

## Instruction manual for driving Toshiba Three-phase synchronous reluctance motor

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***TOSVERT™ VF-S15*** Y-A4/W4

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< At first, Please read this instruction manual. >

**Toshiba Industrial Products and Systems Corporation**

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| <ol style="list-style-type: none"><li>1. Make sure that this instruction manual is delivered to the end user of the inverter unit.</li><li>2. Read this manual before installing or operating the inverter unit, and store it in a safe place for reference.</li><li>3. All information contained in this manual will be changed without notice.<br/>Please visit our website for the latest information.</li></ol> |
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## Safety precautions

This instruction manual provides additional information in the instruction manual when using a Toshiba three-phase synchronous reluctance motor (SynRM) with the VF-S15. Please also refer to the safety precautions, labels, diagrams and symbols described in the inverter instruction manual E6582175 (for Y-W4) or E6581926 (for Y-A4). Please visit our website for the latest information.

The contents described in the instruction manual, on the inverter itself and this instruction manual are very important so that you can use safely the inverter, prevent injury to yourself and other people around you as well as to prevent damage to property in the area. Thoroughly familiarize yourself with the symbols and indications shown below and then continue to read the manual. Make sure that you observe all warnings given.

### Explanation of markings

| Marking                                                                                          | Meaning of marking                                                                                                                |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|  <b>WARNING</b> | Indicates a hazardous situation that, if not avoided, could result in death or serious injury.                                    |
|  <b>CAUTION</b> | Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.                                   |
| <b>NOTICE</b>                                                                                    | Indicates information considered important but not hazard-related. It is used to address practices not related to physical injury |

### Meanings of symbols

| Symbol                                                                              | Meaning of symbol                                                                                                                                             |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Indicates a prohibition (Do not do it). Detailed information on the prohibition is described in illustration and text in or near the symbol.                  |
|  | Indicates a mandatory action that must be followed. Detailed information on the mandatory action is described in illustration and text in or near the symbol. |
|  | Indicates a warning or caution. Detailed information on the warning or caution is described in illustration and text in or near the symbol.                   |

The following provides additional safety precautions for using the Toshiba Three-phase Synchronous Reluctance Motor Inverter VF-S15 Y-W4/A4.

|  <b>WARNING</b> |                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | <ul style="list-style-type: none"> <li>• Read this instruction manual and VF-S15 instruction manual E6582175 (for Y-W4) or E6581926 (for Y-A4) before installing or operating the inverter unit.</li> </ul> <p>Otherwise, it will result in electric shock, fire and other injuries.</p> |

### ■ Limits in purpose

This inverter is designed to control the speeds of Toshiba three-phase synchronous reluctance motors and Three-phase induction motor exclusively.

|  <b>Safety precautions</b>                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>▼ Do not use the product for any loads other than Toshiba three-phase synchronous reluctance motors, and Three-phase induction motors for general industrial usage. Our inverter cannot drive a single-phase motor.</p> |

### ■ Transportation & installation

|  <b>WARNING</b>          |                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Mandatory action</p> | <ul style="list-style-type: none"> <li>• Install an appropriate short circuit protection device (MCCB, ELCB, fuse, and so on) between the power supply and the inverter (primary side). If the appropriate short circuit protection device is not installed, the short circuit current cannot be interrupted only with the inverter, it can result in fire.</li> </ul> |

|  <b>CAUTION</b>          |                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Mandatory action</p> | <ul style="list-style-type: none"> <li>• Do not carry heavy objects by hand. It can result in injury. Ensure operator safety and prevent any damage to the product by handling it with the utmost care.</li> </ul> |

| <b>NOTICE</b>                                                                                          |                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Prohibition</p> | <ul style="list-style-type: none"> <li>• Do not install a Motor-end surge voltage suppression filter (MSF, MSL), or other options on the inverter output side. It can cause unstable motor control, and result in step-out or motor failure.</li> </ul> |

## ■ Wiring

|  <b>WARNING</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Prohibition | <ul style="list-style-type: none"> <li>Do not insert a braking resistor between DC terminals [PA/+] and [PC/-] or [PO] and [PC/-].<br/>This will result in fire.<br/>Connect the braking resistor in accordance with the section “Connecting an external braking resistor (optional)” provided in the instruction manual.</li> <li>Do not connect anything other than the specified Toshiba three-phase synchronous reluctance motor and Three-phase induction motor to the output (motor-side) terminals.<br/>Do not connect multiple motors, even with the specified Toshiba three-phase synchronous reluctance motor,<br/>It will result in the inverter damaged or malfunction.</li> </ul> |

## ■ Operations

|  <b>WARNING</b>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Prohibition | <ul style="list-style-type: none"> <li>Stand clear of the motors or the machines.<br/>It may cause unexpected injury.<br/>Since the auto-restart after momentary stop function [F301: Auto-restart]= “4: At startup” is set for the Toshiba three-phase synchronous reluctance motor drive, the motors and machines that have stopped due to a momentary power failure will restart suddenly after power is restored.<br/>Attach caution labels indicating functions programmed for Auto restart on inverters, motors and machines to prevent accidents.</li> <li>Stand clear of the motors or the machines that have stopped temporarily due to tripping stop, when the retry function is selected.<br/>The motors and machines will restart suddenly, and this will result in injury.<br/>Design the system to ensure the safety even if the motor restarts, for example by installing a protective cover on the motor.</li> </ul> |

|  <b>CAUTION</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Mandatory action | <ul style="list-style-type: none"> <li>• Use an inverter that matches the specifications of both the operating Toshiba three-phase synchronous reluctance motor and the power supply.<br/>Using an unsuitable inverter will lead not only preventing the correct motor operating but also serious accidents such as overheating or fire.</li> <li>• Set the parameter values for driving Toshiba three-phase synchronous reluctance motors into the inverter correctly.<br/>Incorrect parameter settings can cause inverter and motor improper operation and it can result in injury.</li> <li>• When driving a three-phase induction motor, set [Pt: V/F Control Mode Selection] to "0 ~ 2".<br/>If a value intended for driving a Toshiba three-phase synchronous reluctance motor is set for [Pt: V/F Control Mode Selection], the motor will operate incorrectly, and it can result in injury or motor failure.<br/>[Pt: V/F Control Mode Selection] = "3 ~ 8" control mode cannot be used with the Y-A4/W4 model. The control mode for [Pt] set to "3 ~ 8" is equivalent to the [Pt] = "0" setting.</li> </ul> |
| <br>Prohibition    | <ul style="list-style-type: none"> <li>• Do not set functions listed as "Unavailable Functions" on VF-S15 Y-A4/W4.<br/>It can result in injury, due to no operation of function or the unexpected operation of the inverter and the motor.</li> <li>• Do not copy parameter settings between VF-S15 Y-A4/W4 (for Toshiba three-phase synchronous reluctance motor drive) and standard VF-S15 by using the parameter writer or Inverter Maintenance Communication Application.<br/>It can result in injury, due to no operation of function or the unexpected operation of the inverter and the motor by the failure to copy the intended parameters correctly.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## I. Introduction

This product is an inverter designed for driving Toshiba three-phase synchronous reluctance motors(SynRM).

The differences from the standard VF-S15 series are the type-form, the implementation of software (parameters) for driving three-phase synchronous reluctance motors, and the terminal functions of the control circuit terminal block.

This manual focuses on above differences. For other operating instructions, refer to the model comparison table in Section 2 and check by the "VF-S15 Instruction Manual - Detailed Version" (E6582175 for Y-W4, E6581926 for Y-A4)

When driving three-phase synchronous reluctance motors by VF-S15 Y-A4/W4, be sure to use only in combination with Toshiba three-phase synchronous reluctance motors.

The following instruction manual and information are available via the internet at

"<https://www.toshiba-tips.co.jp/en/products/inverter/standard.html>".



A hard copy of this information may be ordered to Toshiba sales representative or the contact address shown below.

### Instruction manual

E6582175: VF-S15 Instruction manual <Detailed manual> for Y-W4.

E6581926: VF-S15 Instruction manual <Detailed manual> for Y-A4.

### Compliance with safety standards

E6581860: VF-S15 Safety function manual (Original instructions).

### Compliance with ATEX

E6581861: ATEX Guide.

### Low Voltage Directive 2014/35/EU

E6582444: Additional manual.

### Declaration of Conformity

#### Ecodesign: technical data

For technical data of ecodesign requirement, access the following website,

"<https://www.toshiba-tips.co.jp/en/products/inverter/>"

Refer to the technical data of standard model for this product.



### • Contact address

Toshiba Industrial Products and Systems Corporation

72-34, Horikawa-cho, Saiwai-Ku, Kawasaki, Kanagawa 212-8585, Japan

TEL : +81-44-520-0828

## 1. Check product purchase

Before using the product you have purchased, check to make sure that it is exactly what you ordered.

**Rating label**

**VF-S15**  
3PH-380/500V-1.5kW/2HP

Model  
Power supply  
Motor capacity

**Inverter main unit**

**Carton box**

Type indication label

**Setup sheet**

| Parameter setting | EU          | AS            | IR            | US          | JP |
|-------------------|-------------|---------------|---------------|-------------|----|
| Main region       | Europe      | Asia, Oceania | North America | Japan       |    |
| Motor             | 230/400 (V) | 230/400 (V)   | 230/460 (V)   | 200/400 (V) |    |
|                   | 50 (Hz)     | 50 (Hz)       | 60 (Hz)       | 60 (Hz)     |    |

Note) Please set a slide switch SW1 to select Sink, Source logic, or PLC (external power input). See the instruction manual in details.

**Quick start manual**

**Danger label kit**

Danger labels for sticking in 6 languages.

**Name plate**

**TOSHIBA**  
TRANSISTOR INVERTER  
**VFS15-4015PL1Y-W4**  
1.5kW-3.1kVA-2HP (0)

| INPUT                                                     | OUTPUT                |
|-----------------------------------------------------------|-----------------------|
| U(V) 3PH 380... 480(UL)500                                | 3PH 380... 480(UL)500 |
| F(Hz) 50/60                                               | 0.1...500             |
| I(A) 6.4                                                  | 4.1                   |
| Loss 2.0 % (90, 100), Level IE2                           |                       |
| SCCR : for rating and protection refer to Manual E6582383 |                       |
| Serial No. 8547 22214407 0001 (2)                         |                       |
| IP20 Made in Indonesia 2025                               |                       |
| Motor Overload Protection Class 20                        |                       |

**Danger label**

**VF-S15 Y-W4/A4**  
Important Information  
Before Use

- English / French
- German / English / French
- Italian / English / French
- Spanish / English / French
- Chinese / English / French

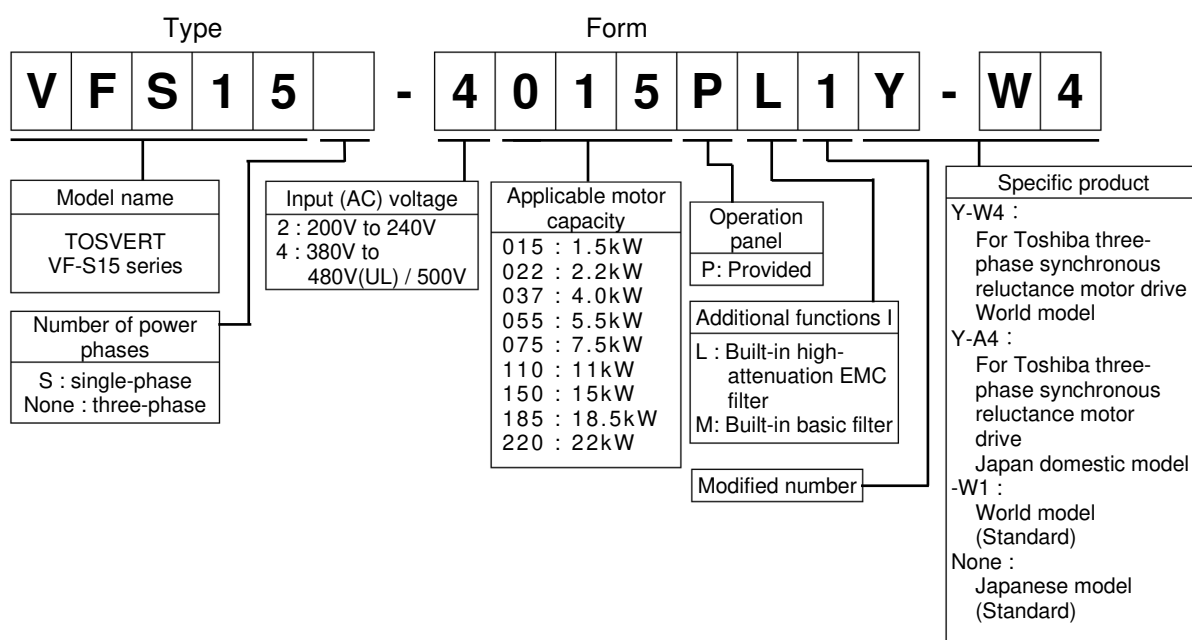
## 2. Type - form

The lineup for the VF-S15 Y-A4/W4 designed for driving Toshiba three-phase synchronous reluctance motors are as follows.

### Line up

- 3-phase 240V class 1.5 to 15 kW (for only Y-A4 model)
- 1-phase 240V class 1.5 to 2.2 kW (for only Y-A4 model)
- 3-phase 500V class 1.5 to 22 kW (18.5kW and 22kW are for only Y-W4 model.)

The Type-form of the standard VF-S15 series and the VF-S15 for driving Toshiba three-phase synchronous reluctance motors Y-A4/W4 correspond as shown below.



- \* 18.5kW and 22kW in 500V class are for only Y-W4 model.
- \* 1-phase 240V class and 3-phase 240V class are for only Y-A4 model.



### 3. Parameter settings for driving Toshiba three-phase synchronous reluctance motors

|                                                                                                              |                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>CAUTION</b>             |                                                                                                                                                                                                                                                                                 |
| <br><b>Mandatory action</b> | <ul style="list-style-type: none"> <li>Set the parameter values for driving Toshiba three-phase synchronous reluctance motors into the inverter correctly. Incorrect parameter settings can cause inverter and motor improper operation and it can result in injury.</li> </ul> |

Set the parameter values from the “Parameter List” for driving Toshiba three-phase synchronous reluctance motors into the inverter.

**\*3** indicates that the parameter value must be set according to the “Parameter List” and must not be changed.

Incorrect parameter settings can cause inverter and motor failure or improper operation.

The “parameter list” is supplied either with the motor or from the sales office.

If you do not have the “Parameter List” on hand, please contact the sales office where you purchased the Toshiba three-phase synchronous reluctance motor.

#### (1) Parameters to be set for driving Toshiba three-phase synchronous reluctance motor.

| Title | Communication No. | Function                                     | Unit | Minimum setting unit<br>Panel/Communication | Default setting          | User setting | Min. Value | Max. Value     |
|-------|-------------------|----------------------------------------------|------|---------------------------------------------|--------------------------|--------------|------------|----------------|
| FH    | 0011              | Maximum frequency                            | Hz   | 0.1/0.01                                    | 80.0                     | <b>*3</b>    | 30.0       | 500.0          |
| UL    | 0012              | Upper limit frequency                        | Hz   | 0.1/0.01                                    | 60.0<br>*1               | <b>*3</b>    | 0.5        | FH             |
| vL    | 0014              | Base frequency 1                             | Hz   | 0.1/0.01                                    | 60.0<br>*1               | <b>*3</b>    | 20.0       | 500.0          |
| vLv   | 0409              | Base frequency voltage 1                     | V    | 1/0.1                                       | 200<br>(400)<br>*1 *2 *4 | <b>*3</b>    | 50         | 330<br>(660)*4 |
| Pt    | 0015              | V/F control mode selection                   | -    | -                                           | 2<br>*1                  | <b>*3</b>    | 0          | 9              |
| F300  | 0300              | PWM carrier frequency                        | kHz  | 0.1/0.1                                     | 12 or 4<br>*2            | <b>*5</b>    | 2.0        | 16.0           |
| F301  | 0301              | Auto-restart control selection               | -    | -                                           | 0                        | <b>*3</b>    | 0          | 4              |
| F310  | 0310              | SRM specific coefficient 1                   | sec  | 0.1/0.1                                     | 0.0                      | <b>*3</b>    | 0.0        | 320.0          |
| F316  | 0316              | PWM carrier frequency control mode selection | -    | -                                           | 1<br>(5)<br>*2 *4        | <b>*3</b>    | 0          | 5              |

\*1: Default setting values vary depending on the setup menu setting. Refer to “VF-S15 Instruction manual”.

\*2: Default setting values vary depending on the capacity. Refer to “VF-S15 Instruction manual” E6582175 for Y-W4 or E6581926 for Y-A4.

**\*3: Set the parameters by the “Parameter list” value. Do not change from the set value.**

\*4: The parentheses “( )” shows the value of 500V class.

**\*5: Refer to the “Parameter List” for setting.**

The adjustable range is 3.0 to 3.5 kHz for the recommended value: 3.3 kHz, and 6.0 to 7.0 kHz for the recommended value: 6.6 kHz. Settings outside of these ranges cannot be used.

\*6: “SRM specific coefficient” is Synchronous Reluctance Motor specific coefficient.

| Title | Communication No. | Function                     | Unit              | Minimum setting unit Panel/Communication | Default setting | User setting | Min. Value | Max. Value |
|-------|-------------------|------------------------------|-------------------|------------------------------------------|-----------------|--------------|------------|------------|
| F401  | 0401              | SRM specific coefficient 2   | %                 | 1/1                                      | 70              | <b>*3</b>    | 0          | 250        |
| F402  | 0402              | Automatic torque boost value | %                 | 0.1/0.1                                  | *2              | <b>*3</b>    | 0.1        | 30.0       |
| F405  | 0405              | Motor rated capacity         | kW                | 0.01/0.01                                | *2              | <b>*3</b>    | 0.01       | 22.00      |
| F412  | 0412              | SRM specific coefficient 3   | %                 | 0.1/0.1                                  | 5.0             | <b>*3</b>    | 0.0        | 25.0       |
| F415  | 0415              | Motor rated current          | A                 | 0.01/0.01                                | *2              | <b>*3</b>    | 0.10       | 100.0      |
| F417  | 0417              | Motor rated speed            | min <sup>-1</sup> | 1/1                                      | *1 *2           | <b>*3</b>    | 100        | 64000      |
| F419  | 0419              | SRM specific coefficient 4   | %                 | 1/1                                      | 100             | <b>*3</b>    | 0          | 1000       |
| F420  | 0420              | SRM specific coefficient 5   | mH                | 0.01/0.01                                | 10.00           | <b>*3</b>    | 0.01       | 650.0      |
| F421  | 0421              | SRM specific coefficient 6   | mH                | 0.01/0.01                                | 10.00           | <b>*3</b>    | 0.01       | 650.0      |
| F422  | 0422              | SRM specific coefficient 7   | mH                | 0.01/0.01                                | 10.00           | <b>*3</b>    | 0.01       | 650.0      |
| F423  | 0423              | SRM specific coefficient 8   | mH                | 0.01/0.01                                | 10.00           | <b>*3</b>    | 0.01       | 650.0      |
| F424  | 0424              | SRM specific coefficient 9   | %                 | 1/1                                      | 100             | <b>*3</b>    | 1          | 150        |
| F425  | 0425              | SRM specific coefficient 10  | -                 | 0.1/0.1                                  | 150.0           | <b>*3</b>    | 135.0      | 179.0      |
| F426  | 0426              | SRM specific coefficient 11  | -                 | 0.1/0.1                                  | 170.0           | <b>*3</b>    | 135.0      | 179.0      |
| F427  | 0427              | SRM specific coefficient 12  | -                 | 1/1                                      | 5242            | <b>*3</b>    | 0          | 32767      |
| F428  | 0428              | SRM specific coefficient 13  | -                 | 1/1                                      | 80              | <b>*3</b>    | 0          | 4096       |
| F429  | 0429              | SRM specific coefficient 14  | -                 | 0.01/0.01                                | 1.00            | <b>*3</b>    | 0.50       | 1.50       |
| F430  | 0430              | SRM specific coefficient 15  | -                 | 0.1/0.1                                  | 2.0             | <b>*3</b>    | 0.1        | 10.0       |
| F431  | 0431              | SRM specific coefficient 16  | -                 | 1/1                                      | 1               | <b>*3</b>    | 1          | 50         |
| F432  | 0432              | SRM specific coefficient 17  | -                 | 1/1                                      | 1               | <b>*3</b>    | 1          | 10         |
| F433  | 0433              | SRM specific coefficient 18  | -                 | 0.1/0.1                                  | 0.0             | <b>*3</b>    | -10.0      | 10.0       |
| F434  | 0434              | SRM specific coefficient 19  | -                 | 0.1/0.1                                  | 0.0             | <b>*3</b>    | -10.0      | 10.0       |
| F435  | 0435              | SRM specific coefficient 20  | -                 | 1/1                                      | 0               | <b>*3</b>    | 0          | 250        |

\*1: Default setting values vary depending on the setup menu setting. Refer to "VF-S15 Instruction manual".

\*2: Default setting values vary depending on the capacity. Refer to "VF-S15 Instruction manual" E6582175 for Y-W4 or E6581926 for Y-A4.

**\*3: Set the parameters by the "Parameter list" value. Do not change from the set value.**

\*6: "SRM specific coefficient" is Synchronous Reluctance Motor specific coefficient.

| Title | Communication No. | Function                                  | Unit | Minimum setting unit Panel/Communication | Default setting | User setting | Min. Value | Max. Value |
|-------|-------------------|-------------------------------------------|------|------------------------------------------|-----------------|--------------|------------|------------|
| F436  | 0436              | SRM specific coefficient 21               | %    | 1/1                                      | 20              | <b>*3</b>    | 1          | 100        |
| F437  | 0437              | SRM specific coefficient 22               | -    | 1/1                                      | 15              | <b>*3</b>    | 1          | 100        |
| F438  | 0438              | SRM specific coefficient 23               | -    | 0.1/0.1                                  | 1.5             | <b>*3</b>    | 0.1        | 100.0      |
| F439  | 0439              | SRM specific coefficient 24               | %    | 1/1                                      | 40              | <b>*3</b>    | 0          | 100        |
| F440  | 0440              | SRM specific coefficient 25               | -    | 0.1/0.1                                  | 1.0             | <b>*3</b>    | 1.0        | 10.0       |
| F441  | 0441              | Power running torque limit 1 level        | %    | 1/1                                      | 250             | <b>*3</b>    | 0          | 250        |
| F443  | 0443              | Regenerative braking torque limit 1 level | %    | 1/1                                      | 250             | <b>*3</b>    | 0          | 250        |
| F444  | 0444              | Power running torque limit 2 level        | %    | 1/1                                      | 250             | <b>*3</b>    | 0          | 250        |
| F445  | 0445              | Regenerative braking torque limit 2 level | %    | 1/1                                      | 250             | <b>*3</b>    | 0          | 250        |
| F446  | 0446              | SRM specific coefficient 26               | %    | 1/1                                      | 8               | <b>*3</b>    | 0          | 50         |
| F447  | 0447              | SRM specific coefficient 27               | -    | 1/1                                      | 15              | <b>*3</b>    | 5          | 100        |
| F448  | 0448              | SRM specific coefficient 28               | %    | 1/1                                      | 50              | <b>*3</b>    | 5          | 200        |
| F458  | 0458              | SRM specific coefficient 29               | -    | 1/1                                      | 101             | <b>*3</b>    | 0          | 101        |
| F459  | 0459              | Load inertia moment ratio                 | -    | 0.1/0.1                                  | 1.5             | <b>*3</b>    | 0.1        | 100.0      |
| F460  | 0460              | SRM specific coefficient 30               | -    | 0.1/0.1                                  | 0.0             | <b>*3</b>    | 0.0        | 25.0       |
| F461  | 0461              | SRM specific coefficient 31               | -    | 0.01/0.01                                | 1.00            | <b>*3</b>    | 0.50       | 2.50       |
| F462  | 0462              | Speed reference filter coefficient        | -    | 1/1                                      | 35              | <b>*3</b>    | 0          | 100        |
| F468  | 0468              | SRM specific coefficient 32               | -    | 0.01/0.01                                | 1.00            | <b>*3</b>    | 0.01       | 1.50       |
| F487  | 0487              | SRM specific coefficient 33               | -    | 1/1                                      | 0               | <b>*3</b>    | 0          | 255        |
| F488  | 0488              | SRM specific coefficient 34               | -    | 1/1                                      | 0               | <b>*3</b>    | 0          | 150        |
| F494  | 0494              | SRM specific coefficient 35               | -    | 1/1                                      | 100             | <b>*3</b>    | 100        | 600        |
| F495  | 0495              | SRM specific coefficient 36               | %    | 1/1                                      | 104             | <b>*3</b>    | 90         | 120        |
| F497  | 0497              | SRM specific coefficient 37               | -    | 1/1                                      | 0               | <b>*3</b>    | 0          | 65535      |
| F498  | 0498              | SRM specific coefficient 38               | -    | 1/1                                      | 0               | <b>*3</b>    | 0          | 65535      |
| F909  | 0909              | SRM specific coefficient 39               | %    | 1/1                                      | 0               | <b>*3</b>    | 0          | 100        |

**\*3: Set the parameters by the “Parameter list” value. Do not change from the set value.**

**\*6: “SRM specific coefficient” is Synchronous Reluctance Motor specific coefficient.**

| Title | Communication No. | Function                         | Unit | Minimum setting unit Panel/Communication | Default setting | User setting | Min. Value | Max. Value |
|-------|-------------------|----------------------------------|------|------------------------------------------|-----------------|--------------|------------|------------|
| F910  | 0910              | Step-out detection current level | %    | 1/0.01                                   | 100             | <b>*3</b>    | 1          | 150        |
| F911  | 0911              | Step-out detection time          | sec  | 0.01/0.01                                | 0.00            | <b>*3</b>    | 0.00       | 2.55       |
| F912  | 0912              | SRM specific coefficient 40      | mH   | 0.01/0.01                                | 10.00           | <b>*3</b>    | 0.01       | 650.0      |
| F913  | 0913              | SRM specific coefficient 41      | mH   | 0.01/0.01                                | 10.00           | <b>*3</b>    | 0.01       | 650.0      |
| F916  | 0916              | SRM specific coefficient 42      | %    | 1/1                                      | 25              | <b>*3</b>    | 0          | 100        |
| F922  | 0922              | SRM specific coefficient 43      | Hz   | 1/1                                      | 15              | <b>*3</b>    | 5          | 80         |
| F923  | 0923              | SRM specific coefficient 44      | %    | 1/1                                      | 25              | <b>*3</b>    | 5          | 100        |
| F924  | 0924              | SRM specific coefficient 45      | Hz   | 1/1                                      | 30              | <b>*3</b>    | 1          | 80         |
| F925  | 0925              | SRM specific coefficient 46      | -    | 0.01/0.01                                | 1.00            | <b>*3</b>    | 0.50       | 2.50       |

**\*3: Set the parameters by the "Parameter list" value. Do not change from the set value.**

**\*6: "SRM specific coefficient" is Synchronous Reluctance Motor specific coefficient.**

## (2) Default settings by inverter rating -1

| Inverter type | Torque boost value | PWM carrier frequency | Dynamic braking resistance | Dynamic braking resistor capacity | Automatic torque boost value | Motor rated capacity |
|---------------|--------------------|-----------------------|----------------------------|-----------------------------------|------------------------------|----------------------|
|               | Vb(%)<br>F172(%)   | F300(kHz)             | F308(Ω)                    | F309(kW)                          | F402(%)                      | F405(kW)             |
| VFS15-2015PM  | 4.8                | 12.0                  | 75.0                       | 0.12                              | 4.4                          | 1.50                 |
| VFS15-2022PM  | 3.1                | 12.0                  | 75.0                       | 0.12                              | 2.9                          | 2.20                 |
| VFS15-2037PM  | 3.1                | 12.0                  | 40.0                       | 0.12                              | 2.8                          | 3.70                 |
| VFS15-2055PM  | 2.5                | 12.0                  | 15.0                       | 0.44                              | 2.3                          | 5.50                 |
| VFS15-2075PM  | 2.3                | 12.0                  | 15.0                       | 0.44                              | 2.0                          | 7.50                 |
| VFS15-2110PM  | 1.8                | 12.0                  | 7.5                        | 0.88                              | 1.6                          | 11.00                |
| VFS15-2150PM  | 1.6                | 12.0                  | 7.5                        | 0.88                              | 1.5                          | 15.00                |
| VFS15S-2015PL | 4.8                | 12.0                  | 75.0                       | 0.12                              | 4.4                          | 1.50                 |
| VFS15S-2022PL | 3.1                | 12.0                  | 75.0                       | 0.12                              | 2.9                          | 2.20                 |
| VFS15-4015PL1 | 4.8                | 12.0                  | 200.0                      | 0.12                              | 4.4                          | 1.50                 |
| VFS15-4022PL1 | 3.1                | 12.0                  | 200.0                      | 0.12                              | 2.9                          | 2.20                 |
| VFS15-4037PL1 | 3.1                | 12.0                  | 160.0                      | 0.12                              | 2.8                          | 3.70                 |
| VFS15-4055PL  | 2.5                | 12.0                  | 60.0                       | 0.44                              | 2.3                          | 5.50                 |
| VFS15-4075PL  | 2.3                | 12.0                  | 60.0                       | 0.44                              | 2.0                          | 7.50                 |
| VFS15-4110PL  | 1.8                | 12.0                  | 30.0                       | 0.88                              | 1.6                          | 11.00                |
| VFS15-4150PL  | 1.6                | 12.0                  | 30.0                       | 0.88                              | 1.5                          | 15.00                |
| VFS15-4185PL  | 1.5                | 4.0                   | 30.0                       | 0.88                              | 1.4                          | 18.50                |
| VFS15-4220PL  | 1.7                | 4.0                   | 15.0                       | 1.76                              | 1.6                          | 22.00                |

## (3) Default settings by inverter rating -2

| Inverter type | Motor rated current | Motor no-load | Motor rated speed                     |                                        | Over-voltage stall protection level | Integrating wattmeter display unit selection |
|---------------|---------------------|---------------|---------------------------------------|----------------------------------------|-------------------------------------|----------------------------------------------|
|               | F415(A)             | F416(%)       | F417 (JP,USA)<br>(min <sup>-1</sup> ) | F417 (ASIA,EU)<br>(min <sup>-1</sup> ) | F626(%)                             | F749                                         |
| VFS15-2015PM  | 6.40                | 42            | 1740                                  | 1445                                   | 136                                 | 0                                            |
| VFS15-2022PM  | 9.40                | 50            | 1755                                  | 1460                                   | 136                                 | 0                                            |
| VFS15-2037PM  | 14.60               | 38            | 1755                                  | 1460                                   | 136                                 | 1                                            |
| VFS15-2055PM  | 21.40               | 41            | 1760                                  | 1465                                   | 136                                 | 1                                            |
| VFS15-2075PM  | 28.60               | 38            | 1755                                  | 1460                                   | 136                                 | 1                                            |
| VFS15-2110PM  | 42.00               | 38            | 1770                                  | 1475                                   | 136                                 | 1                                            |
| VFS15-2150PM  | 55.60               | 33            | 1760                                  | 1470                                   | 136                                 | 1                                            |
| VFS15S-2015PL | 6.40                | 42            | 1740                                  | 1445                                   | 136                                 | 0                                            |
| VFS15S-2022PL | 9.40                | 50            | 1755                                  | 1460                                   | 136                                 | 0                                            |
| VFS15-4015PL1 | 3.20                | 42            | 1740                                  | 1445                                   | 141                                 | 0                                            |
| VFS15-4022PL1 | 4.70                | 50            | 1755                                  | 1460                                   | 141                                 | 0                                            |
| VFS15-4037PL1 | 7.30                | 38            | 1755                                  | 1460                                   | 141                                 | 1                                            |
| VFS15-4055PL  | 10.70               | 41            | 1760                                  | 1465                                   | 141                                 | 1                                            |
| VFS15-4075PL  | 14.30               | 38            | 1755                                  | 1460                                   | 141                                 | 1                                            |
| VFS15-4110PL  | 21.00               | 38            | 1770                                  | 1475                                   | 141                                 | 1                                            |
| VFS15-4150PL  | 27.80               | 33            | 1760                                  | 1470                                   | 141                                 | 1                                            |
| VFS15-4185PL  | 34.50               | 37            | 1770                                  | 1475                                   | 141                                 | 1                                            |
| VFS15-4220PL  | 40.00               | 32            | 1760                                  | 1470                                   | 141                                 | 1                                            |

#### 4. Precautions for application of driving Toshiba three-phase synchronous reluctance motors

|  <b>CAUTION</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Mandatory action | <ul style="list-style-type: none"> <li>• Set the parameter values for driving Toshiba three-phase synchronous reluctance motors into the inverter correctly. Incorrect parameter settings can cause inverter and motor improper operation and it can result in injury.</li> <li>• When driving a three-phase induction motor, set [Pt: V/F Control Mode Selection] to "0 ~ 2". If a value intended for driving a Toshiba three-phase synchronous reluctance motor is set for [Pt: V/F Control Mode Selection], the motor will operate incorrectly, and it can result in injury or motor failure. [Pt: V/F Control Mode Selection] = "3 ~ 8" control mode cannot be used with the Y-A4/W4 model. The control mode for [Pt] set to "3 ~ 8" is equivalent to the [Pt] = "0" setting.</li> </ul> |

##### 1) Operating Frequency Range

It varies depending on the operating motor specifications.

1. [vL: Base frequency] : For 60 Hz specifications, operate at 80 Hz or below.
2. [vL: Base frequency] : For 125 Hz specifications, operate at 144 Hz or below.

##### 2) Overload Conditions

When "OL3" occurs due to over-torque at low speed (mainly below 15 Hz), Increase the inverter and motor rating.

##### 3) Acceleration and Deceleration Rate

The acceleration and deceleration time settings must be adjusted and verified according to the load.

Set the acceleration and deceleration times so that the torque during acceleration and deceleration does not exceed the parameter values specified in the "parameter List":

- [F441: Power running torque limit level 1]
- [F443: Regenerative braking torque limit 1 level]
- [F444: Power running torque limit level 2]
- [F445: Regenerative braking torque limit 2 level]

##### 4) Load inertia moment ratio

[F459: The load inertia moment ratio] must be adjusted and verified according to the load inertia.

Set the ratio as (Load Inertia + Motor Inertia) / Motor Inertia.

#### 5) Magnetic Noise of the Motor

Magnetic noise can be audible from the motor when operating in the range from 0 Hz up to approximately 30% of [vL: base frequency]. This is a normal phenomenon due to control characteristics and does not indicate any malfunction.

#### 6) [F300: PWM carrier frequency]

Be sure to refer to section 4 and set [F300: PWM carrier frequency] for driving the Toshiba three-phase synchronous reluctance motor.

#### 7) [Pt: V/F control mode selection]

When driving a Toshiba three-phase synchronous reluctance motor, be sure to set [Pt: V/F control mode selection] correctly.

Do not use the Pt value specified for Toshiba three-phase synchronous reluctance motor drive with any other type of motor.

## 5. Functions Not Available

|  <b>CAUTION</b> |                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Prohibition | <ul style="list-style-type: none"> <li>Do not set functions listed as “Unavailable Functions” on VF-S15 Y-A4/W4.</li> </ul> <p>It can result in injury, due to no operation of function or the unexpected operation of the inverter and the motor.</p> |

The following functions cannot be used on VF-S15 Y-A4/W4.

Regardless of [Pt: V/F control mode selection] setting, these functions are not available.

In addition, setting these functions via terminal input or communication commands is also prohibited.

### 1) List of Unavailable Functions

| No. | Function                                                                                                                                                      |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | [Pt: V/F control mode selection] = 3 ~ 8 control mode<br>(The control mode for [Pt] set to “3 ~ 8” is equivalent to the [Pt] = “0” setting.)                  |
| 2   | [AU2: Torque boost setting macro function]                                                                                                                    |
| 3   | [F312: Random mode]                                                                                                                                           |
| 4   | [F400: Auto-tuning] = 1 ~ 5 setting                                                                                                                           |
| 5   | Brake sequence operation function<br>Brake release (Output terminal functions 68, 69)                                                                         |
| 6   | [F262: Panel jog run operation mode]<br>Jog run mode (Input terminal function number 18, 19)<br>In jogging operation (Output terminal function number 52, 53) |
| 7   | Drooping control function                                                                                                                                     |
| 8   | Servo lock                                                                                                                                                    |
| 9   | [F454: Constant output zone torque limit selection]                                                                                                           |
| 10  | 2nd V/F control mode switching<br>(Input terminal function number 28, 29 and related parameters)                                                              |
| 11  | No.2 motor switching<br>(Input terminal function number 152, 153 and related parameters)                                                                      |
| 12  | DC braking function                                                                                                                                           |

### 2) Changed Parameter Settings for Unavailable Functions

The following parameters have set to 0 for all of their upper limit, lower limit and default setting value.

These parameters cannot be changed.

| Title | Function                                    | Default setting |
|-------|---------------------------------------------|-----------------|
| AU2   | Torque boost setting macro function         | Fixed at 0      |
| F257  | Factory specific coefficient 2B             | Fixed at 0      |
| F258  | Factory specific coefficient 2C             | Fixed at 0      |
| F262  | Panel jog run mode                          | Fixed at 0      |
| F312  | Random mode                                 | Fixed at 0      |
| F320  | Droop gain                                  | Fixed at 0      |
| F341  | Braking mode selection                      | Fixed at 0      |
| F400  | Auto-tuning                                 | Fixed at 0      |
| F454  | Constant output zone torque limit selection | Fixed at 0      |



## 3) List of Parameters prohibiting change for Unavailable Functions

Do not change the following parameters from their default values

| Title | Function                      | Default setting   |
|-------|-------------------------------|-------------------|
| F250  | DC braking starting frequency | 0 (Do not change) |
| F254  | Motor shaft fixing control    | 0 (Do not change) |

## 4) List of parameters for conditionally available

These parameter setting can be changed only to [F605] = "3" and [F302] = "1" or "2".

| Title | Function                                                                                                                                                  | Default setting                 |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| F605  | Output phase failure detection selection<br>(Available only 3: During operation)                                                                          | 0<br>(available only 3)         |
| F302  | Regenerative power ride-through control<br>(Available only<br>1: Regenerative power ride-through Control or<br>2: Deceleration stop during power failure) | 0<br>(Available only 1<br>or 2) |

## 6. About copying parameters

|  <b>CAUTION</b> |                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Prohibition | <ul style="list-style-type: none"> <li>Do not copy parameter settings between VF-S15 Y-A4/W4 (for Toshiba three-phase synchronous reluctance motor drive) and standard VF-S15 by using the parameter writer.<br/>It can result in injury, due to no operation of function or the unexpected operation of the inverter and the motor by the failure to copy the intended parameters correctly.</li> </ul> |

It is possible to copy parameter data from VF-S15 (Y-A4/W4) to another VF-S15 (Y-A4/W4) by using a parameter writer (RKP002Z, PWU003Z).

However, the intended parameter data can not be copied correctly among the standard VF-S15, because the available parameters differ significantly for the difference of "SRM specific coefficient" parameters in section 3 and "Functions Not Available" described in section 5.

When using the maintenance communication software (PCM002Z) and handling parameter data whose CPU1 version is different from that of the connected unit, ensure to disable "Check the Inverter Type-Form" option setting in the "Environment Options" menu before initiating any configuration or data-transfer procedures.

## 7. Optional external devices

| <b>NOTICE</b>                                                                                      |                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Prohibition | <ul style="list-style-type: none"> <li>Do not install a Motor-end surge voltage suppression filter (MSF, MSL), or other options on the inverter output side.<br/>It can cause unstable motor control, and result in step-out or motor failure.</li> </ul> |

For the Optional external devices selection, refer to section 10.4: Optional external devices in VF-S15 Instruction Manual (E6582175 for Y-W4 or E6581926 for Y-A4).

However, the Motor-end surge voltage suppression filter (MSF, MSL) and other options that use at the inverter output cannot be used because they cause influencing voltage drop at the inverter output. "Zero-phase reactor core-type radio noise reduction filter" can be used on the inverter output.

## 8. Models and their standard specifications

### 1) Standard specifications

Refer to section 12 in VF-S15 Instruction Manual (E6582175 for Y-W4, E6581926 for Y-A4).

### 2) Common specification

Refer to section 12 in VF-S15 Instruction Manual (E6582175 for Y-W4, E6581926 for Y-A4).

The different part are listed below.

| Item                        |                                          | Specification                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Principal control functions | Output frequency range                   | 0.1 to 500.0Hz,<br><b>Set the maximum frequency shown in the “Parameter list”.</b>                                                                                                                                                                                                                                                                                                              |
|                             | <b>Voltage/frequency characteristics</b> | V/f constant, variable torque, <b>Synchronous reluctance motor</b> ,<br>Base frequency (20-500Hz) adjusting, torque boost (0-30%),<br>adjusting frequency at start (0.1-10Hz)                                                                                                                                                                                                                   |
|                             | PWM carrier frequency                    | <b>Set the maximum frequency shown in the “Parameter list”.</b>                                                                                                                                                                                                                                                                                                                                 |
| Operation specifications    | DC braking                               | <b>Not available for use.</b>                                                                                                                                                                                                                                                                                                                                                                   |
|                             | Input terminal function (programmable)   | Possible to select from among about 110 functions, such as forward/reverse run signal input, jog run signal input, operation base signal input and reset signal input, to assign to 8 input terminals. Logic selectable between sink and source.<br><b>(However, the functions listed in section 5 (Functions Not Available) cannot be used.)</b>                                               |
|                             | Output terminal functions (programmable) | Possible to select from among about 150 functions, such as upper/lower limit frequency signal output, low speed detection signal output, specified speed reach signal output and failure signal output, to assign to FL relay output, open collector output terminal, and RY output terminals.<br><b>(However, the functions listed in section 5 (Functions Not Available) cannot be used.)</b> |
|                             | Jog run                                  | <b>Not available for use.</b>                                                                                                                                                                                                                                                                                                                                                                   |
|                             | Regenerative power ride through control  | Possible to keep the motor running using its regenerative energy in case of a momentary power failure (default: OFF).                                                                                                                                                                                                                                                                           |
| Protective function         | <b>Electronic thermal characteristic</b> | Switching between standard motor and constant-torque VF motor, setting of overload trip time, adjustment of stall prevention levels 1 & 2, selection of overload stall                                                                                                                                                                                                                          |
| Protective function         | Location of use                          | Indoors; not exposed to direct sunlight, corrosive gas, explosive gas, flammable gas, oil mist, dust, or metal powder ; and vibration of less than 5.9m/s <sup>2</sup> (10 to 55Hz).<br>/ <b>Non-hazardous location</b>                                                                                                                                                                         |

## 9. Restriction only for Y-W4 model

[AUL] must be set to default setting (“1: Constant torque characteristic”).