1000 Series Technical Training
Yaskawa Drives Department

Sequence Settings
Rev.: 04 (31.08.2010)

Overview and Contents

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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:

J   **V** ✓   **A** ✓

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

Technical Training – Sequence

b1: Mode of Operation

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b1-01: Frequency Reference Selection 1

(J) (V) (A)

b1-01 selects the frequency reference source for REMOTE mode.

All Modes

0: Operator Keypad
(LED on LO/RE key indicates LOCAL mode)

1: Terminals (analogue input terminals)

2: V1000/A1000: MEMOBUS / Modbus Communications (R+, R-, S+, S-)
J1000: optional

3: V1000/A1000: Option Card (Fieldbus options, e.g. CANopen)
J1000: Potentiometer Option

4: V1000/A1000: Pulse Train Input

b1: Mode of Operation

b1-02: Run Command Selection 1

b1-02 selects the source for the RUN command in REMOTE mode.

All Modes

0: Operator

(LED on LO/RE key indicates LOCAL mode)

1: Control Circuit Terminal (S1, S2, ...)

2: MEMOBUS / Modbus Communications (R+, R-, S+, S-)
J1000:   with Option

3: V1000/A1000:   Option Card (Fieldbus options like e.g. CANopen)

b1: Mode of Operation

b1-07: LOCAL / REMOTE Run Selection

J ✓ V ✓ A ✓

All Modes

b1-07 A Run command may already be present when switching between the control sources. Dependent on b1-07 a present Run command is accepted or has to be reapplied.

When switching to LOCAL (Operator) the Run command has to be applied anyway.

0: Run command must be cycled

1: Accepts existing Run command at the new source

➔ If the application allows it, the control can be switched on the fly, without cycling the Run command

b1: Mode of Operation

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b1-15: Frequency Reference Selection 2
b1-16: Run Command Source 2

J V✓ A✓

`All Modes`

Additionally to LOCAL operation the drives can be operated from two different control sources. Frequency Reference 2 and Run Command 2 can be selected separately by b1-15 and b1-16.

A Digital Input is used to change between the sources.

One of the Digital Inputs has to be programmed (H1- ☐☐ = 2)

Digital Input Off:	**b1-01 / b1-02 active**
Digital Input On:	**b1-15 / b1-16 active**

Note: **LOCAL operation has prioritiy, switching to Ref./Command Source 2 is disregarded when the drive is in LOCAL operation.**

➔ **Flexible setup of control source, always controllable from LOCAL**

b1: Mode of Operation

b1-15: Frequency Reference Selection 2
b1-16: Run Command Source 2

(J) (V ✓) (A ✓)

All Modes

b1-15 selects the frequency reference source for Frequency Reference 2 (like b1-01)

0: **Operator Keypad**

1: **Terminals (analogue input terminals)**

2: **MEMOBUS / Modbus Communications (R+, R-, S+, S-)**

3: **Option Card (Fieldbus options like e.g. CANopen)**

4: **Pulse Train Input**

b1-16 selects the Run Command source for Run Command 2 (like b1-02)

0: **Operator (LED on LO/RE key indicates LOCAL mode)**

1: **Control Circuit Terminal (S1, S2, ...)**

2: **MEMOBUS / Modbus Communications (R+, R-, S+, S-)**

3: **Option Card (Fieldbus options like e.g. CANopen)**

b1: Mode of Operation

Selection of Control Source
Overview

Ⓙ✓ Ⓥ✓ Ⓐ✓

All Modes

The drives can be operated from Local or Remote. A1000 and V1000 provide additionally the posibility to switch between two Remote Control Sources.

Changing Control Source is done by Multi-Function Digital Input switching.

J1000	V1000	A1000	LO/RE Selection H1- ☐☐ = 1	Ext. Reference 1/2 H1- ☐☐ = 2	Source	Control	Reference
yes	yes	yes	0	0	Remote 1	b1-01	b1-02
no	yes	yes	0	1	Remote 2	b1-15	b1-16
yes	no	no	0	1	Remote	Memobus	
yes	yes	yes	1	0	Local	Operator	
yes	yes	yes	1	1	Local	Operator	

Note:

- **When a digital input is programmed to Local/Remote H1- ☐☐ = 1 the operator LO/RE key is not functional anymore.**
- **For changing Control Source on the fly, set b1-07 = 1**

b1: Mode of Operation

Indication of active Control Source
Overview

J ✓ V ✓ A ✓

All Modes

Which Control or Reference Source is currently activated can be monitored by a digital output signal.

By the setting parameter H2- ☐☐ = 9 the Frequency Reference source is indicate

Output On: **Digital Operator is active**
Output Off: **External Ref. 1 (b1-01) or external Ref. 2 (b1-15) is active**

By the setting parameter H2- ☐☐ = A the Run Command source is indicate

Output On: **Digital Operator is active**
Output Off: **Ext. Command 1 (b1-02) or ext. Command 2 (b1-16) is active**

A combination of H2- ☐☐ = 9 and A is the setting H2- ☐☐ = 3C (Local/Remote Status)

Output On: **Drive is in LOCAL operation**
Output Off: **either status of setting 9 or A**

b1: Mode of Operation

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b1-03: Stopping Method Selection

(J ✓) (V ✓) (A ✓)

b1-03 selects how the drive reacts if Run command is removed
or Stop is entered.

All Modes

0: Ramp to Stop

1: Coast to Stop

2: DC Injection Braking to Stop

3: V1000/A1000:   Coast to Stop with Timer
    (inhibit timer for restart signal)

9: V1000/A1000:   Simple Positioning Stop
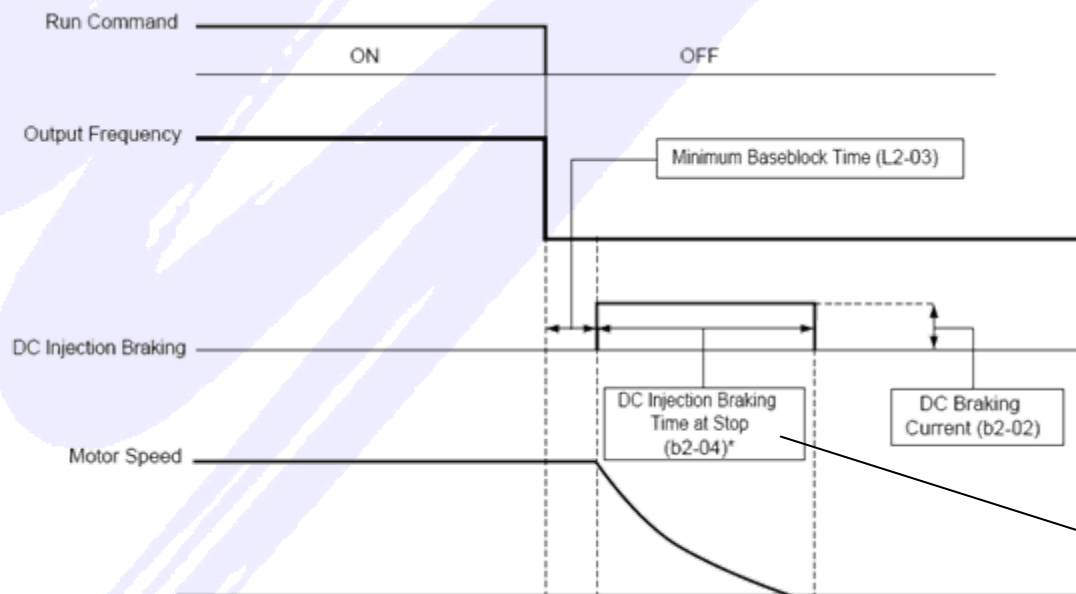   (Speed dependent delayed Stop signal)

b1: Mode of Operation

b1-03: Stopping Method Selection

J ✓ V ✓ A ✓

b1-03 **selects how the drive reacts if Run command is removed or Stop is entered.**

All Modes

2: **DC Injection Braking to Stop**

Run Command — ON / OFF

Output Frequency

Minimum Baseblock Time (L2-03)

DC Injection Braking

DC Injection Braking Time at Stop (b2-04)*

DC Braking Current (b2-02)

Motor Speed

Parameters that influences the DC Injection Brake:

- **b2-02 Level of DC braking current**

- **L2-03 Min. Baseblock Time (to wait for decay of motor remanence) increase if overcurrent "oC"occures**

$$= \frac{b2\text{-}04 \cdot 10 \cdot \text{Output frequency}}{\text{Max. output frequency (E1-04)}}$$

➔ **Stops the application without additional braking resistor, prevents overshoot in reverse direction because of inertia**
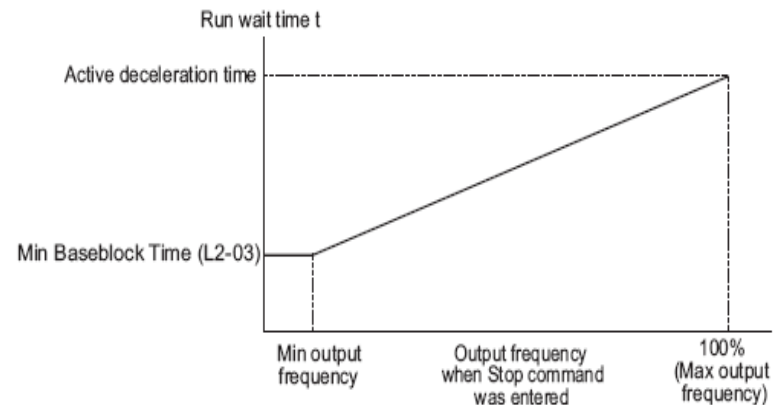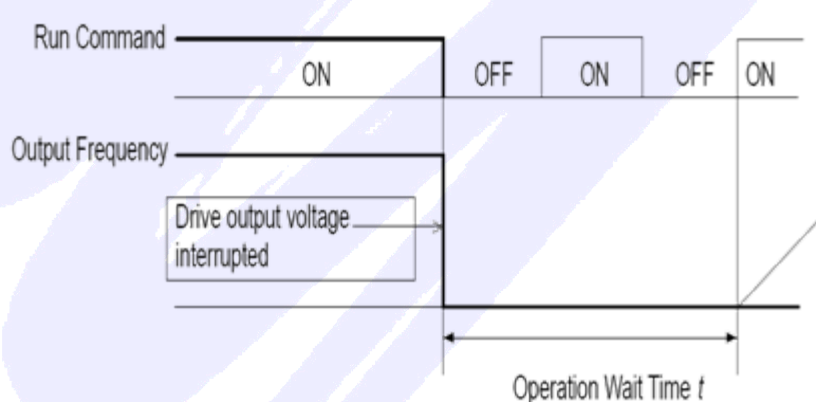
b1: Mode of Operation

b1-03: Stopping Method Selection

J ✓ V ✓ A ✓

b1-03 selects how the drive reacts if Run command is removed or Stop is entered.

All Modes

3:   V1000/A1000:   Coast to Stop with Timer

Note: A Start signal during wait Time is ignored and has to be cycled again after the wait time has expired.

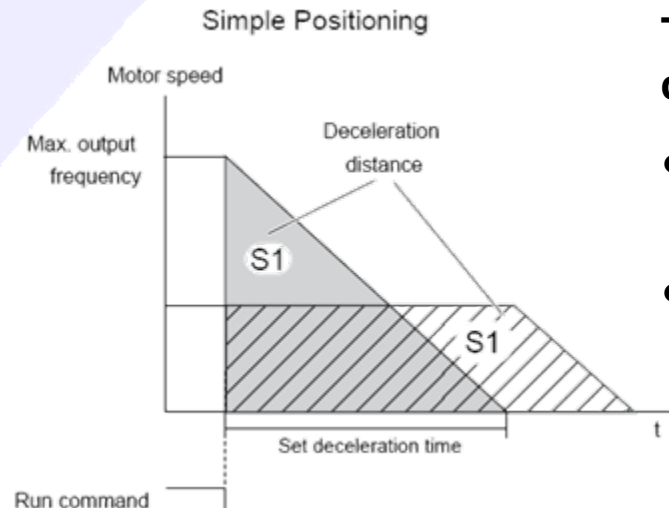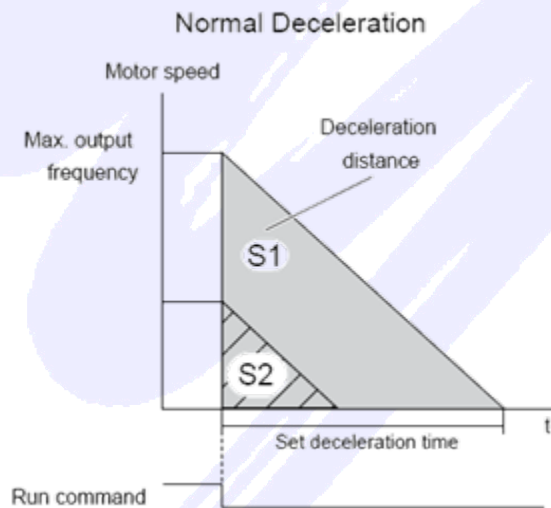**➔   Makes it possible to allow a restart only after a certain delay time. Load can come to stop before restart.**

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b1-03: Stopping Method Selection

(J) ✓ (V) ✓ (A) ✓

All Modes

b1-03 selects how the drive reacts if Run command is removed or Stop is entered.

9:   V1000/A1000:   Simple Positioning Stop

Tuning of the function by d4-12 Stop Position Gain:

- **increase value when stop too early**

- **reduce value when stop too late**

➜ **Stops the application always at the same orientation angle, independent of the speed before, and without requirement of any sensor. For loading / unloading mixers, blenders or similar applications.**

b1: Mode of Operation

b1-04: Reverse Operation Selection

J ✓ V ✓ A ✓

All Modes

b1-04 **selects if the drive is allowed to run reverse.**

0: Reverse Operation enabled

1: Reverse Operation disabled

➔ **Protects the application against mechanical damage, due to not allowed reverse running**

Only Forward signal (default on S1) is active. Reverse signal is ignored.

b1-14 (Phase Order Selection) is still active, motor will reverse if b1-14 is changed.

b1: Mode of Operation

b1-05: Action Selection below Minimum Output Frequency

(J) (V) (A)✓

b1-05 selects how the drive reacts, if the frequency reference is lower
than the setting of E1-09 (Minimum Output Frequency)

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

0: **Follow the Frequency Reference**

1: **Coast to Stop**

2: **Run at the Minimum Frequency**

3: **Zero Speed Control**
the drive will ensure that the motor stays at zero speed.

➔ More flexible operation below minimum speed;
J1000 / V1000 simply stop if speed reference is below minimum speed
The knowledge of the true motor speed is used to perform zero speed
control

b1: Mode of Operation

b1-05: Action Selection below Minimum Output Frequency

(J) (V) (A)✓

b1-05 **Setting 0: Follow the Frequency Reference**

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

The drive follows the speed reference even when it is below minimum speed (E1-09). When Run Command is removed and speed falls below Zero Speed Level (b2-01), Zero Speed Control is performed for the time set in b2-04.

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b1-05: Action Selection below Minimum Output Frequency

(J) (V) (A)
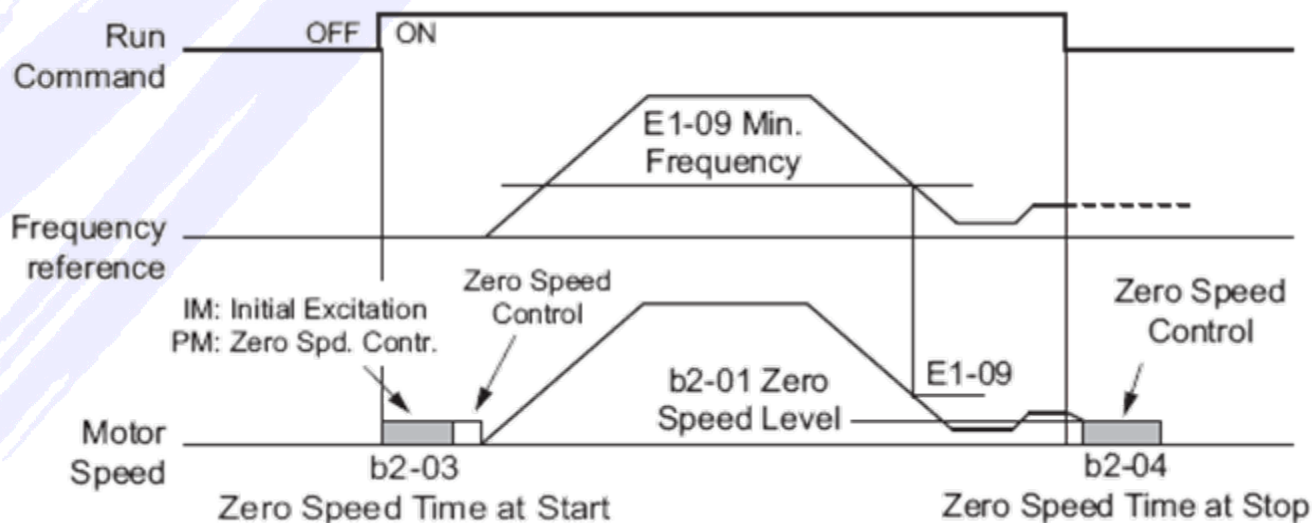
b1-05 Setting 1: Coast to Stop

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

Operation starts when frequency reference exceeds minimum speed (E1-09). During Run, when frequency reference falls below minimum speed, the drives output is shut off, an the motor coasts to stop. When motor speed falls below zero speed level (b2-01), zero speed control is performed for the time set in b2-04.
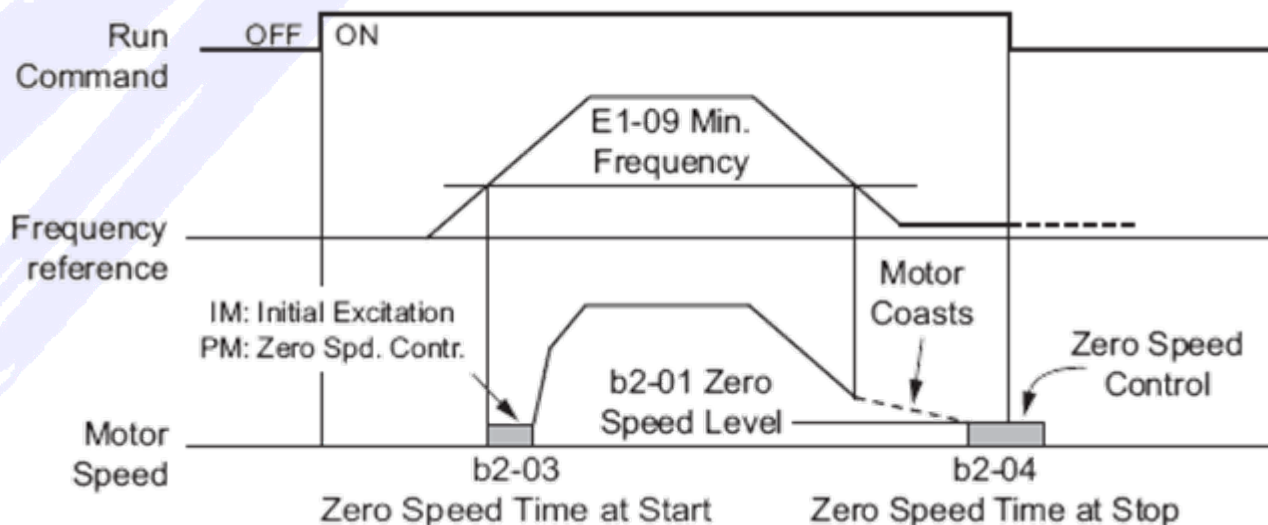
b1: Mode of Operation

b1-05: Action Selection below Minimum Output Frequency

(J) (V) (A) ✓

b1-05 Setting 2: Run at Minimum Speed

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

Whenever a Run command is active and frequency reference falls below minimum speed (E1-09), the drive keeps running at minimum speed. When Run command is removed the drive will decelerate the motor. When zero speed level is reached, zero speed control is performed for the time set in b2-04.
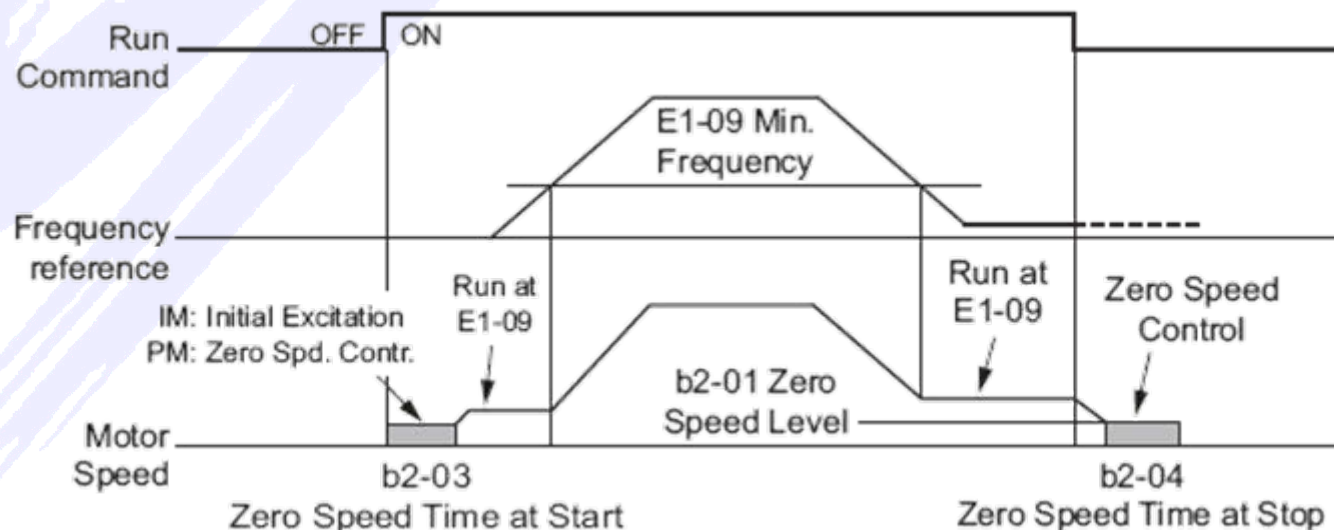
b1: Mode of Operation

b1-05: Action Selection below Minimum Output Frequency

(J) (V) (A)✓

b1-05 **Setting 3: Zero Speed Control**

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

the drive will ensure that the motor stays at zero speed.

Zero Speed Control is applied when the speed reference falls below minimum speed (E1-09), and remains active for the time set in b2-04 when Run command is removed.

b1: Mode of Operation

b1-06: Digital Input Reading

(J) (V) (A)✓
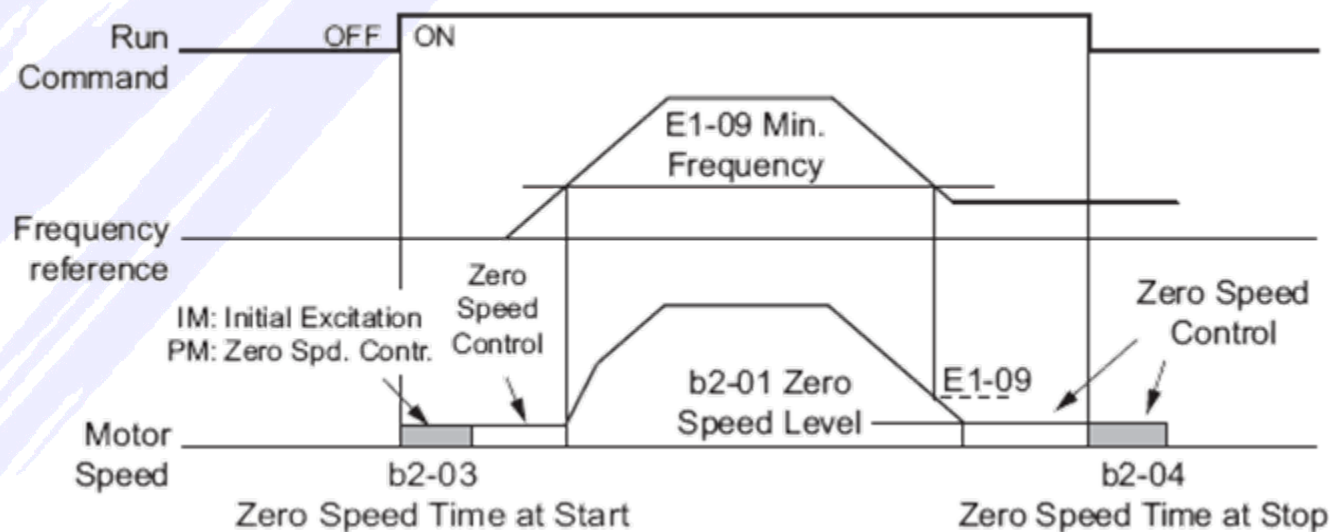
b1-06 Digital Input Reading

All Modes

0: Input Status is read once and processed immediately

1: Input Status is read twice and only processed with same reading

➔ **Suppression of electric noise. Reliable functionality even with bad input signal quality.**

Response on digital inputs is faster when b1-06 = 0

Note: **Input Scan Time:**

J1000/V1000	**2ms**
A1000	**1ms**

b1: Mode of Operation

b1-08: Run Command Selection while in Programming Mode

(J)✓ (V)✓ (A)✓

All Modes

b1-08 selects the condition when the drive can be programmed.

0: Disabled (Run command is only accepted in DRV mode)

1: Enabled (Run command is accepted in any digital operator mode)

2: Prohibited programming during Run

➔ For either more convenience or more safety during programming

Note: Press ESC button several times to return to DRV mode

b1: Mode of Operation

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b1-14: Phase Order Selection
b1-17: Run Command at Power Up

(J) (V) (A)

b1-14 sets the phase sequence for the motor terminals. Makes it possible to change forward / reverse direction without changing the motor cable wiring

All Modes

0: Standard Phase Order
1: Switched Phase Order

➔ **Reduces commissioning time, more convenience**

Note: In Closed Loop Vector Mode also PG rotation direction might have to be changed (F1-05 / -32) as well.

b1-17 determines if the Run signal is level or edge controlled. Means if it can be switched together with power on, or after power on.

0: Run command has to come after power on, or must be cycled
1: Power on and Run command can be switched together.
   Caution! Unexpected start at power on is possible!

➔ **For very simple control of the drive, timer relays are unnecessary.**
   Start with Power On, Stop with Power Off.

Technical Training – Sequence

b4: Delay Timers

b4-01 / b4-02: Timer Function On/Off-Delay Time

(J) (V)✓ (A)✓

All Modes

The Timer Function switches a digital output in a timed relation to on digital input. It can only be used once.

To use the timer function, a multi-function digital input must be set

to „Timer Input" (H1- □□ = 18), and a multi-function digital output must be

set to „Timer Output" (H2- □□ =12).

V1000 for Digital Outputs: P1/PC, P2/PC, MA/MB/MC
A1000 for Digital Outputs: M1/M2, M3/M4, M5/M6

Multi-function Contact Input: Timer Function | ON | ON | On (Closed) Off (Open)

Multi-function Contact Output: Timer Function | ON | ON | On (Closed) Off (Open)

b4-01   b4-02   b4-01   b4-02
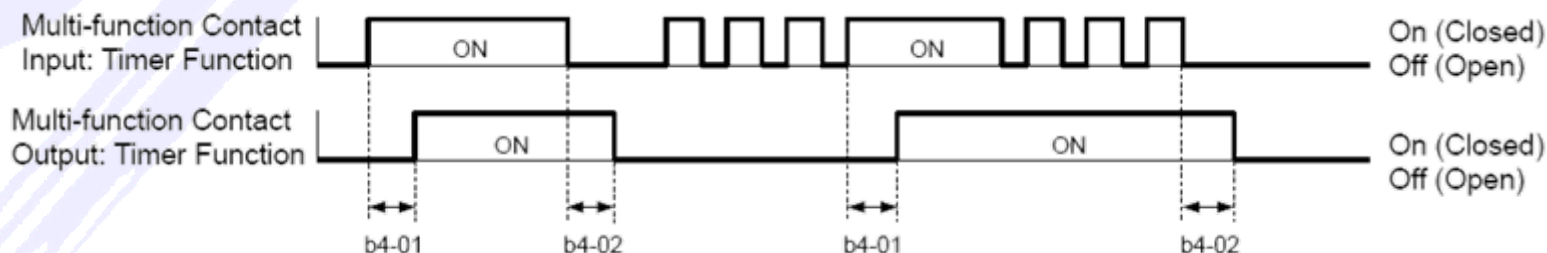
➔   **An external timer relay is unnecessary for simple application**

b4: Delay Timers

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Setup Example for A1000
Delayed Run Command

J V✓ A✓

All Modes

A delayed Run Command gives time to start other auxilliary functions like lubrication pumps.

A1000 inverter

Run

S1 Run

S4

H1-04 = 18

SC

M3

M4

H2-02 = 12

b4: Delay Timers

b4-01 / b4-02: Timer Function On/Off-Delay Time

J V ✓ A ✓
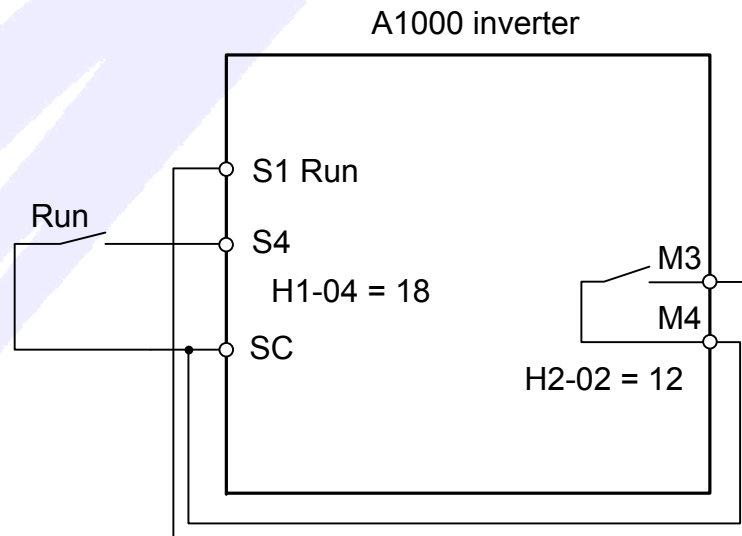
All Modes

b4-01   Timer Function On-Delay Time

Parameter	Name	Range	Default
b4-01	Timer Function On-Delay Time	0.0 to 3000.0 s	0.0 s

b4-02   Timer Function Off-Delay Time

Parameter	Name	Range	Default
b4-02	Timer Function Off-Delay Time	0.0 to 3000.0 s	0.0 s

Technical Training – Sequence

H1: Multi-Function Digital Inputs

H1-01 to H1-08: Functions for Terminals S1 to S8 (J1000 to S5, V1000 to S6, A1000 to S8)

J ✓ V ✓ A ✓

All Modes

All digital inputs are programmable. A list of available functions can be assigned to the digital inputs e.g. S3 by parameter H1-03.

Double selection (except of External Faults) of the same function to more than one input is not possible ("oPE03" "Terminal" fault)

Positive or negative Logic (PNP/NPN) can be selected either by DIP switch or external wire link.

The different drives have different number of digital inputs:

J1000   **V1000**   **A1000**

H1: Multi-Function Digital Inputs

H1-01 to H1-08: Functions for Terminals S1 to S8 (J1000 to S5, V1000 to S6, A1000 to S8)

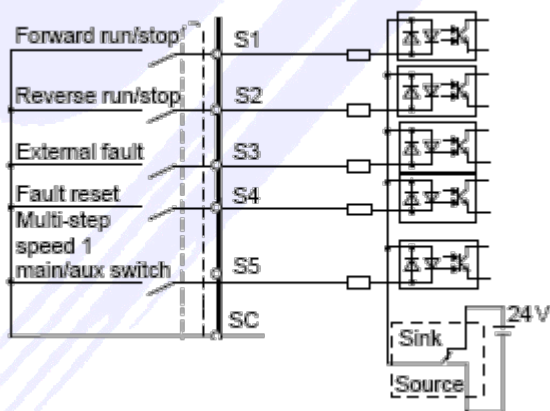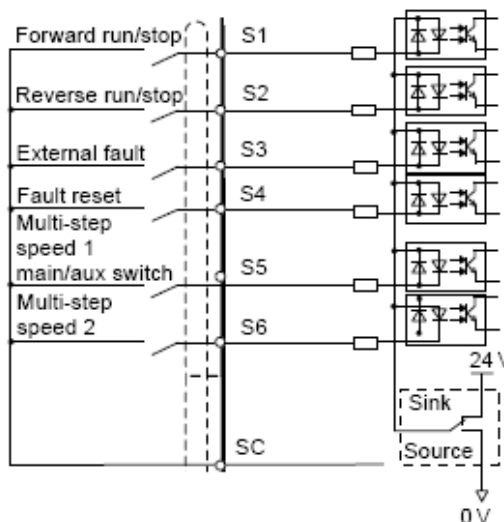**The following list shows the available functions for each drive:**

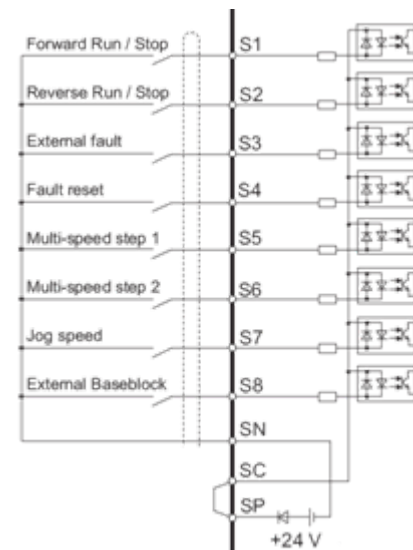| Setting	Function	available for drives		
		J1000	**V1000**	**A1000**
0	**3 - Wire Sequence**	x	x	x
1	**Local / Remote Selection**	x	x	x
2	**External Reference 1/2 selection**	x	x[1]	x[1]
3	**Multi-Step Speed Reference 1**	x	x	x
4	**Multi-Step Speed Reference 2**	x	x	x
5	**Multi-Step Speed Reference 3**	x	x	x
6	**Jog Reference Selection**	x	x	x
7	**Accel / Decel Time Selection 1**	x	x	x
8	**Base Block Command (N.O.)**	x	x	x
9	**Base Block Command (N.C.)**	x	x	x

1) extended functionality

H1: Multi-Function Digital Inputs

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H1-01 to H1-08: Functions for Terminals S1 to S8 (J1000 to S5, V1000 to S6, A1000 to S8)

The following list shows the available functions for each drive:

All Modes

Setting	Function	available for drives		
		J1000	V1000	A1000
A	Accel / Decel Ramp Hold	x	x	x
B	Drive Overheat Alarm (OH2)	-	x	x
C	Analogue Input Selection	-	x	x^1
D	PG Encoder Disable	-	-	x
E	ASR Integral Reset	-	-	x
F	Not used / Through Mode	x	x	x
10	Up Command	x	x	x
11	Down Command	x	x	x
12	Forward Jog		x	x
13	Reverse Jog	-	x	x

1) extended functionality

H1: Multi-Function Digital Inputs

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H1-01 to H1-08: Functions for Terminals S1 to S8 (J1000 to S5, V1000 to S6, A1000 to S8)

The following list shows the available functions for each drive:

All Modes

Setting	Function	available for drives		
		J1000	V1000	A1000
14	Fault Reset	x	x	x
15	Fast Stop (N.O.)	x	x	x
16	Motor 2 Selection	-	x	x
17	Fast Stop (N.C.)	x	x	x
18	Timer Function Input	-	x	x
19	PID Disable	-	x	x
1A	Acceleration / Deceleration Time Selection 2	-	x	x
1B	Program Lockout	-	x	x
1E	Reference Sample Hold	-	x	x
20 to 2F	External Fault	x	x	x

H1: Multi-Function Digital Inputs

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H1-01 to H1-08: Functions for Terminals S1 to S8 (J1000 to S5, V1000 to S6, A1000 to S8)

J ✓ V ✓ A ✓

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
30	PID Integral Reset	-	x	x
31	PID Integral Hold	-	x	x
32	Multi-Step Speed Reference 4	-	x	x
34	PID Soft Starter Cancel	-	x	x
35	PID Input Level Selection	-	x	x
40	Forward Run Command (2-wire sequence)	x	x	x
41	Reverse Run Command (2-wire sequence)	x	x	x
42	Run Command (2-wire sequence 2)	-	x	x
43	Forward / Reverse Command (2-wire sequence 2)	-	x	x
44	Offset Frequency 1	-	x	x

H1: Multi-Function Digital Inputs

H1-01 to H1-08: Functions for Terminals S1 to S8 (J1000 to S5, V1000 to S6, A1000 to S8)

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
45	Offset Frequency 2	-	x	x
46	Offset Frequency 3	-	x	x
47	Node Setup	-	x	x
60	DC Injection Brake Command	-	x	x
61	External Speed Search Command 1	x	x	x
62	External Speed Search Command 2	x	x	x
63	Field Weakening	-	-	x
65	KEB Ride-thru 1 (N.C.)	-	x	x
66	KEB Ride-thru 1 (N.O.)	-	x	x
67	Communication Test Mode	x	x	x

H1: Multi-Function Digital Inputs

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H1-01 to H1-08: Functions for Terminals S1 to S8 (V1000 to S6, A1000 to S8)

J ✓ V ✓ A ✓

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
68	High Slip Braking	-	x	x
6A	Drive Enabled	-	x	x
71	Speed / Torque Control Switch	-	-	x
72	Zero Servo	-	x	x
75	Up 2 Command	-	x	x
76	Down 2 Command	-	x	x
77	ASR Gain Switch	-	-	x
78	External Torque Reference Polarity Inversion	-	-	x
7A	KEB Ride-thru 2 (N.C.)	-	x	x
7B	KEB Ride-thru 2 (N.O.)	-	x	x

H1: Multi-Function Digital Inputs

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H1-01 to H1-08: Functions for Terminals S1 to S8 (V1000 to S6, A1000 to S8)

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
7C	Short Circuit Braking (N.O.)	-	x	x
7D	Short Circuit Braking (N.C.)	-	x	x
7E	Forward / Reverse Detection (V/f with simple PG)	-	x	x
7F	Bidirectional PID Output Enable	-	x	x
90 to 97	Drive Woks EZ Digital Input 1 to 8	-	x	x[1]
9F	Drive Works EZ Enable	-	x	x

1) extended functionality

H1: Multi-Function Digital Inputs

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Functions of Digital Inputs
2-Wire Sequence, , Setting H1- ☐☐ = 40, 41

J ✓ V ✓ A ✓

All Modes

The way how the drive expects Run/Stop and Forward/Reverse signals is determined by 2-wire or 3-wire sequence selection. Both can be set by parameters for Multi-function digital inputs (H1- ☐☐)

Setting for 2-wire sequence:

S1 (H1-01 = 40):   Run Forward

S2 (H1-02 = 41):   Run Reverse

Drive

Forward Run — S1

Reverse Run — S2

SC Digital Input Common

Note: The drive will be set to 2-wire sequence by initializing with A1-03 = 2220. (Default setting)

➔   Recommended setting. Avoids unexpected reversing, drive will stop when a control wire is broken.

H1: Multi-Function Digital Inputs

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Functions of Digital Inputs
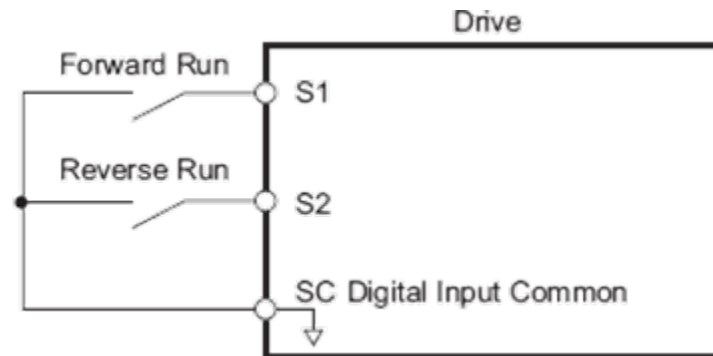## 3-Wire Sequence, , Setting H1- ☐☐ = 0

Ⓙ✓ Ⓥ✓ Ⓐ✓

All Modes

The way how the drive expects Run/Stop and Forward/Reverse signals is determined by 2-wire or 3-wire sequence selection. Both can be set by parameters for Multi-function digital inputs (H1- ☐☐)

Setting for 3-wire sequence:

Selected Input (e.g. S5)
S5 (H1-05 = 0):   3-wire sequence
● **S5 will work as FWD / REV input**
● **S1 function is fixed Start**
● **S2 function is fixed Stop**
● **S5 is level controlled**
● **S1, S2 are edge controlled (min. 2ms control signal)**

Stop Switch (N.C.)   Run Switch (N.O.)   DRIVE

S1 — Run Command (Runs when Closed)
S2 — Stop Command (Stops when Open)
S5 — FWD/REV (Multi-Function Input) (H1-05 = 0)
SC — Sequence Input Common

Note: The drive will be set to 3-wire sequence by initializing with A1-03 = 3330.

H1-01 / H1-02 setting is disregarded, when 3-wire sequence is assigned to any of the digital inputs.

➔   **Unexpected reversing is possible, when S5 signal wire is broken. Not recommended regarding safety.**

H1: Multi-Function Digital Inputs

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Functions of Digital Inputs
2-Wire Sequence 2, , Setting H1- □□ = 42, 43

Ⓙ✓ Ⓥ✓ Ⓐ✓

All Modes

The way how the drive expects Run/Stop and Forward/Reverse signals is determined by 2-wire or 3-wire sequence selection. Both can be set by parameters for Multi-function digital inputs (H1- □□)
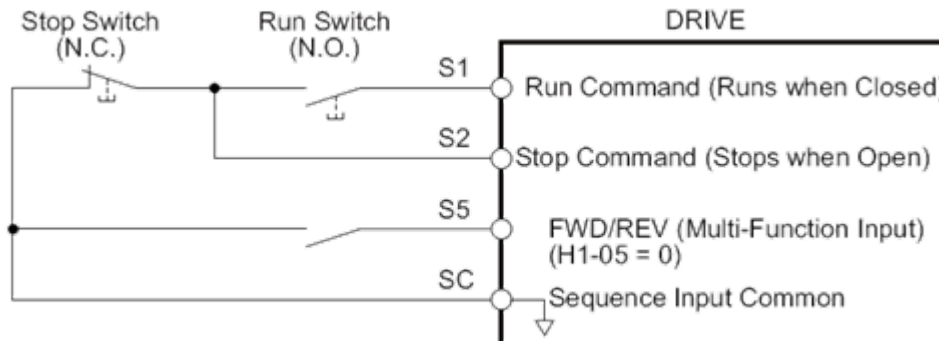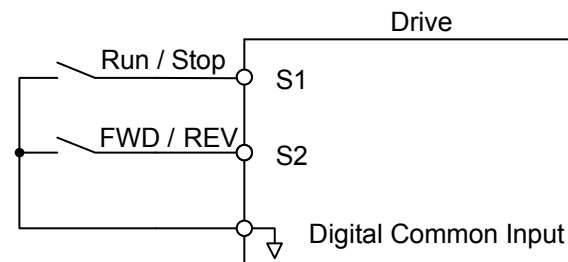
Setting for 2-wire sequence 2:

S1 (H1-01 = 42):   Run / Stop

S2 (H1-02 = 43):   Forward / Reverse

```
                              Drive
         Run / Stop  o  S1
         _____
         FWD / REV    o  S2
         _____
                      o
                      ▽  Digital Common Input
```

Note: Setting **42 / 43** belongs together and cannot be used with **40 / 41** combination.

Initializing to 2-wire sequence 2 with A1-03 is not available.

H1: Multi-Function Digital Inputs

YASKAWA

Functions of Digital Inputs
Base Block, , Setting H1- ☐☐ = 8 or 9

J V A

All Modes

If a digital Input is programmed to Base Block function. The drives output will be disabled immediately when this signal gets active.

H1- ☐☐ = 8   Base Block (N.O.)   Signal has to be tuned ON for Base Block
H1- ☐☐ = 9   Base Block (N.C.)   Signal has to be tuned OFF for Base Block

A digital Output can be programmed to give a signal when the drive is in Base Block.

H2- ☐☐ = 1B   During Base Block (N.C.)

Note: Base Block turns of the IGBT transistors. The motor will be not controlled anymore and will coast. Depending on the motor load, this load might coast to stop for a long time, or on a hoist the load will fall down without external braking measures.

The drive behaves the same when stopped with b1-03 = 0 (Coast to Stop)

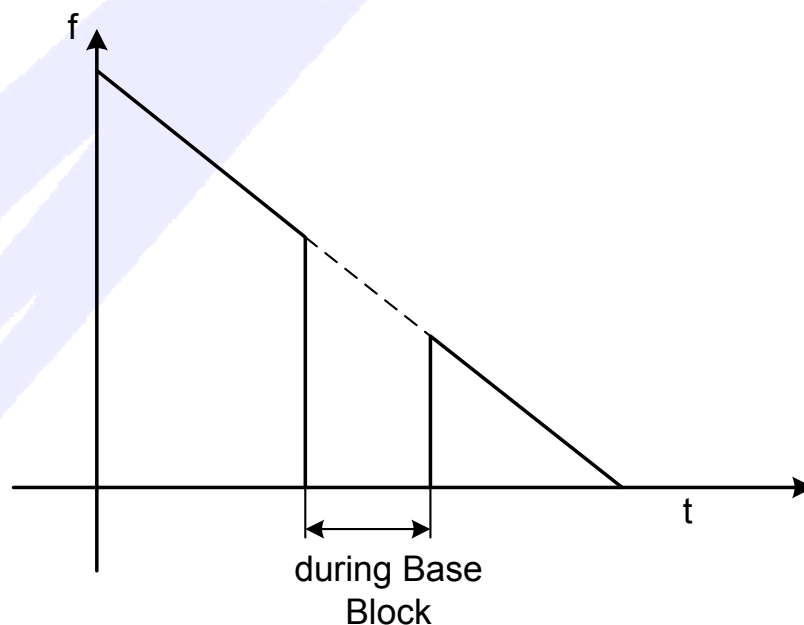# H1: Multi-Function Digital Inputs

Functions of Digital Inputs
Base Block, , Setting H1- □□ = 8 or 9

J ✓ V ✓ A ✓

All Modes

Internal Frequency calculation (e.g. deceleration ramp) is continued during Base Block.

during Base
Block

➔ **Base Block has to be activated, before opening a motor contactor**

H1: Multi-Function Digital Inputs

YASKAWA

Functions of Digital Inputs
Analog Input Selection, Setting H1- ☐☐ = C

J ✓ V ✓ A ✓

All Modes

The Analogue Inputs of the drive can be activated or disabled by a digital input signal.

When Digital Input S☐ (H1-☐☐=C) and signal is ON:
the analogue inputs are disabled as follows:

- **J1000, A1**
- **V1000, A1 and A2**
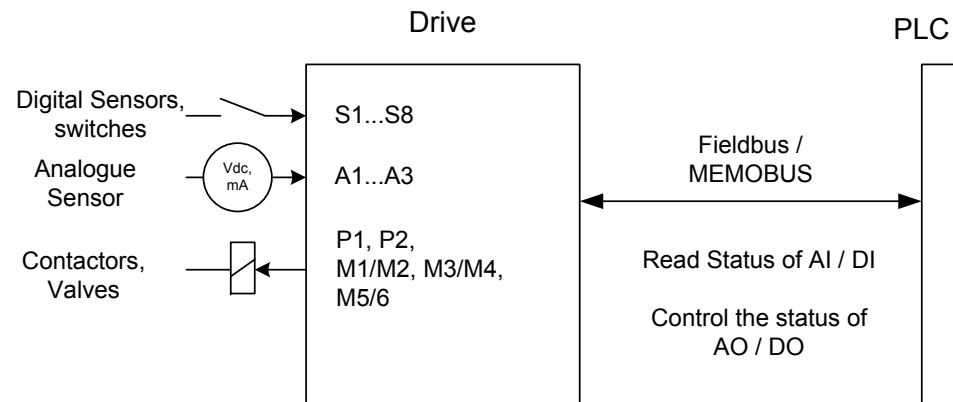- **A1000, A1, A2, A3 (combinations of the available inputs by setting of H3-14)**

Technical Training – Sequence

Multi-Function Analogue/Digital In-/Outputs

Through Mode: Setting H1- /H2-/H3-□□ = F

J ✓ | V ✓ | A ✓

All Modes

- **I/O is inactive for the drive**
- **External, digital or analogue signals can be send to a PLC**
- **via Fieldbus or MEMOBUS/Modbus**
- **for Digital I/O, Analogue Inputs**
- **not available for Analog Outputs FM, AM**

➔ **Cost reduction**
   Reduced wiring effort
   Drive is used as Remote I/O

Drive   PLC

Digital Sensors, → S1...S8
switches   Fieldbus /
                                  MEMOBUS
Analogue   (Vdc, → A1...A3
Sensor   mA)
                          ←→
                          Read Status of AI / DI
Contactors, → P1, P2,
Valves   M1/M2, M3/M4,
                M5/6   Control the status of
                           AO / DO

Technical Training – Sequence

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
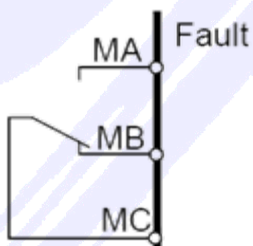## Multi-Function Digital Output Function Selection

All digital outputs are programmable. A list of available functions can be assigned to the digital outputs e.g. P1 by parameter H2-02.
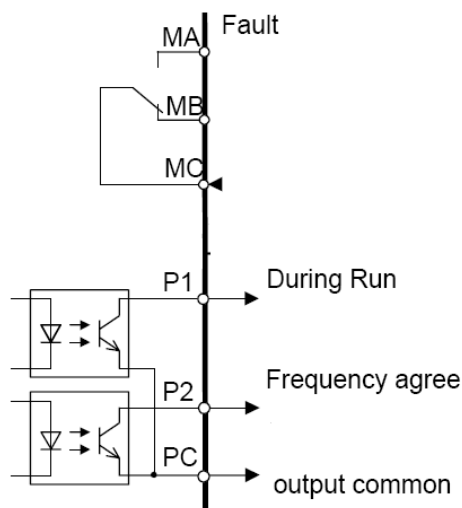**Two or more digital outputs can be assigned to the same function.**

The different drives have different number of digital inputs:

J1000   V1000   A1000

Relay MA/MB/MC
is not programmable

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

The following list shows the available functions for each drive:

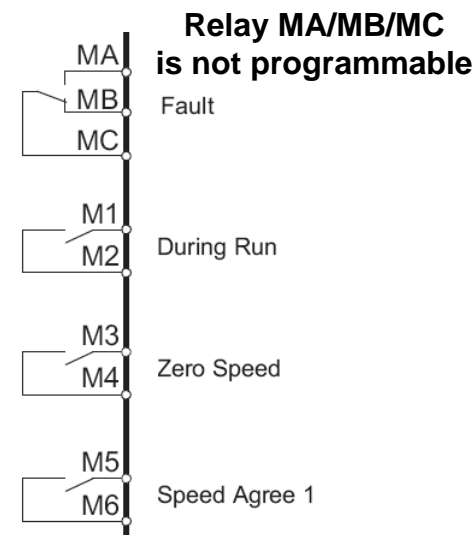| Setting	Function	available for drives		
		J1000	V1000	A1000
0	During Run	x	x	x
1	Zero Speed	x	x	x
2	Speed Agree 1	x	x	x
3	User Set Speed Agree 1	-	x	x
4	Frequency Detection 1	x	x	x
5	Frequency Detection 2	x	x	x
6	Drive Ready	x	x	x
7	DC Bus Undervoltage	x	x	x
8	During Baseblock (N.O.)	x	x	x
9	Frequency Reference Source	-	x	x

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
A	Run Command Source	-	x	x
B	Torque Detection 1 (N.O.)	x	x	x
C	Frequency Reference Loss	-	x	x
D	Braking Resistor Fault	-	x	x
E	Fault	x	x	x
F	Not used / Through Mode	x	x	x
10	Alarm (Minor Fault)	x	x	x
11	Reset Command Active	-	x	x
12	Timer Output	-	x	x
13	Speed Agree 2	-	x	x

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

J V A

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
14	User Set Speed Agree 2	-	x	x
15	Frequency Detection 3	-	x	x
16	Frequency Detection 4	-	x	x
17	Torque Detection 1 (N.C.)	x	x	x
18	Torque Detection 2 (N.O.)	-	x	x
19	Torque Detection 2 (N.C.)	-	x	x
1A	During Reverse Operation	x	x	x
1B	During Baseblock (N.C.)	-	x	x
1C	Motor 2 Selection	-	x	x
1D	During Regeneration	-	-	x

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
1E	Restart Enabled	x	x	x
1F	Motor Overload Alarm ("oL1")	-	x	x
20	Drive Overheat Pre-Alarm ("oH")	-	x	x
22	Mechanical Weakening	-	x	x
2F	Maintenance Period	-	x	x
30	During Torque Limit	-	x	x
31	During Speed Limit	-	-	x
32	During Speed Limit in Torque Control	-	-	x
33	Zero Servo Complete	-	-	x
37	During Frequency Output	-	x	x

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

J ✓ V ✓ A ✓

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
38	Drive Enabled	-	x	x
39	Watt Hour Pulse Output	-	x	x
3C	LOCAL / REMOTE Status	-	x	x
3D	During Speed Search	x	x	x
3E	PID Feedback Low	-	x	x
3F	PID Feedback High	-	x	x
4A	During KEB Operation	-	x	x
4B	During Short-Circuit Braking	-	x	x
4C	During Fast-Stop	-	x	x
4D	"oH" Pre-Alarm Time Limit	-	x	x

H2: Multi-Function Digital Outputs

H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

The following list shows the available functions for each drive:

Setting	Function	available for drives		
		J1000	V1000	A1000
4E	Braking Resistor Fault ("rr")	-	x	x
4F	Braking Resistor Overheat ("rH")	-	x	x
60	Internal Cooling Fan Alarm	-	-	x
61	Rotor Position Detection Completed	-	-	x
90	DriveWorksEZ Digital Output 1	-	x	-
91	DriveWorksEZ Digital Output 2	-	x	-
92	DriveWorksEZ Digital Output 3	-	x	-

All Modes

H2: Multi-Function Digital Outputs

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H2-01: (V1000/A1000 H2-01 to H2-03)
Multi-Function Digital Output Function Selection

J ✓ V ✓ A ✓

All Modes

All functions can be set to inverse output.

Set the function as 1☐☐, where the 1 indicates inverse output and ☐☐ the function code

Example:

Inverse Output for	6 = Drive ready	is 106
Inverse Output for	30 = During Torque Limit	is 130

YEG Presentation - Sequence

Functions of Digital Outputs
During Reverse, Setting H2- ☐☐ = 1A
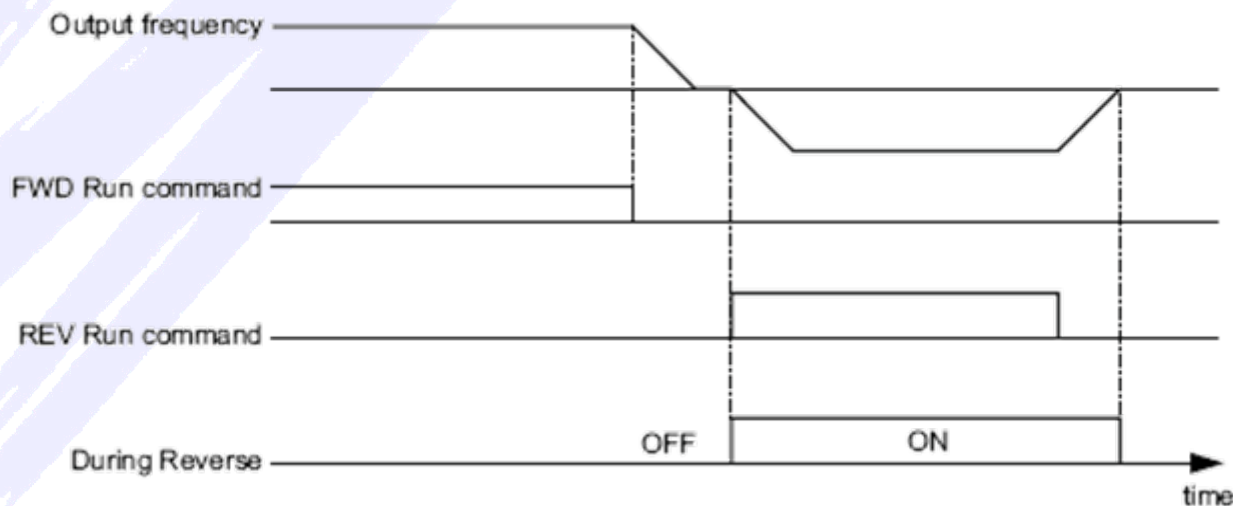
All Modes

Output On: Motor is beeing driven forward or during stop
Output Off: Motor is beeing driven in reverse direction

H2: Multi-Function Digital Outputs

**Functions of Digital Outputs
Indication of Drive Ready, enabled**

J ✓   V ✓   A ✓

All Modes

By the setting parameter H2- □□ = **6** Drive Ready is indicate

Output On: When the drive is ready to operate the motor
Output Off: following listed conditions, when not ready to run

- **When drives power supply is shut off**
- **During Fault**
- **When drives internal power supply has malfunction**
- **When parameter setting error ("oPE□")makes it impossible to run**
- **Although drive stopped, over or under voltage situation occures**
- **While editing parameters in programming mode (when b1-08 = 0)**

H2: Multi-Function Digital Outputs

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Functions of Digital Outputs
Indication of Drive Enabled, During Frequency Output

(J) (V) (A)

`All Modes`

By the setting parameter H2- ☐☐ = **38** Drive Enabled is indicate.

      Output On: A digital input programmed to H1- ☐☐ = **6A** Drive Enabled
                                It reflects the status of this digital input

Note: Even if Hardware Baseblock (H1, H2) enable, disable the drive as well, the status of H1, H2 is not indicated with H2- ☐☐ = **38**.

By the setting parameter H2- ☐☐ = **37** During frequency Output is indicate

      Output On: When drive is outputting frequency
      Output Off: following listed conditions

- **During Baseblock or Hardware Baseblock**
- **During DC Injection Braking**
- **During Short Circuit Braking**

H2: Multi-Function Digital Outputs

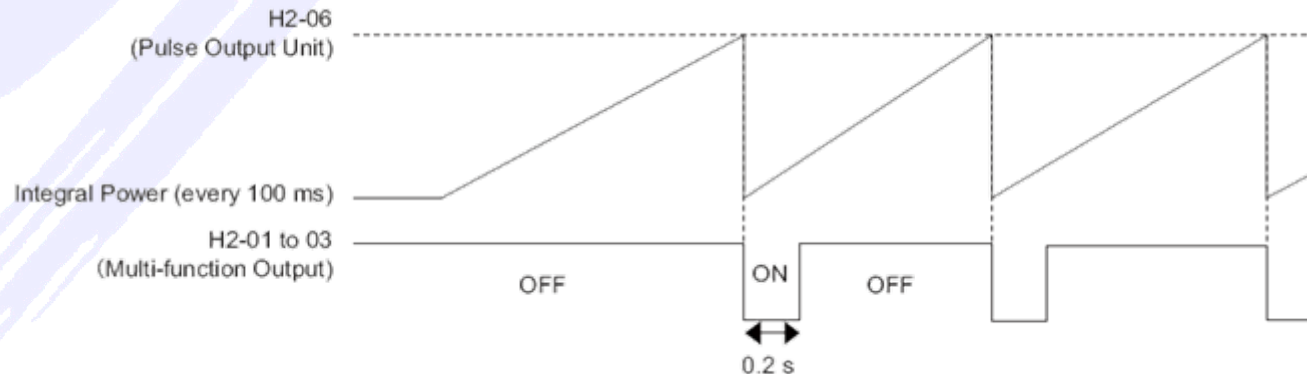## H2-06: Watt Hour Output Unit Selection

J V ✓ A ✓

All Modes

H2-06 **If e.g. H2-01 is set to 39 (Output of the number of Watt hours to be counted by a PLC) H2-06 selects the scaling for the count signal x kWh per count pulse of the digital output. The integral is based on the drives output power (U1-08).**

0: 0.1 kWh units
1: 1 kWh units
2: 10 kWh units
3: 100 kWh units
4: 1000 kWh units

The maximum achievable accuracy of monitor U1-08 is 5% with optimum drives Tuning.

➔ **An external kWh counter can be connected very easily. Cheap solution for monitoring the drive systems power consumption.**

H2: Multi-Function Digital Outputs

H2-06: Watt Hour Output Unit Selection

J V ✓ A ✓

The Watt Hour Output is based on the drives internally calculated Power Monitor U1-08. Depending on the drives Control Method (A1-02) the Power Monitor is calculated differently.

All Modes

A1-02	Function	Power Monitor and Watt Hour Output
0	V/f	Electrical Output Power
1	V/f with PG	Electrical Output Power
2	OLV	Electrical Output Power
3	CLV	Mechanical Output Power
5	OLV PM	Electrical Output Power
6	AOLV PM	Mechanical Output Power
7	CLV PM	Mechanical Output Power

Electric Output Power (simplified):

   Output voltage (controlled by drive) x output current (measured)
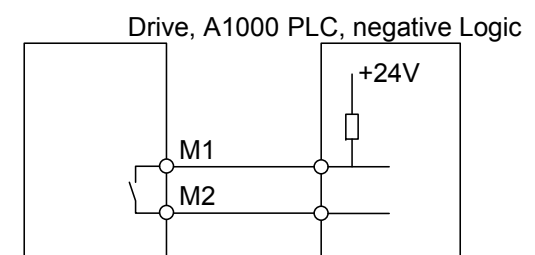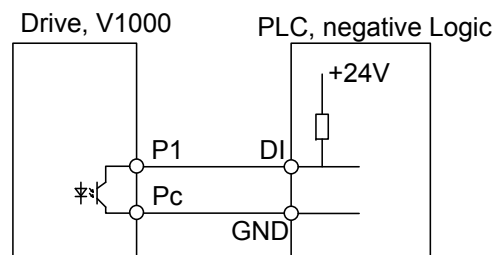
Mechanical Power (simplified):

   Speed (calculated/measured) x Torque (calculated)

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H2-06: Watt Hour Output Unit Selection
Connection Example

J V✓ A✓

All Modes

- **Only positive Output Power of the drive will be intergated.**
  E.g. If the drive is regenerative, the integral will not be calculated down.

- **The power integration continues as long as the drives control has power supply.**

- **Dependent of the connected PLC input or energy counting device. External 24V is needed or output signal has to be negatived.**
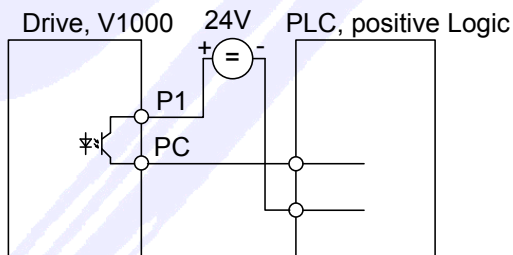
Drive, V1000   24V   PLC, positive Logic
+ (=) -
P1
PC

Drive, V1000   PLC, negative Logic
+24V
P1   DI
Pc
GND

Drive, A1000 PLC, negative Logic
+24V
M1
M2

Technical Training – Sequence

H3: Multi-Function Analogue Inputs

YASKAWA

General Information

J V A

All Modes

The different drives have different number of analogue inputs.
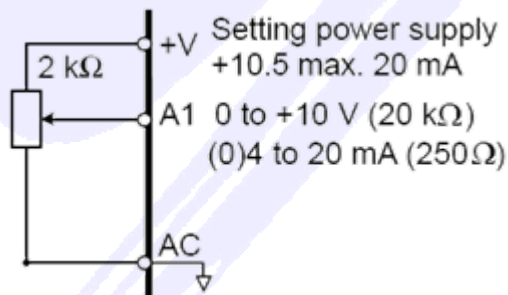
All of them are programmable in function and can be scaled by gain and bias setting.

Setting for voltage or current signal by a DIP switch on the terminal board.

> **Note:** for setting to voltage/current signal also parameter setting H3-01 (H3-09, V1000/A1000) is necessary !

J1000

2 kΩ

+V Setting power supply +10.5 max. 20 mA
A1 0 to +10 V (20 kΩ)
    (0)4 to 20 mA (250Ω)
AC

V1000

2 kΩ

+V Setting power supply +10.5 max. 20 mA
A1 0 to +10 V (20 kΩ)
A2 0 to +10 V (20 kΩ)
    0/4 to 20 m A (250 Ω)
AC

A1000

2 kΩ

+V Power supply +10.5 Vdc, max. 20 mA
A1 Analog Input 1 (Frequency Reference Bias) -10 to +10 Vdc (20 kΩ)
A2 Analog Input 2 (Frequency Reference Bias) -10 to +10 Vdc (20 kΩ) 0 or 4 to 20 mA (250 Ω)
A3 Analog Input 3 / PTC Input (Aux. frequency reference) -10 to +10 Vdc (20 kΩ)
AC 0 V
−V Power supply, -10.5 Vdc, max. 20 mA

H3: Multi-Function Analogue Inputs

YASKAWA

H3-01: Terminal A1 Signal Level Selection

(J) (V) (A)

All Modes

The different drives have different number of analogue inputs:

H3-01   **Signal Level Selection for A1**

0: **0 to 10Vdc with limit**

1: **0 to 10Vdc without limit**

    A1000:   **-10 to +10Vdc**

2: **J1000:**   **4 to 20mA current input**

3: **J1000:**   **0 to 20mA current input**

Note: **Check Monitor U1-14 for correct signal (0 to max. Signal = 0 to 100%)**

V1000: Bipolar input terminal board in preparation (optional)

H3: Multi-Function Analogue Inputs

H3-09: (V1000/A1000) Terminal A2 Signal Level Selection
H3-05: (A1000) Terminal A3 Signal Level Selection

(J) (V✓) (A✓)

All Modes

H3-09   **Signal Level Selection for A2**   (J) (V✓) (A✓)

         0: 0 to 10Vdc with lower limit

         1: 0 to 10Vdc without lower limit

         A1000: -10 to +10Vdc

         2: 4 to 20mA current input

         3: 0 to 20mA current input

H3-05   **Signal Level Selection for A3**   (J) (V) (A✓)

         0: 0 to 10Vdc

         1: -10 to +10Vdc

Note: **If only DIP switch is set to current signal and not parameter H3-09, V1000 will run with wrong input scaling, A1000 will not run at all, Check Monitors for correct setting and scaling (A2: U1-14, A3: U1-15)**

H3: Multi-Function Analogue Inputs

H3-03, H3-11, H3-07: Terminal A1, A2, A3 Gain Setting
H3-04, H3-12, H3-08: Terminal A1, A2, A3 Bias Setting

J V A

All Modes

For scaling the analogue input signal a gain and a bias setting for each analogue input signal is available.

J1000	A1	gain/bias setting	**H3-03/-04**
V1000	A1, A2	gain/bias setting	**H3-03/-04, H3-11/-12**
A1000	A1, A2, A3	gain/bias setting	**H3-03/-04, H3-11/-12, H3-07/-08**

Gain setting defines the signal value at max. analogue signal, bias setting defines the signal value at 0V/mA analogue signal.

H3: Multi-Function Analogue Inputs

H3-03, H3-11, H3-07: Terminal A1, A2, A3 Gain Setting
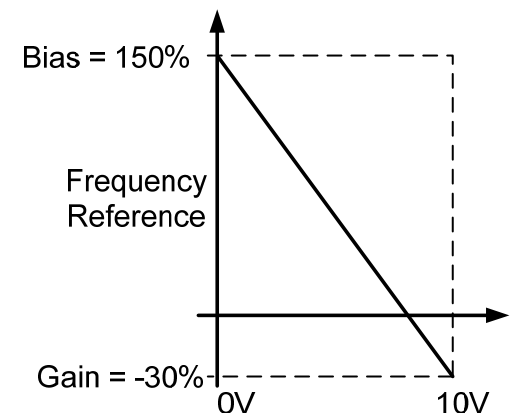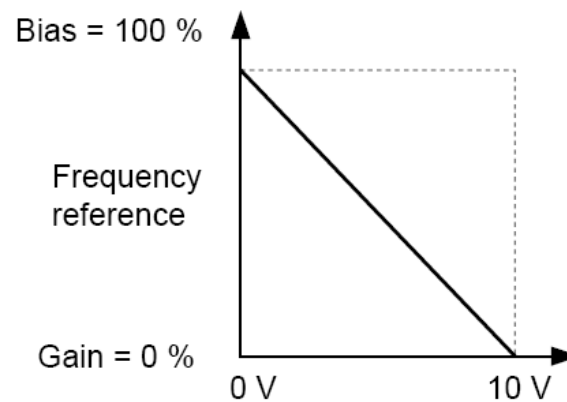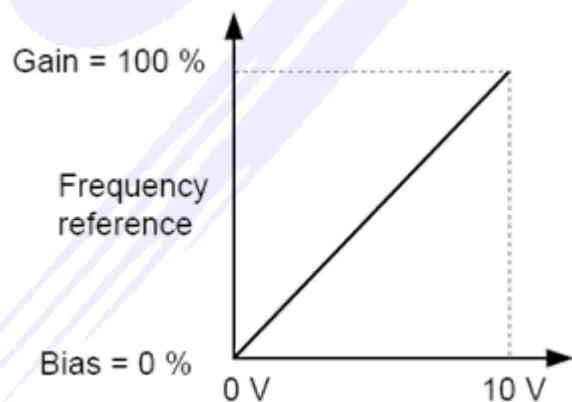**H3-04, H3-12, H3-08: Terminal A1, A2, A3 Bias Setting**

All Modes

H3-03, H3-07, H3-11 Analogue Input Terminal Gain Setting

Parameter	J, V, A	V, A	A	Name	Range	Default
H3-03	A1					
H3-11		A2		Gain Setting	-999.9 to 999.9%	100.0%
H3-07			A3			

H3-03, H3-07, H3-11 Analogue Input Terminal Bias Setting

Parameter	J, V, A	V, A	A	Name	Range	Default
H3-04	A1					
H3-12		A2		Bias Setting	-999.9 to 999.9%	0.0%
H3-08			A3			

H3: Multi-Function Analogue Inputs

YASKAWA

H3-02, H3-10, H3-06:
Terminal A1, A2, A3 Function Selection

(J) (V ✓) (A ✓)

All Modes

All analogue inputs of V1000 / A1000 are programmable. A list of available functions can be assigned to the digital inputs e.g. A1 by parameter H3-02.

Double selection of the same function to more than one input is not possible.
An oPE07 „Analogue Selection" fault will be shown on the Operator.

J1000	**A1**	**not programmable**	
V1000	**A1, A2**	**Function Selection**	**H3-02, H3-10**
A1000	**A1, A2, A3**	**Function Selection**	**H3-02, H3-10, H3-06**

H3: Multi-Function Analogue Inputs

▼ YASKAWA

Relevant Settings for Analogue Input A1

(J)✓ (V)✓ (A)✓

All Modes

H3-01   **Signal Level Selection for A1**

      0: **0 to 10Vdc with limit**

      1: **0 to 10Vdc without limit**

         A1000:   **-10 to +10Vdc**

      2: **J1000:**   **4 to 20mA current input**

      3: **J1000:**   **0 to 20mA current input**

H3-02   **Multi-Function Analogue Input Terminal Settings (V1000/A1000)**
(available functions see on seperate table)

H3-03   **Terminal A1 Gain**

H3-04   **Terminal A1 Bias**

H3: Multi-Function Analogue Inputs

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Relevant Settings for Analogue Input A2

(J) (V ✓) (A ✓)

All Modes

H3-09 **Signal Level Selection for A2**

       0: **0 to 10Vdc with limit**

       1: **0 to 10Vdc without limit**

       2: **4 to 20mA current input**

       3: **0 to 20mA current input**

H3-10 **Multi-Function Analogue Input Terminal Settings A2**
(available functions see on seperate table)

H3-11 **Terminal A2 Gain**

H3-12 **Terminal A2 Bias**

H3: Multi-Function Analogue Inputs

▼ YASKAWA

Relevant Settings for Analogue Input A3

(J) (V) (A ✓)

H3-05   **Signal Level Selection for A3**   `All Modes`

0: **0 to 10Vdc with limit**
1: **0 to 10Vdc without limit**

H3-06   **Multi-Function Analogue Input Terminal Settings A3**
(available functions see on seperate table)

H3-07   **Terminal A3 Gain**

H3-08   **Terminal A3 Bias**

H3: Multi-Function Analogue Inputs

H3-02, H3-10, H3-06:
Multi-Function Analogue Input Terminal Settings

J V ✓ A ✓

The following list shows the available functions for each drive:

All Modes

Setting	Function	available for drives	
		V1000	**A1000**
0	Frequency Bias	X	X
1	Frequency Gain	X	X
2	Auxiliary Frequency Reference	X	X
3	Auxiliary Frequency Reference 2	-	X
4	Output Voltage Bias	X	X
5	Acceleration / Deceleration Time Gain		X
6	DC Injection Braking Current		X
7	Overtorque / Undertorque Detection Level	X	X
8	Stall Prevention Level during Run		X
9	Output Frequency lower Limit level		X

H3: Multi-Function Analogue Inputs

H3-02, H3-10, H3-06:
Multi-Function Analogue Input Terminal Settings

J V ✓ A ✓

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives	
		V1000	**A1000**
B	PID Feedback	x	x
C	PID Setpoint	x	x
D	Frequency Bias	-	x
E	Motor Temperature (PTC Input)	x	x
F	Not used / Trough Mode	x	x
10	Forward Torque Limit	x	x
11	Reverse Torque Limit	X	x
12	Regenerative Torque Limit	X	x
13	Torque Limit using Torque Reference	-	x
14	Torque Compensation	-	x

H3: Multi-Function Analogue Inputs

YASKAWA

H3-02, H3-10, H3-06:
Multi-Function Analogue Input Terminal Settings

J V ✓ A ✓

All Modes

The following list shows the available functions for each drive:

Setting	Function	available for drives	
		V1000	A1000
15	General Torque Limit	X	X
16	Differential PID Feedback	X	X
1F	Not used / Trough Mode		X
30	DriveWorksEZ Analogue Input 1	X	X
31	DriveWorksEZ Analogue Input 2	X	X
32	DriveWorksEZ Analogue Input 2		X
41	Output Voltage Gain	X	

H3: Multi-Function Analogue Inputs

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Functions of Analogue Inputs
Frequency Bias, Setting H3- ☐☐ = 0

(J) (V)✓ (A)✓

All Modes

For summation of analogue input reference sources

Analogue Input, A1...A3
Frequency Bias → Gain / Bias →

Analogue Input, A1...A3
Frequency Bias → Gain / Bias →

→ + → Resulting Frequency Reference
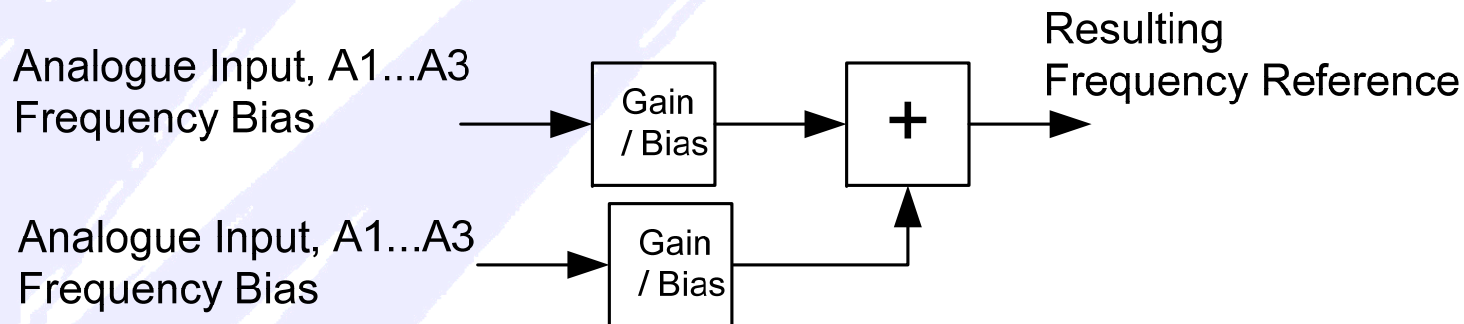
- **If only one analogue input is used for frequency reference, setting is also Frequency Bias**
- **Only works on Analogue Input Frequency Reference**
- **For V1000, A1 and A2**
- **For A1000, A1, A2, A3**
- **Gain/Bias settings for the analogue inputs are also active (for scaling)**
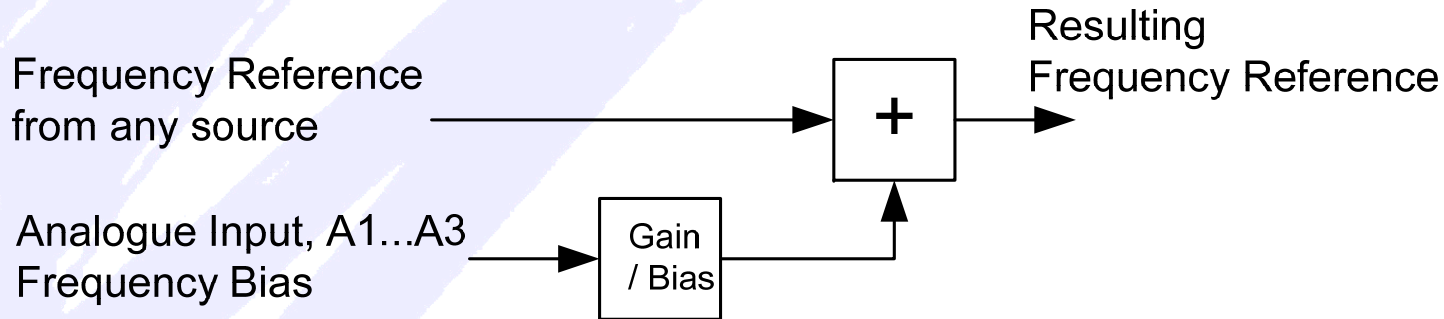
H3: Multi-Function Analogue Inputs

Functions of Analogue Inputs
Frequency Bias, Setting H3- ☐☐ = D

J V A ✓

All Modes

Any of the 3 Analogue Inputs can be used as Frequency Bias for all Frequency Reference sources.

Frequency Reference
from any source

Resulting
Frequency Reference

Analogue Input, A1...A3
Frequency Bias

Gain
/ Bias

+

- **Only on A1000**

- **Works on all Frequency Reference Sources, like Fieldbus, preset frequency references, Memobus**

- **For A1000, A1, A2, A3**

- **Gain/Bias settings for the analogue inputs are also active (for scaling)**

H3: Multi-Function Analogue Inputs

YASKAWA

Functions of Analogue Inputs
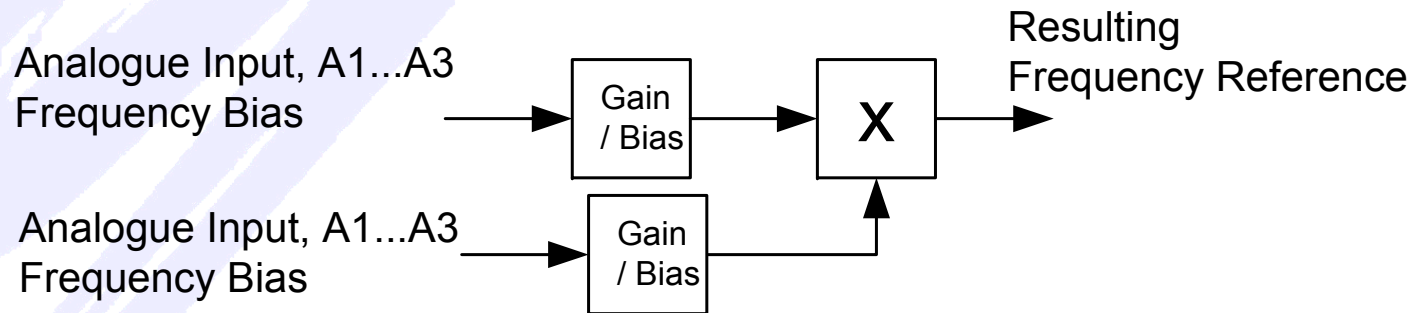## Frequency Gain, Setting H3- ▢▢ = 1

J   V ✓   A ✓

All Modes

Analogue Input Value can be used as multipier for the Frequency Reference from another ananlogue input.

Example:

A1 value (Frequency Bias) = 80% x A2 value (Frequency Gain) = 50%

Resulting Frequency Reference Value = 40% (0.8 x 0.5 x 100%)

Analogue Input, A1...A3
Frequency Bias → Gain / Bias → X → Resulting Frequency Reference

Analogue Input, A1...A3
Frequency Bias → Gain / Bias ↑

- **Only works on Analogue Input Frequency Reference**
- **For V1000, A1 and A2**
- **For A1000, A1, A2, A3**
- **Gain/Bias settings for the analogue inputs are also active (for scaling)**

H3: Multi-Function Analogue Inputs

YASKAWA

H3-13: Analogue Input Filter Time Constant

(J) (V) (A)

All Modes

The analogue signals can be filtered, so that electric noise cannot disturb the drive functionallity. The filter works on all analogue inputs with the same settings.
It is a first order software filter.

H3-13   Analogue Input Filter Time Constant for A1, A2, (A3; A1000 only)

Parameter	Name	Range	Default
H3-13	Analogue Input Filter Time Constant	0.00 to 2.00 s	0.03 s

➔   Even "nervous" signals from the process can be used as reference signal or feedback signal for to control the drive.

H3: Multi-Function Analogue Inputs

H3-14: Analogue Input Terminal Enable Selection

J V ✓ A ✓

All Modes

The analogue inputs can be enabled or disabled by digital input signal (H1- ☐☐ = C).

H3-14   Analogue Input Terminal Enable Selection

1: **A1 only enabled**   **V1000, A1000**

2: **A2 only enabled**   **V1000, A1000**

3: **A1 and A2 only enabled**

4: **A3 only enabled**

5: **A1 and A3 only enabled**

6: **A2 and A3 only enabled**

7: All analogue input terminals enabled   **V1000, A1000**

➔   **Reference offsets can be activated or deactivated, by condition of digital process signal.**

H3: Multi-Function Analogue Inputs

H3-16, H3-17, H3-18: Terminal A1, A2, A3 Offset Adjustment

J V ✓ A ✓

All Modes

To calibrate analogue inputs signals A1, A2, A3 to zero.

Example for A1:

- **Apply 0V to analog input A1**
- **Adjust H3-16 until Monitor U1-13 reads 0.0%**

Parameter	Drive	Name	Range	Default	Monitor
H3-16	V, A	Terminal A1 Offset Adjustment	-500 to +500	0	U1-13
H3-17	V, A	Terminal A2 Offset Adjustment	-500 to +500	0	U1-14
H3-18	A	Terminal A3 Offset Adjustment	-500 to +500	0	U1-15

Note: **Normally no need to adjust, the analogue inputs are calibrated before shipment.**

Technical Training – Sequence

H4: Multi-Function Analogue Outputs
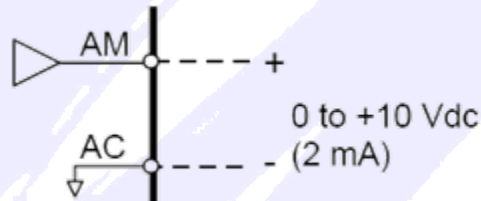
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H4-01, H1-04: Multi-Function Analogue Terminal AM, FM Monitor Selection

J ✓ V ✓ A ✓

All Modes

The different drives have different number of analogue outputs:

J1000 and V1000

AM
AC
0 to +10 Vdc
(2 mA)

A1000

FM — Output frequency -10 to +10 Vdc (2mA) or 4 to 20 mA

AM
AC
0 V — Output current -10 to +10 Vdc (2mA) or 4 to 20 mA
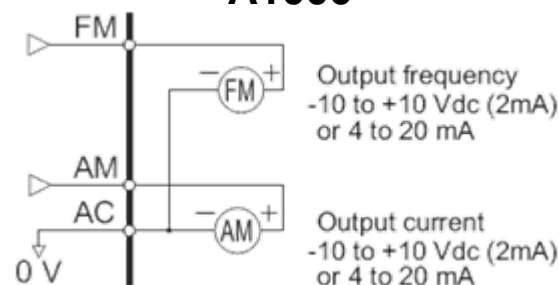
**All analogue outputs are programmable. All available analogue Monitors (U □- □□) can be assigned to the analogue outputs e.g. AM by parameter H4-01.
The analogue outputs can be assigned to the same function.**

Example: U1-02 (Output Frequency) asigned to AM analogue output; H4-01 = 102

J1000	AM	Function Selection	H4-01
V1000	AM	Function Selection	H4-01
A1000	AM, FM	Function Selection	H4-01, H4-04

H4: Multi-Function Analogue Outputs

▼ YASKAWA

H4-02, H4-05: Terminal FM, AM Gain Setting
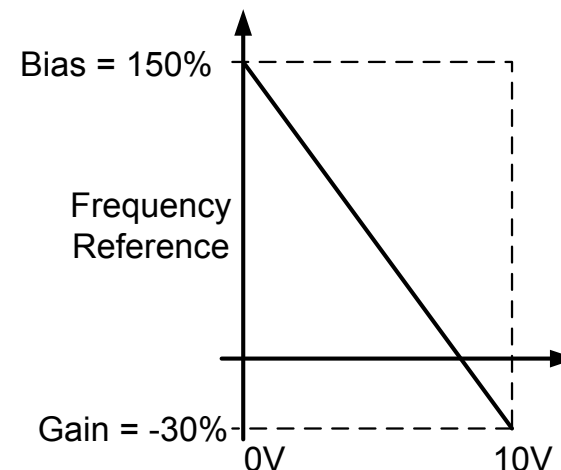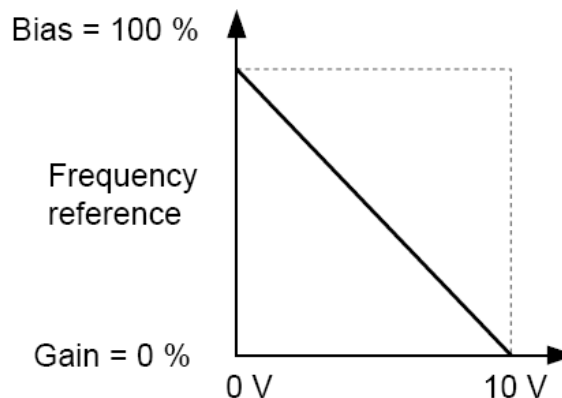## H4-03, H4-06: Terminal FM, AM Bias Setting

J ✓ V ✓ A ✓

`All Modes`

**For scaling the analogue output signal a gain and a bias setting for each analogue output signal is available.**

J1000	AM	gain/bias setting	**H4-02/-03**
V1000	AM	gain/bias setting	**H4-02/-03**
A1000	AM, FM	gain/bias setting	**H4-02/-03, H4-05/-06**

Gain setting defines the signal value at max. analogue signal, bias setting defines the signal value at 0V/mA analogue signal.

H4: Multi-Function Analogue Outputs

YASKAWA
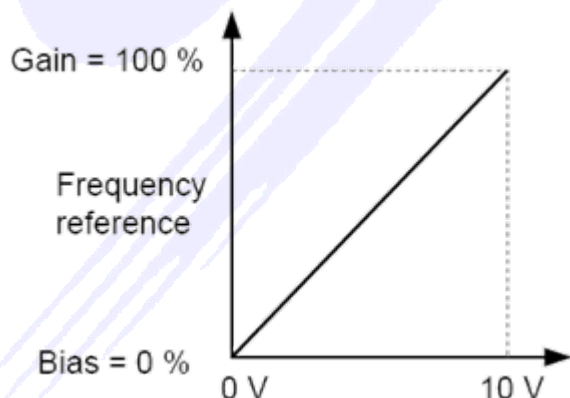
H4-02, H4-05: Terminal FM, AM Gain Setting
H4-03, H4-06: Terminal FM, AM Bias Setting

All Modes

H4-02, H4-05 Analogue Output Terminal Gain Setting

Parameter	J, V, A	A	Name	Range	Default
H4-02	FM		Gain Setting	-999.9 to 999.9%	100.0%
H4-05		AM			50.0%

H4-03, H4-06 Analogue Output Terminal Bias Setting

Parameter	J, V, A	A	Name	Range	Default
H4-03	FM		Bias Setting	-999.9 to 999.9%	0.0%
H4-06		AM			

Technical Training – Sequence

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RS485 / RS422 connection

J ✓   V ✓   A ✓

RS485 2-wire connection
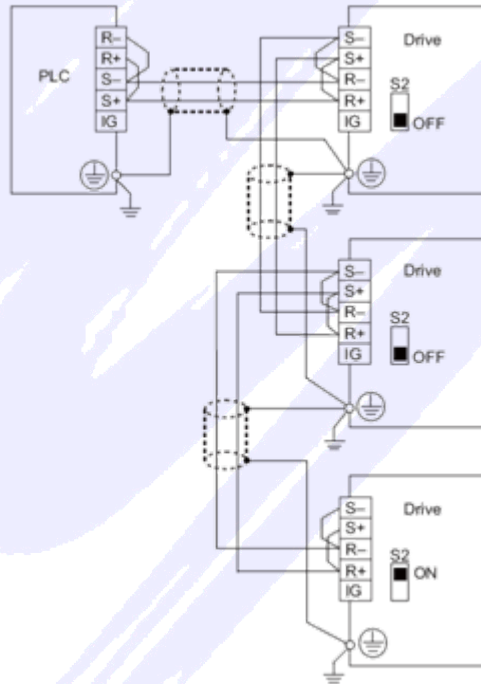
All Modes

RS422 4-wire connection

- **J1000 additionally needs the Option SI-485/J**
- **2-wire RS485 or 4-wire RS422 setup is possible**
- **Termination resistor integrated**

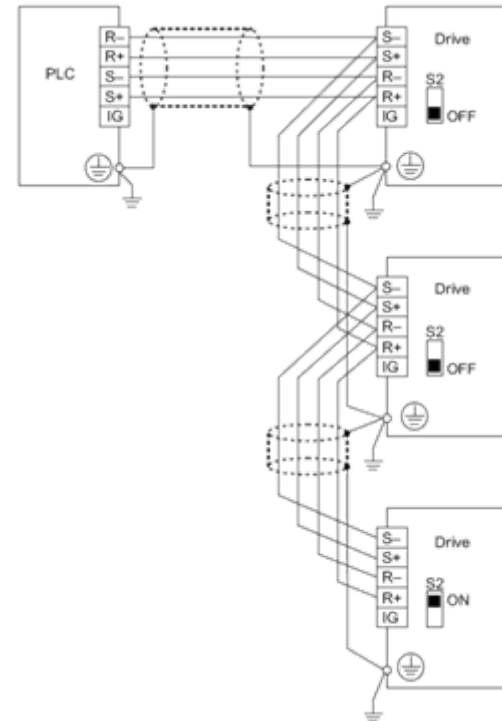# H5: MEMOBUS / Modbus Serial Communication

H5-01: Drive Slave Address

All Modes

H5-01   **Drive Slave Address**

Parameter	Name	Range	Default
H5-01	Drive Slave Address	0 to 20 hex	1F hex

➔   **up to 32 drives can be accessed separately by serial communication**

**Note: To operate the drive via Serial Communication parameters
Frequency Reference Selection b1-01 and
Run Command Selection b1-02 have to be set to 2.
Before the drive has received the first valid communication telegram
"CALL" Communication Error will be displayed. This is not a real
Fault but only indication that no communication is established.**

(H5-05 and H5-09 setting for enable and detection time)

H5: MEMOBUS / Modbus Serial Communication

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H5-02, H5-03: Communication Selection, Speed / Parity

(J✓) (V✓) (A✓)

H5-02   **Communication Speed Selection**   `All Modes`

      0: 1200 bps

      1: 2400 bps

      2: 4800 bps

      <u>**3**: 9600 bps</u>

      4: 19200 bps

      5: 38400 bps

      6: V1000/A1000:   57600 bps

      7: V1000/A1000:   76800 bps

      8: V1000/A1000:   115200 bps

H5-03   **Communication Parity Selection**

      <u>**0**: No Parity</u>

      1: Even Parity

      2: Odd parity

Note: **Changes get effective after power cycle !!**
Memobus via RJ45 connector has fixed communication speed (9600bps)

YASKAWA

H5-04: Stopping Method after Communication Error
H5-05: Communication Fault Detection Selection

(J ✓) (V ✓) (A ✓)

H5-04 **Stopping Method after Communication Error**   All Modes

If a Communication Error "CE" is detected, the drive will act according to this parameter setting.

- **0:** **Ramp to Stop using current Decel Time**
- **1:** **Coast to Stop**
- **2:** **Fast Stop using C1-09 setting**
- **3:** **Alarm only, continue operation**

H5-05 **Communication Fault Detection Selection**

Enables or disables the Communication Error "CE" detection.

- **0:** **Disabled**
- **1:** **Enabled**

➔ **Ensures that the drive stops the machine when communication is disturbed. Improved safety.**

H5-06: Drive Transmit Wait Time
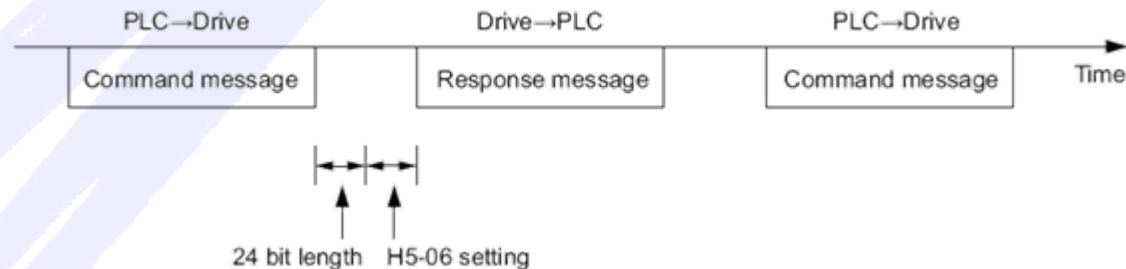## H5-07: RTS Control Selection

Ⓙ✓ Ⓥ✓ Ⓐ✓

H5-06   **Drive Transmit Wait Time**   `All Modes`

sets the waiting time, before the drive starts to respond a a received telegram.

Parameter	Name	Range	Default
H5-06	Drive Transmit Wait Time	5 to 65 ms	5 ms

PLC→Drive — Command message | Drive→PLC — Response message | PLC→Drive — Command message | Time

24 bit length   H5-06 setting

H5-07   **RTS Control Selection**

Ensure that H5-07 = 1 when RS485 (using 2 wire setup)

0: Disabled, RTS is always ON
1: Enabled, RTS turns ON when sending

Note: Because RS422, 4-wire setup is full duplex operation, setting of H5-07 has no influence.

H5: MEMOBUS / Modbus Serial Communication

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H5-09: CE Detection Time
H5-10: Unit Selection for MEMOBUS/Modbus Register 0025hex

J V ✓ A ✓

All Modes

H5-09 **CE Detection Time**

The communication must be lost for set time before "CE" Fault is triggered.

Parameter	Name	Range	Default
H5-09	CE Detection Time	0.0 to 10.0 s	2.0 s

H5-10 **Unit Selection for MEMOBUS/Modbus Register 00025hex**

Output voltage reference (Register 00025hex) resolution could be set here.

0: **0.1 V units**

1: **1 V units**

H5: MEMOBUS / Modbus Serial Communication

H5-11: Communications Enter Command Function Selection

J V ✓ A ✓

All Modes

H5-11 **Communications Enter Command Function Selection**

After changing parameters via MEMOBUS or Fieldbus communication an Enter Command is neccessary to save the changes and activate them. This parameter selects if an Enter Command has to be sent by the user, or if an Enter is automatically performed with every parameter change.

0: Enter Command neccessary (F7 mode)

1: Enter command not neccessary, automatically (V7 mode)

➔ **Setting of H5-11 = 1 , reduces the necessary communication effort, by automatic activation of parameter changes.**

Parameter limits and dependencies are automatically checked.

Note: FAQ document with more detailed information is available.

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H5-11: Communications Enter Command Function Selection

J V ✓ A ✓

All Modes

H5-11 Setting 0:

This setting is meant for the replacement of G7, F7 drives. Parameter processing works comparable like on these drives.

- **All changed parameter values received via serial communication will be put onto a stack. Waiting time for sending next parameter is 50ms.**

- **Limits and dependencies to other parameters are not checked immediately**

- **"oPE" Error will not occure immediately**

- **When the drive received an Enter Command via serial comms, all parameters are processed sequencially.**

- **Depending on the sequence of the sent parameters, earlier sent parameters might be overwritten by later sent parameters, if there are dependencies.**

- **Waiting time after an Enter Command is dependent on the number of changed parameters from 200ms to 2s.**

H5: MEMOBUS / Modbus Serial Communication

H5-11: Communications Enter Command Function Selection

J V ✓ A ✓

H5-11   Setting 1:

All Modes

This setting is meant for the replacement of V7 drives. Parameter processing works comparable like on this drive.

- **All changed parameter values received via serial communication will processed immediately. Waiting time for sending next parameter is 200ms.**

- **Sending an Enter Command is not necessary. Parameter changes will be active immediately.**

- **Limits and dependencies to other parameters are checked immediately**

- **An "oPE" Error will not occure**

- **Depending on the sequence of the sent parameters, earlier sent parameters might be overwritten by later sent parameters, if there are dependencies.**

H5: MEMOBUS / Modbus Serial Communication

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H5-12: Run Command Method Selection

J ✓ V ✓ A ✓

All Modes

H5-12   **Communications Enter Command Function Selection**

This parameter corresponds to the 2-wire/3-wire sequence of Start/Stop, Forward/Reverse. In this case for the control via MEMOBUS

0: Forward/Stop, Reverse/Stop

1: Run/Stop, Forward/Reverse

H5-13: MEMOBUS Frequency Reference and Frequency Monitor Unit

(J) (V) (A)

All Modes

H5-13 determines the way frequency reference and frequency monitor is scaled for MEMOBUS communication.

0: **0.1Hz / 1**
1: o1-03 depending
2: 100% / 30000
3: 0.1% / 1

	Reference on Digital Operator	H5-13							
		0		1		2		3	
		0.1Hz / 1		o1-03 based		100% / 30000		0.1% / 1	
Fmax (E1-04)		50	100	50	100	50	100	0	100
Memobus Fref (23h)	12,34	123	123	1234	1234	7404	3702	247	123
	45,00	450	450	4500	4500	27000	13500	900	450

Note: MEMOBUS reading values, are dezimal.

Technical Training – Sequence

H6: Pulse Train Input / Output

General Information

(J) (V)✓ (A)✓

All Modes

V1000 and A1000 drives have a Pulse Train Input and Output.
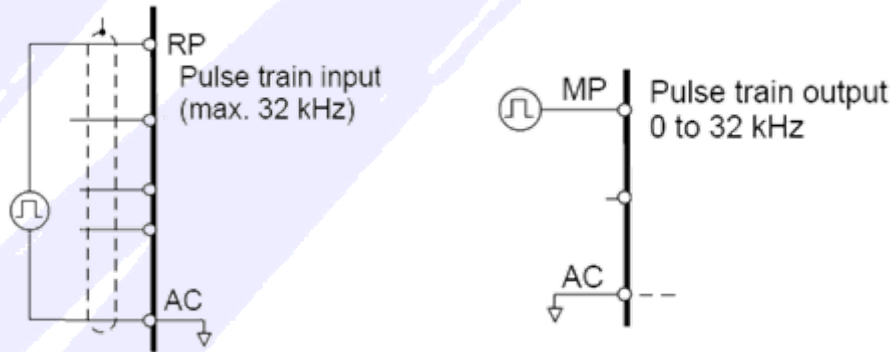
Instead of an analogue signal the application control can provide a pulse frequency (e.g. a PLC digital output). Maximum voltage level +24VDC +5%. A leading master drive can provide the speed reference to a following slave, by Pulse Train Output.

➔ - **PLC digital outputs are a cheap interface to control the drive speed**
- **Very cost effective Closed Loop Speed Control by V/f with simple PG**
- **Electronic gear applications for speed synchronization of multiple drives**

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General Information
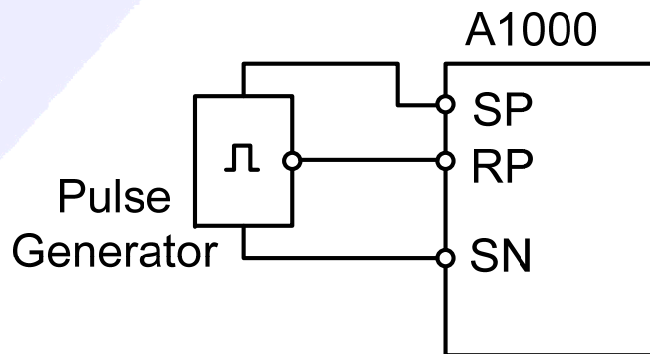## Supply of an external Pulse Generator

(J) (V) (A)✓

All Modes

Connection Example:

A1000 can supply an external pulse generator.

- **The external device has to work with A1000 -24Vdc supply tolerance**
- **Maximum total current consumption at the SP Terminal of A1000: 150mA**

A1000

Pulse
Generator

SP
RP
SN

H6: Pulse Train Input / Output

H6-01: Pulse Train Input Terminal RP Function Selection
H6-02: Pulse Train Input Scaling

J V✓ A✓

All Modes

H6-01   **Pulse Train Input Terminal RP Function Selection**

0: **Frequency Reference**

1: **PID Feedback Value**

2: **PID Setpoint Value**

3: **Speed Feedback (V/f with Simple Speed Feedback)**

H6-02   **Pulse Train Input Scaling**

Sets the pulse frequency for 100% input value

Parameter	Name	Range	Default
H6-02	Pulse Train Input Scaling	100 to 32000 Hz	1440 Hz

H6: Pulse Train Input / Output

H6-03: Pulse Train Input Gain
H6-04: Pulse Train Input Bias

J V✓ A✓

All Modes

H6-03   **Pulse Train Input Terminal RP Gain**

           Gain for scaling the input pulse train signal

Parameter	Name	Range	Default
H6-03	Pulse Train Input Terminal RP Gain	0.0 to 1000.0%	100.0%

H6-04   **Pulse Train Input Terminal RP Bias**

           Bias for scaling the input pulse train signal

Parameter	Name	Range	Default
H6-03	Pulse Train Input Terminal RP Bias	-100.0 to 100.0%	0.0%

➔   **Flexible setting of gear ratio for electronic gear**

H6: Pulse Train Input / Output

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H6-05: Pulse Train Input Filter Time

(J) (V ✓) (A ✓)

All Modes

H6-05   Pulse Train Input Terminal RP Filter Time

Parameter	Name	Range	Default
H6-05	Pulse Train Input RP Filter Time	0.00 to 2.00 s	0.10 s

Note: Increase of the filter time causes a start / stop delay of the drive.

In master / slave applications this might lead to asynchronous start / stop behaving of master and slave.

H6: Pulse Train Input / Output

H6-06: Pulse Train Monitor Selection
H6-07: Pulse Train Monitor Scaling

J   V ✓   A ✓

`All Modes`

H6-06   **Pulse Train Monitor Terminal MP Selection**

Programmable to all analogue Monitors like the Multi-Function Analogue Outputs e.g. set H6-06 = 102 for Monitor U1-02 (Output frequency)

Setting range: **Default setting:**

xyy for Monitor value Ux-yy   **102 (Output frequency)**

➔   **can be set in same way as analogue outputs. Cheap solution to send a monitor signal to an input of a PLC (no need for expensive analogue inputs of the PLC).**

H6-07   **Pulse Train Monitor Terminal MP Scaling**

Parameter	Name	Range	Default
H6-07	Pulse Train Monitor MP Scaling	0 to 32000 Hz	1440 Hz

H6: Pulse Train Input / Output

YASKAWA

H6-08: Pulse Train Minimum frequency

(J) (V) (A)✓

All Modes

H6-08   **Pulse Train Output Terminal RP Minimum Frequency**
Sets the minimum frequency that can be detected by the Pulse Train Input.

- **If the pulse input frequency falls below the set value. Input frequency value goes to 0.**
- **The function is eneabled when H6-01 = 0, 1 or 2**
- **When H6-01 = 3 (V/f with simple PG feedback), minimum frequency becomes the value of disconnection time of PG (F1-14)**

Parameter	Name	Range	Default
H6-08	Pulse Train Minimum Frequency	0.1 to 1000.0 Hz	0.5 Hz

Note: **FAQ document available.**

Technical Training – Sequence