

6.19.4 Dynamic (regenerative) braking - For abrupt motor stop

F304: Dynamic braking selection

F308: Dynamic braking resistance

F309: Dynamic braking resistor capacity

F626: Over-voltage stall protection level

- Function

The inverter does not contain a braking resistor. Connect an external braking resistor in the following cases to enable dynamic braking function:

- 1) when decelerating the motor abruptly or if overvoltage tripping (\overline{OP}) occurs during deceleration stop
- 2) when a continuous regenerative status occurs during downward movement of a lift or the winding-out operation of a tension control machine
- 3) when the load fluctuates and results in a continuous regenerative status even during constant speed operation of a machine such as a press

[Parameter setting]

Title	Function	Adjustment range	Default setting
F304	Dynamic braking selection	0: Disabled 1: Enabled, Resistor overload protection enabled 2: Enabled 3: Enabled, Resistor overload protection enabled (At ST terminal on) 4: Enabled (At ST terminal on)	0
F308	Dynamic braking resistance	1.0-1000 (Ω)	Depending on models (See Section 11.4)
F309	Dynamic braking resistor capacity	0.01-30.00 (kW)	
F626	Over-voltage stall protection level	100-150 (%)	136 (240V class) 141 (500V class)

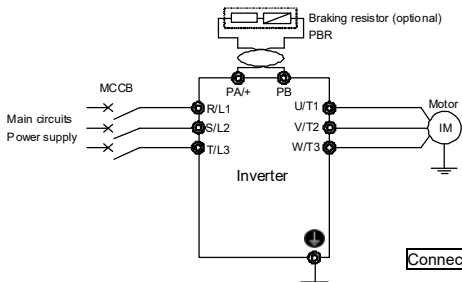
- Overload status of braking resistor can be output by assigning the braking resistor overload pre-alarm (function number : 30,31) to any logic output terminal.

Note 1) The operation level of dynamic braking is defined by parameter **F626**.

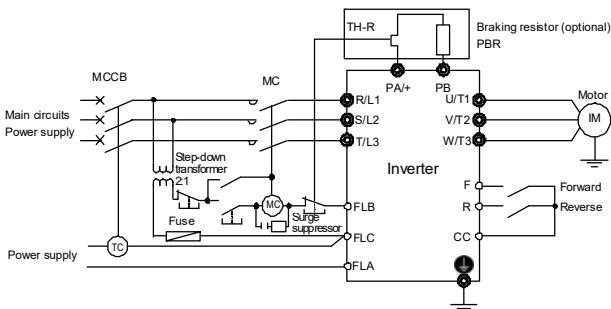
Note 2) In case of parameter **F304** = 1 to 4, the inverter will be automatically set as "without overvoltage limit operation" and controlled so that the resistor consumes the regenerative energy from the motor. (The same function as **F305** = 1)

1) Connecting an external braking resistor (optional)

Separate-optional resistor (with thermal fuse)



Connecting thermal relays and an external braking resistor



Note 1: A TC (Trip coil) is connected as shown in this figure when an MCCB with a trip coil is used instead of an MC. A step-down transformer is needed for every 500V-class inverter, but not for any 240V-class inverter.

Note 2: As a last resort to prevent fire, be sure to connect a thermal relay (THR). Although the inverter has a means of preventing overload and overcurrent to protect the braking resistor, the thermal relay is activated in case the protection function fails to work. Select and connect a thermal relay (THR) appropriately to the capacity (wattage) of the braking resistor.

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[Parameter setting]

Title	Function	Setting
<i>F304</i>	Dynamic braking selection	1
<i>F305</i>	Overvoltage limit operation	1
<i>F308</i>	Dynamic braking resistance	Proper value
<i>F309</i>	Dynamic braking resistor capacity	Proper value
<i>F626</i>	Over-voltage stall protection level	136 (%) (240V class) 141 (%) (500V class)

- To use this inverter in applications that create a continuously regenerative status (such as downward movement of a lift, a press or a tension control machine), or in applications that require deceleration stopping of a machine with a significant load inertial moment, increase the dynamic braking resistor capacity according to the operation rate required.
- To connect an external dynamic braking resistor, select one with a resultant resistance value greater than the minimum allowable resistance value. Be sure to set the appropriate operation rate in *F308* and *F309* to ensure overload protection.
- When using a braking resistor with no thermal fuse, connect and use a thermal relay as a control circuit for cutting the power off.

2) Optional dynamic braking resistors

Optional dynamic braking resistors are listed below. All these resistors are 3%ED in operation rate

Inverter type	Braking resistor		
	Type-form	Rating	Continuous regenerative braking allowable capacity
VFS15-2004PM-W1, 2007PM-W1 VFS15S-2002PL-W1~2007PL-W1	PBR-2007	120W-200Ω	90W
VFS15-2015PM-W1, 2022PM-W1 VFS15S-2015PL-W1, 2022PL-W1	PBR-2022	120W-75Ω	90W
VFS15-2037PM-W1	PBR-2037	120W-40Ω	90W
VFS15-2055PM-W1, 2075PM-W1	PBR7-004W015	440W-15Ω	130W
VFS15-2110PM-W1, 2150PM-W1	PBR7-008W7R5	880W-7.5Ω	270W
VFS15-4004PL-W1~4022PL-W1	PBR-2007	120W-200Ω	90W
VFS15-4037PL-W1	PBR-4037	120W-160Ω	90W
VFS15-4055PL-W1, 4075PL-W1	PBR7-004W060	440W-60Ω	130W
VFS15-4110PL-W1, 4150PL-W1	PBR7-008W030	880W-30Ω	270W

Note 1: The data in Rating above refer to the resultant resistance capacities (watts) and resultant resistance values (Ω).

Note 2: Braking resistors for frequent regenerative braking are optionally available. For more information, contact your Toshiba distributor.

Note 3: Type-form of "PBR-" indicates the thermal fuse". Type-form of "PBR7-" indicates the thermal fuse and thermal relay.

Note 4: The default setting values of parameter *F308* (Dynamic braking resistance) and *F309* (Dynamic braking resistor capacity) are applied to braking resistor option.

3) Minimum resistances of connectable braking resistors

The minimum allowable resistance values of the externally connectable braking resistors are listed in the table below.

Do not connect braking resistors with smaller resultant resistances than the listed minimum allowable resistance values.

Inverter rated output capacity (kW)	240V Class		500V Class	
	Resistance of standard option	Minimum allowable resistance	Resistance of standard option	Minimum allowable resistance
0.2	200Ω	55Ω	-	-
0.4	200Ω	55Ω	200Ω	114Ω
0.75	200Ω	55Ω	200Ω	114Ω
1.5	75Ω	44Ω	200Ω	67Ω
2.2	75Ω	33Ω	200Ω	67Ω
4.0	40Ω	16Ω	160Ω	54Ω
5.5	15Ω	12Ω	60Ω	43Ω
7.5	15Ω	12Ω	60Ω	28Ω
11	7.5Ω	5Ω	30Ω	16Ω
15	7.5Ω	5Ω	30Ω	16Ω

Note: Be sure to set *F308* (Dynamic braking resistance) at the resistance of the dynamic braking resistor connected.