YASKAWA ELECTRIC

TOEZ-S616-10

TRANSISTOR INVERTER
Varispeed™-616GII
OPERATION MANUAL

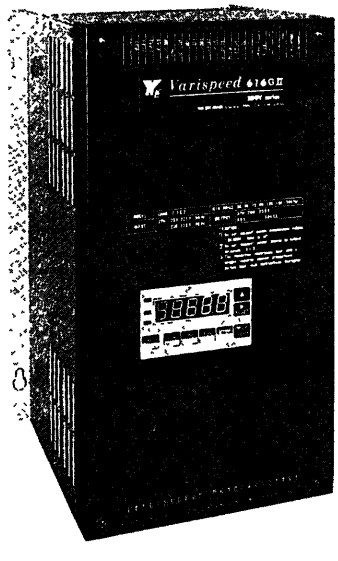
Before initial operation read these instructions thoroughly and retain for future reference

When properly installed, operated and maintained, this equipment will provide a lifetime of optimum operation. It is mandatory that the person who operates, inspects, and maintains this equipment thoroughly read and understand this manual.

This manual is primarily intended to give operators instructions for Varispeed-616GII.

The information contained in manual does not provide all details to be met concerning operations If uncertainties be encountered for particular operation, refer to the following Varispeed-616GII documents for additional information:

- Varispeed-616GII Drives catalog (CHE-S616-10)
- Varispeed-616GII INSTRUCTION MANUAL For 200 V series (TOEZ-S616-10.1)
- Varispeed-616GII INSTRUCTION MANUAL For 400 V series (TOEZ-S616-10.2)
- Varispeed-616GII Applications (SIE-S616-10.10)



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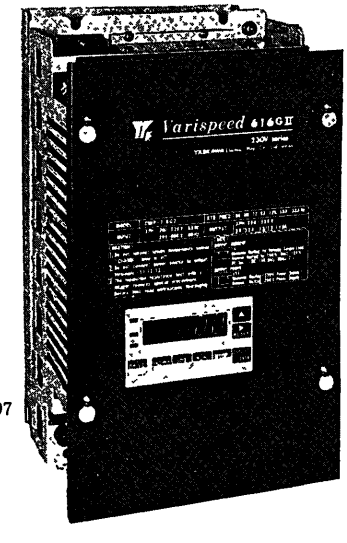

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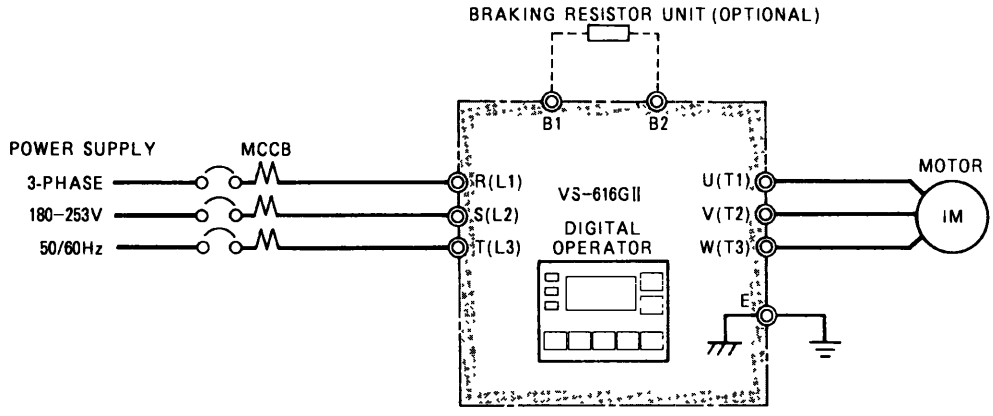
1. SIMPLE OPERATION OF THE DIGITAL OPERATOR

• INTERCONNECTIONS



Frequency setting and operation/stop of the VS-616G II to be performed by the digital operator are preset at the factory prior to shipment

When performing the operation by external signals or by a combination of digital operator and external signals, refer to Page 10.

• Standard settings at the time of shipping from factory

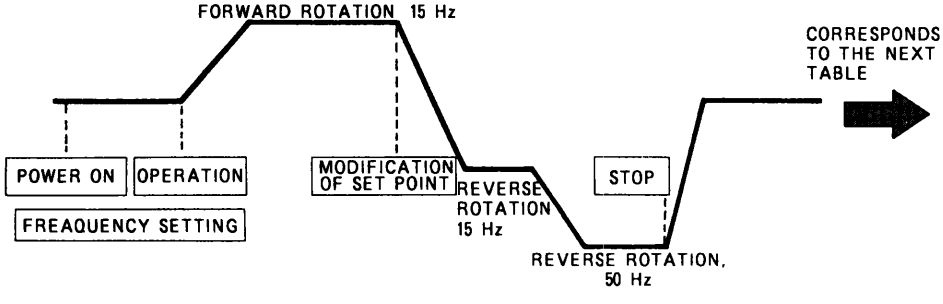
Refer to Operation Manuals (TOEZ-S616-10.1, TOEZ-S616-10 2) for detail

Monitor mode	Contents of standard setting
• Frequency setting	0 Hz
• Frequency command	Digital operator
• Operation command (FWD/REV)	〃

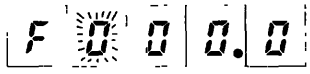
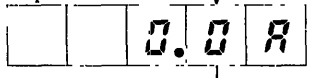
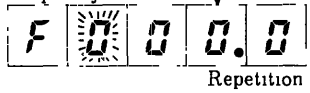
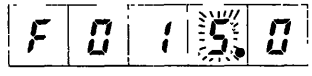
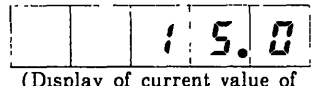
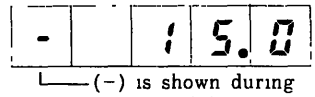
Function selection	Standard settings
• V/f pattern [Functions, characteristic constants Sn-02 (1)]	Maximum frequency 60 Hz, constant torque,
• Acceleration/deceleration time [Functions, characteristic constants Cn-08, 09]	10 sec
• Motor protection	Electro-thermal (standard motor)

• An example of running operation

Operation of forward and reverse rotation will be explained by the following example



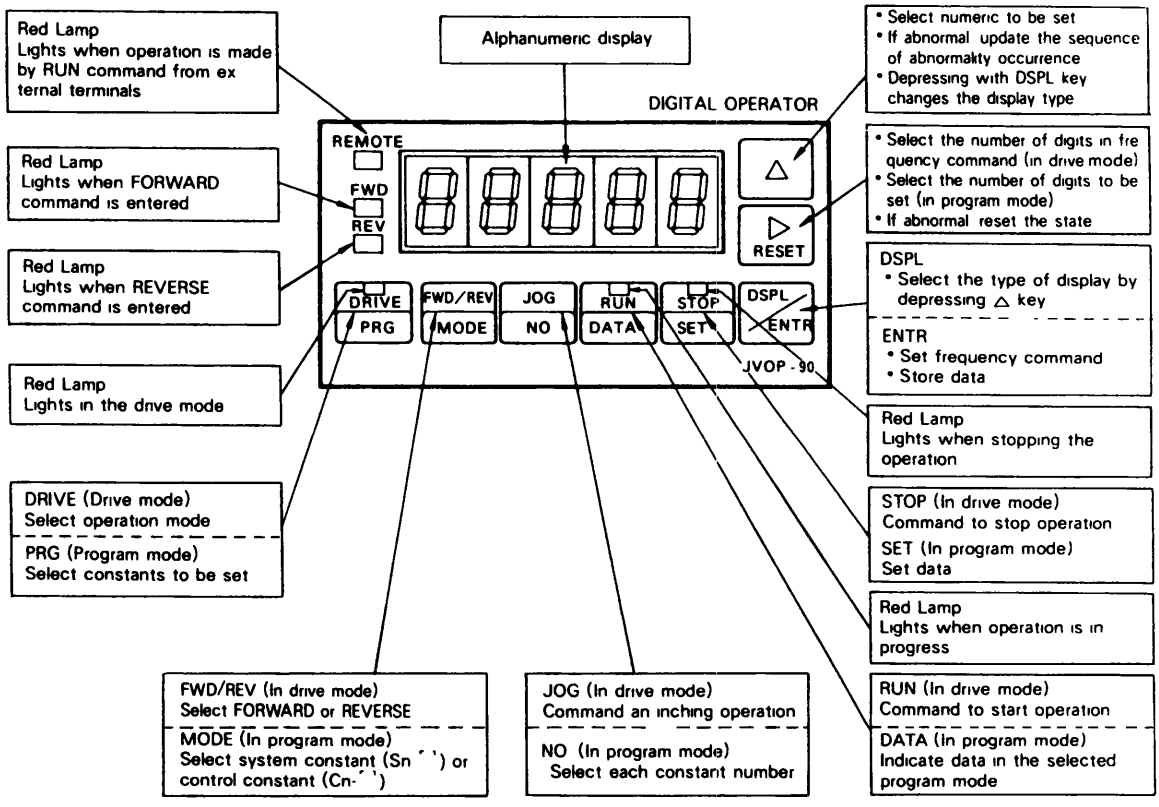
Explanations below correspond to "operating procedure" shown in the next table

Operating procedure	Operation of digital operator	Digital display	Description
Power on		 Blinking	
Frequency setting	Select drive mode with (lights up) DRIVE PRG.		
	Depress ▲ while depressing DSPL ENTR to display frequency command	Frequency command Output frequency Output current  Previous fault Frequency command  Repetition	• When power is on, the display before power off is indicated. Initial seting becomes frequency command. Monitor mode
	Example· Setting frequency command value to 15 Hz Move the value to setting digit by using RESET and make the setting with ▲. Store the frequency command value with DSPL ENTR. (Thses data are stored even when the power is off)		
	Depress ▲ while depressing DSPL ENTR and monitor the output frequency.		
Forward rotation	Select the rotation of motor with FWD/REV MODE.		
	Give running command with RUN DATA.	 (Display of current value of output frequency)	• Motor begins a smooth start and runs.
Reverse rotation	Depress FWD/REV MODE.	 (−) is shown during reverse rotation	• Motor starts reverse rotation
Changing set point	Depress ▲ while depressing DSPL ENTR to display frequency command Change the frequency set point by using RESET ▲. Store frequency command value by DSPL ENTR.		• After depressing DSPL ENTR, the motor rpm begins to increase or decrease and reaches the set point.
Stop	Depress STOP SET.		• After depressing, speed decreases and motor stops.

2. OPERATING METHOD FOR DIGITAL OPERATOR

• Outline of the functions of operation keys

The key expresses its function with upper stage during drive mode selection and with lower stage during program mode selection



• Data set by the digital operator are stored even after turning power off

• If replaced with digital monitor after setting with digital operator, the set data cannot be changed. This protects and the data. Be sure to turn the power off at the time of replacement.

• If fault state occurs, the contents of fault will be stored even after the power is off. Thus, the contents can be checked after turning on the power again

• When selecting the monitor mode, first depress and then depress

• Frequency setting and monitor mode can be changed even during operation

• The program mode can be changed only during stop.

• Key Function

	Key	Key name	Contents
Mode Selection	DRIVE PRG	Drive mode	Selects running operation Red lamp lights in running mode
	DRIVE PRG	Program mode	Changes constants and selects functions Lamp is off in program mode
	Depress DSPL ENTR and ▲ keys simultaneously	Monitor mode	Selects the kinds of monitor (refer to page 3)
Data Setting and Changing	RESET	Digit shift	Selects the digits of data to be set or changed
	▲	Up	Sets and changes the data Numerical value is increased one by one by ▲ (+1 direction only)
			• For setting and changing frequency command by digital operator Frequency command is displayed by DSPL ENTR, ▲ and data are set and stored by DSPL ENTR. • For changing constants and selecting functions· Data are changed by DRIVE PRG FWD/REV MODE JOG NO. RUN DATA and are stored by depressing STOP SET DSPL ENTR
Operation and Stop	RUN DATA	Running	Running starts in drive mode
	JOG NO	JOG running	JOG operation is performed in drive mode
	FWD/REV MODE	Forward/reverse rotation	Switching of forward rotation and reverse rotation is made in drive mode.
	STOP SET	Stop	Running is stopped in drive mode

3. METHOD OF SELECTING FUNCTIONS AND CHANGING CONSTANTS

3.1 Operation of Program Mode

- Data setting and reference in program mode should be performed while the inverter is stopped No data setting and reference are possible during inverter operation
- After data setting, be sure to finally depress DSPL/ENTR. If this key is not depressed, setting and chaging become invalid, and previous data remain
- Motor running is not possible when program mode has been selected Thus, depress DRIVE/PRG and return it to drive mode (Set to DRIVE/PRG Lights.)

3.2 Operating Procedure in Program Mode

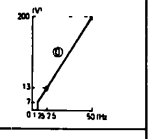
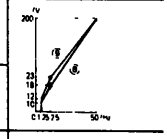
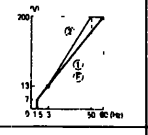
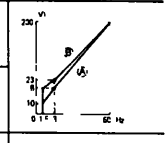
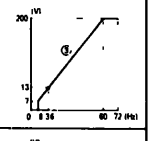
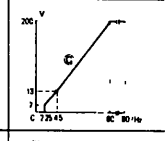
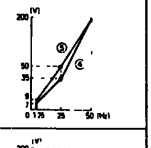
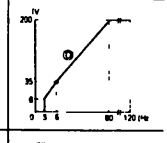
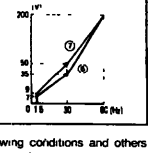
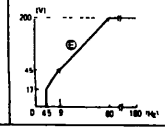
Operating procedure	Key operation	Description
Key operation	DRIVE/PRG	• Drive mode is switched to program mode
Set constant selection	FWD/REV/MODE	• Constants to be set and referenced are selected Sn-□□ ···Mainly for selecting the functions of V/f and external terminals Cn-□□ ···For changing characteristics CH-□□ ···For checking external terminals of digital operator On-□□ ···For constants other than Sn, Cn (Data of Sn-3 are displayed by 1010)
Constant No setting	JOG/NO.	• From the list of constants, data Nos to be set and referenced are set.
	▲ ▶RESET	
Data display	RUN/DATA	• Previous value data are displayed.
Data setting & changing	▲ ▶RESET	• Data are changed
	STOP/SET	• Data are set.
Data storage	DSPL/ENTR	• Data are stored.
Drive mode selection	DRIVE/PRG Lights	• Returned to drive mode.

3.3 Setting Change of Program Mode and Its Contents

Chenges of main functions and characteristics and [ ] are preset at the factory prior to shipment

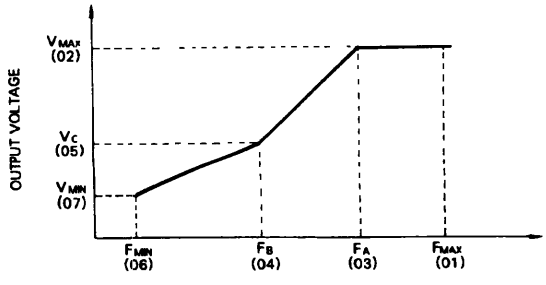
Functions	Key operation	Display	Contents
(1) V/f pattern selection (a) Fixed V/f	RUN DATA ▲ RESET STOP SET DSPL ENTR DRIVE PRG	Sn-02 01 07	Sixteen different kinds of V/f patterns are prepared to permit running corresponding to the type of motor, load characteristics and operational conditions. 15 patterns. Change of V/f patterns not permitted 1 pattern. Change of V/f pattern permitted (Example) Change to the variable torque characteristics

V/f Patterns (15 kinds)

Application	Specification		1S Notch	V/f Pattern	Application	Specification		1S Notch	V/f Pattern
General Purpose	50Hz		⑧		High Starting Torque	50Hz	Starting Torque Low	Ⓑ	
							Starting Torque High	⑨	
	60Hz	60Hz Saturation	① Ⓕ			50Hz	Starting Torque Low	Ⓐ	
		50Hz Saturation	②				Starting Torque High	Ⓔ	
	72Hz		③		Constant Output Operation (Machine Tools)	90Hz		Ⓒ	
Variable Output Operation (Fans and Pumps)	50Hz	Variable Torque 1	④			120Hz		Ⓓ	
		Variable Torque 2	⑤						
	60Hz	Variable Torque 2	⑥			180Hz		Ⓔ	
		Variable Torque 1	⑦						

Note 1 Take account of the following conditions and others when selecting V/f pattern
Pattern matching the voltage-frequency characteristic of the motor
According to the maximum motor speed
2 V/f pattern for high starting orque should be selected for
Long wiring distance
Large voltage drop at stan
AC reactor connected to input or output of the inverter
Use of motor of the rating below the max
For details contact Yaskawa representative

Functions	Key operation	Display	Contents
(b) Arbitrary V/f		Sn-02	
	RUN DATA	01	
	▲ RESET	0F	
	STOP SET		
		Cn-01	V/f constants (Cn-01 to Cn-07)
		~07	Figure in below shows the relationship between constants 1 to 7 V MAX, V C, and V MIN is standardized with the input voltage of 200 V in 200-V and the input voltage of 400 V in 400-V system Use the following formula to convert and set V MAX, V C, and V MIN
		Cn-01	
	RUN DATA	060.0	V MAX = V max × (200 V or 400 V)/Vin V C = V c × (200 V or 400 V)/Vin V MIN = V min × (200 V or 400 V)/Vin (V max, V c, and V min are the actual output voltages, Vin is input voltage)
	▲ RESET	120.0	
	STOP SET		
	JOG NO. ▲	Cn-02	To straighten V/f pattern When FB = FMIN is set, VC setup is invalidated and the output voltages of FA to FMIN become straight
	RUN DATA	200.0	
	▲ RESET	200.0	
	STOP SET		
	⋮		
	JOG NO. ▲	Cn-07	
	RUN DATA		
	▲ RESET	007.0	
		018.0	
	STOP SET		
	DSPL ENTR		
	DRIVE PRG		



V/f Characteristics by Control Constants 1 to 7

Functions	Key operation	Display	Contents
(2) Setting acceleration and decel-reation time		Cn-08 ~09	Accele-ation and deceleration time is set (Example) Setting acceleration to 5 seconds Setting deceleration to 8 seconds Set points prior to shipment

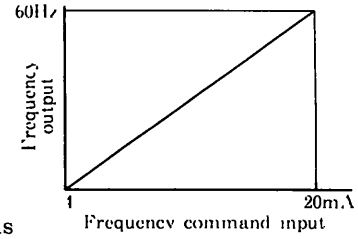
Control rating number	Name	Unit	Seting range	Setting prior to shipment
Cn-08	Accelera-tion time	0.1 s	0.1 ~ 1800.0 s	10.0 s
Cn-09	Decelera-tion time			

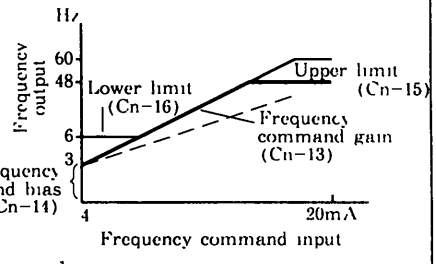
Key operation	Display	Contents
	Cn-08	• Acceleration time setting
RUN DATA	10.0	• Set point at factory prior to shipment
▲ RESET	5.0	• Setting acceleration time to 5 seconds
STOP SET		
JOG NO. ▲	Cn-09	• Setting deceleration time
RUN DATA	10.0	
▲ RESET	8.0	• Setting deceleration time to 8 seconds
STOP SET		
DSPL ENTR		
DRIVE PRG		

Functions	Key operation	Display	Contents
(3) Running signal selection	RUN DATA ▲ RESET STOP SET DSPL ENTR DRIVE PRG	Sn-04 0011 0000	(Example) Mode of performing frequency setting and running/stop by digital operator is changed to the mode of frequency setting and running/stop at the external terminal • Running signal selection

Data / Digits	0	1	Setting prior to shipment
1st digit	Run by frequency command at external terminals	Run by the frequency command at digital operator	0 0 1 1 4th digit | 3rd digit | 2nd digit | 1st digit
2nd digit	Run by running command at external terminals	Run by running command from digital operator	
3rd digit	Main speed frequency command 0-10V/0-100% 4-20mA/0-100%	Main speed frequency command 0-10V/100-0% 4-20mA/100-0%	(Run by digital operator)
4th digit	Reverse rotation possible	Reverse operation not possible	

Functions	Key operation	Display	Contents
(4) Changing the characteris-tics of frequency command			(Example) Characteristics of frequency command and changed First set the data of Sn-04 to 0000
		Cn-13	• Frequency command gain
	RUN DATA	1.00	• Setting at factory prior to shipment
	▲ RESET	(Example) 1.20	• Output is 20% larger than frequency command value (gain 1.2)
	STOP SET		
	JOG NO. ▲	Cn-14	• Frequency command bias
	RUN DATA	0.0	• Setting at factory prior to shipment
	▲ RESET	0.5	• A bias of 0.5% is given to frequency command value.
	STOP SET		
	JOG NO. ▲	Cn-15	• Frequency command upper limit
	RUN DATA	100	• Setting at factory prior to shipment
	▲ RESET	80	• Upper limit of frequency output is limited to 80%
	STOP SET		
	JOG NO. ▲	Cn-16	• Lower limit of frequency command
	RUN DATA	0	• Setting at factory prior to shipment
	▲ RESET	10	• Lower limit of frequency output is limited to 10%.
	STOP SET		
	DSPL ENTR		
	DRIVE PRG		





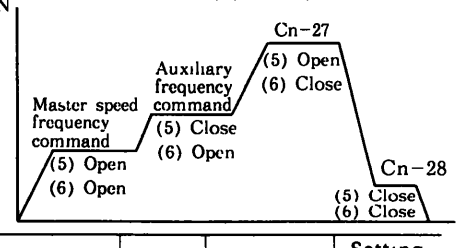
Control constant number	Name	Unit	Setting range	Setting prior to shipment
Cn-13	Frequency command gain	0.01	0.01-2.00	1.00
Cn-14	Frequency command bias	0.1 %	0.0-25.5 %	0.0 %
Cn-15	Upper limit of frequency command	1 %	0-110 %	100 %
Cn-16	Lower limit of frequency command	1 %	0-110 %	0 %

Functions	Key operation	Display	Contents
(5) Selection of protective characteris-tics			(Example) Protective characteristics are changed to "continuous operation after momentary power failure" and "electro-thermal (constant torque)"
		Sn-05	• Selection of protective characteristics
	RUN DATA	0000	
	▲ ▶ RESET	1001	
	STOP SET		
	FWD/REV MODE		
	JOG NO ▲ ▶ RESET	Cn-20	• Selection of motor rating current
		(Example) 7 5GII	
	RUN DATA	26.8	Setting at factory prior to shipment (Refer to page 27)
	▲ ▶ RESET	29.7	To match with the rated current of applied motor
	STOP SET		
	DSPL ENTR		
	DRIVE PRG		

Data / Digit	0	1	Setting prior to shipment
1st digit	Without continuous operation for momentary power failure	With continuous operation for momentary power failure	0 0 0 0
2nd digit	With stall during deceleration	Without stall during deceleration	
3rd digit	With electro-thermal motor protection	Without electro-thermal motor protection	
4th digit	Electro-thermal (variable torque)	Electro-thermal (constant torque)	

Functions	Key operation	Display	Contents
(6) Selection of multiple function contact input			(Example) • Changing to 4-step speed operation + energy saving operation Function of external terminal (8) is changed to energy saving operation. First set the data in $n-04$ to 0000
		$n-11$	Selection of the functions of external terminal (8)
	RUN DATA	6	External coasting to stop
	▲ RESET	9	Energy saving operation
	STOP SET		
			Setting to 4-step speed
	FWD/REV MODE		
	JOG NO ▲ RESET	C_n-27	Frequency command 1 for multiple step speed operation
	RUN DATA	0.0	Setting at factory prior to shipment
	▲ RESET	60.0	Setting to 60 Hz
	STOP SET		
	JOG NO ▲ RESET	C_n-28	Frequency command 2 for multiple step speed operation
	RUN DATA	0.0	Setting at factory prior to shipment
	▲ RESET	1.5	Setting to 1.5 Hz
	STOP SET		
	DSPL ENTR		
	DRIVE PRG		

(Combination of external terminals (5) and (6))



Control constant number	Name	Unit	Setting range	Setting prior to shipment
Cn-27	Frequency command 1 for multiple step speed setting	0.1 Hz	0.0 ~ 396 Hz	0.0Hz
Cn-28	Frequency command 2 for multiple step speed setting			

Functions	Key operation	Display	Contents
(7) Selection of contact output functions			(Example) Overtorque signal is output from contact output Applied inverter CIMR 7 5G2 (reference current 30A) Motor 7 5 kW 4P (rated current of 26 8 A) Overtorque is considered as the rated torque of motor
		Sn - 12	• Selection of contact output functions from (9) and (10)
	RUN DATA	0	Setting at factory prior to shipment
	▲ RESET	3	Selection of overtorque detection
	STOP SET		
	JOG NO ▲ RESET	Sn-06	• Selection of overtorque detection running characteristics
	RUN DATA	0000	Selection at factory prior to shipment
	▲ RESET	0001	With overtorque detection
	STOP SET		
	FWD/REV MODE		
	JOG NO ▲ RESET	Cn-23	Overtorque detection level setting
	RUN DATA	160	Setting at factory prior to shipment (160%)
	▲ RESET	89	New setting (89%)
	STOP SET		
	DSPL ENTR		
	DRIVE PRG		

Contact Output Function

Setting Value	Description: Name	Description: Signal Level (Closed)	Setting prior to shipment
0	Contact during run	Closed During run	0
1	Contact at zero speed	Closed Zero speed	
2	Speed synchronized contact	Closed Speed synchronization	
3	Overtorque detected contact	Closed Overtorque detection	
4	Contact during UV	Closed During UV	

Digit \ Data	0	1	Setting prior to shipment
1st digit	Without overtorque detection	With overtorque detection	0000
2nd digit	Speed coincidence detection	Normal detection	
3rd digit	Continuous operation	Coasting stop	
4th digit			

Control constant No	Name	Unit	Setting range	Setting prior to shipment
Cn-23	Overtorque detection level	1 %	30 ~ 200 %	160 %

MEMO

TRANSISTOR INVERTER

Varispeed™ 616GⅡ

OPERATION MANUAL

A Better Tomorrow for Industry through Automation

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