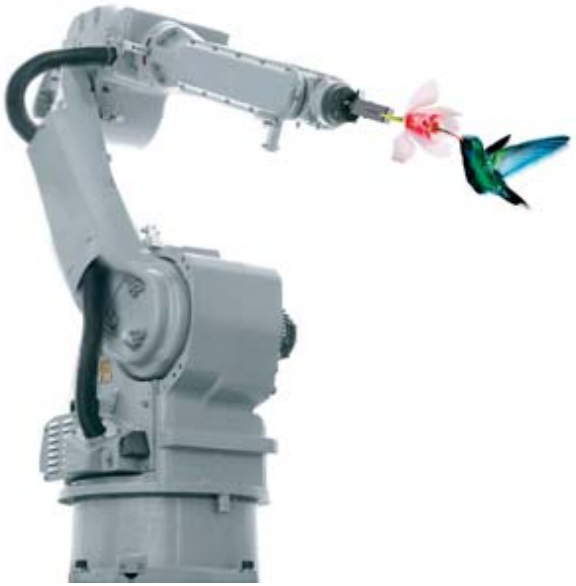
1000 Series Technical Training

Yaskawa Drives Department



Drive and Motor Protection

Rev.: 04 (31.08.2010)

Overview and Contents

Table of contents

How to use this Presentation ?

This presentation shows all property and parameters that can be found in any of the J1000, V1000, A1000 drives. To distinguish whether the property or parameter is available in all of the drives or only in A1000 for example, please note the „ticks“ in the grey bar:

In the example above the function or the parameter would be available in V1000 and A1000 but NOT in J1000.

Default settings (i.e. the standard setting from the factory) are underlined.

Availability in different control modes:

All Modes

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

L1-01: Motor Overload Protection Function Selection
L1-02: Motor Overload Protection Time

All Modes

L1-01 Motor Overload Protection Function Selection (Fault Display "oL1")

0: Disabled, no motor overload protection

1: General purpose motor (60Hz), speed range < 1:10 (standard Self-cooled)

2: Standard Blower cooled motor with speed range ≥ 1:10 (self-cooled)

3: V1000/A1000: Vector motor with speed range 1:100 (forced-cooled)

4: V1000/A1000: PM motor with variable torque (high derating at low speed)

5: A1000: PM motor with constant torque control

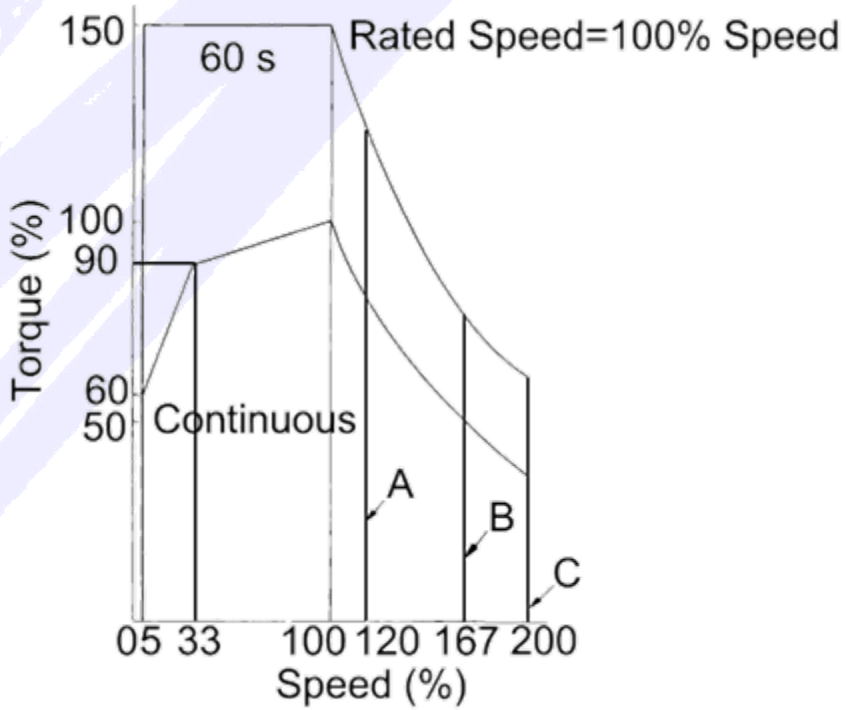
Note: Not each setting is available in all Control Method.
Default setting depends on set Control Method.

L1-01: Motor Overload Protection Function Selection Overload Tolerance

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

1: **General purpose motor (60Hz), speed range < 1:10 (standard Self-cooled)**

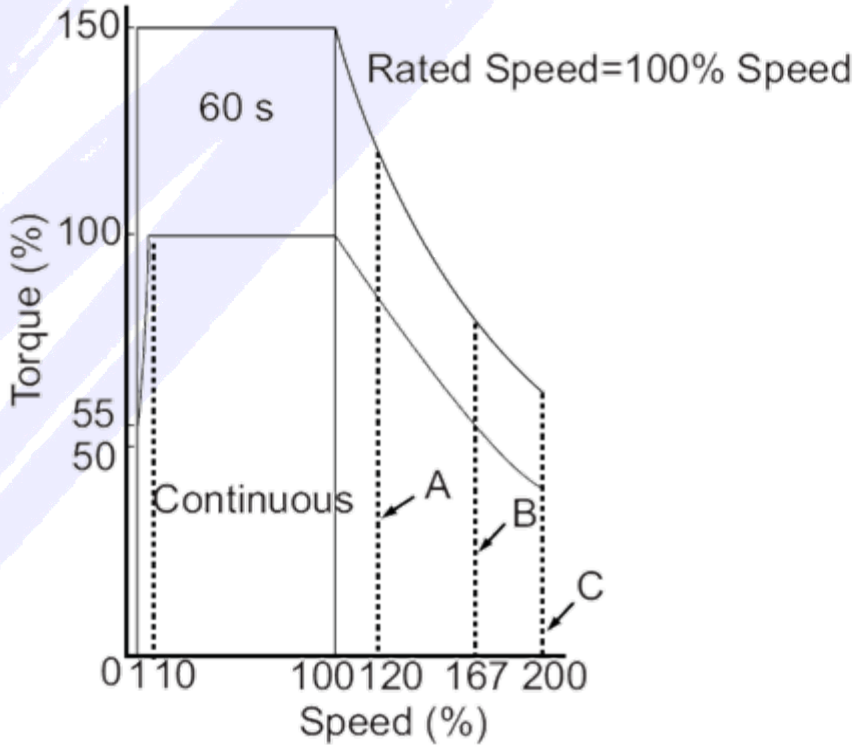
Default setting for A1-02 = 0, 1, 2



L1-01: Motor Overload Protection Function Selection Overload Tolerance

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

2: Standard Blower cooled motor with speed range ≥ 1:10 (forced-cooled)

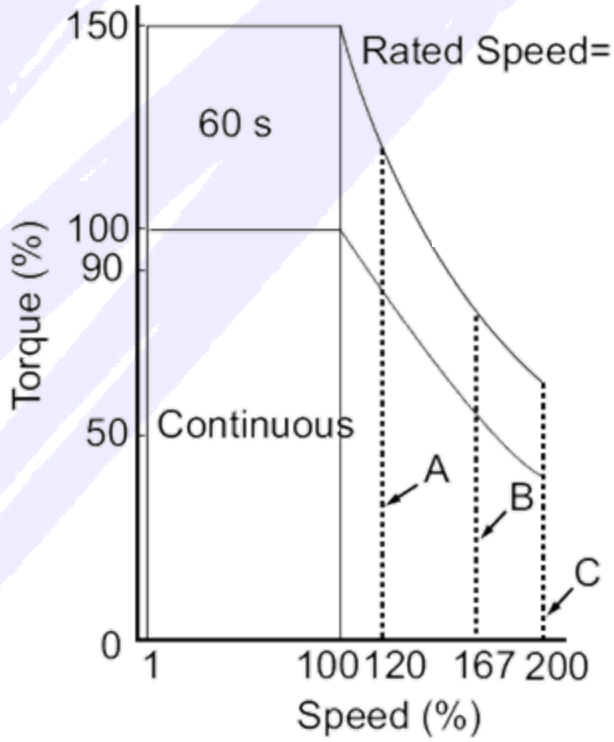


L1-01: Motor Overload Protection Function Selection Overload Tolerance

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

3: Vector motor with speed range 1:100 (forced-cooled)



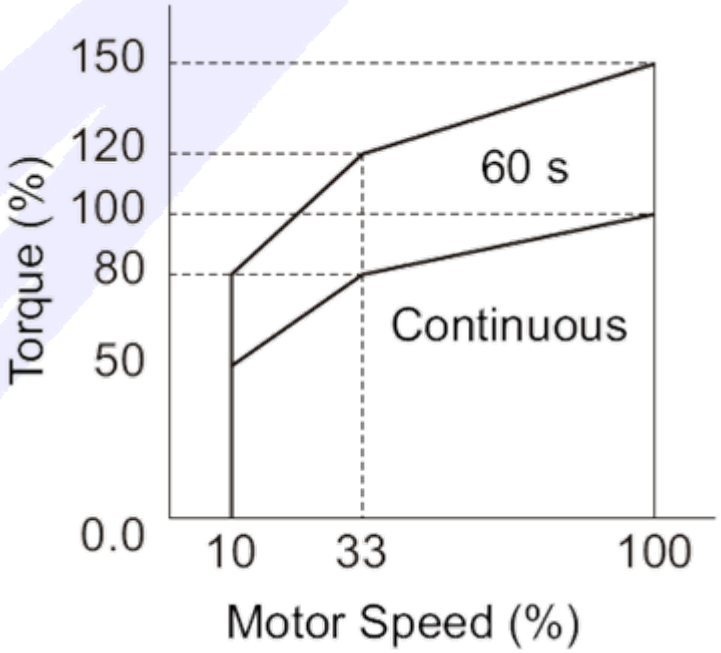
L1-01: Motor Overload Protection Function Selection Overload Tolerance

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

4: **PM motor with variable torque**

Default setting for A1-02 = 5, 6 OLV/PM AOLV/PM

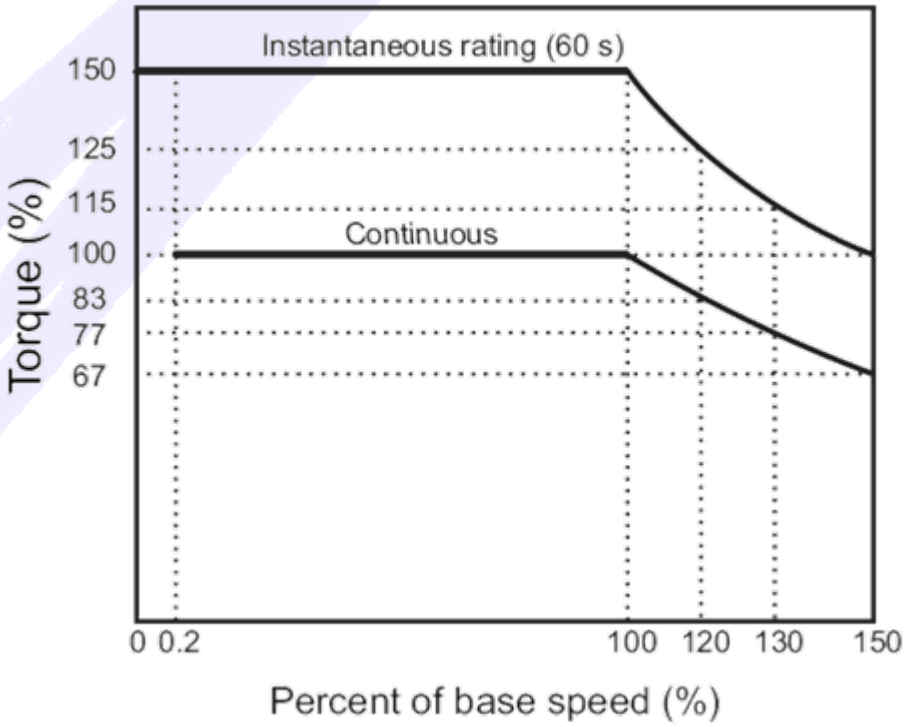


L1-01: Motor Overload Protection Function Selection Overload Tolerance

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

5: **PM motor with constant torque control**

Default setting for A1-02 = 7 CLV/PM



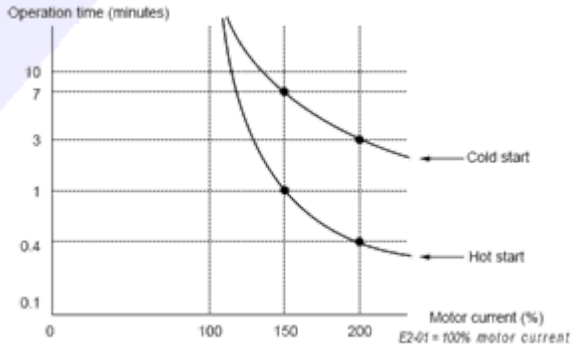
L1-02: Motor Overload Protection Time

All Modes

L1-02 Motor Overload Protection Time

Sets the time it takes the drive to detect motor overheat due to overload. Default is set to operation with 150% overload for 1min (with hot motor).

Parameter	Name	Range	Default
L1-02	Motor Overload Protection Time	0.1 to 5.0 min	1.0 min



➔ **No need for a thermal sensor in the motor winding. Reduced wiring effort.**

Note: Set E2-01 (Motor Rated Current) to apropriate value. The internal overload protection function is UL listed and in accordance with NEC and CEC.

L1-13: Continues Electrothermal Operation Selection

All Modes

L1-13 Continues Electrothermal Operation Selection

Selects if the motor overload integral is cleared or saved at power loss.

Enabled means continue with the latched value before the power loss.

0: Disabled

1: Enabled

➔ **If the control powers off the inverter, the motor thermal condition is still available after power on. Improved motor protection.**

Note: With F7 / V7 drives, the overload integral was reset by power loss !
L1-13 = 0 gives same behavior as F7 / V7.

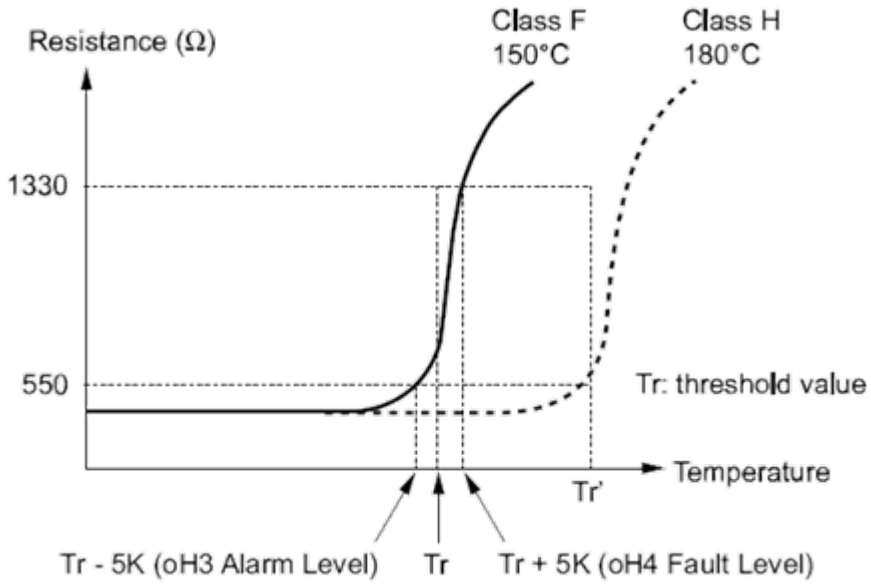
Motor Overload Alarm Operation with PTC Input

J V A

All Modes

PTC Characteristic (shown per phase in the diagram below):

- The motor stator winding has fitted a PTC thermistor in each phase.
- They are internally connected in series
- The Alarm/Fault Temperature Level are dependent from the motor winding temperature class. (E.g. 150°C for class F)



L1-03: Motor Overload Alarm Operation Selection (PTC Input)
L1-04: Motor Overload Fault Operation Selection (PTC Input)

J V A

All Modes

L1-03 Motor Overload Alarm Operation Selection (PTC Input)
Sets the drive's behavior when "oH3" Alarm level is exceeded.

0: Ramp to Stop
1: Coast to Stop
2: Fast Stop using C1-09 setting
3: Alarm only "oH3" will flash)

➔ **gives a motor over temperature warning, by load reduction or other measures, a trip may be avoided.**

L1-04 Motor Overload Fault Operation Selection (PTC Input)
Sets the drive's behavior when "oH4" Fault level is exceeded.

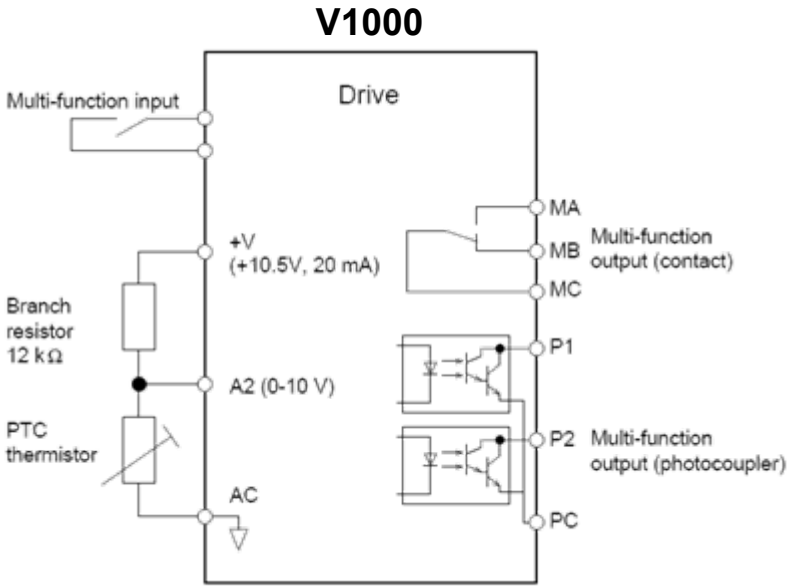
0: Ramp to Stop
1: Coast to Stop
2: Fast Stop using C1-09 setting

Motor Overload Alarm Operation with PTC Input Connection at V1000 or A1000

All Modes

How to connect a PTC motor thermistor to V1000:

- PTC can be connected with a branch resistor to Analogue Input A2
- A2 Analog Input Selection H3-09 = E
- Alarm “oH3” belongs to the minor faults, can be signalized on a digital output by H2- ☐☐ = 10. It is meant as an over temperature warning.
- Fault “oH4” will stop the drive. It will be signalize by the Fault signal, H2- ☐☐ = E



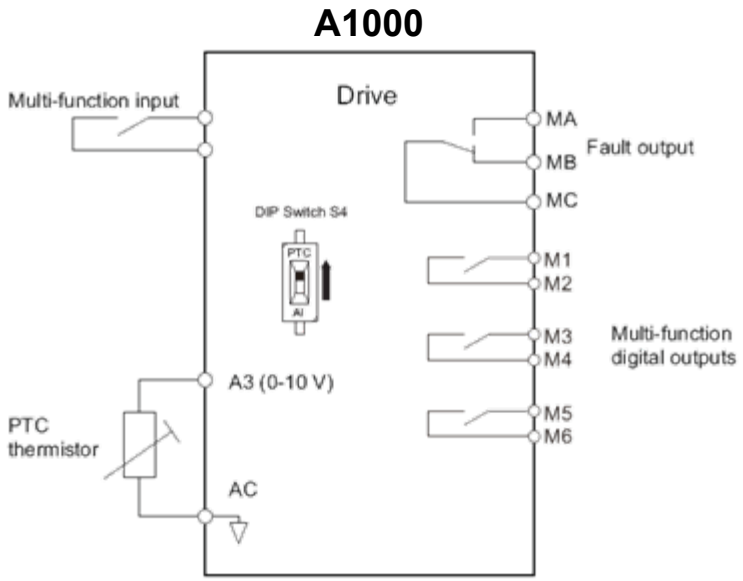
Motor Overload Alarm Operation with PTC Input Connection at A1000

J V A

All Modes

How to connect a PTC motor thermistor to A1000:

- PTC can be connected directly to Analogue Input A3
- DIP switch S4 has to be set to PTC
- A3 Analog Input Selection H3-06 = E
- Alarm “oH3” belongs to the minor faults, can be signalized on a digital output by H2- ☐☐ = 10. It is meant as an over temperature warning.
- Fault “oH4” will stop the drive. It will be signalize by the Fault signal, H2- ☐☐ = E



L1-05: Motor Temperature Input Filter Time (PTC Input)

J V A

All Modes

L1-05 Motor Temperature Input Filter Time (PTC Input)

Sets a filter constant for the analogue signal to avoid electric noise disturbance.

Parameter	Name	Range	Default
L1-05	Motor Temperature Input Filter Time	0.00 to 10.00 s	0.20 s

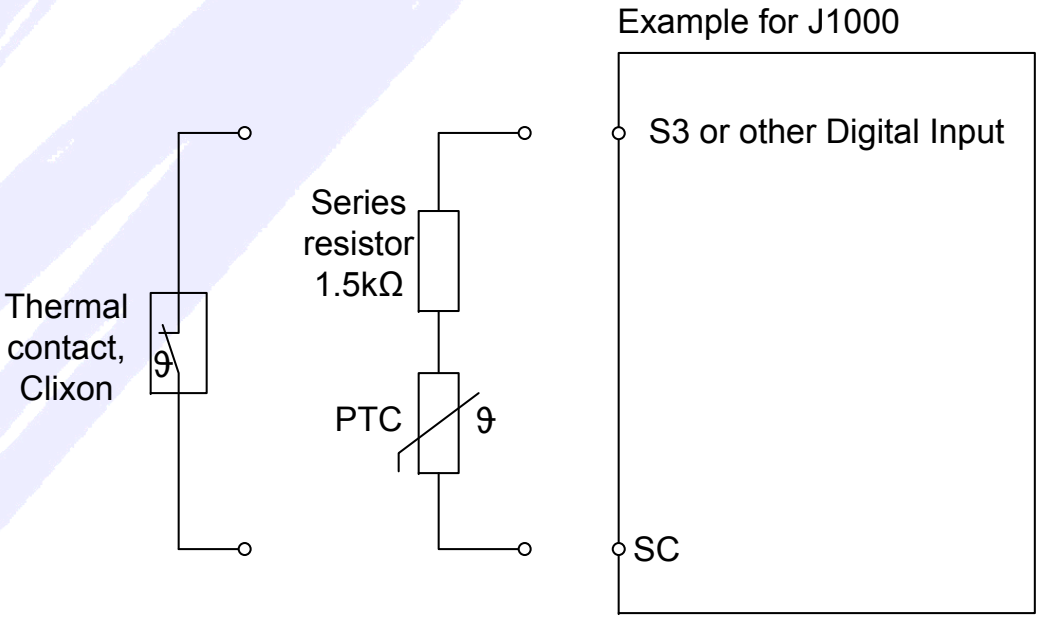
➔ **Motor temperature rises quite slowly. The Filter increases the reliability of the temperature monitoring.**

Note: Not available with a simple thermal circuit breaker at digital input

Motor Overload Alarm Operation using a digital input instead of analogue input

All Modes

- **Motor has to be equipped with either thermal circuit breaker or PTC**



Motor Overload Alarm Operation using a digital input instead of analogue input

J V A

All Modes

- The Digital input has to be programmed to External Fault (H1- ☐☐ = 20 to 2F)
- Display message “EF☐” depending on programmed digital input number (e.g. “EF3” at S3)
- Select the required characteristic for external fault behaviour
- The alarm /fault level depends on the temperature characteristic of the thermal circuit breaker. (No L1- ☐☐ parameter is related)
- No pre-alarm signal is possible only Fault message “EF☐”

➔ Especially recommended for J1000 if the analogue input is needed otherwise.

Technical Training – Protection

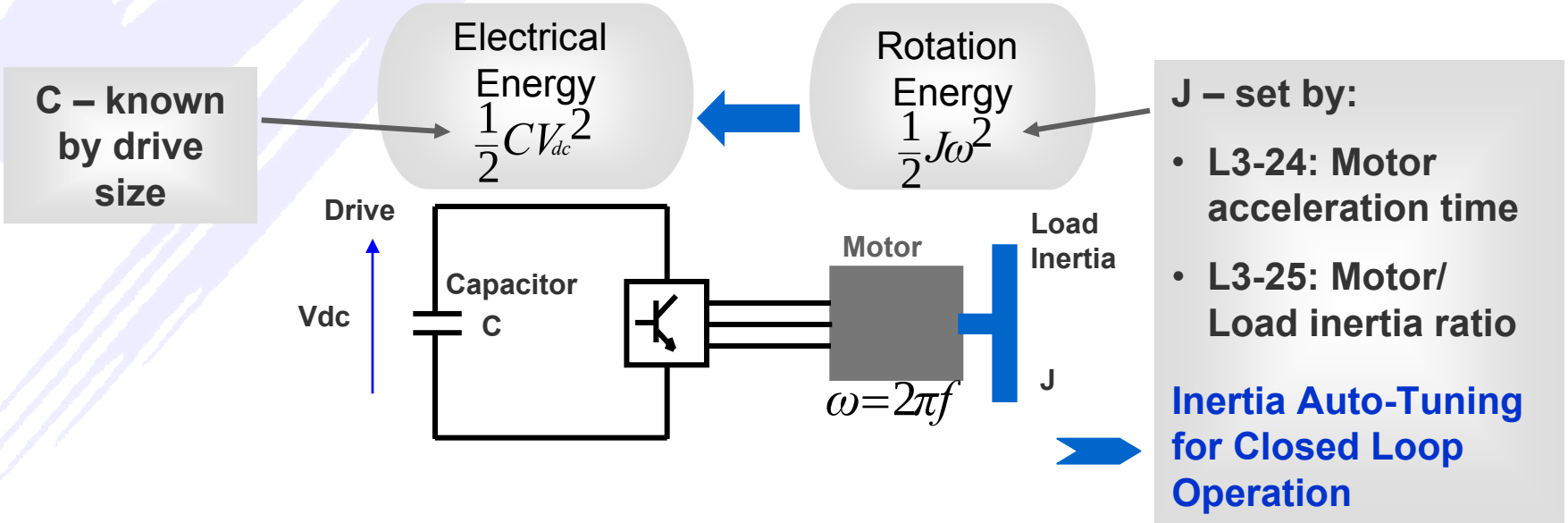
Power Calculation Overview

General Description

All Modes

Functions that control the DC bus voltage use power calculations

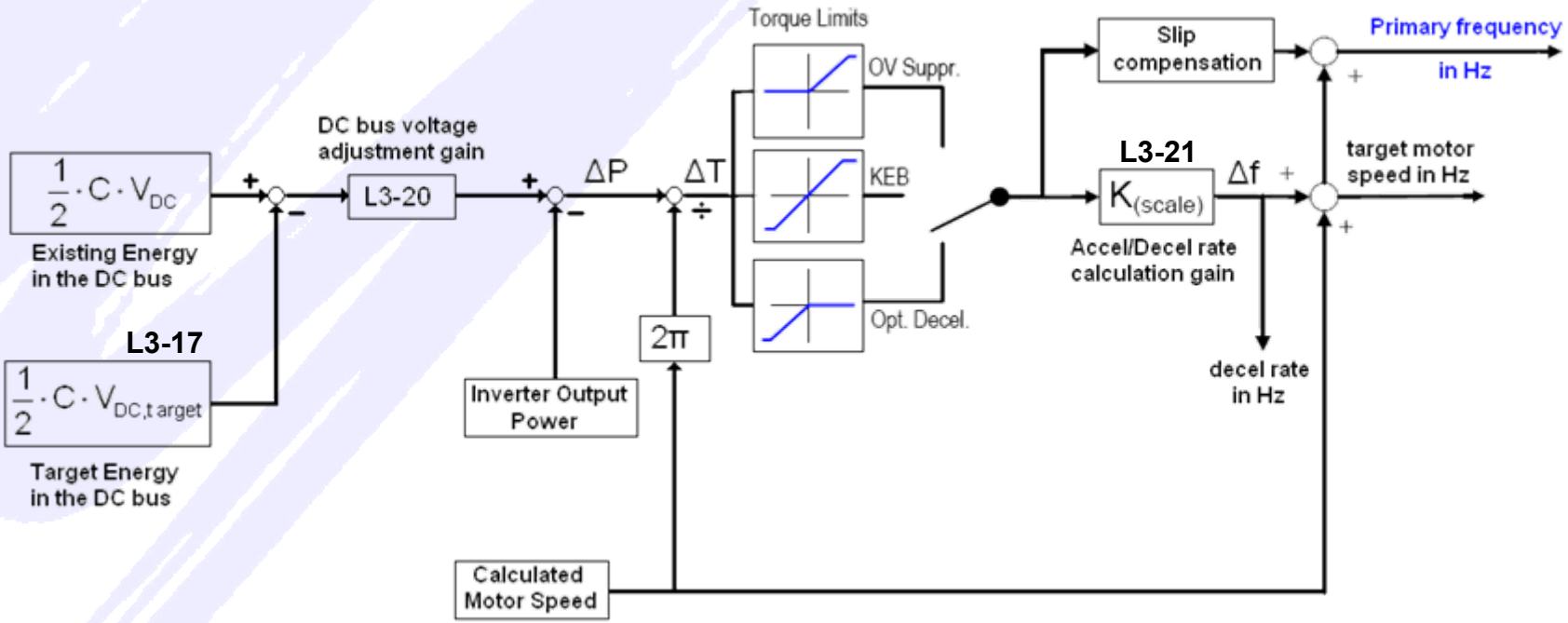
- **Over Voltage Suppression**
- **Optimal deceleration (Stall prevention during deceleration)**
- **Kinetic Energy Braking 2**
- **Mechanical data (load inertia ratio, motor acceleration time) are used to estimate the needed speed change for keeping the DC bus at the desired level**



Power Calculation Overview

General Description

All Modes



- Drive calculates difference “output energy“ ↔ “Energy for desired DC bus voltage“
- Drive calculates needed speed change
- Drive sets output depending on control mode (V/f or Vector control)

Power Calculation

Related Parameters

J V A

All Modes

L3-17 Target DC Bus Voltage

sets the DC bus voltage level that should be controlled for following functions:

- **Overvoltage Supression (L3-11 = 1)**
- **Intelligent Stall Prevention During Deceleration (L3-04 = 2)**

Parameter	Name	Range	Default
L3-17	Target DC Bus Voltage	150 to 400 Vdc	370 Vdc

Note: Value for 200 V class units, double the values for 400 V class units.

Power Calculation

Related Parameters

J V A

All Modes

L3-20 Overvoltage Suppression Function Selection
sets the proportional gain to control the DC link voltage.

Used for following functions:

- **Overvoltage Supression** **(L3-11 = 1)**
- **A1000: Single Drive KEB 2** **(L2-29 = 1)**
- **KEB Ride-Thru 2** **(H2- ☐☐ = 7A or 7B)**
- **Intelligent Stall Prevention During Deceleration** **(L3-04 = 2)**

Parameter	Name	Range	Default
L3-20	DC Bus Voltage Adjustment Gain	0.00 to 5.00	depends on control method (A1-02)

Power Calculation

Related Parameters

J V A

All Modes

L3-21 Acceleration / Deceleration Rate Calculation Gain

Sets the proportional gain for DC link overvoltage suppression for necessary speed change.

Used for following functions:

- **Overvoltage Supression (L3-11 = 1)**
- **A1000: Single Drive KEB 2 (L2-29 = 1)**
- **Intelligent Stall Prevention During Deceleration (L3-04 = 2)**

Parameter	Name	Drive	Range	Default
L3-21	Acceleration / Deceleration Rate Calculation Gain	A1000	0.10 to 10.00	1.00
		V1000	0.00 to 200.00	

Power Calculation

Related Parameters

J V A

All Modes

L3-24 Motor Acceleration Time for Inertia Calculation
sets the time needed to accelerate a motor at rated torque from stop to maximum speed.

Used for following functions:

- **Overvoltage Supression** **(L3-11 = 1)**
- **A1000: Single Drive KEB 2** **(L2-29 = 1)**
- **Intelligent Stall Prevention During Deceleration** **(L3-04 = 2)**

Parameter	Name	Range	Default
L3-24	Motor Acceleration Time for Inertia Calculation	0.001 to 10.000 s	Dependent on o2-04, E2-11 and E5-01

Auto-Tuning in Closed Loop Vector modes for IM or PM L3-24.
Manual Tuning is possible according to following equation:

$$L3\text{-}24 = \frac{2 \cdot \pi \cdot J\,[kgm^2] \cdot n_{rated}[r/min]}{60 \cdot T_{rated}[Nm]}$$

with nominal Torque: $$T_{rated}[Nm] = \frac{60 \cdot P_{Motor}[kW] \cdot 10^3}{2 \cdot \pi \cdot n_{rated}[r/min]}$$

Power Calculation

Related Parameters

All Modes

L3-25 Load Inertia Ratio

Determines the ratio between rotor inertia and load inertia.

Used for following functions:

- **Overvoltage Supression** **(L3-11 = 1)**
- **A1000: Single Drive KEB 2** **(L2-29 = 1)**
- **Intelligent Stall Prevention During Deceleration** **(L3-04 = 2)**

Parameter	Name	Range	Default
L3-25	Load Inertia Ratio	0.0 to 1000.0	1.0

Auto-Tuning in Closed Loop Vector modes for IM or PM L3-25.
Manual Tuning is possible according to following equation:

$$\text{L3-25} = \frac{\text{Machine Inertia}}{\text{Motor Inertia}}$$

Power Calculation

Over Voltage Suppression

J V A

All Modes

Function:

- Load dependent temporary increase of output frequency
- DC bus voltage is controlled
- Information of energy flow from motor to drive is used.
- Output frequency might be higher than reference
- Value of E1-04 (max. Frequency) is maximum limit

Application needs:

- Cyclic changing load conditions motoring/regenerating
- Eccentric loads, like punch presses
- braking resistor should not be used

Related parameters:

- L3-11 = 1 Overvoltage Suppression active
- L3-17 Target DC bus voltage
- L3-20 DC bus voltage gain
- L3-21 Deceleration calculation gain
- L3-24 Motor inertia calculation
- L3-25 Load inertia ratio

L3-11: Overvoltage Suppression Function Selection

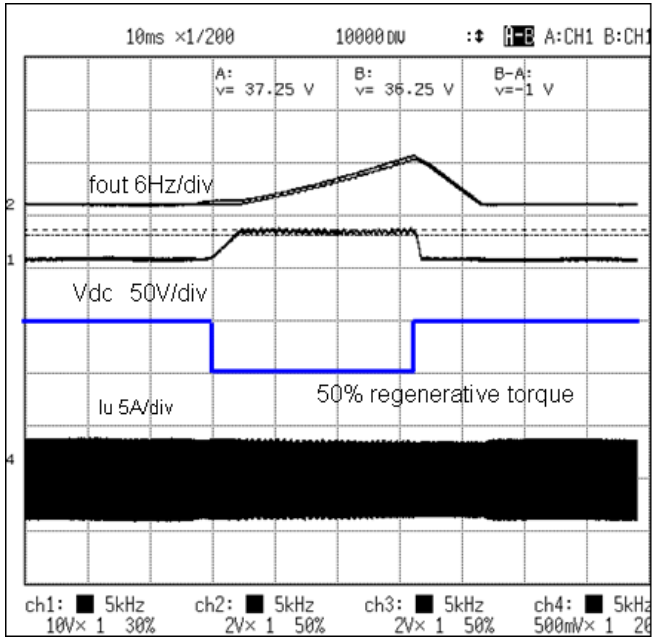
All Modes

L3-11 Overvoltage Suppression Function Selection

Enable this function to avoid "ov" trips cyclic load changes. This allows the drive to increase output frequency in regenerative motor situations.

0: Disabled

1: Enabled



Regenerative Load condition:

Output Frequency is increased to avoid OV trip

Power Calculation

Optimal Deceleration

All Modes

Funktion:

- Deceleration to Stop
- DC bus voltage is controlled
- Information of energy flow from motor to drive is used.
- Braking time is shortened, load and inertia dependent
- Actual deceleration time might be shortened to 1/10

Application needs:

- Fast deceleration to Stop, with some moderate inertia
- Braking time accuracy is not needed
- Braking resistor should be avoided

Related parameters:

- L3-04 = 2 Intelligent Stall Prevention active
- L3-17 Target DC bus voltage
- L3-20 DC bus voltage gain
- L3-21 Deceleration calculation gain
- L3-24 Motor inertia calculation
- L3-25 Load inertia ratio

Power Calculation

Kinetic Energy Braking 2

J V A

All Modes

Funktion:

- Kinetic energy is transferred to electric energy for DC bus
- DC bus voltage is controlled
- Information of energy flow from motor to drive is used.
- only for single drives, not for synchronized sytems
- less tuning necessary than on F7 (KEB 1)

Application needs:

- Keep motor control during short main loss
- Certain inertia is required to keep DC bus voltage stable

Related parameters:

- L2-01 = 3, 4 or 5 Momentary Power Loss Operation
- L2-29 = 1 Single Drive KEB 2 (only A1000)
- L2-11 Target DC bus voltage during KEB
- L3-20 DC bus voltage gain
- L3-21 Deceleration calculation gain
- L3-24 Motor inertia calculation
- L3-25 Load inertia ratio
- L2-05, L2-07, L2-10 for tuning KEB 2

Technical Training – Protection

L2: Momentary Power Loss Ride-Thru

KEB function
Difference KEB 1 / KEB 2

J V A

All Modes

KEB 1 (F7 functionality):

- Detection by Undervoltage Level (L2-05) and Digital Power Loss Signal
- DC link voltage controlled
- Deceleration during KEB based on Fast Stop Ramp C1-09
- C1-09 setting has to fit, just without “OV” tripping
- Setting for Digital Input H1- ☐☐ = 65, 66
- A1000: Setting L2-29 = 0, 2

KEB 2 (new functionality):

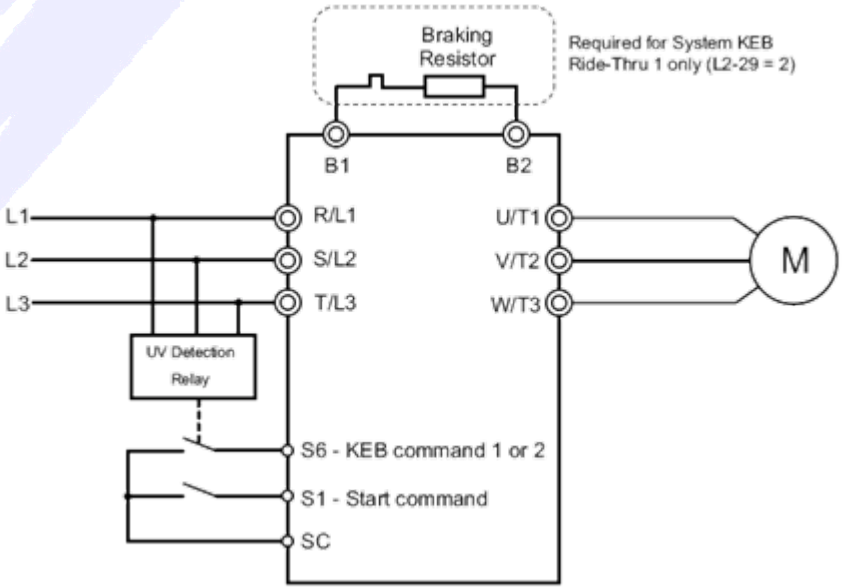
- Detection by Undervoltage Level (L2-05) and Digital Power Loss Signal
- DC voltage is controlled based on Power Flow Calculation
- Tuning of inertia parameters (L2-24, L2-25) are necessary
- Deceleration during KEB is free (not based on Fast Stop Ramp C1-09)
- Setting for Digital Input H1- ☐☐ = 7A, 7B
- A1000: Setting L2-29 = 1, 3

L2: Momentary Power Loss Ride-Thru

KEB function
Wiring Example

All Modes

- Drive Run Command must not be turned off during during KEB Ride-Thru function
- External Power Loss Relay must be assiged to a digital input programmed to KEB command (e.g. S6, H1-06 = 65 / 66 for KEB 1 = 7A / 7B for KEB 2)
- Optional braking resistor or braking unit is needed for System KEB (L2-29 = 2) on A1000



L2: Momentary Power Loss Ride-Thru

Kinetic Energy Braking (KEB Function) related Parameters in Overview

J V A

All Modes

L2-29 = 0,2 (KEB 1) **L2-29 = 1,3 (KEB 2)**

Parameter	Name	Description	KEB Mode (L2-29)			
			0	1	2	3
C1-09	Fast Stop Time		x	-	-	-
C2-03	S-Curve at Deceleration Start		x	-	x	x
L2-05	Under Voltage Detection Level		x	x	x	x
L2-06	KEB Deceleration Time		-	-	x	x
L2-07	KEB Acceleration Time		x	x	x	x
L2-08	Frequency Gain at KEB Start	not in PM control methods	x	-	x	x
L2-10	KEB Detection Time		x	x	x	x
L2-11	Desired DC Bus Voltage during KEB		x	x	x	x
L3-20	Main Circuit Adjustment Gain		-	x	-	-
L3-21	Accel/Decel Rate Calculation Gain		-	x	-	-
L3-24	Motor Acceleration Time	not in PM and CLV control	-	x	-	-
L3-25	Load Inertia Ratio	Only in CLV controls and V/f w PG	-	x	-	-

L2: Momentary Power Loss Ride-Thru

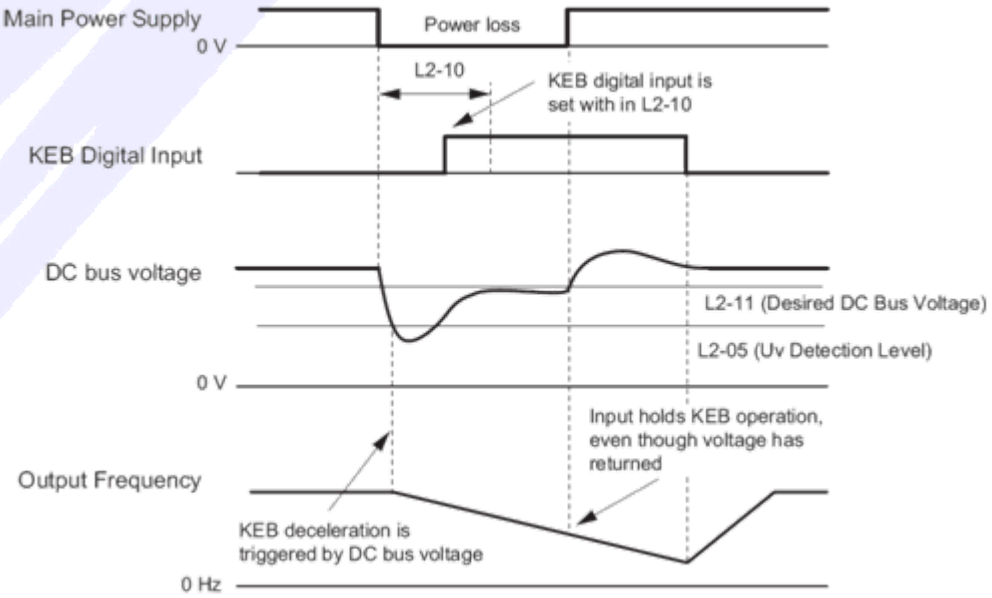
Kinetic Energy Braking
Power Loss Detection

J V A

All Modes

KEB Function

- Detection by DC bus undervoltage level L2-05, very quickly
- KEB Digital Input (external Power Loss Relay)
- External Signal might react slowly, but necessarily within KEB Detection Time (L2-10)

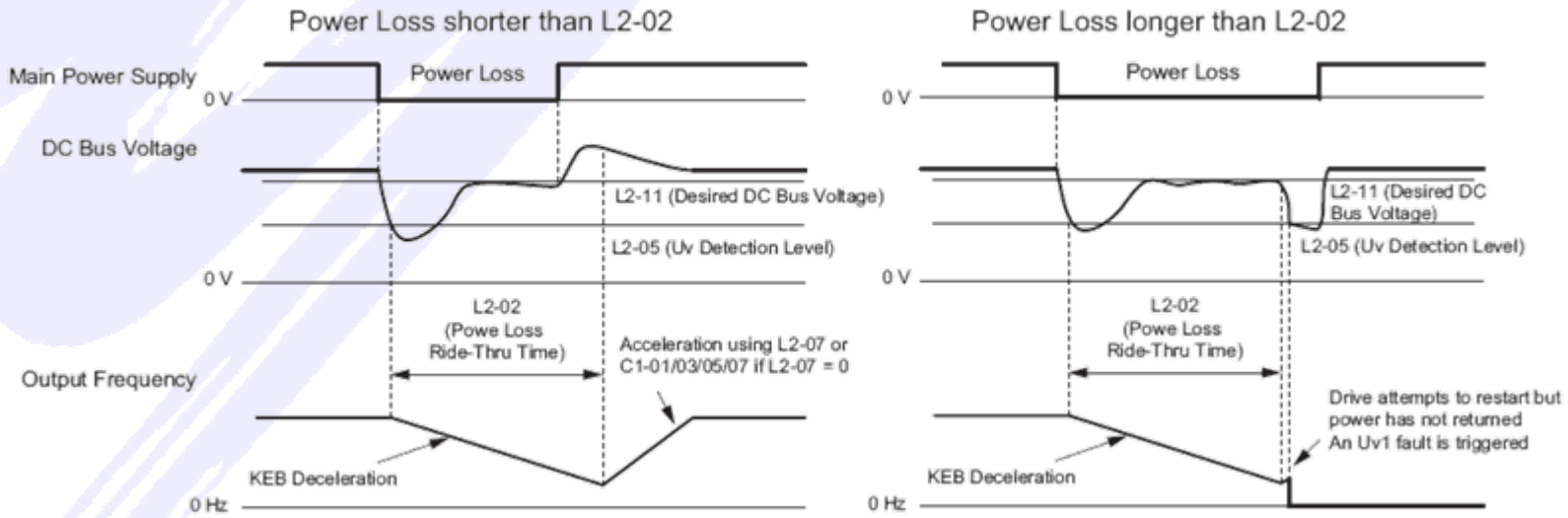


L2: Momentary Power Loss Ride-Thru

Kinetic Energy Braking
Power Loss Detection & Continuation

All Modes

- KEB Function without Digital Input (from external Power Loss Relay)
- Detection by DC bus undervoltage level L2-05
- KEB function remains active for the time set in L2-02
- Power Loss for longer time than set in L2-02 will cause “Uv1” fault



L2: Momentary Power Loss Ride-Thru

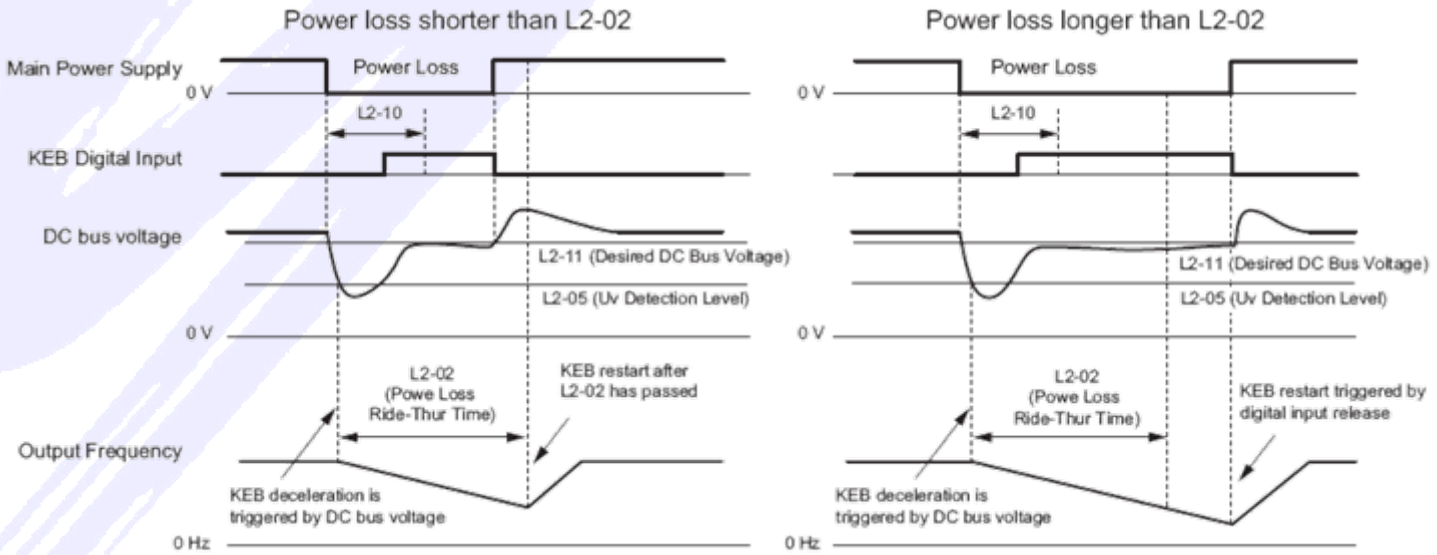
Kinetic Energy Braking
Power Loss Detection & Continuation

J V A

All Modes

KEB Function with Digital Input (from external Power Loss Relay)

- **Detection by DC bus undervoltage level L2-05**
- **KEB function remains active by digital input signal (H1-☐☐= 65 / 66 / 7A / 7B)**
- **Drive will continue KEB function, even if power loss time is longer than L2-02**



Note: **L2-02 has priority over L2-10 time setting. When L2-02 is over, DC bus level and digital input status is checked, and drive restarts**

L2: Momentary Power Loss Ride-Thru

L2-01: Momentary Power Loss Operation Selection (Kinetic Energy Braking)

All Modes

L2-01 Momentary Power Loss Operation Selection

Sets the drive's behavior at power loss.

0: Drive trips on "Uv1" when power is lost

1: Recovers within time set in L2-02. "Uv1" trip with longer power loss.

2: V1000/A1000: Recovers as long CPU is powered. No "Uv1" detection.

3: A1000: KEB deceleration for the time set in L2-02.

4: A1000: KEB deceleration as long as the CPU is powered.

5: A1000: KEB deceleration to stop

Note: Settings 3 to 5: Type of KEB operation determined by L2-29 setting (L2-29 only on A1000 available)

L2: Momentary Power Loss Ride-Thru

L2-02: Momentary Power Loss Ride-thru Time
L2-03: Momentary Power Loss Minimum Baseblock Time

J V A

All Modes

L2-02 Momentary Power Loss Ride-thru Time

Only effective when L2-01 = 1 or 3

Parameter	Name	Range	Default
L2-02	Momentary Power Loss Ride-thru Time	0.0 to 25.5 s	o2-04 dependent

L2-03 Momentary Power Loss Minimum Baseblock Time

Sets the wait time for the motor residual voltage decay, before restart.

Parameter	Name	Range	Default
L2-03	Momentary Power Loss Minimum Baseblock Time	0.1 to 5.0 s	o2-04 dependent

Note: Larger size motors need longer timer for the remanent voltage to decay.

L2: Momentary Power Loss Ride-Thru

L2-04: Momentary Power Loss Voltage Recovery Ramp Time

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L2-04 Momentary Power Loss Voltage Recovery Ramp Time

Sets the time constant to ramp up the voltage during speed search.

(on V1000 also in OLV/PM control method available !)

Parameter	Name	Range	Default
L2-04	Momentary Power Loss Voltage Recovery Ramp Time	0.0 to 5.0 s	o2-04 dependent

L2: Momentary Power Loss Ride-Thru

L2-05: Undervoltage Detection Level

All Modes

L2-05 Undervoltage Detection Level

Sets the DC bus undervoltage trip level

Parameter	Name	Range	Default
L2-05	Undervoltage Detection Level	150 to 210 V	190V

Note: Value in the table is for 200 V class units, double the values for 400V class units.
This parameter is used for KEB 1 and KEB 2
Value is initialized when E1-01 is changed.

L2: Momentary Power Loss Ride-Thru

L2-06: Kinetic Energy Braking Deceleration Time
L2-07: Kinetic Energy Braking Acceleration Time

J V A

All Modes

L2-06 Kinetic Energy Braking (KEB) Deceleration Time

Parameter	Name	Drive	Range	Default
L2-06	Kinetic Energy Braking (KEB) Deceleration Time	A1000	0.0 to 6000.0 s	0.0 s
		V1000	0.0 to 200.0 s	0.0 s

L2-07 Kinetic Energy Braking (KEB) Acceleration Time

Parameter	Name	Drive	Range	Default
L2-07	Kinetic Energy Braking (KEB) Acceleration Time	A1000	0.0 to 6000.0 s	0.0 s
		V1000	0.0 to 200.0 s	0.0 s

L2: Momentary Power Loss Ride-Thru

L2-08: Frequency Gain at Kinetic Energy Braking Start

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L2-08 Frequency Gain at Kinetic Energy Braking Start

At the start of KEB function an initial frequency reduction is necessary to get teh motor quickly into regenerative state. This parameter sets the gain for this initial frequency step.

Parameter	Name	Range	Default
L2-08	Frequency Gain at Kinetic Energy Braking Start	0 to 300%	100%

The amount of frequency reduction = Slip frequency prior KEB x L2-08 x 2

Note: On V1000 also in OLV/PM control method available !

L2-11: DC Bus Voltage Setpoint during KEB

J V A

All Modes

L2-11 DC Bus Voltage Setpoint during KEB 2

Sets the desired DC bus voltage during KEB Ride-thru 2 function.

Parameter	Name	Range	Default
L2-11	Frequency Gain at Kinetic Energy Braking Start	150 to 400 Vdc	1.22 x value of E1-01

Note: Value in the table is for 200 V class units, double the values for 400V class units.

L2: Momentary Power Loss Ride-Thru

L2-10: Kinetic Energy Braking Detection Time
L2-29: Kinetic Energy Braking Method Selection

J V A

All Modes

L2-10 Kinetic Energy Braking (KEB) Detection Time (Minimum KEB Time)
Sets the minimum time for the KEB function to be active.

Parameter	Name	Range	Default
L2-10	Kinetic Energy Braking Detection Time	0 to 2000 ms	50 ms

L2-29 Kinetic Energy Braking Method Selection
Selects the Kinetic Energy Braking methode for single drives or DC link shared drive systems.

0: Single Drive Kinetic Energy Braking Ride-thru 1
1: Single Drive Kinetic Energy Braking Ride-thru 2
2: System Kinetic Energy Braking Ride-thru 1
3: System Kinetic Energy Braking Ride-thru 2

Technical Training – Protection

L3-26: Additional DC Bus Capacitors

J V A

All Modes

L3-26 Additional DC Bus Capacitors

sets the capacity of additionally connected DC link capacitors to increase the power storing capacity for KEB function.
It is used for Single Drive KEB Ride-tru 2

Parameter	Name	Range	Default
L3-26	Additional DC Bus Capacitors	0 to 65000 µF	0 µF

L2: Momentary Power Loss Ride-Thru

KEB function on J1000

All Modes

L2-01 Momentary Power Loss Operation Selection

Sets the drive‘s behavior at power loss.

0: Drive trips on “Uv1“ when power is lost

1: Recovers within a drives capacity dependent time.
“Uv1“ trip with longer power loss.

Drives Model(s)	Allowable Power Loss Time
JCBA0001 to 0003, JC2A0002 to 0004, JC4A0001 and 0002	0.1 s
JCBA0006, JC2A0006, JC4A0004	0.2 s
JCBA0010, JC2A0010, JC4A0005	0.3 s
JC2A0012, JC4A0009 to 0011	0.5 s
JC2A0020	1.0 s

2: Recovers as long CPU is powered. No “Uv1“ detection.

L3: Stall Prevention

L3-01: Stall Prevention Selection during Acceleration
L3-02: Stall Prevention Level during Acceleration

V/f | V/f w/PG | OLV | CLV
OLV/PM | A OLV/PM | CLV/PM

L3-01 Stall Prevention Selection during Acceleration

0: Disabled, acceleration active ramp, motor might stall

1: General Purpose, acceleration is stopped when current exceeds L3-02 level.

2: V1000/A1000: Intelligent, acceleration at shortest time at L3-02 level, acceleration ramp is ignored

L3-02 Stall Prevention Level during Acceleration

This setting is used with L3-01 = 1 or 2

Parameter	Name	Range	Default
L3-02	Stall Prevention Level during Acceleration	0 to 150%	ND: 120 %, HD: 150 %

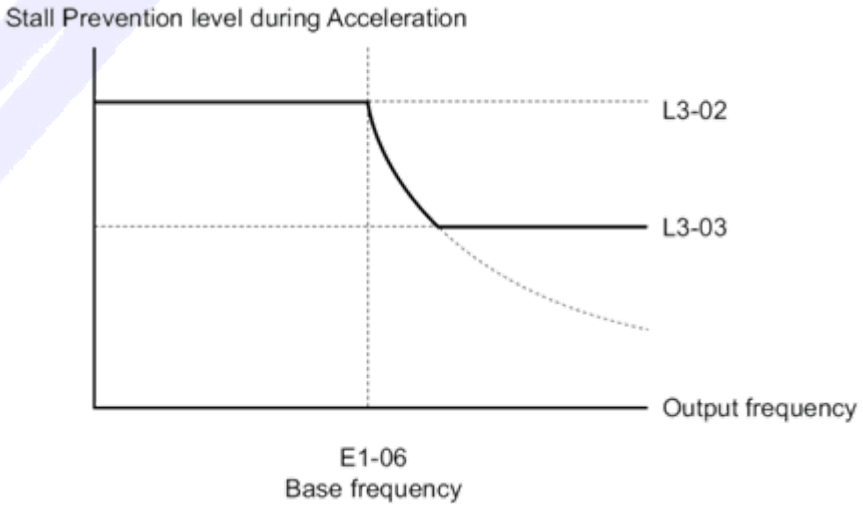
L3-03: Stall Prevention Limit during Acceleration

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L3-03 Stall Prevention Limit during Acceleration

Sets the stall prevention lower limit in constant power range, as percentage of drive rated current.

Parameter	Name	Range	Default
L3-03	Stall Prevention Limit during Acceleration	0 to 100%	50%



L3-22: Deceleration Time at Stall Prevention during Acceleration

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L3-22 Deceleration Time at Stall Prevention during Acceleration

sets the brief deceleration time when stalling occurs during acceleration of a PM motor. When L3-22 = 0 the function is disabled and the standard deceleration time is used.

Parameter	Name	Range	Default
L3-22	Deceleration Time at Stall Prevention during Acceleration	0.0 to 6000.0 s	0.0 s

Note: Only effective for PM motors when L3-01 = 1.

L3-04: Stall Prevention Selection during Deceleration

All Modes

L3-04 Stall Prevention Selection during deceleration

- **0**: Disabled, acceleration active ramp, motor might stall
- **1**: General Purpose, deceleration is stopped when DC link exceeds stall prevention level.
- **2**: V1000/A1000: Intelligent, deceleration at shortest time at L3-17 level, min. 1/10 of set deceleration time
- **3**: Stall prevention with braking resistor.
- **4**: V1000/A1000: Overexcitation Deceleration, with increased motor flux.
- **5**: A1000: Overexcitation Deceleration 2. Adjusted deceleration according to DC link voltage

Note: Setting 3 to 5 not available in OLV/PM

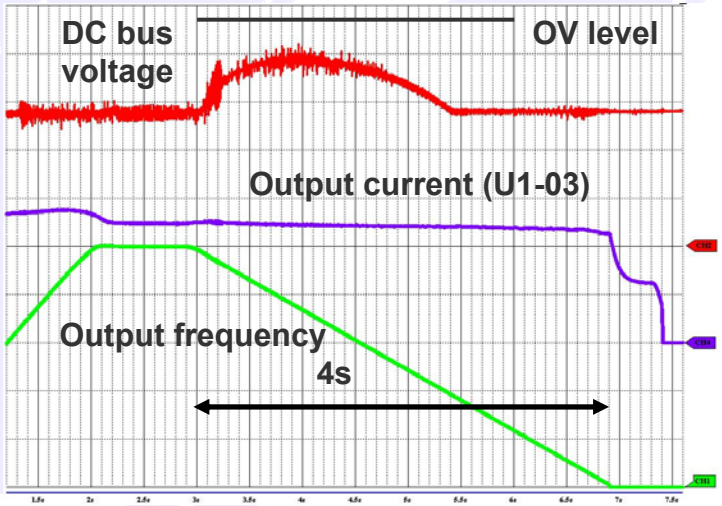
Setting 2 to 5 not available in AOLV/PM CLV/PM

L3-04: Stall Prevention Selection during Deceleration Overexcitation Deceleration

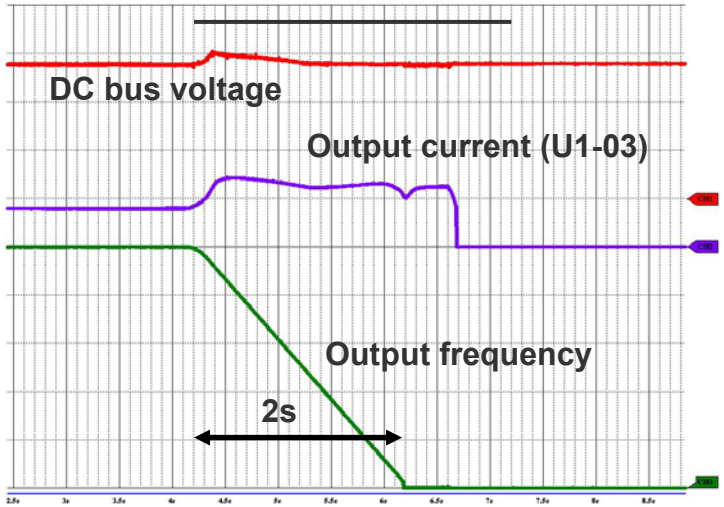
J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L3-04 Setting 4: Overexcitation Deceleration, with increased motor flux



Normal deceleration (L3-04 = 0)



Overexcitation deceleration 1 (L3-04 = 4)

- Reduction of deceleration time without using a braking resistor
- Frequent use might overheat the motor, not considered in “oL1” calculation
- “OV” tripping is possible because of no stall prevention

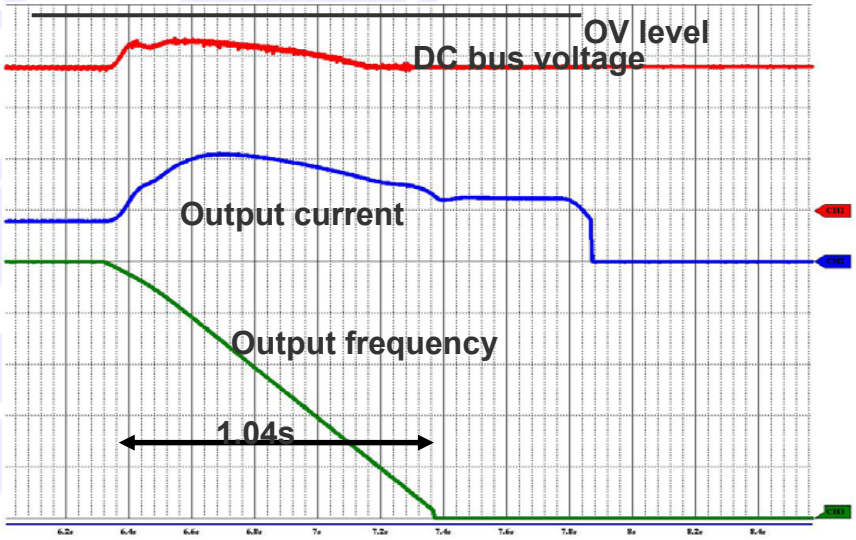
L3: Stall Prevention

L3-04: Stall Prevention Selection during Deceleration
Overexcitation Deceleration

J V A

V/f | V/f w/PG | OLV | CLV
OLV/PM | A OLV/PM | CLV/PM

L3-04 Setting 5: Overexcitation Deceleration 2.
DC link voltage controlled deceleration



- Even shorter deceleration than with setting 4 (V1000)
- Prevention of “Ov” tripping
- Frequent use heats up the motor, not considered in “oL1” calculation

Overexcitation Deceleration

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

- Overexcitation deceleration increases the flux during deceleration
  - Shorter deceleration time compared to standard deceleration without using of a braking resistor possible
  - Enabled by setting L3-04 = 4 or 5

Note: Overexcitation deceleration can not be used with PM motors.
Only used at stop command.

Overexcitation Deceleration

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

- Frequently use of overexcitation deceleration causes motor temperature increase
  - Regenerative energy dissipated as heat in the motor windings

Note: Make sure the motor temperature does not exceed the maximum allowable value or consider using a braking resistor option instead

- The drive decelerates at the active deceleration time
  - Overvoltage “OV” fault can occur
  - Stall prevention is not active

- Active Run command has priority about overexcitation deceleration

n3-13: Overexcitation Deceleration Gain

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

Parameter	Name	Range	Default
n3-13	Overexcitation Deceleration Gain	1.00 to 1.40	1.10

- Multiplies a gain to the V/f pattern output value during Overexcitation Deceleration
  - Increase the gain to improve the braking power of Overexcitation Deceleration
  - Decrease n3-13 if overcurrent (“oC”), motor overload (“oL1”) or inverter overload (“oL2”) occurs

- Inverter returns to normal V/f value after:
  - Motor stopped
  - Accelerating to the frequency reference

n3-14: High Frequency Injection during Overexcitation Deceleration

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

- Injecting high frequency into the motor increases motor losses
  - ➔ Shortens deceleration time

Note: Injecting high frequency can increase audible noise from the motor and might not be desirable in environments where motor noise is a concern

0: Disable High Frequency Injection During Overexcitation Deceleration

1: Enable High Frequency Injection During Overexcitation Deceleration

L3: Stall Prevention

n3-23: Overexcitation Operation Selection

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

- **Limits the Overexcitation Deceleration operation selected in parameter L3-04 to forward only or reverse only**

0: Overexcitation Operation as Selected in L3-04 in Forward and Reverse Direction

1: Overexcitation Operation as Selected in L3-04 in Forward Direction Only

2: Overexcitation Operation as Selected in L3-04 in Reverse Direction Only

L3-05: Stall Prevention Selection during Run
L3-06: Stall Prevention Level during Run

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L3-05 Stall Prevention Selection during Run

0: Disabled, drive runs at set frequency.
1: Deceleration Time 1. Uses setting of C1-02 at stall prevention
2: Deceleration Time 2. Uses setting of C1-04 at stall prevention

L3-06 Stall Prevention Level during Run

Parameter	Name	Range	Default
L3-06	Stall Prevention Level during Run	30 to 200%	dependent on C6-01 and L8-38 setting

Note:

- L3-23 activates the stall prevention function in constant power area
- Upper limit and default deepends on C6-01 (HD/ND setting) and L8-38 carrier frequency reduction

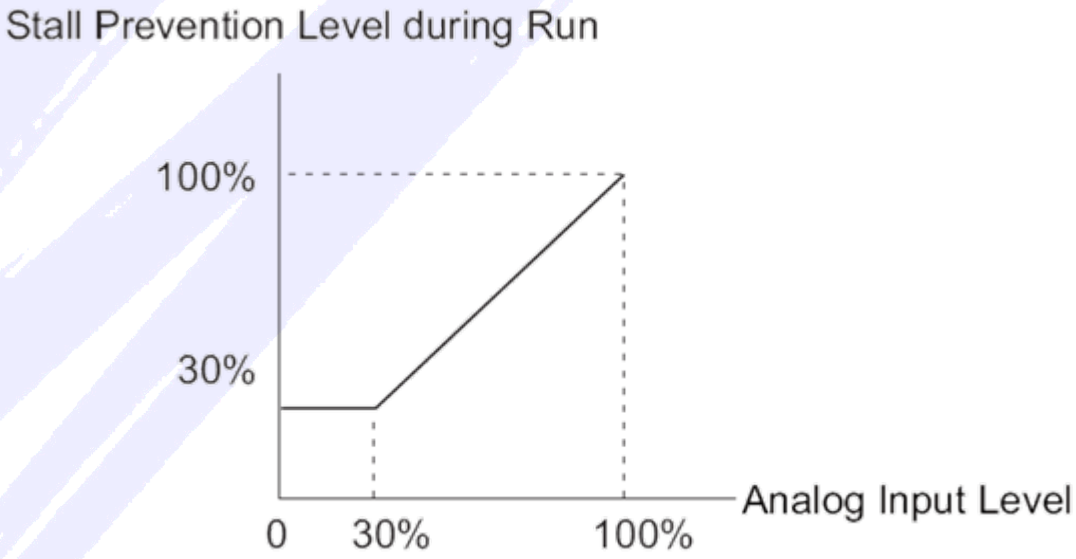
L3: Stall Prevention

Stall Prevention Limit during Run, by Analogue Input Setting H3- ☐☐ = 8

J V A

All Modes

This setting allows an analogue input to adjust the Stall Prevention Level.

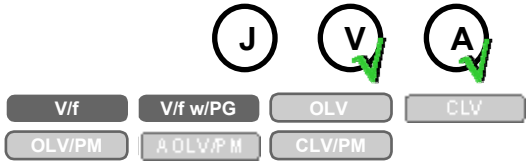


Either Stall Prevention Level (L3-06) or the analogue value is used, whichever value is lower. Minimum value is clamped to 30%.

L3: Stall Prevention

L3-23: Autom. Reduction Selection for Stall Prev. during RUN
L3-27: Stall Prevention Detection Time

L3-23 Automatic Reduction Selection for Stall Prevention during RUN in field weakening

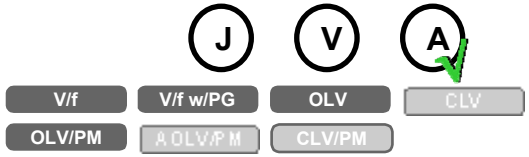


0: Stall prevention level determined by L3-06 over complete frequency range

1: Stall prevention level automatically reduced to 40% of L3-06 in constant power range

L3-27 Stall Prevention Detection Time

sets a delay time from when stall prevention level is reached and the stall prevention function is activated.



Parameter	Name	Range	Default
L3-27	Stall Prevention Detection Time	0 to 5000 ms	50 ms

Technical Training – Protection

L4: Speed Agree / Frequency Reference Loss Detection

Overview

All Modes

- Actual output frequency and frequency reference can be compared for various conditions.
- Detection Level and Detection Width can be set by parameters L4-01 to L4-04
- Multi-function digital outputs can be programmed (H2-xx) to signalize these conditions

➔ Other application parts or production process can be started if Speed Agree condition is present.

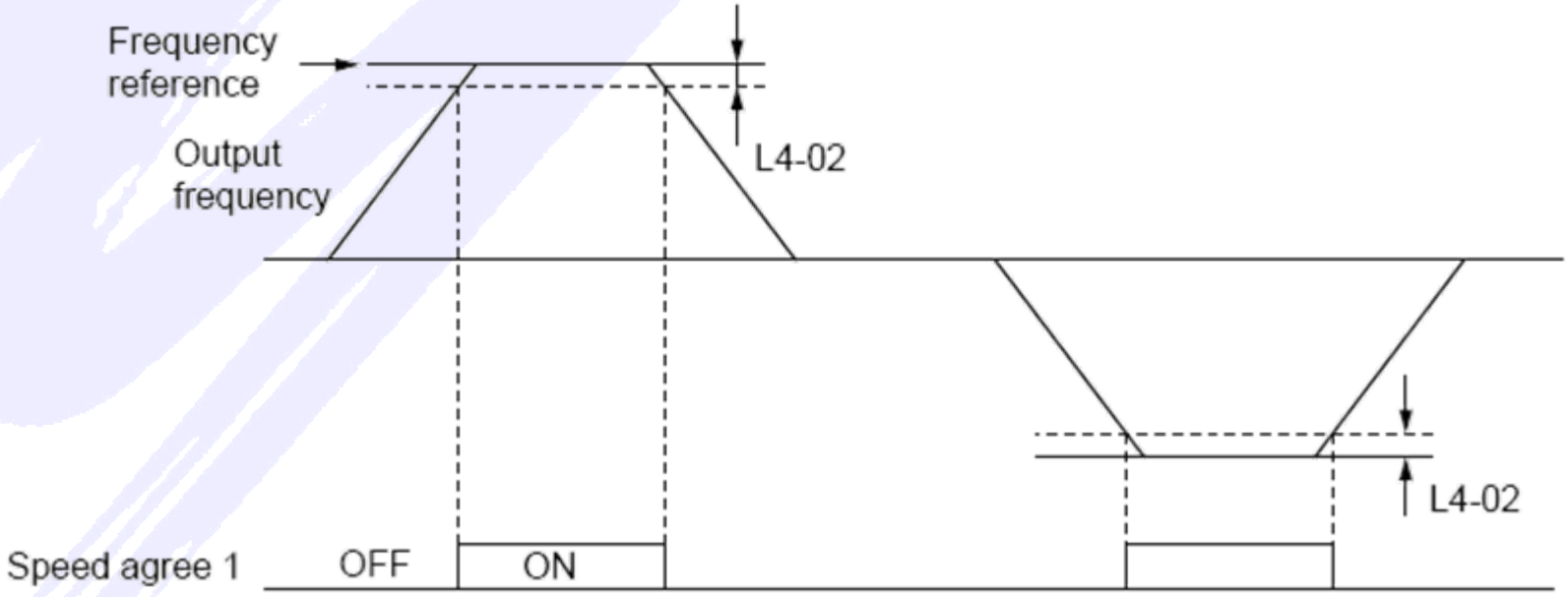
Production process can be interrupted if Speed Agree is not present any more. Reduced production scrap.

L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 2, Speed Agree 1 (f_{ref}/f_{out} Agree 1)
Active whenever actual output frequency is within Detection Width (L4-02) of frequency reference, regardless of direction.

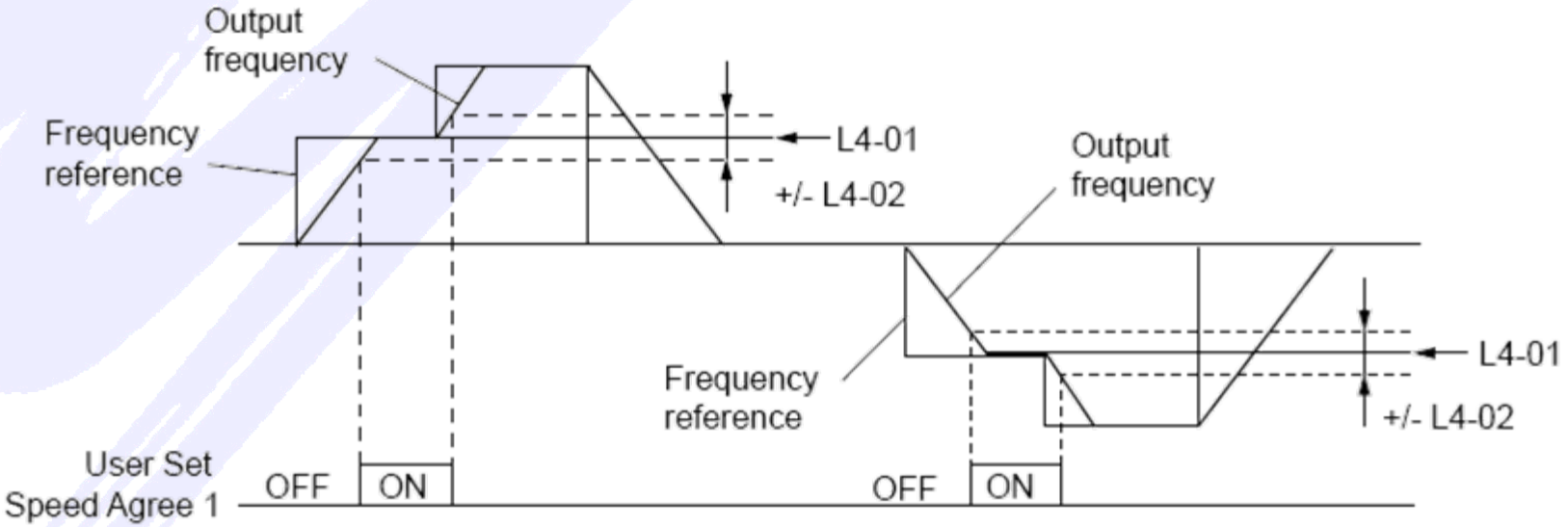


L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 3, User Set Speed Agree 1 (f_{ref}/f_{set} Agree 1)
Active whenever actual output frequency and frequency reference are within Detetction Width (L4-02) of the programmed Speed Agree Level (L4-01)



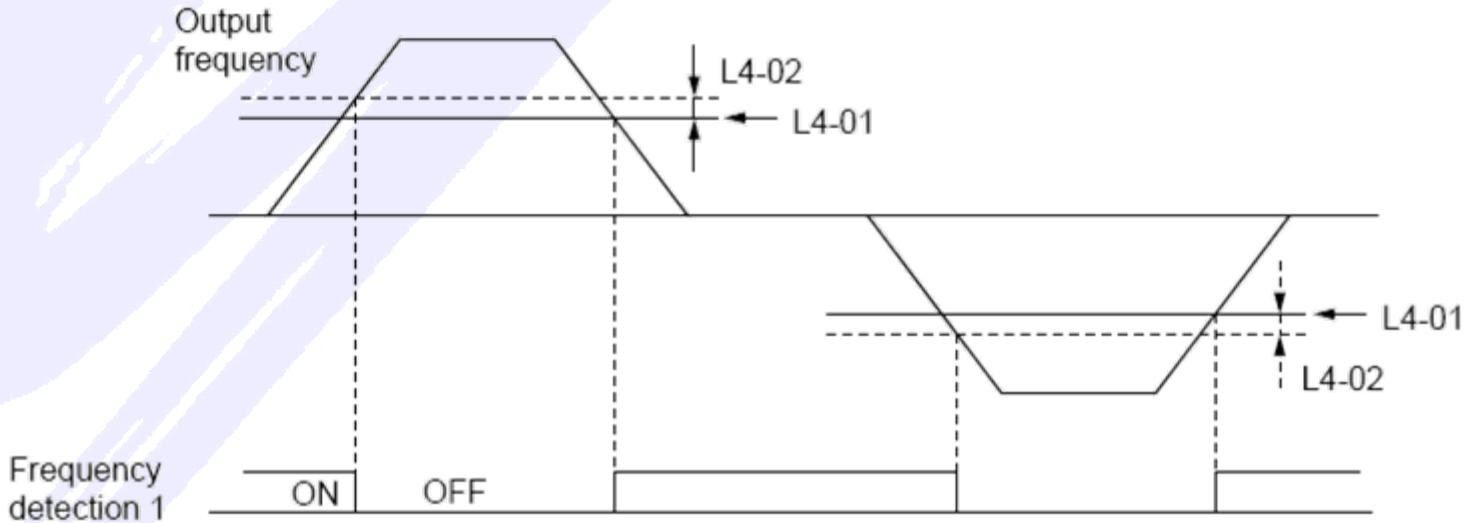
Note: Works in both directions, with same level (L4-01)

L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 4, Frequency Detection 1
Active as long as output frequency is below Detection Level (L4-01) plus hysteresis (L4-02)



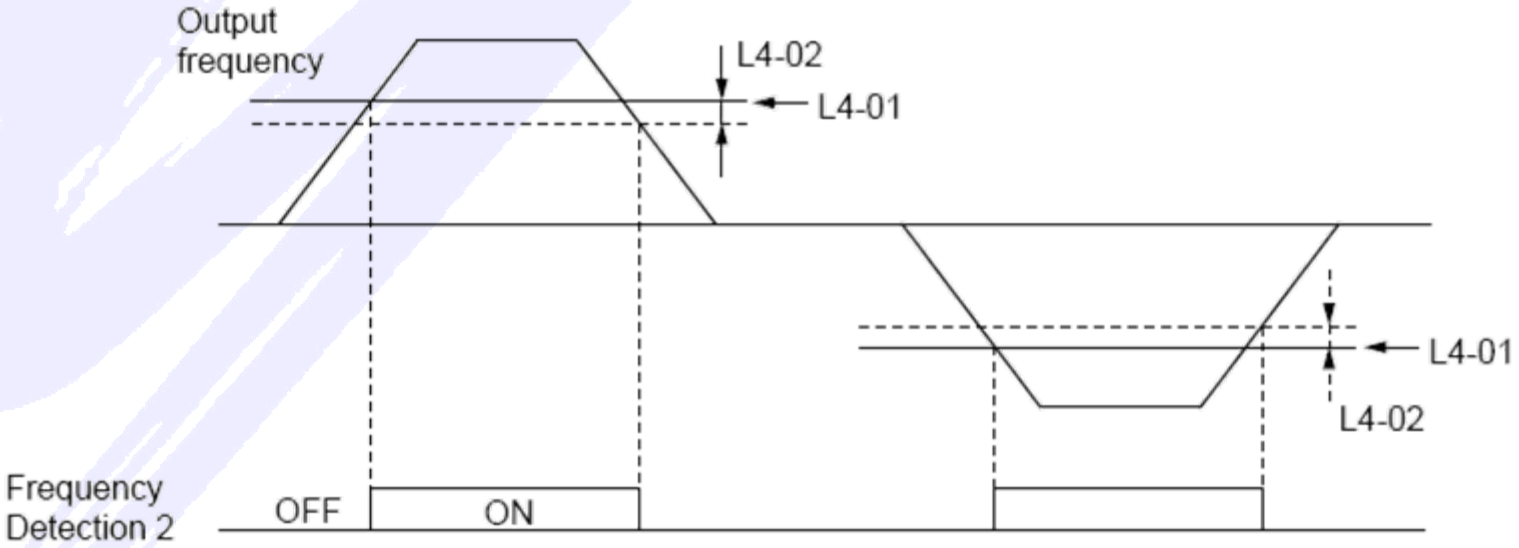
Note: Works in both directions, with same level (L4-01)

L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 5, Frequency Detection 2
Active whenever output frequency is equal or above Detection Level (L4-01).
Inactive when output frequency is below L4-01 minus hysteresis (L4-02)

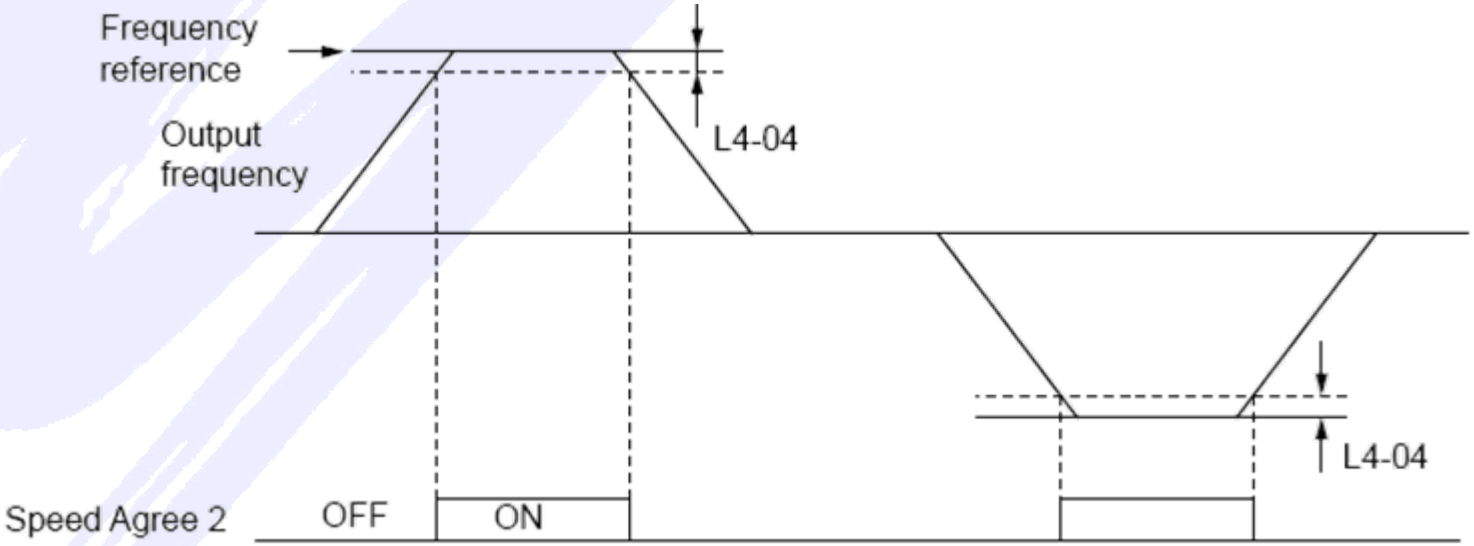


L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 13, Speed Agree 2 (f_{ref}/f_{out} Agree 2)
Active whenever output frequency is within Detection Width (L4-04) frequency reference regardless of direction.

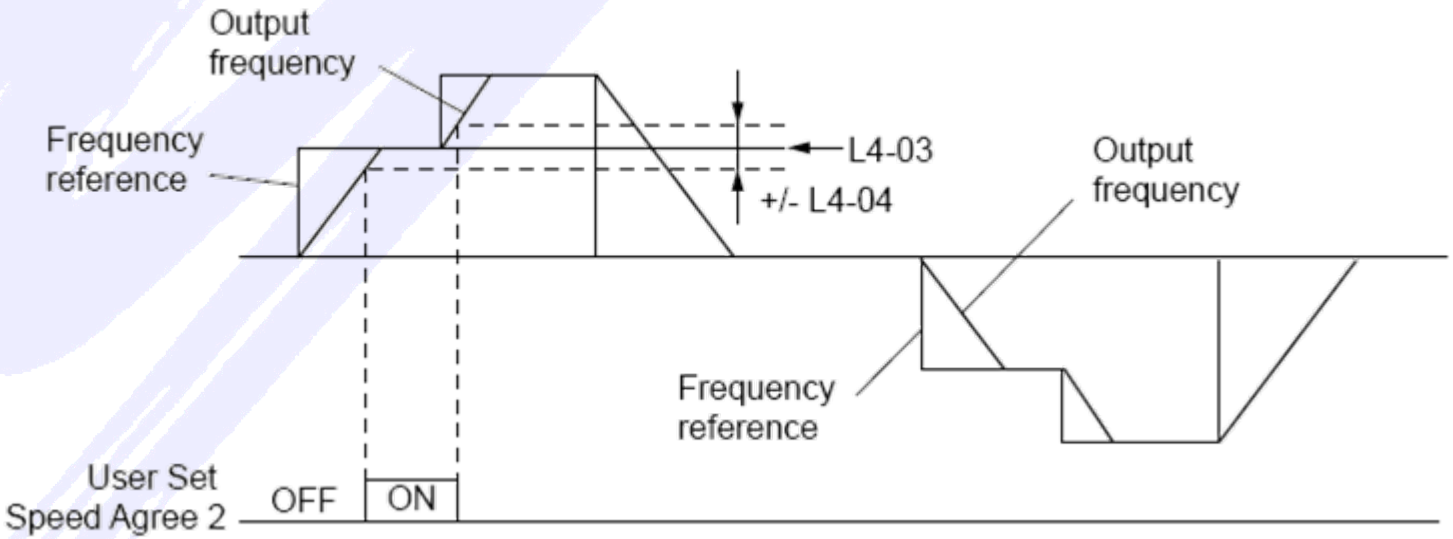


L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 14, User Set Speed Agree 2 (f_{ref}/f_{set} Agree 2)
Active whenever output frequency and frequency reference are within Detection Width (L4-04) of programmed Detection Level (L4-03). As Level (L4-03) is signed, function works in one direction only.

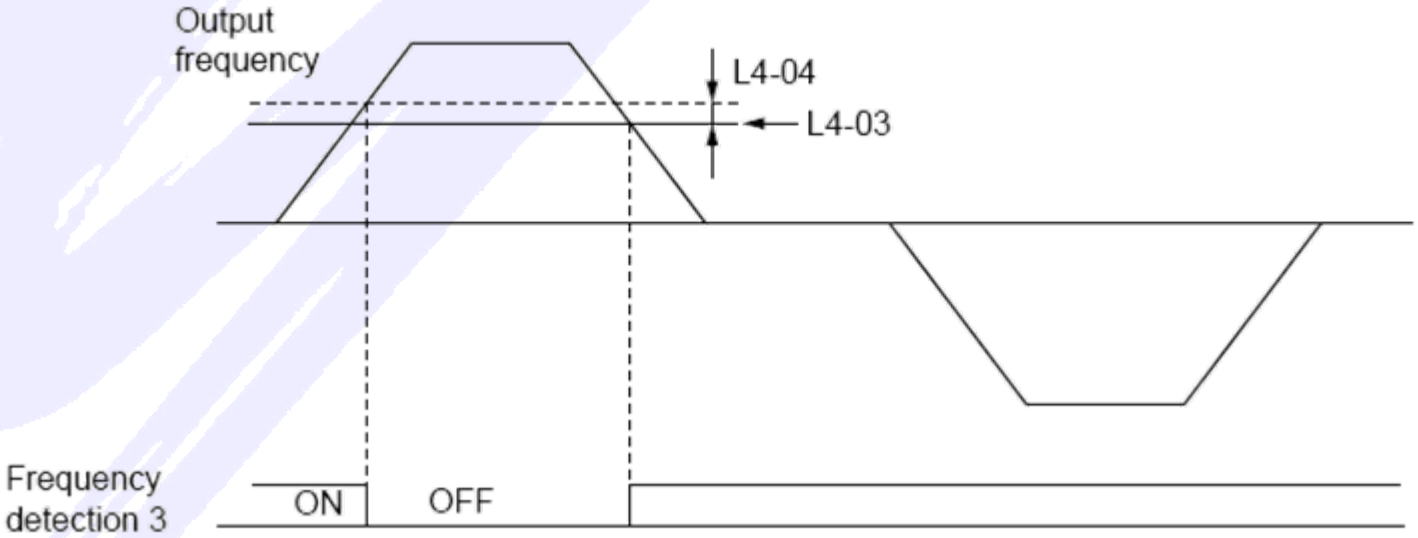


L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 15, Frequency Reference Detection 3
Active as long as output frequency is below Detection Level (L4-03) plus hysteresis (L4-04). As Level (L4-03) is signed, function works in one direction only.



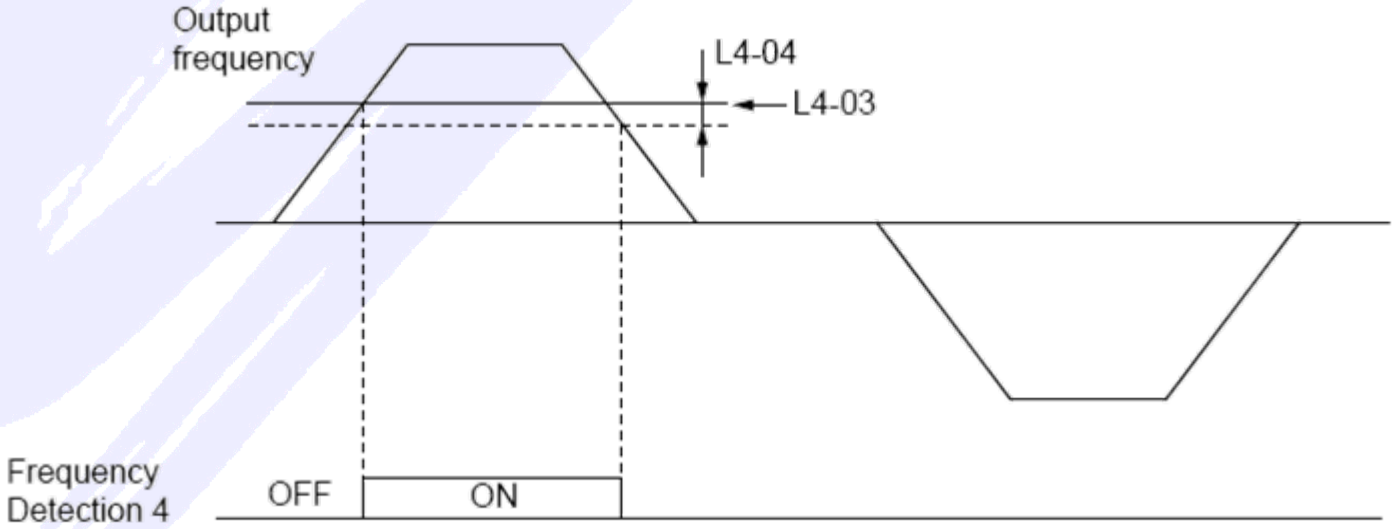
Example with positive value for L3-04

L4: Speed Agree / Frequency Reference Loss Detection

Time Charts for Speed Agree and Frequency Detection

All Modes

Setting H2- ☐☐ = 16, Frequency Reference Detection 4
Active whenever output frequency is equal or above Detection Level (L4-03).
As Level (L4-03) is signed, function works in one direction only.



Example with positive value for L3-04

L4: Speed Agree / Frequency Reference Loss Detection

L4-01: Speed Agreement Detection Level
L4-02: Speed Agreement Detection Width

All Modes

L4-01 Speed Agreement Detection Level

J V A

Sets the level to switch for the Digital output H2- ☐☐
when set to (2, 4, 5), Speed Agree 1, Frequency Detection 1 or 2.
(V1000 and A1000 also for H2-☐☐ = 3, User Set Speed Agree 1)

Parameter	Name	Range	Default
L4-01	Speed Agree Detection Level	0.0 to 400.0 Hz	0.0 Hz

L4-02 Speed Agreement Detection Width

J V A

Parameter	Name	Range	Default
L4-02	Speed Agreement Detection Width	0.0 to 20.0 Hz	2.0 Hz

➔ The Speed Agreement Detection can be used to start or stop application functions that can only operate at nominal speed. Like grinding, polishing, cutting etc.

L4-03: Speed Agreement Detection Level (+/-)
L4-04: Speed Agreement Detection Width (+/-)

J V A

All Modes

L4-03 Speed Agreement Detection Level (+/-)

Parameter	Name	Range	Default
L4-03	Speed Agreement Detection Level (+/-)	-400.0 to 400.0 Hz	0.0 Hz

L4-04 Speed Agreement Detection Width (+/-)

Parameter	Name	Range	Default
L4-04	Speed Agreement Detection Width (+/-)	0.0 to 20.0 Hz	2.0 Hz

➔ To ensure a proper hysteresis, and to avoid unwanted switching of the Speed Agree signal.

L4-07: Frequency Detection Conditions

All Modes

L4-07 Frequency Detection Conditions

0: No detection during baseblock

1: Detection always enabled

Note: For applications with brake control L4-07 = 0 setting is important.
To ensure that the brake is not opened while external baseblock is present.
Hoist or crane applications always need additional external safety measures !

➔ **For hoist or crane applications to open the brake not before the drive provides enough torque to lift the load securely.**

L4: Speed Agree / Frequency Reference Loss Detection

L4-08: Speed Agree Detection Conditions

L4-08 Frequency Detection Conditions

0: Match speed with soft-starter output

1: Match frequency Reference and Motor Speed

The detection condition of following functions is effected by this parameter:

- **L6-01 / -04 for OL3 and OL4 and UL3 and UL4**
- **Speed Agree for DriveWorksEZ**
- **UP2/Down2 function**

Note: in V/f control the setting of L4-08 is not active, soft-starter output is used to determine speed agree.

L4: Speed Agree / Frequency Reference Loss Detection

L4-05: Frequency Reference Loss Detection Selection
L4-06: Frequency Reference at Reference Loss

J V A

All Modes

L4-05 Frequency Reference Loss Detection Selection

0: Stop, drive follows the reference

1: Run, Drive will continue running at set percentage of reference in L4-06.

L4-06 Frequency Reference at Reference Loss

Sets the frequency reference at reference loss, as percentage of reference value before loss. fref = fref before loss x L4-06

Parameter	Name	Range	Default
L4-06	Frequency Reference at Reference Loss	0.0 to 100.0%	80.0%

➔ beneficial for applications where the Frequency Reference Source is switched, or might be interrupted for a short time. Ensures that the inverter remains running.

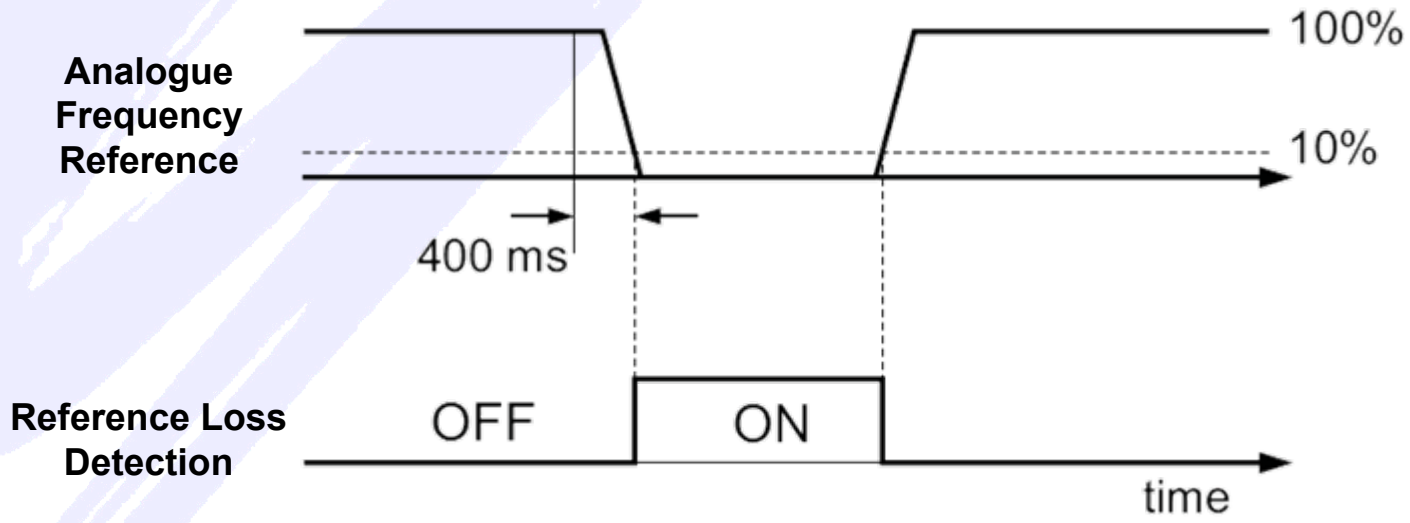
L4: Speed Agree / Frequency Reference Loss Detection

Frequency Reference Loss Detection

J V A

All Modes

Works only on Analogue Reference Source.



Digital Output can be programmed for Frequency Reference Loss Detection

Set H2- ☐☐ = C

Technical Training – Protection

L5-01: Number of Auto Restart Attempts

All Modes

L5-01 Number of Auto Restart Attempts

Automatic Restart will be attempted when one of the following faults occures:
“GF, LF,oC, oH1, oL1, oL2, oL3, oL4, ov, PF, rH, rr, Uv1, Sto“

Note: The counter will be reset after 10 min operation without fault.
Each Auto Restart performs speed search according to b3-24 setting.

Parameter	Name	Range	Default
L5-01	Number of Auto Restart Attempts	0 to 10	0

➔ **For automatically operated applications, where manual fault reset is not possible, or inconvenient. Increased machine availability for only occasionally appearing faults.**

YASKAWA

L5-02: Auto Restart Operation Selection
L4-04: Fault Reset Interval Time

J V A

All Modes

L5-02 Auto Restart Operation Selection

Sets Fault output activation during restart attempts. (H2-☐☐ = E)

Is proceeded like a Minor Fault.

0: Fault output not active

1: Fault output active during restart attempt

L5-04 Fault Reset Interval Time

Sets the waiting time between performing fault restarts.

Parameter	Name	Range	Default
L5-04	Fault Reset Interval Time	0.5 s to 600.0 s	10.0 s

L5-05: Fault Reset Operation Selection

J V A

All Modes

L5-05 Fault Reset Operation Selection

Selects the method of incrementing the restart counter.

0: Continuously attempt to restart and increment counter after successful restart (operation like VS-616-F7/G7)

1: Attempt to Restart with the interval time set in L5-04. Every trial increments the counter (operation like VS-606V7)

Setting 0: **Drive attempts to restart continuesly. With each sucessful restart the counter is increased.**

The drive finally trips when the counter reaches L5-01 value.

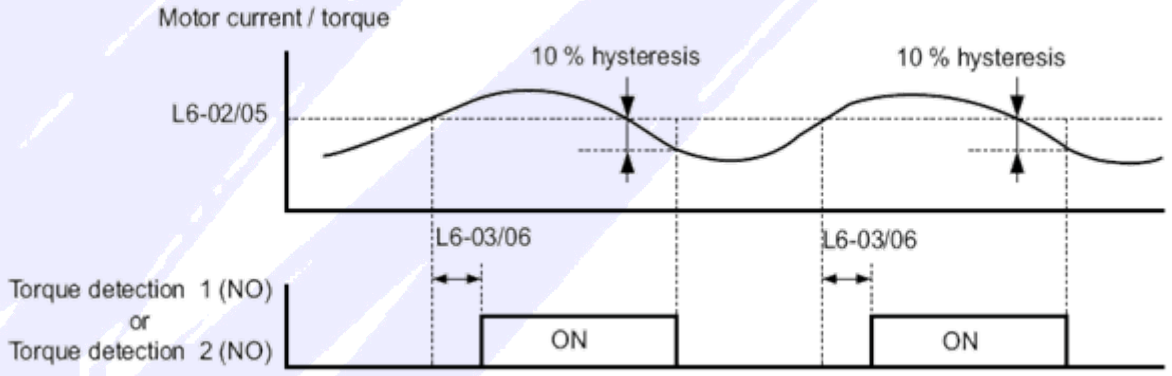
Setting 1: **Drive tries to restarts after interval time L5-04. Each attempt increases the counter. The drive trips when the counter reaches L5-01 value.**

Technical Training – Protection

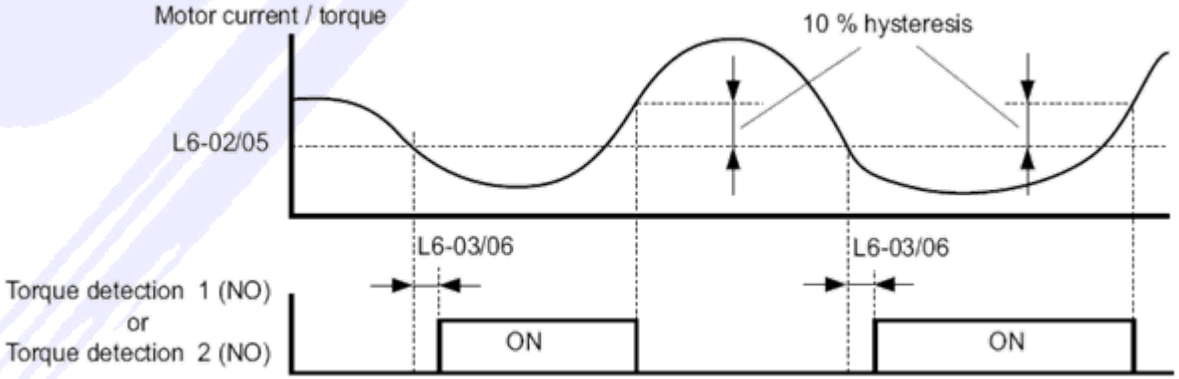
L6: Torque Detection

L6-01: Torque Detection Selection 1
L6-04: Torque Detection Selection 2

All Modes



Overtorque Detection Operation “oL□”



Undertorque Detection Operation “uL□”

L6: Torque Detection

L6-01: Torque Detection Selection 1
L6-04: Torque Detection Selection 2

All Modes

Digital Outputs can be programmed for a torque detection signal.

H2- ☐☐= B	Torque Detection 1, N.O. (“oL3” or “uL3”)
H2- ☐☐= 17	Torque Detection 1, N.C. (“oL3” or “uL3”)
H2- ☐☐= 18	Torque Detection 2, N.O. (“oL4” or “uL4”)
H2- ☐☐= 19	Torque Detection 2, N.C. (“oL4” or “uL4”)

➔ To detect mechanical wear of cutters or grinders, belt breakage, or other abnormal load conditions. For preventive maintenance, or machine protection.

Note: In V/f, V/f with PG, OLV PM the function is based on output current U1-03
In all other control methods it is based on Torque Reference U1-09

L6: Torque Detection

L6-01: Torque Detection Selection 1
L6-04: Torque Detection Selection 2

All Modes

Overview about the possible configurations for Torque Detection

Setting value	0		1		2		3		4		5		6		7		8	
Setting L6- ☐☐	-01	-04	-01	-04	-01	-04	-01	-04	-01	-04	-01	-04	-01	-04	-01	-04	-01	-04
“oL3”	-	-	x	-	x	-	x	-	x	-	-	-	-	-	-	-	-	-
“uL3”	-	-	-	-	-	-	-	-	-	-	x	-	x	-	x	-	x	-
“oL4”	-	-	-	x	-	x	-	x	-	x	-	-	-	-	-	-	-	-
“uL4”	-	-	-	-	-	-	-	-	-	-	-	x	-	x	-	x	-	x
Alarm only	-	-	x	x	x	x	-	-	-	-	x	x	x	x	-	-	-	-
Fault	-	-	-	-	-	-	x	x	x	x	-	-	-	-	x	x	x	x
At Speed Agree	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x	-	-
At Run	-	-	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x
J1000	x	-	x	-	x	-	x	-	x	-	-	-	-	-	-	-	-	-
V1000, A1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

L6: Torque Detection

L6-02 / L6-05 Torque Detection Level 1 / 2
L6-03 / L6-06 Torque Detection Time 1 / 2

J V A

All Modes

Torque Detection Level

Parameter	Drive	Name	Range	Default
L6-02	J, V, A	Torque Detection Level 1	0 to 300%	150%
L6-05	V, A	Torque Detection Level 2		

Torque Detection Time

Parameter	Drive	Name	Range	Default
L6-03	J, V, A	Torque Detection Time 1	0.0 s to 10.0 s	0.1 s
L6-06	V, A	Torque Detection Time 2		

Note: In V/f the function is based on output current U1-03
In Vector Control it is based on Torque Reference U1-09

L6-02: Torque Detection Level 1
L6-03: Torque Detection Time 1

All Modes

L6-02 Torque Detection Level 1

Parameter	Name	Range	Default
L6-02	Torque Detection Level 1	0 to 300%	150%

L6-03 Torque Detection Time 1

Parameter	Name	Range	Default
L6-03	Torque Detection Time 1	0.0 s to 10.0 s	0.1 s

L6-05: Torque Detection Level 2
L6-06: Torque Detection Time 2

J V A

All Modes

L6-05 Torque Detection Level 2

Parameter	Name	Range	Default
L6-05	Torque Detection Level 2	0 to 300%	150%

L6-06 Torque Detection Time 2

Parameter	Name	Range	Default
L6-06	Torque Detection Time 2	0.0 s to 10.0 s	0.1 s

Note: In V/f the function is based on output current U1-03
In Vector Control it is based on Torque Reference U1-09

L6: Torque Detection

L6-08: Mechanical Weakening (“oL5”) Detection Operation

All Modes

L6-08 Mechanical Weakening Detection Operation (Fault message “oL5”)
To detect overtorque or undertorque situations due to mechanical weakening of the machine after a certain machine operation time.

- **Function is activated when the value of cummulated operation time counter (U4-01) exceeds the set value of parameter L6-11**
- **Setting of Torque Detection 1 is used to trigger the function (L6-01, L6-02, L6-03)**
- **Detection speed range is set by L6-08, L6-09**
- **Signal at Digital Output with H2- ☐☐ = 22**

L8-06 setting		0	1	2	3	4	5	6	7	8
detected when speed > L6-09	signed	-	x	-	x	-	-	-	-	-
	unsigned	-	-	x	-	x	-	-	-	-
detected when speed < L6-09	signed	-	-	-	-	-	x	-	x	-
	unsigned	-	-	-	-	-	-	x	-	x
Alarm only		-	x	x	-	-	x	x	-	-
Fault		-	-	-	x	x	-	-	x	x

L6-09: Mechanical Weakening Detection Speed Level
L6-10: Mechanical Weakening Detection Time

J V A

All Modes

L6-09 Mechanical Weakening Detection Speed Level

Parameter	Name	Range	Default
L6-09	Mechanical Weakening Detection Speed Level	-110 to +110%	+110%

L6-10 Mechanical Weakening Detection Time

Detection has to last for the set time before Alarm/Fault is triggered.

Parameter	Name	Range	Default
L6-10	Mechanical Weakening Detection Time	0.0 to 10.0s	0.1s

L6-11: Mechanical Weakening Detection Start Time

J V A

All Modes

L6-11 Mechanical Weakening Detection Start Time

Sets the operation time (U4-01) after that the function is activated.

Parameter	Name	Range	Default
L6-11	Mechanical Weakening Detection Start Time	0 to 65535h	0 h

➔ **Increases machine productivity due to minimized maintenance time. Preventive Maintenance, avoids serious and expensive machine damage.**

Technical Training – Protection

L7: Torque Limit

L7-01, L7-02, L7-03, L7-04: Torque Limits
Forward / Reverse / Fwd Regenerative / Rev Regenerative

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

L7-01 Forward Torque Limit
L7-02 Reverse Torque Limit
L7-03 Forward Regenerative Torque Limit
L7-04 Reverse Regenerative Torque Limit

When the drives internal torque reference U1-09 exceeds the set level, the output frequency will be reduced (increased for regenerative torque limits)

Parameter	Name	Range	Default
L7-01 to -04	Torque Limits	0 to 300%	200%

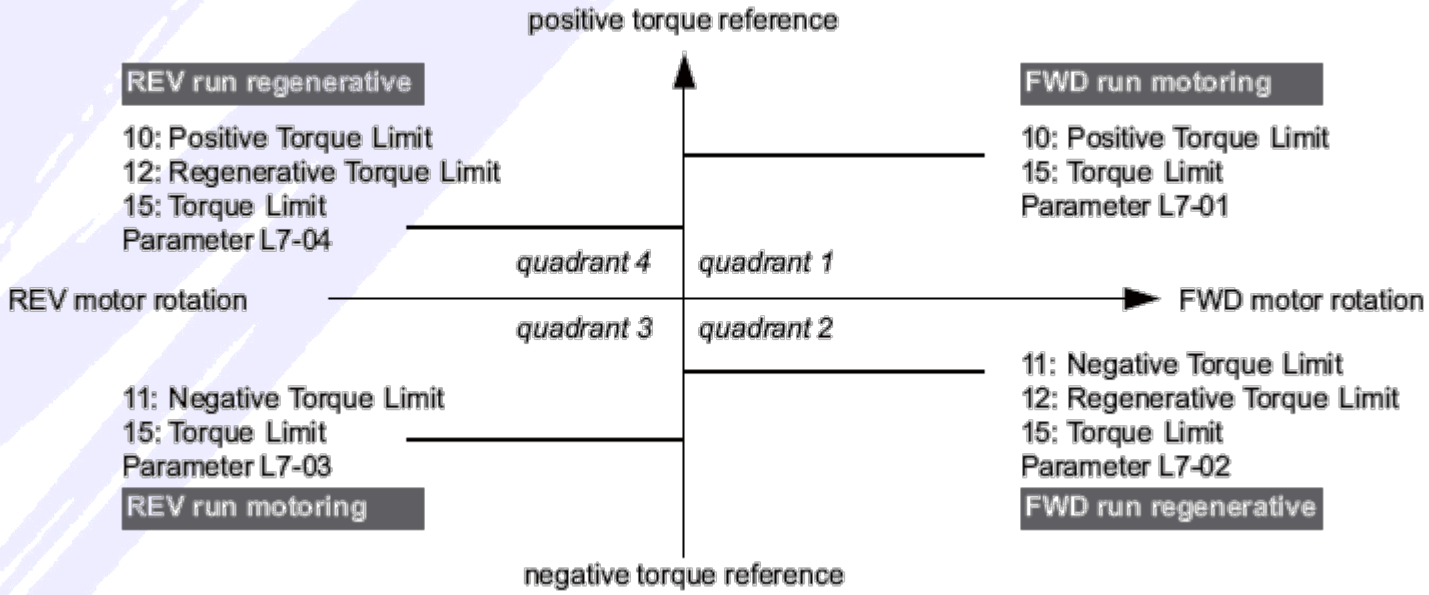
➔ **Limits the mechanical stress for the application. Possibility to control the tension of simple winding applications.**

L7: Torque Limit & H3 Analog Input Functions

L7-01 to L7-04: Torque Limits
Forward / Reverse / Fwd Regenerative / Rev Regenerative

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

Settings for Analogue Inputs
H3-02, H3-06 or H3-10: 10, 11, 12 or 15



Example: **If parameter L7-01 = 130%, L7-02 to L7-04 = 200% and a general torque limit of 150% is set by an analogue input (H3-02, H3-06 or H3-10 = 15) then torque limit in quadrant 1 will be 130%, but 150% in all other quadrants.**

L7-06: Torque Limit Integral Time Constant
L7-07: Torque Limit Control Method Selection during Accel/Decel

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L7-06 Torque Limit Integral Time Constant

Parameter	Name	Range	Default
L7-06	Torque Limit Integral Time Constant	5 to 10000 ms	200 ms

L7-07 Torque Limit Control Method Selection during Accel/Decel

0: Proportional Control, during accel/decel
integral control in constant speed (at speed agree)

1: Integral Control, all the time

➔ Use Integral Control for better accuracy even during speed changes or during start and stop of the application. Drive will also decelerate when at torque limit. Beneficial for simple winding applications to reduce speed according to master speed.

Technical Training – Protection

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L8-02: Overheat Alarm Level
L8-03: Overheat Pre-Alarm Operation Selection

J V A

All Modes

L8-02 Overheat Alarm Level

When the heat sink temperature exceeds the set value Overheat Alarm ("oH") will be triggered. It is based on a temperature sensor measurement. The "oH1" Fault trip will be triggered at L8-02 default setting + 10°C.

Parameter	Name	Range	Default
L8-02	Overheat Alarm Level	50 to 130° C	o2-04 dependent

L8-03 Overheat Pre-Alarm Operation Selection

Sets how the drive reacts when an overheat alarm ("oH") is detected.

0: Ramp to Stop using the active deceleration time
1: Coast to Stop
2: Fast-Stop using the time set in C1-09
3: Alarm only. Drive continues running, an alarm is triggered.
4: Reduced Speed Operation, as set in L8-19

L8-19: Frequency Reduction Rate during oH-Pre-Alarm

J V A

All Modes

L8-03 Overheat Pre-Alarm Operation Selection, Setting: 4
Reduced Speed Operation, as set in L8-19

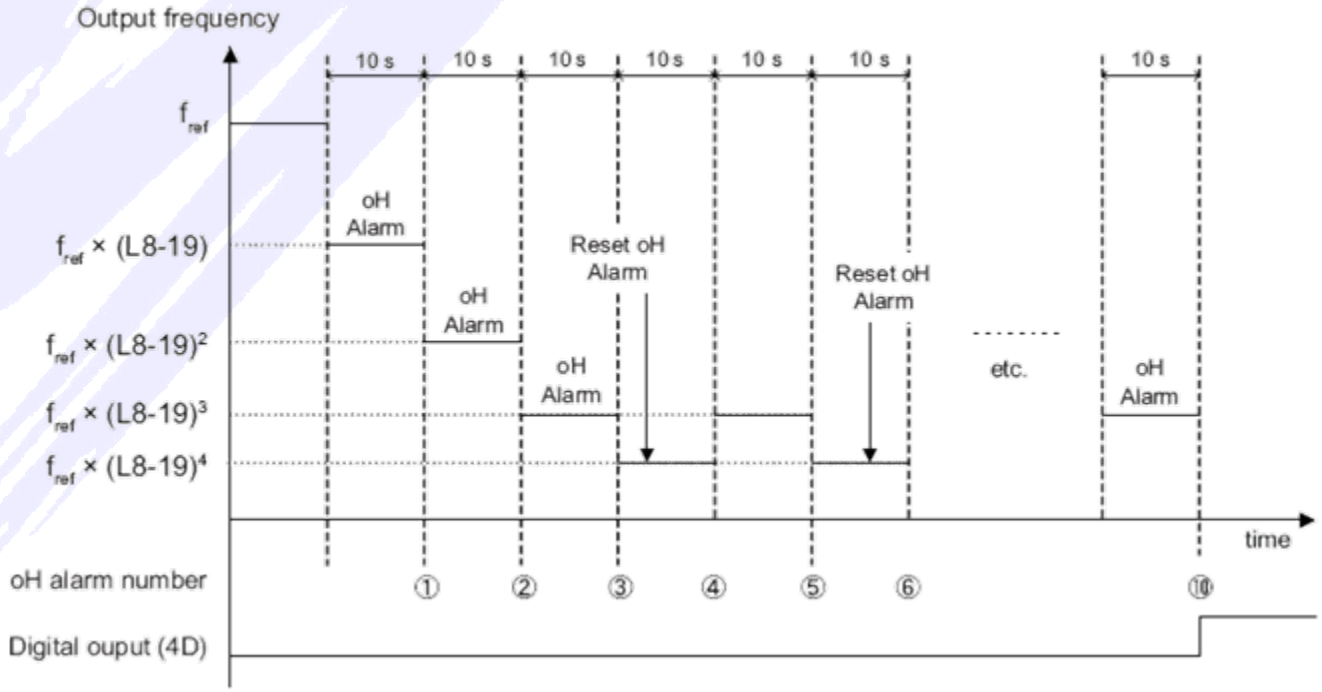
- When an overheat alarm occures the operation is continued, but the speed is reduced to the level set in parameter L8-19, to reduce the motor load and reduce the motor temperature.
- If the alarm is still present after 10s the speed is reduced once again
- This is done 10 times before the drive finally trips on “oH”
- While “oh” alarm is present a signal at a programmed digital output is present (H2- ☐☐ = 20)
- If the “oH” alarm is not anymore present, speed is again increased in steps

L8-19: Frequency Reduction Rate during oH-Pre-Alarm

All Modes

L8-19 Frequency Reduction Rate during oH-Pre-Alarm

Parameter	Name	Range	Default
L8-19	Frequency Reduction Rate during oH-Pre-Alarm	0.1 to 0.9	0.8



L8-05: Input Phase Loss Protection Selection

All Modes

L8-05 Input Phase Loss Protection Selection

detection by measuring for DC link voltage ripple during single phase operation (with a certain load). Display fault message is ”PF”.

0: Disabled
1: Enabled

Note: Input phase loss detection is not triggered, when

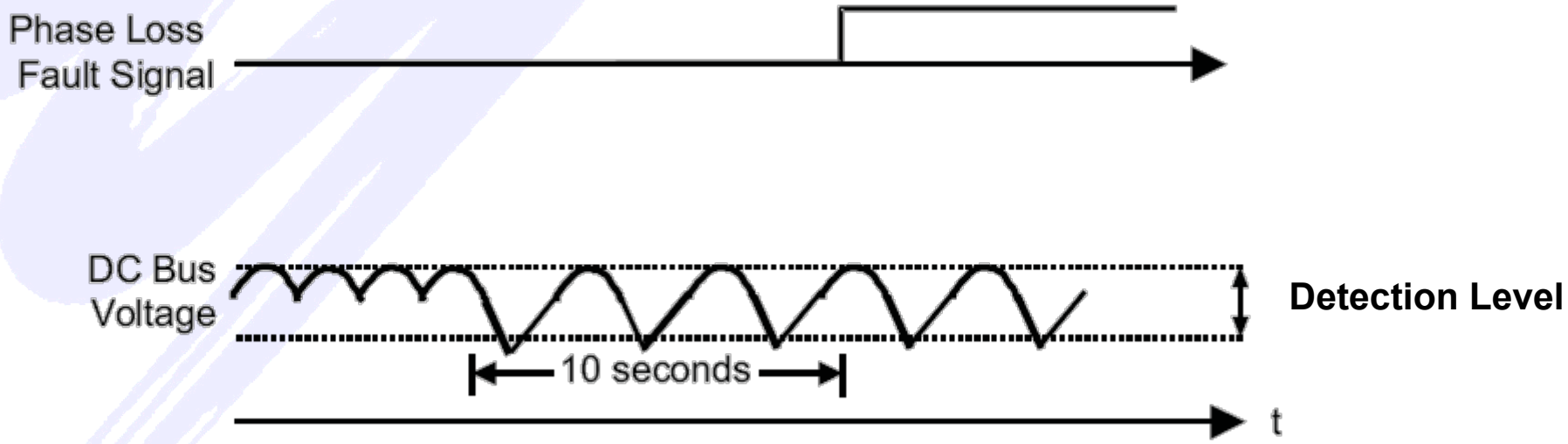
- Drive is decelerating
- No Run command is active
- Output current is not above 30% drive rated current

➔
- Prevents an overload stress to the diode rectifier bridge and the DC link capacitors.
- at light load condition of the application, a short term single phase condition might be tolerable
- Function is disabled by default for single phase inverters (CIMR-VCBA… or CIMR-JCBA…)

L8-05: Input Phase Loss Protection Selection

All Modes

Detection Level for Input Phase Loss is depending on drives voltage class, and drives capacity.
The value is approx. 15 to 35% of nominal DC Bus Voltage (voltage class x √2)



L8-07: Output Phase Loss Protection Selection

All Modes

L8-07 Output Phase Loss Protection Selection

This fault is triggered when the output current falls bellow 5% of the drives rated current.

Improves the motor protection and guards for contactor faults, winding or wiring faults. Display fault message is ”LF”.

0: Disabled

1: Enabled (triggered by a single phase loss)

2: Enabled (triggered when two or more phases are lost)

- Output phase loss detection can be mistakenly be triggered, if motor rated current is very small compared to drive rated current.
- Out put phase loss detection is not possible with a light loaded PM Motor

In these cases it is recommended to disable the function.

L8-09: Output Ground Fault Detection Selection

J V A

All Modes

L8-09 Output Ground Fault Detection Selection

The sum of all 3 output currents is calculated and should normally be 0.

A gound fault is triggered, when a high leakage current or a gound short circuit occurs in one or two output phases. ”GF” trigger level is 50% of drives rated current. Display fault message is ”GF”.

0: Disabled

1: Enabled

Note: “GF” detection is available for drives > 4kW, below 4kW “GF” is combined with “oC” detection.

L8-10: Heat Sink Cooling Fan Operation Selection
L8-11: Heat Sink Cooling Fan Operation Delay Time

All Modes

L8-10 Heat Sink Cooling Fan Operation Selection

J V A

0: Fan is on during run only, and switch-off delayed by setting of L8-11

1: Fan is always on when the drive is powered

➔ Extends the cooling fan life time. Inverter is noiseless when disabled.

L8-11 Heat Sink Cooling Fan Operation Delay Time

J V A

When the inverter is stopped, the fan keeps running for the delay time.

Parameter	Name	Range	Default
L8-11	Heat Sink Cooling Fan Operation Delay Time	0 to 300 s	60 s

➔ Improved cooling

L8-18: Software CLA Selection (Software Current Limit)

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L8-18 Software CLA Selection (Software Current Limit)

Additionally to the Hardware current limit the drive has a software current limit to prevent damage to the IGBT transistors due to overcurrent, by limiting the output voltage.

It is not recommended to turn off the Software CLA function.

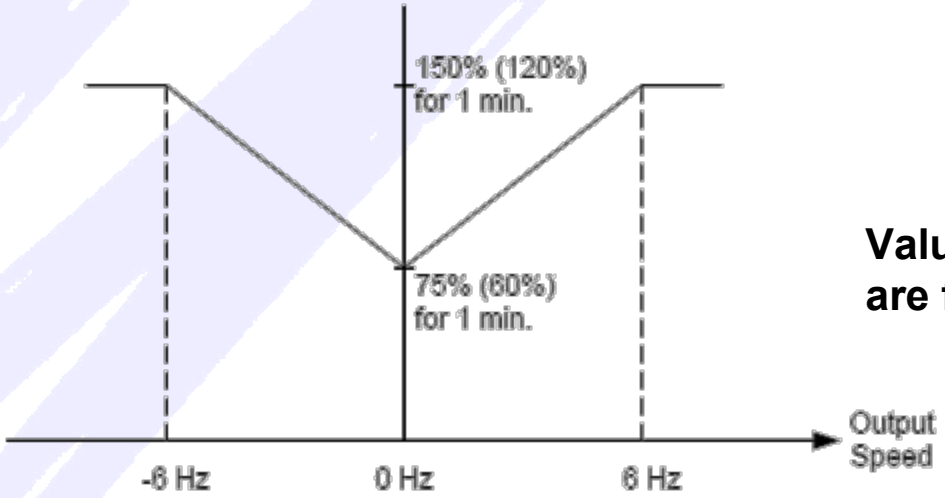
0: Disabled

1: Enabled

Note: at carrier frequencies > 4kHz Software CLA function is not active. The drive is still protected sufficiently by Hardware current limit.

L8-15: oL2 Characteristic Selection at Low Speeds

All Modes



Values in parentheses are for ND setting

L8-15 oL2 Characteristic Selection at Low Speeds

0: Disabled, overload protection level is not reduced

1: Enabled, overload protection level is automatically reduced at speeds below 6Hz

Note: Disable is not recommended, drives lifetime might be reduced due to high overload below 6Hz.

L8-29: Current Unbalance Detection (“LF2”)

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

L8-29 Current Unbalance Detection (“LF2”)

For all PM motor control methods a special output current imbalance detection function is available. PM motors are quite sensible for current imbalance. Undetected the magnets might heat up and might be demagnetized.

0: Disabled
1: Enabled

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L8-27: Over Current Detection Gain

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

L8-27 Over Current Detection Gain

Adjusts the overcurrent detection level in PM Motor control modes. For oversized drives this parameter is intended to improve protection against motor demagnetizing.

Overcurrent detection will use whichever value is lowest, drives overcurent level, of motor rated current (E5-03) x L8-27. Drive will then trip on “oC”.

Parameter	Name	Range	Default
L8-27	Over Current Detection Gain	0.0 % to 300.0 %	300.0 %

L8-12: Ambient Temperature Setting
L8-35: Installation Method Selection

All Modes

L8-12 Ambient Temperature Setting

Parameter	Name	Range	Default
L8-12	Ambient Temperature Setting	-10 to +50° C	40°C

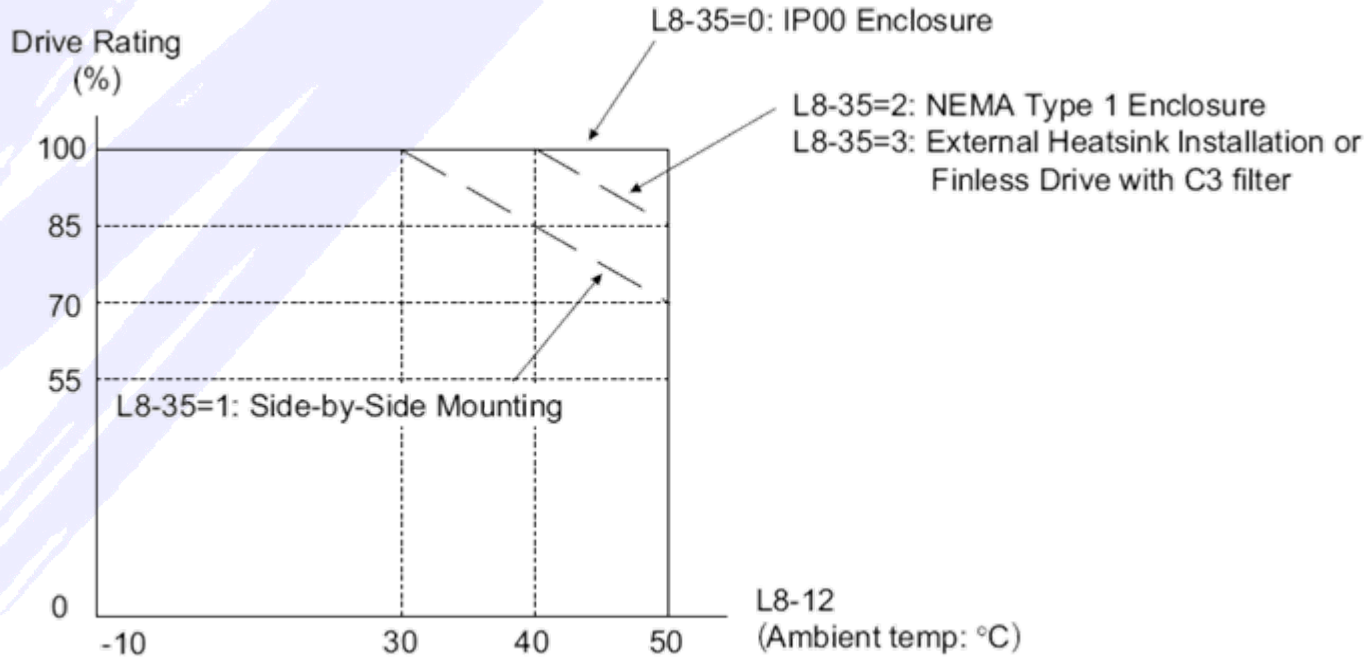
L8-35 Installation Method Selection
(default setting inverter size dependent, o2-04)

0: IP20 / Open-Chassis Drive
1: Side-by-Side-Mounting
2: IP20 / NEMA Type 1 Drive
3: Finless Inverter or External Heatsink Installation

L8-12: Ambient Temperature Setting
L8-35: Installation Method Selection

The chart below shows the drives derating depending on ambient temperature, enclosure and installation method

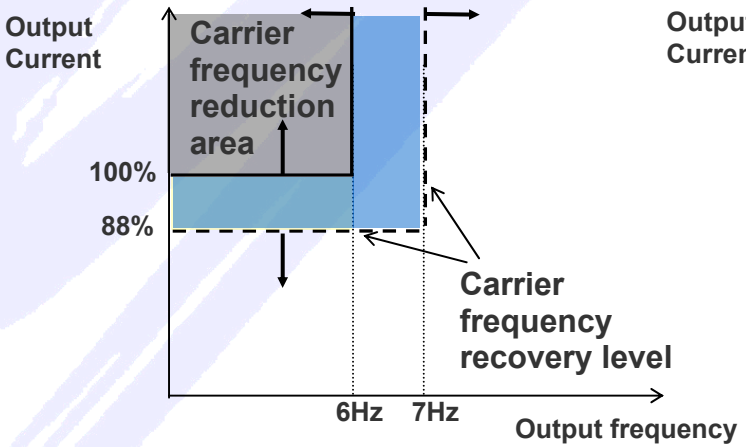
All Modes



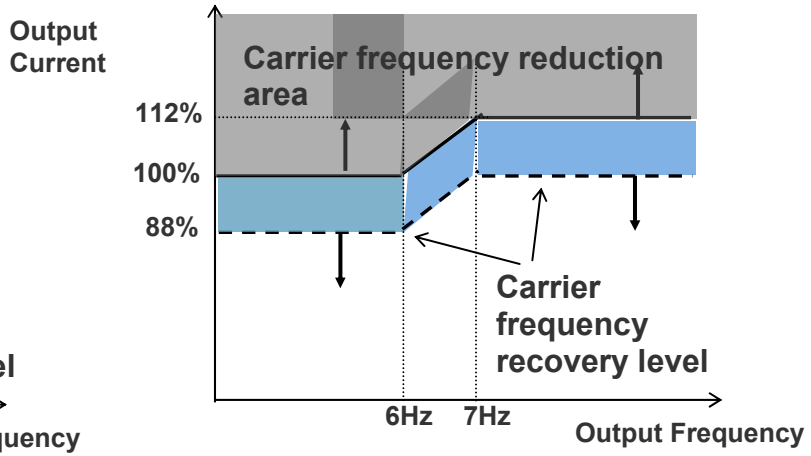
L8-38: Carrier Frequency Reduction
L8-40: Carrier Frequency Reduction Off-Delay Time

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

- If output current exceeds the current limit (100 or 112% in drawing below) carrier frequency is reduced
- OL2 (Drive overload) margin is increased
- Configuration by setting L8-38 and L8-40



L8-38 = 1 (only active below 6 Hz)



L8-38 = 2 (always active)

➔ **No “oL2” trip at short time overload**

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L8-38: Carrier Frequency Reduction
L8-40: Carrier Frequency Reduction Off-Delay Time

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | A OLV/PM | CLV/PM

L8-38 Carrier Frequency Reduction
(default setting inverter size dependent, o2-04)

0: Disabled
1: Enabled for frequencies below 6Hz
2: Enabled for entire frequency range

L8-40 Carrier Frequency Reduction Off-Delay Time

Parameter	Name	Range	Default
L8-40	Carrier Frequency Reduction Off-Delay Time	0.00 to 2.00 s	0.50 s

Note: with setting 0.00s Carrier Frequency Reduction is disabled

L8-41: High Current Alarm Selection

J V A

All Modes

L8-41 High Current Alarm Selection, Display message “HCA”

An Alarm is triggerd, when output current exceeds 150% of inverter rated current.

A Digital Output can be programmed to indicate, by H2- ☐☐ = 10 (belongs to minor faults)

0: Disabled

1: Enabled

L8-55: Internal Braking Transistor Protection

J V A

All Modes

L8-55 Internal Braking Transistor Protection. Display fault message is ”rF”.

The protection function has to be enabled only, when an external braking resistor is connected to terminals B1 / B2.

0: Disabled
1: Enabled

Do not enable this function when:

- when using a regeneration unit RC5 (or third party)
- when using an external braking unit like CDBR
- with common DC bus applications, when internal braking transistor is not used

Only following A1000 inverters have built-in braking transistor:
CIMR-AC2A0004 to 0138, CIMR-AC4A0002 to 0072

Technical Training – Protection