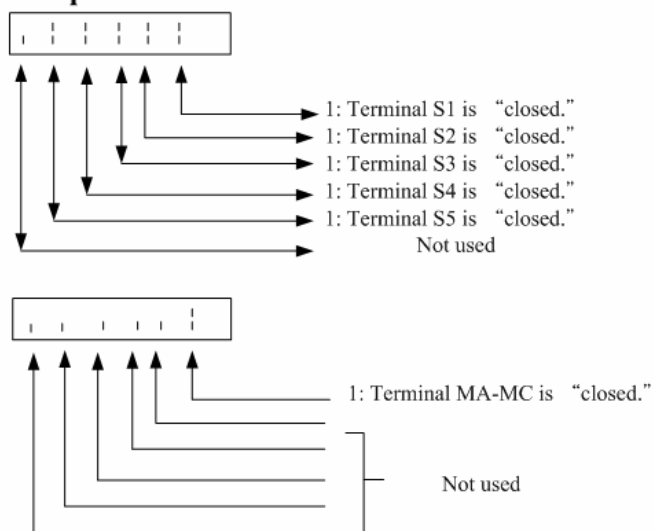
[Example] Monitoring Output Voltage Reference

IOUT

▼ DSPL

U04
MNTR   ▶   220
               MNTR

ENTER   DSPL or ENTER

Select U04 by pressing ⋀ or ⋁ key.

Output voltage reference is displayed.

DSPL ▼

F/R

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• Monitoring

Following items can be monitored by U- constants.

Constant No.	Name		Description
U01	Frequency reference (FREF)	Hz	Frequency reference can be monitored. (Same as FREF)
U02	Output frequency (FOUT)	Hz	Output frequency can be monitored. (Same as FOUT)
U03	Output current (IOUT)	A	Output current can be monitored. (Same as IOUT)
U04	Output voltage	V	Output voltage can be monitored.
U05	DC voltage	V	Main circuit DC voltage can be monitored.
U06	Input terminal status	---	Input terminal status of control circuit terminals can be monitored.
U07	Output terminal status	---	Output terminal status of control circuit terminals can be monitored.
U09	Fault history	---	Last four fault history is displayed.
U10	Software No.	---	Software No. can be checked.
U15	Data reception error	---	Contents of MEMOBUS communication data reception error can be checked. (contents of transmission register No. 003DH are the same)

Input/Output terminal status
Input terminal status

1: Terminal S1 is "closed."
1: Terminal S2 is "closed."
1: Terminal S3 is "closed."
1: Terminal S4 is "closed."
1: Terminal S5 is "closed."
Not used

1: Terminal MA-MC is "closed."

Not used

Fault history display method
Fault description is displayed when U09 is selected.
(Example)

      □□□   : Fault description

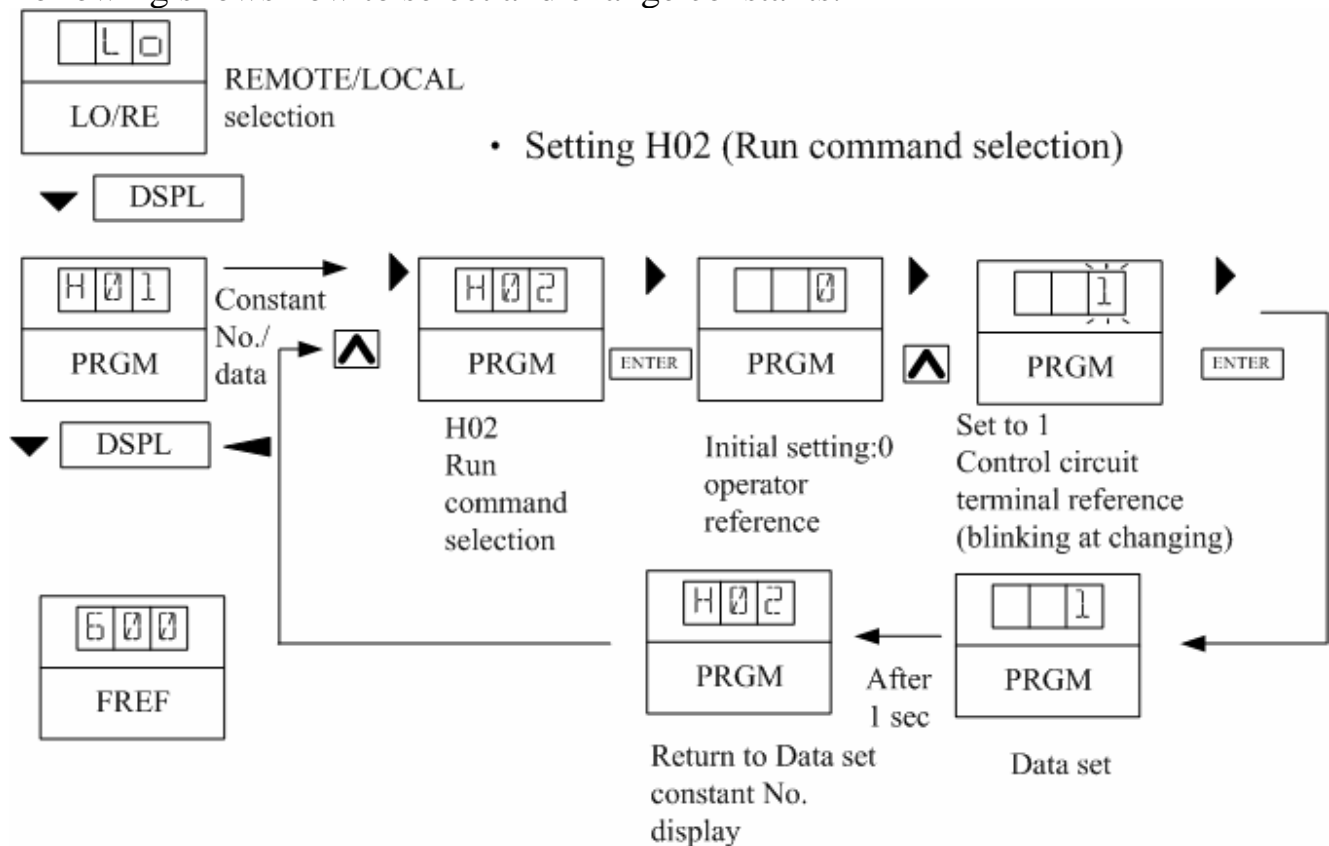   "---" is displayed if there is no fault.

Clearing fault history
Set constant H01 to 6 to clear fault history. Set data returns to its
initial value after completion of 6 setting.
Note: Constant initialize (H01=12, 13) clears the fault history.

Setting and referring constants
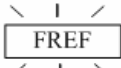Following shows how to select and change constants.

• Setting H02 (Run command selection)

REMOTE/LOCAL selection

LO/RE

DSPL

H01   PRGM   Constant No./data

DSPL

6 0 0   FREF

H0 2   PRGM   H02 Run command selection

0   PRGM   Initial setting:0 operator reference   ENTER

1   PRGM   Set to 1 Control circuit terminal reference (blinking at changing)   ENTER

1   PRGM   Data set

H0 2   PRGM   After 1 sec   Return to Data set constant No. display

Simple Data Setting

Potentiometer setting and digital setting are both available for simple accel/decel operation of the TG100.

Frequency reference by potentiometer signal is set with initial setting (H03=0).

Factory setting of the model with operator (without potentiometer) is set by digital operator (H03=1).

Following is an example in which the function LEDs are used to set frequency reference, acceleration time, deceleration time, and motor direction.

Operation Steps	Operator Display	LED Display	Status Indicator LED
1. Turn ON the power supply.	0.0	FREF	RUN (BLINKING) ALARM ●
2. Set constant H03 to 1.	1	PRGM	RUN (BLINKING) ALARM ●
3. Set the following constants. H16 : 15.0 (acceleration time) H17 : 5.0 (deceleration time)	15.0 5.0	PRGM	RUN (BLINKING) ALARM ●
4. Select forward or reverse run by pressing △ or ▽ key. Examine the application. (Never select REV when reverse run is prohibited.)	For (Forward) or rEu (Reverse)	F/R	RUN (BLINKING) ALARM ●
5. Set the reference by pressing △ or ▽ key.	60.0	FREF	RUN (BLINKING) ALARM ●
6. Press RUN	0.0 to 60.0	FOUT	RUN (BLINKING) ALARM ●
7. Press STOP to stop.	60.0 to 0.0	FOUT	RUN (BLINKING) ALARM ●

Status indicator lamp   ⛢ : BLINKING (Long Blinking)   ⛢ : BLINKING   ● : OFF

5. PROGRAMMING FEATURES

Factory settings of the constants are shown as [⬜] in the tables.

● Constant Set-up and Initialization

Constant selection/initialization (H01)

The following table describes the data which can be set or read when H01 is set.
Unused constants among H01 to H79 are not displayed.

H01 Setting	Constant that can be set	Constant that can be referred
0	H01	H01 to H79
1	H01 to H79*	H01 to H79
6	Fault history cleared	
7	Not used	
12	Initialize	
13	Initialize (3-wire sequence)¥	

* Excluding setting disabled constants.

NOTE Err " appears on the LED display for one second and the set data returns to its initial values in the following cases :

(1) The set values of input terminal function selection 2 to 5 (H36 to H39) are the same.
(2) If the following conditions are not satisfied in the V/f pattern setting :

Max. output frequency (H09) $\geqq$ Max. voltage output frequency (H11)

$>$ Mid. output frequency (H12)

$\geqq$ Min. output frequency (H14)

For details, refer to "Adjusting torque according to application"
 (V/f pattern setting)
(3) If the following conditions are not satisfied in the Jump frequency setting :
Jump frequency 2 (H50) $\leqq$ Jump frequency 1 (H49)
(4) If Frequency reference lower limit (H31) $\leqq$ Frequency reference upper limit (H30)
(5) If motor rated current (H32) $\leqq$ 150% of inverter rated current

●Selecting V/f pattern

Adjusting torque according to application

Adjust motor torque by using "V/f pattern" and "full-range automatic torque boost".

• V/f pattern setting
Set V/f pattern by H09 to H15 as described below. Set each pattern when using a special motor (high-speed motor, etc.) or when requiring special torque adjustment of machine.

Be sure to satisfy the following conditions for the setting of H09 to H15
$H14 \leqq H12 < H11 \leqq H09$
If $H14 = H12$ is set, the set value of H13 is disabled.

Constants No.	Name	Unit	Setting range	Initial Setting
H09	Max. output frequency	0.1Hz	50.0 to 400.0Hz	50.0Hz
H10	Max. voltage	1V	1 to 255V (1 to 510V)	200V (400V)
H11	Max. voltage output frequency (base frequency)	0.1Hz	0.2 to 400.0Hz	50.0Hz
H12	Mid. output frequency	0.1Hz	1 to 399Hz	1.3Hz
H13	Mid. output frequency voltage	1V	1 to 255V (1 to 510V)	12V (24V)
H14	Min. output frequency	0.1Hz	0.1 to 10.0Hz	1.3Hz
H15	Min. output frequency voltage	1V	1 to 50V (1 to 100V)	12V (24V)

• Typical setting of V/f pattern

Set the V/f pattern according to the application as described below. For 400V class, the voltage values (H10, H13, and H15) should be doubled. When running at a frequency exceeding 50Hz/60Hz, change the maximum output frequency (H09).

Note: Be sure to set the maximum output frequency according to the motor characteristics.

(1) For general-purpose applications

Motor Specification : 60Hz

Constant	Setting
H09	60
H10	200
H11	60
H12	1.5
H13	12
H14	1.5
H15	12

Motor Specification : 50Hz (Factory setting)

Constant	Setting
H09	50
H10	200
H11	50
H12	1.3
H13	12
H14	1.3
H15	12

(2) For fans/pumps

Motor Specification : 60Hz

Constant	Setting
H09	60
H10	200
H11	60
H12	30
H13	50
H14	1.5
H15	10

Motor Specification : 50Hz

Constant	Setting
H09	50
H10	200
H11	50
H12	25
H13	50
H14	1.3
H15	10

(3) For applications requiring high starting torque

Motor Specification : 60Hz

Constant	Setting
H09	60
H10	200
H11	60
H12	3
H13	24
H14	1.5
H15	18

Motor Specification : 50Hz

Constant	Setting
H09	50
H10	200
H11	50
H12	2.5
H13	24
H14	1.3
H15	18

Increasing voltage of V/f pattern increases motor torque, but an excessive increase may cause motor overexcitation, motor overheat or vibration.

Note : H012 is to be set to motor rated voltage.

When operating with frequency larger than 60Hz/50Hz, change only max. output frequency (H09).

CONSTANT TORQUE CONSTANT OUTPUT OR VARIABLE OUTPUT

H10 =200V

BASE POINT

H11=60Hz   H09=90Hz

• **Full-range automatic torque boost**

Motor torque requirement changes according to load conditions. Fullrange automatic torque boost adjusts voltage of V/f pattern according to the requirement. The TG100 automatically adjusts the voltage during constant-speed operation as well as during acceleration.

The required torque is calculated by the inverter.

This ensures tripless operation and energy-saving effects.

| Output voltage | ∞ | Torque compensation gain (H63) | × | Required torque |

Operation V (VOLTAGE)

Required torque → Increase voltage

f (FREQUENCY)

Normally, no adjustment is necessary for torque compensation gain (H63 factory setting : 1.0). When the wiring distance between the inverter and the motor is long, or when the motor generates vibration, change the automatic torque compensation gain. In these cases, set the V/f pattern (H09 to H15).

● Switching LOCAL/REMOTE Modes

The following functions can be selected by switching the LOCAL or REMOTE mode. To select RUN/STOP commands or frequency reference, change the mode in advance depending on the following applications.

• LOCAL mode : Enables the digital operator for RUN/STOP commands and FWD/REV run commands.
Frequency reference can be set by volume or FREF .

• REMOTE mode : Run by the H02 setting (run command selection).
Frequency reference can be set by H03 (frequency reference selection) setting.

● How to select LOCAL/REMOTE modes

When LOCAL/REMOTE switching function is not set for multi-function input selection	When LOCAL/REMOTE switching function is set at multi-function input selection

(When 17 is not set to any of constants H36 to H39)

(When 17 is set to any of constants H36 to H39)

Select Lo for operator LO/RE selection.	Select rE for operator LO/RE selection.	Set multi-function input terminal is turned ON.	Set multi-function input terminal is turned OFF.

LOCAL mode   REMOTE mode

Selecting Run/Stop Commands

Refer to ■Switching LOCAL / REMOTE Modes to select
either the LOCAL mode or REMOTE mode.
Operation method (RUN / STOP commands, FWD / REV run
commands) can be selected by the following method.

● LOCAL mode

When Lo (local mode) is selected for digital operator LO/RE ON mode, or
when LOCAL / REMOTE switching function is set and the input terminals are
turned ON, run operation is enabled by the STP or RUN of the digital operator,
and FWD/REV run is enabled by F/R ON mode (using ∧ ∨ key).
LO/RE is not effective when local / remote switching function is selected for
multi-function input selection.

● REMOTE mode

• Select remote mode.
  There are following two methods to select remote mode.
1. Select rE (remote mode) for LO/RE selection.
2. When the local / remote switching function is selected for multifunction
   input selection, turn OFF the input terminal to select remote mode.
• Select operation method by setting the constant H02.
  H02=0: Enables the digital operator (same with local mode)
      =1: Enables the multi-function input terminal (see fig. below)
      =2: Enables communications (When option card is installed)
• Example for using the multi-function input terminal as operation
  reference (two-wire sequence)
For example of three-wire sequence.

● **Operating (RUN / STOP commands) by communications**
  (When option card is installed)
  Setting constant H02 to 2 in REMOTE mode can give RUN/STOP
  commands by communication (MEMOBUS communications).
  For details.

● Selecting Frequency Reference

Frequency reference can be selected by the following methods.

● Setting by operator

Select REMOTE or LOCAL mode in advance. For the method for selecting the mode.

LOCAL mode

Select command method by constant H07.

H07=0 : Enables the setting by potentiometer on digital operator (initial setting). Factory setting of the model with digital operator (without potentiometer) is H07=1.

=1 : Enables the digital setting by digital operator, setting value is stored in constant H21 (frequency reference 1).

• Digital setting by digital operator

Input frequency while FREF is lit (press ENTER after setting the numeric value).

Frequency reference setting is effective when 1 is set to constant H08 instead of pressing ENTER key.

H08=0 : Enables frequency reference setting by ENTER key (initial setting).

=1 : Disable frequency reference setting by ENTER key.

REMOTE mode

Select command method by constant H03.

H03=0 : Enables frequency reference setting by potentiometer on digital operator (initial setting). Initial setting of the model with digital operator (without potentiometer) is H03=1.

=1 : Frequency reference 1 effective. (constant H21)

=2 : Voltage reference (0 to 10V) (See the figure below)

=3 : Current reference (4 to 20mA)

=4 : Current reference (0 to 20mA)

=6 : communication

Example of frequency reference by voltage signal

MASTER SPEED FREQUENCY REFERENECE 2KΩ (0 TO +10V)

FS
FREQUENCY SETTING POWER
+12V, 20mA
FR
FC(0V)

H03 = 2 (Factory setting : 0)

● Setting Operation Conditions

Reverse run prohibit (H05)

"Reverse run disabled" setting does not accept a reverse run command from the control circuit terminal or digital operator. This setting is used for applications where a reverse run command can cause problems.

Setting	Description
0	Reverse run enabled.
1	Reverse run disabled.

Multi-step speed selection

By combining frequency reference and input terminal function selections, up to 16 steps of speed can be set.

8-step speed change
H02=1 (operation mode selection)   H36=1
H03=1 (Frequency reference selection) H37=6 (Multi-function contact input terminal 3)
H21=25.0Hz (Frequency reference 1)   H38=7 (Multi-function contact input terminal 4)
H22=30.0Hz (Frequency reference 2)   H39=8 (Multi-function contact input terminal 5)
H23=35.0Hz (Frequency reference 3)
H24=40.0Hz (Frequency reference 4)
H25=45.0Hz (Frequency reference 5)
H26=50.0Hz (Frequency reference 6)
H27=55.0Hz (Frequency reference 7)
H28=60.0Hz (Frequency reference 8)

NOTE When all multi-function reference inputs are OFF, frequency reference selected by constant H03 (frequency reference selection) becomes effective.

FWD RUN/STOP — S1
REV RUN/STOP — S2
MULTI-STEP SPEED REF 1 — S3
MULTI-STEP SPEED REF 2 — S4
MULTI-STEP SPEED REF 3 — S5
SC

H36=2 (Input terminal S2) Initial Setting
H37=6 (Input terminal S3) Change the setting to 6.
H38=7 (Input terminal S4) Change the setting to 7.
H39=8 (Input terminal S5) Change the setting to 8.

FREQUENCY REFERENCE

(H21) 25.0 Hz
(H22) 30.0 Hz
(H23) 35.0 Hz
(H24) 40.0 Hz
(H25) 45.0 Hz
(H26) 50.0 Hz
(H27) 55.0 Hz
(H28) 60.0 Hz

TIME

FWD (REV) RUN/STOP — ON

MULTI-STEP SPEED REF. 1 (TERMINAL S3) — ON ON ON ON

MULTI-STEP SPEED REF. 2 (TERMINAL S4) — ON ON

MULTI-STEP SPEED REF. 3 (TERMINAL S5) — ON

Operating at low speed

By inputting a jog command and then a forward (reverse) run command, operation is enabled at the jog frequency set in H29. When multi-step speed references 1, 2, 3 or 4 are input simultaneously with the jog command, the jog command has priority.

Name	Constant No.	Setting
Jog frequency	H29	Factory setting : 6.0Hz
Jog command	H36 to H39	Set to "10" for any constant.

Adjusting speed setting signal

To provide frequency reference by analog input of control circuit terminal FR or FC, the relationship between analog input and frequency reference can be set.

FREQUENCY REFERNCE

MAX. OUTPUT FREQUENCY $\times \dfrac{GAIN}{100}$

MAX. OUTPUT FREQUENCY $\times \dfrac{BIAS}{100}$

( ) indicates the value when current reference input is selected.

0V
(4mA)
(0mA)

10V
(20mA)
(20mA)

- **Frequency reference gain (H41)**
  The analog input voltage value for the max. output frequency (H09) can be set in units of 1% (max. output frequency H09=100%)
  * Factory setting : 100%
- **Frequency reference bias (H42)**
  The frequency reference provided when analog input is 0V (4mA or 0mA) can be set in units of 1%. (max. output frequency H09=100%)
  * Factory setting : 0%

Typical Setting
- To operate the inverter with frequency reference of 50% to 100% at 0 to 5V input

MAX. FREQUENCY (100%)

0%

0V   5V   10V

Gain H41 = 200
Bias H42 = 0

• To operate the inverter with frequency reference of 50% to 100% at 0 to 10V input

MAX. FREQUENCY (100%)

0%

0V   5V   10V

Gain H41 = 200
Bias H42 = 0

Adjusting frequency upper and lower limits

- **Frequency reference upper limit (H30)**
  Sets the upper limit of the frequency reference in units of 1%.
  (H09: Max. output frequency = 100%)
  Factory setting: 100%
- **Frequency reference lower limit (H31)**
  Sets the lower limit of the frequency reference in units of 1%.
  (H09: Max. output frequency = 100%)
  When operating at frequency reference 0, operation is continued at the frequency reference lower limit.
  However, when frequency reference lower limit is set to less than the min. output frequency (H14), operation is not performed.
  Factory setting: 0%

Using two accel/decel times

* When "deceleration to a stop" is selected (H04 = 0).
By setting input terminal function selection (either of H36 to H39) to "11 (accel/decel time select)", accel/decel time is selected by turning ON/OFF the accel/decel time select (terminal S2 to S5).

At OFF : H16 (accel time 1)
          H17 (decel time 1)
At ON : H18 (accel time 2)
         H19 (decel time 2)

• Accel time
Set the time needed for output frequency to reach 100% from 0%.
• Decel time
Set the time needed for output frequency to reach 0% from 100%.
(Maximum output frequency H09=100%)

Automatic restart after momentary power loss (H47)

When momentary power loss occurs, operation restarts automatically.

Setting	Description
0	Continuous operation after momentary power loss not provided.
1*	Continuous operation after power recovery within momentary power loss ridethru time
2*†	Continuous operation after power recovery (Fault output not provided)

* Hold the operation command to continue the operation after recovery from a momentary power loss.
† When 2 is selected, operation restarts if power supply voltage reaches its normal level while control power supply is held. No fault signal is output.

Soft-start characteristics (H20)

To prevent shock at machine start/stop, accel/decel can be performed in Scurve pattern.

Setting	S-curve characteristic time
0	S-curve characteristic not provided
1	0.2 second
2	0.5 second
3	1.0 second

Note : S-curve characteristic time is the time from accel/decel rate 0 to a regular accel/decel rate determined by the set accel/decel time.

S-CURVE CHARACTERISTIC TIME (Tsc)

The following time chart shows FWD/REV run switching at deceleration to a stop.

Torque detection

If an excessive load is applied to the machine, output current increase can be detected to output alarm signals to multi-function output terminals MA and MB.
To output an overtorque detection signal, set output terminal function selection H40 to "overtorque detection" [Setting:6 (NO contact) or 7 (NC contact)].

* Overtorque detection release width (hysterisis) is set at approx. 5% of inverter rated current.

• Overtorque detection function selection (H59)

Setting	Description
0	Overtorque detection not provided
1	Detected during constant-speed running, and operation continues after detection.
2	Detected during constant-speed running, and operation stops during detection.
3	Detected during running, and operation continues after detection.
4	Detected during running, and operation stops during detection.

(1) To detect overtorque at accel/decel, set to 3 or 4.
(2) To continue the operation after overtorque detection, set to 1 or 3.
   During detection, the operator displays "OL3" alarm (blinking).
(3) To halt the inverter by a fault at overtorque detection, set to 2 or 4. At
   detection, the operator displays "OL3" fault (ON).

• Overtorque detection level (H60)
  Sets the overtorque detection current level in units of 1%. (Inverter rated
  current = 100%)
  Factory setting: 160%

• Overtorque detection time (H61)
  If the time when motor current exceeds the overtorque detection level (H60)is longer
  than overtorque detection time (H61), the overtorque detection function operates.
  Factory setting : 0.1sec.

Frequency detection (H58)

Effective when either of output terminal function selection H40 is set to "frequency detection" (setting: 4 or 5). "Frequency detection" turns ON when output frequency is higher or lower than the frequency detection level (H58).

• Frequency detection 1

  (Output frequency $\geqq$ Frequency detection level H58)

  (Set H40 to "4.")

```
ONFREQUENCY DETECTION                    RELEASE
LEVEL [Hz] (H58)                         WIDTH
                                         - 2Hz

    OUTPUT
    FREQUENCY

    FREQUENCY
    DETECTION                    ON
    SIGNAL
```

• Frequency detection 2

  (Output frequency _ Frequency detection level H58)

  (Set H40 to "5.")

```
RELEASE                  FREQUENCY
WIDTH                    DETECTION
+2Hz                     LEVEL (Hz)
                         (H58)

    OUTPUT
    FREQUENCY

FREQUENCY
DETECTION    ON                    ON
SIGNAL
```

Jump frequencies (H49 to H51)

This function allows the prohibition or "jumping" of critical frequencies so that the motor can operate without resonance caused by machine systems. This function is also used for dead band control. Setting the value to 0.00Hz disables this function.
Set prohibited frequency 1 or 2 as follows :

OUTPUT FREQUENCY

H49 $\geqq$ H50
If this condition is not satisfied the inverter displays $E\ulcorner\ulcorner$ for one second and restores the data to original settings.

Operation is prohibited within jump frequency range.
However, motor operates without jumping during accel/decel.

Continuing operation by automatic fault reset (H48)

Sets the inverter to restart and reset fault detection after a fault occurs.
The number of self-diagnosis and retry attempts can be set at H48 up to 10.
The inverter automatically restarts after the following faults occur :

OC (overcurrent)
GF (ground fault)
OV (overvoltage)
The number of retry attempts are cleared to 0 in the following cases :
(1) If no other fault occurs within 10 minutes after retry
(2) When the fault reset signal is ON after the fault is detected
(3) Power supply is turned OFF

Operating coasting motor without trip

To operate coasting motor without trip, use the speed search command or DC injection braking at start.

• Speed search command

Restarts a coasting motor without stopping it. This function enables smooth switching between motor commercial power supply operation and inverter operation.

Set input terminal function selection (H36 to H39) to "14" (search command from maximum output frequency) or "15" (search command from set frequency).

Build a sequence so that FWD (REV) run command is input at the same time as the search command or after the search command. If the run command is input before the search command, the search command becomes disabled.

• Time chart at search command input

• DC injection braking at start (H52, H54)

Restarts a coasting motor after stopping it. Set the DC injection braking time at start in H54 in units of 0.1 second. Set DC injection braking current in H52 in units of 1% (inverter rated current =100%). When the setting of H54 is "0", DC injection braking is not performed and acceleration starts from the minimum output frequency.

When H52 is set to 0, acceleration starts from the minimum output frequency after the baseblocking for H54 setting time.

Holding accel/decel temporarily

To hold acceleration or deceleration, input accel/decel hold command. The output frequency is maintained when the accel/decel hold command is input during acceleration or deceleration.
When the stop command is input during accel/decel prohibition command input, accel/decel hold is released and operation ramps to stop.
Set multi-function input terminal selection (H36 to H39) to 16 (accel/decel hold command).

Time chart at accel/decel hold command input

Note : When the FWD (REV) run command is input along with the accel/decel hold command, the motor does not operate. However, when frequency reference lower limit (H31) is set greater than or equal to min. output frequency (H14), the motor operates at frequency reference lower limit (H31).

Using frequency meter or ammeter (H44)

Selects to output either output frequency or output current to analog output terminals AM-AC for monitoring.

Setting	Description
0	Output frequency
1	Output current

In initial setting, analog voltage of approx. 10V is output when output frequency (output current) is 100%.

Calibrating frequency meter or ammeter (H45)

Used to adjust analog output gain.

Set the analog output voltage at 100% of output frequency (output current). Frequency meter displays 0 to 60Hz at 0 to 3V.

$$10V \times \boxed{\begin{array}{c} \text{H45 Setting} \\ 0.30 \cdot \end{array}} = 3V$$

Output frequency becomes 100% at this value.

Reducing motor noise or leakage current

Set inverter output transistor switching frequency (carrier frequency).

Setting	Carrier Frequency	Metallic Noise from Motor	Noise and Current Leakage
7	12fout (Hz)	Higher	Smaller
8	24fout (Hz)	↑	↓
9	36fout (Hz)		
1	2.5 (kHz)		
2	5.0 (kHz)		
3	7.5 (kHz)		
4	10.0 (kHz)	Not audible	Larger

Setting values 7, 8, or 9 multiplies output frequency according to output frequency value.

Factory setting varies according to inverter capacity (kVA).

Voltage Class (V)	Capacity (kW)	Initial Setting		Maximum Continuous Output Current (A)	Reduced Current (A)
		Setting	Carrier Frequency		
220 Single-phase 3-phase	0.55	4	10kHz	3	_____
	1.1	4	10kHz	5	
	1.5	3	7.5kHz	8	7
	2.2	3	7.5kHz	11	10
	4	3	7.5kHz	17.5	16.5
440 3-phase	0.55	3	7.5kHz	1.8	1.6
	1.1	3	7.5kHz	3.4	3
	1.5	3	7.5kHz	4.8	4
	2.2	3	7.5kHz	5.5	4.8
	3	3	7.5kHz	7.2	6.3
	4	3	7.5kHz	9.2	8.1

NOTE (1) Reduce continuous output current when changing carrier frequency to 4 (10 kHz) for the 220V class (1.5kW or more) and 440V class inverters. Refer to the table above for the reduced current.
[Operation Condition]
• Input power supply voltage : 3-phase 200 to 230V (220V class)
  Single-phase 200 to 240V (220V class)
  3-phase 380 to 460V (440V class)
• Ambient temperature : -10 to +50°C (14 to 122°F)

2) If the wiring distance is long, reduce the inverter carrier frequency as described below.

Wiring Distance between Inverter and Motor	Up to 50m	Up to 100m	More than 100m
Carrier frequency (H46 setting)	10kHz or less (H46=1,2,3,4, 7,8,9)	5kHz or less (H46=1,2, 7,8,9)	2.5kHz or less (H46=1, 7,8,9,)

(3) Carrier frequency is automatically reduced to 2.5kHz when Reducing carrier frequency selection at low speed (H75) is set to 1 and the following conditions are satisfied:
  Output frequency $\leqq$ 5Hz
  Output current $\geqq$ 110%
Factory setting : 0 (Disabled)

Operator stop key selection (H06)

Selects processing when STOP key is pressed during operation from multifunction input terminal.

Setting	Description
0	STOP key effective when running either from multi-function input terminals or communications. When STOP key is pressed, the inverter stops according to the setting of constant H04. At this time, the digital operator displays "$S\Gamma P$" alarm (blinking). This stop command is held in the inverter until both forward and reverse run commands are open, or unitl run command from communications becomes zero.
1	STOP key ineffective when running either from multi-function input terminals or communications.

Selecting Stopping Method

Selecting stopping method (H04)

Selects the stopping method suitable for application.

Setting	Description
0	Deceleration to stop
1	Coast to stop

● Deceleration to stop
Example when accel/decel time 1 is selected

* When frequency reference is changed during running.

Upon termination of the FWD (REV) run command, the motor decelerates at the decel rate determined by the time set to deceleration time 1 (H17) and DC injection braking is applied immediately before stop. DC injection braking is also applied when the motor decelerates by setting frequency reference lower than min. output frequency (H14) with FWD (or REV) run command ON. If the decel time is short or the load inertia is large, overvoltage (OV) fault may occur at deceleration. In this case, increase the decel time.

• Coast to stop
  Example when accel/decel time 1 is selected

OUTPUT
FREQUENCY   ACCEL   DECEL
            TIME 1   TIME 1
            (H16)   (H17)   COAST TO
                                        STOP

FWD (REV)   TIME
RUN
COMMAND   ON

       * When frequency reference is changed during running.

Upon removal of the FWD (REV) run command, the motor starts coasting.

Applying DC injection braking

• DC injection braking current (H52)
  Sets DC injection braking current in units of 1%. (Inverter rated current=100%)
• DC injection braking time at stop (H53)
  Sets the DC injection braking time at stopping in units of 0.1 second.
  When the setting of H53 is 0, DC injection braking is not performed but
  inverter output is shut OFF at the timing of DC injection braking start.

H14 MIN.
OUTPUT
FREQUENCY

H53
DC INJECTION BRAKING
TIME AT STOP

When coasting to a stop is specified in stopping method selection (H04), DC
injection braking at stop does not operate.

● Building Interface Circuits with External Devices

Using input signals

Multi-function input terminal S2 to S5 functions can be changed when necessary by setting constants H36 to H39 respectively. The same value cannot be set to different constant settings.

Setting	Name	Description	Ref.
0	FWD/REV run command (3-wire sequence selection)	Setting enabled only for H37	53
2	Reverse run (2-wire sequence selection)		31
3	External fault (NO contact input)	Inverter stops by external fault signal input.Digital operator display is "EF□*.	—
4	External fault (NC contact input)		—
5	Fault reset	Resets the fault. Fault reset not effective with the run signal ON.	33
6	Multi-step speed reference 1		33
7	Multi-step speed reference 2		33
8	Multi-step speed reference 3		33
10	JOG command		34
11	Accel/decel time select		37
12	External baseblock (NO contact input)	Motor coast to a stop by this signal input.	—
13	External baseblock (NC contact input)	Digital operator display is "bb."	—
14	Search command from maximum frequency	Speed search reference signal	44
15	Search command from set frequency		44
16	Accel/decel hold command		45
17	LOCAL/REMOTE selection		30
18	Communication/ control circuit terminal selection		55
19	Emergency stop fault (NO contact input)	Inverter stops by emergency stop signal input according to stopping method selection (H04). When frequency coasting to a stop (H04 is set to 1) method is selected, inverter coasts to a stop according to decel time setting 2 (H19). Digital operator display is 5⌐P . (lit at fault, blinking at alarm)	—
20	Emergency stop alarm (NO contact input)		—
21	Emergency stop fault (NC contact input)		—
22	Emergency stop alarm (NC contact input)		—
34	UP/DOWN command	Setting enabled only for H39 (terminal S5)	53
35	Self-test	Setting enabled only for H39 (terminal S5)	—

* Numbers 2 to 5 is displayed in□corresponding to the terminal numbers S2 to S5 respectively.

Initial setting

No.	Terminal	Initial Setting	Function
H36	S2	2	Reverse run (2-wire sequence selection)
H37	S3	5	Fault reset
H38	S4	3	External fault (NO contact input)
H39	S5	6	Multi-step speed reference 1

Terminal function at 3-wire sequence selection

When 0 is set at the terminal S3 (H37), terminal S1 becomes run command, terminal S2 becomes stop command, and terminal S3 becomes FWD/REV run command

RUN SW
(NO CONTACT) TG100

STOP SW
(NC CONTACT)

Terminal	Function
S1	Run command (Run when "closed")
S2	Stop command (Stop when "open")
S3	FWD/REV run selection FWD run when "open" REV run when "closed"
SC	

• LOCAL/REMOTE select (setting: 17)

Select operation reference either by the digital operator or by the settings of run command selection (H02) and frequency reference selection (H03).

LOCAL/REMOTE select is available only during stop.

Open : Run according to the setting of run command selection (H02) or frequency reference selection (H03).

Closed : Run by frequency reference and run command from the digital operator.

(Example) Set H02 = 1, H03 = 2, H07 = 0.

Open : Run by frequency reference from multi-function input terminal FR and run command from multi-function input terminals S1 to S5.

Closed : Run by potentiometer frequency reference and run command from the digital operator.

• UP/DOWN command (setting: H39 = 034)

With the FWD (REV) run command entered, accel/decel is enabled by inputting the UP or DOWN signals to multi-function input terminals S4 and S5 without changing the frequency reference, so that operation can be performed at the desired speed. When UP/DOWN commands are specified by H39, any function set to H38 becomes disabled; terminal S4 becomes an input terminal for the UP command and terminal S5 for the DOWN command.

Multi-function Input Terminal S4 (UP command)	Closed	Open	Open	Closed
Multi-function Input Terminal S5 (DOWN command)	Open	Closed	Open	Closed
Operation Status	Accel	Decel	Hold	Hold

U = UP (accelerating) status
D = DOWN (decelerating) status
H = HOLD (constant speed) status
U1 = UP status, clamping at upper limit speed
D1 = DOWN status, clamping at lower limit speed

Notes :

1. When UP/DOWN command is selected, the upper limit speed is set regardless of frequency reference.
   Upper limit speed = Max. output frequency (H09)
   $\times$Frequency reference upper limit (H30)/100%

2. Lower limit value is either min. output frequency (H14) or max. output frequency (H09) $\times$ frequency reference lower limit (H31)/100% (whichever is larger.).

3. When the FWD (REV) run command is input, operation starts at the lower limit speed without an UP/DOWN command.

4. If the jog command is input while running by the UP/DOWN command, the jog command has priority.

5. Multi-step speed reference 1 to 3 is not effective when UP/DOWN command is selected. Multi-step speed reference is effective during running in hold status.

6. When "1" is set for HOLD output frequency memory selection (H62), output frequency can be recorded during HOLD.

Setting	Description
0	Output frequency is not recorded during HOLD.
1	When HOLD status is continued for 5 seconds or longer, the output frequency during HOLD is recorded and the inverter restarts at the recorded frequency.

• Communication/multi-function input terminal selection input (setting: 18) (This function is effective when option card is installed)
Operation can be changed from communication command, or from multifunction input terminal or digital operator command. Run command from communication and frequency reference are effective
when multi-function input terminal for this setting is "Closed."
Run command in LOCAL/REMOTE mode and frequency reference are effective when "Open."

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Using output signals (H40)

</div>

Multi-function output terminal MA, MB, P1 and P2 functions can be changed when necessary by setting constant H057.
• Terminal MA and MB functions: Set to H40

Setting	Name	Description	Ref.page
0	Fault	Closed when inverter fault occurs.	-
1	In operation	Closed when either FWD/REV command is input or voltage is output from the inverter.	-
2	Agreed frequency	Closed when setting frequency agrees with inverter output frequency.	56
3	Zero speed	Closed when inverter output frequency is less than min. output frequency.	-
4	Frequency detection	Output frequency $\geqq$ Frequency detection level (H58)	42
5	Frequency detection	Output frequency $\leqq$ Frequency detection level (H58)	42
6	Overtorque detection (NO contact output)	—	41
7	Overtorque detection (NC contact output)	—	41
10	Minor fault	Closed when the alarm is indicated.	—
11	Base blocked	Closed when the inverter output is shut off.	—
12	Operation mode	Closed when "LOCAL" is selected by LOCAL/REMOTE selection.	—
13	Inverter operation ready	Closed when inverter fault is not detected, and operation is ready.	—
14	Fault restart	Closed during fault retry	—
15	In UV	Closed when undervoltage is detected.	—
16	In reverse run	Closed during reverse run.	—
17	In speed search	Closed when inverter conducts speed search.	—
18	Data output from communication	Operates multi-function output terminal independently from inverter operation (by MEMOBUS communication)	64

Initial setting of multi-function output terminal

No.	Terminals	Initial Setting
H40	MA, MB	1 (in operation)

• Frequency agreed signal (setting=2)

DETECTION WIDTH ±2Hz

RELEASE WIDTH ±4Hz

OUTPUT FREQUNENCY

ON

FREQUENCY AGREED SIGNAL

● Setting Frequency by Current Reference Input

When setting frequency by inputting
current reference (4-20mA or 0-20mA)
from the control circuit terminal FR,
switch the Jump switch SW8 on the control
circuit board to "I" side.
SW8 is accessed by removing the option
cover.

SW8

V   I

NOTE

Never input voltage reference to control circuit terminal FR when Jump switch SW8 is
switched to "I" side.

Current reference selection

After changing Jump switch (V/I switch of SW8), PRESS [PRGM] on the digital operator, then set the following constants.

$$4\text{-}20\text{mA}....\text{H}03 = 3$$
$$0\text{-}20\text{mA}....\text{H}03 = 4$$

• Setting : H02 = 0, H03 = 3 or 4

Press the digital operator keys to run or stop the inverter. Switch run and stop direction by setting F/R LED.
Set frequency by the analog current signal [0-100% (max. frequency) / 4-20mA or 0-20mA] connected to the control circuit terminal.

• Setting : H02 = 1, H03 = 3 or 4

Switch run/stop and FWD/REV run with switching device connected to the control circuit terminal.
Multi-function input terminal S2 is set to Reverse run / stop (H36 = 2).

Set frequency by the analog current signal [0-100% (max. frequency) / 4-20mA or 0-20mA] connected to the control circuit terminal.

Frequency reference gain (H41)/bias (H42) can be set even when current reference input is selected. For details, refer to "Adjusting frequency setting signal" on page 45.

● Preventing Motor from Stalling (Current Limit)

Automatically adjusts the output frequency and output current according to the load to continue operation without stalling the motor.

• Stall prevention (current limit) level during acceleration (H56)

　Sets the stall prevention (current limit) level during acceleration in units of 1% (Inverter rated current = 100%).

Factory setting: 170%

A setting of 200% disables the stall prevention (current limit) during acceleration. During acceleration, if the output current exceeds the value set for H56, acceleration stops and frequency is maintained. When the output current goes down to the value set for H56, acceleration starts.

MOTOR CURRENT

H56

OUTPUT FREQUENCY

TIME

TIME

*Stops the acceleration to prevent the motor from stalling.

†Release width (hysteresis) of stall prevention during accel is approx. 5% of inverter rated current.

In the constant output area [output frequency > max. voltage output frequency (H11)], following equation automatically decreases the stall prevention (current limit) level during acceleration.

$$\boxed{\text{Stall prevention (current limit) level during accel in constant output area}} = \boxed{\begin{array}{c}\text{Stall prevention (current limit) level during accel (H56)}\end{array}} \times \dfrac{\boxed{\text{Max. voltage output frequency (H11)}}}{\boxed{\text{Output frequency}}}$$

Stall prevention level during acceleration

Stall prevention during accel (H56)

Stall prevention limit during accel (40% of H56)

Max. voltage output frequency H11

Output frequency

• Stall prevention (current limit) level during running (H57)

Sets the stall prevention (current limit) level during running in units of 1% (Inverter rated current = 100%).

* Factory setting: 160%

A setting of 200% disables the stall prevention (current limit) during running.

If stall prevention action current at agreed speed exceeds the value set for H57 for longer than 100msec, deceleration starts.

When the output current exceeds the value set for H57, deceleration continues. When the output current goes down to the value set for H57, acceleration starts, up to the set frequency.

Stall prevention accel/decel settings during operation are: currently selected acceleration time 1 (H16), deceleration time 1 (H17) and acceleration time 2 (H18) and deceleration time 2 (H19).

MOTOR CURRENT

* reduces frequency prevent speed loss
† at acceleration start, output current hysterisis is approx., 5% of inverter rated current.

• Stall prevention (current limit) function during deceleration (H55)

To prevent overvoltage during deceleration, the inverter automatically lengthen the deceleration time according to the value of main circuit DC voltage.

Setting	Stall prevention (current limit) during deceleration
0	Provided
1	Not Provided

Controls the deceleration time to prevent overvoltage fault.

■Decreasing Motor Speed Fluctuation

Slip compensation

As the load becomes larger, motor speed is reduced and motor slip value is increased. The slip compensating function controls the motor speed at a constant value even if the load varies.
When inverter output current is equal to the motor rated current (H32), the compensation frequency is added to the output frequency.
Compensation frequency = Motor rated slip (H64)

$$\times \quad \frac{\text{Output current} - \text{Motor no-load current (H65)}}{\text{Motor rated current (H32)} - \text{Motor no-load current (H65)}}$$

$$\times \quad \text{Slip compensation gain (H66)}$$

Constants

Constants No.	Name	Unit	Setting range	Initial Setting
H32	Motor rated current	0.1A	0 to 120% of inverter rated current	*
H64	Motor rated slip	0.1Hz	0.0 to 20Hz	*
H65	Motor no-load current	1%	0 to 99% (100%=Motor rated current H32)	*
H66	Slip compensation gain	0.1	0.0 to 2.5	0
H67	Slip compensation time constant	0.1s	0.0 to 25.5s When 0.0s is set, delay time becomes 2.0s	2.0s

＊ Differs depending on inverter capacity.

Notes : 1. Slip compensation is not performed in the following condition:
Output frequency < min. output frequency (H14)
2. Slip compensation is not performed during regeneration.
3. Slip compensation is not performed when motor rated current (H32) is set to 0.0A.

■ Motor Protection

Motor overload detection

The TG100 protects against motor overload with a built-in electronic thermal overload relay.
• Motor rated current (electoronic thermal reference current, H32)
Set to the rated current value shown on the motor nameplate.
Note: Setting to 0.0A disables the motor overload protective function.

• Motor overload protection selection (H33, H34)

H33 Setting	Electronic Thermal Characteristics
0	Applied to general-purpose motor
1	Applied to inverter motor
2	Electronic thermal overload protection not provided

Constants No.	Name	Unit	Setting Range	Initial Setting
H34	Protection constant selection	1min	1 to 60min	8min

The electronic thermal overload function monitors motor temperature, based on inverter output current and time, to protect the motor from overheating. When electronic thermal overload relay is enabled, an "OL1" error occurs, shutting OFF the inverter output and preventing excessive overheating in the motor. When operating with one inverter connected to one motor, an external thermal relay is not needed. When operating several motors with one inverter, install a thermal relay on each motor.

• General-purpose motor and inverter motor

Induction motors are classified as general-purpose motors or inverter motors, based on their cooling capabilities. Therefore, the motor overload function operates differently between these two motor types.

Example of 200V class motor

	Cooling Effect	Torque Characteristics	Electronic Thermal overload
General-purpose Motor	Effective when operated at 50/60Hz from commercial power supply.	180 155 140 TORQUE (%) 100 80 55 38 0 — 60 SEC SHORT-TERM — CONTINUOUS RATING — 3 20 60 120 OPERATION FREQUENCY (Hz) Base Frequency 60Hz (V/f for 60Hz, 220V Input Voltage) For low-speed operation, torque must be limited in order to stop motor temperature rise	"OL1" error (motor overload protection) occurs when continuously operated at 50/60Hz or less at 100% load.
Inverter Motor	Effective even when operated at low speed (approx. 6Hz)	180 150 TORQUE (%) 100 55 38 0 — 60 SEC SHORT-TERM — CONTINUOUS RATING — 6 60 120 OPERATION FREQUENCY (Hz) Base Frequency 60Hz (V/f for 60Hz, 220V Input Voltage) Use an inverter motor for continuous operation at low speed.	Electronic thermal overload protection not activated even when continuously operated at 50/60Hz or less at 100% load.

■ Selecting Cooling Fan Operation

In order to increase lifetime, the cooling fan can be set to operate only when inverter is running.

H35 = 0 (initial setting) : Operates only when inverter is running (Continues operation for 1 minute after inverter is stopped.)

= 1 : Operates with power ON

■ Using MEMOBUS (MODBUS) Communications

Serial communication is available with TG100 using programmable controller (MEMOCON series) and MEMOBUS. In order to perform serial communications, RS-485/422 interface card (optional) must be installed. Refer to MEMOBUS Instruction Manual for details of communications.

□ MEMOBUS (MODBUS) communications

MEMOBUS system is composed of a single master (PLC) and slaves (1 to 31 TG100 units).

Communication between master and slave (serial communication) is controlled according to the master program with the master initiating communication and the slave responding.

The master sends a signal to one slave at a time. Each slave has a preregistered address No., and the master specifies the number and conduct signal communications. The slave receives the communication to carry out designated functions and reply to the master.

MEMOCON Series

TG 100   TG 100   TG 100

Example of RS-485 communication

□ Communications specifications

Interface	RS-422, RS-485
Synchronization	Asynchronous (Start-stop synchronization)
Communication parameters	Baud rate : Selected from 2400/4800/9600/19200 bps Data length : 8 bits fixed Parity : Selected from even/odd/none Stop bits : 1 bit fixed
Communication protocol	MEMOBUS (MODBUS) (RTU mode only)
Max. number of inverters that can be connected	31 units (When using RS-485)

6. FAULT DIAGNOSIS

■ Protective and Diagnostic Function

This section describes the alarm and fault displays, explanations for fault conditions and corrective actions to be taken if the TG100 malfunctions.

< Corrective actions for models without digital operator >

1. Input fault reset or cycle the power supply OFF and ON.

2. When a fault cannot be corrected:

   Turn the power supply OFF and check the wiring and control logic.

<Corrective Actions of Models with Digital Operator>

☀ : ON   ● : BLINKING   ● : OFF

Alarm Display and Contents

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN ALARM (Green) (Red)			
Uu Blinking		Warning Fault contacts do not change state.	UV (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the inverter output is OFF. 220V: Main circuit DC voltage drops below approx. 220V. (160V for singlephase) 440V: Main circuit DC voltage drops below approx. 440V.	Check the following : · Power supply voltage · Main circuit power supply wiring is connected. · Terminal screws are securely tightened.
ou Blinking	● ●		OV (Main circuit overvoltage) Main circuit DC voltage exceeds the overvoltage detection level while the inverter output is OFF. Detection level : 220V class: approx. 410V or more 440V class: approx. 820V or more	Check the power supply voltage.
oH Blinking			OH (Cooling fin overheat) Intake air temperature rises while the inverter output is OFF.	Check the intake air temperature.
cAL Blinking			CAL (MEMOBUS communications waiting) Correct data has not been received from the PLC when the constants H02 (run command selection) is 2 or H03 (frequency reference selection) is 6, and power is turned ON.	Check communication devices, and transmission signals.

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN ALARM (Green) (Red)			
OP3 Blinking	● (blinking) ● (blinking)	Warning Fault contacts do not change state.	OP□ (Constant setting error when the constant setting is performed through the MEMOBUS communications) OP1: Two or more values are set for multifunction input selection. (constants H36 to H39) OP2: Relationship among V / f constants is not correct. (constants H09,H11,H12, H14) OP3: Setting value of motor rated current exceeds 120% of inverter rated current. (constant H32) OP4: Upper / lower limit of frequency reference is reversed.(constants H30, H31) OP5: Setting values of jump frequencies 1 and 2 are not appropriate.(constants H49, H50) OP9: Carrier frequency setting is incorrect. (constant H46)	Check the setting values.
OL3 Blinking	○ (on) ● (blinking)		OL 3 (Overtorque detection) Motor current exceeded the preset value in constant H60.	Reduce the load, and expand the accel / decel time.
SEr Blinking			SER (Sequence error) Inverter receives LOCAL / REMOTE select command or communication / control circuit terminal changing signals from the multifunction terminal while the inverter is outputting.	Check the external circuit (sequence).

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN ALARM (Green) (Red)			
bb Blinking		Warning Fault contacts do not change state.	BB (External baseblock) Baseblock command at multi-function terminal is active, the inverter output is shut OFF (motor coasting). Temporary condition is cleared when input command is removed.	Check the external circuit (sequence).
EF Blinking			EF (Simultaneous FWD/ REV run commands) When FWD and REV run commands are simultaneously input for over 500ms, the inverter stops according to constant H04.	Check the external circuit (sequence).
STP Blinking	☼ or ●	● ●		STP (Operator function stop) STOP RESET is pressed during running by the control circuit terminals FWD / REV command, or by the run command from communications. The inverter stops according to constant H04. STP(Emergency stop) Inverter receives emergency stop alarm signal. Inverter stops according to constant H04.	Open FWD/REV command of control circuit terminals .

Check the external circuit (sequence |
| FAn Blinking | | | FAN(Cooling fan fault) Cooling fan is locked | Check the following: • Cooling fan • Cooling fan wiring is not connected. |
| CE Blinking | | | CE (MEMOBUS comunications fault) | Check the comunication devices or signals. |

Fault Display and Contents

Fault Display			Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green)	ALARM (Red)			
oC	●	☼	Protective Operation Output is shut OFF and motor coasts to a stop.	OC (Overcurrent) Inverter output current momentarily exceeds approx. 200% of rated current. (Control power supply fault) Voltage fault of control power supply is detected.	• Short circuit or grounding at inverter output side • Excessive load GD^2 • Extremely rapid accel/decel time (constants H16 to H19) • Special motor used • Starting motor during coasting • Motor of a capacity greater than the inverter rating has been started. • Magnetic contactor open/closed at the inverter output side ↓ • Cycle power. If the fault remains, replace the inverter.
GF				GF (Ground fault) Ground fault current at the inverter output exceeded inverter rated current.	• Check that motor insulation has not deteriorated. • Check the connection between inverter and motor.
oU				OV (Main circuit overvoltage) Main circuit DC voltage exceeds the overvoltage detection level because of excessive regenerative energy from the motor. 220V: Stops at main circuit DC voltage below approx. 410V. 440V: Stops at main circuit DC voltage approx. 820V or more	• Insufficient decel time (constants H17 and H19) • Lowering of minus load (elevator, etc.) ↓ • Increase decel time.
Uu1				UV1 (Main circuit low voltage) Main circuit DC voltage drops below the lowvoltage detection level while the inverter output is ON. 220V: Stops at main circuit DC voltage below approx. 200V.(160V for single-phase) 440V: Stops at main circuit DC voltage approx. 400V or more.	• Reduction of input power supply voltage • Open phase of input supply • Occurrence of momentary power loss ↓ Check the following : • Power supply voltage • Main circuit power supply wiring is connected. • Terminal screws are securely tightened.

Fault Display		Inverter Statu	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oH		Protective Operation	OH (Cooling fin overheat) Temperature rise because of inverter overload operation or intake air temperature rise.	• Excessive load • Improper V/f pattern setting • Insufficient accel time if the fault occurs during acceleration • Intake air temperature exceeding 122˚F(50˚C) ↓ • Cooling fan stops Check the following : • Load size • V/f pattern setting (constants H09 to H15) • Intake air temperature.
oL1	● ☼	Output is shut OFF and motor coasts to a stop.	OL1 (Motor overload) Motor overload protection operates by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (constants H09 to H15) • Set the motor rated current shown on the nameplate by constant H32.
oL2			OL2 (Inverter overload) Inverter overload protection operates by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (constants H09 to H15) • Check the inverter capacity.
oL3			OL3 (Overtorque detection) Inverter output current exceeded the preset value in constant H60. When overtorque is detected, inverter performs operation according to the preset setting of constant H59.	Check the driven machine and correct the cause of the fault, or increase the value of constant H60 up to the highest value allowed for the machine.

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN ALARM (Green) (Red)			
EFo	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop.	EF□ (External fault) Inverter receives an external fault input from control circuit terminal. EF0: External fault reference through MEMOBUS communications EF2: External fault input command from control circuit terminal S2 EF3: External fault input command from control circuit terminal S3 EF4: External fault input command from control circuit terminal S4 EF5: External fault input command from control circuit terminal S5	Check the external circuit (sequence).
F00			CPF-00 Initial memory fault has detected.	Cycle power. If the fault remains, replace the inverter.
F0 I			CPF-01 ROM error has detected.	Cycle power. If the fault remains, replace the inverter.
F04			CPF-04 EEPROM fault of inverter control circuit is detected.	• Record all constant data and initialize the constants. (Refer to page 36 for constant initialization.) • Cycle power. If the fault remains, replace the inverter.

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN ALARM (Green) (Red)			
F05	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop.	CPF-05 A/D converter fault is detected.	Cycle power. If the fault remains, replace the inverter.
F06			CPF-06 ・ Option card connecting fault ・ A non-corresponding option card is connected.	Remove power to the inverter. Check the connection of the digital operator. Verify inverter software number.
F07			CPF-07 Operator control circuit (EEPROM or A/D converter) fault	Cycle power. If the fault remains, replace the inverter.
cE			CE(MEMOBUS communications fault) Normal reception of communication data is not possible.	Check the communication devices or communication signals.
STP	☀ ☼ or ● ☼	Stops according to constant	STP(Emergency stop) The inverter stops according to constant H04 after receiving the emergency stop fault signal.	Check the external circuit (sequence).
— (OFF)	● ●		・ Insufficient power supply voltage ・ Control power supply fault ・ Hardware faul	Check the following : ・ Power supply voltage ・ Main circuit power supply wiring is connected. ・ Terminal screws are securely tightened. ・ Control sequence. Replace the inverter.

■ Troubleshooing

Trouble	Cause	Corrective Actions
The motor does not operate when an external operation signal is input.	**The operation method selection is wrong.** The run command (H02) is not set to Control Circuit Terminal.	Set the run command (H02) to Control Circuit Terminal.
	A 3-wire sequence is in effect. The multi-function input method (H37) is set to 3-wire sequence, and the S2 control terminal is not closed.	To use a 3-wire sequence, make the wiring so that the S2 control terminal is closed. To use a 2-wire sequence, set the multifunction input (H37) to a value other than 3-wire sequence.
	The frequency reference is too low. The input frequency reference is lower than the setting for the min.output frequency (H14).	Input a frequency reference greater than the min. output frequency (H14).
	Local mode is in effect.	Set the LO/RE selection of the digital operator to RE.
	The SW setting for the reference selection is wrong. Example: The reference 4-20mA is input, but the SW is set to "V".	For analog input, make sure that the frequency reference (H03) and SW settings are correct.
The motor stops. The torque is not output.	**The stall prevention level during acceleration is too low.** Because the stall prevention level during acceleration (H56) is set too low, the output current reaches the set level, the output frequency is stopped, and the acceleration time is lengthened.	Check if the stall prevention level during acceleration (H56) is set to an appropriate value.
	The stall prevention level during running is too low. Because the stall prevention level during running (H57) is set too low, the output current reaches the set level, and the speed drops.	Check if the stall prevention level during running (H57) is set to an appropriate value.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	Lengthen the set acceleration time (H16). Reduce the load.

Trouble	Cause	Corrective Actions
	When the maximum frequency was changed, the maximum voltage frequency was also changed.	To increase the speed of a general-purpose motor, only change the maximum frequency.
	The V/f set value is too low.	Set the V/f (H09 to H15) according to the load characteristics.
The motor speed is unstable. The motor speed fluctuates when operating with a light load.	The stall prevention level during running is too low. Because the stall prevention level during running (H57) is too low, the output current reaches the set level and the speed drops.	Check if the stall prevention level during running (H57) is set to an appropriate value.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	Reduce the load.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	Reduce the load.
	The carrier frequency is too high. If operating the motor with a light load, a high carrier frequency may cause the motor speed to fluctuate.	Decrease the carrier frequency (H46).
	The V/f set value is too high for a low speed operation. Because the set value for the V/f is too high, over-excitation occurs at low speeds.	Set the V/f (H09 to H15) according to the load characteristics.
	The maximum frequency and base frequency were incorrectly adjusted. Example: To operate a 60 Hz motor at 40 Hz or less, the maximum frequency and base frequency are set to 40 Hz.	Set the maximum frequency and the base frequency according to the motor specifications.
	The inverter is used for an operation at 1.5 Hz or less.	Do not use the TG100 inverter for an operation that runs at 1.5 Hz or less. For an operation at 1.5 Hz or less, use a different inverter model.
	The analog reference input is unstable and has noise interference.	Increase the set value for the filter time constant.

Trouble	Cause	Corrective Actions
The digital operator does not turn ON.	**The power is not being supplied.** The breaker or other component on the power input side is not turned ON, and the power is being not supplied.	Check if the power is being supplied.

7. SPECIFICATIONS

■ Standard Specifications (220V Class)

Voltage Class		220V single- / 3-phase				
TG100	3-phase	L05	L10	L20	L30	L50
	Single-phase	S05	S10	S20	S30	S50
Max. Applicable Motor Output kW (HP)*		0.55 (0.5)	1.1 (1)	1.5 (2)	2.2 (3)	4.0 (5)
Output Characteristics	Inverter Capacity (kVA)	1.2	2	3	4.2	6.7
	Rated Output Current (A)	3	5.5	8	11	17.5
	Max. Output Voltage (V)	3-phase, 200 to 240V (proportional to input voltage) Single-phase, 200 to 240V (proportional to input voltage)				
	Max. Output Frequency (Hz)	400Hz(Programmable)				
Power Supply	Rated Input Voltage and Frequency	3-phase, 200 to 240V, 50/60Hz Single-phase, 200 to 240V, 50/60Hz				
	Allowable Voltage Fluctuation	-15 to + 10%				
	Allowable Frequency Fluctuation	±5%				
Control Characteristics	Control Method	Sine wave PWM (V/f control)				
	Frequency Control Range	0.1 to 400Hz				
	Frequency Accuracy (Temperature Change)	Digital reference: ± 0.01% (-10 to + 50°C) Analog reference: ± 0.5% (25 ± 10°C)				
	Frequency Setting Resolution	Digital reference: 0.1Hz (less than 100Hz) / 1Hz (100Hz or more) Analog reference: 1 / 1000 of max. output frequency				
	Output Frequency Resolution	0.01Hz				
	Overload Capacity	150% rated output current for one minute				
	Frequency Reference Signal	0 to 10VDC (20kΩ), 4 to 20mA (250Ω), 0 to 20mA (250Ω), Frequency setting potentiometer (Selectable)				
	Accel/Decel Time	0.0 to 999 sec. (accel / decel time are independently programmed)				
	Braking Torque	150% up <Break Resistor>				
	V/f Characteristics	Possible to program any V / f pattern				

* Based on a standard 4-pole motor for max. applicable motor output.
† Shows deceleration torque for uncoupled motor decelerating from 60Hz with the shortest possible deceleration time.

Voltage Class			200V single- / 3-phase				
TG100	3-phase		L05	L10	L20	L30	L50
	Singlephase		S05	S10	S20	S30	S50
Protective Functions	Motor Overload Protection		Electronic thermal overload relay				
	Instantaneous Overcurrent		Motor coasts to a stop at approx. 200% of inverter rated current				
	Overload		Motor coasts to a stop after 1 minute at 150% of inverter rated output current				
	Overvoltage		Motor coasts to a stop if DC bus voltage exceed 410V				
	Undervoltage		Stops when DC bus voltage is approx. 200V or less (approx. 160V or less for single-phase series)				
	Momentary Power Loss		Following items are selectable : Not provided (stops if power loss is 15ms or longer), continuous operation if power loss is approx. 0.5s or shorter, continuous operation				
	Cooling Fin Overheat		Protected by electronic circuit				
	Stall Prevention Level		Can be set individual level during accel / decel, provided / not provided available during coast to a stop				
	Cooling Fan Fault		Protected by electronic circuit (fan lock detection)				
	Ground Fault		Protected by electronic circuit (rated output current level)				
	Power Charge Indication		RUN lamp stays ON or digital operator LED stays ON. (Charge LED is provided for 400V) ON until the DC bus voltage becomes 50V or less.				
Other Functions	Input Signals	Multi-function Input	Four of the following input signals are selectable: Reverse run (3-wire sequence), fault reset, external fault (NO / NC contact input), multi-step speed operation, Jog command, accel / decel time select. external baseblock (NO / NC contact input), speed search command, accel / decel hold command, LOCAL / REMOTE selection, communication / control circuit terminal selection, emergency stop fault emergency stop alarm				
	Output Signals	Multi-function Output*	Following output signals are selectable (1 NO / NC contact output) : Fault, running, zero speed, at frequency, frequency detection (output frequency $\leqq$ or $\geqq$ set value), during overtorque detection, minor error, during baseblock, operation mode, inverter run ready, during fault retry, during UV, during speed search, data output through communication				
	Standard Functions		Full-range automatic torque boost, slip compensation,DC injection braking current / time at start/stop,frequency reference bias /gain, frequency reference with built-in potentiometer, constant copy, [MEMOBUS communications (RS-485/422, max. 19.2K bps) (optional)]				

*Minimum permissible load:5VDc ,10mA(as reference value)

Voltage Class			220V single- / 3-phase				
TG100		3-phase	L05	L10	L20	L30	L50
		Singlephase	S05	S10	S20	S30	S50
Other Functions	Display	Status Indicator LED	RUN and ALARM provided as LED's				
		Digital Operator	Available to monitor frequency reference, output frequency, output current				
	Wiring Distance between Inverter and Motor		100m (328ft) or less †				
Enclosure			Open chassis				
Cooling Method			Cooling fan is provided for the following models: 220V, 1.5kW (2HP) or large inverters (single-phase)(3-phase) Other models are self-cooling				
Environmental Conditions	Ambient Temperature		Open chasis : -10 to +50°C (14 to 122°F) (not frozen)				
	Humidity		95%RH or less (non-condensing)				
	Storage Temperature *		-20 to +60°C (-4 to +140°F)				
	Location		Indoor (free from corrosive gases or dust)				
	Elevation		1000m (3280ft) or less				
	Vibration		Up to 9.8m / S^2 (1G) at less than 20Hz, up to 2m / S^2 (0.2G) at 20 to 50Hz				

＊ Temperature during shipping (for short period)
† If the wiring distance between inverter and motor is long, reduce the inverter carrier frequency.
For details, refer to "Reducing motor noise or leakage current (H46)".

■ Standard Specifications (440V Class)

Voltage Class		440V 3-phase					
TG100	3-phase	H05	H10	H20	H30	H40	H50
Max. Applicable Motor Output kW (HP) *		0.55 (0.75)	1.1 (1.5)	1.5 (2)	2.2 (3)	3 (4)	4.0 (5)
Output Characteristics	Inverter Capacity (kVA)	1.5	2.7	3.8	4.3	5.5	7.1
	Rated Output Current (A)	1.9	3.5	48	5.6	7.2	9.2
	Max. Output Voltage (V)	3-phase, 380 to 460V (proportional to input voltage)					
	Max. Output Frequency (Hz)	400Hz(Programmable)					
Power Supply	Rated input Voltage and Frequency	3-phase, 380 to 480V, 50/60Hz					
	Allowable Voltage Fluctuation	-15 to + 10%					
	Allowable Frequency Fluctuation	±5%					
Control Characteristics	Control Method	Sine wave PWM (V/f control)					
	Frequency Control Range	0.1 to 400Hz					
	Frequency Accuracy (Temperature Change)	Digital reference: ± 0.01%, -10 to + 50°C (14 to 122°F) Analog reference: ± 0.5%, 25 ± 10°C (59 to 95°F)					
	Frequency Setting Resolution	Digital reference: 0.1Hz (less than 100Hz) / 1Hz (100Hz or more) Analog reference: 1 / 1000 of max. output frequency					
	Output Frequency Resolution	0.01Hz					
	Overload Capacity	150% rated output current for one minute					
	Frequency Reference Signal	0 to 10VDC (20kΩ), 4 to 20mA (250Ω), 0 to 20mA (250Ω) Frequency setting potentiometer (Selectable)					
	Accel/Decel Time	0.0 to 999 sec. (accel / decel time are independently programmed)					
	Braking Torque	UP 150% <Breaking Resistor>					
	V/f Characteristics	Possible to program any V / f patterm					

∗ Based on a standard 4-pole motor for max. applicable motor output.
† Shows deceleration torque for uncoupled motor decelerating from 60Hz with the shortest possible deceleration time.

Voltage Class			440V 3-phase					
TG100	3-phase	H05	H10	H20	H30	H40	H50
Protective Functions	Motor Overload Protection	Electronic thermal overload relay						
	Instantaneous Overcurrent	Motor coasts to a stop at approx. 200% of inverter rated current						
	Overload	Motor coasts to a stop after 1 minute at 150% of inverter rated output current						
	Overvoltage	Motor coasts to a stop if DC bus voltage exceed 820V						
	Undervoltage	Stops when DC bus voltage is approx. 400V or less						
	Momentary Power Loss	Following items are selectable : Not provided (stops if power loss is 15ms or longer), continuous operation if power loss is approx. 0.5s or shorter, continuous operation						
	Cooling Fin Overheat	Protected by electronic circuit						
	Stall Prevention Level	Can be set to individual levels during accel / decel, provided / not provided available during coast to a stop						
	Cooling Fan Fault	Protected by electronic circuit (fan look detection)						
	Ground Fault	Protected by electronic circuit (rated output current level)						
	Power Charge Indication	Charge LED is provided. ON until the DC bus voltage becomes 50V or less.						
Other Functions	Input Signals	Multi-function Input	Four of the following input signals are selectable: Reverse run (3-wire sequence), fault reset,external fault (NO / NC contact input), multi-step speed operation, Jog command, accel / decel time select.external baseblock (NO / NC contact input), speed search command, accel / decel hold command, LOCAL / REMOTE selection, communication / control circuit terminal selection,emergency stop fault emergency stop alarm					
	Output Signals	Multi-function Output *	Following output signals are selectable (1 NO / NC contact output,) :Fault, running, zero speed, at frequency, frequency detection (output frequency ≦ or ≧ set value), during overtorque detection,minor error, during baseblock,operation mode, inverter run ready,during fault retry,during UV, during speed search, data output through communication					
	Standard Functions		Full-range automatic torque boost, slip compensation, DC injection braking current / time at start/stop frequency reference bias /gain, frequency reference with built-in potentiometer, constant copy, [MEMOBUS communications (RS-485/422, max. 19.2K bps) (optional)]					

＊ Minimum permissible load: 5VDC, 10mA (as reference value)

Voltage Class			440V 3-phase					
TG100		3-phase	H05	H10	H20	H30	H40	H50
Other Functions	Display	Status Indicator LED	RUN and ALARM provided as standard LED's					
		Digital Operator	Available to monitor frequency reference, output frequency, output current					
	Wiring Distance between Inverter and Motor		100m (328ft) or less†					
Enclosure			Open chassis					
Cooling Method			Cooling fan is provided for the following models: 440V, 1.5kW (2HP) or large inverters (3-phase) Other models are self cooling.					
Environmental Conditions	Ambient Temperature		Open chassis: -10 to +50°C (14 to 122°F) (not frozen)					
	Humidity		95%RH or less (non-condensing)					
	Storage Temperature*		-20 to +60°C (-4 to 140°F)					
	Location		Indoor (free from corrosive gases or dust)					
	Elevation		1000m (3280ft) or less					
	Vibration		Up to 9.8m / S^2 (1G) at less than 20Hz, up to 2m / S^2 (0.2G) at 20 to 50Hz					

∗ Temperature during shipping (for short period)
† If the wiring distance between inverter and motor is long, reduce the inverter carrier frequency.
For details, refer to "Reducing motor noise or leakage current (H46)".

Resistor(OPTION)

B1 B2

MCCB

FOR
SINGLE-
PHASE,
USE R/L1
AND T/L3

R   R/L1   U/T1
S   S/L2   V/T2   IM
T   T/L3   W/T3

TG100

FORWARD
RUN/STOP   S1

REVERSE
RUN/STOP   S2

FAULT RESET   S3

EXTERNAL FAULT
(NO CONTACT)   S4

MULTI-STEP
SPEED REF. 1   S5

MULTIFUNC
TION
INPUT

SC

SHIELDED CONNECTION
TERMINAL

MA

MB   RUNNING

MC

MULTI-FUNCTION†
OUTPUT
250VAC 1A OR LESS
30VDC 1A OR LESS

AC250V 1A以下

DC30V 1A以下

FS SPEED REFERENCE PULSE TRAIN
(30kHz MAX.)

FREQUENCY SETTING POWER SUPPLY
(+12V 20mA)

2kΩ   P

FREQUENCY
REF.

P

FR   SPEED FREQUENCY REFERENCE
0 TO □10V (20kΩ) OR
4 to 20mA / 0 to 20mA (250Ω)

M3

M4

(OPTION)
Open collector output
<Zero speed signal>

FC

0V

DIGITAL OPERATOR
FREQUENCY
SETTING
VOLUME

MIN   MAX

ANALOG MONITOR
OUTPUT
0 TO 10VDC (2mA)
OUTPUT FREQUENCY

AM

P   FM

AC

DC 0~+10V(2mA)

Shielded

P   Twisted-pair wires

† Minimum permissible load: 5VDC, 10mA (as reference value)

Terminal description

Type			Terminal	Name	Function (Signal Level)	
Main Circuit			R/L1, S/L2, T/L3	AC power supply input	Use main circuit power input. (Use terminals R/L1 and S/L2 for single -phase inverters. Never use terminal T/L3.)	
			U/T1, V/T2, W/T3	Inverter output	Inverter output	
			B1 B2	Braking	Resistor input	
			⏚	Grounding	For grounding (according to the local grounding code)	
Control Circuit	Input	Sequence	S1	Forward run input	Closed: FWD run, open: REV run	Photo-coupler insulation, 24VDC, 8mA
			S2	Multi-function input selection 2	Factory setting closed: REV run, open: FWD run	
			S3	Multi-function input selection 3	Factory setting: Fault reset	
			S4	Multi-function input selection 4	Factory setting: External fault (NO contact)	
			S5	Multi-function input selection 5	Factory setting: Multi-step speed reference 1	
			SC	Multi-function input selection common	For control signal	
		Frequency reference	FS	Power for frequency setting	+12V (permissible current 20mA max.)	
			FR	Master speed frequency reference	0 to +10VDC (20kΩ) or 4 to 20mA (250kΩ) or 0 to 20mA (250Ω) (1/1000 resolution)	
			FC	Frequency reference common	0V	
	Output	Multi-function † contact output	MA	NO contact output	Factory setting: running	Contact capacity 250VAC 1A or less, 30VDC 1A or less
			MB	NC contact output		
			MC	Contact output common		
			AM	Analog monitor output	Factory setting: Output frequency 0 to +10VDC	0 to +10VDC, 2mA or less,
			AC	Analog monitor common	0V	8-bit resolution

† Minimum permissible load: 5VDC, 10mA (as reference value)

■ Sequence Input Connection with NPN/PNP Transistor

When connecting sequence inputs (S1 to S5) with transistor, turn the rotary switch SW7 depending on the polarity(0V common: NPN side, +24V common: PNP side). Factory setting: NPN side

Sequence connection with NPN transistor (0V common)

Sequence connection with PNP transistor (+24V common)

Dimensions/Heat Loss

L05(0.4KW)220V~L30(2.2KW)220V
H05(0.4KW)440V~H50(3.7KW)440V
S05(0.4KW)220V~S30(2.2KW)220V

■ Constants List

• Addition of constants accompanied by the upgraded software version The constants marked with #1 are applicable for the upgraded software version
• Constants that can be changed during operation
  The constants whose numbers are in bold can be changed during operation.

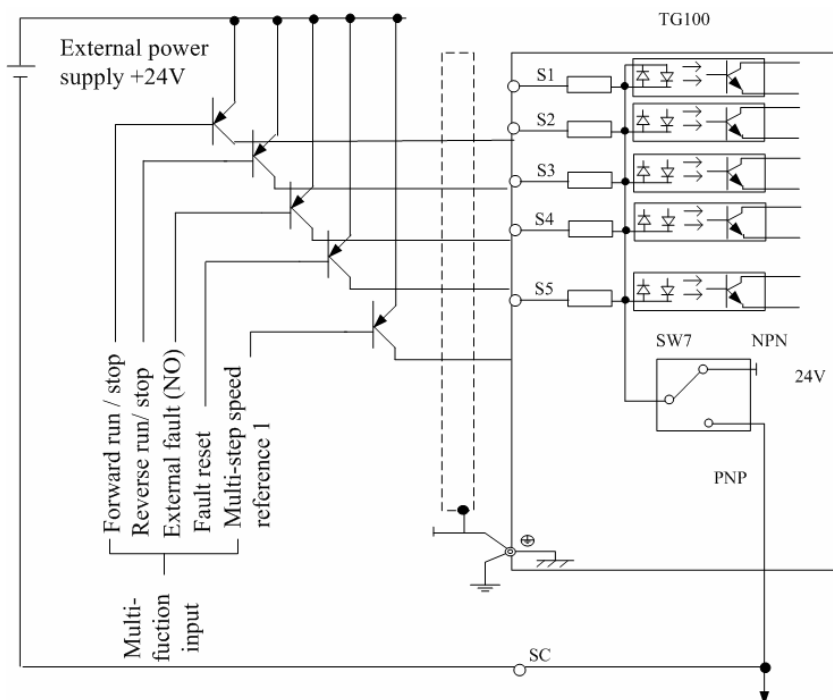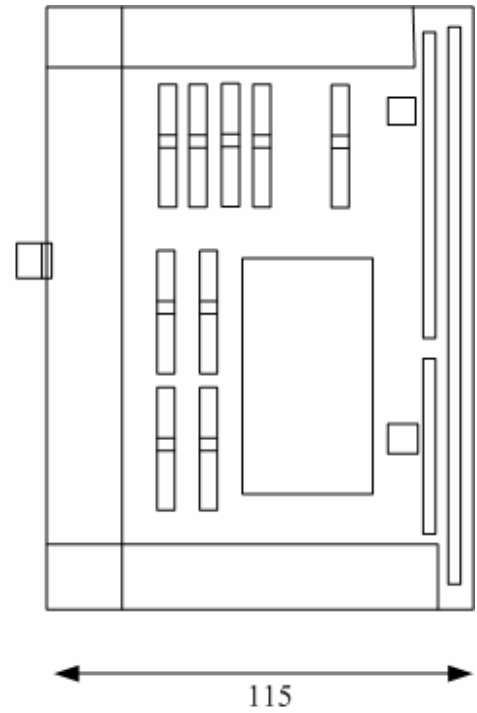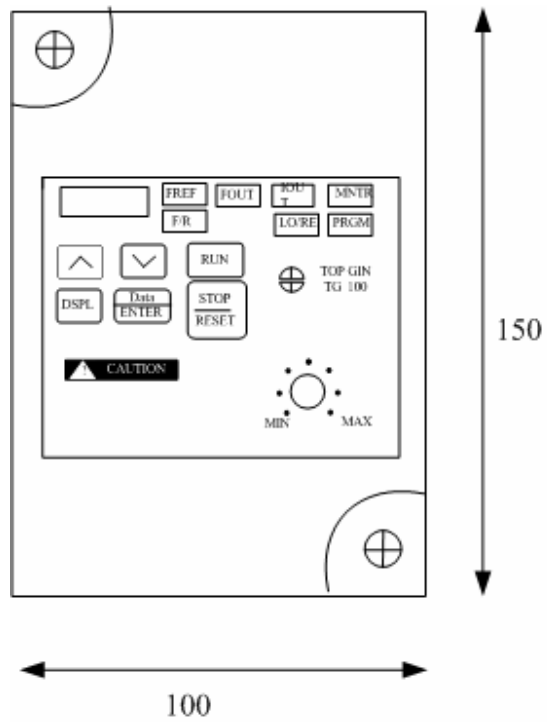| Ho.	Register No. for Transmission	Name	Setting Range	Setting Unit	Initial Setting	Ref. Page
01	0101H	Password	0, 1, 6, 12, 13	1	1	26
02	0102H	Run command selection	0 to 2	1	0	31
03	0103H	Frequency reference selection	0 to 6	1	0 (Note 4)	32
04	0104H	Selecting stopping method	0, 1	1	0	50
05	0105H	Selecting reverse run prohibited	0, 1	1	0	33
06	0106H	Stop key function	0, 1	1	0	49
07	0107H	Selecting frequency reference in local mode	0, 1	1	0 (Note 4)	32
08	0108H	Frequency reference setting method from digital	0, 1	1	0	32
09	0109H	Max. output frequency	50.0 to 400Hz	0.1Hz (less than 100Hz)	50.0Hz	27
10	010AH	Max. voltage	1 to 255V (Note 1)	0.1V	200V (Note 1)	27
11	010BH	Max. voltage output frequency	0.2 to 400Hz	1Hz (100Hz or more)	50.0Hz	27
12	010CH	Mid. output frequency	0.1 to 399	1Hz (100Hz or more)	1.3Hz	27
13	010DH	Mid. output frequency voltage	1 to 255V (Note 1)	1V	12V (Note 1)	27
14	010EH	Min. output frequency	0.1 to 10.0Hz	0.1Hz	1.3Hz	27
15	010FH	Min. output frequency voltage	1 to 50V (Note 1)	0.1V	12V (Note 1)	27
16	0110H	Acceleration time 1	0.0 to 999	0.1s (less than 100s) 1s (100s or more)	10.0s	37
17	0111H	Deceleration time 1	0.0 to 999	0.1s (less than 100s) 1s (100s or more)	10.0s	37
18	0112H	Acceleration time 2	0.0 to 999	0.1s (less than 100s) 1s (100s or more)	10.0s	37
19	0113H	Deceleration time 2	0.0 to 999	0.1s (less than 100s) 1s (101s or more)	10.0s	37
20	0114H	S-curve selection	0 to 3	1	0	39

No.	Register No. for Transmission	Name	Setting Range	Setting Unit	Initial Setting	Ref. Page
21	0115H	Frequency reference 1 (Master speed frequency reference)	0.0 to 400	0.1Hz (less than 100Hz) 1Hz (100Hz or more)	0.0Hz	33
22	0116H	Frequency reference 2	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
23	0117H	Frequency reference 3	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
24	0118H	Frequency reference 4	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
25	0119H	Frequency reference 5	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
26	011AH	Frequency reference 6	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
27	011BH	Frequency reference 7	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
28	011CH	Frequency reference 8	0.0 to 400	0.1Hz (less than 100Hz)	0.0Hz	33
29	011DH	Jog frequency	0.0 to 400	0.1Hz (less than 100Hz)	6.0Hz	34
30	011EH	Frequency reference upper limit	0 to 110%	1%	100%	37
31	011FH	Frequency reference lower limit	0 to 110%	1%	0%	37
32	0120H	Motor rated current	0 to 120% of inverter rated current	0.1A	(Note 2)	62
33	0121H	Electronic thermal motor protection	0 to 2	1	0	62
34	0122H	Electronic thermal motor protection time constant setting	1 to 60 min	1min	8min	62
35	0123H	Selecting cooling fan operation	0, 1	1	0	63

No.	Register No. for Transmission	Name	Setting Range	Setting Unit	Initial Setting	Ref. Page
36	0124H	Multi-function input selection 2	2 to 8 10 to 22	1	2	52
37	0125H	Multi-function input selection 3	0, 2 to 8 10 to 22	1	5	52
38	0126H	Multi-function input selection 4	2 to 8 10 to 22	1	3	52
39	0127H	Multi-function inputselection 5	2 to 8 10 to 22, 34, 35	1	6	52
40	0128H	Multi-function output selection	0 to 7, 10 to 18	1	1	55
41	0129H	Analog frequency reference	0 to 255%	1%	100%	35
42	012AH	Analog frequency reference	-99 to 99%	1%	0%	35
43	012BH	Filter time constant for analog frequency	0.00 to 2.00s	0.01s	0.10S	—
44	012CH	Multi-function analog output (terminal AM-AC)	0, 1	1	0	46
45	012DH	Analog monitor gain	0.00 to 2.00	0.01	1	46
46	012EH	Carrier frequency selection	1 to 4, 7 to 9	1	4 (Note 3)	47
47	012FH	Momentary power loss ridethrough method	0 to 2	1	0	38
48	0130H	Automatic retry attempts	0 to 10 times	1	0 time	43
49	0131H	Jump frequency 1	0.0 to 400Hz	0.01Hz (less than100Hz) /0.1Hz (100Hz or more)	0.0Hz	43
50	132H	Jump frequency 2	0.0 to 400Hz	0.01Hz (less than100Hz) /0.1Hz (100Hz or more)	0.0Hz	43
51	133H	Jump frequency range	0.0 to 25.5Hz	0.1Hz	0.0Hz	43
52	134H	DC injection braking current	0 to 100%	1%	50%	45
53	135H	DC injection braking time at	0.0 to 25.5%	0.1s	0.5s	51
54	136H	DC injection braking time at	0.0 to 25.5%	0.1s	0.0s	45
55	137H	Stall prevention during	0, 1	1	0	60
56	138H	Stall prevention during	30 to 200%	1%	170%	59
57	139H	Stall prevention during running	30 to 200%	1%	160%	60
58	013AH	Frequency detection level	0.0 to 400Hz	0.1Hz (less than 100Hz) / 1Hz (100Hz or more	0.0Hz	42

No.	Register No. for Transmission	Name	Setting Range	Setting Unit	Initial Setting	Ref. Page
59	013BH	Overtorque detection function	0 to 4	1	0	41
60	013CH	Overtorque detection level	30 to 200%	1%	160%	41
61	013DH	Overtorque detection time	0.1 to 10.0s	0.1s	0.1s	41
62	013EH	Hold output	0, 1	1	0	54
63	013FH	Torque compensation gain	0.0 to 2.5	0.1	1	29
64	0140H	Motor rated slip	0.0 to 20.0Hz	0.1Hz	(Note 2)	-
65	0141H	Motor no-load current	0 to 99%	1%	(Note 2)	-
66	0142H	Slip compensation gain	0.0 to 2.5	0.1	0	61
67	0143H	Slip compensation time constant	0.0 to 25.5s	0.1s	2.0s	61
68	0144H	MEMOBUS timeover selection	0 to 4	1	0	—
69	0145H	MEMOBUS frequency reference and frequency monitor unit	0 to 3	1	0	—
70	0146H	MEMOBUS slave address	0 to 32	1	0	—
71	147H	MEMOBUS BPS selection	0 to 3	1	2	—
72	148H	MEMOBUS parity selection	0 to 2	1	2	—
73	149H	Transmission waiting time	10 to 65ms	1ms	10ms	—
74	014AH	RTS control	0, 1	1	0	—
78	014EH	Fault history	Stores, displays most recent alarm	Setting disabled	—	24
79	014FH	Software version No.	Displays lowerplace 3 digits of software No.	Setting disabled	—	—

Notes:
1. Upper limit of setting range and initial setting are doubled at 440V class.
2. Changes depending on inverter capacity Refer to the next page.
3. Changes depending on inverter capacity. Refer to page 58.
4. Initial setting of the model with digital operator (without potentiometer) is 1. Setting can be set to 0 by constant initialization.