

Overhead travelling cranes [Hoisting equipment]

Features of overhead travelling cranes

Overhead travelling cranes in hoisting equipment use inverters for lifting, travelling and running with a heavy load.

These cranes can reduce the cost of construction and maintenance because they have simple structures.

Merits of inverter drives

Overhead travelling cranes with inverters have the following merits:

- Inverters can keep the load from swinging by smoothing acceleration/deceleration.

Using S-pattern acceleration/deceleration, inverters start and stop cranes more smoothly. In addition, the vector control without sensors can support stable speed.

- Inverters can control descendent speed.

Usually, hoisting equipment has mechanical brakes to avoid increasing speed in downward operation.

However, inverters use braking resistors for this purpose.

- Inverters can detect overload.

Inverters support the following functions:

Torque limit function

Overtorque protection

- Inverters can control mechanical brakes with output torque detection.

VF-S15 and VF-AS1 has special functions for hoist applications.

One of these functions supports mechanical brake control.

- High speed operation at light load

If VF-S15/VF-AS1 detects a light load, it automatically increases the speed by utilizing tact time reduction.

Notices regarding the use of inverter drives

- Overload trips by frequent inching operation

Frequent inching operations may cause overload trips.

When you use many inching operations within a short time, please monitor the inverter display to avoid inverter overload.

- Surge voltage of magnet contactors

Operations of magnet contactors cause surge voltage.

Therefore, please install surge reduction filters for magnet contactors.

- **Contact loss of trolley wire**

When overhead travelling cranes use trolley wires between inverters and motors, contact loss of trolley wires will cause inverter trips.

In this case, please replace trolley wires with cab-tire cables.

- **Brake operation**

VF-S15 and VF-AS1 has a special function for brake operation.

Using this brake function, inverters can control mechanical brakes with output torque detection for added safety.

However, please adjust this function with an initial load test to assure it works reliably.

- **Low speed operation**

Generally motors need to reduce their output torque when operating under 30Hz.

The motors are cooled by fans mounted on their shafts, so when the motor speed decreases, the cooling efficiency also decreases.

Special motors for inverter drives don't need to reduce their output torque between 6 to 60Hz.

- **Electromagnetic noise**

The inverter is generating "electromagnetic noise".

If there are some high accuracy sensors or other sensitive equipment near the inverter drive, the inverter's noise may cause some trouble or a malfunction.

Electromagnetic noise can be avoided by installing an external noise filter or using a different wiring method.

- **Harmonics**

The inverter is generating "harmonics".

These harmonics sometimes cause a malfunction in other control equipment that is connected to the same power source.

Harmonics can be avoided by installing an external "reactor".

To decrease "harmonics", we recommend installing DC reactors in all our inverter models.

(NOTE: 100V input models require AC reactors.)

Selection

In almost all cases, the capacity of the inverter is larger than the motor capacity, because hoisting equipment need high starting torque.

When inverters are installed in trolley cabinets, inverters need special modifications for vibration.

Conditions that require an inverter capacity increase

- Large starting torque over 200%.
- Short acceleration/deceleration time settings.

Application samples

Overhead travelling cranes usually use the following operating methods:

[Lifting motors]

- Vector control without sensor
- Brake functions
- Preset speed control
- High speed operation at light weight

[Traversing and running motors]

- S pattern acceleration/deceleration
- Acceleration/deceleration 1 and 2 switching

Setting table for inverters (VF-AS1)

Overhead travelling cranes usually have remote control unit.

Button	Action
UP DOWN	Lifting
LEFT RIGHT	Traversing
FORWARD REVERSE	Running

Title	Function	Setting range	Recommended setting
uL	Base frequency 1	25 to 500 Hz	52
uLv	Base frequency voltage 1	200V input model: 50 to 330 V 400V input model: 50 to 660 V	Depends on the motor
Pb	Dynamic braking selection	0 to 2	1 (Enabled)
Pbr	Dynamic braking resistance	0.5 to 1000 Ohm	Depends on the resistor
PbCP	Dynamic braking capacity	0.01 to 600 kW	Depends on the resistor
F117	Input terminal function selection 7 (S3)	0 to 135	20
F328	Light-load high-speed operation selection	0 to 4	Depends on the system
F341	Braking mode selection	0 to 3	Depends on the system
F405	Motor rated capacity (motor name plate)	0.10 to 500.0 kW	Depends on the motor
F406	Motor rated current (motor name plate)	0.1 to 2000 A	Depends on the motor
F407	Motor rated rotational speed (motor name plate)	100 to 60000 min ⁻¹	Depends on the motor

Auto-tuning function (VF-AS1)

After setting these parameters, please perform the following steps.

- (1) Set F400 (Auto-tuning 1) = 4 (Motor constant auto calculation).
- (2) Connect the motor wiring.
- (3) Set F400 = 2 (Continue operation after auto-tuning).
- (4) Turn on the start signal.