Variable frequency drive (VFD)

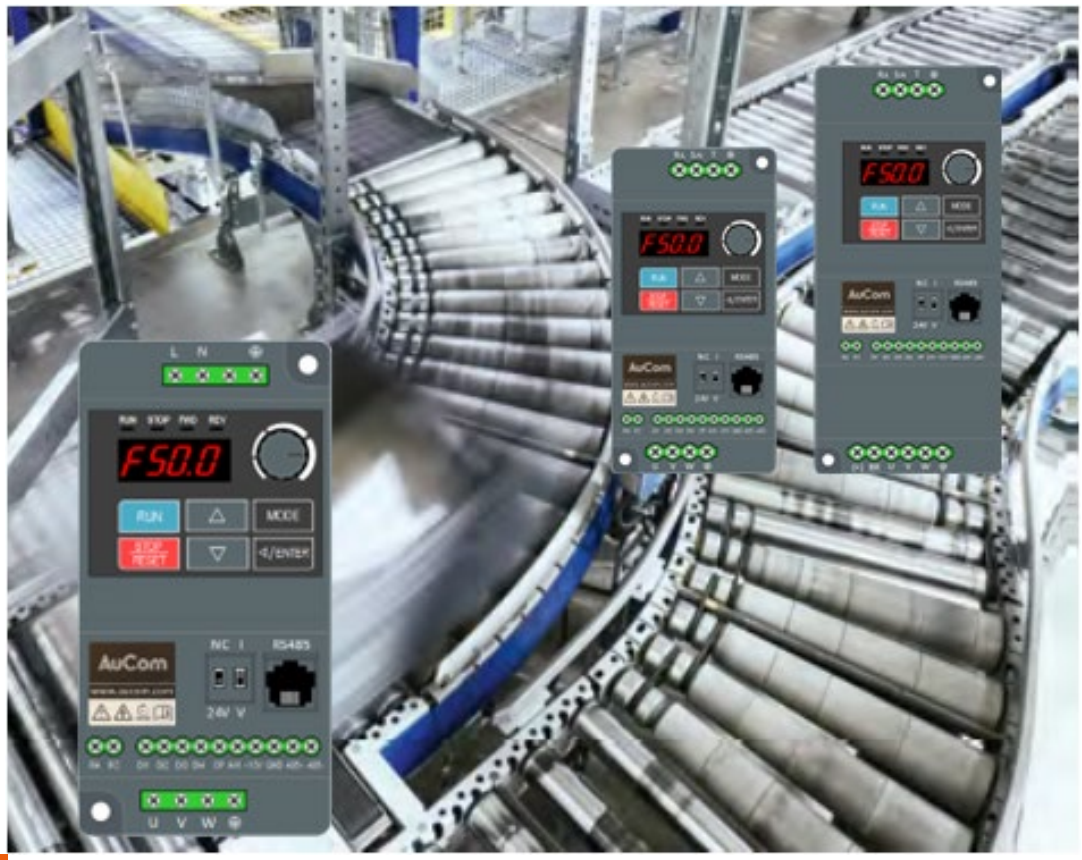
Low voltage 200 – 240 VAC (1~) and 380 – 460 VAC (3~)

User Manual

en

H1 Series

LV-MD – Low Voltage Variable Frequency Micro Drive



RIGHT FROM THE START

AuCom

READ THESE INSTRUCTIONS BEFORE USE!

Imprint

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Validity

Product: H1 Series LV-MD

INTRODUCTION

GENERAL INFORMATION

PRODUCT IDENTIFICATION

Model:	H1 Series LV-MD
Product type:	Speed regulation and control of AC low voltage three-phase motors
Product group:	Variable frequency drive (VFD)

MANUFACTURER

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CHANGE LOG

Version	Change	Initiator	Date
1.0.0	Initial version	AuCom, (FB)	31.01.2025

Tab. 1-1 H1 Series LV-MD User Manual – Change log

NOTES ON THIS USER MANUAL

This document contains important information for safe, effective, and efficient use of the H1 product.

SOURCE USER MANUAL The source user manual was written in English language.

STORAGE This user manual is an integral part of the H1 product and must always be kept in the immediate vicinity of the H1 VFD.

TARGET AUDIENCE This user manual is intended for the personnel responsible for the:

- installation,
- commissioning,
- operating,
- maintenance, and
- service

of the product. You can find further information on qualification requirements and access levels of the personnel in chapter "1.3 Target Audience and Qualification".

CHAPTER OVERVIEW

Chapter "1 Safety "
General safety instructions relevant to the product.

Chapter "2 Product Overview "
Basic information on the H1 frequency inverter and its features.

Chapter "**3 Mechanical Installation**"
Mechanical design of the H1 models and its main components.

Chapter "**4 Electrical Installation**
Electrical design of the H1 models and its main components.

Chapter "**5 Operation and Display**"
Presentation and explanation of all relevant elements and procedures for the initial commissioning and operation of the H1 VFD.

Chapter "**6 Commissioning**"
Measures and instructions for the initial commissioning of the H1 VFD for the various motor types.

Chapter "**7 Maintenance**"
Measures for planning and carrying out maintenance work to maintain the H1 VFD target state and optimise its availability.

Chapter "**8 Troubleshooting**"
Information on causes and remedial measures of potential malfunctions as well as instructions for restoring the H1 VFD to its target state.

Chapter "**9 Disposal**"
Instructions for the proper and environmentally friendly disposal of the H1 VFD after final decommissioning.

Chapter "**10 Spare Parts**"
Ordering information on available spare parts and accessories for the H1 product.

"Annex"

CHAPTER REFERENCE

For a quick and clear introduction to commissioning the H1 LV-MD, the flowchart for the commissioning procedure and the connection diagram are summarised in the "Annex".

SYMBOLS AND REPRESENTATIONS

WARNINGS

In this user manual, safety and protection levels are classified as DANGER, WARNING, HOT SURFACE, CAUTION and NOTICE.

DANGER

Warns of an electric shock hazard with a high degree of risk which, if not avoided, may result in death or serious injury.

WARNING

Warns of an electric shock hazard with a medium degree of risk which, if not avoided, may result in death or serious injury.

HOT SURFACE

Failure to follow these instructions may result in injury to the user.

CAUTION

Warns of a hazard (general hazard location) with a low degree of risk which, if not avoided, may result in minor or moderate injury.

NOTICE

Warns of situations that can lead to property damage if not avoided.

If several different levels of hazards are combined in one warning, the highest level of warning is always selected. Warnings about personal hazards may include warnings about property damage.

WARNING STRUCTURE

The warnings used in this user manual are each indicated by:

- a warning symbol,
- a signal word to indicate the extent of the hazard,
- an indication of the nature and source of the hazard,
- an indication of the possible consequences if the hazard is not avoided, and
- the measures to be taken to avoid the hazard.

Warning symbol

Signal word

Nature and source of the hazard

Possible consequences of not avoiding the hazard.

➢ Measure 1 to be taken to avoid the hazard

➢ Measure 2 to be taken to avoid the hazard

➢ ...

INFORMATIVE NOTES

In this user manual, additional information of a general nature or for more detailed information on specific matters is given as a NOTE or as a DISPOSAL NOTE.

NOTE

Indicates specific information relating to the use or operation of the product.

NOTES ON DISPOSAL

In this user manual, instructions for proper and environmentally friendly disposal are shown as DISPOSAL NOTES.

DISPOSAL NOTE

Indicates the regulations for the disposal of old electrical appliances.

REFERENCES

To increase the efficiency of this user manual, reference is made to exemplary instructions or further chapters for the description of the same procedure or further information.

CHAPTER REFERENCE

- Indication of the process/topic as well as indication of the referenced chapter number and the chapter title.

LABELLING OF INSTRUCTIONS

The *beginning* of a *general* instruction sequence on how to perform an action sequence is introduced as follows:

INSTRUCTION – Title of the instruction

START

The *beginning* of an instruction sequence *with indication of the required authorisation (user level)* to perform an action sequence is introduced as follows:

INSTRUCTION – Title of the instruction

START *USER LEVEL: "Unlocked keyboard"*

The action steps of the action sequence of an instruction are indicated as follows:

STEP 1: ...

- Result 1 of the first action step
- Result 2 of the first action step
- ...

STEP 2: ...

- Result 1 of the second action step
- Result 2 of the second action step
- ...

The end of a general or specific instruction sequence is indicated as follows:

END

TYPOGRAPHIC CONVENTIONS

In this user manual, *italics* are used for names of:

- Parameters and functions,
- Parameter setting options,
- Alarm and fault messages, and
- Common terms of particular importance.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ABBREVIATIONS

Acronym	Description
ABS	absolute value
ACC, Acc	acceleration
ADS, Ads	address
AI	analog input
AMP	ampere, current
AMR	adaptive motor regulation
AO	analog output
APR	Automatic position regulation
ASR	automatic speed regulation
AVR	automatic voltage regulation
Bro	broken
CHG	change
CiA402	CANopen device profile for drives and position (motion) control
CLR	clear
CMD, Cmd, cmd	command
CNT	counter
Comm	command sourced from serial communication
COMP	compensation
CTRL, Ctrl	control
Cur	current
DBC	dead band compensation
DCI	DC Injection
DCS	distributed communication system
dEb	decelerate energy backup, represents the instantaneous stop function, while voltage drop in the grid, this function is controlling the motor (slow down) to reduce the impact on the grid and resume the operation when the voltage is recovered. This is to achieve the undervoltage process without stopping.
EF	external fault
DEC, Dec	deceleration
Det	detection
Dev	deviation
DFM	display frequency monitoring/measurement
DHCP	Dynamic Host Configuration Protocol
DI	digital input
DIR, Dir	direction
DO	digital output
DOB	disturbance observer
DPWM	Discrete Pulse Width Modulation
EF	error, fault
EMC	electromagnetic capability
EMF	electromotive force

Acronym	Description
Emp	empty
ERR, Err	error
FBK, Fbk, Fdb	feedback
FFD	feedforward
FLUXBEMF	flux back electromotive force
FLX	flux
FM	frequency modulation
FOC	field-oriented control
FWD, Frd	forward
GF	ground fault
GFF	ground fault
HOA	Hand-Off-Automatic
Hp, HiSPD	high-speed
I/F, IF	current/flux
IDBST	initial deceleration boost
IGBT	insulated-gate bipolar transistor
ICT	In-Circuit Testing
IM	induction motor
INC	increase
JOG	derived from the English verb 'to jog', which in this context means 'to move slowly and in a controlled manner'
KPD	kinetic power demand
L/R	local/remote
LIM, Lim	limit
LMVF	low voltage motor variable frequency (drive)
Lo	lower
LOC/REM	local/remote
Lp	low pass
LPF	low pass filter
LPG	low pass gain
Ls, LoSPD	low speed
LSErr, LsEr	low speed error
LV	low voltage
Lvl	level
M1 ... M4	motor 1 ... motor 4
MID	middle
MOV	metal oxide varistor
MTPA	maximum torque per ampere
Mul	multiplication, multi
NB	Negative Big (PID controller - Fuzzy logic)
NC	normally closed or not connected
NL	negative limit
NS	Negative Small (PID controller - Fuzzy logic)
oc	overcurrent

Acronym	Description
oC	degrees Celsius [°C]
OH	overheat
oL	overload
OPER	operation
OPL	output phase loss
ORG	origin
OV, ov	overvoltage
P2P	point-to-point
PB	Positive Big (PID controller - Fuzzy logic)
PDFF	proportional-derivative feed-forward
PG	pulse generator
PHL	phase loss
PI	Proportional-Integral Controller (PI)
PID	Proportional-Integral-Derivative Controller (PID)
PLC	programmable logic controller
PL	positive limit
PLS	pulse
PM	permanent magnetic motor
PMLESS	without permanent magnet
PMVVC	voltage vector control method for permanent magnet synchronous motors
POS, Pos	position
PT	Potential Transformer
PTC	positive temperature coefficient
REC	recorded
REG	regulation
res	resistor
Ret	return
REV, Rev	reverse, reversal, change of direction
REV	revolutions
revs	revolutions
RLY	(output) relay
Rot	rotation
RPM, rpm	revolutions per minute
SCI	serial communication interface
SDO	service data object
SECT	sector
SEL, Sel	selection
SOOC	Selective Object Orientation Control or Start/Stop/Override Control ???
SPD, Spd	speed
SPWM	sinusoidal pulse width modulation
STP	Stop
sup	supress

Acronym	Description
SVPWM	Space Vector Pulse Width Modulation
Sw	switching
S/W	software
SynRM	synchronous reluctance motor
Tap	taper
Ten	tension
TE	torque error
TQC, Tq	torque control
TQCPG	torque control with current proportional gain
TQR	torque control ratio
TRANS	transition
Unwd	unwind
Up	upper
VDR	Voltage dependent resistor
VF, V/F	voltage/frequency control
VFD	variable frequency drive
VFFD	voltage feedforward
Vlt	Volt
VR	variable resistor
VVC	voltage vector control
W/	with
W/O	without
Y-D	star/delta connection
Z, Zo	zero

SYMBOLS AND DEFINITIONS

Name/Symbol	Description	Unit
Id	magnetising current (dq transformation)	[A]
Iq	active motor current (dq transformation)	[A]
F	frequency	[Hz]
I	current	[A]
P	active power	[kW]
Jm, J	inertia of the motor	[kg m^2]
Rs	stator resistance	[Ω]
Rr	rotor resistance	[Ω]
Lm	mutual inductance	[mH]
Lx	leakage inductance	[mH]
Ld	d-axis inductance (dq transformation)	[mH]
Lq	q-axis inductance (dq transformation)	[mH]
n	speed	[rpm]
n*	speed setpoint	[rpm]
Vd, Ud	d-axis voltage (dq transformation)	[V]
Vq, Uq	q-axis voltage (dq transformation)	[V]
Kd	derivative term in the PID controller	-

Name/Symbol	Description	Unit
Ke	constant to describe the back electromotive force (EMF)	-
Ki, KI	integral factor of a controller; reciprocal of the time constant Ti	-
Kp, KP	proportional gain of a controller	-
Kr	Gain factor for the feedforward component within the proportional-derivative feedforward (PDFF) control in the speed control loop	-
⌀	diameter	

1 SAFETY

To use the AuCom H1 product safely, you must read, understand, and observe all the information in this user manual before use. This user manual must always be available when working on and with the product.

1.1 WARNING SIGNS ON THE H1 CABINET

The following warning signs are attached to the H1 cabinet and must be observed:

Warning sign	Description
	• Indicates a hazardous location with an electric shock hazard.
	• General reference to a hazardous point with reference to the relevant documentation.
	• Indicates a hazardous location with a hot surface and a risk of an injury hazard.

1.2 INTENDED USE

H1 frequency inverters are used for stepless speed control of three-phase drives (asynchronous motors) on the low voltage level (380 to 460 V).

This user manual serves as a specification for the intended use of the product and must be strictly adhered to. The user manual must be available for all activities connected with the product.

QUALIFIED AND AUTHORISED PERSONNEL

Only appropriately qualified and authorised personnel can carry out work on and with the product during the entire product life cycle.

TRANSPORT AND STORAGE

You must observe and comply with all instructions and relevant technical data on transport and storage conditions.

PERSONAL PROTECTIVE EQUIPMENT

At all times, you must observe the regulations on the use of personal protective equipment (PPE).

PLANT CONSTRUCTION

You must comply with all applicable country-specific, local, and industry-specific ordinances and regulations for the safety and construction of the plant.

ENVIRONMENT AND INSTALLATION

You must observe and comply with all instructions and information on ambient conditions and installation conditions.

OPERATION

All components of the application (frequency inverter, drive, power supply and its fuse protection) must be coordinated with each other regarding their rated variables, their function, and all parameter settings.

PRODUCT MODIFICATION AND DISCLAIMER

Modification or manipulation of the H1 VFD is not permitted.

Modification or tampering with the H1 VFD means that the product is being used outside of its specification and is therefore a non-intended use, which can cause personal injury and damage to the system. Any consequences of improper use of the product are not covered by AuCom Support and will void the guarantee or warranty. AuCom excludes all liability for improper use and any consequences that may arise from it.

MISUSE

Any use that does not correspond to the intended use of the H1 product is considered misuse.

DANGER

Danger in case of misuse

Misuse of the H1 VFD can result in death, serious personal injury, and damage to the equipment.

- Never operate the product unless all safety devices of the H1 VFD are functioning properly or are ready for operation.
- Never operate the product at a voltage level that does not correspond to the specified H1 VFD input voltage.
- Never connect drives to the product whose rated voltage and current are not matched to the rated values of the H1 VFD.
- Never put the product into operation unless all parameter settings of the H1 VFD have been adjusted to the connected drive and the application.
- Never modify or manipulate the product with hardware and/or software components not specified by AuCom.
- Never use spare parts that are not specified by AuCom.

1.3 TARGET AUDIENCE AND QUALIFICATION

The H1 VFD is intended for use by qualified personnel in commercial areas of various industries where frequency inverters are used to control the speed of three-phase low voltage motors.

This user manual is intended for qualified personnel for the installation, commissioning, operation, maintenance, and service of this product. According to their training and experience, qualified personnel are able to recognise risks when using the product and its applications and to avert potential hazards to persons and system components.

Key access to the operating unit (HMI) can be disabled or enabled via software settings. In this way, individual user levels can be created in the H1 VFD; see chapter "5.2.5 User Levels".

USER LEVEL "LOCKED KEYBOARD"

In this user level, operation of the H1 VFD via the buttons on the operating unit (HMI) is disabled, while operation via DCS or DIs is possible, provided the H1 VFD is configured accordingly.

USER LEVEL "UNLOCKED KEYBOARD"

The technical personnel have advanced expertise for applications of frequency inverters on the low voltage level. This user level allows start/stop control of LV AC motors via the frequency inverter as well as reading and setting all parameters (commissioning, operation, and maintenance).

The instruction of the personnel is carried out based on the complete technical documentation as well as training by experts.

1.4 SAFETY INSTRUCTIONS

1.4.1 FIVE SAFETY RULES OF ELECTRICAL ENGINEERING

For all work on the H1 VFD you must apply the five safety rules of electrical engineering according to DIN VDE 0105 in the following order:

1. Disconnect completely
2. Secure against re-connection
3. Verify absence of operating voltage
4. Earthing and short-circuiting
5. Provide protection against adjacent live parts

To restart the equipment, follow the five safety rules is done in reverse order.

1.4.2 SAFE OPERATION

HANDLING THE H1 UNIT

Installation, commissioning, demounting, taking measurements, etc, of or on the H1 VFD may only be carried out by personnel technically qualified for the task. The installation must be carried out in accordance with local standards.

OPENING THE H1 UNIT

WARNING

Always switch off the mains voltage before opening the drive unit and wait at least 10 minutes to allow the buffer capacitors to discharge.

Always take adequate precautions before opening the H1 VFD. Although the connections for the control signals and the switches are isolated from the main voltage, do not touch the control board when the H1 VFD is switched on.

PRECAUTIONS TO BE TAKEN WITH A CONNECTED LOAD (MOTOR)

If work must be carried out on a connected load (motor) or on the driven machine, the mains voltage must always be disconnected from the H1 product first. Wait at least 10 minutes before starting work.

EMC REGULATIONS

To comply with the EMC Directive, it is essential to follow the installation instructions. All installation descriptions in this manual follow the EMC Directive.

MAINS VOLTAGE SELECTION

The H1 product may be ordered for use with the mains voltage range:

- 200 to 240 V AC (1-phase LV-MD models), or
- 380 to 460 V AC (3-phase LV-MD models)

VOLTAGE TESTS (MEGGER)

Do not carry out voltage tests (Megger) on the motor, before all the motor cables have been disconnected from the H1 VFD.

CONDENSATION

If the H1 product is moved from a cold (storage) room to a room where it will be installed, condensation can occur. This can result in sensitive components becoming damp. Do not connect the mains voltage until all visible dampness has evaporated.

INCORRECT CONNECTION

The H1 VFD is not protected against incorrect connection of the mains voltage, and against connection of the mains voltage to the motor outputs U, V and W. The H1 product can be damaged in this way.

TRANSPORT

To avoid damage, keep the H1 VFD in its original packaging during transport. This packaging is specially designed to absorb shocks during transport.

HEAT WARNING

HOT SURFACE

Be aware of specific parts on the H1 VFD having high temperature.

DC-LINK RESIDUAL VOLTAGE

WARNING

After switching off the mains supply, dangerous voltage can still be present in the H1 drive.

- When opening the equipment for installing and/or commissioning activities wait at least 10 minutes.
- In case of malfunction a qualified technician should check the DC-link voltage or wait for one hour before dismantling the H1 VFD for repair.

2 PRODUCT OVERVIEW

2.1 IMPORTANT NOTES ON THE PRODUCT

H1 Series LV-MD is a high-performance general frequency inverter (VFD) for low voltage 3-phase AC motors induction motors (IM). This product line has rich hardware configuration and powerful software and accommodates communication protocols Modbus RTU or CANopen. As a high-performance general-purpose VFD series that adopts a book-type design and meets the needs of multiple installation regions.

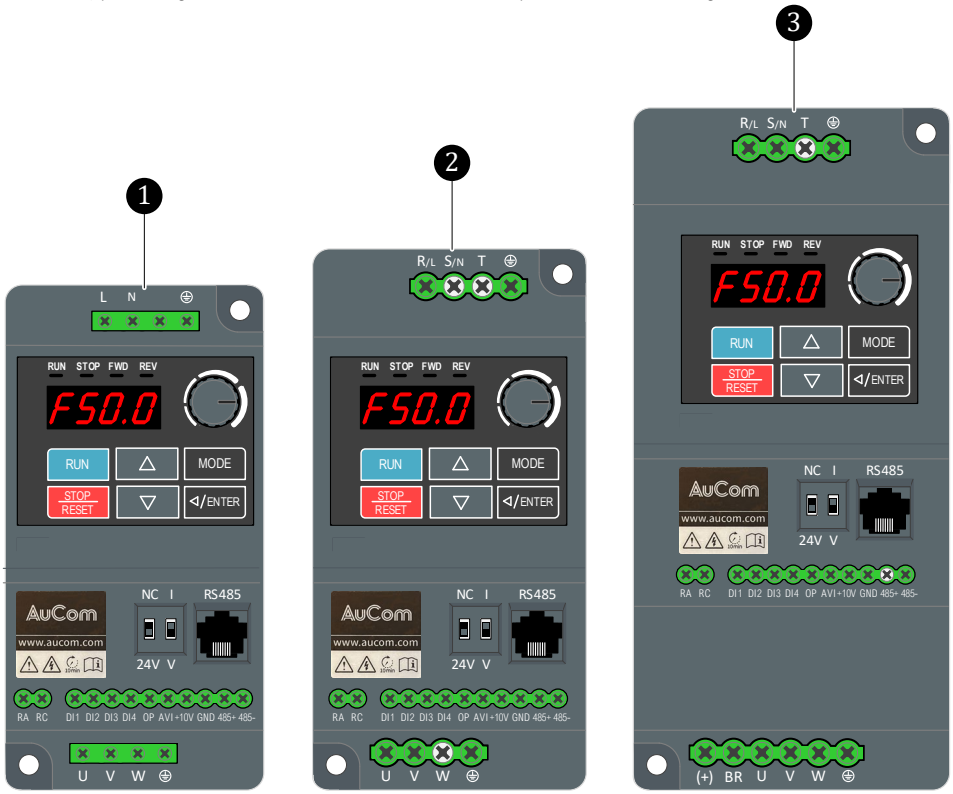

Fig. 2-1 H1 Series – LV-MD

1. Frame size FS1: for applicable 1-phase motors of 0.4 ... 2.2 kW
2. Frame size FS2: for applicable 1-phase or 3-phase motors of 0.75 ... 2.2 kW
3. Frame size FS3: for applicable 3-phase motors of 4 ... 5.5 kW

INTENDED USE OF THE H1 PRODUCT

H1 Series frequency inverters for drives with variable speed offer the following solutions for the use of low voltage motors with regard to:

- Intelligent control of low voltage AC asynchronous motors (induction motors)
- Motor speed control (VFD)
- Motor soft start (extension of motor life cycle)
- Star/Delta motor start
- Motor DOL start (Package solution)
- Energy saving through optimised power consumption of the motor at different speed and power requirements

INDUSTRIES

Typical industries:

- Food
- Woodworking
- Textiles
- Ceramics

- Logistics
- Pumps and Ventilation
- Conveyor Technology
- Others ...

AREAS OF APPLICATION

Pressure Control

- Pressure control algorithm eliminates the necessity of purchasing an external controller.

Motor Control

- 1-phase and 3-phase asynchronous motors (induction motors IM)

AUCOM H1 SERIES LV-MD PRODUCT FAMILY

The H1 Series covers a wide range of applicable motor power.

All LV-MD models are available as air-cooled systems and offer the same advantages such as high reliability, advanced functionality, user-friendly operation, and a wide range of options .

AuCom H1 Series LV-MD	Description
Power range	0.44 ... 5.5 kW
Voltage range	1-phase, 200 ... 240 V AC 3-phase, 380 ... 460 V AC
IP class, cabinet	IP20
Control mode	C: V/F or VVC (set by parameter)
EMC filter	Option
DCS communication (standard)	Modbus RTU or CANopen
DCS communication: phys. interface (Modbus RTU)	RS485
Performance classes/ Frame sizes (FS)	For applicable motors: FS1: 0.4 ... 2.2 kW; 1-phase motors FS2: 0.75 ... 2.2 kW; 1-phase or 3-phase motors FS3: 4 ... 5.5 kW; 3-phase motors
CE certification	All sizes

Tab. 2-1 AuCom H1 Series LV-MD – Product family

2.1.1 RECEIVING INSPECTION

Upon receiving the H1 product:

- Confirm the exterior packaging of the VFD is in good condition.
- Unpack and confirm the surface of the VFD is in good condition and verify that there are no broken or shifted internal components.
- Check the packing list to confirm all components are received.

CAUTION

If there is any damage to the VFD, refuse shipment and immediately contact the carrier.

H1 PACKAGING

The LV-MD VFDs are packaged in cardboard boxes. All the items packed in the cardboard box are as shown in the following figure:

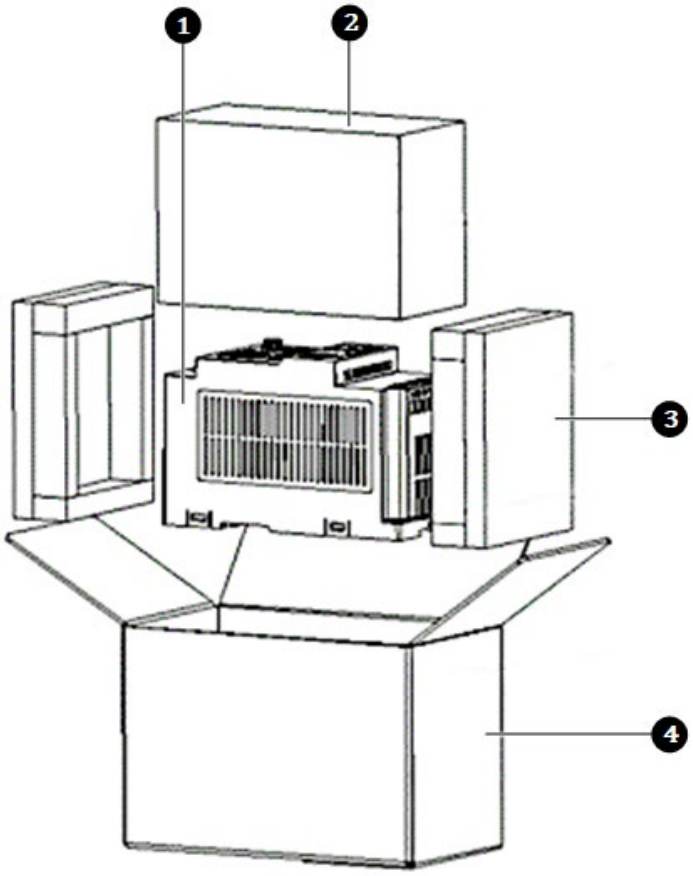

Fig. 2-2 H1 VFD packaging

1. H1 VFD
2. Shrink film
3. Expanded polyethylene (EPE)
4. Cardboard box

UNPACKING PROCEDURE

The manual and accessories are placed in different compartments. The unpacking procedure is as follows:

- Remove all the tapes and open the box cover.
- Remove all the filling materials.
- Take out the VFD.
- Cut apart the plastic wrap tape of the VFD.
- Check whether there is any damage sign.
- Dispose of or recover the plastic package according to the local regulations.

2.1.2 LABELLING OF THE PRODUCT

NAMEPLATE

All relevant information describing the H1 product is summarised on the nameplate of the H1 LV-MD control unit. For H1 packages, there is a separate nameplate for the H1 cabinet.

H1 CONTROL UNIT – NAME PLATE

The nameplate is attached to the outside of the H1 VFD and shows the following information:

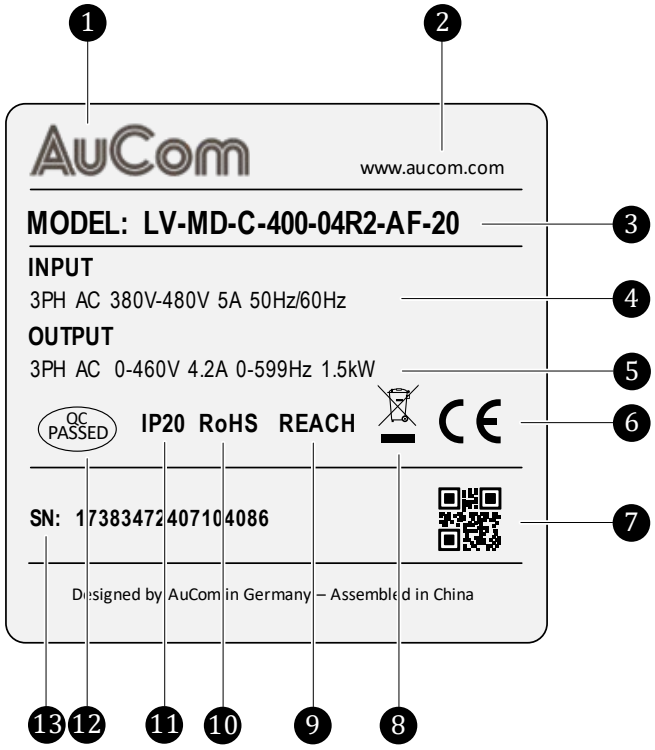

Fig. 2-3 H1 VFD control unit – Name plate

1. Company logo of the manufacturer
2. Manufacturer's website
3. H1 model
4. Technical product data: H1 VFD input
5. Technical product data: H1 VFD output
6. CE marking
7. QR code
8. Disposal symbol
9. *Registration, Evaluation, Authorisation and Restriction of Chemicals* compliance mark
10. *Restriction of Hazardous Substances* compliance mark
11. Ingress protection class according to IEC 60529:1989
12. Manufacturer's quality mark
13. Serial number

H1 CABINET – NAME PLATE

The nameplate is attached to the outside of the H1 cabinet and shows the following information:

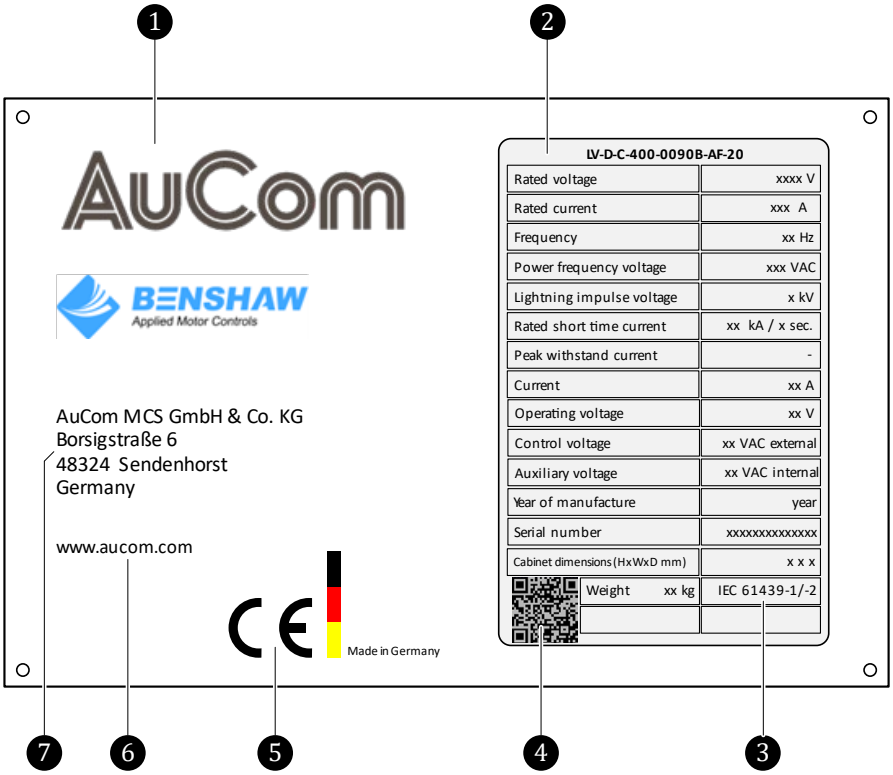

Fig. 2-4 H1 VFD cabinet – Name plate

1. Company logo of the manufacturer
2. Technical product data
3. Product standard (IEC)
4. QR code
5. CE marking
6. Manufacturer's website
7. Manufacturer's address

TECHNICAL PRODUCT DATA

Technical specification	Description
Rated Voltage value	Mains supply voltage
Rated current / power	Rated current/rated power at the H1 VFD output
Frequency	Mains supply frequency
Power frequency voltage	AC withstand voltage
Lightning impulse voltage	Impulse withstand voltage
Rated short time current	Rated short time withstand current
Peak withstand current	Rated impulse withstand current
Current	Rated current (H1 VFD output)
Operating voltage	Rated voltage (H1 VFD output)
Control voltage	-
Auxiliary voltage	-
Year of Manufacture	-
Serial number	-
IPxx	Ingress protection class according to IEC 60529:1989
Weight	Weight of the H1 VFD system

Tab. 2-2 Technical data on the H1 VFD cabinet nameplate

QR CODE

In addition to the data on the nameplate, the QR code shown on the nameplate contains further information on the delivered H1 product.

You can scan the QR code using a camera or a smartphone or a PC/notebook. Once scanned, you are automatically linked to this page on the AuCom website:

https://www.aucom.com/contact-us/support-enquiry

You can use the above link to submit a support request for further information.

PRODUCT CODE

The product code can be used to determine the exact model of the H1 product. This identification is required for model-specific information during assembly and installation. The product code is located on the name plate of the H1 LV-MD control unit.

Ordering identifier							Ordering **option**
1	2	3	4	5	6	7	
LV	MD	C	400	04R2	AF	20	Protection class: 20 = IP20
					AF		H1 cooling method: AF = Air flow
				04R2			Rated current at H1 output I_{rms}* [A]:
			400				Rated voltage at H1 input U_{rms} [V]: 230 = 200-240 V AC 400 = 380-460 V AC
		C					Type of application: C = Constant torque
	MD						Area of application: MD = Micro drive
LV							AuCom H1 type (voltage level): LV = Low voltage

* See table below *Rated currents*

Tab. 2-3 Ordering identifiers and ordering options in the H1 product code

NOTES ON MODEL SELECTION

Model selection of the H1 VFD depends on the motor type to be driven, the motor ratings, and the load characteristics. For special or atypical loads, motors or environments, follow the advice and recommendations below.

EXTREME ENVIRONMENTAL CONDITIONS

When used in extreme environments, e.g., at high ambient temperatures or at high altitudes (> 1000 m) or ambient temperatures (> 40 °C), the power of the drive must be reduced (derating). This may result in a VFD with a higher rated power being required for the application (see *Ordering identifier 5*).

CAUTION

The LV frequency inverter is not designed for operation in potentially explosive atmospheres. As a result, it must not be installed in such environments.

NOTE

- The connected load determines the output current that the H1 VFD must apply.
- The above recommendations do not cover all cases of special loads and motors. Contact AuCom or your local supplier to confirm the model required.

ORDERING IDENTIFIER AND ORDERING OPTIONS

The ordering identifier is shown at the top of "Tab. 2-3 Ordering identifiers and ordering options in the H1 product code".

ORDERING IDENTIFIER 1 Application voltage level of the H1 product.

ORDERING IDENTIFIER 2 Performance type of the H1 product.

ORDERING IDENTIFIER 3 H1 model according to the application referring to constant torque.

ORDERING IDENTIFIER 4 Rated voltage (mains voltage) at the H1 input.

Product code	Mains Voltage system	Mains voltage [V]	Output Voltage system	Output Voltage [V]	Applicable motor [kW]	Frame size
LV-MD-C-230-02R7-AF-20	1-phase	200 ... 240	3-phase	0 ... 240	0.4	FS1
LV-MD-C-230-04R2-AF-20					0.75	
LV-MD-C-230-07R5-AF-20					1.5	
LV-MD-C-230-0011-AF-20					2.2	FS2
LV-MD-C-400-02R5-AF-20	3-phase	380 ... 460	3-phase	0 ... 460	0.75	
LV-MD-C-400-04R2-AF-20					1.5	
LV-MD-C-400-05R5-AF-20					2.2	
LV-MD-C-400-0009-AF-20					4.0	FS3
LV-MD-C-400-0013-AF-20					5.5	

Tab. 2-4 Rated voltages available at the H1 output

ORDERING IDENTIFIER 5 Selection of rated output current at H1 output and brake unit:

Product code	Mains Voltage system	Input current [A]	Output current [A]	Brake unit	Applicable motor [kW]	Frame size
LV-MD-C-230-02R7-AF-20	1-phase	6.5	2.7	-	0.4	FS1
LV-MD-C-230-04R2-AF-20		9.3	4.2		0.75	
LV-MD-C-230-07R5-AF-20		15.7	7.5		1.5	
LV-MD-C-230-0011-AF-20		24	11		2.2	FS2
LV-MD-C-400-02R5-AF-20	3-phase	3.2	2.5		0.75	
LV-MD-C-400-04R2-AF-20		5	4.2		1.5	
LV-MD-C-400-05R5-AF-20		7.1	5.5		2.2	
LV-MD-C-400-0009-AF-20		10	9	Ext. B	4.0	FS3
LV-MD-C-400-0013-AF-20		17	13	Ext. B	5.5	
LV-MD-C-400-0009B-AF-20		10	9	Int. B	4.0	
LV-MD-C-400-0013B-AF-20		17	13	Int. B	5.5	

Tab. 2-5 Rated currents and brake units available at the H1 output

NOTE

- FS3 VFDs have an optional configuration internal brake unit, or an optional external brake unit. For details refer to "Tab. 4-2 Recommended braking resistor selection table".

ORDERING IDENTIFIER 6 Cooling method of the H1 product.

ORDERING IDENTIFIER 7 The *Ingress Protection* class rating according to the IP code is IP20.

2.1.3 CONFORMITY

EU DECLARATION OF CONFORMITY

AuCom APPLIED MOTOR CONTROLS

EU Declaration of Conformity

(Directive 2014/30/EU)
(Directive 2014/35/EU)
(Directive 2014/65/EU)

Product type: Low Voltage Variable Frequency Drive

Manufacturer: AuCom MCS GmbH & Co.KG

Address: Borsigstraße 6

48324 Sendenhorst

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Product identification: H1 Series

Design variants considered:

LV-MD-C-230-02R7-AF-20
LV-MD-C-230-04R2-AF-20
LV-MD-C-230-07R5-AF-20
LV-MD-C-230-0011-AF-20
LV-MD-C-400-02R5-AF-20
LV-MD-C-400-04R2-AF-20
LV-MD-C-400-05R5-AF-20
LV-MD-C-400-0009-AF-20
LV-MD-C-400-0013-AF-20
LV-MD-C-400-0009B-AF-20
LV-MD-C-400-0013B-AF-20

The object of the declaration described above is in conformity with the following relevant Union harmonisation legislation(s):

2014/30/EU: DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) (Text with EEA relevance); Official Journal of the European Union L96/79, 29/03/2014.

EU Declaration of Conformity H1-Series V-20250123-GB.docx

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2014/35/EU: DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits; Official Journal of the European Union L96/357, 29/03/2014.

2011/65/EU: Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast) (Text with EEA relevance); Official Journal of the European Union L174/88, 01/07/2011.

Conformity to the directives is verified through total compliance with all of the specifications applicable to the product in the following Standards:

DIN EN IEC 61800-3:2024-04: Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods for PDS and machine tools (IEC 61800-3:2022); German version EN IEC 61800-3:2023

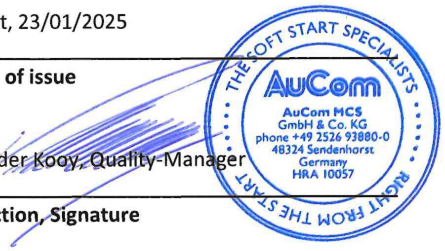
DIN EN 61800-5-1:2017-11: Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1:2007 + A1:2016); German version EN 61800-5-1:2007 + A1:2017
DIN EN 61800-5-1/A11:2021-08: Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy; German version EN 61800-5-1:2007/A11:2021

DIN EN IEC 63000:2019-05: Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016); German version EN IEC 63000:2018

Signed for on behalf of AuCom MCS GmbH & Co.KG

Sendenhorst, 23/01/2025

Place/ Date of issue



Patrick van der Kooy, Quality-Manager

Name, Function, Signature

EU Declaration of Conformity H1-Series V-20250123-GB.docx

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PRODUCT STANDARD FOR EMC

Product standard DIN EN IEC 61800-3, second edition of 2004 defines the:

FIRST ENVIRONMENT

(Extended EMC) as environment that includes domestic premises. It also includes establishments directly connected without intermediate transformers to a low voltage power supply network that supplies buildings used for domestic purposes.

- Category C2:

  Power Drive System (PDS) of rated voltage < 1000 V, which is neither a plug-in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by a professional.

SECOND ENVIRONMENT

(Standard EMC) includes all other establishments.

- Category C3:

  PDS of rated voltage < 1000 V, intended for use in the second environment and not intended for use in the first environment.

- Category C4:

  PDS or rated voltage equal or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment.

The H1 VFD complies with the product standard DIN EN IEC 61800-3 (Any kind of metal screened cable may be used). The H1 VFD is designed to meet the requirements according to category C3.

By using the optional "Extended EMC" filter the H1 VFD fulfils the requirements according to category C2.

WARNING

In a domestic environment this product may cause radio interference, in which case it may be necessary to take adequate additional measures.

WARNING

The H1 VFD, complying with category C3, is not intended to be used on a low-voltage public network which supplies domestic premises; radio interference is expected if used in such a network. Contact your supplier if you need additional measures.

SAFETY OF MACHINERY

FUNCTIONAL SAFETY

NOTE

The LV-MD do not have certified Safety functions and all machine safety must be established with external components like Safety relay etc.

NORMS AND STANDARDS

EUROPEAN MARKET

INTERNATIONAL

Standard	Definition
EMC Directive	2014/30/EU
Low Voltage Directive	2014/35/EU
WEEE Directive	2012/19/EU
EN 60204-1:2018	Safety of machinery - Electrical equipment of machines Part 1: General requirements.
EN IEC 61000-6-2:2019 EN IEC 61000-6-4:2019	Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity standard for industrial environments. Part 6-4: Generic standards - Emission standard for industrial environments.
DIN EN IEC 61800-3:2024	Adjustable speed electrical power drive systems Part 3: EMC requirements and specific test methods. EMC Directive: Declaration of Conformity and CE marking
IEC TR 61000-3-15:2011	Electromagnetic compatibility (EMC) Part 3-15: Limits assessment of low frequency electromagnetic immunity and emission requirements for dispersed generation system in LV network.
DIN EN 61800-5-1:2017	Adjustable speed electrical power drive systems Part 5-1. Safety requirements - Electrical, thermal and energy. Low Voltage Directive: Declaration of Conformity and CE marking

Tab. 2-6 European and international standards

2.2 PRODUCT DATA

2.2.1 FEATURES AND FUNCTIONS OF THE H1 VFD

The H1 LV-MD drives are suitable for frequency regulation and control of low voltage three-phase motors. The H1 LV-MD offer the following features and functions:

MAIN FEATURES

BOOK TYPE DESIGN

- Independent vertical straight-through air duct for heat dissipation Side-by-side installation to save the footprint
- Narrow-body scheme: with a small footprint and high-power density

GREEN & HIGH EFFICIENCY

- Automatic energy saving control: Improve the control efficiency for no-load motors in fans and water pumps their no-load current values can be reduced by 30 %.
- Energy control: To increase the operational efficiency the deceleration time can be shortened.

EASE OF RELIABILITY AND USE

Standard-configuration via HMI keypad functions

VOLTAGE LEVELS

VFD applications for low voltage levels from 380 V to 460 V.

ADJUSTABLE FREQUENCY RANGE

Motor speed is controlled via an adjustable frequency range from 0.1 to 599 Hz.

MOTOR CONTROL METHODS

Asynchronous motor (induction motor) according to extended V/F and VVC control characteristic

START/STOP MODES

Various, adjustable start/stop characteristics for the motor such as acceleration and deceleration ramps as well as motor coasting.

N OR F* SETPOINT SETTING*

You can specify the required speed/frequency setpoint either manually on site via the keypad or the frequency knob of the operating unit (HMI) or remotely via an analog input (AI), digital inputs (DI) or via the distributed control system (DCS).

VFD OPERATING MODES

You can control the VFD either manually on site via the RUN/STOP buttons of the operating unit (HMI) or remotely via a distributed control system (DCS) or via digital inputs (DI).

MULTI-SPEED FUNCTION

Allows the setting of multiple preset speeds for the motor, enabling easy switching between different speed levels during operation.

SLEEP/WAKE-UP FUNCTION

Puts the converter into an energy-saving standby mode (Sleep mode) when the motor is not needed for an extended period and reactivates it (Wake-up) when operation is to be resumed.

HOLDING BRAKE FUNCTION

Controls the activation of a brake to hold the motor in a stationary position when it is not running, preventing unwanted movement.

ANALOG INPUT: MULTI-POINT CURVE

Defines multiple control points along a motor's speed curve, allowing for more precise adjustments of performance based on varying input signals.

DISTRIBUTED CONTROL SYSTEM (DCS)

The VFD can be integrated into a distributed control system. The following communication protocols are available: Modbus RTU and CANopen.

MOTOR REVERSE MODE

Reverse the motor rotation direction via the VFD.

2.2.2 DIMENSIONS AND WEIGHTS

H1 LV-MD MODELS

Dimensions, weight, and space requirements for a H1 LV-MD model depend on the rated power of the H1 VFD. For dimensions and weights of the various H1 LV-MD models refer to "Tab. 2-7 H1 Series LV-MD model specifications".

H1 LV-MD CABINETS

Dimensions, weight, and space requirements for a H1 cabinet depend on the rated power of the H1 VFD.

The exact specifications are only known when the product code is defined.

DOCUMENT REFERENCE

- For further information please refer to the document "AuCom_LV-Drive-Packages_Digital.pdf".
- For detailed information, contact AuCom.

2.2.3 TECHNICAL DATA

ELECTRICAL AND MECHANICAL LV-MD MODEL SPECIFICATIONS

The following LV-MD model specifications refer to:

- LV-MD input voltage:
  - 1-phase: 200 ... 240 V AC +/-10 %
  - 3-phase: 380 ... 460 V AC +/-10 %
- LV-MD input frequency: 50/60 Hz
- LV-MD output voltage:
  - 3-phase: 0 ... 240 V AC, for 1-phase input
  - 3-phase: 0 ... 460 V AC, for 3-phase input

LV-MD MODEL SPECIFICATION

Product code	Mains Voltage system	Input current [A]	Output current [A]	Applicable motor [kW]	Frame size	Frame dimension H x W x D [mm]	Net weight [kg]
LV-MD-C-230-02R7-AF-20	1-phase	6.5	2.7	0.4	FS1	133 x 69 x 104	0.6
LV-MD-C-230-04R2-AF-20		9.3	4.2	0.75			
LV-MD-C-230-07R5-AF-20		15.7	7.5	1.5			
LV-MD-C-230-0011-AF-20		24	11	2.2	FS2	143 x 73 x 105	0.8
LV-MD-C-400-02R5-AF-20	3-phase	3.2	2.5	0.75			
LV-MD-C-400-04R2-AF-20		5	4.2	1.5			
LV-MD-C-400-05R5-AF-20		7.1	5.5	2.2			
LV-MD-C-400-0009-AF-20		10	9	4.0	FS3	180 x 84.5 x 117.5	0.85
LV-MD-C-400-0013-AF-20		17	13	5.5			

Tab. 2-7 H1 Series LV-MD model specifications

GENERAL ELECTRICAL SPECIFICATION

General specification	
LV-MD rated power	0.4 ... 2.2 kW (for 1-phase input)
	0.75 ... 5.5 kW (for 3-phase input)
Mains voltage	1-phase: 200 ... 240 V ± 10 %
	3-phase: 380 ... 460 V ± 10 %
Output AC voltage	3-phase: 0 ... 240 V AC (for 1-phase input)
	3-phase: 0 ... 460 V AC (for 3-phase input)
Protection class	IP20
Cooling method	AF (Air Forced)
Main control performance	
Output frequency	0.1 ... 599 Hz
Carrier frequency	2 ... 6 kHz Automatic carrier frequency adjustment can be done according to the load characteristics.
Output frequency resolution	• Digital setting (HMI, DI): 0.01 Hz, for: f < 10 Hz 0.1 Hz, for: f > 10 Hz • Communication-based control: 0.01Hz • Analog Setting: Maximum Frequency × ± 0.1 %
Control mode	V/F control
Starting torque	• 150 %, for 60 s • 180 %, for 3 s
Maximum Torque	up to 150 % of the rated torque at 5.0 Hz
Torque response	Torque step response < 20 ms
Torque accuracy	• ± 10 % (SVC) • ± 5 % (FVC)
Overload capacity	The output current up to 150 % of the rated output current can be maintained for 60 s, while the output current up to 180 % of the rated output current can be maintained for 3 s.
V/F curve	• Standard V/F curve • 1.5-power V/F curve • "and second-power curves are set"
Acceleration and deceleration curve	• Linear or S-curve acceleration/deceleration • four groups of acceleration/deceleration times • acceleration/deceleration time range: 0.01 ... 600.0 s (two acceleration times and two deceleration times can be set separately)
Multi-speed running	Up to 16 preset speeds can be realized through terminals
Built-in PID	Can easily realize closed loop process control.
Customized functions	
Peripheral safety self-test	A safety test is performed on the peripherals to timely identify any problems, such as a grounding problem or a short-circuit, and improve the reliability of the system
Fast current limiting function	A quick current limiting algorithm is embedded to reduce the probability that an overcurrent fault happens to the VFD.
Automatic Voltage Regulation (AVR)	A constant voltage output can be maintained in case of grid voltage variations.
Standardized panel extension cable	Customers can extend the panel using standard network cables.
DCS Communication	At least six protocol types are supported (Modbus RTU and CANopen)
VFD operation (RUN)	
Run command channels	Support multiple command signal input methods:

	• Operating unit (HMI) • Digital inputs (DI) • DCS communication
Frequency sources	Multiple frequency setting sources: • Operating unit (HMI), • Analog inputs (AI), • Digital inputs (DI), • DCS communication
Auxiliary frequency sources	Multiple auxiliary frequency setting sources: • Operating unit (HMI), • Analog inputs (AI), • Digital inputs (DI), • DCS communication setting Users can flexibly fine tune and combine auxiliary frequency sources.
Universal terminals	4 x Digital input (DI) including 1 x high-speed input 1 x Relay output (RY) 1 x Analog input (AI) 1 x RS485 (Modbus RTU)
Display and panel operation	
LCD display	7 segment display
Protections and options	
Protection functions	• Motor short-circuit detection • Input/output phase loss protection • Overcurrent protection • Overvoltage protection • Undervoltage protection • Overtemperature protection • Overload protection • Underload protection • Excessive slip protection • Overtorque protection • Abnormal start protection • PTC action selection

Tab. 2-8 General specification

ENVIRONMENTAL CONDITIONS

OPERATION

Item	Specification
Use place	Indoor, free from direct sunlight, dust, corrosive gas, flammable gas, oil mist, water vapour, dripping water or salt, etc.
Pollution degree	2
Altitude	• < 1000 m: no derating is required • > 1000 m: derating is required
Nominal ambient temperature	-10 ... +40 °C • The VFDs based on a cooling mode rather than natural cooling shall be installed closely side by side. • The maximum normal operating temperature is 40 °C. • In case of > 40 °C, the VFD shall be derated; the upper operating temperature limit is 50 °C.
Storage temperature	-20 ... +60 °C
Transportation temperature	-20 ... +60 °C
Relative humidity, non-condensing	< 90 %RH, without water droplets
Vibrations	Complies with IEC 60068-2-6
Contamination, according to IEC 60721-3-3	No electrically conductive dust allowed. Cooling air must be clean and free from corrosive materials. Chemical gases, class 3C2 (Coated boards 3C3). Solid particles, class 3S2.

Tab. 2-9 Environmental conditions – Operation

BASIC I/O DATA

Digital Inputs (DI), 8 Channels			
Design	Opto-coupler isolation, compatible with bipolar inputs		
Default built-in power supply	PNP type (source)		
Input voltage range (DI 1 to DI 7)	9 ... 30 V DC		
Input voltage range (HDI 8)	15 ... 30 V DC		
Input impedance	< 3.3 V DC: 3 kΩ / ≥ 3.3 V DC: 3 kΩ		
Signal delay	≤ 8 ms		
Terminals	Name	Function (*Default*)	
	OP	*DI power supply* for: PNP mode or NPN mode (wire bridge to +24 V) *without* external power supply or *No function* for: PNP or NPN mode *with* external power supply	
	DI 1	*Forward / STOP*	
	DI 2	*Reverse / STOP*	
	DI 3	*Multi-stage command 1*	
	DI 4	*Multi-stage command 2*	
Analog Inputs (AI, differential), 1 Channel			
Design	Voltage input: 0 ... 10 V or Current input: 0 ... 20 mA (parameterizable)		
Input voltage	0 ... 10 V DC		
Input current	0 ... 20 mA or 4 ... 20 mA		
Max. input voltage	+30 V		
Input impedance	10 kΩ (voltage); 500 Ω (current)		
Resolution	12 bit		
Hardware accuracy	0.5 % Type + 1 LSB		
Non-linearity	1 LSB		
Terminals	Name	Function (*Default*)	
	GND	Ground	
	AVI	*FREQ Reference*	
	+10 V	+10 V or 20 mA	
Relay Outputs (RY), 1 relay			
Design	Potential-free normal open contact		
Single relay output capability	250 V AC / 3 A (NO) 250 V AC / 2 A (NO) estimate cosφ = 0.4 30 V DC / 3 A (NO)		
Terminals	Name		Function (Default)
	RC (NO)	RY1	*Error Indication*
	RA		COM: RA
RS485 Communication (Modbus RTU)			
RS485 transmit (T) & receive (R) signals	Isolated differential signals -7 V ... 12 V		
Terminals	Name	Function	
	GND	Ground	
	485+	RxD/TxD high level	
	485-	RxD/TxD low level	

Tab. 2-10 Basic I/O data

2.3 SCOPE OF SUPPLY

Standard:

- 1 x LV-MD low voltage variable frequency converter

Option: H1 package

- 1 x H1 LV-MD cabinet

DOCUMENT REFERENCE

- For further information please refer to the document "AuCom_LV-Drive-Packages_Digital.pdf".
- For detailed information, contact AuCom.

3 MECHANICAL INSTALLATION

3.1 FS1 TO FS3 OVERALL DIMENSIONS

3.1.1 DIMENSIONS – H1 LV-MD DEVICES

FRAME SIZE FS1

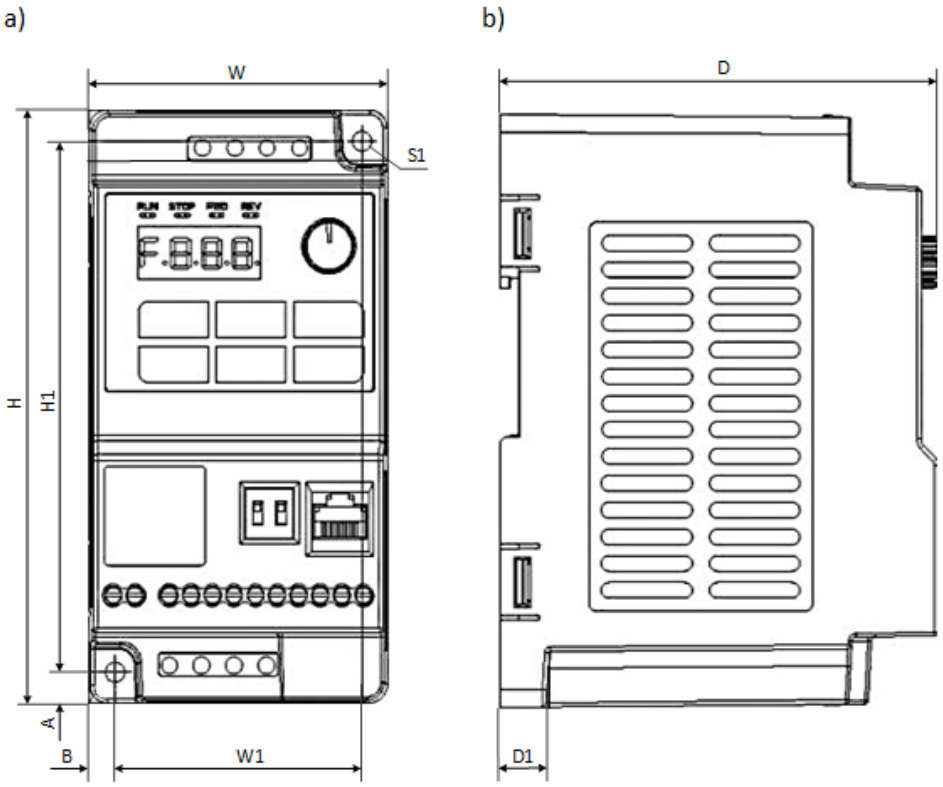


Fig. 3-1 Two-view drawing – FS1:
a) Front view
b) Side view

Frame size	H [mm]	W [mm]	D [mm]	D1 [mm]	W1 [mm]	H1 [mm]	A [mm]	B [mm]	S1 [mm]
FS1	133	69	104	11.5	57.5	119.5	7	6	Ø 4.5

Tab. 3-1 Housing/Mounting dimensions – FS1

FRAME SIZE FS2

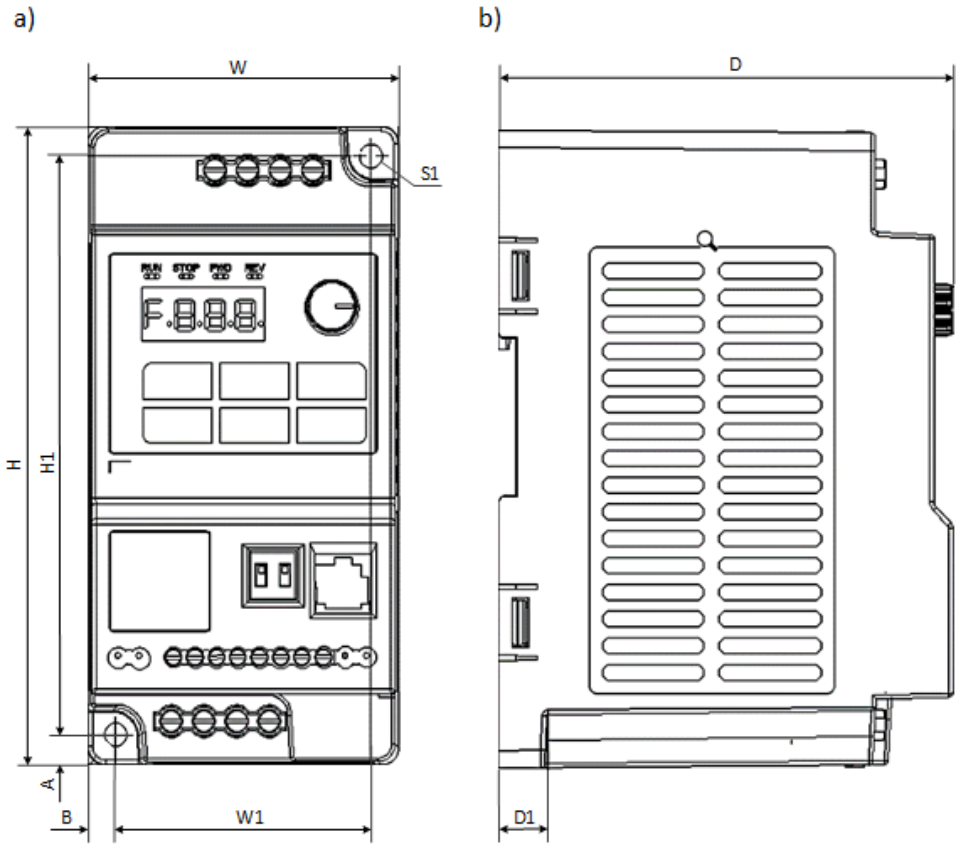


Fig. 3-2 Two-view drawing – FS2:
a) Front view
b) Side view

Frame size	H [mm]	W [mm]	D [mm]	D1 [mm]	W1 [mm]	H1 [mm]	A [mm]	B [mm]	S1 [mm]
FS2	143	73	105	12	60	130	6.8	6.5	Ø 5.5

Tab. 3-2 Housing/Mounting dimensions – FS2

FRAME SIZE FS3

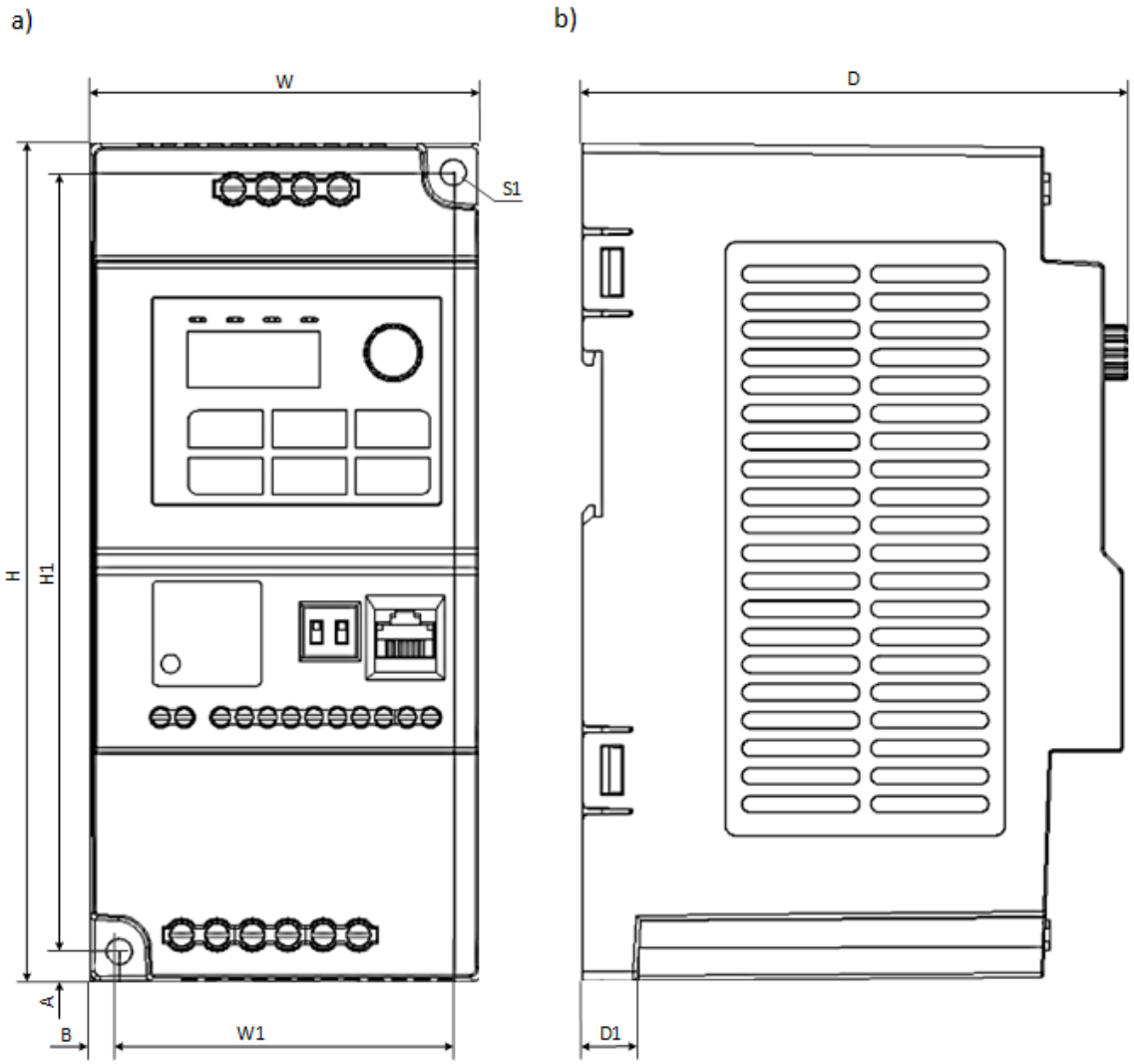


Fig. 3-3 Four-view drawing – FS3:
a) Front view
b) Side view

Frame size	H [mm]	W [mm]	D [mm]	W [mm]	W1 [mm]	H1 [mm]	A [mm]	B [mm]	S1 [mm]
FS3	180	84.5	117.5	12	72	167.5	6.3	6.3	Ø 5.5

Tab. 3-3 Housing/Mounting dimensions – FS3

3.1.2 DETACHED OPERATING UNIT (HMI)

All LV-MD models can optionally be equipped with a remote operating unit (HMI) that can be mounted separately from the LV-MD control unit:

- Detached HMI with mounting frame

NOTE

➢ When using a detached HMI, a standard LAN communication cable is required to be connected between the HMI and the H1 control unit.

DETACHED HMI WITH MOUNTING FRAME

The use of a mounting frame requires a panel cut-out into which the mounting frame is fixed with retaining clips.

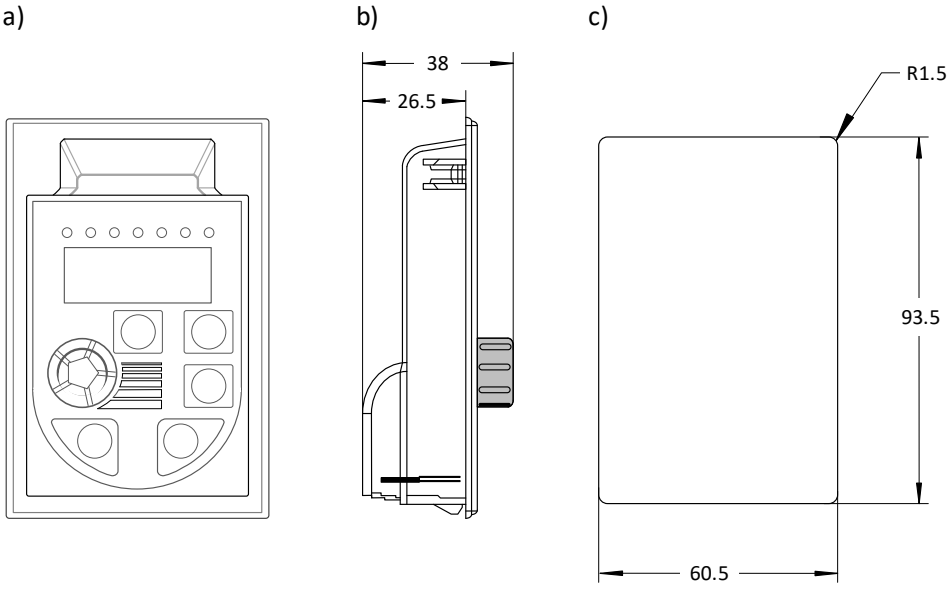


Fig. 3-4 Detached HMI with mounting frame:
a) HMI front view
b) Mounting frame side view
c) Panel cutout

NOTE

This method requires a mounting plate cut-out for connecting the communication cable to the RJ45 interface on the back of the HMI.

3.2 INSTALLATION REQUIREMENTS

The LV-MD VFD can be mounted on a wall or in a cabinet.

3.2.1 INSTALLATION ENVIRONMENT

AMBIENT TEMPERATURE

The surrounding ambient temperature greatly affects the lifespan of the VFD, and the operating environment temperature of the VFD should not exceed the allowable temperature range (-10 … 50 °C). When the ambient temperature is between 40 … 50 °C, derating is required.

MOUNTING SURFACE

Install the VFD on the surface of a flame-retardant object. There should be enough space around it for heat dissipation. The VFD easily generates a lot of heat when working and install it vertically on the mounting support with screws.

VIBRATION ENVIRONMENT

Install the VFD in a place that is not prone to vibration, with vibrations not exceeding 0.6 g, especially away from equipment such as punch presses.

CLIMATIC ENVIRONMENT Avoid installation in places exposed to direct sunlight, humidity, or water droplets.

HAZARDOUS ENVIRONMENT Avoid installation in locations with corrosive, flammable, or explosive gases in the air.

POLLUTION ENVIRONMENT Avoid installation in places with oil pollution, high dust levels, or metal dust.

3.2.2 INSTALLATION TOOLS

ASSEMBLY TOOLS

Tool	Description
Electric drill and bit	Used to drill mounting holes in the mounting surface.
Phillips and flat-head screwdrivers	Used to tighten or loosen screws.
Tape measure	Used to measure and check the VFD installation dimensions.
Gloves	Wear gloves against static electricity during VFD installation.
Bottom bracket (optional)	Used to fix the VFD in the cabinet.
Mounting rail (optional)	Used to fix the VFD.
Screws	Used to fix the VFD with the mounting surface.

Tab. 3-4 Installation tools

ASSEMBLY ACCESSORIES The required accessories and their quantities are shown in the following table.

Installation method	Screw specification	Description	Quantity
Wall mounting	The user purchases screws according to the mounting holes.	Used to fix the VFD onto the wall.	2
DIN rail mounting	Screws are purchased as optional parts from our company.	Used to fix the VFD onto the guide rail support.	1

Tab. 3-5 Accessories and quantities

WIRING TOOLS The dimensions of the main circuit's terminals need to be considered for their connections. Appropriate tools need to be selected to connect the terminals and tighten their connections. See the following table for the wiring tools requirements.

Frame size	Description
FS1 to FS3	• a flat-head screwdriver, • a Philips screwdriver, • a wire stripper, and • a pair of wiring pliers

Tab. 3-6 Wiring tools

3.2.3 INSTALLATION SPACE – FRAME SIZES FS1 TO FS3

NOTE

When installing models, attention should be paid to cooling issues:

- Always install the VFD vertically to facilitate heat dissipation upwards, but not upside down or horizontally. If there are multiple VFDs in a cabinet, it is best to install them side by side. In cases where *top and bottom* installations are necessary, refer to the schematic in "Fig. 3-7 Installation space FS1 to FS3 – Covered top and bottom row installation" and install a heat dissipation guide plate.
- Follow the installation space guidelines shown in "Fig. 3-5 Installation space FS1 to FS3 – Covered single installation" and "Fig. 3-6 Installation space FS1 to FS3 – Covered side-by-side installation to ensure proper cooling space for the VFD. However, consider the heat dissipation of other devices in the cabinet when arranging.
- The installation bracket must be made of flame-retardant material.
- For applications with metal dust, it is recommended to install the radiator outside the cabinet. Therefore, the space inside the fully sealed cabinet should be as large as possible.

The VFD's installation space and spacings vary with its power rating.

COVERED SINGLE INSTALLATION SPACE

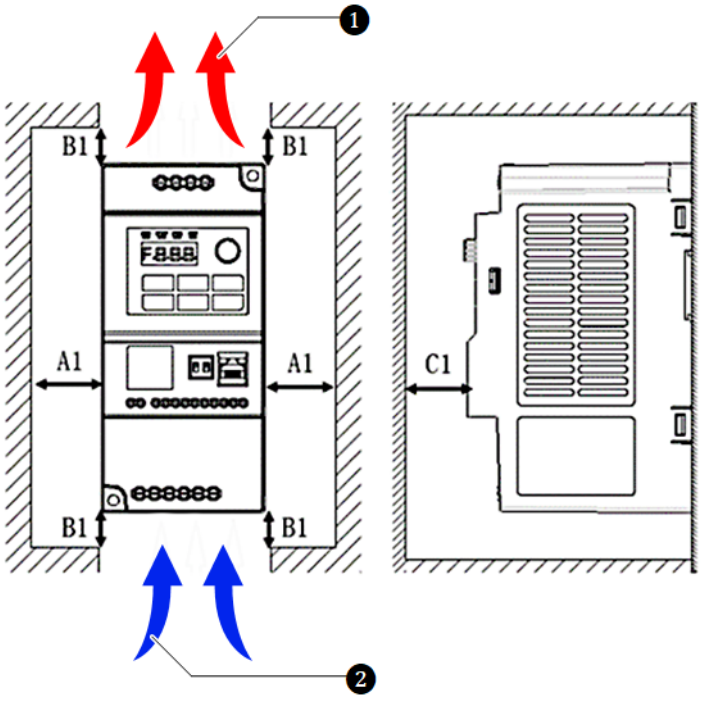


Fig. 3-5 Installation space FS1 to FS3 – Covered single installation

1 Hot air
2 Cold air
A1 Minimum horizontal cooling space
B1 Minimum vertical cooling space
C1 Minimum front cooling space

Frame size	Power Rating	Vertical cooling space A1 [mm]	Horizontal cooling space B1 [mm]	Front cooling space C1 [mm]
FS1	0.4 kW	≥ 20	≥ 80	≥ 80
FS1 & FS2	0.75 kW			
	1.5 kW			
	2.2 kW			
FS3	4.0 kW			
	5.5 kW			

Tab. 3-7 Installation space requirements (covered single) – FS1 to FS3

COVERED SIDE-BY-SIDE INSTALLATION SPACE

The H1 product can be used in applications that require installation in the top and bottom row. The heat from the appliances in the bottom row may cause the temperature of the appliances in the top row to rise, resulting in overheating/overload faults. Therefore, measures such as the installation of heat baffles should be taken.

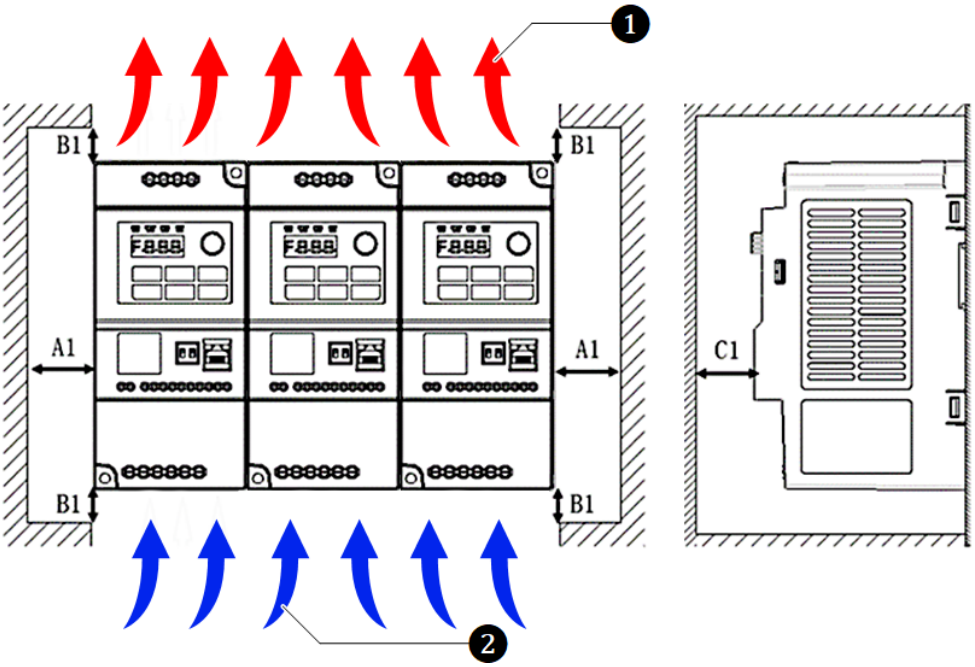


Fig. 3-6 Installation space FS1 to FS3 – Covered side-by-side installation

1 Hot air
2 Cold air
A1 Minimum horizontal cooling space
B1 Minimum vertical cooling space
C1 Minimum front cooling space

Frame size	Power Rating	Vertical cooling space A1 [mm]	Horizontal cooling space B1 [mm]	Front cooling space C1 [mm]
FS1	0.4 kW	≥ 20	≥ 100	≥ 80
FS1 & FS2	0.75 kW			
	1.5 kW			
	2.2 kW			
FS3	4.0 kW		≥ 120	
	5.5 kW			

Tab. 3-8 Installation space requirements (covered, side-by-side) – FS1 to FS3

COVERED TOP AND BOTTOM ROW INSTALLATION SPACE

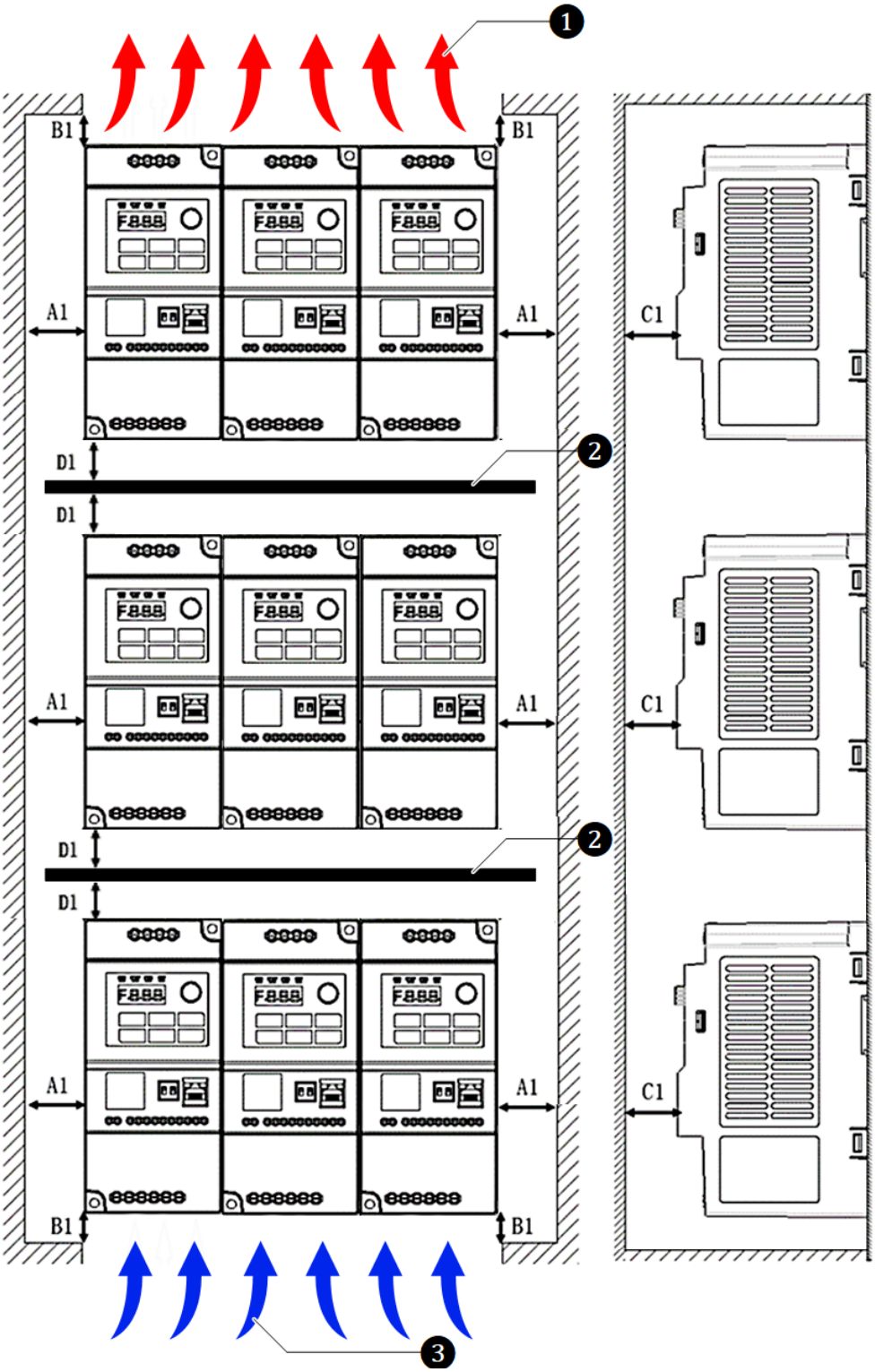


Fig. 3-7 Installation space FS1 to FS3 – Covered top and bottom row installation

❶ Hot air
❷ Heat insulation deflector
❸ Cold air
A1 Minimum horizontal cooling space
B1 Minimum vertical cooling space
C1 Minimum front cooling space
D1 Minimum heat deflector space

Frame size	Power Rating	Vertical cooling space A1 [mm]	Horizontal cooling space B1 [mm]	Front cooling space C1 [mm]	Heat deflector cooloing space
FS1	0.4 kW	≥ 20	≥ 100	≥ 80	≥ 80
FS1 & FS2	0.75 kW				
	1.5 kW				
	2.2 kW				
FS3	4.0 kW		≥ 120		
	5.5 kW				

Tab. 3-9 Installation space requirements (covered top and bottom row) – FS1 to FS3

3.2.4 WALL MOUNTING

Before installing the VFD in a control cabinet, a control cabinet design must be developed to ensure that the VFD has sufficient space for mounting and heat dissipation. This includes the space required in the cabinet, the design of the mounting plate and the design of the heat dissipation of the cabinet body.

WARNING

- Before installation, make sure that the VFD-supporting component has sufficient mechanical strength.
- When installing the equipment, cover the top part of the equipment with cloth or paper to prevent metal chips, oil, water, etc. from entering the equipment during drilling. If foreign matter enters the inside of the equipment, it may cause the equipment to malfunction. Remove these cloths or papers when the operation is finished. If they continue to be covered, the ventilation will deteriorate and cause the equipment to heat up abnormally.
- Ensure that there is sufficient VFD mounting space and consider the heat dissipations of the other items in the cabinet; for details, see "Covered Single Installation Space" and "Covered Side-by-side Installation Space" in chapter "3.2.3 Installation space – Frame Sizes FS1 to FS3".
- Please install the VFD vertically for upward heat dissipation. If there are two or more VFDs in the cabinet, side-by-side installation is implemented. In case multiple VFDs are installed one above another, install one or more heat insulation deflectors; for details, see "Covered Top and Bottom Installation Space in chapter "3.2.3 Installation space – Frame Sizes FS1 to FS3".
- If a mounting bracket is required, its material must be flame-retardant.
- For an application scenario with metal dust, it is recommended to use an installation cabinet that can completely close the VFD so that it is isolated from the metal dust, and in this case, the completely closed space in the cabinet should be as large as

possible; it is recommended that the heat sink is installed outside the cabinet.

- Tight all the screws to the specified torque. Otherwise, there may occur a fire or electric shock.
- Do not place flammable or explosive materials near the equipment.

WALL MOUNTING HOLES

For the locations and diameters of the wall mounting holes, see chapter "3.1 FS1 to FS3 Overall Dimensions".

WALL MOUNTING INSTALLATION PROCEDURE

Use the Phillips screwdriver to fasten two screws, one at the top right and the other at the bottom center (M4 and M5 screws with Phillips head are recommended; the screw length is determined by the user).

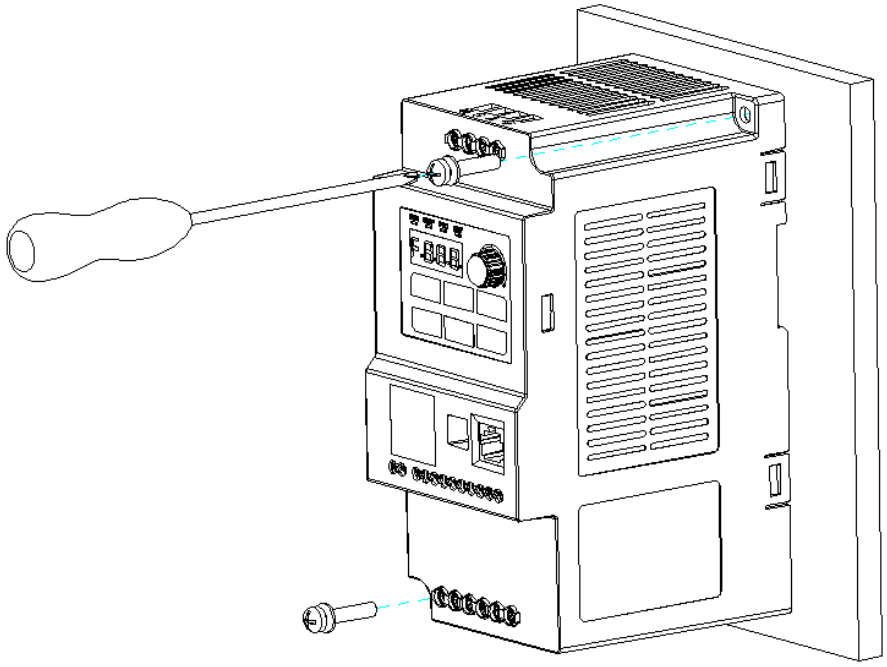


Fig. 3-8 Wall Mounting

When mounting the VFD on the wall, always fasten it with the two screws at the top right and bottom left.

WARNING

Do not fasten the VFD with only one screw, as otherwise the VFD may come loose due to uneven force application during continuous operation.

VFD REMOVAL

DANGER

Before disconnecting the power circuit and the wiring of the control circuit, make sure that the VFD is de-energized for at least 10 min.

For VFD removal, screw out the two screws respectively in the upper right and lower left with a Philips screwdriver and remove it.

3.2.5 DIN RAIL MOUNTING

UNLOCK THE DIN RAIL FASTENER

Use a slotted screwdriver to move the DIN rail fastening slightly outwards, as shown in Fig. 3-9.

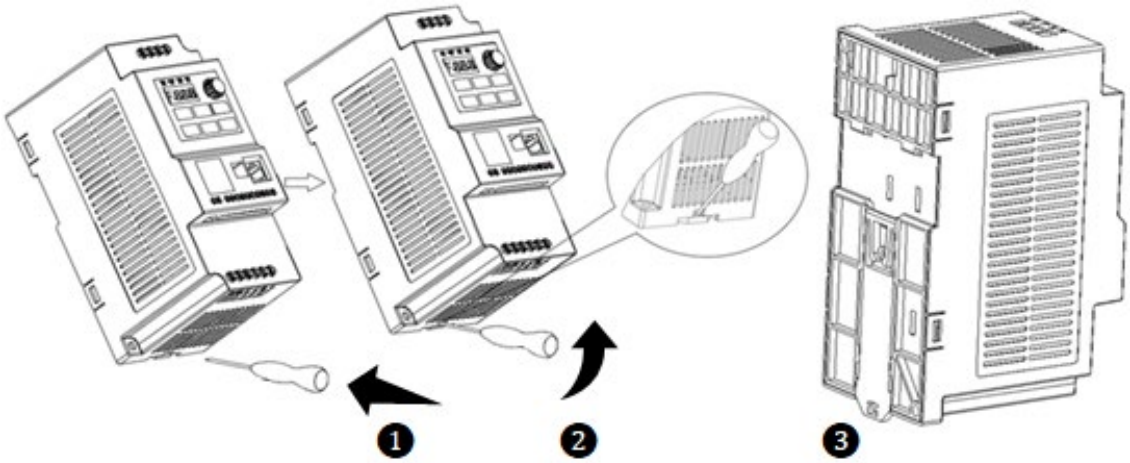


Fig. 3-9 Unlocking the DIN rail fastener

1. Press the screwdriver into the slot of the DIN rail fastening.
2. Lever the screwdriver upwards to pull out the DIN rail fastener.
3. Unlocked DIN rail fastener

INSTALLATION SCENARIO 1

If the guide rail has *not yet* been installed in the cabinet, unlock the fastener according to Fig. 3-9, and place the DIN rail behind the upper solid clamps of the VFD; see Fig. 3-10.

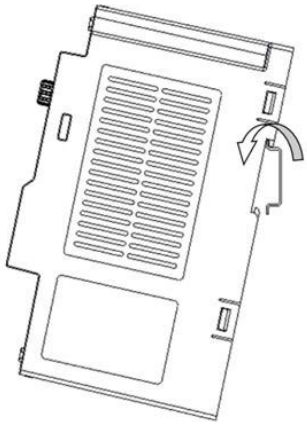


Fig. 3-10 DIN rail mounting scenario 1 – Placing the DIN rail

Push upward the fastener to the extreme to allow it to lock the guide rail according to Fig. 3-11.

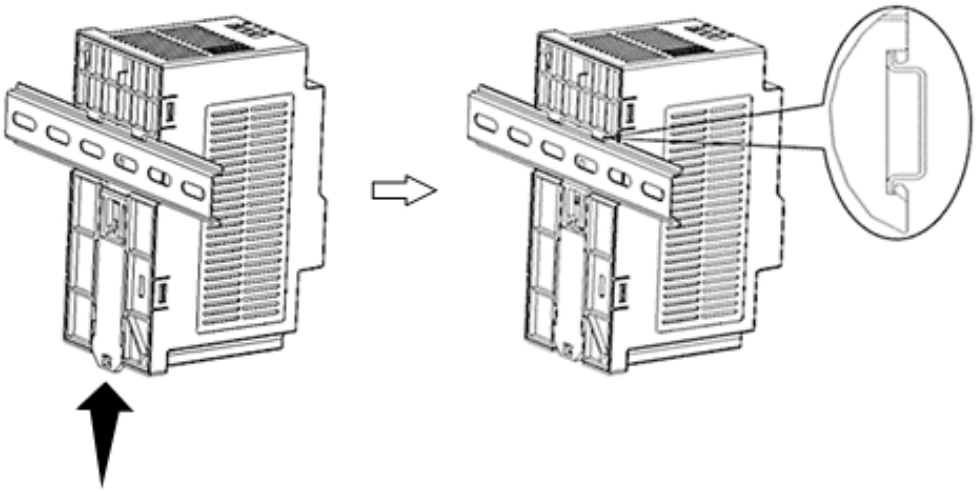


Fig. 3-11 DIN rail mounting scenario 1 – Locking the DIN rail

INSTALLATION SCENARIO 2

If the guide rail has been mounted in the cabinet, hold up the VFD in place according to Fig. 3-12, press the bottom of the VFD in the oblique downward direction as shown by the arrow by the hand to place the guide rail into the fastener. Then push the guide rail fastener to the extreme to allow it to lock the guide rail.

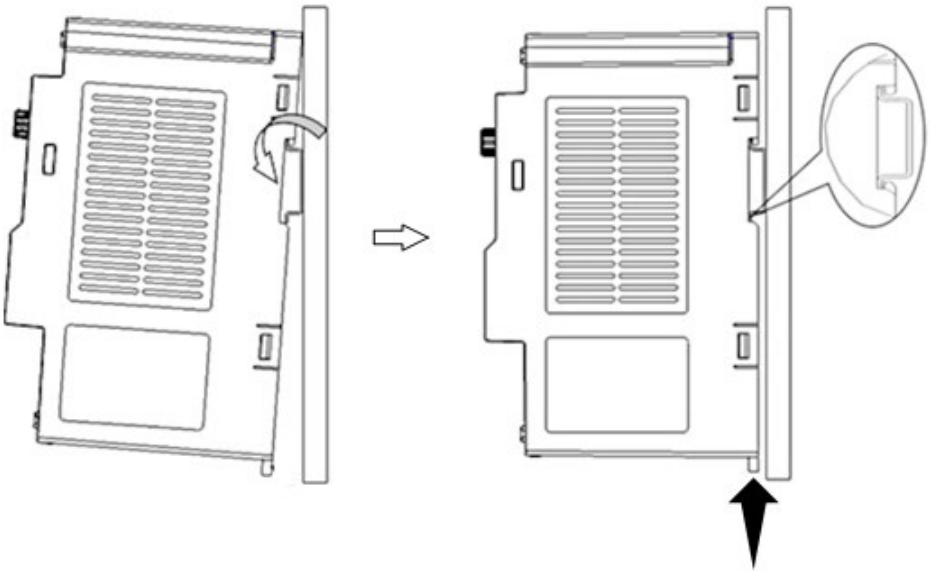


Fig. 3-12 DIN rail mounting scenario 2 – Locking the DIN rail

VFD REMOVAL

DANGER

Before disconnecting the power circuit and the wiring of the control circuit, make sure that the VFD is de-energized for at least 10 min.

Gently move the DIN rail fastener a little outward with a slotted screwdriver to unlock the DIN rail. Then, pull the VFD in the oblique upward direction to remove it from the DIN rail.

NOTE

It is recommended to use the procedure for scenario 1.

4 ELECTRICAL INSTALLATION

4.1 GUIDANCE ON SELECTING PERIPHERAL ELECTRICAL COMPONENTS

VFD model	Air switch (MCCB) [A]	Contactor [A]	R,S,T / U,V,W		Control circuit wire [mm²]	Grounding	
			Wire [mm²]	Cable lug model		Wire [mm²]	Cable lug model
LV-MD-C-230-02R7-AF-20	10	9	1	E1010	0.5	1	E1010
LV-MD-C-230-04R2-AF-20	16	16	2.5	E2512	0.5	2.5	E2512
LV-MD-C-230-07R5-AF-20	20	25	2.5	E2512	0.5	2.5	E2512
LV-MD-C-230-0011-AF-20	32	32	4	E4012	0.5	4	E4012
LV-MD-C-400-02R5-AF-20	3	9	0.75	E7510	0.5	0.75	E7510
LV-MD-C-400-04R2-AF-20	4	9	0.75	E7510	0.5	0.75	E7510
LV-MD-C-400-05R5-AF-20	10	9	1	E1010	0.5	1	E1010
LV-MD-C-400-0009(B)-AF-20	16	16	2.5	E2512	0.5	2.5	E2512
LV-MD-C-400-0013 (B)-AF-20	20	25	2.5	E2512	0.5	2.5	E2512

Tab. 4-1 Recommended selection of LV-MD peripheral electrical components

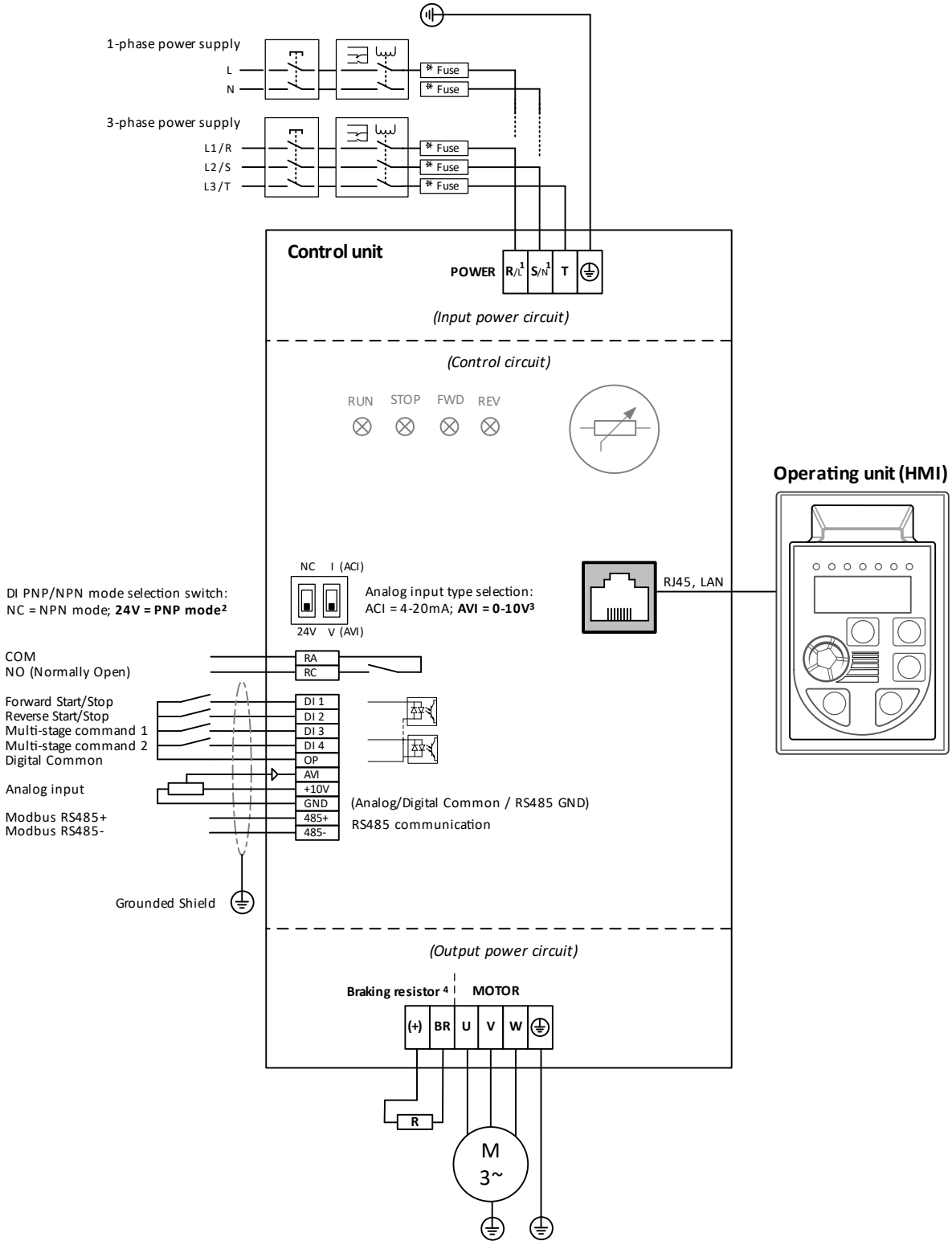
Frame size	VFD model	Brake unit	125 % of rated braking torque (10 %, 10 s at most)	Braking current [A]
FS3	LV-MD-C-400-0009B-AF-20	Internal brake unit	1000 W / 75 Ω	6.4
	LV-MD-C-400-0013B-AF-20		1100 W / 75 Ω	8.5

Tab. 4-2 Recommended braking resistor selection table

4.2 ELECTRICAL WIRING

4.2.1 CONNECTION DIAGRAM

LV-MD CONNECTION DIAGRAM
FS1 TO FS3



1 R/L and T/N: 1-phase connection terminals.
2 Default wiring method: PNP mode without external power supply.
3 Default analog input type setting: 24V (AVI).
4 FS1 and FS2 models do not offer braking resistor terminals.

Fig. 4-1 LV-MD connection diagram – FS1 to FS3

NOTE

The LV-MD models 0.4 ... 2.2 kW (FS1 and FS2) do *not* provide a braking unit, while the LV-MD models 4.0 ... 5.5 kW (FS3) have an optional configuration *internal* brake unit; or an optional *external* brake unit.

4.2.2 CONTROL CIRCUIT

INTERFACE

Fig. 4-2 LV-MD Control unit – Interfaces and LED indications

Interface	Description
RJ45	LAN communication to detached HMI; plug

Tab. 4-3 LV-MD Control unit – Interfaces and LED indications

CONNECTION TERMINALS AND DIP SWITCHES

Tab. 4-4 LV-MD Control unit – Terminals of auxiliary and control circuits

TERMINALS

Terminal Name		Description
Digital Output (Output relay RY1; Normal Open contact)		
RY1	RC	NC (Normally Open)
	RA	COM (Common)
Digital inputs (DI)		
DIP switch: NC 24V		Wiring methods for digital inputs (DI): • NPN mode • PNP mode
DI 1		• Opto-coupler isolation, compatible with bipolar input • Input impedance: 3 kΩ • Voltage range for DI 1-DI 4 level input: 9 ... 30 V DC • Default built-in power supply • NC/24V DIP switch to select NPN or PNP mode
DI 2		
DI 3		
DI 4		
OP		• +24 V DC external or internal power supply acc. to the selected DI wiring method (NPN mode/PNP mode, with/without external power supply)

Terminal Name	Description
	• internal power supply: maximum output current: 200 mA
GND	• Common for digital inputs (DI) acc. to the selected DI wiring method (NPN mode/PNP mode, with/without external power supply)
Analog input (AVI)	
DIP switch: I V	Operating modes for analog input: • Analog input (AVI) = current input • Analog input (AVI) = voltage input
AVI	• Configurable input range: 0 ... 10 V DC / 0 ... 20 mA / 4 ... 20 mA • Input impedance: 10 kΩ for voltage input, 500 Ω for current input
+10V	0 ... 10 V DC / 0 ... 20 mA / 4 ... 20 mA (depending on AI configuration)
GND	AVI: Common
RS485 interface for Modbus communication	
GND	Ground
485+	Positive data line in differential signal transmission
485-	Negative data line in differential signal transmission

Tab. 4-5 LV-MD control circuit – Terminals

WIRING METHODS

This section describes the various wiring methods for the signal input terminals for digital inputs (DI), digital output (relay output) and analog input (AI).

Due to the susceptibility of weak analog voltage signals to external interference, shielded cables are generally required, and the wiring distance should be as short as possible, not exceeding 20 m.

DIGITAL INPUT (DI) TERMINALS

If the *Active operating mode* is selected, suitable filter measures must be taken to prevent crosstalk from the power supply.

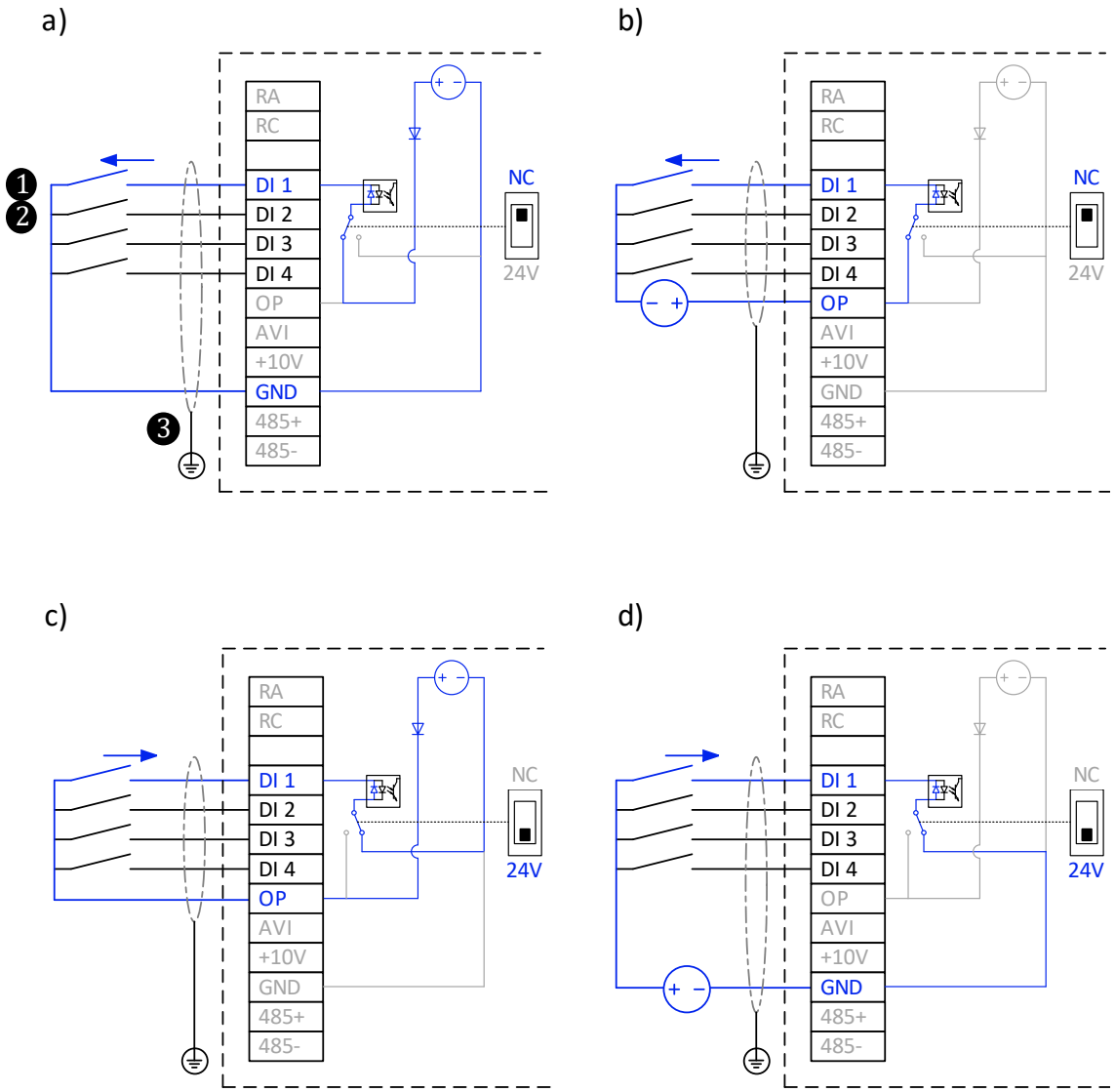


Fig. 4-3 Digital Inputs (DI) terminal wiring methods:
a) NPN mode without external power supply
b) NPN mode with external power supply
c) PNP mode without external power supply
d) PNP mode with external power supply

1. DI 1: Default setting is "FWD Start/Stop"
2. DI 2: Default setting is "REV Start/Stop"
3. Grounded shield

NOTE

When using an external power supply unit:

➢ the DI ports (DI 1 ... DI 4) require an external power supply in the range of 9 ... 30 V.

ANALOG INPUT (AI) TERMINALS

Where some analog signals are subjected to serious interference, a filter capacitor or a ferrite core needs to be used on the analog signal source side.

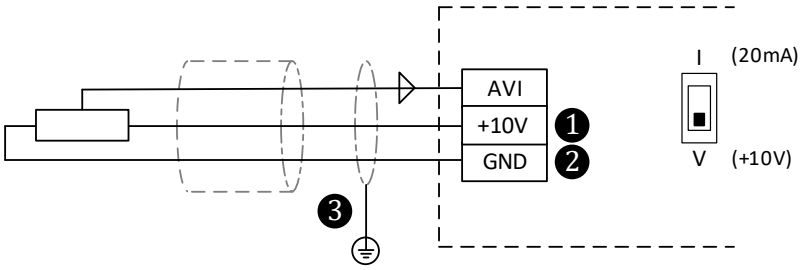


Fig. 4-4 Analog inputs (AI) terminal wiring method

1. +10 V or 20 mA (selectable)
2. Analog Ground
3. Grounded shield

4.2.3 POWER CIRCUIT

CONNECTION TERMINALS – INPUT SIDE

Fig. 4-5 LV-MD Input - Power supply terminals

LV-MD INPUT SIDE

Terminal	Description
	LV mains
POWER:	
R/L	Phase R (3-phase power supply) / Phase L (1-phase power supply)
S/N	Phase S (3-phase power supply)
T	Phase T (3-phase power supply) / Neutral N (1-phase power supply)
	Earthing
⏚	Protection Earth (PE) The terminal must be reliably grounded to avoid abnormal operation or damage to the equipment.

Tab. 4-6 LV-MD terminals – Input side

CONNECTION TERMINALS – OUTPUT SIDE

Fig. 4-6 LV-MD output (FS1 and FS2) – Motor terminals

Fig. 4-7 LV-MD output (FS3) – Brake unit and Motor terminals

LV-MD BRAKE UNIT FS3 ONLY!

Select braking resistors based on recommended values and ensure wiring distance is less than 5 m to prevent damage to the VFD.

Terminal	Description
	Brake unit
Braking resistor:	(Frame size FS3 only!)
(+)	DC bus (+) / Braking resistor
BR	BR Breaking Resistor / Internal connection to Ground Source

Tab. 4-7 LV-MD terminals – External braking resistor

LV-MD OUTPUT SIDE

Capacitors or surge protection devices must not be connected to the output side of the VFD, otherwise frequent protection or even damage to the VFD may be caused.

Terminal	Description
	3-phase AC motor
MOTOR:	
U	Phase U of connected 3-phase AC motor
V	Phase V of connected 3-phase AC motor
W	Phase W of connected 3-phase AC motor
⏚	Protection Earth (PE)

Tab. 4-8 LV-MD terminals – Output side

NOTICE

- The terminal must be reliably grounded to avoid abnormal operation or damage to the equipment.
- The grounding terminals must not be shared with the power supply neutral wire N terminal.

When the motor cable is too long, it is easy to generate electrical resonance due to the influence of the distributed capacitance, which will cause motor insulation damage or generate large leakage current to protect the VFD from overcurrent. Refer to the table below for cable length.

Product code	Rated output current [A]	Without AC output reactor		With AC output reactor	
		Shielded cable [m]	Unshielded cable [m]	Shielded cable [m]	Unshielded cable [m]
LV-MD-C-230-02R7-AF-20	2.7	30	50	50	80
LV-MD-C-230-04R2-AF-20	4.2	30	50	50	80
LV-MD-C-230-07R5-AF-20	7.5	30	50	50	80
LV-MD-C-230-0011-AF-20	11	50	75	75	115
LV-MD-C-400-02R5-AF-20	2.5	50	75	75	115
LV-MD-C-400-04R2-AF-20	4.2	50	75	75	115
LV-MD-C-400-05R5-AF-20	5.5	50	75	75	115
LV-MD-C-400-0009-AF-20	9	50	75	75	115
LV-MD-C-400-0013-AF-20	13	50	75	75	115

Tab. 4-9 LV-MD Motor maximum cable length

5 OPERATION AND DISPLAY

5.1 OPERATING UNIT (HMI)

The keyboard allows for modification of VFD function parameters, monitoring of VFD working status, and control of VFD operation (START, STOP), etc. The HMI layout is shown in Fig. 5-1, with detailed function descriptions in "Tab. 5-2 Operating unit (HMI) – Operating keys", and LED indicator explanations in "Tab. 5-1 Operating unit (HMI) – LED indicators".

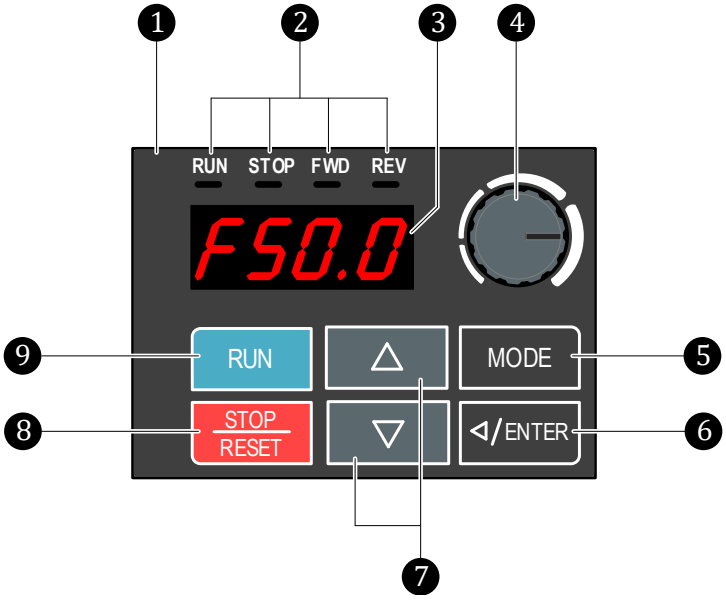


Fig. 5-1 Operating unit (HMI) with seven-segment display, LEDs, frequency setting knob and keys

1. Operating unit
2. LED indications (RUN, STOP, FWD, REV)
3. Seven-segment LC display
4. Frequency setting knob
5. Main menu key
6. Menu Enter/Exit key
7. Navigation/Setting keys
8. STOP/RESET key
9. RUN key

SEVEN-SEGMENT LC DISPLAY

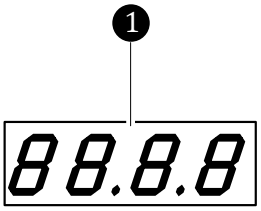


Fig. 5-2 Seven-Segment LC Display

1. 4 x seven segment digits

LED INDICATORS

LED	Function		
	ON	Flashing	OFF
RUN	Steady red: VFD running state	Flashing red (200 ms cycle): VFD is in the process of stopping (in this case, the stop LED is steady red).	
STOP	Steady red: VFD stopping or standby state	-	VFD is in the running state.
FWD	Steady red: Forward running state	Flashing red (200 ms cycle): Currently switching direction from forward to reverse	
REV	Steady red: Reverse running state	Flashing red (200 ms cycle): Currently switching direction from reverse to forward	

Tab. 5-1 Operating unit (HMI) – LED indicators

OPERATING KEYS

Key	Function	Description
	Frequency setting	• Rotate this knob to select the required frequency setting.
	VFD RUN command	• This key is only effective when the VFD operation command source is set to digital operator. Press the RUN key to start running. • When the VFD starts running, the corresponding status LED (green) lights up.
	• VFD STOP command • Reset	• This key is only effective when the VFD operation command source is set to digital operator, press to stop output. • In *stop mode*, the corresponding status LED (red) lights up. • In the event of a *fault*, press this key to reset the VFD. • Press this key to reset counters and parameters
	• Select setting value • Select setting option • Select motor operation direction	• In *parameter setting mode*, use *UP/DOWN* keys to increase or decrease the setting value. • Press *UP* key for forward direction • Press *DOWN* key for reverse direction

Key	Function	Description
MODE	• Navigation through main menu • Select a digit of a setting value • Exit	• Press this key to select a main menu. • Return to the previous menu. • Press this key to move from one parameter setting value digit to another • Cancel execution.
◁/ENTER	• Enter menu or parameter • Navigation • Confirmation	• Press this key to enter the selected menu or parameter. • Press this key to move from one digit to another during parameter setting. • Confirm parameter settings

Tab. 5-2 Operating unit (HMI) – Operating keys

5.2 GENERAL OPERATING INSTRUCTIONS

5.2.1 SWITCH LV-MD ON/OFF

WARNING

An incorrectly connected power supply will damage the LV-MD.

- Before switching on the LV-MD, ensure that all wiring is correct.
- Never connect the power supply to the terminals U, V, W.

INSTRUCTION – Switch LV-MD On and Off

START — *USER LEVEL:* None

SWITCH ON LV-MD

STEP 1: Switch on power supply to the LV-MD (3-phase models: R, S, T; 1-phase models: R/L, S/N)

Fig. 5-3 Start-up screen

- The *Start-up screen* is displayed during the system start-up phase.
- During start-up the seven-segment display shows the message *E014 Undervoltage during stopping*.
- All LEDs and the displayed message are flashing red.
- After power on the LV-MD requires approx. 7 s to start up the system.

MAIN SCREEN

STEP 2: The start-up phase is complete, and the display automatically shows the *Main screen*.

Fig. 5-4 Main menu: F[Hz] Frequency setpoint

- The main screen shows the selected menu of the *Start-up Display*; here for example: *F[Hz] Frequency setpoint* with the currently set setpoint.

NOTE

The *Start-up Display* can be set by parameter *F7-20 Start-up display.*

SWITCH OFF LV-MD

STEP 3: Switch off the LV-MD power supply

Fig. 5-5 Actual displayed menu

- The LV-MD remains in full operation for 14 s (first shutdown phase).
- The display continues to show the currently displayed menu; here: *F[Hz] Frequency Setpoint.*

STEP 4: The first shutdown phase has expired and the second phase of shutdown the LVD begins.

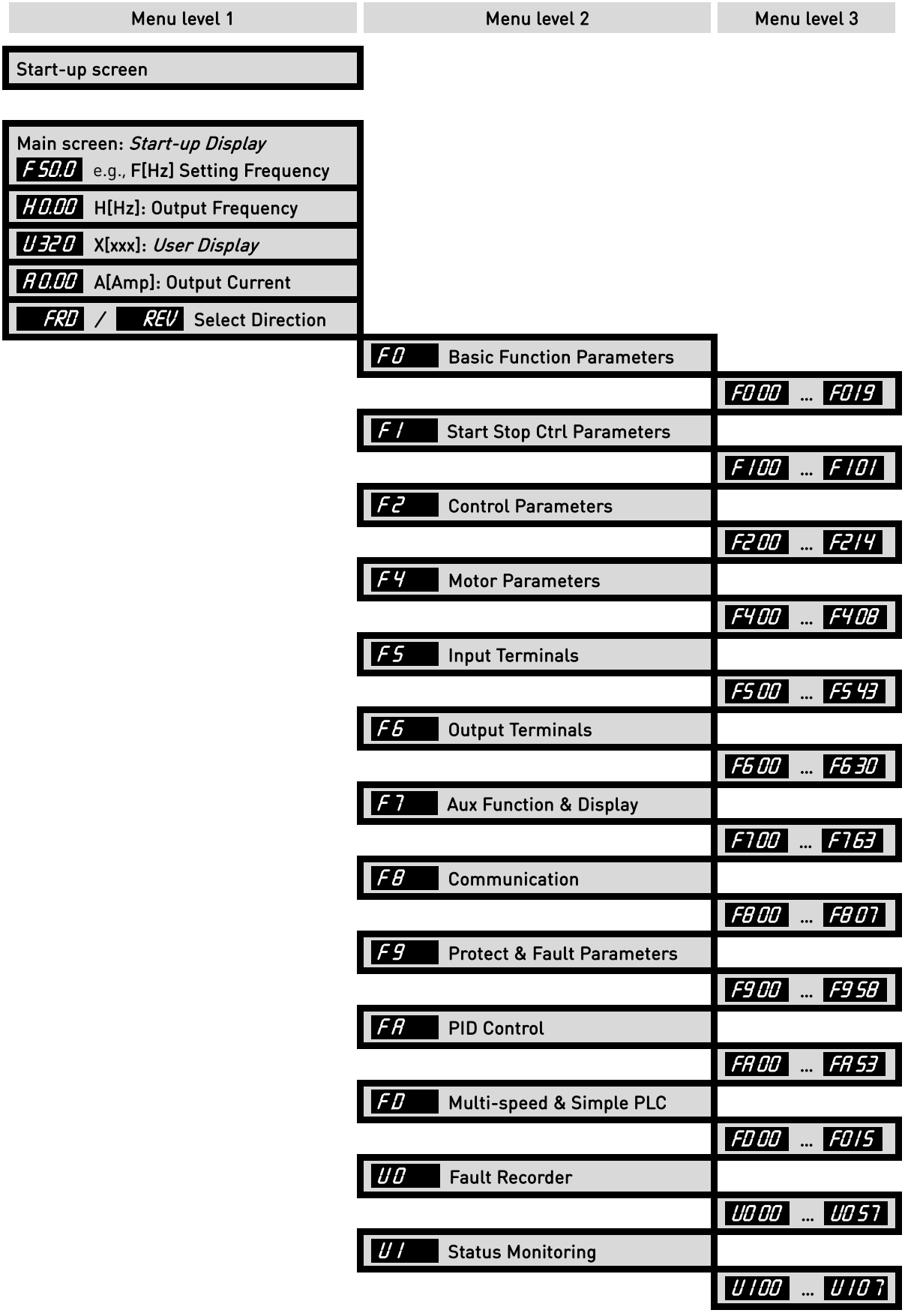
Fig. 5-6 Shutdown: Message E014

- During second shutdown phase the display shows the message *E014 Undervoltage during stopping* for 8 s.
- All LEDs and the displayed message are flashing red.
- After the second shutdown phase (8 s) has elapsed, the LV-MD is switched off.

END

5.2.2 MENU STRUCTURE

The software menu of the VFD control unit is divided into menu levels.
The following figure shows the menu structure in the display of the operating unit (HMI).



Menu level 1	Menu level 2	Menu level 3
	L1 Customization Code	
		L100 ... L102
	L2 Optimize Ctrl Para	
		L217 ... L223
	L4 Holding Brake	
		L400
	L5 Sleep / Wake-Up	
		L500 ... L504
	L6 Swing Frq & Counters	
		L600 ... L602
	L7 AI Multipoint Curve	
		L700 ... L706

Tab. 5-3 Menu structure of the operating unit (HMI)

5.2.3 MENU NAVIGATION

Navigation through the software menu is required to operate the H1 VFD. *Menu navigation* means:

- to select of a menu at the same menu level or
- to enter or exit a menu or parameter, or
- to select a parameter setting option, or
- to select the setting digits for setting a numerical parameter value.

Four different operating keys are arranged on the keypad of the operating unit (HMI) for these functions.

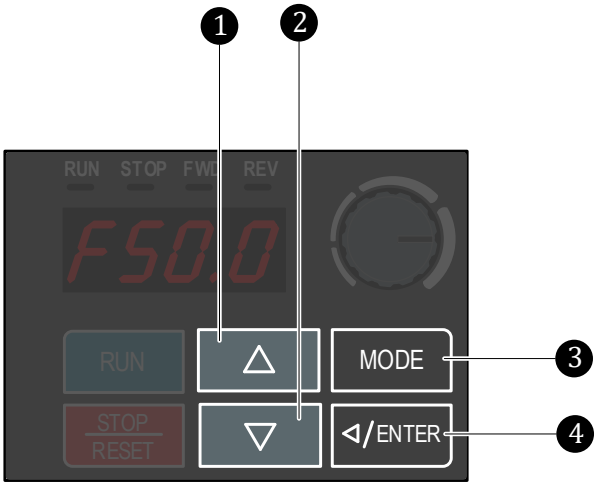


Fig. 5-7 Navigation keys

1. *UP* key
2. *DOWN* key
3. Menu selection / Menu EXIT key
4. Menu ENTER key/Digit selection/Setting option selection

MENU SELECTION ON THE SAME MENU LEVEL

The following examples show the menu selection on:

- the main menu level (menu level 1), and
- on menu level 2.

EXAMPLE 1

INSTRUCTION (example) – Menu Selection on the Main Menu Level (1)

START *USER LEVEL: Keypad unlocked*

POWER ON LV-MD

STEP 1: Switch on power supply to the input terminals of the LV-MD.

Fig. 5-8 Main Menu: e.g., F[Hz]

➢ **Main menu *Start-up Display***: Once the start-up process is complete, the display shows the selected menu of the *Start-up Display* which is defined by parameter *F7-20 Start-up Display*. Here: menu *F[Hz] Frequency Setpoint*

SELECT MAIN MENU: H[HZ] FREQUENCY OUTPUT

STEP 2: Press the *MODE* MODE key.

Fig. 5-9 Main Menu: H[Hz]

➢ **Main Menu *Output Frequency***: The display shows the main menu *H[Hz] Output Frequency*.

SELECT MAIN MENU: X[XXX]: USER DISPLAY

STEP 3: Press the *MODE* MODE key.

Fig. 5-10 Main Menu: U[xxx]

➢ **Main Menu *User Display***: The display shows the main menu which is defined by parameter *F7-21 User Display*. Here: menu *U[xxx] DC bus voltage*

SELECT MAIN MENU: A[AMP] OUTPUT CURRENT

STEP 4: Press the *MODE* MODE key.

Fig. 5-11 Main Menu: A[Amp]

➢ **Main Menu: *Output Frequency***: The display shows the main menu *A[xxx] Output Current*.

SELECT MAIN MENU: SELECT DIRECTION

STEP 5: Press the *MODE* MODE key.

Fig. 5-12 Main Menu: Select Direction

➢ **Main Menu *Select Direction***: The display shows the main menu which is defined by parameter *F0-09 Fwd/Rev Forbid*. Here: menu *Forward and reverse enabled.*

NOTE

Another click to the *MODE* MODE key takes you back to the first main menu *Start-up Display*.

END

EXAMPLE 2

INSTRUCTION (example) – Menu Selection on Menu Level 2

START

USER LEVEL: Keypad unlocked

ENTER MENU LEVEL 2

Fig. 5-13 Menu level 2: e.g., Menu F0

STEP 1: Navigate to menu level 2

- To enter menu level 2 from *any main menu*, press the *ENTER* ◁/ENTER key.
- To enter menu level 2 from *menu level 3*, press the *MODE* MODE key.

NOTE

The last menu called up in menu level 2 is displayed; here: e.g., *F0*

MENU SELECTION ON MENU LEVEL 2

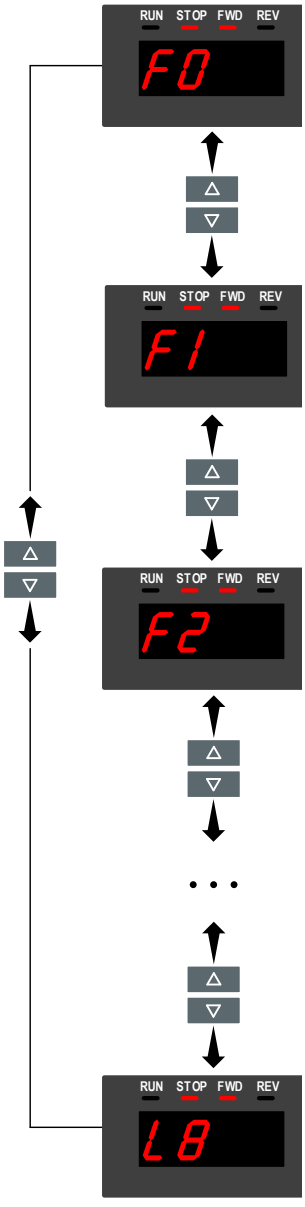


Fig. 5-14 UP/DOWN menu selection

STEP 2: Use the *UP* △ key or the *DOWN* ▽ key to select the desired menu.

- The display shows the next menu in *UP* or *DOWN* selection direction.

END

ENTER / EXIT A MENU / PARAMETER

CHAPTER REFERENCE

- To *enter* a menu and a parameter, refer to STEPS 2 and 3 of the example instructions "Parameter Setting via *UP/DOWN* Keys (to set an option)" in chapter "5.2.4 Changing Parameter Settings (General)".
- To *exit* a parameter and a menu, refer to STEPS 6 to 8 of the example instructions "Parameter Setting via *UP/DOWN* Keys (to set an option)" in chapter "5.2.4 Changing Parameter Settings (General)".

SELECT A PARAMETER SETTING OPTION

CHAPTER REFERENCE

- To select a parameter *setting option*, refer to STEP 4 of the example instructions "Parameter Setting via *UP/DOWN* Keys (to set an option)" in chapter "5.2.4 Changing Parameter Settings (General)".

SELECT THE SETTING DIGITS TO SET A NUMERICAL PARAMETER VALUE

CHAPTER REFERENCE

To select the setting digits for *numerical parameter value* setting , refer to STEPS 4 to 6 of the example instructions "Parameter Setting via *ENTER* and *UP/DOWN* Keys (to set a numerical value)" in chapter "5.2.4 Changing Parameter Settings (General)".

5.2.4 CHANGING PARAMETER SETTINGS (GENERAL)

For correct and safe operation of the VFD, the control must be adapted to the general conditions of the various applications. This is done by setting the parameters on the HMI.

You can set the LV-MD parameters using:

- the *UP/DOWN* keys (to select an option)
- the *MODE*, *ENTER* and *UP/DOWN* keys (to set a numerical value)

Four different operating keys are arranged on the keypad of the operating unit (HMI) for these functions.

Fig. 5-15 Parameter setting keys

1. *ENTER* key to select a digit and setting confirmation
2. *UP* key to select setting options or increase numerical values
3. *DOWN* key to select setting options or decrease numerical values

In the following, the two types of parameter setting are explained with the help of example instructions.

PARAMETER SETTING VIA UP/DOWN KEYS (TO SET AN OPTION)

The following instruction describes how to change the *setting option* of parameter *F0-06 Source of FREQ*. The setting option is changed from *07 Keypad VR setting* to *00 Digital keypad*.

INSTRUCTION (example) –Setting of Parameter F0 Source of FREQ

START *Keypad unlocked*

STEP 1: Navigate to menu *F0 Parameter Setup*.

Fig. 5-16 Menu: F0 Parameter Setup

- ➢ The display shows menu *F0 Parameter Setup*.
- ➢ The digits *F0* start to flash.

ENTER MENU F0

STEP 2: Press the ENTER ◁/ENTER key.

Fig. 5-17 Parameter F0-06

NOTE

- When you enter a parameter menu, the display always shows the last parameter called up.
- Use the *UP/DOWN* △ ▽ keys to select the desired parameter.

- The display shows Parameter *F0-06 Source of FREQ*.
- The digits *06* start to flash.

ENTER THE PARAMETER F0-06

STEP 3: Press the ENTER ◁/ENTER key.

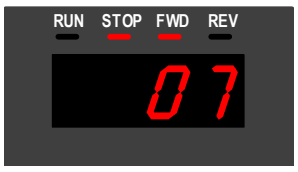


Fig. 5-18 Setting option 07

- The Display shows the currently set option *07 Keypad VR setting.*
- The digit *07* starts to flash. This indicates that the setting option can be changed.

SELECT SETTING OPTION

Use the *Up* △ or *DOWN* ▽ key to select the desired setting option. Here: the *DOWN* key to select setting option *00 Digital keypad.*

STEP 4: Keep the UP ▽ key pressed until setting option 09 appears.

Fig. 5-19 Setting option 00

- The display shows the selected setting option *00 Digital keypad*.

NOTE

The changed setting is not yet saved in the VFD control unit and therefore has no influence on the functions of the VFD!

Follow the next step to save the changed setting.

SAVE NEW SETTING

STEP 5: Press the ENTER ◁/ENTER key for at least 1 s.

Fig. 5-20 Parameter F0-07

- The changed setting is saved!
- The display switches over to the next parameter *F0-07 AUX FREQ Source*.

EXIT THE PARAMETER SETTINGS

STEP 6: Press the *MODE* MODE key to exit the *parameter settings*.

Fig. 5-21 Parameter F0-06

- Parameter *F0-06 Source of FREQ* appears on the display again.

EXIT PARAMETER F0-06

Fig. 5-22 Menu: F0 Parameter Setup

STEP 7: Press the *MODE* MODE key to exit parameter *F0-06 Source of FREQ.*

➢ The parameter menu *F0 Parameter Setup* appears on the display again.

EXIT MENU F0 PARAMETER SETUP

Fig. 5-23 Main menu:

STEP 8: Press the MODE MODE key to exit menu *F0 Parameter Setup*.

➢ The display shows again the main menu *Start-up Display* which is defined by parameter *F7-20 Start-up Display*. Here: menu *F[Hz] Frequency Setpoint*

END

PARAMETER SETTING VIA ENTER AND UP/DOWN KEYS (TO SET A VALUE)

The following instruction describes how to change the numerical setting value of parameter *F0-14 1st DEC Time*. The numerical value is changed from 10.00 s to 12.00 s.

INSTRUCTION (example) – Setting the *F0-14 1st DEC Time* parameter (to set a value)

START *USER LEVEL: Keypad Unlock*

STEP 1: Navigate to menu *F0 Parameter Setup.*

Fig. 5-24 Menu: F0 Parameter Setup

➢ The display shows menu *F0 Parameter Setup*.

➢ The digits *F0* start to flash.

ENTER MENU F0

STEP 2: Press the ENTER ◁/ENTER key.

Fig. 5-25 Parameter F0-14

NOTE

➢ When you enter a parameter menu, the display always shows the last parameter called up.

➢ Use the *UP/DOWN* △ ▽ keys to select the desired parameter.

➢ The display shows Parameter *F0-14 1st DEC Time*.

➢ The digits *14* start to flash.

ENTER THE PARAMETER F0-14

STEP 3: Press the ENTER ◁/ENTER key.

Fig. 5-26 Setting option 07

- The Display shows the currently set value *10.00 s.*
- The first digit *0* on the right starts to flash.

DIGIT SELECTION

STEP 4: Press the ENTER ◁/ENTER key twice.

- The display still shows the currently set value *10.00 s.*
- The second digit *0* from the left starts to flash and can be set.

SET NUMERICAL VALUE

Use the *Up* △ or *DOWN* ▽ key to set the desired numerical value. Here: the *UP* key to set *2* as desired value.

STEP 5: Press the UP △ key twice.

Fig. 5-27 Changed setting

- The display shows the changed set value *12.00 s.*

> **NOTE**
>
> The changed setting is not yet saved in the VFD control unit and therefore has no influence on the functions of the VFD!
>
> Follow the next step to save the changed setting.

SAVE NEW SETTING

STEP 6: Press the ENTER ◁/ENTER key for at least 1 s.

Fig. 5-28 Parameter F0-07

- The changed setting is saved!
- The display switches over to the next parameter *F0-15 Derating Method*.

EXIT PARAMETER F0-15

STEP 7: Press the *MODE* MODE key to exit parameter *F0-15 Derating Method.*

Fig. 5-29 Menu: F0 Parameter Setup

- The parameter menu *F0 Parameter Setup* appears on the display again.

EXIT MENU F0 PARAMETER SETUP

STEP 8: Press the MODE MODE key to exit menu *F0 Parameter Setup*.

Fig. 5-30 Main menu:

- The display shows again the main menu *Start-up Display* which is defined by parameter *F7-20 Start-up Display*. Here: menu *F[Hz] Frequency Setpoint*

END

5.2.5 USER LEVELS

The LV-MD provides different user levels (access levels) which differ in the authorisation to operate the VFD and/or to change parameter settings.

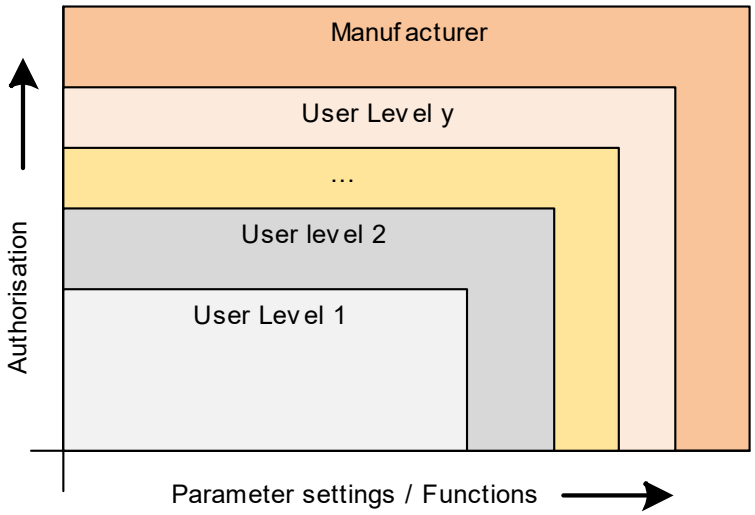


Fig. 5-31 User levels Access levels for parameter settings and functions

CREATING USER LEVELS The user levels can be created by using the combination of different *parameters* and the *password protection*:

- Password protection:

> **CHAPTER REFERENCE**
>
> For setting a password, refer to chapter" 5.2.6 Set/Change Password."

- Parameter setting:

> **CHAPTER REFERENCE**
>
> For selecting the appropriate parameter(s) to create a user level, refer to chapter "5.4 Parameter Setup Menus – Menu Level 2".

The following table shows some examples of parameters that can be used to create a user level:

Function code	Parameter name	Setting options	Default setting	Change ability	Comm. address
Parameter group ***F7: Auxiliary Functions and Keypad Display***					
F7-61	*Para Display sel* (Enhanced parameter display selection)	0 = Displayed menus: F0, F1, F2, F4, F5, F6, F7, F8, F9, FA, FD, U0, U1 1 = Displayed menus: F0, F1, F2, F4, F5, F6, F7, F8, F9, FA, FD, U0, U1, L1, L2, L4, L5, L6, L7	1	☆	073D
Parameter group ***F0: Basic Function Parameters***					
F0-18	*Parameter Reset* (Parameter management setting and reset execution keys)	0 = No Function 1 = Parameter write protection	0	★	0012

Tab. 5-4 Possible parameters for user level (examples)

5.2.6 SET/CHANGE PASSWORD

To set/change a password to lock the menu access of the LV-MD, it is required to unlock the keypad first.

> **CHAPTER REFERENCE**
>
> To unlock menu access that has already been protected by a password, first refer to chapter „5.2.7 Unlock Password Protection" and follow the steps of the given instruction.

When the keypad is unlocked, carry out the steps in the following instructions.

INSTRUCTION – Set Password

START — *USER LEVEL: Keypad unlocked*

NAVIGATE TO MENU F7

STEP 1: Power-on the LV-MD.

➢ The Display shows the main menu F *[Hz] Frequency Setpoint*.

Fig. 5-32 Main screen

STEP 2: Press the *ENTER* ◁/ENTER key seven times in succession.

➢ The display shows menu *F7 Aux Function & Display*.

Fig. 5-33 Menu F7

ENTER PARAMETER F7-34 PASSWORD INPUT

STEP 3: Press the *ENTER* ◁/ENTER key.

➢ The display shows parameter *F7-00 JOG Frequency*.

➢ Digits *00* start to flash.

Fig. 5-34 Parameter F7-00

SELECT PARAMETER F7-34 PASSWORD INPUT

Hold the *UP* △ key pressed until parameter number F734 appears.

➢ The display shows parameter *F7-34 Password Input*.

➢ Digits *34* start to flash.

Fig. 5-35 Parameter F7-34

ENTER PARAMETER F7-34 TO SET THE PASSWORD

STEP 4: Press the *ENTER* ◁/ENTER key.

Fig. 5-36 F7-34 Parameter mask

- The display shows the parameter mask of parameter F7-34.
- Digits *0000* start to flash.
- The first *0* digit from the right starts flashing and can be set according to the desired password.

NOTE

The displayed value *0000* of parameter F7-34 indicates that:

- either the LV-MD ist already password-protected and the actual password is entered by parameter *F7-33 Parameter Decoder* to unlock the protection,
- or the LV-MD ist not yet password-protected.

ENTER THE PASSWORD

STEP 5: Navigate to the other digits and set the full password.

Fig. 5-37 Password entered

- The full password is entered; for example: *2025*.

NOTE

The changed parameter setting is not yet saved in the VFD control unit and therefore has no influence on the functions of the VFD!

- Follow the next step to save the password.

SAVE THE PASSWORD

STEP 6: Press the *ENTER* ◁/ENTER key for at least 5 s.

Fig. 5-38 Parameter F7-35

- The password is saved!
- The display switches over to the next parameter *F7-35 Power Save Enable*.

CHECK PASSWORD PROTECTION STATUS

STEP 7: Press the *DOWN* ▽ key to navigate back to parameter F7-34.

Fig. 5-39 Parameter F7-34

STEP 8: Press the ENTER ◁/ENTER key.

Fig. 5-40 F7-34: Password protection status – locked

- The display shows *0001* to indicate that password protection is active, and access to the corresponding LV-MD functions is *locked*.

END

5.2.7 UNLOCK PASSWORD PROTECTION

When the password protection of the LV-MD is *active (locked)*, parameter *F7-34 Parameter Entry* shows the following *password protection status*:

Fig. 5-41 Parameter F7-34 Password protection status

Unlock the password protection of the LV-MD according to the following instruction.

INSTRUCTION – Unlock password protection

START *USER LEVEL: Keypad unlocked*

STEP 1: Navigate to parameter *F7-33 Password Decoder*.

Fig. 5-42 Parameter F7-33

➢ The display shows parameter *F7-33 Password Decoder*.

ENTER PARAMETER F7-33 TO SET THE PASSWORD

STEP 1: Press the *ENTER* ◁/ENTER key.

Fig. 5-43 F7-33 Parameter mask

➢ The display shows the parameter mask of parameter F7-33.

ENTER THE PASSWORD

STEP 2: Navigate to the other digits and set the full password.

Fig. 5-44 Password entered

➢ The full password is entered; for example: 2025.

NOTE

The password entry is not yet saved in the VFD control unit and therefore has no influence on the functions of the VFD!

➢ Follow the next step to save the password entry.

SAVE THE PASSWORD

STEP 3: Press the *ENTER* ◁/ENTER key for at least 1 s.

Fig. 5-45 Parameter F734

➢ The password is saved.

➢ The display switches over to the next parameter *F7-34 Password Input*.

➢ Password protection is *inactive (unlocked)*.

CHECK PASSWORD PROTECTION STATUS

STEP 4: Press the *ENTER* ◁/ENTER key.

Fig. 5-46 F7-43: Password protection status - Unlocked

➢ The display shows *0000* to indicate that password protection is inactive, and access to the corresponding LV-MD functions is *unlocked*.

NOTE

The LV-MD allows *four attempts* at maximum to enter the correct password.

➢ In case you enter a wrong password, parameter F7-33 indicates the unsuccessful attempts as follows:

Fig. 5-47 F-33: First wrong password entry

Fig. 5-48 F7-33: Second wrong password entry

Fig. 5-49 F7-33: Third wrong password entry

➢ If the fourth attempt also fails, the display shows the fault message E052 Password entered incorrectly four times:

Fig. 5-50 Fault message E052

➢ All four LEDs and the display start flashing.

➢ As consequence, power supply of the LV-MD must be turned off and on again to allow another four password entry attempts.

➢ If the password is lost, send the device back to the manufacturer for unlocking.

END

5.2.8 LOCK PASSWORD PROTECTION

When the password protection of the LV-MD is *inactive (unlocked)*, parameter *F7-34 Parameter Entry* shows the following *password protection status*:

Fig. 5-51 Parameter F7-34 Password protection status - Unlocked

Lock the password protection of the LV-MD:

- according to the following instruction
- or by rebooting the LV-MD.

INSTRUCTION – Lock password protection

START *USER LEVEL: Keypad unlocked*

STEP 5: Navigate to parameter *F7-34 Password Entry*.

Fig. 5-52 Parameter F7-34

➢ The display shows parameter *F7-34 Password Entry*.

ENTER PARAMETER F7-34 TO SET THE PASSWORD

STEP 6: Press the *ENTER* ◁/ENTER key.

Fig. 5-53 F7-34 Parameter mask

➢ The display shows the parameter mask of parameter F7-34.

ENTER THE PASSWORD

STEP 7: Navigate to the four digits in succession to enter the full password.

Fig. 5-54 Password entered

➢ The full password is entered; for example: *2025*.

NOTE

The password entry is not yet saved in the VFD control unit and therefore has no influence on the functions of the VFD!

➢ Follow the next step to save the password entry.

SAVE THE PASSWORD

STEP 8: Press the *ENTER* ◁/ENTER key for at least 1 s.

Fig. 5-55 Parameter F735

➢ The password is saved.
➢ The display switches over to the next parameter *F7-35 Power Save Enable*.
➢ Password protection is active (locked).

CHECK PASSWORD PROTECTION STATUS

STEP 9: Navigate back to Parameter F7-34

STEP 10: Press the *ENTER* ◁/ENTER key.

Fig. 5-56 F7-43: Password protection status - Locked

➢ The display shows *0001* to indicate that password protection is active, and access to the corresponding LV-MD functions is *locked*.

END

5.2.9 RESET VFD PARAMETERS TO FACTORY SETTINGS

For the first commissioning it is recommended to reset the VFD parameters to the factory settings.

NOTE

Depending on the mains frequency, the LV-MD can be reset o 50 Hz or 60 Hz factory settings.

- ➢ Reset to 50 Hz factory settings: *F0-18 = 09*
- ➢ Reset to 60 Hz factory settings: *F0-18 = 10*

INSTRUCTION – Reset Parameters to Factory Settings (50 Hz settings)

START *USER LEVEL: Keypad unlocked*

STEP 1: Navigate to Parameter *F0-18 Parameter Reset*

Fig. 5-57 Parameter F0-18

➢ The two digits from the right start to flash.

STEP 2: Press the *ENTER* ◁/ENTER key.

Fig. 5-58 F0-18 Parameter mask

➢ The display shows the parameter mask of parameter F0-18.

➢ The first digit from the right starts to flash.

STEP 3: Keep the *UP* △ key pressed until setting option 09 appears.

Fig. 5-59 F0-18 Setting option 09

➢ The display shows setting option *09 Reset to factory value (50 Hz).*

STEP 4: Press the ENTER ◁/ENTER key for at least 1 s.

Fig. 5-60 Loading factory settings

- The 50 Hz factory parameters are loaded.
- The Display shows the information *Load* for 3 s.

Fig. 5-61 Parameter F0-19

- After the 3 s have elapsed the VFD parameters are reset to the factory settings.
- The display switches over to the next parameter *F0-19 Keypad FREQ*.

NOTE

The setting of parameter *F0-18* switches automatically back to *00 (if password protection was not set)* or *01 (if password protection was set)*.

END

NOTICE

The parameters listed in the following table are *not* reset when a *parameter reset: F0-18 = 09 (or 10)* is carried out.

Parameter group ***F0: Basic Function Parameters***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F0-00	*Identity Code* (Product model)	Specified number depending on LV-MD model acc. to the product code: • Product type • Input voltage [V], • Power [kW], • number of input voltage phases.	XXXX	●	0000
F0-01	*Duty Selection* (Light and heavy load selection)	1 = Heavy duty (Heavy load)	1	●	0001
F0-02	*Rated current*	Specified value depending on LV-MD model acc. to the product code: 0.00 ... 655.3 A	Machine type determination XXXX	●	0002
F0-18	*Parameter Reset* (Parameter management setting and reset execution keys)	0 = No Function 1 = Parameter write protection 2 = *Reserved* 3 = *Reserved* 4 = *Reserved* 5 = kWh display reset (execution key) 6 = *Reserved* 7 = Reset CAN slave (supported by extended models) (execution key) 8 = *Reserved* 9 = Reset to factory value of 50 Hz (execution key) *10 = Reset to factory value of 50 Hz (execution key)* 11 = *Reserved* 12 = *Reserved* 13 = *Reserved*	0	★	0012
Parameter group ***F5: Input Terminals***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F5-22	*AI1 Input Bias* (AI1 input offset voltage)	-100.0 ... 100.0 %	000.0 %	☆	0516

F5-23	*AI1 Bias Mode* (AI1 offset mode selection)	0 = No offset 1 = Below offset = offset 2 = Above offset = offset 3 = Absolute value offset centered 4 = Offset centered	0	☆	0517
F5-24	*AI1 Input Gain*	-500.0 ... 500.0 %	100.0 %	★/T	0518
F5-25	*AI1 Input LPF* (AI1 filter time)	0.00 ... 20.00 s	0.01 s	☆	0519
F5-43	*AI Cur Loss Th* (4-20mA wire break threshold)	0.00 ... 4.00 mA	2.00 mA	☆	052B
Parameter group ***F7: Auxiliary Functions and Keypad Display***					
Function code	**Parameter name**	**Setting range/Setting options/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
F7-57	*Firmware Version* (Software version (H))	0.0 ... 6553.5	10.10	●	0739
F7-58	S/W 2nd Version (Software version (L))	0.0 ... 6553.5	1.25	●	073A
F7-59	*Date Code* (Software release date)	0 ... 65535	4514	●	073B
Parameter group ***F9: Protection & Faults***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F9-00	*Protect Bit* (Protection control bit)	***0000 ... FFFF*** (Hexadecimal)	0000	☆	0900
Parameter group ***L7: AI Multi-Point Curve Setting***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
L7-01	*AI1 Low Point* (AI1 lowest input value)	0.00 ... 20.00	0.00	☆	1D01
L7-02	*AI1 Low%* (AI1 lowest percentage)	0.00 ... 100.0 %	0.00 %	☆/T	1D02
L7-03	*AI1 Mid Point* (AI1 mid-point input value)	0.00 ... 20.00	5.00	☆	1D03
L7-04	*AI1 Mid%* (AI1 mid-point percentage)	0.00 ... 100.0 %	50.00 %	☆/T	1D04
L7-05	*AI1 High Point* (AI1 highest input value)	0.00 ... 20.00	10.00	☆	1D05
L7-06	*AI1 High%* (AI1 highest percentage)	0.00 ... 100.0 %	100.0 %	☆/T	1D06

Tab. 5-5 Non-resettable parameters by: F0-18 = 09 (or 10)

5.2.10 CHANGE MOTOR OPERATION DIRECTION DURING OPERATION

The following instruction shows the steps to be taken when changing the motor operation direction during operation, as an example for a set frequency of 50 Hz.

> **NOTE**
>
> To switch between the forward and reverse direction of the motor, the parameter setting *F0-09 Fwd/Rev Forbid = 0 (Forward and reverse enabled)* must be selected.

INSTRUCTION – Change Motor Operation Direction: FWD→REV

START — *USER LEVEL: Keypad unlocked*

STEP 1: Navigate to the *Select Direction* menu.

Fig. 5-62 Selection Direction menu – RUN Forward

- The motor operates in forward direction.
- The *RUN* LED lights up red.
- The display shows the currently selected motor direction; here: forwards.
- The *FWD* LED indication lights up red.

CHANGE DIRECTION: FIRST STAGE

STEP 2: Press the *DOWN* ▽ key.

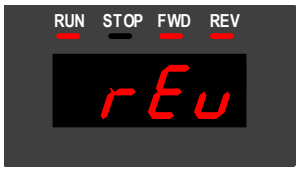


Fig. 5-63 Selection Direction menu – RUN Forward

- The display shows the Reverse direction.
- The *REV* LED lights up red.
- The *FWD* LED starts to flash.
- The first stage of the process for changing from the forward direction to the reverse direction of the motor starts.
- *First stage*: The currently set frequency is gradually decreased to 0 Hz:

Fig. 5-64 Automatic decrease of the set frequency to 0 Hz

CHANGE DIRECTION: SECOND STAGE

STEP 3: Automatic negative frequency setting.

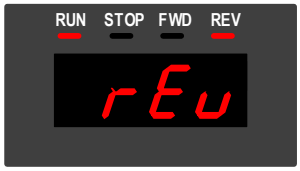


Fig. 5-65 Selection Direction menu – RUN Reverse

- The *REV* LED remains lit red.
- The *FWD* LED is switched off.
- The second stage of the process for changing from the forward direction to the reverse direction of the motor starts.
- *Second stage*: The frequency is gradually increased to the currently set frequency as a negative value:

Fig. 5-66 Automatic increase of the set frequency to the currently set value

END

5.3 MAIN MENU (HMI) – MENU LEVEL 1

The menu screen of the H1 VFD operating unit (HMI) displays the *main menu* of the LV-MD. The following menus are available:

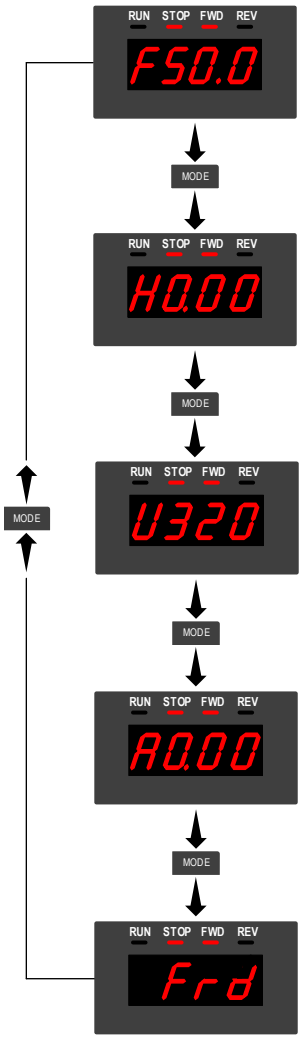


Fig. 5-67 Menu Level 1

- F[Hz]: Setting Frequency
- H(Hz): Output frequency
- X[xxx]*:* User Display (configurable)
- A[Amp]: Output current
- Frd/Rev: Select Direction

5.3.1 MENU: F[HZ] SETTING FREQUENCY

This menu displayed on the main screen shows the set frequency for VFD operation. The frequency setting source can be selected via the parameter *F0-06 Source of FREQ*. The following setting options are available:

- 0 = Numeric keypad
- 1 = RS485 communication
- 2 = Analog input
- 3 = External Up/Down input
- 4 = Pulse input without direction
- 5 = Pulse input with direction
- 6 = CANopen input (supported by extended models)
- 7 = Keypad VR setting (knob)
- 8 = Communication card input
- 9 = PID
- 10 = Digital terminal multispeed
- 11 = *Reserved*

5.3.2 MENU: H[HZ] OUTPUT FREQUENCY

This menu displayed on the main screen shows the *VFD output frequency* during operation.

5.3.3 MENU: X[XXX] USER DISPLAY

The menu displayed on the main screen can be selected by parameter *F7-21 User Display*. The following setting options are available:

- 0 = VFD Output current
- 1 = PG card feedback frequency
- 2 = Actual motor running frequency
- 3 = DC bus voltage
- 4 = Output voltage
- 5 = Power factor
- 6 = Output power
- 7 = Actual motor running speed
- 8 = Output torque %
- 9 = PG feedback value
- 10 = PID feedback value %
- 11 = AI1 %
- 12 = *Reserved*
- 13 = *Reserved*
- 14 = *Reserved*
- 15 = *Reserved*
- 16 = *Reserved*

5.3.4 MENU: A[AMP] OUTPUT CURRENT

This menu displayed on the main screen shows the *VFD output current* during operation.

5.3.5 MENU: FRD/REV SELECT DIRECTION

This menu allows you to switch between the *forward (Frd)* and *reverse (Rev)* direction for operating the motor.

NOTE

To switch between the forward and reverse direction of the motor, the parameter setting *F0-09 Fwd/Rev Forbid = 0 (Forward and reverse enabled)* must be selected.

CHAPTER REFERENCE

For switching procedure, refer to chapter "5.2.10 Change Motor Operation Direction During Operation".

5.3.6 MENU: START-UP DISPLAY

The menu displayed on the main screen *after power-on the LV-MD* can be selected by parameter *F7-20 Start-up Display*. The following setting options are available:

- 0 = F[Hz] (Setting Frequency)
- 1 = H[Hz] (Output Frequency)
- 2 = U (User Display)
- 3 = A[Amp] (Output Current)
- 4 = Frd/Rev (Select Direction)

5.4 PARAMETER SETUP MENUS – MENU LEVEL 2

The ***Parameter Setup menus*** refer to the various operating functions of the H1 VFD and consists of the following submenus with its *Function Group Codes Fx, Ux, Hx and Lx*:

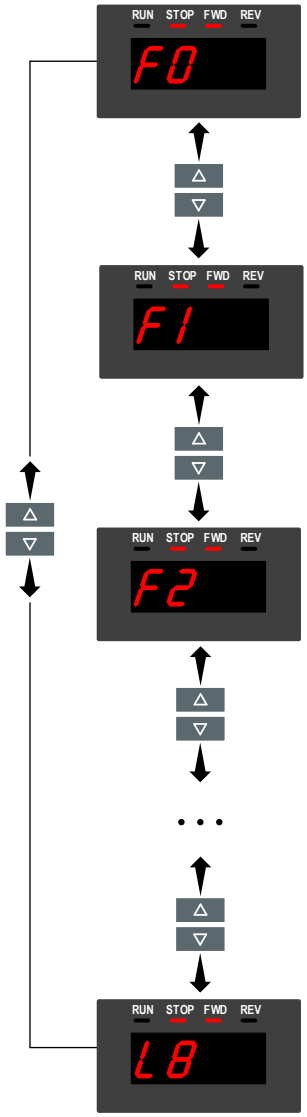


Fig. 5-68 Menu Level 2

- F0: Basic Function Parameters
- F1: Start Stop Control Parameters
- F2: V/F Control Parameters
- F4: Motor Parameters (parameters of motor M1)
- F5: Input Terminals (parameters)
- F6: Output Terminals (parameters)
- F7: Auxiliary Functions & Display
- F8: Communication (parameters)
- F9: Protection & Fault Parameters
- FA: PID Control (parameters)
- FD: Multi-speed (function parameters)
- U0: Fault Recorder (parameters)
- U1: Status Monitoring (parameters)
- L1: Customization Code (parameters))
- L2: Optimize Control Parameters
- L4: Holding Brake (holding brake function parameters)
- L5: Sleep Wake-Up (sleep wake function parameters)
- L6: Counter (parameters)
- L7: AI Multipoint Curve (analog input multipoint curve parameters)

NOTE

The following parameter menus are *not* in the *scope of supply* of the LV-MD:

- F3: Vector Control Parameters
- FB: Tension Control Parameters
- FC: Position Control Parameters
- FE: Torque Control Parameters
- FF: FACTORY Parameters (manufacturer parameters)
- H0: Other Motor Parameters
- H1: Other Motor VF Set (parameters)
- H2: Other Motor Vector Parameters
- H3: Other Motor Fault Parameters
- L0: System Control Parameters
- L3: Master Slave Control (parameters)
- L8: Application Macro (parameters)

PARAMETER FUNCTION CODES

A *function code* is assigned to each parameter. The function code consists of:

- the *number of the menu* to which the parameter belongs, e.g., *F0*, and
- a *consecutive parameter number*.

The parameter function codes are shown in the display without a hyphen.

EXAMPLE *"F0-03 Control Mode"*

Menu		Consecutive parameter number	Parameter name
Menu number	Menu name		
F0	Basic Function Parameters	*-03*	*Control Mode*

PARAMETER CHANGEABILITY The *changeability symbols* are described as follows:

☆ indicates that the H1 VFD parameters *can* be modified during both STOP and RUN operation.

★ indicates that the H1 VFD *cannot* be modified while in RUN operation.

○ Indicates that the parameter is a *factory parameter* and *cannot* be changed by the user.

● Indicates the VFD's *actual detected value* or *manufacturer's fixed value*, which *cannot* be changed.

T Automatic decimal shift

SERIAL COMMUNICATION *Communication addresses* in the function parameter table are written in hexadecimal.

F0: BASIC FUNCTION PARAMETERS

PARAMETER LIST

Parameter group *F0: Basic Function Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F0-00	*Identity Code* (Product model)	Specified number depending on LV-MD model acc. to the product code: • Product type • Input voltage [V], • Power [kW], • number of input voltage phases.	XXXX	●	0000
F0-01	*Duty Selection* (Light and heavy load selection)	1 = Heavy duty (Heavy load)	1	●	0001
F0-02	*Rated current*	Specified value depending on LV-MD model acc. to the product code: 0.00 ... 655.3 A	Machine type determination	●	0002
F0-03	*Control Method* (Control mode)	0 = Speed mode	0	●	0003
F0-04	*Velocity mode* (Speed mode selection)	0 = VF control 1 =-*No Function (not settable)* 2 = VVC voltage vector control	0	★	0004
F0-05	*Source of OPER* (Run command source selection)	0 = Digital operator 1 = External terminal input 2 = RS485 communication input 3 = CANopen input (supported by extended models)	0	★	0005
F0-06	*Source of FREQ* (Frequency source selection)	0 = Numeric keypad 1 = RS485 communication 2 = Analog input 3 = External Up/Down input 4 = *Reserved* 5 = *Reserved* 6 = CANopen input (supported by extended models) 7 = Keypad VR setting (knob) 8 = *Reserved* 9 = PID 10 = Digital terminal multispeed 11 = *Reserved*	7	★	0006

Parameter group *F0: Basic Function Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F0-07	*AUX FREQ Source* (Auxiliary frequency sources)	0 = Disable 1 = Numeric keypad 2 = RS485 communication 3 = Analog input 4 = *Reserved* 5 = *Reserved* 6 = CANopen input (supported by extended models) 7 = Keypad VR	0	★	0007
F0-08	*AUX FREQ FUN SEL* (Selection of frequency source combination)	0 = Main + Auxiliary frequency 1 = Main frequency - Auxiliary frequency 2 = Auxiliary frequency - main frequency	0	★	0008
F0-09	*Fwd/Rev Forbid* (Forward/reverse disable selection)	0 = Forward and reverse enabled 1 = Reverse disabled 2 = Forward disabled	0	★	0009
F0-10	*Upper Bound FREQHz* (Maximum frequency)	0.00 ... 599.0 Hz	599.0 Hz	☆/T	000A
F0-11	*Lower Bound FREQHz* (Minimum frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	000B
F0-12	*ACC/DEC TimeUnit* (Speed curve time unit)	0 = Acceleration and deceleration unit is 0.01 s 1 = Acceleration and deceleration unit is 0.1 s	0	★	000C
F0-13	*1st ACC Time* (Acceleration time 1)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	000D
F0-14	*1st DEC Time* (Deceleration time 1)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	000E
F0-15	*Carry Frequency kHz* (Carrier frequency)	2 = 2 kHz 3 = 3 kHz 4 = 4 kHz 5 = 5 kHz 6 = 6 kHz	4 kHz	★	000F
F0-16	*Derating Method* (Carrier reduction mode)	0 = Reduce carrier based on current temperature 1 = Reserved 2 = Same as setting 0	0	☆	0010
F0-17	*Reserved*	-	-	-	*0011*
F0-18	*Parameter Reset* (Parameter management setting and reset execution keys)	0 = No Function 1 = Parameter write protection 2 = *Reserved* 3 = *Reserved* 4 = *Reserved* 5 = kWh display reset (execution key) 6 = *Reserved* 7 = Reset CAN slave (supported by extended models) (execution key) 8 = *Reserved* 9 = Reset to factory value of 50 Hz (execution key) 10 = Reset to factory value of 50 Hz (execution key) 11 = *Reserved* 12 = *Reserved* 13 = *Reserved*	0	★	0012
F0-19	*Keypad FREQ* (Parameter setting frequency command value)	0.00 ... 599.0 Hz	50 Hz	☆/T	0013

Tab. 5-6 Parameter list – F0: Basic Function Parameters

F1: START STOP CONTROL PARAMETERS

PARAMETER LIST

Parameter group *F1: Start Stop Control Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F1-00	*Restart Method* (Start speed tracking)	0 = Disable (No action) 1 = From Fmax (Track from maximum frequency) 2 = From SPD REF (Track frequency at start-up) 3 = From Fmin (Track from the minimum frequency)	0	☆	0100
F1-01	*PM startup way* (Initial position identification method)	0 = No initial angle identification	0	☆	0101
F1-02	*Fault Re-RUN Way* (Abnormal restart mode)	0 = Stop Operation (Stop running) 1 = SPD REF Search (Track current speed) 2 = MIN SPD Search (Track minimum frequency)	0	☆	0102
F1-03	*SPD Search Curr %* (Maximum current for speed tracking)	20 ... 200 %	100 %	☆	0103
F1-04	*Voltage INC Gain* (Voltage increase rate)	1 ... 200 %	100 %	☆	0104
F1-05	*Start Frequency Hz*	0.00 ... 599.0 Hz	0.50 Hz	★/T	0105
F1-06	*Gear ACC Time* (Start-up hold time)	0.00 ... 600.0 s	0.00 s	☆/T	0106
F1-07	*Gear ACC FREQ* (Startup hold frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0107
F1-08	*DC Inject Level %* (Braking current size)	0 ... 100 %	0 %	☆	0108
F1-09	*DC Inject Start sec* *(Start-up braking* time)	0.0 ... 60.0 s	0.0 s	☆	0109
F1-10	*DCI Kp Gain* (DC braking proportion coefficient)	0 ... 9999	2000	☆/T	010A
F1-11	*DCI Ki Gain* (DC brake integral coefficient)	0 ... 9999	100	☆/T	010B
F1-12	*Stop Methods*	0 = Deceleration stop 1 = Free stop	0	☆	010C
F1-13	*Decel Method* (Deceleration methods)	0 = Deceleration method 0 1 = Deceleration method 1 2 = Deceleration method 2	0	★	010D
F1-14	*Fast Dec I Limit* (Maximum current for flux braking)	0 ... 2500	1000	☆	010E
F1-15	*TRANS ACC/DEC1-4Hz* (1-4 segment acceleration/deceleration switching point)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	010F
F1-16	*Curve Time 1* (S acceleration time 1)	0.00 ... 25.00 s	0.20 s	☆	0110
F1-17	*Curve Time 1* (S acceleration time 2)	0.00 ... 25.00 s	0.20 s	☆	0111
F1-18	*Curve Time 1* (S deceleration time 1)	0.00 ... 25.00 s	0.20 s	☆	0112
F1-19	*Curve Time 1* (S deceleration time 2)	0.00 ... 25.00 s	0.20 s	☆	0113
F1-20	*Auto ACC/DEC* (Automatic acceleration and deceleration selection)	0 = Linear acceleration and deceleration 1 = Automatic acceleration linear deceleration 2 = Linear acceleration auto deceleration 3 = Automatic acceleration and deceleration	0	☆	0114

Parameter group *F1: Start Stop Control Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
		4 = Auto acceleration deceleration suppression			
F1-21	*Auto ACC/DEC Kp Hz* (Auto acceleration and deceleration Kp)	0 ... 9999	200	☆/T	0115
F1-22	*Auto ACC/DEC Ki sec* (Auto acceleration and deceleration Ki)	0.000 ... 65.53	0.400	☆/T	0116
F1-23	*EF Stop Select* (Abnormal stop mode)	0 = Free stop 1 = According to the first deceleration time 2 = According to the second deceleration time 3 = According to the third deceleration time 4 = According to the fourth deceleration time 5 = According to the system deceleration time 6 = Automatic deceleration	0	☆	0117
F1-24	*DC Inject Stop* (Stop braking time)	0.0 ... 60.0 s	0.0 s	☆	0118
F1-25	*DC Inject StartFHz* (Braking start frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0119
F1-26	*Gear DEC Time* (Stop hold time)	0.00 ... 600.0 s	0.00 s	☆/T	011A
F1-27	*Gear DEC FREQ* (Stop hold frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆	011B
F1-28	*Reserved*	-	-	-	*011C*
F1-29	*Momentary Power* (Instantaneous power failure start mode)	0 = Stop running 1 = Track current speed 2 = Track minimum frequency	0	☆	011D
F1-30	*Power Loss Time sec* (Allowed power-off time)	0.0 ... 20.0 s	2.0 s	☆	011E
F1-31	*Base Block Time sec* (Base block interruption time)	0.0 ... 5.0 s	0.5 s	☆	011F
F1-32	*dEb Return LevelVdc* (dEb recovery threshold)	0.0 ... 100.0 V (1~)/ 0.0 ... 200.0 V (3~)	20.0 V (1~) / 40.0 V (3~)	☆	0120
F1-33	*dEb offset Level* (dEb action bias threshold)	0.0 ... 200.0	40.0	☆	0121
F1-34	*dEb Decel SE* (dEb deceleration selection)	0 = No action 1 = Enabled, not recoverable 2 = Enabled, recoverable	0	☆	0122
F1-35	*dEb Return Time sec* (dEb recovery time)	0.0 ... 25.0 s	3.0 s	☆	0123

Tab. 5-7 Parameter list – F1: Start Stop Control Parameters

F2: V/F CONTROL PARAMETERS

PARAMETER LIST

Parameter group *F2: V/F Control Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F2-00	*VF Curve Mode* (V/F voltage selection)	0 = General V/F curve 1 = 1.5 power V/F curve 2 = 2 power V/F curve	0	★	0200
F2-01	*TQR COMP Gain* (Torque compensation gain)	0 ... 10	1	☆	0201
F2-02	TQR COMP Filter sec (Torque filter time)	0.001 ... 10.00 s	0.500 s	☆/T	0202
F2-03	*Reserved*	-	*0*	●	*0203*
F2-04	*M1 Min Out FREQ Hz* (M1 multi-point VF frequency point 1)	0.00 ... 599.0 Hz	0.50 Hz	★/T	0204
F2-05	*M1 Min Out VOLT V* (M1 multi-point VF voltage point 1)	0.0 ... 240.0 V (1~) 0.0 ... 460.0 V (3~)	11.0 V (1~) / 22.0 V (3~)	★	0205
F2-06	*M1 Mul VF FREQ 2Hz* (M1 multi-point VF frequency point 2)	0.00 ... 599.0 Hz	1.50 Hz	★/T	0206
F2-07	*M1 Mul VF VOLT 2V* (M1 multi-point VF voltage point 2)	0.0 ... 240.0 V (1~) 0.0 ... 460.0 V (3~)	5.0 V (1~) / 10.0 V (3~)	★	0207
F2-08	*M1 Mul VF FREQ 3Hz* (M1 multi-point VF frequency point 3)	0.00 ... 599.0 Hz	3.00 Hz	★/T	0208
F2-09	*M1 Mul VF VOLT 3V* (M1 multi-point VF voltage point 3)	0.0 ... 240.0 V (1~) 0.0 ... 460.0 V (3~)	11.0 V (1~) / 22.0 V (3~)	★	0209
F2-10	*Slip COMP Filter sec* (Slip compensation filter time)	0.001 ... 9.999 s	0.100 s	☆	020A
F2-11	*Slip COMP Gain* Slip compensation gain)	0.00 ... 10.00	0.00	☆	020B
F2-12	*Gen Slip Comp GA* (Generating torque compensation gain)	0.00 ... 1.00	1.00	☆	020C
F2-13	*MAX Slip Freq.* (Maximum slip limit value)	0.00 ... 200.00 Hz	20.00 Hz	☆/T	020D
F2-14	*Vibrate sup Gain* (Oscillation suppression gain)	0 ... 9999	1000	☆	020E

Tab. 5-8 Parameter list – F2: V/F Control Parameters 02

F4: MOTOR PARAMETERS

PARAMETER LIST

Parameter group *F4: Motor Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F4-00	*Motor Type Sel* (Motor type selection)	0 = Induction motor	0	★	0400
F4-01	*Reserved*	-	*0*	★	*0401*
F4-02	*M1 Max Output FR Hz* (M1 maximum frequency)	0.00 ... 599.0 Hz	50.00 Hz	★/T	0402
F4-03	*Motor1 F base* (M1 rated frequency)	0.00 ... 599.0 Hz	50.00 Hz	★/T	0403
F4-04	*M1 VOLT Base* (M1 rated voltage)	0.0 ... 255.0 V (1~) 0.0 ... 510.0 V (3~)	220.0 V)1~) / 380.0 V (3~)	★	0404
F4-05	*Motor1 Rated P* (IM1 rated power)	0.00 ... 655.3 kW	Machine type Determination 2.20 kW	★/T	0405
F4-06	*Motor1 Poles* (IM1 number of motor poles; automatically calculated)	2 ... 20	Machine type Determination 4	★	0406
F4-07	*Motor1 Rated A* (IM1 rated current)	0.00 ... 655.3 A	Machine type Determination 11 A	★/T	0407
F4-08	*Motor1 Rated* (IM1 rated speed)	0 ... 9999 rpm	Machine type Determination 1410 rpm	★/T	0408
F4-09	*System Jm* (Inertia per unit value)	1 ... 9999 pu	Machine type Determination 256	★	0409
F4-10	*Motor1 No-Load* (IM1 no-load current)	0.00A ... setting value of F4-07	Machine type Determination 4.40 A	★	040A
F4-11	*Motor1 Rs* (IM1 stator resistance)	0.000 ... 65.53 Ω	Machine type Determination 1.025 Ω	★	040B

Tab. 5-9 Parameter list – F4: Motor Parameters

F5: INPUT TERMINALS

PARAMETER LIST

Parameter group *F5: Input Terminals*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F5-00	*DI1 Function SEL* (DI1 terminal function selection)	0 = No function 1 = Multi-stage/multi-point position 1 2 = Multi-stage/multi-point position 2 3 = Multi-stage/multi-point position 3 4 = Multi-stage/multi-point position 4 5 = Fault reset 6 = Jogging 7 = Speed pause 8 = 1-2 stage acceleration/deceleration switching 9 = 3-4 stage acceleration/deceleration switching 10 = External fault 11 = Gate blocking 12 = Stop output 13 = Automatic acceleration and deceleration disabled 14 = *Reserved* 15 = AI1 input frequency command 16 = *Reserved* 17 = *Reserved* 18 = Deceleration stop 19 = External command for frequency rise 20 = External command for frequency drop 21 = PID function disable 22 = Clear counter 23 = Input counter 24 = External forward jogging 25 = External reverse jogging 26 = *Reserved* 27 = *Reserved* 28 = External fault free stop 31 = *Reserved* ... 39 = *Reserved* 40 = Motor free stop 41 = Manual mode enable 42 = Automatic mode enable 43 = *Reserved* ... 48 = *Reserved* 49 = VFD enable 50 = Slave dEb execution 51 = *Reserved* 52 = *Reserved* 53 = CANopen quick stop 54 = *Reserved* 55 = *Reserved* 56 = LOC/REM switch 57 = *Reserved* ... 69 = *Reserved* 70 = Auxiliary frequency disable 71 = PID disable, zero output 72 = PID disable, maintain output 73 = PID I gain zero 74 = PID feedback reverse 75 = *Reserved* ... 94 = *Reserved*	0	★	0500
F5-01	*DI2 Function SEL* (DI2 terminal function selection)		0	★	0501
F5-02	*DI3 Function SEL* (DI3 terminal function selection)		1	★	0502
F5-03	*DI4 Function SEL* (DI4 terminal function selection)		2	★	0503
F5-04	*Reserved*	-	-	-	*0504*
F5-05	*Reserved*	–	–	-	*0505*
F5-06	*Reserved*	–	–	-	*0506*

Parameter group *F5: Input Terminals*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F5-07	*Reserved*	–	–	-	*0507*
F5-08	*DI CMD Control* (Terminal command mode)	0 = No function 1 = 2-wire mode 1 2 = 2-wire mode 2 3 = 3-wire mode 4 = 2-wire mode 1/quick start 5 = 2-wire mode 2/quick start 6 = 3-wire quick start	1	★	0508
F5-09	*Up/Down Key Mode* (UP/DOWN mode selection)	0 = System acceleration and deceleration time 1 = Fixed acceleration/deceleration F5-10 2 = Pulse signal F5-10 3 = Curve 4 = Step acceleration/deceleration	0	☆	0509
F5-10	*Up/Down Key SPD Hz/ms* (UP/DOWN rate of change)	0.001 ... 1.000 Hz/ms	0.001 Hz/ms	☆	050A
F5-11	*Reserved*	-	-	-	*050B*
F5-12	*Reserved*	-	-	-	*050C*
F5-13	*Reserved*	-	-	-	*050D*
F5-14	*Reserved*	-	-	-	*050E*
F5-15	DI *Active* level (DI terminal effective logic)	***0000 ... FFFF*** (Hexadecimal) (≙ Binär: 0000 0000 0000 0000 ... 1111 1111 1111 1111 ≙ Decimal: 0 ... 65535) Definition 1: pos. logic = 0 and neg. logic = 1 Definition 2: DI4->2^3, DI3->2^2, DI2->2^1, DI1 -> 2^0 Example 1 (all 4 DIs work acc. to pos. logic): • Binary: 0000 0000 0000 0000 • Decimal: 0 • => Hexadecimal setting: 0000h Example 2 (all 4 DIs work acc. to neg. logic): • Binary: 0000 0000 0000 1111 • Decimal: 15 • => Hexadecimal setting: 000Fh Example 3 (only DI2 and DI4 operate according to negative logic): • Binary: 0000 0000 0000 1010 • Decimal: 10 • => Hexadecimal setting: 000Ah	0	☆	050F
F5-16	*DI Response time sec* (DI terminal response time)	0.000 ... 9.999 s	0.005 s	☆	0510
F5-17	*Inter ACT Mix SEL* (Virtual/real DI terminal selection)	***0000 ... FFFF*** (Hexadecimal) (≙ Binär: 0000 0000 0000 0000 ... 1111 1111 1111 1111 ≙ Decimal: 0 ... 65535) Definition 1: real DI = 0 and virtual DI = 1 Definition 2: DI4->2^3, DI3->2^2, DI2->2^1, DI1 -> 2^0 Example 1 (all 4 DIs are in real mode): • Binary: 0000 0000 0000 0000; • Decimal: 0 • => Hexadecimal setting: 0000h Example 2 (all 4 DIs are in virtual mode): • Binary: 0000 0000 0000 1111; • Decimal: 15 • => Hexadecimal setting: 000Fh	0	☆	0511

Parameter group *F5: Input Terminals*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
		Example 3 (only DI2 and DI4 are in virtual mode): • Binary: 0000 0000 0000 1010 • Decimal: 10 • => Hexadecimal setting: 000Ah			
F5-18	*Inter ACT Value* (Virtual terminal status setting)	***0000 ... FFFF*** (Hexadecimal) (≙ Binär: 0000 0000 0000 0000 ... 1111 1111 1111 1111 ≙ Decimal: 0 ... 65535) Definition 1: 'Low' status = 0 and 'High' status = 1 Definition 2: DI4->2^3, DI3->2^2, DI2->2^1, DI1 -> 2^0 Example 1 (all 4 DIs are in 'Low' status): • Binary: 0000 0000 0000 0000; • Decimal: 0 • => Hexadecimal setting: 0000h Example 2 (all 4 DIs are in 'High' status): • Binary: 0000 0000 0000 1111 • Decimal: 15 • => Hexadecimal setting: 000Fh Example 3 (only DI2 and DI4 are in 'High' status): • Binary: 0000 0000 0000 1010 • Decimal: 10 • => Hexadecimal setting: 000Ah	0	☆	0512
F5-19	*Fault Reset OP* (External running selection)	0 = Invalid 1 = Run if there is a run command	0	☆	0513
F5-20	*AI1v/AI1i SEL* (AI1 signal type selection)	0 = 0-10 V input selection 1 = 0-20 mA input selection 2 = 4-20 mA input selection	0	☆	0514
F5-21	*AI1 Function Sel* (AI1 function selection)	0 = No function 1 = Frequency setting 2 = *Reserved* 3 = *Reserved* 4 = PID target value 5 = PID feedback value 6 = Thermistor PTC input 7 = *Reserved* 8 = *Reserved* 9 = *Reserved* 10 = *Reserved* 11 = Thermistor PT100 value 12 = Auxiliary frequency setting 13 = PID offset 14 = *Reserved* 15 = *Reserved* 16 = *Reserved* 17 = *Reserved* 18 = *Reserved* 19 = *Reserved* 20 = *Reserved*	1	☆	0515
F5-22	*AI1 Input Bias* (AI1 input offset voltage)	-100.0 ... 100.0 %	000.0 %	☆	0516
F5-23	*AI1 Bias Mode* (AI1 offset mode selection)	0 = No offset 1 = Below offset = offset 2 = Above offset = offset 3 = Absolute value offset centered 4 = Offset centered	0	☆	0517
F5-24	*AI1 Input Gain*	-500.0 ... 500.0 %	100.0 %	★/T	0518
F5-25	*AI1 Input LPF* (AI1 filter time)	0.00 ... 20.00 s	0.01 s	☆	0519

Parameter group *F5: Input Terminals*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F5-26	*Reserved*	-	-	–	*051A*
F5-27	*Reserved*	-	-	–	*051B*
F5-28	*Reserved*	-	-	–	*051C*
F5-29	*Reserved*	-	-	–	*051D*
F5-30	*Reserved*	-	-	–	*051E*
F5-31	*Reserved*	-	-	–	*051F*
F5-32	*Reserved*	-	-	–	*0520*
F5-33	*Reserved*	-	-	–	*0521*
F5-34	*Reserved*	-	-	–	*0522*
F5-35	*Reserved*	-	-	–	*0523*
F5-36	*Reserved*	-	-	–	*0524*
F5-37	*Reserved*	-	-	–	*0525*
F5-38	*AI Bias REV Mode* (Analog frequency negative value inversion)	0 = Forward/reverse determined by operation source 1 = Forward/reverse determined by offset	0	☆	0526
2	*Reserved*	-	-	–	*0527*
F5-40	*Reserved*	-	-	–	*0528*
F5-41	*Reserved*	-	-	–	*0529*
F5-42	*Loss of AI Cur* (4-20mA wire break action)	0 = No wire break detection 1 = Maintain frequency before wire break 2 = Decelerate to 0 Hz 3 = Immediate fault stop	0	☆	052A
F5-43	*AI Cur Loss Th* (4-20mA wire break threshold)	0.00 ... 4.00 mA	2.00 mA	☆	052B

Tab. 5-10 Parameter list – F5: Input Terminals

F6: OUTPUT TERMINALS

PARAMETER LIST

Parameter group *F6: Output Terminals*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F6-00	*RY1 Function SEL* (RLY1 terminal function selection)	0 = No function 1 = VFD running 2 = Reached set speed 3 = Reached frequency 1 4 = Reached frequency 2 5 = Zero speed command running 6 = Zero speed command 7 = Over-torque threshold 1 8 = Over-torque threshold 2 9 = VFD ready complete 10 = Low voltage warning 11 = Fault indication 12 = Brake release 13 = Overheat warning 14 = Braking unit action 15 = PID deviation warning 16 = Excessive slip 17 = Set count value reached 18 = Final count value reached 19 = Base block 20 = Fault output 21 = Overvoltage 22 = Overcurrent stall prevention 23 = Overvoltage stall prevention 24 = Operation source other than operator 25 = Forward command 26 = Reverse command 29 = Above F6-08 speed value 30 = Below F6-08 speed value 31 = *Reserved* 32 = *Reserved* 33 = Zero operating output frequency 34 = Zero output frequency 35 = Fault option 1 36 = Fault option 2 37 = Fault option 3 38 = Fault option 4 39 = *Reserved* 40 = Reached set frequency STP 41 = *Reserved* 42 = Trolley gate opening output 43 = Above F6-09 speed 44 = Low current output 45 = UVW electromagnetic switch enable 46 = dEb action output 47 = *Reserved* 48 = *Reserved* 49 = *Reserved* 50 = *Reserved* 51 = RS485 control output 52 = *Reserved* 66 = *Reserved* 67 = Analog setpoint reached output 68 = *Reserved* 73 = *Reserved* 74 = *Reserved* 75 = *Reserved* 76 = *Reserved*	11	☆	0600

Parameter group *F6: Output Terminals*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F6-01	*Reserved*	-	-	-	*0601*
F6-02	*Reserved*	-	-	-	*0602*
F6-03	*Reserved*	-	-	-	*0603*
F6-04	*RLY Active level* (RLY terminal valid logic)	***0000 ... FFFF*** (Hexadecimal)	0	☆	0604
F6-05	*RLY by AI level* (RLY output AI source)	0 = AI1 1 = *Reserved* 2 = *Reserved* 3 = *Reserved* 4 = *Reserved*	0	☆	0605
F6-06	*AI Upper Level* (DO output AI upper limit value)	-100.0 ... 100.0 %	50.00 %	☆/T	0606
F6-07	*AI Lower Level* (DO output AI lower limit value)	-100.0 ... 100.0 %	10.00 %	☆/T	0607
F6-08	*Speed Area Set* (DO action frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0608
F6-09	*Desire RPM* (Motor zero speed judgment threshold)	0 ... 9999 rpm	0 rpm	☆/T	0609
F6-10	*Reserved*	–	–	–	–
F6-11	*Reserved*	–	–	–	–
F6-12	*Reserved*	–	–	–	–
F6-13	*Reserved*	–	–	–	*060D*
F6-14	*Reserved*	–	–	–	*060E*
F6-15	*Reserved*	–	–	–	*060F*
F6-16	*Reserved*	–	–	–	*0610*
F6-17	*Reserved*	–	–	–	*0611*
F6-18	*Reserved*	–	–	–	*0612*
F6-19	*Reserved*	–	–	–	*0613*
F6-20	*Reserved*	–	–	–	*0614*
F6-21	*Reserved*	–	–	–	*0615*
F6-22	*Reserved*	–	–	–	*0616*
F6-23	*Reserved*	–	–	–	*0617*
F6-24	*Reserved*	–	–	–	*0618*
F6-25	*Reserved*	–	–	–	*0619*
F6-26	*Reserved*	–	–	–	*061A*
F6-27	*Desire FREQ-1* (Frequency reach 1 detection value)	0.00 ... 599.0 Hz	50.00 Hz	☆/T	061B
F6-28	*Desire FREQ1 BND Hz* (Frequency reach 1 amplitude)	0.00 ... 599.0 Hz	2.00 Hz	☆/T	061C
F6-29	*Desire FREQ-2* (Frequency reach 2 detection value)	0.00 ... 599.0 Hz	50.00 Hz	☆/T	061D
F6-30	*Desire FREQ2 BND Hz* (Frequency reach 2 amplitude)	0.00 ... 599.0 Hz	2.00 Hz	☆/T	061E

Tab. 5-11 Parameter list – F6: Output Terminals

F7: AUXILIARY FUNCTIONS AND KEYPAD DISPLAY

PARAMETER LIST

Parameter group *F7: Auxiliary Functions and Keypad Display*					
Function code	**Parameter name**	**Setting range/Setting options/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
F7-00	*JOG Frequency* (JOG frequency setting)	0.00 ... 599.0 Hz	6.00 Hz	☆/T	0700
F7-01	*JOG ACC Time* (JOG acceleration time)	0.00 ... 600.0 s	10.00 s	☆/T	0701
F7-02	*JOG DEC Time* (JOG deceleration time)	0.00 ... 600.0 s	10.00 s	☆/T	0702
F7-03	*2nd ACC Time* (Acceleration time 2)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	0703
F7-04	*2nd DEC Time* (Deceleration time 2)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	0704
F7-05	*3rd ACC Time* (Acceleration time 3)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	0705
F7-06	*3rd DEC Time* (Deceleration time 3)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	0706
F7-07	*4th ACC Time* (Acceleration time 4)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	0707
F7-08	*4th DEC Time* (Deceleration time 4)	0.00 ... 600.0 s	Machine type determination 10.00 s	☆/T	0708
F7-09	*Skip FREQ 1UP* (Skip frequency 1 upper limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0709
F7-10	*Skip FREQ 1Low Hz* (Skip frequency 1 lower limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	070A
F7-11	*Skip FREQ 2Up* (Skip frequency 2 upper limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	070B
F7-12	*Skip FREQ 2Low Hz* (Skip frequency 2 lower limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	070C
F7-13	*Skip FREQ 3UP* (Skip frequency 3 upper limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	070D
F7-14	*Skip FREQ 3Low Hz* (Skip frequency 3 lower limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	070E
F7-15	*PM Up Skip Freq Hz* (Skip frequency 4 upper limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	070F
F7-16	*PM Low Skip Freq Hz* (Skip frequency 4 lower limit)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0710
F7-17	*Cooling Fan Way* (Fan control method)	0 = Continuous fan operation 1 = 1 min stop after shutdown 2 = Stops with the VFD 3 = Starts at 40 °C temperature 4 = Fans work during running; during downtime, fans are idle below 38 °C and work above 40 °C	4	☆	0711
F7-18	*Reserved*	-	-	-	*0712*
F7-19	*KPD STOP ENABLE* (Keyboard STOP key Enable)	0 = Disable 1 = Enable	0	☆	0713
F7-20	*Start-up Display*	0 = F[Hz] (Setting Frequency)	0	☆	0714

Parameter group *F7: Auxiliary Functions and Keypad Display*					
Function code	**Parameter name**	**Setting range/Setting options/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
	(Startup screen selection)	1 = H[Hz] (Output Frequency) 2 = U (User Display) 3 = A[Amp] (Output Current) 4 = Frd/Rev (Select Direction)			
F7-21	*User Display* (Page display selection)	0 = VFD Output current 1 = PG card feedback frequency 2 = Actual motor running frequency 3 = DC bus voltage 4 = Output voltage 5 = Power factor 6 = Output power 7 = Actual motor running speed 8 = Output torque % 9 = PG feedback value 10 = PID feedback value % 11 = AI1 % 12 = *Reserved* 13 = *Reserved* 14 = *Reserved* 15 = *Reserved* 16 = *Reserved*	3	☆	0715
F7-22	*Reserved*	–	–	–	*0716*
F7-23	*Reserved*	–	–	–	*0717*
F7-24	*Reserved*	–	–	–	*0718*
F7-25	*Reserved*	–	–	–	*0719*
F7-26	*Power on Counter* (Cumulative power-on count)	0 ... 6553	-	●/T	071A
F7-27	*Power on Timer* (Cumulative power-on days)	0 ... 6553	-	●/T	071B
F7-28	*Power on Timer* (Cumulative power-on minutes)	0 ... 1439	-	●	071C
F7-29	*Additive Run Day day* (Cumulative running days)	0 ... 6553	-	●	071D
F7-30	*Additive Run Min min* (Cumulative running minutes)	0 ... 6553	-	●/T	071E
F7-31	*Accumul Run Hour min* (Motor running time)	0 ... 1439min	-	☆	071F
F7-32	*Accumul Run-day day* (Motor running days)	0 ... 6553	-	☆	0720
F7-33	*Password Decoder* (Password entry)	0 ... 9999	0000	☆/T	0721
F7-34	*Password Input* (Password setting)	0 ... 9999 Password protection status indication: 0: No password set, or correct password entered in F7-33 1: Password protection is active	0000	☆/T	0722
F7-35	*PowerSave Enable* (Automatic energy saving setting)	0 = Disable 1 = Enable	0	☆	0723
F7-36	*PowerSave Gain* (Energy saving gain)	10 ... 1000	100	☆	0724
F7-37	*Auto Voltage REG* (Automatic voltage regulation)	0 = Activate AVR function 1 = Cancel AVR function 2 = Cancel AVR during deceleration	0	☆	0725
F7-38	*LPF of AMPS Disp sec* (Current display filter)	0.001 ... 65.53 s	0.100 s	☆/T	0726
F7-39	*LPF of Display*	0.001 ... 65.53 s	0.100 s	☆/T	0727

Parameter group *F7: Auxiliary Functions and Keypad Display*					
Function code	**Parameter name**	**Setting range/Setting options/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
	(Display filter time)				
F7-40	*SW-RLY Delay CNT* (Soft start switch delay time)	0 ... 9999	7000	☆	0728
F7-41	*OutFreq Dev Band* (Running frequency deviation dead zone)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0729
F7-42	*Rn Dir Toggle* (Output phase sequence switching)	0 = Output phase sequence switching 1 = Output phase sequence switching	0	☆	072A
F7-43	*Reserved*	-	-	-	*072B*
F7-44	*Reserved*	-	-	-	*072C*
F7-45	*Reserved*	-	-	-	*072D*
F7-46	*Reserved*	-	-	-	*072E*
F7-47	*Reserved*	-	-	-	*072F*
F7-48	*Reserved*	-	-	-	*0730*
F7-49	*Reserved*	-	-	-	*0731*
F7-50	*Reserved*	-	-	-	*0732*
F7-51	*Reserved*	-	-	-	*0733*
F7-52	*W-sec Low word* (W-sec low byte)	0.0 ... 6553	0.0	●/T	0734
F7-53	*W-sec High word* (W-sec high byte)	0.0 ... 6553	0.0	●/T	0735
F7-54	*W-hours* [Wh]	0.0 ... 6553	0.0	●/T	0736
F7-55	*kWh Low word* (kWh low byte)	0.0 ... 6553	0.0	●/T	0737
F7-56	*kWh High word* (kWh high byte)	0.0 ... 6553	0.0	●/T	0738
F7-57	*Firmware Version* (Software version (H))	0.0 ... 6553	10.10	●	0739
F7-58	S/W 2nd Version (Software version (L))	0.0 ... 6553	1.25	●	073A
F7-59	*Date Code* (Software release date)	0 ... 6553	4514	●	073B
F7-60	*Reserved*	-	-	–	*073C*
F7-61	*Para Display sel* (Enhanced parameter display selection)	0 = Displayed menus: F0, F1, F2, F4, F5, F6, F7, F8, F9, FA, FD, U0, U1 1 = Displayed menus: F0, F1, F2, F4, F5, F6, F7, F8, F9, FA, FD, U0, U1, L1, L2, L4, L5, L6, L7	1	☆	073D
F7-62	*Reserved*	-	-	–	–
F7-63	*Reserved*	-	-	–	–

Tab. 5-12 Parameter list – F7: Auxiliary Functions and Keypad Display

F8: COMMUNICATION

PARAMETER LIST

Parameter group *F8: Communication*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F8-00	*MODBUS Baud Rate kbps*	4.8 ... 19.2kbps	19.2 kbps	☆	0800
F8-01	*MODBUS Protocol* (Communication data format)	1 = 7,N,2 for ASCII 2 = 7,E,1 for ASCII 3 = 7,O,1 for ASCII 4 = 7,E,2 for ASCII 5 = 7,O,2 for ASCII 6 = 8,N,1 for ASCII 7 = 8,N,2 for ASCII 8 = 8,E,1 for ASCII 9 = 8,O,1 for ASCII 10 = 8,E,2 for ASCII 11 = 8,O,2 for ASCII 12 = 8,N,1 for RTU 13 = 8,N,2 for RTU 14 = 8,E,1 for RTU 15 = 8,O,1 for RTU 16 = 8,E,2 for RTU 17 = 8,O,2 for RTU	12	☆	0801
F8-02	*LMVF Com Address* (Communication address)	1 ... 254	1	☆	0802
F8-03	*Response Delay Tms*	0.0 ... 200.0 ms	2.0 ms	☆	0803
F8-04	*MODBUS TimeOut sec* (Communication timeout time)	0.0 ... 100.0 s	0.0 s	☆	0804
F8-05	*MODBUS Fault Way* (Communication error handling)	0 = Warning and continue running 1 = Warn and decelerate to stop 2 = Warn and free stop 3 = No warning	3	☆	0805
F8-06	*Comm Main FREQ* (Communication set frequency)	0.00 ... 599.0 Hz	50.00 Hz	●/T	0806
F8-07	*Com Decode* (Communication decoding method)	0 = Use 20XX 1 = Use 60XX	1	☆	0807

Tab. 5-13 Parameter list – F8: Communication

F9: PROTECTION & FAULTS

PARAMETER LIST

Parameter group *F9: Protection & Faults*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
F9-00	*Protect Bit* (Protection control bit)	***0000 ... FFFF*** (Hexadecimal)	0000	☆	0900
F9-01	*Thermal RLY SEL* (Motor 1 overload protection)	0 = Constant torque output motor 1 = Variable torque output motor 2 = No motor overload protection	2	☆	0901
F9-02	*Thermal RLY1 T* (Motor 1 overload time)	30.0 ... 600.0 s	60.0 s	☆	0902
F9-03	*STALL V MODE* (Overvoltage stall mode)	0 = Overvoltage stall mode 0 1 = Overvoltage stall mode 1	1	☆	0903
F9-04	*OV STALL Vlt LvlV* (Overvoltage stall threshold)	0.0 ... 450.0 V (1~) 0.0 ... 900.0 V (3~)	380.0 V (1~) / 760.0 V (3~)	☆	0904
F9-05	*STALL V DEC Time sec* (Overvoltage stall deceleration time)	0.00 ... 655.3 s	600.0 s	☆/T	0905
F9-06	*Lux Auto Reset* (Undervoltage fault auto clear)	0 = Disable 1 = Enable	0	☆	0906
F9-07	*Reserved*	-	-	–	*0907*
F9-08	*OCA Cur Level* (OC stall threshold during acceleration)	0 ... 200 %	150 %	☆	0908
F9-09	*Stall Level Limit%* (Overcurrent stall limit threshold)	0 ... 100 %	100 %	☆	0909
F9-10	*OCN Level* (OC stall threshold during operation)	0 ... 200 %	150 %	☆	090A
F9-11	*Stall ACCDEC SEL* (Constant speed OC acceleration and deceleration selection)	0 = System acceleration and deceleration time 1 = First acceleration and deceleration time 2 = Second acceleration and deceleration time 3 = Third acceleration and deceleration time 4 = Fourth acceleration and deceleration time 5 = Automatic acceleration and deceleration time	0	☆	090B
F9-12	*IN-PHL Act sel* (Input phase loss action selection)	0 = Warning and decelerate to stop 1 = Warning and coast to stop	0	☆	090C
F9-13	*IN-PHL LPF* (Input phase loss filter time)	0.00 ... 600.0 s	0.20 s	☆/T	090D
F9-14	*PHL Vdc-Ripple %Vdc* (Input phase loss voltage threshold)	0.0 ... 160.0 V (1~) 0.0 ... 320.0 V (3~)	30.0 V (1~) / 60.0 V (3~)	☆	090E
F9-15	*Out-PHL Act sel* (Output phase loss action selection)	0 = Warning and continue running 1 = Warn and decelerate to stop 2 = Warn and free stop 3 = No warning	3	☆	090F
F9-16	*OPL Detection T sec* (Output phase loss detection time)	0.000 ... 65.53 s	0.100 s	☆/T	0910
F9-17	*OPL Curren Band %* (Output phase loss current threshold)	0.00 ... 100.0 %	7.00 %	☆/T	0911
F9-18	*DCI Time for OPL sec* (Output phase loss braking time)	0.000 ... 65.53 s	0.000 s	☆/T	0912
F9-19	*Reserved*	-	-	-	*0913*

F9-20	*Reserved*	-	-	-	*0914*
F9-21	*Reserved*	-	-	-	*0915*
F9-22	*Under AMP Level %* (Low current setting threshold)	0.0 ... 100.0 %	0.0 %	☆	0916
F9-23	*Under AMP DET* (Low current detection time)	0.00 ... 360.00 s	0.00 s	☆/T	0917
F9-24	*Under AMP TRET* (Low current action mode)	0 = No function 1 = Alarm and coast to stop 2 = Alarm and second deceleration to stop 3 = Alarm and continue operation	0	☆	0918
F9-25	*Slip Deviation L%* (Excessive slip detection value)	0.0 ... 100.0 %	0.0 %	☆	0919
F9-26	*Slip Deviation T sec* (Excessive slip detection time)	0.0 ... 10.0 s	1.0 s	☆	091A
F9-27	*Over Slip Way* (Excessive slip action selection)	0 = Warning and continue running 1 = Warn and decelerate to stop 2 = Warn and free stop 3 = No warning	0	☆	091B
F9-28	*Reserved*	-	-	-	*091C*
F9-29	*Reserved*	-	-	-	*091D*
F9-30	*Reserved*	-	-	-	*091E*
F9-31	*Reserved*	-	-	-	*091F*
F9-32	*Reserved*	-	-	-	*0920*
F9-33	*Reserved*	-	-	-	*0921*
F9-34	*Reserved*	-	-	-	*0922*
F9-35	*Reserved*	-	-	-	*0923*
F9-36	*Over TQC1 Method* (Over-torque selection 1)	0 = Detection disabled 1 = Constant speed detection continues operation 2 = Constant speed detection stop operation 3 = Running detection continue operation 4 = Operation detection stop operation	0	☆	0924
F9-37	*Over TQC1 Level %* (Over-torque threshold 1)	10 ... 250 %	120 %	☆	0925
F9-38	*Over TQC1 Time* (Over-torque time 1)	0.1 ... 60.0 s	0.1 s	☆	0926
F9-39	*Reserved*	-	-	–	~~*0927*~~
F9-40	*Reserved*	-	-	–	~~*0928*~~
F9-41	*Reserved*	-	-	–	~~*0929*~~
F9-42	*Reserved*	-	-	–	~~*092A*~~
F9-43	*Reserved*	-	-	–	~~*092B*~~
F9-44	*Reserved*	-	-	–	~~*092C*~~
F9-45	*Reserved*	-	-	–	~~*092D*~~
F9-46	*Auto Restart* (Abnormal start count)	0 ... 10	0	☆	092E
F9-47	*Reset Restart CNT sec* (Abnormal restart reset time)	0.0 ... 6000 s	60.0 s	☆/T	092F
F9-48	*PTC Treatments* (PTC action selection)	0 = Warn and continue running 1 = Warn and decelerate to stop 2 = Warn and free stop 3 = No warning	0	☆	0930
F9-49	*PTC Level* (PTC threshold)	0.0 ... 100.0 %	50.0 %	☆	0931
F9-50	*PT DET LEVEL 1* (PT detection threshold 1)	0.000 ... 10.00 V	5.000 V	☆/T	0932
F9-51	*PT DET LEVEL 2*	0.000 ... 10.00 V	7.000 V	☆/T	0933

	(PT detection threshold 2)				
F9-52	*PT DROP FREQ* (PT voltage 1 protection frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0934
F9-53	*PT TREAT DELAY* (PT action delay time)	0 ... 6000 s	60 s	☆	0935
F9-54	*Reserved*	-	-	-	*0936*
F9-55	*Reserved*	-	-	-	*0937*
F9-56	*Reserved*	-	-	-	*0938*
F9-57	*DCI OPL Cur Band%* (Output phase loss threshold 2)	0.00 ... 100.0 %	2.00 %	☆/T	0939
F9-58	*OV Stall Ret Lvl V* (Overvoltage stall recovery threshold)	0.0 V ... 450.0 V (1~) 0.0 V ... 900.0 V (3~)	315.0 V (1~) / 630.0 V (3~)	☆	093A

Tab. 5-14 Parameter list – F9: Protection & Faults

FA: PID CONTROL

PARAMETER LIST

Parameter group *FA: PID Control*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
FA-00	*PID FBK SEL* (PID feedback type selection)	0 = No function 1 = Negative feedback analog input 2 = *Reserved* 3 = *Reserved* 4 = Positive feedback pulse input 5 = *Reserved* 6 = *Reserved* 7 = Negative feedback communication input 8 = Positive feedback communication input	0	☆	0A00
FA-01	*PID REF SEL* (PID setpoint source selection)	0 = Frequency command 1 = Parameter FA-02 2 = RS485 communication 3 = Analog input 4 = CANopen *5 = Reserved* 6 = *Reserved*	0	☆	0A01
FA-02	*PID REF%* (PID setting value)	-100.0 ... 100.0 %	50.00 %	☆/T	0A02
FA-03	*PID COMM ACC/DEC sec* (PID setting change time)	0.00 ... 655.3 s	0.00 s	☆/T	0A03
FA-04	*PID FBK Filter* (PID feedback filter time)	0.1 ... 300.0 s	5.0 s	☆	0A04
FA-05	*P Gain of PID* (Proportional coefficient 1)	0.00 ... 99.99 %	8.00 %	☆	0A05
FA-06	*I Gain of PID* (Integral time 1)	0.00 ... 99.99 %	0.05 s	☆	0A06
FA-07	*D Gain of PID* (Derivative time 1)	0.00 ... 1.00 s	0.00 s	☆	0A07
FA-08	*P Gain2 of PID* (Proportional coefficient 2)	0.00 ... 99.99	20.00	☆/T	0A08
FA-09	*I Gain2 of PID* (Integral time 2)	0.00 ... 99.99 s	0.08 s	☆/T	0A09
FA-10	*D Gain2 of PID* (Derivative time 2)	0.00 ... 1.00 s	0.00 s	☆	0A0A
FA-11	*PID Mode* (PID series-parallel selection)	0 = Kp, Kp*Ki, Kp*Kd 1 = Kp, Ki, Kd	1	☆	0A0B

Parameter group *FA: PID Control*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
FA-12	*PID CTRL SEL* (PID control cycle time)	0 = Execute 2 ms enhanced PID control 1 = Execute 1 ms standard PID control	0	☆	0A0C
FA-13	*PID Gain2 Sel* (PID parameter switching condition)	0 = No function 1 = Switch based on output frequency 2 = Switch based on PID deviation	0	☆	0A0D
FA-14	*PID Gain2 Err1* (PID parameter switch err1)	0.00 ... 100.0 %	10.00 %	☆/T	0A0E
FA-15	*PID Gain2 Err2* (PID parameter switch err2)	0.00 ... 100.0 %	40.00 %	☆/T	0A0F
FA-16	*Rev After Start sec* (Allowable PID reversal delay)	0.0 ... 999.9 s	0.0 s	☆	0A10
FA-17	*PID Reserve* (PID direction change selection)	0 = Disable 1 = Enable	0	☆	0A11
FA-18	*FBK Slope* (Feedback inhibition deviation rate)	0 ... 100 %	10 %	☆	0A12
FA-19	*FBK Slope Gain* (Feedback inhibition gain)	0 ... 1000	800	☆	0A13
FA-20	*PID Offset Way* (PID compensation selection)	0 = Parameter setting 1 = Analog input	0	☆	0A14
FA-21	*PID Offset* (PID compensation value)	-99.9 ... 99.9	0.0	☆	0A15
FA-22	*PID out Band* (PID dead zone limit)	0.0 ... 99.99 %	0.06 %	☆	0A16
FA-23	*PID Hold by Err %* (PID control deviation limit)	0.0 ... 99.99 %	0.00 %	☆	0A17
FA-24	*I Gain Disable* (Integral separation level)	0.0 ... 99.99 %	0.00 %	☆	0A18
FA-25	*Up Limit for I* (Integral upper limit)	0.0 ... 100.0 %	100.0 %	☆/T	0A19
FA-26	*I Limit for Wake%* (Wake-up integral limit)	0.0 ... 200.0 %	50.0 %	☆	0A1A
FA-27	*AUX PID REV* (Main-auxiliary inversion cut-off frequency)	0.00 ... 100.0 %	10.0 %	☆	0A1B
FA-28	*PID Out-Limit % %* (PID output forward limit)	0.0 ... 100.0 %	100.0 %	☆	0A1C
FA-29	*PID Neg.Out Limit%%* (PID output reverse limit)	0.0 ... 100.0 %	100.0 %	☆	0A1D
FA-30	*PID Base SEL* (PID output frequency reference)	0 = PID control output 100.00 % corresponds to the maximum output frequency F4-02 1 = PID control output 100.00 % corresponds to auxiliary frequency	0	☆	0A1E
FA-31	*PID Out-Filter* (PID output filtering time)	0.0 ... 2.5 s	0.0 s	☆	0A1F
FA-32	*PID Enable Level%* (Soft start-PID switching value)	0.00 ... 99.99 %	5.00 %	☆	0A20
FA-33	*Smart Start Freq Hz* (Soft start frequency)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	0A21
FA-34	*Smart Start Acc sec* (Soft start acceleration time)	0.00 ... 600.0 s	3.00 s	☆/T	0A22
FA-35	*Emp Reel Current A* (No-load current)	0.00 ... 655.3 A	0.00 A	☆/T	0A23
FA-36	*SmSt Acc Adjust sec* (Soft start acceleration step)	0.00 ... 600.0 s	0.10 s	☆/T	0A24

Parameter group *FA: PID Control*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
FA-37	*Reserved*	-	-	-	*0A25*
FA-38	*Reserved*	-	-	-	*0A26*
FA-39	*Reserved*	-	-	-	*0A27*
FA-40	*Reserved*	-	-	-	*0A28*
FA-41	*Reserved*	-	-	-	*0A29*
FA-42	*Reserved*	-	-	-	*0A2A*
FA-43	*Reserved*	-	-	-	*0A2B*
FA-44	*Reserved*	-	-	-	*0A2C*
FA-45	*Reserved*	-	-	-	*0A2D*
FA-46	*Reserved*	-	-	-	*0A2E*
FA-47	*Reserved*	-	-	-	*0A2F*
FA-48	*Reserved*	-	-	-	*0A30*
FA-49	*FBK Detec Time sec* (Feedback anomaly detection time)	0.0 ... 999.9 s	0.0 s	☆	0A31
FA-50	*PID FBK Loss* (Feedback disconnection action selection)	0 = Warn and continue running 1 = Warning and decelerate to stop 2 = Warning and free stop 3 = Operate at the frequency before disconnection	0	☆	0A32
FA-51	*PID DEV. Level* (PID feedback abnormal deviation)	1.0 ... 50.0 %	10.0 %	☆	0A33
FA-52	*PID DEV. Time* (Deviation anomaly detection time)	0.1 ... 300.0 s	5.0 s	☆	0A34
FA-53	*PID CTRL BIT* (PID control flag)	***0000 ... FFFF*** (Hexadecimal)	0002	☆	0A35

Tab. 5-15 Parameter list – FA: PID Control

FD: MULTI-SPEED FUNCTION

PARAMETER LIST

Parameter group *FD: Multi-Speed Function*					
Function code	**Parameter name**	**Setting range**	**Default setting**	**Change ability**	**Comm. address**
FD-00	*Multi-speed 0*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D00
FD-01	*Multi-speed 1*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D01
FD-02	*Multi-speed 2*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D02
FD-03	*Multi-speed 3*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D03
FD-04	*Multi-speed 4*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D04
FD-05	*Multi-speed 5*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D05
FD-06	*Multi-speed 6*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D06
FD-07	*Multi-speed 7*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D07
FD-08	*Multi-speed 8*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D08
FD-09	*Multi-speed 9*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D09
FD-10	*Multi-speed 10*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D0A
FD-11	*Multi-speed 11*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D0B
FD-12	*Multi-speed 12*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D0C
FD-13	*Multi-speed 13*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D0D
FD-14	*Multi-speed 14*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D0E

Parameter group *FD: Multi-Speed Function*					
Function code	**Parameter name**	**Setting range**	**Default setting**	**Change ability**	**Comm. address**
FD-15	*Multi-speed 15*	-100.0 ... 100.0 Hz	0.00 Hz	☆/T	0D0F

Tab. 5-16 Parameter list – FD: Multi-Speed & Simple PLC Function

U0: FAULT RECORDER

PARAMETER LIST

Parameter group *U0: Fault Recorder*					
Function code	**Physical quantity name**	**Setting range/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
U0-00	*1st Fault Record*	0 ... 6553	0	●	1000
U0-01	*2nd Fault Record*	0 ... 6553	0	●	1001
U0-02	*3rd Fault Record*	0 ... 6553	0	●	1002
U0-03	*4th Fault Record*	0 ... 6553	0	●	1003
U0-04	*5th Fault Record*	0 ... 6553	0	●	1004
U0-05	*6th Fault Record*	0 ... 6553	0	●	1005
U0-06	*7th Fault Record*	0 ... 6553	0	●	1006
U0-07	*8th Fault Record*	0 ... 6553	0	●	1007
U0-08	*9th Fault Record*	0 ... 6553	0	●	1008
U0-09	*10th Fault Record*	0 ... 6553	0	●	1009
U0-10	*Fault Option 1* (Fault output 1)	0 ... 9999	0	☆	100A
U0-11	*Fault Option 2* (Fault output 2)	0 ... 9999	0	☆	100B
U0-12	*Fault Option 3* (Fault output 3)	0 ... 9999	0	☆	100C
U0-13	*Fault Option 4* (Fault output 4)	0 ... 9999	0	☆	100D
U0-14	*RPM of Motor REC rpm* (Fault 1-Motor speed)	-32767 ... 32767 rpm	0 rpm	●	100E
U0-15	*Reserved*	-	-	-	*100F*
U0-16	*MI Status REC.* (Fault 1-Input terminal)	0 ... 6553	0	●	1010
U0-17	*MI Status REC.* (Fault 1-Output terminal)	0 ... 6553	0	●	1011
U0-18	*INV Status REC.* (Fault 1-VFD status)	0 ... 6553	0	●	1012
U0-19	*CMD FREQ REC* (Fault 1-Frequency command Hz)	0.00 ... 655.3 Hz	0.00 Hz	●	1013
U0-20	*Out FREQ REC* (Fault 1-Output frequency)	0.00 ... 599.0 Hz	0.00 Hz	●/T	1014
U0-21	*Out Voltage REC V* (Fault 1-Output voltage)	0.0 ... 6553 V	0.0 V	●	1015
U0-22	*DCBus Value REC Vdc* (Fault 1-DC voltage)	0.0 ... 6553 V	0.0 V	●	1016
U0-23	*Isum Value REC* (Fault 1-Output current)	0.00 ... 655.3 A	0.00 A	●	1017
U0-24	*IGBT Temp REC* (Fault 1-IGBT temperature)	-3276.7 ... 3276.7 ℃	0.0 °C	●	1018
U0-25	*Reserved*	-	-	-	*1019*
U0-26	*Out FREQ REC 2*	0.00 ... 599.0 Hz	0.00 Hz	●/T	101A

Parameter group *U0: Fault Recorder*					
Function code	**Physical quantity name**	**Setting range/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
	(Fault 2-Output frequency)				
U0-27	*DCBus Value REC 2 Vdc* (Fault 2-DC voltage)	0.0 ... 6553 V	0.0 V	●	101B
U0-28	*Isum Value REC 2 A* (Fault 2-Output current)	0.00 ... 655.3 A	0.00 A	●	101C
U0-29	*IGBT Temp REC 2 °C* (Fault 2-IGBT temperature)	-3276.7 ... 3276.7 °C	0.0 °C	●	101D
U0-30	*Out FREQ REC 3* (Fault 3-Output frequency)	0.00 ... 599.0 Hz	0.00 Hz	●/T	101E
U0-31	*DCBus Value REC 3 Vdc* (Fault 3 - DC voltage)	0.0 ... 6553 V	0.0 V	●	101F
U0-32	*Isum Value REC 3 A* (Fault 3-Output current)	0.00 ... 655.3 A	0.00 A	●	1020
U0-33	*IGBT Temp REC 3 °C* (Fault 3-IGBT temperature)	-3276.7 ... 3276.7 °C	0.0 °C	●	1021
U0-34	*Out FREQ REC 4* (Fault 4-Output frequency)	0.00 ... 599.0 Hz	0.00 Hz	●/T	1022
U0-35	*DCBus Value REC 4 Vdc* (Fault 4 - DC voltage)	0.0 ... 6553 V	0.0 V	●	1023
U0-36	*Isum Value REC 4 A* (Fault 4-Output current)	0.00 ... 655.3 A	0.00 A	●	1024
U0-37	*IGBT Temp REC 4 °C* (Fault 4-IGBT temperature)	-3276.7 ... 3276.7 °C	0.0 °C	●	1025
U0-38	*Out FREQ REC 5* (Fault 5-Output frequency)	0.00 ... 599.0 Hz	0.00 Hz	●/T	1026
U0-39	*DCBus Value REC 5 Vdc* (Fault 5-DC voltage)	0.0V ... 6553 V	0.0 V	●	1027
U0-40	*Isum Value REC 5 A* (Fault 5-Output current)	0.00 ... 655.3 A	0.00 A	●	1028
U0-41	*IGBT Temp REC 5 °C* (Fault 5-IGBT temperature)	-3276.7 ... 3276.7 °C	0.0 °C	●	1029
U0-42	*Out FREQ REC 6* (Fault 6-Output frequency)	0.00 ... 599.0 Hz	0.00 Hz	●/T	102A
U0-43	*DCBus Value REC 6 Vdc* (Fault 6-DC voltage)	0.0 ... 6553 V	0.0 V	●	102B
U0-44	*Isum Value REC 6 A* (Fault 6-Output current)	0.00 ... 655.3 A	0.00 A	●	102C
U0-45	*IGBT Temp REC 6 °C* (Fault 6-IGBT temperature)	-3276.7 ... 3276.7 °C	0.0 °C	●	102D
U0-46	*Error REC 1 Day day* (Days since Fault 1 occurred)	0 ... 6553	0	●/T	102E
U0-47	*Error REC 1 Min min* (Minutes since Fault 1 occurred)	0 ... 1439	0	●	102F
U0-48	*Error REC 2 Day day* (Days since Fault 2 occurred)	0 ... 6553	0	●/T	1030
U0-49	*Error REC 2Min min* (Minutes since Fault 2 occurred)	0 ... 1439	0	●	1031
U0-50	*Error REC 3 Day day* (Days since Fault 3 occurred)	0 ... 6553	0	●/T	1032
U0-51	*Error REC 3 Min min* (Minutes since Fault 3 occurred)	0 ... 1439	0	●	1033
U0-52	*Error REC 4 Day day* (Days since Fault 4 occurred)	0 ... 6553	0	●/T	1034
U0-53	*Error REC 4 Min min*	0 ... 1439	0	●	1035

Parameter group *U0: Fault Recorder*					
Function code	**Physical quantity name**	**Setting range/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
	(Minutes since Fault 4 occurred)				
U0-54	*Error REC 5 Day day* (Days since Fault 5 occurred)	0 ... 6553	0	●/T	1036
U0-55	*Error REC 5 Min min* (Minutes since Fault 5 occurred)	0 ... 1439	0	●	1037
U0-56	*Error REC 6 Day day* (Days since Fault 6 occurred)	0 ... 6553	0	●/T	1038
U0-57	*Error REC 6 Min min* (Minutes since Fault 6 occurred)	0 ... 1439	0	●	1039

Tab. 5-17 Parameter list – U0: Fault Recorder

U1: STATUS MONITORING

PARAMETER LIST

Parameter group *U1: Status Monitoring*					
Function code	**Physical quantity name**	**Setting range/Measuring range**	**Default setting**	**Change ability**	**Comm. address**
U1-00	*DIx Status* (DI terminal status)	0 ... 6553	0	●	1100
U1-01	*RLY Status* (RLY terminal status)	0 ... 6553	8	●	1101
U1-02	*Freq Cmd* (Frequency command (read-only))	0.00 ... 599.0 Hz	50.00 Hz	●/T	1102
U1-03	*EXT Speed REC* (External frequency record)	00.00 ... 599.0 Hz	50.00 Hz	●/T	1103
U1-04	*PID Fbk Value* (PID feedback value)	-200.00 ... 200.00	0.00	●/T	1104
U1-05	*P Gain Monitor* (KP gain monitoring value)	0.00 ... 99.99%	0.00%	●	1105
U1-06	*I Gain Monitor* (KI gain monitoring value)	0.00 ... 100.0s	0.00s	●/T	1106
U1-07	*D Gain Monitor* (KD gain monitoring value)	0.00 ... 1.00	0.00	●	1107
U1-08	*Reserved*	-	-	-	1108
U1-09	*Reserved*	-	-	-	1109
...	...	...	...	...	...
U1-50	*Reserved*	-	-	-	-

Tab. 5-18 Parameter list – U1: Status Monitoring 17

L1: CUSTOMIZATION CODE

PARAMETER LIST

Parameter group ***L1: Customization Code***					
Function code	**Parameter name**	**Setting options**	**Default setting**	**Change ability**	**Comm. address**
L1-00	*Hand FREQ Source* (Frequency source selection (HAND))	0 = Numerical keypad 1 = RS485 communication 2 = Analog input 3 = External Up/Down input 4 = *Reserved* 5 = *Reserved* 6 = CANopen input 7 = Keypad VR setting 8 = *Reserved* 9 = PID	0	★	1700
L1-01	*Hand OPER Source* (Run command source (HAND))	0 = Numerical keypad 1 = External terminal input 2 = RS485 communication input 3 = CANopen input 4 = *Reserved* 5 = *Reserved*	0	★	1701
L1-02	*LOC/REM SEL* (LOC/REM action selection)	0 = Standard HOA operation 1 = L/R do not maintain state 2 = Maintain REM state 3 = Maintain LOC state 4 = Maintain REM/LOC state	0	★	1702

Tab. 5-19 Parameter list – L1: Customization Code

L2: OPTIMIZATION CONTROL PARAMETERS

PARAMETER LIST

Parameter group *L2: Optimization Control Parameters*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
L2-00	*Reserved*	-	-	-	*1800*
L2-01	*Reserved*	-	-	-	*1801*
L2-02	*Reserved*	-	-	-	*1802*
L2-03	*Reserved*	-	-	-	*1803*
L2-04	*Reserved*	-	-	-	*1804*
L2-05	*Reserved*	-	-	-	*1805*
L2-06	*Reserved*	-	-	-	*1806*
L2-07	*Reserved*	-	-	-	*1807*
L2-08	*Reserved*	-	-	-	*1808*
L2-09	*Reserved*	-	-	-	*1809*
L2-10	*Reserved*	-	-	-	*180A*
L2-11	*Reserved*	-	-	-	*180B*
L2-12	*Reserved*	-	-	-	*180C*
L2-13	*Reserved*	-	-	-	*180D*
L2-14	*Reserved*	-	-	-	*180E*
L2-15	*Reserved*	-	-	-	*180F*
L2-16	*Reserved*	-	-	-	*1810*
L2-17	*Brake res open V Vdc* (Braking resistor activation voltage)	350.0 ... 450.0 V (1~) 700.0 ... 900.0 V (3~)	370.0 V (1~) / 740.0 V (3~)	☆	1811
L2-18	*Low Voltage* (Under voltage protection value)	150.0 ... 220.0 V (1~) 250.0 ... 440.0 V (3~)	180.0 V (1~) / 360.0 V (3~)	☆	1812
L2-19	*Select Zero SPD* (Zero speed operation selection)	0 = Await output 1 = Zero speed position control output 2 = Output at minimum frequency	0	★	1813
L2-20	*Reserved*	-	-	-	*1814*
L2-21	*Reserved*	-	-	-	*1815*
L2-22	*Reserved*	-	-	-	*1816*
L2-23	*OverModuation Idx* (Overmodulation gain)	80 ... 120	100	☆	1817

Tab. 5-20 Parameter list – L2: Optimization Control Parameters

L4: HOLDING BRAKE FUNCTION

PARAMETER LIST

Parameter group *L4: Holding Brake Function*					
Function code	**Parameter name**	**Setting range**	**Default setting**	**Change ability**	**Comm. address**
L4-00	*Braking Freq* (Braking frequency)	0.00 ... 599.0 Hz	0.00	☆/T	1A00

Tab. 5-21 Parameter list – L4: Holding Brake Function

L5: SLEEP/WAKE-UP FUNCTION

PARAMETER LIST

Parameter group *L5: **Sleep/Wake-Up Function***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
L5-00	*Source of Sleep* (Sleep mode reference selection)	0 = PID command reached 1 = PID feedback reached	0	★	1B00
L5-01	*Sleep Point* (Sleep threshold)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	1B01
L5-02	*Wake Point* (Wake threshold)	0.00 ... 599.0 Hz	0.00 Hz	☆/T	1B02
L5-03	*Sleep Time* (Sleep delay)	0.0 ... 999.9 s	0.0 s	☆	1B03
L5-04	*Wake Delay Time sec* (Wake delay)	0.00 ... 600.0 s	0.00 s	☆/T	1B04

Tab. 5-22 Parameter list – L5: Sleep/Wake-Up Function

L6: COUNTERS

PARAMETER LIST

Parameter group ***L6: Counters***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
L6-00	*Final Counter* (Final count value setting)	0 ... 9999	0	☆/T	1C00
L6-01	*Middle Counter* (Intermediate count value setting)	0 ... 9999	0	☆/T	1C01
L6-02	*Count EF enable* (Count reached EF enable)	0 = Count arrival, no external fault (EF) 1 = Count arrival, external fault (EF)	0	☆	1C02

Tab. 5-23 Parameter list – L6: Swing Frequency & Fixed length, and Counting

L7: AI MULTI-POINT CURVE SETTING

PARAMETER LIST

Parameter group ***L7: AI Multi-Point Curve Setting***					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
L7-00	*AI curve select* (AI curve selection)	0 = General curve 1 = AI1 three-point curve 2 = *Reserved* 3 = *Reserved* 4 = *Reserved* 5 = *Reserved* 6 = *Reserved* 7 = *Reserved*	0	☆	1D00
L7-01	*AI1 Low Point* (AI1 lowest input value)	0.00 ... 20.00	0.00	☆	1D01
L7-02	*AI1 Low%* (AI1 lowest percentage)	0.00 ... 100.0 %	0.00 %	☆/T	1D02
L7-03	*AI1 Mid Point* (AI1 mid-point input value)	0.00 ... 20.00	5.00	☆	1D03
L7-04	*AI1 Mid%* (AI1 mid-point percentage)	0.00 ... 100.0 %	50.00 %	☆/T	1D04
L7-05	*AI1 High Point*	0.00 ... 20.00	10.00	☆	1D05

Parameter group *L7: AI Multi-Point Curve Setting*					
Function code	**Parameter name**	**Setting range/Setting options**	**Default setting**	**Change ability**	**Comm. address**
	(AI1 highest input value)				
L7-06	*AI1 High%* (AI1 highest percentage)	0.00 ... 100.0 %	100.0 %	☆/T	1D06

Tab. 5-24 Parameter list – L7: AI Multi-Point Curve Setting

6 COMMISSIONING

Before starting the VFD, some necessary steps, including installation, wiring, and basic checks, need to be completed to ensure the drive meets the starting conditions. Different control modes have different commissioning procedures. The commissioning procedures for VF and VVC control modes are described as follows.

6.1 ASYNCHRONOUS MOTOR VF AND VVC CONTROL

Both VF control and VVC control can drive asynchronous motors, and their commissioning methods are almost identical. This section will introduce them together. The relevant parameters for commissioning asynchronous motors with VF and VVC are listed in the following table.

Function code	Parameter name	Setting value/Setting option	Default setting	Change ability	Comm. address
Parameter group *F4: Motor Parameters*					
F4-03	*Motor1 F base* (M1 rated frequency)	0.00 ... 599.0 Hz	50.00 Hz	★/T	0403
F4-04	*M1 VOLT Base* (M1 rated voltage)	0.0 ... 255.0 V (1~) 0.0 ... 510.0 V (3~)	220.0 V)1~) / 380.0 V (3~)	★	0404
Parameter group *F2: V/F Control Parameters 02*					
F2-04	*M1 Min Out FREQ Hz* (M1 multi-point VF frequency point 1)	0.00 ... 599.0 Hz	0.50 Hz	★/T	0204
F2-05	*M1 Min Out VOLT V* (M1 multi-point VF voltage point 1)	0.0 ... 240.0 V (1~) 0.0 ... 460.0 V (3~)	11.0 V (1~) / 22.0 V (3~)	★	0205
F2-06	*M1 Mul VF FREQ 2Hz* (M1 multi-point VF frequency point 2)	0.00 ... 599.0 Hz	1.50 Hz	★/T	0206
F2-07	*M1 Mul VF VOLT 2V* (M1 multi-point VF voltage point 2)	0.0 ... 240.0 V (1~) 0.0 ... 460.0 V (3~)	5.0 V (1~) / 10.0 V (3~)	★	0207
F2-08	*M1 Mul VF FREQ 3Hz* (M1 multi-point VF frequency point 3)	0.00 ... 599.0 Hz	3.00 Hz	★/T	0208
F2-09	*M1 Mul VF VOLT 3V* (M1 multi-point VF voltage point 3)	0.0 ... 240.0 V (1~) 0.0 ... 460.0 V (3~)	11.0 V (1~) / 22.0 V (3~)	★	0209
F2-10	*Slip COMP Filter sec* (Slip compensation filter time)	0.001 ... 9.999 s	0.100 s	☆	020A
F2-11	*Slip COMP Gain* Slip compensation gain)	0.00 ... 10.00	0.00	☆	020B
F2-14	*Gen Slip Comp GA* (Generating torque compensation gain)	0.00 ... 1.00	1.00	☆	020C
Parameter group *F7: Auxiliary Functions and Keypad Display*					
F7-37	*Auto Voltage REG* (Automatic voltage regulation)	0 = Activate AVR function 1 = Cancel AVR function 2 = Cancel AVR during deceleration	0	☆	0725

Tab. 6-1 Parameters for asynchronous motor VF and VVC commissioning

6.1.1 BASIC SETTINGS

The basic settings for commissioning asynchronous motors with VF and VVC primarily include setting the:

- *motor nameplate parameters*.

Generally, motor parameter identification is not needed.

CHAPTER REFERENCE

The setup process is shown in the "Annex" as a flow chart: "Figure 2 Basic setting process for VF and VVC of induction (asynchronous) Motors (IM)".

Basic setting steps for VF and VVC are according to the following instruction.

INSTRUCTION – Basic Settings for VF and VVC

START *USER LEVEL: Keypad Unlock*

PARAMETER RESET **STEP 1:** Set parameter *F0-18 Parameter reset = 9*.

- The VFD parameters can be restored to factory settings.

MOTOR TYPE SELECTION **STEP 2:** Set Parameter *F4-00 Motor Type Selection = 0*.

- Setting option "0" is for induction motors.

NAME PLATE PARAMETER SETTING **STEP 3:** Set the *motor parameters* according to the actual motor nameplate parameters as shown in the following table.

Function code	Parameter name	Setting value/Setting option	Default setting	Change ability	Comm. address
Parameter group *F4: Motor Parameters*					
F4-00	*Motor Type Sel* (Motor type selection)	0 = Induction motor	0	★	0400
F4-03	*Motor1 F base* (M1 rated frequency)	0.00 ... 599.0 Hz	50.00 Hz	★/T	0403
F4-04	*M1 VOLT Base* (M1 rated voltage)	0.0 ... 255.0 V (1~) 0.0 ... 510.0 V (3~)	220.0 V)1~) / 380.0 V (3~)	★	0404
F4-05	*Motor1 Rated P* (IM1 rated power)	0.00 ... 655.3 kW	Machine type Determination 2.20 kW	★/T	0405
F4-06	*Motor1 Poles* (IM1 number of motor poles; automatically calculated)	2 ... 20	Machine type Determination 4	★	0406
F4-07	*Motor1 Rated A* (IM1 rated current)	0.00 ... 655.3 A	Machine type Determination 11 A	★/T	0407
F4-08	*Motor1 Rated* (IM1 rated speed)	0 ... 9999 rpm	Machine type Determination 1410 rpm	★/T	0408

Tab. 6-2 Motor nameplate parameters

CONTROL MODE **STEP 4:** Set the control mode to VF or VVC; set *F0-03 Control Method = 0* for *speed mode* and setting *F0-04 Velocity mode = 0* will set the control mode to *VF control*.

- If F0-*04 Velocity mode = 2*, it will be VVC for an asynchronous motor.

END

6.1.2 NO-LOAD COMMISSIONING

After completing the basic settings, *no-load debugging* can be performed. Control the motor to run at different frequencies, and if the motor vibrates, increase setting of parameter *F2-14 Oscillation Suppression Gain*.

6.1.3 FULL-LOAD COMMISSIONING

After no-load commissioning, proceed with *load commissioning*. If the motor's load capacity is insufficient, try increasing *F2-01 Torque compensation gain*.

Under full load, if the actual motor speed is lower than the set speed, try increasing *F2-11 Slip Compensation Gain*.
Conversely, if the actual motor speed is higher than the set speed, try reducing *F2-11 Slip Compensation Gain*.

7 MAINTENANCE

WARNING

Danger due to electric shock!

After switching off the mains supply, dangerous voltage can still be present in the H1 VFD unit.

- *Do not* perform troubleshooting and maintenance on the H1 VFD with power on.
- Ensure you power off the H1 VFD before opening the cabinet door and follow all lock-out/ tag-out safety procedures.
- Apply the five safety rules of electrical engineering (see *Five rules of electrical engineering*).
- Always switch the mains voltage off if it is necessary to open the H1 VFD unit and wait at least 10 minutes to allow the capacitors to discharge.
- Always check the DC-link voltage or wait one hour after the mains voltage has been switched off, before dismantling the H1 VFD unit for maintenance, inspection, or repair.
- Only qualified electrical maintenance personnel should perform maintenance, inspection, or replacement of parts.

The H1 VFD is designed to require minimum of servicing and maintenance. There are however some things which must be checked regularly to optimise product lifetime.

- Keep the H1 unit clean and cooling efficient (clean air inlets, heatsink profile, parts, components, etc.)
- There is an internal fan that should be inspected and cleaned from dust if necessary.
- If H1 VFD is built into cabinets, also check, and clean the dust filters of the cabinets regularly.
- Check external wiring, connections, and control signals.
- Check tightening of all terminal screws regularly, especially important are power and motor cable connections.

Preventive maintenance can optimise the product lifetime and secure trouble-free operation without interruptions.
For more information on maintenance, please contact your AuCom service partner.

PRECAUTIONS TO TAKE WITH A CONNECTED MOTOR

NOTE

Refer to motor manufacturers instruction manual for motor maintenance requirements.

If work must be carried out on a connected motor or on the driven machine, the mains voltage must always first be disconnected from the H1 unit.

8 TROUBLESHOOTING

WARNING

Danger due to electric shock!

After switching off the mains supply, dangerous voltage can still be present in the H1 VFD.

- *Do not* perform troubleshooting and maintenance on the H1 VFD with power on.
- Ensure you power off the H1 VFD before opening the cabinet door and follow all lock-out/ tag-out safety procedures.
- Apply the five safety rules of electrical engineering (see *Five rules of electrical engineering*).
- Always switch the mains voltage off if it is necessary to open the H1 VFD and wait at least 10 minutes to allow the capacitors to discharge.
- Always check the DC-link voltage or wait one hour after the mains voltage has been switched off, before dismantling the H1 VFD for maintenance, inspection, or repair.
- Only qualified electrical maintenance personnel should perform maintenance, inspection, or replacement of parts.

8.1 ALARM EVENTS – CAUSES AND REMEDIES

For some errors that have a minor impact on the system, the VFD only issues a warning and continues to operate, while displaying the warning name and corresponding warning code on the LCD panel.
Once the warning reset conditions are met, the warning is automatically cleared, and the motor operates normally. Warning codes and corresponding warning handling are shown in Tab. 8-1 Alarm events – Causes and remedy.

Use this table to troubleshoot when the VFD reports an *alarm* event.

Alarm code	Alarm message	Description	Possible cause	Reset method and conditions
A001	*Communication command error*	RS485 Modbus, illegal communication command	1. Communication command sent by the host computer is incorrect. 2. Misoperation due to interference and differing communication conditions with the host machine. 3. Communication cable disconnected or poorly connected.	*Reset:* • When parameter F8-05 is set to 0 for "warning" and continues to operate, the warning is *automatically* reset after receiving the correct communication command.
A002	*Communication address error*	RS485 Modbus, illegal communication data address		
A003	*Communication data error*	RS485 Modbus, illegal communication data value		
A004	*VFD unable to handle*	RS485 Modbus, writing data to a read-only address		
A005	*Communication transmission timeout*	RS485 Modbus, transmission timeout	1. The host did not send the communication command within the time set by parameter F8-04 2. Misoperation due to interference 3. Communication conditions differ from those of the host machine 4. Communication cable is disconnected or poorly connected.	*Reset:* • When parameter F8-05 is set to 0 for "warning" and continues operation, it's considered a "warning", which is *automatically* reset after receiving the next communication packet.
A007	*Parameter copy error 1*	Keypad to Drive COPY function error warning 1	1. Check if new parameters have been added to the VFD software. 2. Misoperation due to interference.	*Reset:* • *Manual* reset is required.
A008	*Parameter copy error 2*	Keypad to Drive COPY function error warning 2		

Alarm code	Alarm message	Description	Possible cause	Reset method and conditions
A009	*IGBT overheating Warning*	The VFD detects an IGBT overheat occurrence that is beyond the IGBT overheat warning threshold (overheat temperature: - 5 = 95-5 = 90℃).	1. Check if the on-site environment or temperature inside the control cabinet is too high, or if the ventilation holes of the cabinet are blocked. 2. Check for foreign objects on the heatsink, and whether the fan is rotating. 3. Insufficient ventilation space for the VFD 4. Check if the load matches the VFD 5. Long time operation at 100% or more than 100% rated output.	*Reset:* • The warning is *automatically* reset when the IGBT temperature falls below 85°C.
A011	*PID feedback signal warning*	PID feedback signal loss warning (applicable to analog feedback signals, requires PID function to be enabled)	1. PID feedback wiring loose or disconnected. 2. Feedback device fault 3. Hardware fault.	*Reset:* • When parameter FA-50 is set to 0 or 3, it's considered a "warning". Warning is *automatically* cleared when the feedback signal exceeds 4 mA. • When parameter FA-50 is set to 1 or 2, it's considered a "fault" and requires *manual* reset.
A012	*AI current signal disconnection*	Warning A012 is issued, when 4-20mA disconnection action (parameter F5-42) is set to 1 or 2, any one of the analog input terminals AI1, AI2, or AI1 is of the 4-20mA current signal type, and the analog input function is non-zero, the input current signal at that terminal falls below the 4-20mA disconnection threshold (parameter F5-43).	Analog input current signal is disconnection	*Reset:* • Warning is *automatically* cleared when disconnection warning conditions are not met.
A013	*Low current warning*	If the actual current value is detected to be lower than the threshold (F9-22) and F9-24 is set to 3, an A013 warning is reported.	1. The output line to the motor is disconnected 2. Incorrect protection setting 3. Current detection anomaly	
A019	*Input phase loss*	VFD input phase loss	1. Input power phase loss occurred. 2. Single-phase power input in a three-phase machine type. 3. Power supply voltage fluctuated. 4. Loose terminals of the input power supply. 5. Check if the input cables of the three-phase power supply have been cut. 6. Unbalanced three-phase input power supply.	*Reset*: • A018 warning is automatically cleared after the machine is stopped.

Alarm code	Alarm message	Description	Possible cause	Reset method and conditions
A020	*Over-torque*	Over-torque warning	1. Incorrect parameter setting. 2. Fault on the mechanical side. 3. Excessive load 4. Acceleration/deceleration and duty cycle time too short 5. Voltage too high in V/F control 6. Motor capacity too small 7. Overload during low-speed operation 8. Torque compensation amount too large 9. Inappropriate setting of speed tracking function parameters (including situations of instant power-off restart and abnormal restart).	*Reset:* • A020 warning is *automatically* cleared when the output current is less than the set value of parameter F9-37.
A022	*Motor Overheating*	Motor overheating	1. Motor jam 2. Excessive load 3. High ambient temperature 4. The motor's cooling system/fan is malfunctioning. 5. Frequent use in low-speed operation; 6. Acceleration/ deceleration time and duty cycle time too short 7. Voltage too high in V/F control. 8. Check if the motor's rated current setting matches the motor nameplate 9. Check if the PTC-related settings and wiring are appropriate. 10. Check if the stall prevention action setting is correct. 11. Imbalance in motor three-phase impedance 12. Excessive harmonic components.	*Reset:* • When parameter F9-48 is set to 0 for "warning", A022 warning is *automatically* cleared when the temperature is less than or equal to the set value of parameter F9-49.
A024	*Excessive slip*	Using the maximum slip (parameter F2-13) as a baseline, when the VFD's output is steady, and either F > H or F < H exceeds the threshold of parameter F9-25 and lasts longer than the set time of parameter F9-26, A024 warning occurs.	1. Verify if the motor parameters are correct. 2. Excessive load 3. Check if the set values of parameters F9-25, F9-26, and F2-13 are appropriate.	*Reset:* • When parameter F9-27 is set to 0 for "warning", the A024 warning is *automatically* cleared when the VFD's output is steady, and the deviation between the setting speed and actual speed no longer exceeds the set value of parameter F9-25.
A028	*Output phase loss warning*	VFD output phase loss	1. Imbalance in the three-phase impedance of the motor 2. Issues with wiring 3. The motor is a single-phase motor 4. Fault in the current sensor 5. VFD capacity significantly exceeds motor capacity.	*Reset:* • When parameter F9-15 is set to 0, the A028 warning is *automatically* cleared after the VFD stops.
A030	*Different model parameter copy error*	Keypad to Drive COPY function error warning 3	Copying parameters to an VFD of a different model.	*Reset:* • *Manual* reset is required.

Alarm code	Alarm message	Description	Possible cause	Reset method and conditions
A031	*Over-torque*	Over-torque 3 warning	1. Incorrect parameter setting 2. Mechanical side failure (e.g., over torque, mechanical lock-up, etc.) 3. Excessive load 4. Acceleration/ deceleration time or duty cycle time too short 5. Voltage too high in V/F control 6. Motor capacity too small 7. Overload during low-speed operation; 8. Torque compensation amount too large 9. Improper setting of speed tracking function parameter 10. (Including situations of momentary power outage restart and abnormal restart).	*Reset:* • A031 warning is *automatically* cleared when the output current is less than the set value of parameter H3-06.
A032	*Over-torque*	Over-torque 4 warning	Same as above	*Reset:* • A032 warning is *automatically* cleared when the output current is less than the set value of parameter H3-11.
A036	*CGd_Fault Canopen Guarding Time out*	CANopen software disconnection 1	1. Communication timeout duration set too short. 2. Misoperation due to interference.	*Reset:* • A *manual* reset signal sent from the host is required.
A037	*CHb_Fault Canopen Heartbeat Time out*	CANopen software disconnection 2	1. Communication timeout duration set too short. 2. Misoperation due to interference 3. Communication cable disconnected or poorly connected.	
A039	*CANopen hardware disconnection*	CAN BUS hardware disconnection	1. Verify if the communication format is correct. 2. Misoperation due to Interference 3. Communication cable disconnected or poorly connected.	*Reset:* • A *manual* reset is required: power off and then power on again.
A040	*CANopen index error*	CANopen communication index error	Incorrect setting of communication index	*Reset:* • A *manual* reset signal sent from the host is required.
A041	*CANopen node ID error*	CANopen node ID error (only supports 1–127)	Incorrect setting of communication node ID	*Reset:* • When parameter *F0-18 Parameter Reset* is set to 7 (*Reset CAN Slave*), a *manual* reset is required and can be done immediately.
A042	*CANopen memory error*	CANopen memory error	CANopen internal memory error	
A043	*CANopen SDO transmission timeout*	SDO transmission timeout (warning occurs only at the master station)	1. Slave station not connected. 2. Sync cycle set too short. 3. Misoperation due to interference 4. Communication cable is disconnected or poorly connected.	*Reset:* • A043 warning is *automatically* cleared when the master station re-sends an SDO and gets a response.
A044	*CANopen SDO reception overflow*	CANopen internal stack buffer overflow	Host sends too many SDOs at once	*Reset:* • A *manual* reset signal sent from the host is required.
A045	*CANopen startup error*	CANopen startup error warning	1. Severe hardware interference 2. Communication speed set incorrectly 3. Communication card not connected or loosely connected.	*Reset:* • A *manual* reset is required: Turn off CANopen, power off and then power on again.

Alarm code	Alarm message	Description	Possible cause	Reset method and conditions
A046	*CANopen format error*	CANopen protocol error	Host sends incorrect communication packets.	*Reset:* • A *manual* reset signal sent from the host is required.

Tab. 8-1 Alarm events – Causes and remedy

8.2 FAULT EVENTS – CAUSES AND REMEDIES

If a fault occurs during the operation of the system, the VFD will immediately stop outputting to protect the motor from further damage. Simultaneously, the VFD will trigger the corresponding fault relay contact and display the fault code on the control panel for rapid problem diagnosis. There are respective fault types and common solutions corresponding to each fault code, which can be found in "Tab. 8-2 Fault events – Causes and remedy".

Please note that the information listed in the following table is for reference only and should not be altered arbitrarily. If you are unable to resolve the problem, please contact our technical support or product agent for assistance.

Use this table to troubleshoot when the VFD reports a *fault* event.

Fault code	Fault message	Description	Possible cause	Reset method and conditions
E001	*Overcurrent during acceleration*	During acceleration, the output current exceeds the VFD's overcurrent threshold. When E001 occurs, the VFD immediately stops output, and the motor will coast to a stop.	1. The set acceleration time is too short. 2. Check if poor insulation in the motor wiring is causing a short circuit in the output. 3. Inspect the motor for burnout or insulation aging. 4. The torque compensation amount is too large. 5. The load is too heavy. 6. The V/F curve setting is abnormal. 7. Hardware failure.	*Reset:* • A *manual* reset is possible only after the error has cleared for at least 5 seconds.
E002	*Overcurrent during deceleration*	During deceleration or stopping, the output current exceeds the VFD's overcurrent threshold. When E002 occurs, the VFD immediately stops output, and the motor will coast to a stop.		
E003	*Overcurrent during constant speed*	During the constant speed operation, the output current exceeds the VFD's overcurrent threshold. When E003 occurs, the VFD immediately stops output, and the motor will coast to a stop.		
E006	*Overcurrent during stopping*	Overcurrent or hardware circuit anomaly occurs during stopping. After E006 occurs, power off and then power on. If there is a hardware issue, E033, E034, or E035 will appear.	1. Misoperation due to interference 2. Hardware failure	
E007	*Overvoltage during acceleration*	During acceleration, the VFD detects excessive bus voltage. When E007 occurs, the VFD immediately stops output, and the motor will coast to a stop.	1. The acceleration is too low (e.g., when accelerating with a lifting load downwards) 2. Check if the stall prevention action setting is less than the no-load current. 3. The power supply voltage is too high. 4. There is an operation of leading phase capacitors within the same power supply system. 5. The motor is in a power generation state. 6. The acceleration time is too short. 7. The motor experiences a ground short circuit.	*Reset:* • A *manual* reset is possible only when the bus voltage falls below approximately 90% of the overvoltage threshold (405/810V).

Fault code	Fault message	Description	Possible cause	Reset method and conditions
			8. Incorrect wiring of the braking resistor or braking unit 9. Misoperation due to interference.	
E008	*Overvoltage during deceleration*	During deceleration, the VFD detects excessive bus voltage. When E008 occurs, the VFD immediately stops output, and the motor will coast to a stop.	1. The deceleration time is too short, causing excessive regenerative energy from the load. 2. Check if the stall prevention action setting is less than the no-load current. 3. The power supply voltage is too high. 4. There is an operation of leading phase capacitors within the same power supply system. 5. The motor is in a power generation state. 6. The deceleration time is too short. 7. The motor experiences a ground short circuit. 8. Incorrect wiring of the braking resistor or braking unit 9. Misoperation due to interference.	
E009	*Overvoltage during constant speed*	During constant speed operation, the VFD detects excessive bus voltage. When E009 occurs, the VFD immediately stops output, and the motor will coast to a stop.	1. Rapid load changes 2. Check if the stall prevention action setting is less than the no-load current. 3. The power supply voltage is too high. 4. There is an operation of leading phase capacitors within the same power supply system. 5. The motor is in a power generation state. 6. The motor experiences a ground short circuit. 7. Incorrect wiring of the braking resistor or braking unit 8. Misoperation due to interference.	
E010	*Overvoltage during stopping*	Overvoltage occurs when the VFD is stopping.	1. Power supply voltage too high 2. Operation of leading phase capacitors within the same power supply system 3. Incorrect wiring of the braking resistor or braking unit 4. Hardware failure (voltage sampling circuit anomaly) 5. The motor experiences a ground short circuit.	
E011	*Undervoltage during acceleration*	During acceleration, the VFD detects the bus voltage is lower than the value set in parameter L2-18.	1. Power outage occurred. 2. Power supply voltage fluctuated. 3. Check if there is a large capacity motor starting. 4. Excessive load 5. Shared DC bus 6. Check if a DC reactor has been added.	*Reset:* • A *manual* reset is possible only when the bus voltage is higher than the set value of parameter *L2-18 Low Voltage* + 60 V.
E012	*Undervoltage during deceleration*	During deceleration, the VFD detects the bus voltage is lower than the value set in parameter L2-18.		
E013	*Undervoltage during constant speed*	During constant speed, the VFD detects the bus voltage is lower than the value set in parameter L2-18.		

Fault code	Fault message	Description	Possible cause	Reset method and conditions
E014	*Undervoltage during stopping*	During stopping, the VFD detects the bus voltage is lower than the value set in parameter L2-18.		
E015	*Input phase loss protection*	Power supply input phase loss protection.	1. Input power phase loss occurred. 2. Single-phase power input in a three-phase machine type 3. Power supply voltage fluctuations 4. Loose terminals of the input power supply 5. Check if the input cables of the three-phase power supply have been cut. 6. Unbalanced three-phase input power supply.	*Reset:* • *Manual* reset is required.
E016	*IGBT overtemperature*	The VFD detects an excessively high IGBT temperature, exceeding 95°C.	1. Check if the on-site environment or temperature inside the control cabinet is too high, or if the ventilation holes of the cabinet are blocked. 2. Check for foreign objects on the heatsink, and whether the fan is rotating. 3. Insufficient ventilation space for the VFD 4. Check if the load matches the VFD. 5. Operating for a long time at 100% or more than 100% of the rated output.	*Reset:* • A *manual* reset is possible only the IGBT temperature drops below 85°C.
E021	*VFD overload*	The output current exceeds the VFD's current capacity, rated at 150% for 1 minute.	1. Excessive load 2. Acceleration/deceleration time and duty cycle time too short 3. Voltage too high in V/F control 4. VFD capacity too small 5. Overload occurring during low-speed operation 6. Torque compensation amount too large 7. Check if the stall prevention action setting is correct. 8. Output phase loss 9. Speed tracking function parameter setting is inappropriate.	*Reset:* • A *manual* reset is possible only after the error has cleared for at least 5 seconds.

Fault code	Fault message	Description	Possible cause	Reset method and conditions
E022	*Motor 1 overload protection*	Motor 1 overload protection is activated, after which, the motor will coast to a stop.	1. Excessive load 2. Acceleration/deceleration time and duty cycle time too short 3. When using a motor specifically designed for VFDs, set parameter *F9-01 Thermal RLY SEL* (motor 1 overload protection) = *0 (Inverter Motor)* for constant torque output motor. 4. Incorrect action value for motor overload 5. The set value for the maximum motor frequency is too low. 6. Driving multiple motors with one VFD 7. Check if the stall prevention action setting is correct. 8. Torque compensation amount too large 9. Motor fan not operating normally. 10. Three-phase impedance imbalance in the motor.	*Reset:* • A *manual* reset is possible only after the error has cleared for at least 5 seconds.
E024	*Motor overheating*	Motor PTC over-temperature warning. When the motor is installed with PTC and this function is activated (parameter *F5-21/27/33 = 6* thermistor PTC input), if the PTC input is higher than the set value in parameter F9-49, it will be handled according to the setting in parameter F9-48.	1. Motor jam 2. Excessive load 3. High ambient temperature 4. The motor's cooling system/fan is malfunctioning. 5. Frequent use in low-speed operation 6. Acceleration/deceleration time and duty cycle time too short 7. Voltage too high in V/F control 8. Check if the setting of the motor's rated current matches the motor nameplate. 9. Check if the PTC-related settings and wiring are appropriate. 10. Check if the stall prevention action setting is correct. 11. Three-phase impedance imbalance in the motor 12. Excessive harmonic components.	Parameter *F9-48 PTC Treatments* setting options: 0: Warning and continue running 1: Fault and decelerate to stop 2: Fault and coast to stop 3: No warning *Reset:* • When parameter F9-48 is set to 0, it's a warning and the message will *automatically* reset when the temperature falls below the set value in parameter F9-49. • When Parameter F9-48 is set to 1 or 2, it's a fault and requires *manual* reset and can be done immediately.
E026	*Over torque*	When the output current exceeds the torque detection value F9-37, and it lasts longer than the over-torque detection time set in parameter F9-38, E026 will be displayed if parameter F9-36 is set to 2 or 4.	1. Incorrect parameter setting 2. Fault on the mechanical side 3. Excessive load 4. Acceleration/deceleration time or duty cycle time too short 5. Voltage too high in V/F control 6. Motor capacity too small 7. Overload during low speed operation 8. Torque compensation amount too large 9. Inappropriate setting of speed tracking function parameters (including situations of instant power-off restart and abnormal restart).	Parameter *F9-36 Over TQC1 Method* setting options: 0: Detection disabled 1: Over-torque detection during constant speed operation, continue running 2: Over-torque detection during constant speed operation and stop running 3: Over-torque detection during operation, continue running 4: Over-torque detection during operation and stop running *Reset:* • When parameter F9-36 is set to 1 or 3, it will *automatically* clear when the output current is less

Fault code	Fault message	Description	Possible cause	Reset method and conditions
				than Parameter F9-36. • When parameter F9-36 is set to 2 or 4, *manual* reset is required and can be done immediately.
E028	*Low current*	Detection of low current condition	1. Motor cable disconnection 2. Inappropriate setting of the low current protection function 3. Excessively low load.	Parameter *F9-24 Under AMP TREAT* setting options: 0: No function 1: Error and free stop 2: Error with stop based on the second deceleration time 3: Warning and continue operation. *Reset:* • Parameter F9-24 set to 3 indicates a "warning". The fault message is *automatically* cleared when the output current exceeds parameter F9-22 + 0.1 A. • For setting 1 or 2 of parameter F9-24, indicating a "fault", a *manual* reset is required and can be done immediately.
E031	*Memory readout anomaly*	Abnormal EEPROM data readout from memory	Abnormal EEPROM data readout from memory	*Reset:* • A *manual* reset is required and can be done immediately.
E036 E037	*cc hardware circuit anomaly* *oc hardware circuit anomaly*	At power-on, the VFD's cc hardware protection circuit is abnormal. At power-on, the VFD's oc hardware protection circuit is abnormal.	Hardware fault	Power-off required
E041	*PID disconnection*	PID feedback error	1. Check if the analog feedback value is abnormal. 2. Verify if the negative feedback type is set correctly. 3. PID deviation threshold set too low, causing false alarms.	Parameter *FA-50 PID FBK Loss* setting options (feedback signal disconnection handling): 0: Warn and continue running 1: Fault and decelerate to stop 2: Fault and free stop 3: Warning and running at the frequency before disconnection.
E048	*AI current signal disconnection*	When the 4-20mA disconnection action (parameter F5-42) is set to 3, and any one of the AI analog input terminals is of the 4-20mA current signal type, with the analog input function set to non-zero, if the input current signal at that terminal falls below the 4-20mA disconnection threshold (parameter F5-43), fault E048 is reported.	Analog input current signal is disconnection	*Reset:* • A *manual* reset is possible when disconnection fault conditions are not met.
E049	*External faults*	External fault, the VFD decelerates according to the setting of parameter F1-23.	DI terminal function = 10 (External fault), and the signal is valid	Parameter *F1-23 EF Stop Select* setting options: 0: Stop with free run 1: According to the first deceleration time 2: According to the second deceleration time 3: According to the third deceleration time

Fault code	Fault message	Description	Possible cause	Reset method and conditions
				4: According to the fourth deceleration time 5: System deceleration (according to the original deceleration time) 6: Automatic deceleration Manual reset required *Reset:* • A *manual* reset is possible only after the external fault has cleared.
E050	*External terminal emergency stop*	When the DI terminal function is set to "external fault free stop", if the terminal signal is valid, the VFD immediately stops output, and the motor comes to a free stop.	DI terminal function = *28 (External fault free stop)*, and the signal is valid	*Reset:* • A *manual* reset is possible only after the "External Fault Free Stop" signal has cleared.
E051	*External interrupt*	When the DI terminal function is set to "Gate Block", the VFD immediately stops output, and the motor comes to a free stop.	DI terminal function = *11 (Gate Block)*, and the signal is valid.	*Reset:* • The fault message is automatically cleared after the "Gate Block signal" disappears.
E052	*Password entered incorrectly four times*	Password decoding failed three consecutive times	Parameter F7-33 password entry error	*Reset:* • A *manual* reset is required after power-off.
E054	*Illegal communication command*	Illegal communication command	1. Communication command sent by the host computer is incorrect. 2. Misoperation due to interference 3. Communication conditions differ from those of the host machine. 4. Communication cable is disconnected or poorly connected.	Parameter *F8-05 MODBUS Fault Way* setting options (Communication error handling methods): 0: Warning and continue running 1: Error and decelerate to stop. 2: Warning and free stop 3: No warning and continue operation *Reset:* • A *manual* reset is required and can be done immediately.
E055	*Illegal communication address*	Illegal communication data address		
E056	*Communication data error*	Illegal communication data value		
E057	*Communication writing to read-only address*	Writing data to a read-only address		
E058	*Modbus transmission timeout*	Modbus transmission timeout	1. The host computer failed to transmit the communication command within the time set by parameter F8-04. 2. Misoperation due to interference 3. Communication conditions differ from those of the host machine. 4. Communication cable is disconnected or poorly connected.	
E062	*Deceleration regenerative braking action*	As long as parameter F1-34 is not zero, and a power glitch or outage causes the bus voltage to drop below the deceleration regenerative braking action threshold, the deceleration regenerative braking function activates, initiating motor deceleration and stopping, during which fault E062 is displayed.	1. Unstable power supply or power outage 2. Other large loads starting in the power system.	Parameter *F1-34 dEb Decel SEL* setting options: 0: Disable 1: Don't Return. 2: Return *Reset:* • When parameter F1-34 is set to 2, the fault message is *automatically* cleared after power is restored. • When parameter F1-34 is set to 1, after the VFD decelerates to 0Hz, the fault message can be

Fault code	Fault message	Description	Possible cause	Reset method and conditions
				manually reset.
E063	*Excessive slip*	Slip anomaly, using the maximum slip (parameter F2-13) as a reference. When the VFD's output is steady, and the deviation between the given speed and actual speed exceeds the set value of parameter F9-25, and this deviation lasts longer than the set time of parameter F9-26, fault E063 occurs. Fault E063 only occurs when driving an induction motor.	1. Verify if the motor parameters are correct. 2. Excessive load 3. Check if the set values of parameters F9-25, F9-26, and F2-13 are appropriate.	Parameter *F9-27 Over Slip Way* setting options: 0: Warning and continue running 1: Error and decelerate to stop. 2: Warning and free stop 3: No warning *Reset:* • When parameter F9-27 is set to 0 for "warning," and when the VFD's output is steady, and the deviation between the given speed and actual speed no longer exceeds the set value of parameter "*F9-25 Slip Deviation L%*", the fault message is *automatically* cleared. • When parameter F9-27 is set to 1 or 2 for "fault", a *manual* reset is required.
E064	*Please reset the machine type code*	Machine type code is incorrectly set	Machine type code is incorrectly set	Set parameter *F0-00 Product identity code* according to the VFD specification sheet
E066	*Software-incurred overcurrent*		1. The set acceleration time is too short. 2. Check if poor insulation in the motor wiring is causing a short circuit in the output. 3. Inspect the motor for burnout or insulation aging. 4. The torque compensation amount is too large. 5. The load is too heavy. 6. The V/F curve setting is abnormal. 7. Hardware failure.	*Reset:* • A *manual* reset is possible only after the error has cleared for at least 5 seconds.
E079	*U phase overcurrent*	U-phase short circuit detected before VFD operation	1. Incorrect motor wiring 2. Output short circuit caused by poor insulation of motor wiring. 3. Inspect the motor for burnout or insulation aging. 4. Misoperation due to interference 5. Longer motor cable wiring length 6. Hardware fault.	*Reset:* • A *manual* reset is possible only after the error has cleared for at least 5 seconds.
E080	*V phase overcurrent*	V-phase short circuit detected before VFD operation		
E081	*W phase overcurrent*	W-phase short circuit detected before VFD operation		
E082	*U-phase output phase loss*	U-phase output phase loss	1. Imbalance in the three-phase impedance of the motor 2. Issues with wiring 3. The motor is a single-phase motor. 4. Fault in the current sensor 5. VFD capacity significantly exceeds motor capacity.	Parameter *"F9-15 Out-PHL Act sel"* setting options: 0: Warning and continue running 1: Error and decelerate to stop 2: Error and free stop 3: No warning *Reset:* • A *manual* reset is required and can be done immediately.
E083	*V phase output phase loss*	V phase output phase loss		
E084	*W phase output phase loss*	W phase output phase loss		
E087	*Low frequency overload protection*	Load close to the limit of the power module	Power module overload	*Reset:* • A *manual* reset is required and can be done immediately.
E141	*Pre-operation grounding fault*	Ground short circuit detected during output	1. Incorrect motor wiring 2. Output short circuit caused by poor	*Reset:* • A *manual* reset is possible only

Fault code	Fault message	Description	Possible cause	Reset method and conditions
		wiring detection before VFD operation.	insulation of motor wiring. 3. Inspect the motor for burnout or insulation aging. 4. Misoperation due to interference 5. Longer motor cable wiring length 6. Hardware fault.	after the condition has cleared for at least 5 seconds.

Tab. 8-2 Fault events – Causes and remedy

9 DISPOSAL

If the H1 VFD is decommissioned permanently, observe the following preparatory measures for the proper and environmentally friendly disposal of the product.

DISMANTLING AND SCRAPPING

The enclosures of the drives are made from recyclable material as aluminium, iron, and plastic. Each drive contains several components demanding special treatment, for example electrolytic capacitors. The circuit boards contain small amounts of tin and lead. Any local or national regulations in force for the disposal and recycling of these materials must be complied with.

SAFETY INSTRUCTIONS

Always follow the safety instructions in chapter *Safety* when carrying out any work.

ELECTRICAL AND ELECTRONIC COMPONENTS

DISPOSAL NOTE

- Assemblies of the H1 VFD containing electrical or electronic components must be disposed of in accordance with *Directive 2012/19/EU*.
- *Non-EU countries:* Waste electrical equipment must be disposed of in accordance with the locally applicable legal regulations.
- Never dispose of old electrical appliances with household waste.

REACH-REGULATION

Information on article 33

The following substance of very high concern on the REACH Candidate List of 14 June 2023 is present in this product at a concentration of more than 0.1 % by weight:

- Lead; CAS number: 7439-92-1; EC number: 231-100-4

According to the current state of knowledge, it can be assumed that the above-mentioned substance does not pose a risk if this product is used and disposed of as intended.

NON-ELECTRICAL COMPONENTS

Assemblies of the H1 VFD that do not contain electrical components, such as control cabinet equipment, control cabinet enclosures, cabinet doors, etc., must be disposed of in accordance with local regulations. For this purpose, contact your recycling partner or the local authorities.

PACKAGING

The materials used for the packaging of the H1 VFD, such as wood, PVC, and plastic, are recyclable. Contact your recycling partner or local authorities for more information.

10 SPARE PARTS

The use of spare parts and accessories not specified by AuCom may result in material damage to the product.

- You must only use spare parts and accessories specified and approved by AuCom.

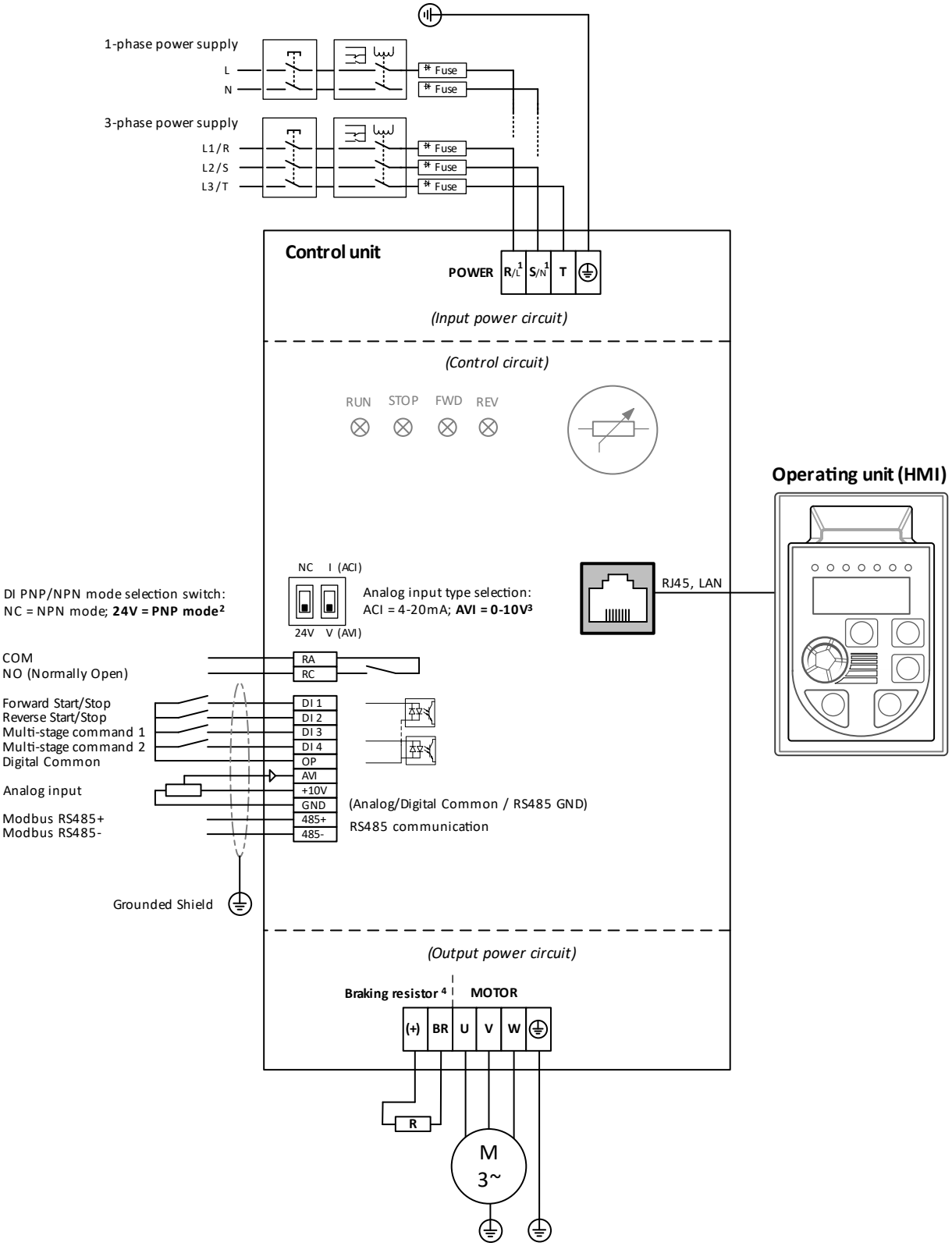
ORDERING INFORMATION

For H1 packages a range of spare parts and accessories are available for the H1 product.

For orders, contact AuCom MCS GmbH & Co. KG or your local supplier.
(For the ordering contact details, see chapter "Introduction" in this manual)

ANNEX

ELECTRICAL WIRING – H1 LV-MD CONNECTION DIAGRAM



1 R/L and T/N: 1-phase connection terminals.
2 Default wiring method: PNP mode without external power supply.
3 Default analog input type setting: 24V (AVI).
4 FS1 and FS2 models do not offer braking resistor terminals.

Figure 1 H1 Series – LV-MD connection diagram

COMMISSIONING OF IM MOTORS, VF AND VVC – BASIC SETTING PROCESS

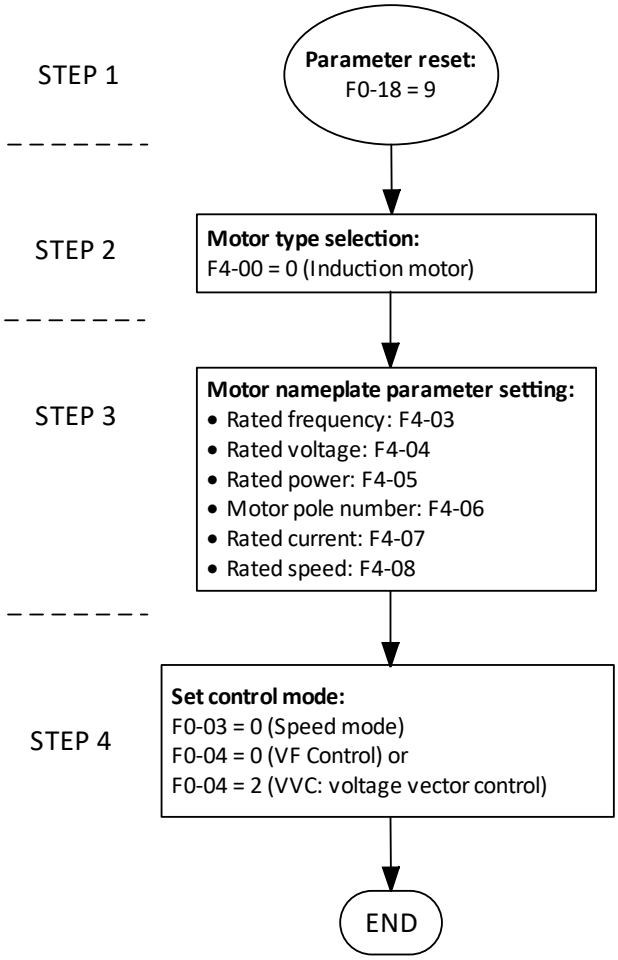


Figure 2 Basic setting process for VF and VVC of induction (asynchronous) Motors (IM)

CHAPTER REFERENCE

For detailed instruction, refer to chapter "6.1.1 Basic settings".

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RIGHT FROM THE START

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