

## VARMECA 30

Variable speed motor or geared motor

Extended functions

# VARMECA 30

## Variable speed motor or geared motor

### NOTE

LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.



### CAUTION

For the user's own safety, this variable speed drive must be connected to an approved earth (  $\perp$  terminal).

If accidentally starting the installation is likely to cause a risk to personnel or the machines being driven, it is essential to supply the equipment via a circuit-breaking device (power contactor) which can be controlled via an external safety system (emergency stop, detection of errors on the installation).

The variable speed drive is fitted with safety devices which, in the event of a fault, control stopping and thus stop the motor. The motor itself can become jammed for mechanical reasons. Voltage fluctuations, and in particular power cuts, may also cause the motor to stop.

The removal of the causes of the shutdown can lead to restarting, which may be dangerous for certain machines or installations. In such cases, it is essential that the user takes appropriate precautions against the motor restarting after an unscheduled stop.

The variable speed drive is designed to be able to supply a motor and the driven machine above its rated speed. If the motor or the machine are not mechanically designed to withstand such speeds, the user may be exposed to serious danger resulting from their mechanical deterioration. Before programming a high speed, it is important that the user checks that the installation can withstand it.

The variable speed drive which is the subject of this manual is designed to be integrated in an installation or an electrical machine, and can under no circumstances be considered to be a safety device. It is therefore the responsibility of the machine manufacturer, the designer of the installation or the user to take all necessary precautions to ensure that the system complies with current standards, and to provide any devices required to ensure the safety of equipment and personnel.

Using the drive for hoisting: when using this application, it is essential to follow the special instructions in an application-specific manual which is available on request. It is the responsibility of the user to obtain this manual from his usual LEROY-SOMER contact.

**LEROY-SOMER declines all responsibility in the event of the above recommendations not being observed.**

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Manual corresponding to software versions higher than or equal to 3.10

# VARMECA 30

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### SAFETY AND OPERATING INSTRUCTIONS FOR VARIABLE SPEED DRIVES

(In accordance with the low voltage directive 73/23/EEC modified by 93/68/EEC)

 • Throughout the manual, this symbol warns of consequences which may arise from inappropriate use of the drive, since electrical risks may lead to material or physical damage as well as constituting a fire hazard.

#### 1 - General

Depending on their degree of protection, the variable speed drives may contain unprotected live parts, which may be moving or rotating, as well as hot surfaces, during operation. Unjustified removal of protection devices, incorrect use, faulty installation or inappropriate operation could represent a serious risk to personnel and equipment.

For further information, consult the manual.

All work relating to transportation, installation, commissioning and maintenance must be performed by experienced, qualified personnel (see IEC 364 or CENELEC HD 384, or DIN VDE 0100 and national specifications for installation and accident prevention).

In these basic safety instructions, qualified personnel means persons competent to install, mount, commission and operate the product and possessing the relevant qualifications.

#### 2 - Use

Variable speed drives are components designed for integration in installations or electrical machines.

When integrated in a machine, commissioning must not take place until it has been verified that the machine conforms with directive 89/392/EEC (Machinery Directive). It is also necessary to comply with standard EN 60204, which stipulates in particular that electrical actuators (which include variable speed drives) cannot be considered as circuit-breaking devices and certainly not as isolating switches.

Commissioning can take place only if the requirements of the Electromagnetic Compatibility Directive (89/336/EEC, modified by 92/31/EEC) are met.

The variable speed drives meet the requirements of the Low Voltage Directive 73/23/EEC, modified by 93/68/EEC. The harmonised standards of the DIN VDE 0160 series in connection with standard VDE 0660, part 500 and EN 60146/VDE 0558 are also applicable.

The technical characteristics and instructions concerning the connection conditions specified on the nameplate and in the documentation provided must be observed without fail.

#### 3 - Transportation, storage

All instructions concerning transportation, storage and correct handling must be observed.

The climatic conditions specified in the technical manual must be observed.

#### 4 - Installation

The installation and cooling of equipment must comply with the specifications in the manual supplied with the product.

The variable speed drives must be protected against any excessive stress. In particular, there must be no damage to parts and/or modification of the clearance between components during transportation and handling. Avoid touching the electronic components and contact parts.

The variable speed drives contain parts which are sensitive to electrostatic stresses and may be easily damaged if handled incorrectly. Electrical components must not be exposed to mechanical damage or destruction (risks to health!).

#### 5 - Electrical connection

When work is performed on variable speed drives which are powered up, the national accident prevention regulations must be observed.

The electrical installation must comply with the relevant specifications (for example conductor cross-sections, protection via fused circuit-breaker, connection of protective conductor). More detailed information is given in the manual. Instructions for an installation which meets the requirements for electromagnetic compatibility, such as screening, earthing, presence of filters and correct insertion of cables and conductors, are given in the documentation supplied with the variable speed drives. These instructions must be followed in all cases, even if the variable speed drive carries the CE mark. Adherence to the limits given in the EMC legislation is the responsibility of the manufacturer of the installation or the machine.

#### 6 - Operation

Installations in which variable speed drives are to be integrated must be fitted with additional protection and monitoring devices as laid down in the current relevant safety regulations, such as the law on technical equipment, accident prevention regulations, etc. Modifications to the variable speed drives using control software are permitted.

Active parts of the device and the live power connections must not be touched immediately after the variable speed drive is powered down, as the capacitors may still be charged. In view of this, the warnings fixed to the variable speed drives must be observed.

During operation, all doors and protective covers must be kept closed.

#### 7 - Servicing and maintenance

Refer to the manufacturer's documentation.

**This manual is to be given to the end user.**

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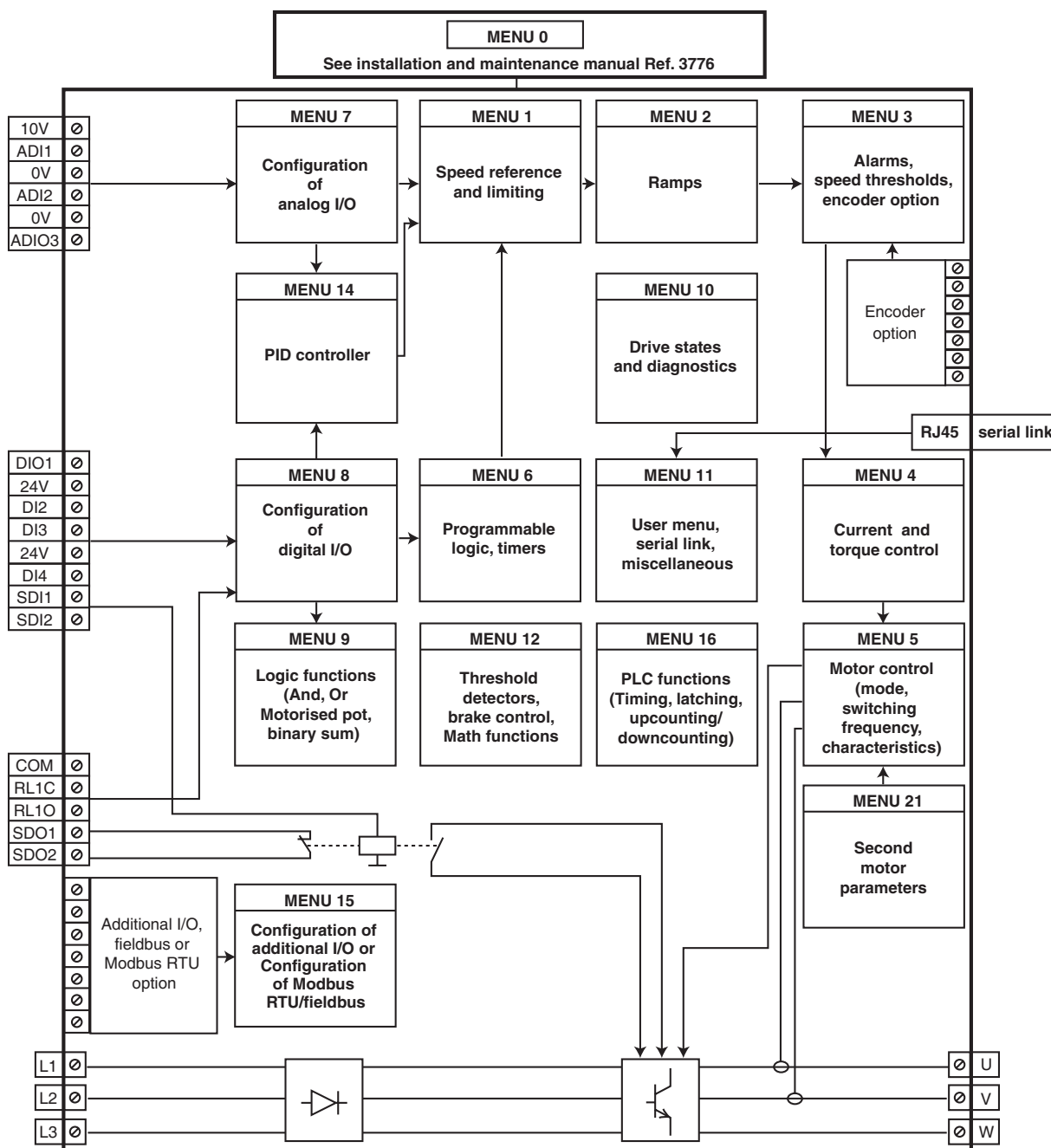
## Variable speed motor or geared motor

### FOREWORD

### CAUTION

- This is the technical manual complementing installation and maintenance manual ref. 3776.
- Before setting the drive parameters, it is essential to have strictly observed all instructions relating to installation, connection and commissioning of the drive contained in document ref. 3776.

### MENU ORGANISATION




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## Variable speed motor or geared motor

**Explanation of symbols used in this document.**

**1.06** : A shadowed number in bold refers to a parameter.

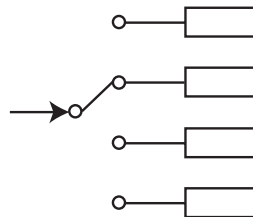
 : Refers to a drive input or output terminal.

**1.21** : Parameters which appear in a rectangle or identified R-W are parameters with Read and Write access.

They can be designated as an assignment destination for connection to:

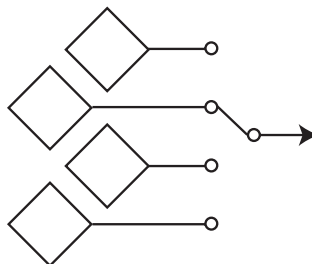
- digital inputs for bit parameters
- analog inputs for non-bit parameters
- outputs of internal functions (threshold detectors, logical or arithmetical operations, etc.)

Parameters identified R-W/P cannot be assigned.



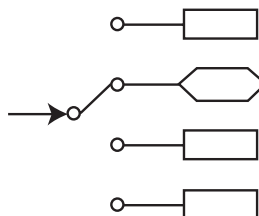
**1.01** : Parameters which appear in a diamond or identified RO/P are parameters with Read Only access which are write-protected. They are used to provide information concerning operation of the drive and can be designated as an assignment source for connection to:

- digital outputs for bit parameters
- analog outputs for non-bit parameters
- inputs of internal functions (threshold detectors, logical or arithmetical operations, etc.)





**1.36** : Parameters which appear in a hexagon or identified by R-A are parameters which can only be assigned to:

- digital inputs for bit parameters
- analog inputs for non-bit parameters



**0 (Inactive) (OFF):** The values of "bit" parameters can correspond to a value 0, 1, 2, etc. via the serial link, to a mnemonic of up to 32 characters using the PX-LCD console, or to a mnemonic of 4 characters maximum using the drive display. These values and labels are given for each parameter concerned.

 : Indicates a parameter used when the drive is configured in open loop Flux Vector Control mode or U/F.

 : Indicates a parameter used when the drive is configured in closed loop Flux Vector Control mode.

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### Notes

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MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

### 1 - MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

#### 1.1 - List of parameters in Menu 1

Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>1.01</b>	Frequency/speed reference selected	RO/P	$\pm 1.06$	-	-
<b>1.02</b>	Pre-skip filter reference	RO/P	$\pm 1.06$ or <b>1.07</b> to <b>1.06</b>	-	-
<b>1.03</b>	Pre-ramp reference	RO/P	$\pm 1.06$ or <b>1.07</b> to <b>1.06</b>	-	-
<b>1.04</b>	Reference offset	R-W	$\pm 1.06$	0	
<b>1.05</b>	Jog reference	R-W	0 to 16000 min <sup>-1</sup>	45 min <sup>-1</sup>	
<b>1.06</b>	Maximum reference clamp	R-W	0 to 32000 min <sup>-1</sup>	Eur: 1500 min <sup>-1</sup> USA: 1800 min <sup>-1</sup>	
<b>1.07</b>	Minimum reference clamp	R-W	0 to <b>1.06</b>	0	
<b>1.08</b>	Not used				
<b>1.09</b>	Reference offset select	R-W	0 or 1	0	
<b>1.10</b>	Bipolar reference enable	R-W	0 or 1	0	
<b>1.11</b>	Reference enabled indicator	RO/P	0 or 1	-	-
<b>1.12</b>	Reverse selected indicator	RO/P	0 or 1	-	-
<b>1.13</b>	Jog selected indicator	RO/P	0 or 1	-	-
<b>1.14</b>	Reference selector	R-W	0 to 4	1	
<b>1.15</b>	Preset selector	R-W	0 to 9	0	
<b>1.16</b>	Preset reference selector timer	R-W	0 to 9999 s	0	
<b>1.17</b>	Keypad control mode reference	R-W		0	-
<b>1.18</b> to <b>1.20</b>	Not used				
<b>1.21</b> to <b>1.28</b>	Preset reference 1 to Preset reference 8	R-W	$\pm 1.06$	0	
<b>1.29</b>	Skip reference 1	R-W	0 to $\pm 1.06$ min <sup>-1</sup>	0	
<b>1.30</b>	Skip reference band 1	R-W	0 to 300 min <sup>-1</sup>	15 min <sup>-1</sup>	
<b>1.31</b>	Skip reference 2	R-W	0 to $\pm 1.06$ min <sup>-1</sup>	0	
<b>1.32</b>	Skip reference band 2	R-W	0 to 300 min <sup>-1</sup>	15 min <sup>-1</sup>	
<b>1.33</b> and <b>1.34</b>	Not used				
<b>1.35</b>	Reference in rejection zone	RO/P	0 or 1	-	-
<b>1.36</b>	Analog reference 1	R-A	<b>1.07</b> to <b>1.06</b> ( <b>1.10</b> = 0) $\pm 1.06$ ( <b>1.10</b> = 1)	-	-
<b>1.37</b>	Analog reference 2	R-A	<b>1.07</b> to <b>1.06</b> ( <b>1.10</b> = 0) $\pm 1.06$ ( <b>1.10</b> = 1)	-	-
<b>1.38</b>	Percentage trim	R-W	$\pm 100.0\%$	0	
<b>1.39</b> and <b>1.40</b>	Not used				
<b>1.41</b> and <b>1.42</b>	Reference select	R-A	0 or 1	-	-
<b>1.43</b> and <b>1.44</b>	Not used				
<b>1.45</b> to <b>1.47</b>	Preset reference select	R-A	0 or 1	-	-
<b>1.48</b>	Reference timer reset flag	R-W	0 or 1	0	

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MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>1.49</b>	Selected reference indicator	RO/P	1 to 4	-	-
<b>1.50</b>	Selected preset reference indicator	RO/P	1 to 8	-	-
<b>1.51</b>	Power-up keypad control mode reference	R-W	0 to 2	0	
<b>1.52</b> to <b>1.59</b>	Not used				
<b>1.60</b>	Pre-offset reference	RO	$\pm 1.06$	-	-
<b>1.61</b> to <b>1.68</b>	Not used				
<b>1.69</b>	Number of scanned references	R-W	1 to 8	8	-
<b>1.70</b>	Scan time selection	R-W	0 or 1	0	-
<b>1.71</b>	RP1 time	R-W	0 to 9999 s	0	-
<b>1.72</b>	RP2 time	R-W	0 to 9999 s	0	-
<b>1.73</b>	RP3 time	R-W	0 to 9999 s	0	-
<b>1.74</b>	RP4 time	R-W	0 to 9999 s	0	-
<b>1.75</b>	RP5 time	R-W	0 to 9999 s	0	-
<b>1.76</b>	RP6 time	R-W	0 to 9999 s	0	-
<b>1.77</b>	RP7 time	R-W	0 to 9999 s	0	-
<b>1.78</b>	RP8 time	R-W	0 to 9999 s	0	-

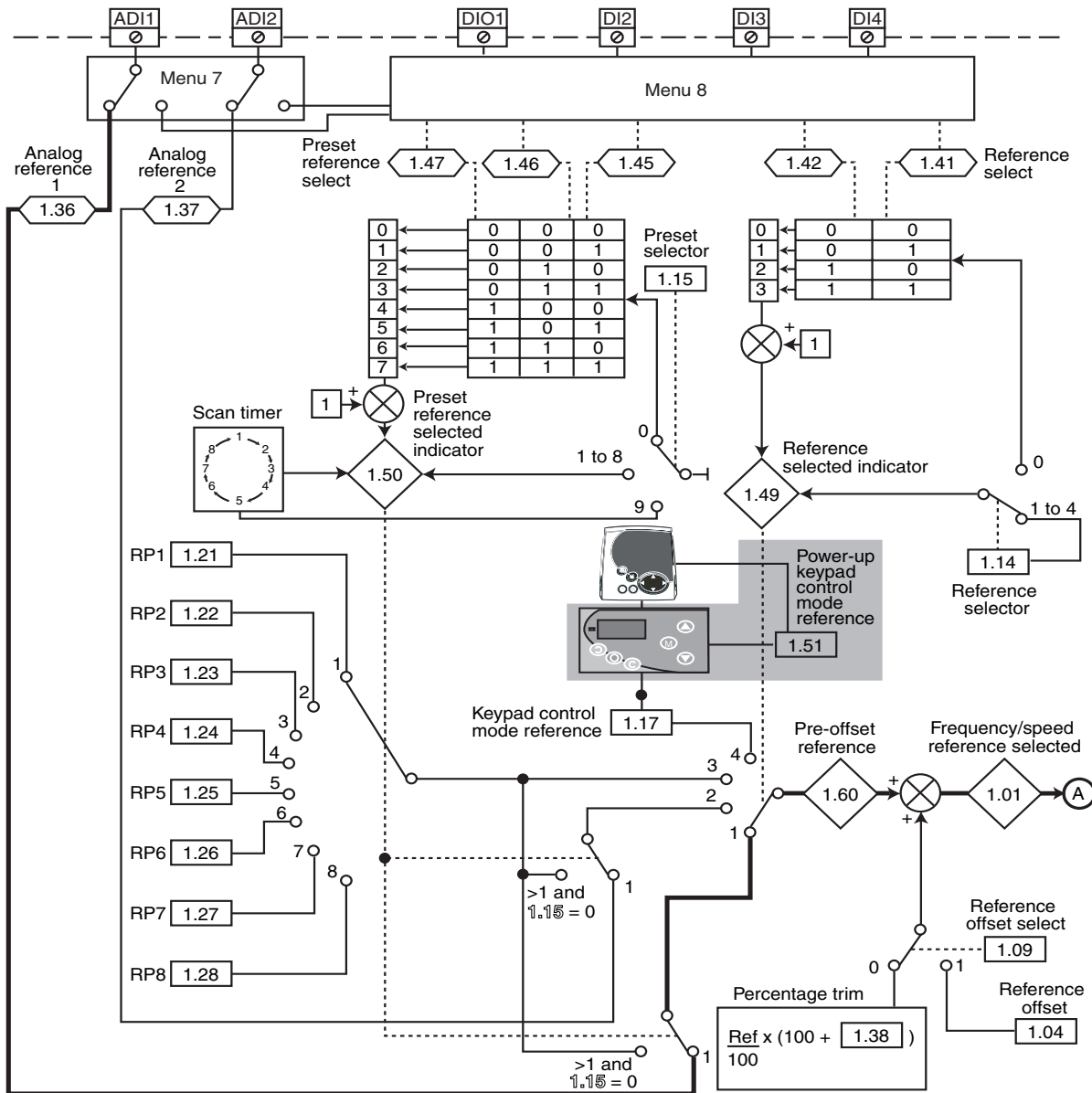
VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

### 1.2 - Menu 1 diagram

#### 1.2.1 - Selection of reference (speed)



**Scan timer parameter settings**

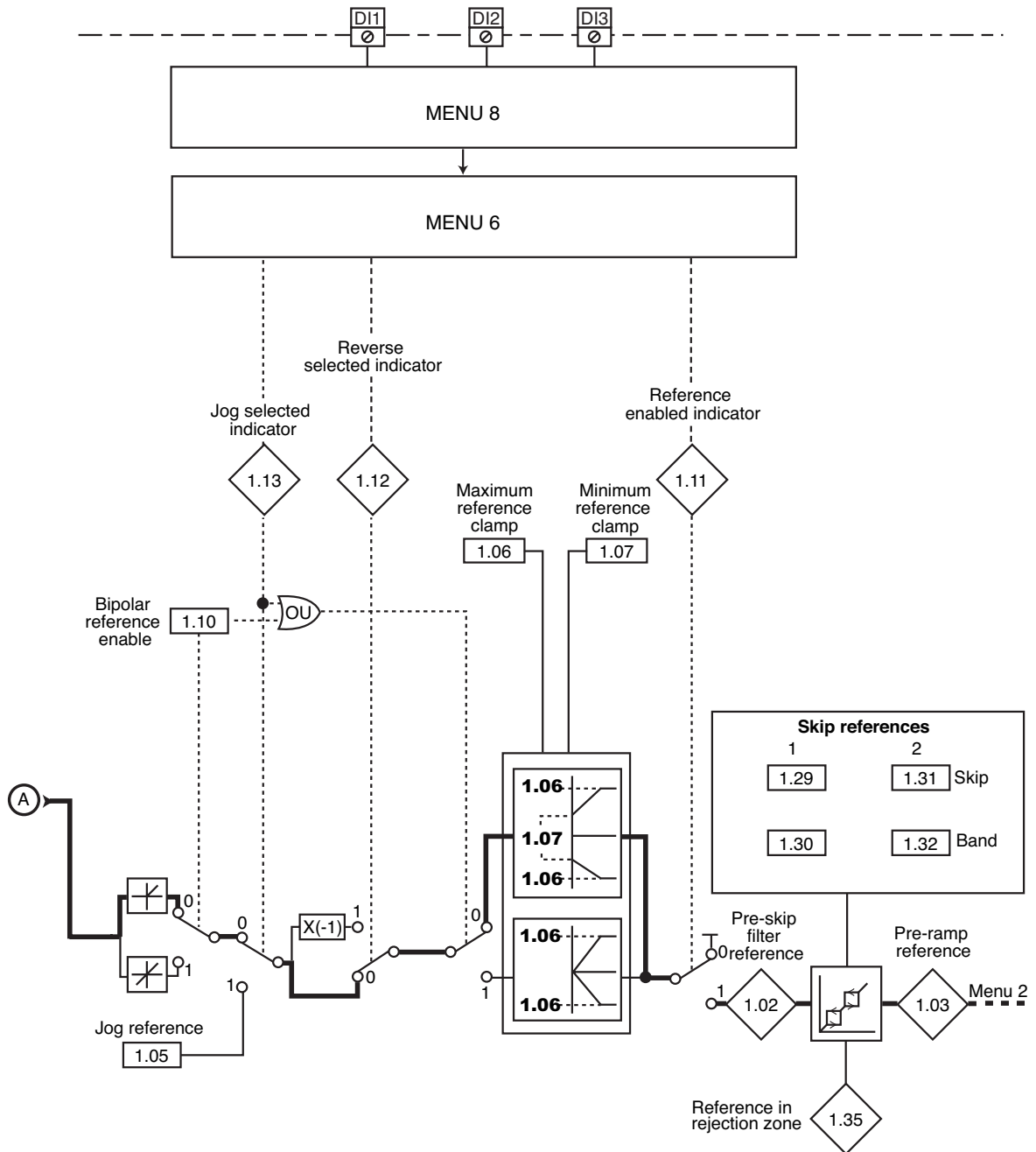
1.16	Preset reference selector timer	1.73	RP3 time
1.48	Reference timer reset flag	1.74	RP4 time
1.69	Number of scanned references	1.75	RP5 time
1.70	Scan time selection	1.76	RP6 time
1.71	RP1 time	1.77	RP7 time
1.72	RP2 time	1.78	RP8 time

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## Variable speed motor or geared motor MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

### 1.2.2 - Limiting and filters



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## Variable speed motor or geared motor

MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

### 1.3 - Explanation of parameters in menu 1

#### 1.01 : Frequency/speed reference selected

Adjustment range :  $\pm 1.06$

Indicates the value of the reference.

#### 1.02 : Pre-skip filter reference

Adjustment range :  $\pm 1.06$  or **1.07** to **1.06**

Reference after limiting but before the skips.

#### 1.03 : Pre-ramp reference

Adjustment range :  $\pm 1.06$  or **1.07** to **1.06**

Indicates the reference after the skips but before the acceleration or deceleration ramps.

#### 1.04 : Reference offset

Adjustment range :  $\pm 1.06$

Factory setting : 0

This reference is added to (positive value) or subtracted from (negative value) the selected reference if **1.09** is equal to 1 (OFFS). It can be used to correct the selected main reference to obtain an accurate setting.

#### 1.05 : Jog reference

Adjustment range : 0 to 16000  $\text{min}^{-1}$

Factory setting : 45  $\text{min}^{-1}$

Operating speed when the jog input has been selected.

#### 1.06 : Maximum reference clamp

Adjustment range : 0 to 32000  $\text{min}^{-1}$

Factory setting : Eur = 1500  $\text{min}^{-1}$

USA = 1800  $\text{min}^{-1}$

**! Before setting the maximum reference clamp, check that the motor and the driven machine can withstand it.**

Maximum speed in both directions of rotation.

#### 1.07 : Minimum reference clamp

Adjustment range : 0 to **1.06**

Factory setting : 0

In unipolar mode, defines the minimum speed.

#### CAUTION:

- This parameter is inactive during jog operation.
- If the value of **1.06** is lower than that of **1.07**, the value of **1.07** is automatically changed to the new value of **1.06**.

#### 1.08 : Not used

#### 1.09 : Reference offset select

Adjustment range : 0 or 1

Factory setting : 0

**0 (Ref x 01.38) (ProP):** The main reference has a value proportional to it added. The percentage is adjusted using the parameter **1.38**.

**1 (Ref + 01.04) (OFFS):** A fixed value set in **1.04** is added to the main reference.

#### 1.10 : Bipolar reference enable

Adjustment range : 0 or 1

Factory setting : 0

**0 (+ only ref) (PoS):** All negative references are treated as zero.

**1 (+ and - ref) (nEg):** Used to change the direction of rotation using the reference polarity. May come from the preset references.

**Note:** The analog inputs of the drive are unipolar.

#### 1.11 : Reference enabled indicator

Adjustment range : 0 or 1

Used to check enabling of the run command.

**0 (Stop) (StoP):** Stop.

**1 (Run) (run):** Run.

#### 1.12 : Reverse selected indicator

Adjustment range : 0 or 1

Used to check enabling of the direction of rotation.

**0 (Forward) (Fd):** Forward.

**1 (Reverse) (rS):** Reverse.

#### 1.13 : Jog selected indicator

Adjustment range : 0 or 1

Used to check enabling of the jog command.

**0 (Disabled) (OFF):** Jog operation not enabled.

**1 (Enabled) (Jog):** Jog operation enabled.

#### 1.14 : Reference selector

Adjustment range : 0 to 4

Factory setting : 1

**0 (Via terminal block) (SEL):** The speed reference is selected by combining the digital inputs assigned to parameters **1.41** and **1.42**.

**1 (Analog input 1) (Ana1):** The speed reference comes from analog input 1.

**2 (Analog input 2) (Ana2):** The speed reference comes from analog input 2.

**3 (Preset ref.) (Pr):** The speed reference comes from the preset references.

**4 (Console) (Pad):** The speed reference comes from the local control or the LCD console.

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## Variable speed motor or geared motor

MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

**1.15** : Preset selector

Adjustment range : 0 to 9

Factory setting : 0

This parameter is used to select the preset references. It works as follows:

**0 (Via terminal block) (Sel):** Is used to select the reference by combining the digital inputs assigned to parameters **1.45 to 1.47**.

**1 (PR 1) (Pr1):** Preset reference 1

**2 (PR 2) (Pr2):** Preset reference 2

**3 (PR 3) (Pr3):** Preset reference 3

**4 (PR 4) (Pr4):** Preset reference 4

**5 (PR 5) (Pr5):** Preset reference 5

**6 (PR 6) (Pr6):** Preset reference 6

**7 (PR 7) (Pr7):** Preset reference 7

**8 (PR 8) (Pr8):** Preset reference 8

**9 (Scan timer val.) (Cycl):** The reference is selected automatically by a scan timer.

**1.16** : Preset reference selector timer

Adjustment range : 0 to 9999 s

Factory setting : 0

When **1.15** = 9 (cycl), is used to set the time between each reference where the scan time is identical between each preset reference (**1.70** is set to 0).

**1.17** : Keypad control mode referenceAdjustment range : **1.07** to **1.06** (**1.10** = 0)

Factory setting : 0

Indicates the reference value coming from the local control or the LCD console.

**1.18** to **1.20** : Not used**1.21** to **1.28** : Preset references 1 to 8Adjustment range :  $\pm 1.06$ 

Factory setting : 0

In order, **1.21** to **1.28** are used to define preset references RP1 to RP8.

**1.29** and **1.31** : Skip references 1 and 2Adjustment range : 0 to  $\pm 1.06 \text{ min}^{-1}$ 

Factory setting : 0

Two skips are available to avoid a machine running at critical speeds. When one of these parameters is at 0, the function is deactivated.

**1.30** and **1.32** : Skip reference bands 1 and 2Adjustment range : 0 to  $300 \text{ min}^{-1}$ Factory setting :  $15 \text{ min}^{-1}$ 

Define the skip band around the avoided speed. The total skip will therefore equal the threshold set  $\pm$  skip band. When the reference is within the window determined in this way, the drive will prevent operation in this zone.

**1.33** and **1.34** : Not used**1.35** : Reference in rejection zone

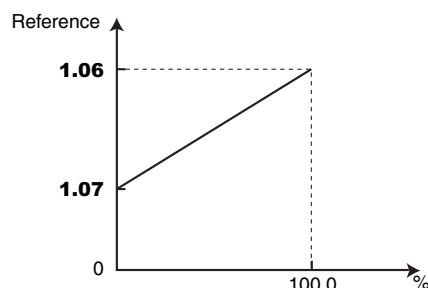
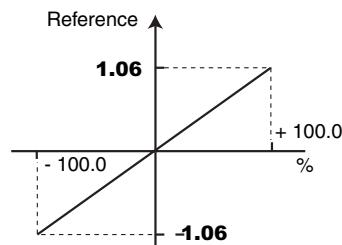
Adjustment range : 0 or 1

**0 (Inactive) (OFF):** The selected reference is not within one of the rejection zones.

**1 (Active) (On):** The selected reference is within one of the rejection zones. In this case, the motor speed does not correspond to the requested reference.

**1.36** and **1.37** : Analog references 1 and 2Adjustment range : **1.07** to **1.06** (**1.10** = 0)  
 $\pm 1.06$  (**1.10** = 1)

The analog inputs assigned to these parameters are automatically scaled so that 100.0% of the input corresponds to the maximum reference (**1.06**). Similarly the 0% input level will correspond to the minimum reference **1.07** or 0 according to **1.10**.

Unipolar mode (**1.10** = 0)Bipolar mode (**1.10** = 1), requires an Additional I/O option**1.38** : Percentage trimAdjustment range :  $\pm 100.0\%$ 

Factory setting : 0

An offset proportional to the selected reference can be added to this reference.

The multiplication coefficient is determined by the analog input assigned to **1.38**.

$$\text{Final ref} = \frac{\text{selected reference} \times (\mathbf{1.38} + 100)}{100}$$

**1.39** and **1.40** : Not used

# VARMECA 30

## Variable speed motor or geared motor

MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

**1.41** and **1.42** : Reference select

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

Used to assign the digital inputs to selection of the speed reference.

1.41	1.42	Selected reference
0	0	Analog input 1
1	0	Analog input 2
0	1	Preset references
1	1	Reference via keypad

**1.43** and **1.44** : Not used

**1.45** to **1.47** : Preset reference select

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

Used to assign the digital inputs to selection of the preset references.

1.45	1.46	1.47	Selected reference	1.50
0	0	0	Preset reference 1 (RP1)	1
1	0	0	Preset reference 2 (RP2)	2
0	1	0	Preset reference 3 (RP3)	3
1	1	0	Preset reference 4 (RP4)	4
0	0	1	Preset reference 5 (RP5)	5
1	0	1	Preset reference 6 (RP6)	6
0	1	1	Preset reference 7 (RP7)	7
1	1	1	Preset reference 8 (RP8)	8

**1.48** : Reference timer reset flag

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF)**: Reset inactive.

**1 (Yes) (On)**: The preset reference scan timer is reset to zero.

In this case, the reference becomes RP1 again.

Can be used to control cycle starting via a digital input.

**1.49** : Selected reference indicator

Adjustment range : 0 to 4

**0 (Via terminal block) (SeL)**:

**1 (Analog input 1) (Ana1)**: Analog input 1 reference is selected.

**2 (Analog input 2) (Ana2)**: Analog input 2 reference is selected.

**3 (Preset ref.) (Pr)**: The preset references are selected.

**4 (Console) (Pad)**:

Indicates the reference that has been selected.

**1.50** : Selected preset reference indicator

Adjustment range : 1 to 8

**0 (Via terminal block) (SeL)**: Is used to select the reference by combining the digital inputs assigned to parameters **1.45** to **1.47**.

**1 (PR 1) (Pr1)**: Preset reference 1 selected.

**2 (PR 2) (Pr2)**: Preset reference 2 selected.

**3 (PR 3) (Pr3)**: Preset reference 3 selected.

**4 (PR 4) (Pr4)**: Preset reference 4 selected.

**5 (PR 5) (Pr5)**: Preset reference 5 selected.

**6 (PR 6) (Pr6)**: Preset reference 6 selected.

**7 (PR 7) (Pr7)**: Preset reference 7 selected.

**8 (PR 8) (Pr8)**: Preset reference 8 selected.

Indicates the selected preset reference.

**1.51** : Power-up keypad control mode reference

Adjustment range : 0 to 2

Factory setting : 0

**0 (Reset to 0) (rSet)**: On power-up, the keypad reference is reset to zero.

**1 (Previous) (Prec)**: On power-up, the keypad reference retains the value it had before power-down.

**2 (RP 1) (Pr1)**: On power-up, the keypad reference takes the value of preset reference 1 (**1.21**).

**1.52** to **1.59** : Not used

**1.60** : Pre-offset reference

Adjustment range :  $\pm$  **1.06**

Indicates the value of the selected reference before offset.

**1.61** to **1.68** : Not used

**1.69** : Number of scanned references

Adjustment range : 1 to 8

Factory setting : 8

Used to configure the number of preset references integrated in the scan timer.

For example, if **1.69** = 3, the scan timer will perform a cycle RP1 --> RP2 --> RP3 --> RP1 etc.

**1.70** : Scan time selection

Adjustment range : 0 or 1

Factory setting : 0

**0 (Identical) (Iden)**: The time between each preset reference is the same for all references.

**1 (Different) (diFF)**: The time between each preset reference is different.

**1.71** : RP1 scan timer time

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP1.

**1.72** : RP2 scan timer time

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP2.

VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

MENU 1: SPEED REFERENCE: SELECTION, LIMITING AND FILTERS

**1.73 : RP3 scan timer time**

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP3.

**1.74 : RP4 scan timer time**

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP4.

**1.75 : RP5 scan timer time**

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP5.

**1.76 : RP6 scan timer time**

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP6.

**1.77 : RP7 scan timer time**

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP7.

**1.78 : RP8 scan timer time**

Adjustment range : 0 to 9999 s

Factory setting : 0

If **1.70** is set to 1, determines the time during which the drive remains at reference RP8.



# VARMECA 30

## Variable speed motor or geared motor


MENU 2: RAMPS

## 2 - MENU 2: RAMPS

### 2.1 - List of parameters in Menu 2

Parameter	Name	Type	Adjustment range	Factory setting	User setting
2.01	Post-ramp reference	RO/P	If <b>1.10</b> = 0 and <b>2.02</b> = 0: 0 to <b>1.06</b>	-	-
			If <b>1.10</b> = 0 and <b>2.02</b> = 1: <b>1.07</b> to <b>1.06</b>		
			If <b>1.10</b> = 1: $\pm$ <b>1.06</b>		
2.02	Ramp by-pass ( <input type="checkbox"/> )	R-W	0 or 1	0	
2.03	Ramp hold	R-W	0 or 1	0	
2.04	Ramp mode select	R-W	0 to 3	1	
2.05	Not used				
2.06	S ramp enable	R-W	0 or 1	0	
2.07	S ramp acceleration limit	R-W	2 to 10	10	
2.08	Standard ramp voltage for regulation	R-W	T = 0 to 800 V	Eur: 690 V* USA: 750 V	
2.09	Not used				
2.10	Acceleration rate selector	R-W	0 to 9	1	
2.11 to 2.18	Acceleration rate 1 to Acceleration rate 8	R-W	0.1 to 600.0 s/1000 min <sup>-1</sup>	3.0 s/1000 min <sup>-1</sup>	
2.19	Jog acceleration rate	R-W	0.1 to 600.0 s/1000 min <sup>-1</sup>	0.2 s/1000 min <sup>-1</sup>	
2.20	Deceleration rate selector	R-W	0 to 9	1	
2.21 to 2.28	Deceleration rate 1 to Deceleration rate 8	R-W	0.1 to 600.0 s/1000 min <sup>-1</sup>	5.0 s/1000 min <sup>-1</sup>	
2.29	Jog deceleration rate	R-W	0.1 to 600.0 s/1000 min <sup>-1</sup>	0.2 s/1000 min <sup>-1</sup>	
2.30 to 2.50	Not used				
2.51	Ramp hold condition	R-W	0 or 1	0	

\* VARMECA 31M/32M: 370 V  
VARMECA 310 M: 170 V

 VMA 33/34 only

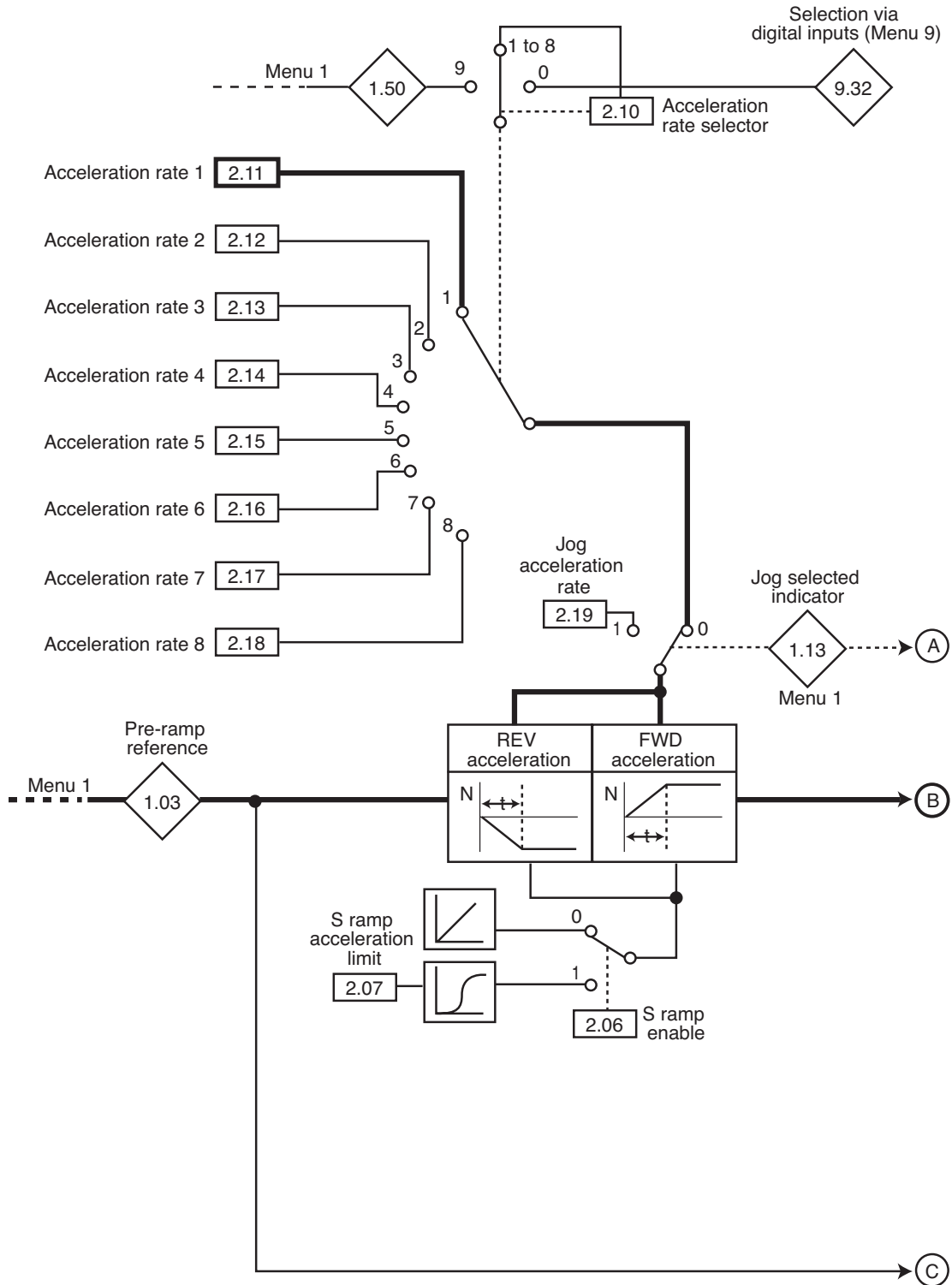
# VARMECA 30

## Variable speed motor or geared motor

MENU 2: RAMPS

### 2.2 - Menu 2 diagrams

#### 2.2.1 - Acceleration ramps

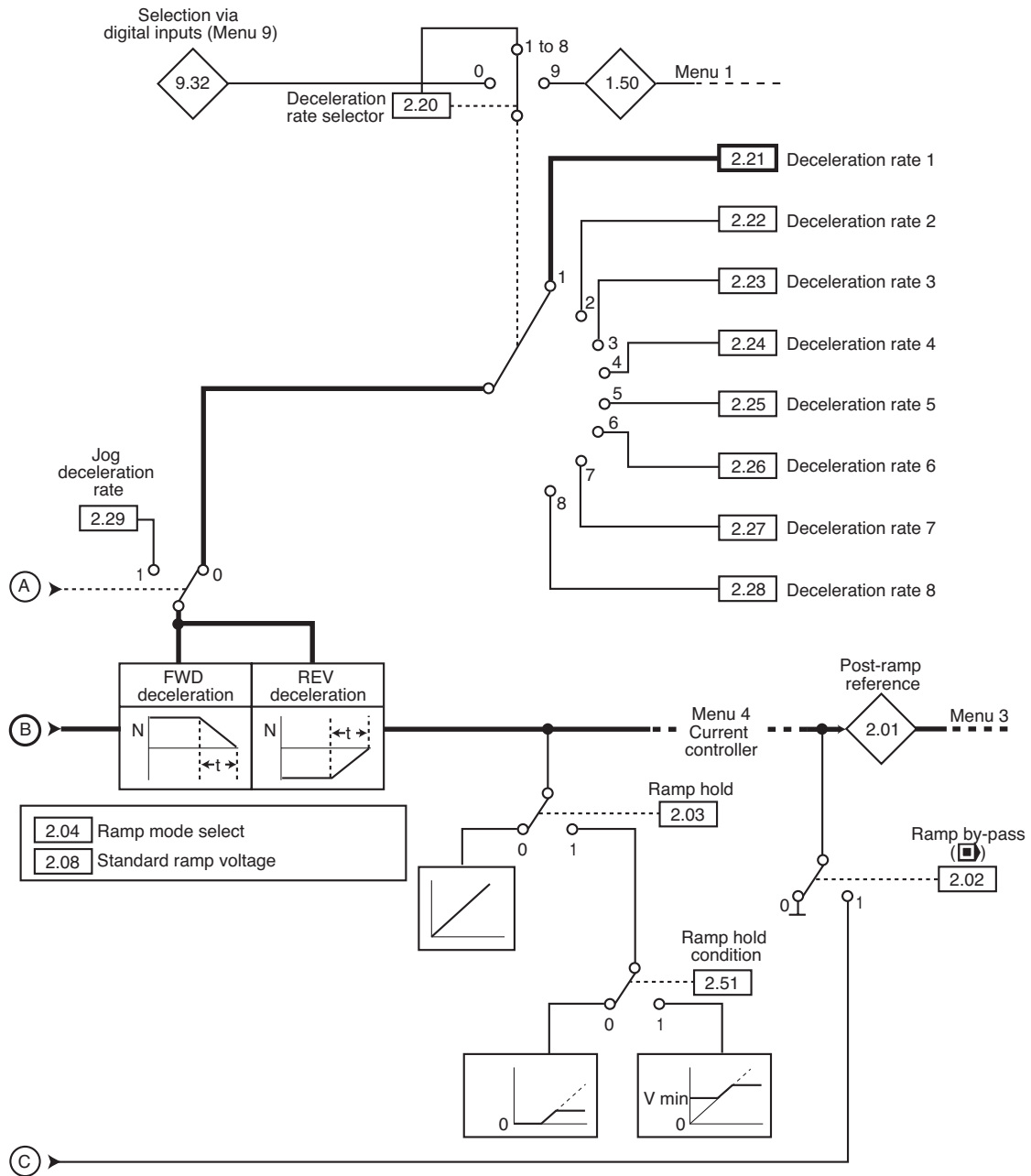


# VARMECA 30

## Variable speed motor or geared motor

MENU 2: RAMPS

### 2.2.2 - Deceleration ramps



# VARMECA 30

## Variable speed motor or geared motor

MENU 2: RAMPS

### 2.3 - Explanation of parameters in menu 2

#### **2.01** : Post-ramp reference

Adjustment range : • If **1.10** = 0 and **2.02** = 0: 0 to **1.06**  
 • plf **1.10** = 0 and **2.02** = 1: **1.07** to **1.06**  
 • If **1.10** = 1:  $\pm$  **1.06**

Measurement of the post-ramp reference. Used for diagnostics.

#### **2.02** : Ramp by-pass (☐)

Adjustment range : 0 or 1  
 Factory setting : 0

**0 (No) (no)**: Ramps active.

**1 (Yes) (raMP)**: Ramps short-circuited.

#### **2.03** : Ramp hold

Adjustment range : 0 or 1  
 Factory setting : 0

**0 (No) (raMP)**: Ramp freed.

**1 (Yes) (StoP)**: The ramp is held and acceleration (or deceleration) is therefore interrupted.

**CAUTION:**

**Ramp hold is not possible on a stop command.**

#### **2.04** : Ramp mode select

Adjustment range : 0 to 3  
 Factory setting : 1

**0 (Fixed ramp) (Fst)**: Deceleration ramp imposed. If the deceleration ramp that has been configured is too fast in relation to the inertia of the load, the DC bus voltage exceeds its maximum value (set in **2.08**) and the drive trips on "OU" overvoltage.

**CAUTION:**

**Select mode 2.04 = 0 (Fst) when a braking resistor is used.**

**1 (Auto ramp) (Std)**: Standard deceleration ramp with automatic extension of the ramp time in order to avoid causing a DC bus overvoltage trip on the drive (threshold set in **2.08**).

**2 (Auto ramp+) (StdH)**: The drive allows the motor voltage to be increased up to 1.2 times the rated voltage set in **5.09** (motor rated voltage), to avoid reaching the maximum DC bus voltage threshold (threshold set in **2.08**). However, if this is not sufficient, the standard deceleration ramp time is extended, to avoid causing a DC bus overvoltage trip on the drive.

For the same amount of energy, mode 2 enables faster deceleration than mode 1.

**3 (Fixed ramp+) (FstH)**: Same as mode 2, but the ramp is imposed. If the configured ramp is too fast, the drive goes into OU trip state.

**CAUTION:**

**In modes 2 and 3, the motor must be able to tolerate additional losses related to the increase in voltage at its terminals.**

#### **2.05** : Not used

#### **2.06** : S ramp enable

Adjustment range : 0 or 1

Factory setting : 0

**0 (Linear) (Lin)**: The ramp is linear.

**1 (En S) (S-rP)**: A curved part (defined in **2.07**) at the start and end of the ramp avoids load swinging.

**CAUTION:**

**The S ramp is deactivated during controlled decelerations (2.04 = 1 or 2).**

#### **2.07** : S ramp acceleration limit

Adjustment range : 2 to 10

Factory setting : 10

Used to modify the ramp curve by the same value at the start and end of the ramp.

The value 4 represents a time for the curved part equal to 25% of the total ramp, and 10 represents a time for the curved part equal to 10%.

#### **2.08** : Standard ramp voltage

Adjustment range : 0 to 800 V

Factory setting : Eur: 690 V, USA: 750 V

This threshold is used when the drive is configured in standard deceleration mode (**2.04** = 1 or 2).

If this threshold is too low, the machine will stop in freewheel mode. If this threshold is too high and there are no resistors connected, the drive will trip due to DC bus overvoltage ("OU" trip).

The minimum value of this parameter must be 50 V higher than the DC bus voltage obtained with the maximum supply voltage. ( $U_{bus} = U_{supply} \times \sqrt{2}$ ).

#### **2.09** : Not used

#### **2.10** : Acceleration rate selector

Adjustment range : 0 to 9

Factory setting : 1

This parameter is used to select the acceleration ramp as follows:

**0 (Via terminal block) (Sel)**: Selection of the acceleration ramp via digital input. The choice of ramp comes from the binary sum in menu 9 (**9.32**).

**1 (Accel. 1) (Acc1)**: Acceleration ramp 1

**2 (Accel. 2) (Acc2)**: Acceleration ramp 2

**3 (Accel. 3) (Acc3)**: Acceleration ramp 3

**4 (Accel. 4) (Acc4)**: Acceleration ramp 4

**5 (Accel. 5) (Acc5)**: Acceleration ramp 5

**6 (Accel. 6) (Acc6)**: Acceleration ramp 6

**7 (Accel. 7) (Acc7)**: Acceleration ramp 7

**8 (Accel. 8) (Acc8)**: Acceleration ramp 8

**9 (Adapted to RP) (rP.Pr)**: The ramp is automatically associated with the corresponding preset speed.

# VARMECA 30

## Variable speed motor or geared motor

MENU 2: RAMPS

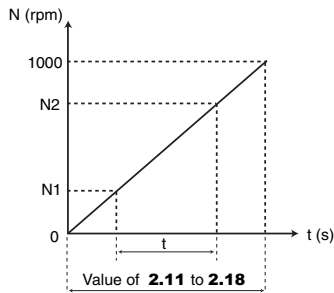
### 2.11 to 2.18 : Acceleration rates 1 to 8

Adjustment range : 0.1 to 600.0 s/1000 min<sup>-1</sup>

Factory setting : 3.0 s/1000 min<sup>-1</sup>

Sets the time for acceleration from 0 to 1000 min<sup>-1</sup>.

$$2.11 \text{ to } 2.18 = \frac{t(s) \times 1000 \text{ rpm}}{(N2 - N1) \text{ rpm}}$$



**2.11:** Acceleration rate 1 (main ramp in factory settings)

**2.12:** Acceleration rate 2

**2.13:** Acceleration rate 3

**2.14:** Acceleration rate 4

**2.15:** Acceleration rate 5

**2.16:** Acceleration rate 6

**2.17:** Acceleration rate 7

**2.18:** Acceleration rate 8

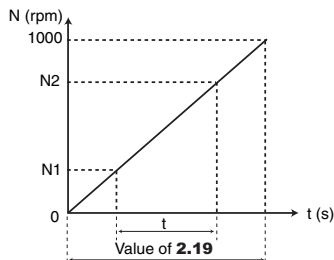
### 2.19 : Jog acceleration rate

Adjustment range : 0.1 to 600.0 s/1000 min<sup>-1</sup>

Factory setting : 0.2 s/1000 min<sup>-1</sup>

Sets the time for acceleration from 0 to 1000 min<sup>-1</sup>.

$$2.19 = \frac{t(s) \times 1000 \text{ rpm}}{(N2 - N1) \text{ rpm}}$$



### 2.20 : Deceleration rate selector

Adjustment range : 0 to 9

Factory setting : 1

This parameter is used to select the deceleration ramp as follows:

**0 (Via terminal block) (Sel):** Selection of the deceleration ramp via digital input. The choice of ramp comes from the binary sum in menu 9 (**9.32**).

**1 (Decel. 1) (Dec1):** Deceleration ramp 1

**2 (Decel. 2) (Dec2):** Deceleration ramp 2

**3 (Decel. 3) (Dec3):** Deceleration ramp 3

**4 (Decel. 4) (Dec4):** Deceleration ramp 4

**5 (Decel. 5) (Dec5):** Deceleration ramp 5

**6 (Decel. 6) (Dec6):** Deceleration ramp 6

**7 (Decel. 7) (Dec7):** Deceleration ramp 7

**8 (Decel. 8) (Dec8):** Deceleration ramp 8

**9 (Adapted to RP) (rPPr):** The ramp is automatically associated with the corresponding preset speed.

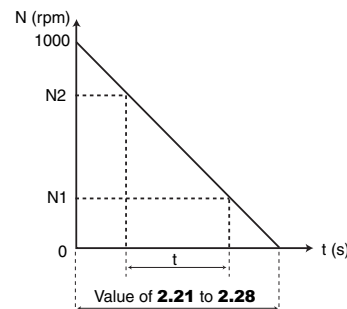
### 2.21 to 2.28 : Deceleration rates 1 to 8

Adjustment range : 0.1 to 600.0 s/1000 min<sup>-1</sup>

Factory setting : 5.0 s/1000 min<sup>-1</sup>

Sets the time for deceleration from 1000 min<sup>-1</sup> to 0.

$$2.21 \text{ to } 2.28 = \frac{t(s) \times 1000 \text{ rpm}}{(N2 - N1) \text{ rpm}}$$



**2.21:** Deceleration rate 1 (main ramp in factory settings)

**2.22:** Deceleration rate 2

**2.23:** Deceleration rate 3

**2.24:** Deceleration rate 4

**2.25:** Deceleration rate 5

**2.26:** Deceleration rate 6

**2.27:** Deceleration rate 7

**2.28:** Deceleration rate 8

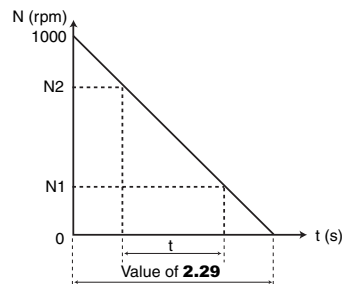
### 2.29 : Jog deceleration rate

Adjustment range : 0.1 to 600.0 s/1000 min<sup>-1</sup>

Factory setting : 0.2 s/1000 min<sup>-1</sup>

Sets the time for deceleration from 1000 min<sup>-1</sup> to 0.

$$2.29 = \frac{t(s) \times 1000 \text{ rpm}}{(N2 - N1) \text{ rpm}}$$



### 2.30 to 2.50 : Not used

### 2.51 : Ramp hold condition

Adjustment range : 0 or 1

Factory setting : 0

**0 (ALWAYS) (ALL):** When **2.03** = 1, the ramp is always held.

**1 (> V MIN) (S.Min):** When **2.03** = 1, the ramp is freed between 0 and V min (**1.07**).

# VARMECA 30

## Variable speed motor or geared motor

### MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

## 3 - MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

### 3.1 - List of parameters in Menu 3

Parameter	Name		Type	Adjustment range	Factory setting	User setting
3.01	Final speed reference	<input checked="" type="checkbox"/>	RO/P	$\pm 2 \times 1.06 \text{ min}^{-1}$	-	-
3.02	Speed feedback		RO/P	$\pm 2 \times 1.06 \text{ min}^{-1}$		-
3.03	Speed error	<input checked="" type="checkbox"/>	RO/P	$\pm 2 \times 1.06 \text{ min}^{-1}$		-
3.04	Speed controller output	<input checked="" type="checkbox"/>	RO/P	$\pm 300.0\%$	-	-
3.05	Zero speed threshold		R-W	0 to $500 \text{ min}^{-1}$	$30 \text{ min}^{-1}$	
3.06	At speed lower limit		R-W	0 to $500 \text{ min}^{-1}$	$30 \text{ min}^{-1}$	
3.07 to 3.09	Not used					
3.10	Speed controller proportional gain (Kp1)	<input checked="" type="checkbox"/>	R-W	0 to 32000	200	
3.11	Speed controller integral gain (Ki1)	<input checked="" type="checkbox"/>	R-W	0 to 32000	100	
3.12*	Speed controller differential feedback gain	<input checked="" type="checkbox"/>	R-W	0 to 32000	0	
3.13	Speed controller proportional gain (Kp2)	<input checked="" type="checkbox"/>	R-W	0 to 32000	200	
3.14	Speed controller integral gain (Ki2)	<input checked="" type="checkbox"/>	R-W	0 to 32000	100	
3.15*	Speed controller differential feedback gain	<input checked="" type="checkbox"/>	R-W	0 to 32000	0	
3.16	Speed controller gain select	<input checked="" type="checkbox"/>	R-W	0 or 1	0	
3.17*	Speed controller set-up method	<input checked="" type="checkbox"/>	R-W	0 to 2	0	
3.18	Motor and load inertia	<input checked="" type="checkbox"/>	R-W	0.001 to 32.000 Kkgm <sup>2</sup>	0.001 Kkgm <sup>2</sup>	
3.19	Not used					
3.20	Bandwidth	<input checked="" type="checkbox"/>	R-W	0.1 to 255.0 Hz	10.0 Hz	
3.21	Damping factor	<input checked="" type="checkbox"/>	R-W	0 to 10.0	1.0	
3.22*	Hard speed reference	<input checked="" type="checkbox"/>	R-W	0 to $2 \times 1.06 \text{ min}^{-1}$	0	
3.23*	Hard speed reference selector	<input checked="" type="checkbox"/>	R-W	0 or 1	0	
3.24	Not used					
3.25	Encoder phase angle	<input checked="" type="checkbox"/>	R-W	0 to 359.9°	0	
3.26 to 3.28	Not used					
3.29	Drive encoder position	<input checked="" type="checkbox"/>	RO/P	- 32768 to 32767	-	
3.30 to 3.33	Not used					
3.34	Drive encoder lines per revolution		R-W	0 to 32000 lpr	1024 lpr	
3.35 to 3.37	Not used					
3.38	Drive encoder type		R-W	0 to 8	If <b>11.31</b> = 0 to 2: 0 If <b>11.31</b> = 3: 3	
3.39 to 3.41	Not used					
3.42	Drive encoder filter	<input checked="" type="checkbox"/>	R-W	0 to 10	3.0	
3.43	Maximum drive encoder reference		R-W	0 to 32000 (VMA 33/34) 0 to 1000 (VMA 31/32)	500	
3.44	Drive encoder reference scaling		R-W	0 to 2.0000	1.0000	
3.45	Drive encoder reference	<input checked="" type="checkbox"/>	RO/P	0 to 100%	-	
		<input checked="" type="checkbox"/>	RO/P	$\pm 100\%$	-	
3.46	Drive encoder reference destination		R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	

\* Function not available in version V3.10.

  VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

### MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

Parameter	Name		Type	Adjustment range	Factory setting	User setting
<b>3.47</b> to <b>3.50</b>	Not used					
<b>3.51</b>	Vmin alarm threshold		R-W	0 to 500 min <sup>-1</sup>	90 min <sup>-1</sup>	
<b>3.52</b>	Vmax alarm threshold		R-W	0 to 500 min <sup>-1</sup>	90 min <sup>-1</sup>	
<b>3.53</b> to <b>3.60</b>	Not used					
<b>3.61</b>	Drive encoder source		R-W/P	<b>0.00 to 21.51</b>	0.00	
<b>3.62</b>	Drive encoder frequency		RO/P	0 to 5000 Hz	-	-
<b>3.63*</b>	Maximum drive output reference		R-W	0 to 32000	5000	
<b>3.64*</b>	Drive output reference scaling		R-W	0 to 2.0000	1.0000	
<b>3.65*</b>	Drive output reference		RO/P	0 to 100%	-	
<b>3.66*</b>	Not used					
<b>3.67</b>	Reference select	<input checked="" type="checkbox"/>	R-W	0 or 1	0	
<b>3.68</b>	Minimum frequency threshold		R-W	1.0 to 10.0 Hz	1.0 Hz	
<b>3.69</b> and <b>3.70</b>	Not used					
<b>3.71*</b>	Drive output reference source		R-W/P	<b>0.00 to 21.51</b>	0.00	
<b>3.72*</b>	Drive output period		RO/P	0.5 to 3200.0 s	-	
<b>3.73</b>	Drive output signal		RO/P	0 or 1	-	-

\* Function not available in version V3.10.

: VMA 31/32 Sensorless servo motor control parameters

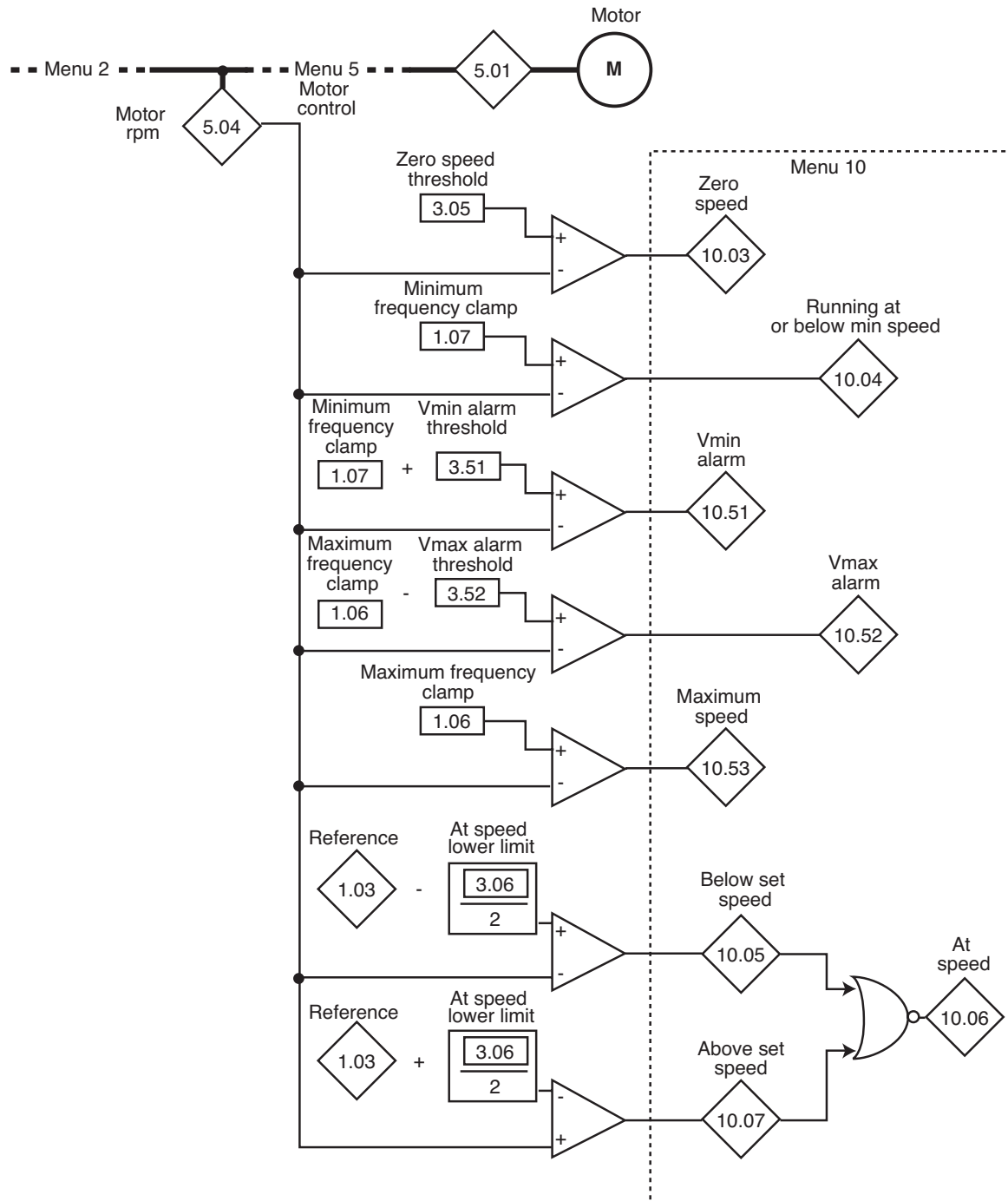
: VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

### 3.2 - Menu 3 diagram

#### 3.2.1 - Basic version



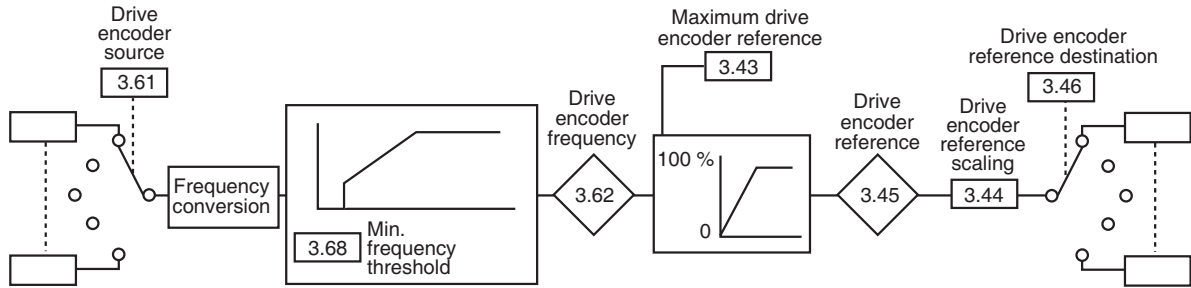


# VARMECA 30

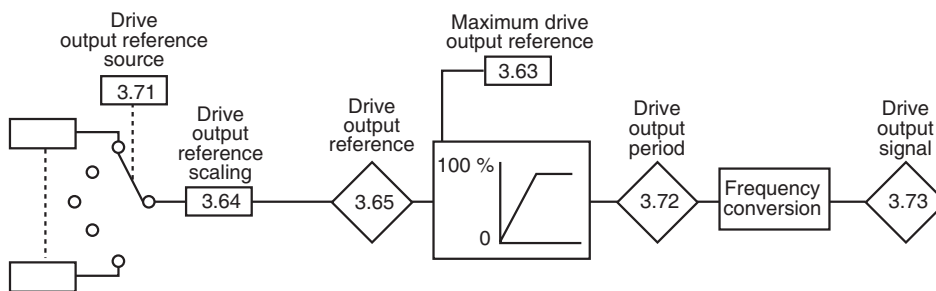
## Variable speed motor or geared motor

### MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

**Drive encoder input**



**Drive encoder output**

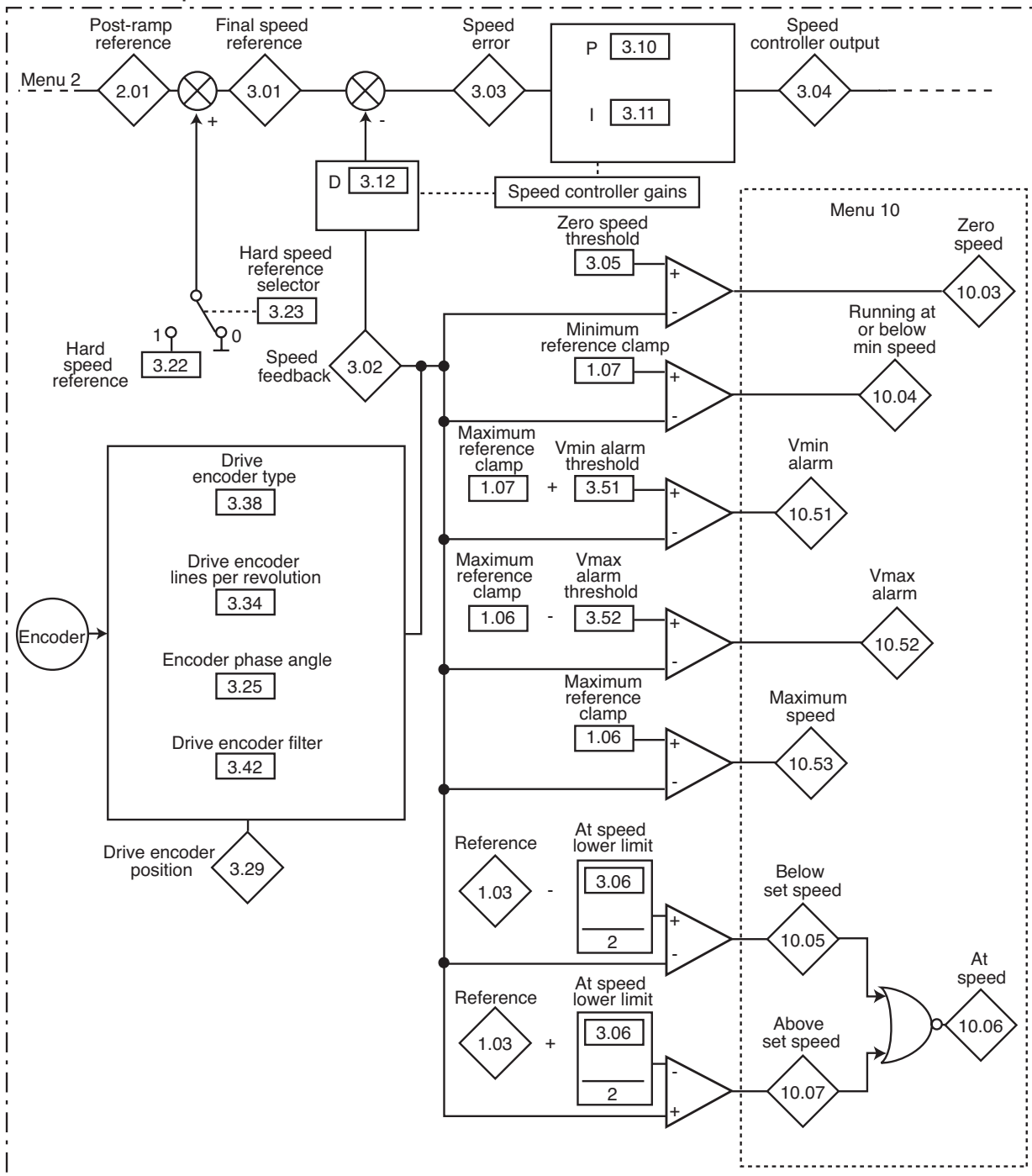


# VARMECA 30

## Variable speed motor or geared motor MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

### 3.2.2 - With encoder option

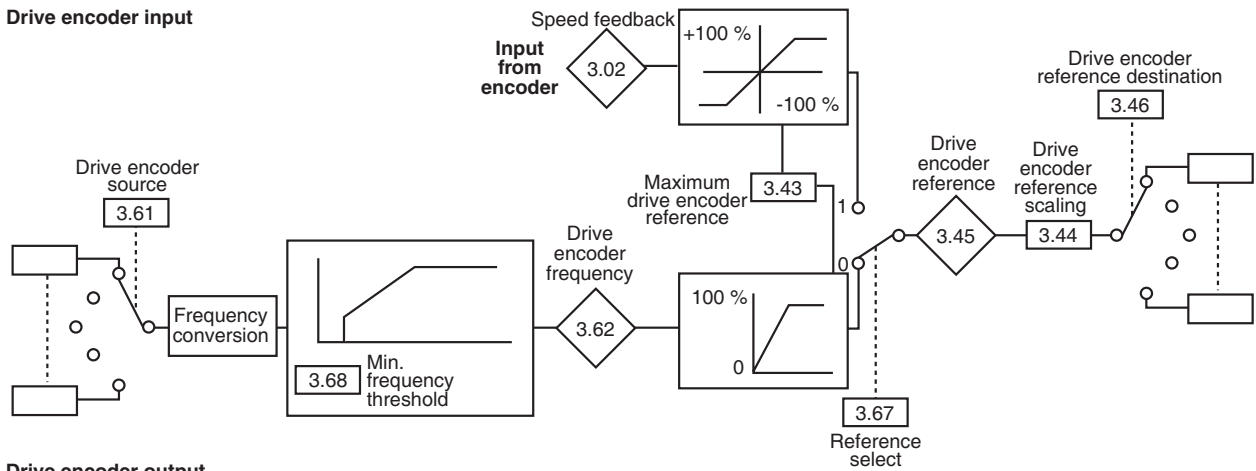
#### Encoder feedback option



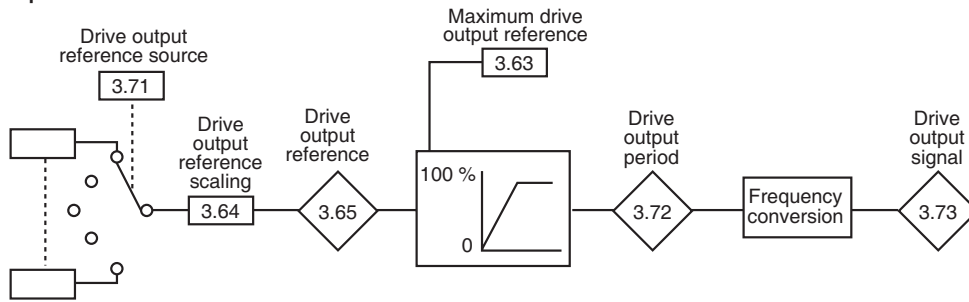
# VARMECA 30

## Variable speed motor or geared motor MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

### Drive encoder input



### Drive encoder output




# VARMECA 30

## Variable speed motor or geared motor

### MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

### 3.3 - Explanation of parameters in Menu 3

Parameters marked with the symbol  can be accessed only when an encoder feedback option is present.

#### **3.01** : Final speed reference

Adjustment range :  $\pm 2 \times 1.06 \text{ min}^{-1}$   
Represents the sum of the post-ramp reference and the hard speed reference if this is enabled.

#### **3.02** : Speed feedback

Adjustment range :  $\pm 2 \times 1.06 \text{ min}^{-1}$   
Actual speed coming from the encoder.

#### **3.03** : Speed error

Adjustment range :  $\pm 2 \times 1.06 \text{ min}^{-1}$   
Difference between the final speed reference and the speed feedback.

#### **3.04** : Speed controller output

Adjustment range :  $\pm 300.0\%$   
The speed controller output produces a torque reference to be used in determining the value of the active current.

#### **3.05** : Zero speed threshold

Adjustment range : 0 to  $500 \text{ min}^{-1}$   
Factory setting :  $30 \text{ min}^{-1}$   
If the motor speed **2.01** is at or below the level defined by this parameter, the zero speed alarm **10.03** will be at 1, otherwise it will be at 0.

#### **3.06** : At speed lower limit

Adjustment range : 0 to  $500 \text{ min}^{-1}$   
Factory setting :  $30 \text{ min}^{-1}$  (VARMECA 31/32:  $60 \text{ min}^{-1}$ )  
Defines the window within which the "At speed" alarm is activated.  
**10.06** is at 1 when the post-ramp reference equals the reference  $\pm (3.06/2)$ .

#### **3.07** to **3.09** : Not used

#### **3.10** : Speed controller proportional gain (Kp1)

Adjustment range : 0 to 32000  
Factory setting : 200  
Adjusts the stability of the motor speed in the event of sudden variations in the reference.  
Increase the proportional gain until vibration occurs in the motor, then reduce the value by 20 to 30%, checking that the motor remains stable in the event of sudden variations in speed, both at no load and on load.

#### **3.11** : Speed controller integral gain (Ki1)

Adjustment range : 0 to 32000  
Factory setting : 100  
Adjusts the stability of the motor speed on load impact.  
Increase the integral gain so that the same speed is obtained on load and at no load in the event of load impact.  
**Warning: Do not configure a zero value in this parameter (may cause difficulties when the motor stops).**

#### **3.12** : Speed controller differential feedback gain (Kd1)

Adjustment range : 0 to 32000  
Factory setting : 0  
Adjusts the stability of the motor speed in the event of load shedding or sudden variations in the reference.  
Reduces overshoots.  
In general, leave the setting at 0.  
**Function not available.**

#### **3.13** : Speed controller proportional gain (Kp2)

Adjustment range : 0 to 32000  
Factory setting : 200  
Adjusts the stability of the motor speed in the event of sudden variations in the reference.  
The drive uses Kp1 (**3.10**) or Kp2 (**3.13**) depending on the value of **3.16**.

#### **3.14** : Speed controller integral gain (Ki2)

Adjustment range : 0 to 32000  
Factory setting : 100  
Adjusts the stability of the motor speed on load impact.  
The drive uses Ki1 (**3.11**) or Ki2 (**3.14**) depending on the value of **3.16**.

#### **3.15** : Speed controller differential feedback gain (Kd2)

Adjustment range : 0 to 32000  
Factory setting : 0  
Adjusts the stability of the motor speed in the event of load shedding or sudden variations in the reference.  
The drive uses Kd1 (**3.12**) or Kd2 (**3.15**) depending on the value of **3.16**.  
**Function not available.**

#### **3.16** : Speed controller gain select

Adjustment range : 0 or 1  
Factory setting : 0  
This parameter can be modified when the drive is disabled or enabled.  
**0 (Gain No1) (gai.1): Selection of gains Kp1 (3.10), Ki1 (3.11) and Kd1 (3.12).**  
**1 (Gain No2) (gai.2): Selection of gains Kp2 (3.13), Ki2 (3.14) and Kd2 (3.15).**

#### **3.17** : Speed controller set-up method

Adjustment range : 0 to 2  
Factory setting : 0  
**0 (User) (User): The speed controller operates with the gains entered by the user.**  
**1 (AUTO) (Auto): The speed controller operates with the gains calculated from the total inertia entered in **3.18**, the bandwidth entered in **3.20** and the damping factor entered in **3.21**.**  
**2 (Gain x 16) (Pr.16): For applications with very high inertia for which a very high proportional gain is necessary, this mode causes the proportional gain configured in **3.10** or **3.13** to be multiplied by 16.**  
**Function not available.**

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# VARMECA 30

## Variable speed motor or geared motor

### MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

**3.18** : Motor and load inertia (□)

Adjustment range : 0.001 to 32,000 Kgm<sup>2</sup>  
 Factory setting : 0.001 Kgm<sup>2</sup>

Corresponds to the total inertia applied to the motor (motor inertia + load inertia).

This parameter is used for automatic calculation of the gains (see **3.17**), and to provide a torque correction during acceleration if necessary.

**3.19** : Not used**3.20** : Bandwidth (□)

Adjustment range : 0.1 to 255.0 Hz  
 Factory setting : 10.0 Hz

Used to set the bandwidth taken into account with speed controller operating mode 1 (see **3.17**).

**3.21** : Damping factor (□)

Adjustment range : 0 to 10.0  
 Factory setting : 1.0

Used to set the damping factor taken into account with speed controller operating mode 1 (see **3.17**).

**3.22** : Hard speed reference (□)

Adjustment range : 0 to 2 x 1.06 min<sup>-1</sup>  
 Factory setting : 0

This hard speed reference is an additional reference which is not affected by the ramps.

**Function not available.**

**3.23** : Hard speed reference selector (□)

Adjustment range : 0 or 1  
 Factory setting : 0

**0 (Disabled) (OFF):** Hard speed reference selector inactive.

**1 (Enabled) (On):** Used to add an unramped speed reference to the main reference.

**Function not available.**

**3.24** : Not used**3.25** : Encoder phase angle (□)

Adjustment range : 0 to 359.9°  
 Factory setting : 0

Indicates the result of the phasing test. It is stored when the drive is powered down and will be modified automatically only after a new phasing test.

**! The phase angle, where it is known, can be entered manually. Any incorrect value can cause the motor to rotate in the wrong direction or trip the drive.**

**3.26** to **3.28** : Not used**3.29** : Drive encoder position (□)

Adjustment range : -32768 to +32767

Indicates the position of the encoder in relation to the line it was on at power-up.

**3.30** to **3.33** : Not used**3.34** : Drive encoder lines per revolution

Adjustment range : 0 to 32000 lines  
 Factory setting : 1024 lines

Used to configure the number of lines per encoder revolution. Converts the encoder input into a speed.

**3.35** to **3.37** : Not used**3.38** : Drive encoder type

Adjustment range : 0 to 8  
 Factory setting : 0 if **11.31** = 0 to 2  
 3 if **11.31** = 3

**0 (INCREMENTAL) (Incr):** Quadrature incremental encoder

**1 (INCREM.FD) (Fd):** Incremental encoder with Frequency/Direction output

**2 (INCREM.F.RES) (Fr):** Incremental encoder with FWD/REV outputs

**3 (INCREM.UVW) (CoMM):** Incremental encoder with commutation channels

**4 (HALL EFFECT) (haLL):** Hall effect sensor

**5 (NONE TYPE 1) (tyP1):** Sensorless mode 1

**6 (NONE TYPE 2) (tyP2):** Sensorless mode 2

**7 (NONE TYPE 3) (tyP3):** Sensorless mode 3

**8 (NONE TYPE 4) (tyP4):** Sensorless mode 4

**3.39** to **3.41** : Not used**3.42** : Drive encoder filter (□)

Adjustment range : 0 to 10  
 Factory setting : 3.0

This parameter is used to insert a moving average filter in the encoder speed feedback, such that:  
 time constant = 2<sup>3.42</sup> ms.

This is particularly useful for attenuating the current demand when the load has high inertia and high gain is necessary on the speed controller. If the filter is not enabled under these conditions, it is possible for the speed controller output to change continuously from one current limit to another, disabling the integral function of the speed controller. The filter is inactive if **3.42** = 0.

**3.43** : Maximum drive encoder reference

Adjustment range : 0 to 32000 (VMA 33/34)  
 0 to 1000 (VMA 31/32)

Factory setting : 500

Adjusts the frequency of the input which is to correspond to 100% of the numerical destination value.

**3.44** : Drive encoder reference scaling

Adjustment range : 0 to 2.0000  
 Factory setting : 1.0000

Used for scaling the numerical reference which is to be converted into pulses.

**3.45** : Drive encoder reference

Adjustment range : 0 to 100% (□); ± 100% (□)

Indicates the value of the numerical reference resulting from conversion of the pulse signal.

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# VARMECA 30

## Variable speed motor or geared motor

### MENU 3: FREQUENCY THRESHOLDS - ENCODER OPTION

**3.46** : Drive encoder reference destinationAdjustment range : **0.00** to **21.51**Factory setting : **0.00**

Used to select the destination of the numerical reference resulting from conversion of the pulse signal. Only "non-bit" type parameters can be programmed. If an unsuitable parameter is selected, **3.46** will be frozen at 0.

**3.47** to **3.50** : Not used**3.51** : Vmin alarm thresholdAdjustment range : 0 to 500 min<sup>-1</sup>Factory setting : 90 min<sup>-1</sup>

Triggers an alarm **10.51** when the motor speed is such that:  
 - (**5.04**) < Vmin (**1.07** or **21.02**) + **3.51** in open loop mode,  
 - (**3.02**) < Vmin (**1.07** or **21.02**) + **3.51** in closed loop mode.

**3.52** : Vmax alarm thresholdAdjustment range : 0 to 500 min<sup>-1</sup>Factory setting : 90 min<sup>-1</sup>

Triggers an alarm **10.52** when the motor speed is such that:  
 - (**5.04**) > Vmax (**1.06** or **21.01**) - **3.52** in open loop mode,  
 - (**3.02**) > Vmax (**1.06** or **21.01**) - **3.52** in closed loop mode.

**3.53** to **3.60** : Not used**3.61** : Drive encoder sourceAdjustment range : **0.00** to **21.51**Factory setting : **0.00**

Used to select the source of pulses. Only "bit" type parameters can be programmed. If an unsuitable parameter is selected, **3.61** will be frozen at 0.

**Note:** Use only inputs ADI1, ADI2, DIO1, DI2 and DI3 as the drive encoder source. The maximum input frequency must be 5 kHz. If the input frequency is higher than 5 kHz, use an encoder feedback option, and set **3.67** to 1 (EnCd).

**3.62** : Drive encoder frequency

Adjustment range : 0 to 1000.0 Hz

Drive encoder frequency which will be converted into a numerical reference (accuracy 0.1 Hz).

Application example:

Pulses from an inductive sensor connected to a digital input are converted into a reference which is assigned to the speed reference.

Max.	DI01	DI2	ADI1	ADI03
frequency	DI3	DI4	ADI2	
allowed as	1000.0 Hz	1000.0 Hz	50.0 Hz	1000.0 Hz
pulse inputs				

**3.63** : Maximum drive output reference

Adjustment range : 0 to 1000.0 Hz

Factory setting : 20.0 Hz

Adjusts the pulse frequency which should correspond to 100% of the original numerical reference.

**Note:** Set **3.63** above 0.5 Hz, since the drive output is inactive below this value.

**3.64** : Drive output reference scaling

Adjustment range : 0 to 32.00

Factory setting : 1.00

Used for scaling the reference from the drive encoder.

**3.65** : Drive output reference

Adjustment range : 0 to 100%

Indicates the value of the analog reference.

**3.66** : Not used**3.67** : Reference select (□)

Adjustment range : 0 or 1

Factory setting : 0

**0 (Freq. input) (Freq):** An analog reference is generated from a frequency signal.

**1 (Enc. input) (Encd):** The encoder signal is used to generate an analog reference (e.g. speed reference).

**3.68** : Minimum frequency threshold (□)

Adjustment range : 1.0 to 10.0 Hz

Factory setting : 1.0 Hz

This parameter is used to define a minimum signal absence detection time for the frequency input. Used to adapt detection to the period of the signal.

This minimum time = 1/(**3.68**).

**3.69** and **3.70** : Not used**3.71** : Drive output reference sourceAdjustment range : **0.00** to **21.51**Factory setting : **0.00**

Used to select the source of the numerical reference which will be converted into pulses.

**3.72** : Drive output period

Adjustment range : 0.000 to 2.000 s

Drive output period resulting from conversion of the numerical reference.

Application example:

A potentiometer connected to an analog input generates a reference which is converted into pulses whose period is proportional to the reference. The pulses are assigned to the run command.

**3.73** : Drive output signal

Adjustment range : 0 or 1

**0 (Inactive) (OFF)****1 (Active) (On)**

Used to assign the drive output to a digital output if necessary, e.g. DIO1.

**Note:** There is no counting above 2 seconds.

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# VARMECA 30


## Variable speed motor or geared motor

### MENU 4: CURRENT AND TORQUE CONTROL

## 4 - MENU 4: CURRENT AND TORQUE CONTROL

### 4.1 - List of parameters in Menu 4

Parameter	Name		Type	Adjustment range	Factory setting	User setting
4.01	Current magnitude		RO/P	0 to max. current drive (A)	-	-
4.02	Active current		RO/P	± max. drive current	-	-
4.03	Not used					
4.04	Current demand		RO/P	± active current limit (% active In)	-	-
4.05 and 4.06	Not used					
4.07	Active current limit		R-W	0 to + 300.0% (% active)	165.0%	
4.08	Torque reference		R-W	± 300.0% (% active In)	0	
4.09 and 4.10	Not used					
4.11	Torque mode selector		R-W	0 or 1	0	
4.12	Current demand filter	<input checked="" type="checkbox"/>	R-W	0 to 10 ms	0	
4.13	Current controller Kp gain		R-W	0 to 999	20	
4.14	Current controller Ki gain		R-W	0 to 250	40	
4.15	Thermal time constant		R-W	0 to 250 s	89 s	
4.16	Thermal protection mode		R-W	0 or 1	0	
4.17	Reactive current		RO/P	± 9999	-	-
4.18	Overriding current limit		RO/P	0 to + 300% (% active In)	-	-
4.19	Overload accumulator		RO/P	0 to 100.0%	-	-
4.20	Percentage load		RO/P	± active current limit (% active In)	-	-
4.21	Selection of load display (PAD option)		R-W	0 or 1	0	
4.22 to 4.51	Not used					
4.52	Max. speed in torque control mode		R-W	0 to 32000 min <sup>-1</sup>	1500 min <sup>-1</sup>	

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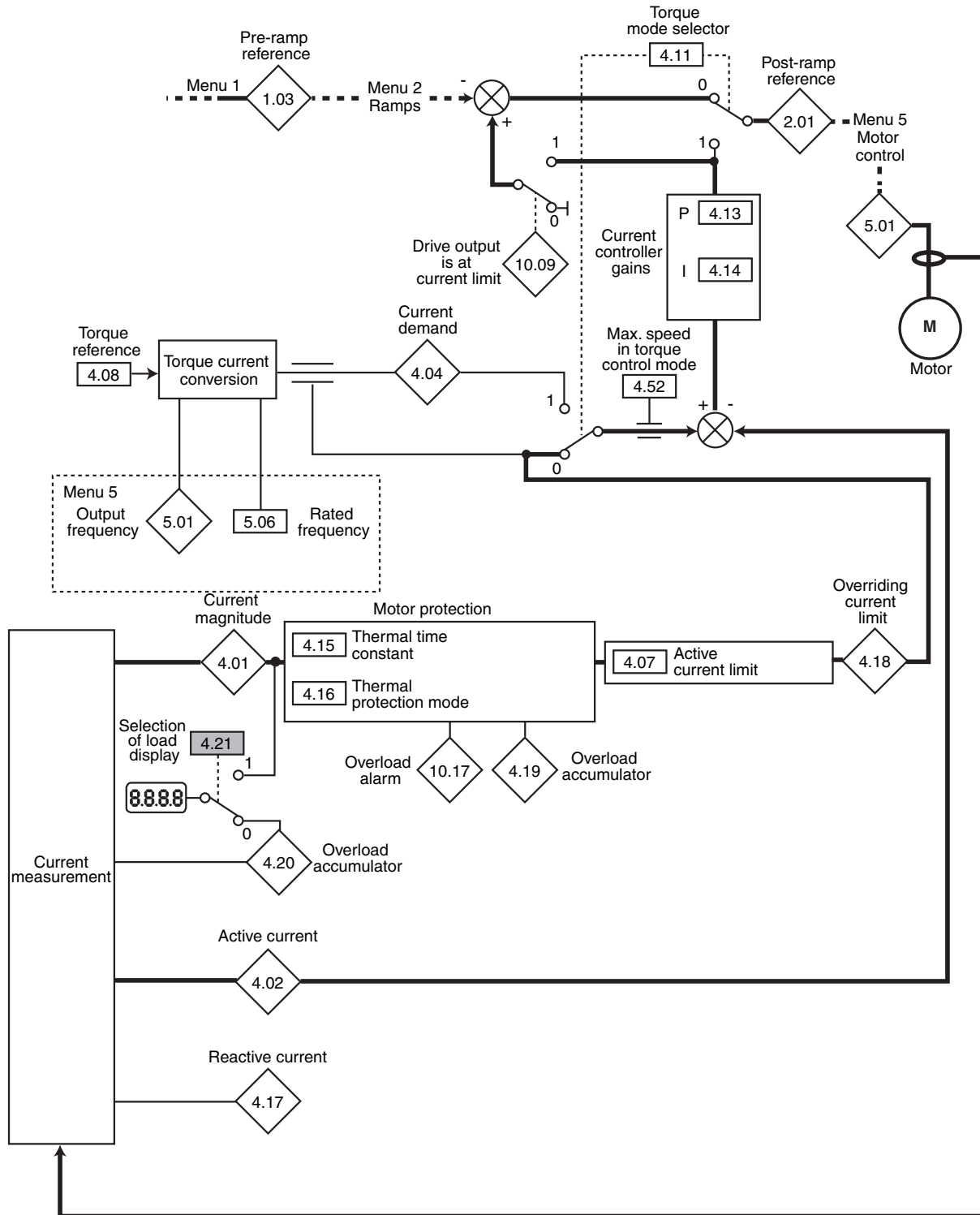
# VARMECA 30

## Variable speed motor or geared motor

### MENU 4: CURRENT AND TORQUE CONTROL

## 4.2 - Menu 4 diagram

### 4.2.1 - Basic version



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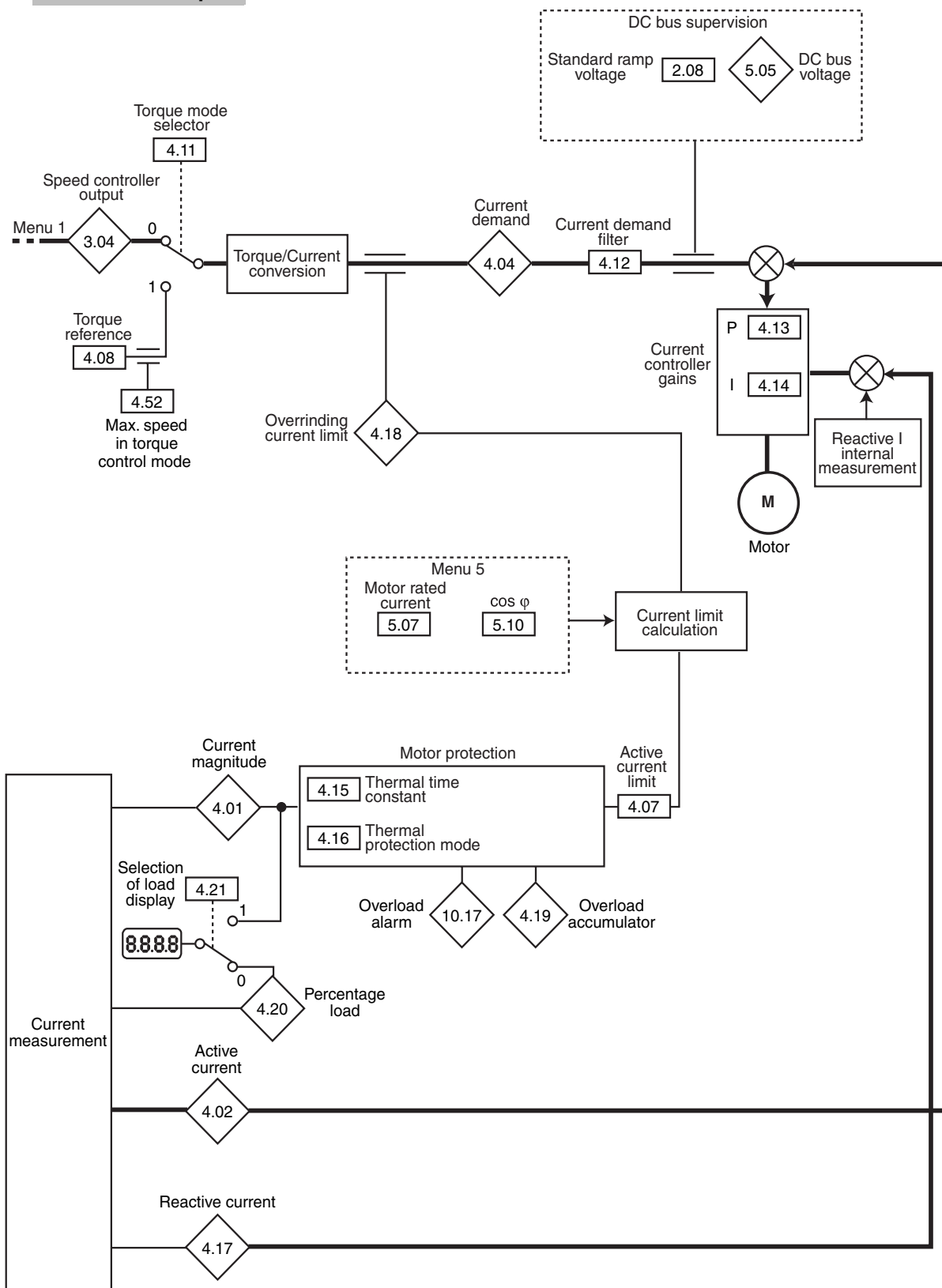


# VARMECA 30

## Variable speed motor or geared motor

### MENU 4: CURRENT AND TORQUE CONTROL

#### 4.2.2 - With encoder option



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# VARMECA 30

## Variable speed motor or geared motor

### MENU 4: CURRENT AND TORQUE CONTROL

### 4.3 - Explanation of parameters in menu 4

#### 4.01 : Current magnitude

Adjustment range : 0 to max. drive current (A)  
Reading of the rms current in each drive output phase.  
This is the result of the vectorial sum of the reactive current and the active current.

#### 4.02 : Active current

Adjustment range : ± max. drive current  
Reading of the active current delivered by the drive.  
The active current gives a fairly precise image of the motor torque between 10 Hz and 50 Hz.  
A negative value indicates operation in generator mode with driving load whereas a positive value indicates operation in motor mode.

#### 4.03 : Not used

#### 4.04 : Current demand

Adjustment range : ± active current limit (% active In)  
The current demand is the result of conversion of the torque reference **4.08** corrected by the active current limit **4.07**.

#### 4.05 and 4.06 : Not used

#### 4.07 : Active current limit

Adjustment range : 0 to +300.0% (% active In)\*  
Factory setting : 165.0%  
Determines the active current limit that applies in both motor and generator mode in both directions of rotation.  
With frequency control (**4.11** = 0), the output frequency will automatically be adjusted in order to adhere to the current limit.  
The current limit is an active current limit whereas the maximum current permitted by the drive is a total current.  
The maximum value of **4.07** can therefore take the following value:

$$\text{Max. active I} = \frac{\sqrt{\text{total max } I^2 - \text{reactive } I^2}}{\text{Active In}} \times 100 \%$$

$$\text{Max. total I} = 150\% \text{ drive In}$$

$$\text{Active In} = \text{motor In} \times \cos \varphi$$

$$\text{Reactive current} = \sqrt{\text{motor In}^2 - \text{active In}^2}$$

\* : The maximum value of **4.07** depends on the value of **11.32**, **5.07** and **5.10**, such that:

- For an induction motor (**11.31** = 0, 1 or 2)

$$\frac{(\mathbf{11.32} \times 2.22)}{(\mathbf{5.07} \times \mathbf{5.10})} \times 100$$

- For a synchronous motor (**11.31** = 3)

$$\frac{(\mathbf{11.32} \times 2.22)}{\mathbf{5.07}} \times 100$$

#### 4.08 : Torque reference

Adjustment range : ± 300.0% (% active In)

Factory setting : 0

Main torque reference when the drive is configured for torque control.

Give a positive reference for the torque to be applied in the clockwise direction and, conversely, a negative reference for the torque to be applied in the anti-clockwise direction.

#### 4.09 and 4.10 : Not used


#### 4.11 : Torque mode selector

Adjustment range : 0 or 1

Factory setting : 0

**0 (Speed) (SPd): Speed control with current limiting by parameter 4.07.**

**1 (Torque) (trq):** Torque control. The speed reference is no longer active and the torque reference can be given by analog reference 2 (if it is programmed on the torque reference, parameter **4.08**). The output frequency is adjusted so that the active current measured by the drive is equal to the reference.

• With torque control (**4.11** = 1),  
 the machine races if the resistive torque drops to zero. It is therefore essential to make sure that parameter **1.06**, which limits the maximum speed, is set so as to ensure the safety of equipment and personnel.  
When racing occurs, the maximum speed reached is **1.06** + 30%.

#### 4.12 : Current demand filter (▣)

Adjustment range : 0 to 10 ms

Factory setting : 0

This filter is used to introduce a time constant aimed at reducing any noise generated by the speed controller, such that: time constant = 2<sup>4.12</sup> ms.

#### 4.13 : Current controller Kp gain

#### 4.14 : Current controller Ki gain

Adjustment range : **4.13** = 0 to 999, **4.14** = 0 to 250

Factory setting : **4.13** = 20

**4.14** = 40

Due to a number of factors internal to the drive, oscillations may occur in the following cases:

- Frequency regulation with current limiting around the rated frequency and on load impacts
- Torque control on machines with a low load and around the rated speed
- On a mains supply break or on a controlled deceleration ramp when DC bus regulation is requested.

To reduce these oscillations, we recommend that you first:

- increase the proportional gain **4.13**
- then reduce the integral gain **4.14**.

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# VARMECA 30

## Variable speed motor or geared motor

### MENU 4: CURRENT AND TORQUE CONTROL

**4.15** : Thermal time constant

Adjustment range : 0 to 250 s

Factory setting : 89 s

This parameter is used to define the motor thermal protection. If known, the thermal time constant of the motor should be entered directly in **4.15**. Otherwise it should be calculated as a function of the maximum time for which the motor can tolerate 150%  $I_N$ .

$$4.15 = \frac{\text{maximum duration } 150\% I_N}{0.674}$$

**Note:** When **7.11** = (ADI2 configured as a PTC input), it is possible to deactivate the motor thermal protection (itAC motor overload trip) by setting **4.15** = 0.

**4.16** : Thermal protection mode

Adjustment range : 0 or 1

Factory setting : 0

**0 (Def/I limit) (deF): The drive will trip when the threshold defined in parameter 4.15 is reached.**

**1 (Auto I lim.) (Auto):** The limiting current will automatically be reduced below 100%  $I_N$  when the threshold defined in parameter **4.15** is reached.

**4.17** : Reactive current

Adjustment range : ± 9999

Reactive current reading

**4.18** : Overriding current limitAdjustment range : 0 to +300% (% max. active  $I_n$ )

Depending on the system operation, indicates the rms current limit in real time.

**4.19** : Overload accumulator

Adjustment range : 0 to 100.0%

The accumulator increases according to the formula

$$4.19 = \frac{4.01^2 (1 - e^{-t/4.15})}{(5.07 \times 1.05)^2} \times 100\%$$

When **4.19** reaches 100%, the drive goes into "It Ac" trip state or causes the limiting current to be reduced.

**4.20** : Percentage loadAdjustment range : ± active current limit (% active  $I_n$ )

This parameter indicates the drive load level. A positive value indicates operation in motor mode whereas a negative value indicates operation in generator mode (driving load).

**4.21** : Selection of load display

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to obtain an indication of the load or the total current on the display.

4.21	LCD display	LED display	Functions
0	As % $I_{nom}$	Ld	Display of the drive load level 4.20.
1	In Amps	A	Display of the total motor

**4.22** to **4.51** : Not used**4.52** : Max. speed in torque control modeAdjustment range : 0 to 32000  $\text{min}^{-1}$ Factory setting : 1500  $\text{min}^{-1}$ 

In torque control mode, this parameter is used to set the speed at which the drive reverts to speed regulation, in order to avoid reaching an excessive rotation speed. The maximum speed taken into account corresponds to the value of parameter **4.52** + 20%.

**Note:** Parameter **1.06**, Maximum reference clamp, is always active, as is the "OSP" overspeed trip (**1.06** + 20%).

VMA 33/34 only







# VARMECA 30

## Variable speed motor or geared motor

MENU 5: MOTOR CONTROL


## 5 - MENU 5: MOTOR CONTROL

### 5.1 - List of parameters in Menu 5

Parameter	Name	Type	Adjustment range	Factory setting	User setting
5.01	Output frequency	RO/P	±400.0 Hz	-	-
5.02	Output voltage	RO/P	0 to <b>5.09</b> Volts	-	-
5.03	Output power	RO/P	0 to 200 kW	-	-
5.04	Motor speed	RO/P	± 2 x <b>1.06</b> min <sup>-1</sup>	-	-
5.05	DC bus voltage	RO/P	M: 0 to 460 V T: 0 to 860 V	-	-
5.06	Motor rated frequency	R-W	0 to 400.0 Hz	Eur: 50.0 Hz USA: 60.0 Hz	
5.07	Motor rated current	R-W	0 to drive rated current (A)	Motor rated current corresponding to the rating	
5.08	Motor rated speed	R-W	0 to 9999 min <sup>-1</sup>	Motor rated speed corresponding to the rating	
5.09	Motor rated voltage	R-W	0 to 480 V	-	
5.10	Rated power factor (cos φ)	R-W	0 to 1.00	0.85	
5.11	Number of motor poles	R-W	0 to 4	0	
5.12	Autotune	R-W	0 to 2	0	
5.13	Dynamic V to F	R-W	0 or 1	0	
5.14	Voltage mode select	 R-W	0 to 5	3 then 1	
5.15	Low frequency voltage boost	R-W	0 to 25.0% of <b>5.09</b>	0	
5.16	Not used				
5.17	Stator resistance	R-W	0 to 32.000 Ω**	0	
5.18	Maximum switching frequency	R-W	0 to 5	1	
5.19	High stability space vector modulation	R-W	0 or 1	0	
5.20*	Quasi-square enable	 R-W	0 or 1	0	
5.21 and 5.22	Not used				
5.23	Voltage offset	R-W	0 to 25.5 Volts	0	-
5.24	Transient inductance	R-W	0 to 3200.0 mH	0	
5.25	Stator inductance (Ls)	 R-W	0 to 3200.0 mH	150.0 mH	
5.26 to 5.31	Not used				
5.32*	Motor torque per amp (Kt)	 R-W	0.01 to 320.00 NmA <sup>-1</sup>	1.00 NmA <sup>-1</sup>	
5.33	Motor volts per 1000 min <sup>-1</sup> (Ke)	 R-W	0 to 10000 V	98 V	
5.34	Unit for displaying the speed (PAD option)	R-W	0 to 2	1	
5.35	Disable automatic adjustment of the switching	R-W	0 or 1	0	
5.36 to 5.50	Not used				
5.51	q axis inductance	 R-W	0 to 999.9 mH	150.0 mH	
5.52	Gearless optimisation	R-W	0 or 1	0	
5.53 to 5.57	Not used				
5.58	Enable boost on starting	R-W	0 or 1	0	
5.59	Not used				
5.60	Low speed switching frequency	R-W	0 to 5	0	
5.61	Switching frequency change threshold	R-W	0 to 400.0 Hz	0	

\* Function not available

\*\* VARMECA 31/32: 320.0 Ω

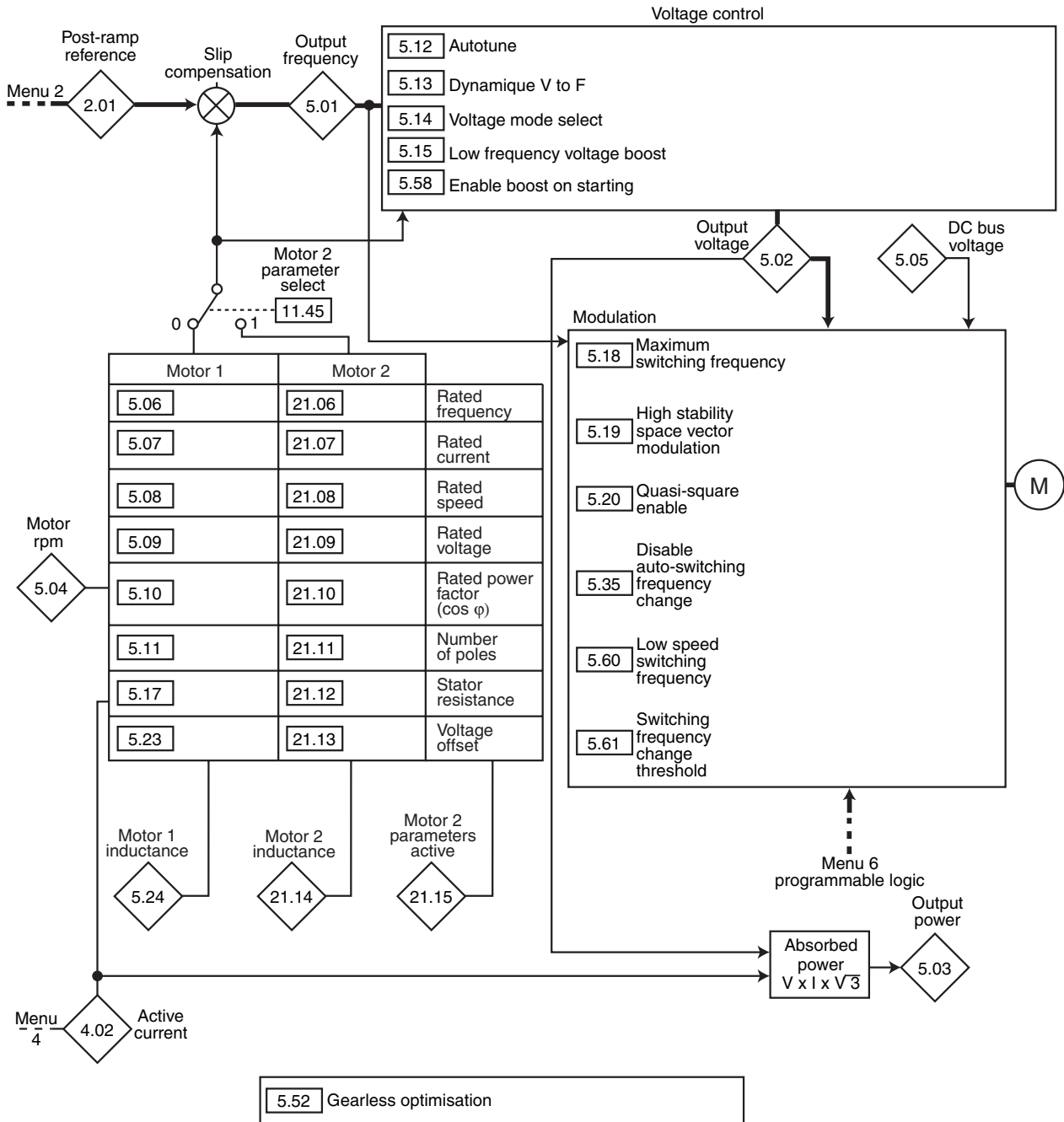
 VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

MENU 5: MOTOR CONTROL

### 5.2 - Menu 5 diagram



# VARMECA 30

## Variable speed motor or geared motor

MENU 5: MOTOR CONTROL

### 5.3 - Explanation of parameters in Menu 5

**5.01** : Output frequency

Adjustment range : ±400.0 Hz  
**5.01** is the drive output frequency.

**5.02** : Output voltage

Adjustment range : 0 to **5.09** Volts  
 This is the rms voltage at the drive output.

**5.03** : Output power

Adjustment range : 0 to 200 kW  
**5.03** is the calculated motor active power.

$$5.03 = 4.01 \times 5.02 \times (\cos \varphi \times \frac{\sqrt{3}}{1000} \text{ kW}).$$

If this parameter has been assigned to an analog output via menu 7, 10 V corresponds to the maximum power measurable by the drive (I max = 150% of drive rated current).

**5.04** : Motor speed

Adjustment range : ± 2 x **1.06** min<sup>-1</sup>  
 The motor speed is calculated according to the formula:

$$5.04 \text{ (min}^{-1}\text{)} = \frac{60 \times 5.01}{\text{number of pairs of motor poles}}$$

**5.05** : DC bus voltage

Adjustment range : TL = 0 to 420 V  
 T = 0 to 860 V  
 Indicates the DC bus voltage measurement.

**5.06** : Motor rated frequency

Adjustment range : 0 to 400.0 Hz  
 Factory setting : **Eur = 50.0 Hz**  
 USA = 60.0 Hz  
 This is the point at which motor operation changes from constant torque to constant power.  
 In standard operation, it is the frequency indicated on the motor nameplate.

**5.07** : Motor rated current

Adjustment range : 0 to drive rated current (A)  
 Factory setting : Motor rated current corresponding to the drive rating  
 This is the value of the motor rated current indicated on the nameplate. The overload is calculated from this value.

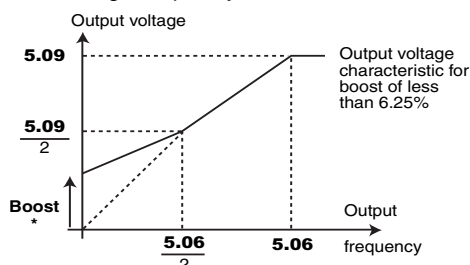
**5.08** : Motor rated speed

Adjustment range : 0 to 9999 min<sup>-1</sup>  
 Factory setting : Motor rated speed corresponding to the drive rating  
 This is the on-load speed of the motor indicated on the nameplate.

**5.09** : Motor rated voltage

Adjustment range : 0 to 480 V  
 Factory setting : **Eur (TL): 200 V, USA (TL): 230 V**  
**Eur (T): 400 V, USA (TL): 460 V**

Defines the voltage/frequency ratio as follows:



\* If fixed boost has been selected **5.14** = 2.

**5.10** : Rated power factor (Cos φ)

Adjustment range : 0 to 1.00  
 Factory setting : 0.85  
 The power factor is measured automatically during a level 2 autotune phase (see **5.12**) and set in this parameter. If it has not been possible to carry out the autotune procedure, enter the Cos φ value indicated on the motor nameplate.

**5.11** : Number of motor poles

Adjustment range : 0 to 4  
 Factory setting : 0  
**0 (Automatic) (Auto)**

**1 (2 Poles) (2P)**

**2 (4 Poles) (4P)**

**3 (6 Poles) (6P)**

**4 (8 Poles) (8P)**

When this parameter is at 0, the drive automatically calculates the number of poles according to the rated speed (**5.08**) and the rated frequency (**5.06**). However, the value can be entered directly in accordance with the table below:

Motor rated speed min <sup>-1</sup>	Number of poles	5.11
3000	2	1
1500	4	2
1000	6	3
750	8	4

# VARMECA 30

## Variable speed motor or geared motor

MENU 5: MOTOR CONTROL

### 5.12 : Autotune

Adjustment range : 0 to 2  
Factory setting : 0

**!** • The measurement taken when **5.12 = 2** should be taken with the motor uncoupled since the variable speed drive drives the motor at 2/3 of its rated speed. Check that this operation does not present any safety risks, and ensure that the motor is stopped before the autotune procedure.

• After modifying motor parameters, repeat autotuning.

**0 (no) (no): No autotune**

**1 (No rotation) (StoP):** Measurement of motor characteristics when stopped. The stator resistance and the voltage offset are stored in **5.17** and **5.23** respectively.

**Procedure:**

- Ensure that the motor parameters have been configured and that the motor is stopped.
  - Enable the drive.
  - Give a run command. The display indicates "Auto" and "tunE" alternately. Wait for the display to stabilise at 0.
  - Disable the drive and remove the run command.
- The motor is then ready to operate normally.  
Parameter **5.12** returns to 0 as soon as autotuning is complete.

**CAUTION:**

This autotuning is performed automatically even though **5.12 = 0**, in the following cases:

- Initial commissioning of the drive
- Return to factory settings, after the drive has been enabled and a run command given

**2 (With rotat.) (rot):** Measurement of motor characteristics with rotation.

The stator resistance and the voltage offset are stored in **5.17** and **5.23** respectively, and the reactive current and leakage inductance are used to calculate the power factor **5.10**. This mode is used to obtain optimum performance.

**Procedure:**

- Ensure that the motor parameters have been configured and that the motor is stopped.
  - Enable the drive.
  - Give a run command. The motor accelerates up to 2/3 of rated speed, then performs a freewheel stop. During autotuning, the display indicates "Auto" and "tunE" alternately. Wait for the display to stabilise at 0.
  - Disable the drive and remove the run command.
- The motor is then ready to operate normally.  
Parameter **5.12** returns to 0 as soon as autotuning is complete.

### 5.13 : Dynamic V to F

Adjustment range : 0 or 1  
Factory setting : 0

**0 (Fixed) (Lin):** The V/F ratio is fixed and set by the base frequency (**5.06**).

**1 (Dynamic) (dyn):** Dynamic V/F ratio.

Generates a voltage/frequency characteristic which varies with the load. It is for use in quadratic torque applications (pumps/fans/compressors). It can be used in constant torque applications with low dynamics to reduce motor noise.

### 5.14 : Voltage mode select

Adjustment range : 0 to 5  
Factory setting : 3

Determines the open loop control mode. Modes 0, 1, 3 or 4 are used in flux vector control mode. The difference between these modes is the method used to identify the motor parameters, particularly the stator resistance. As these parameters vary with temperature and are essential for obtaining optimum performance, the machine cycle must be taken into account for selecting the most appropriate mode. Modes 2 and 5 correspond to a U/F ratio control mode. This ratio is linear in mode 2 and quadratic in mode 5.

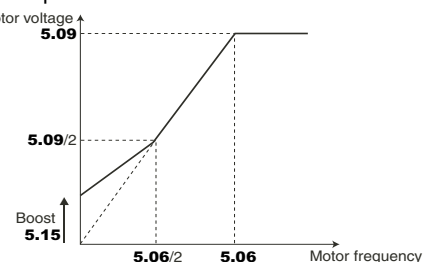
**0 (VECT.LEVEL3) (r.run):** The stator resistance and voltage offset are measured each time the drive receives a run command.

These measurements are valid only if the machine is stopped, and totally defluxed. The measurement is not taken when the run command is given less than 2 seconds after the previous stop. This is the most effective flux vector control mode. However, the operating cycle must be compatible with the 2 seconds required between a stop command and a new run command.

**1 (VECT.LEVEL0) (r.no):** The stator resistance **5.17** and voltage offset **5.23** are not measured.

This mode is of course the least effective. It should be used only when mode 0 (r.run) is incompatible with the operating cycle. If this were the case, during commissioning, an autotune (**5.12**) should be performed to read the values measured in **5.17** and **5.23** and use them with mode 1 (r.no) in normal operation.

**2 (U/F) (UtoF):** Voltage-frequency ratio with fixed boost adjustable via parameters **5.15** and **5.09**.



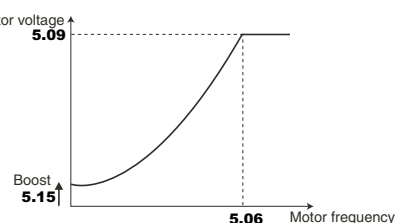
**CAUTION:**

Use this mode to control several motors.

**3 (VECT.LEVEL1) (r.FSt):** The stator resistance **5.17** and voltage offset **5.23** are measured the first time the drive is enabled.

**4 (VECT.LEVEL2) (r.On):** The stator resistance **5.17** and voltage offset **5.23** are measured the first time the drive is enabled following each power-up.

**5 (QUASI SQUARE) (SqrE):** Quadratic voltage/frequency ratio.



**!** • In mode 4 (r.On), a voltage is briefly applied to the motor. For safety reasons, no electrical circuit must be accessible once the drive is powered up.

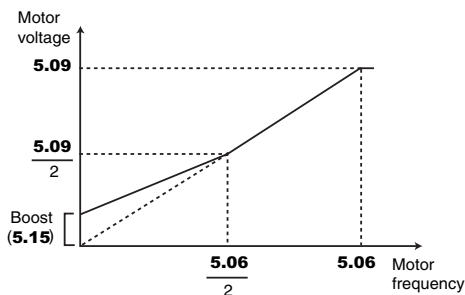
# VARMECA 30

## Variable speed motor or geared motor

MENU 5: MOTOR CONTROL

**5.15** : Low frequency voltage boost

Adjustment range : 0 to 25.0% of motor Un (**5.09**)  
 Factory setting : 0  
 For operation in U/F mode (**5.14** at 2) or in open loop flux vector mode if **5.58** = 1, parameter **5.15** is used to overflux the motor at low speed so that it delivers more torque on starting. It is a percentage of the rated motor voltage (**5.09**).



**5.16** : Not used

**5.17** : Stator resistance

Adjustment range : 0 to 32.000 Ω for VMA 33/34  
 0 to 320.00 Ω for VMA 31/32  
 Factory setting : 0  
 This parameter stores the motor stator resistance for flux vector control mode (see parameter **5.14**).  
 The stator resistance value is only read if **5.14** = 0.  
 If the stator resistance cannot be measured (motor not connected, value higher than the max. rating) an "rS" trip occurs.  
 During autotuning (**5.12** = 1 or 2), the value of the stator resistance is automatically stored in **5.17**.

**5.18** : Maximum switching frequency

Adjustment range : 0 to 5  
 Factory setting : 1  
 Sets the PWM switching frequency.

5.18	VMA 33/34 frequency	VMA 31/32 frequency
0	3 kHz	3 kHz
1	4.5 kHz	4 kHz
2	5.5 kHz	5 kHz
3	6 kHz	6 kHz
4	9 kHz	8 kHz
5	11 kHz	10 kHz
6	-	12 kHz
7	-	16 kHz

**CAUTION:**

A high switching frequency reduces the magnetic noise, but it increases the motor temperature rise and the level of radio-frequency interference emission, and reduces the starting torque.  
 If the temperature of the IGBTs becomes too high, the drive can reduce the switching frequency selected by the user (see **5.35** and **10.18**).

**5.19** : High stability space vector modulation

Adjustment range : 0 or 1  
 Factory setting : 0  
**0 (Disabled) (OFF):** Function disabled.  
**1 (Enabled) (On):** Function enabled. Instabilities can occur:  
 - at 50% of the motor rated frequency for an underloaded motor  
 - around and above the motor rated speed, when the motor is underloaded or very heavily loaded.  
 This function is used to eliminate these instabilities. It also enables a slight reduction in the drive temperature rise. However, using this mode may result in a slight increase in motor noise.

**5.20** : Quasi-square enable

Adjustment range : 0 or 1  
 Factory setting : 0  
**0 (Disabled) (OFF):** Function disabled.  
**1 (Enabled) (On):** The maximum output voltage of the drive is higher, resulting in an increase in motor torque. This is beneficial for applications where it is desirable to reduce speed pick-up times in the event of long cycles. However, the motor torque may have slight ripples when it is lightly loaded.  
**Function not available.**

**5.21** and **5.22** : Not used

**5.23** : Voltage offset

Adjustment range : 0 to 25.5 volts  
 Factory setting : 0  
 This voltage offset is measured by the drive (see parameter **5.14**). It is used to correct imperfections in the drive, especially voltage drops in the IGBTs and idle times. This parameter has an important role in low-speed operation, i.e. when the drive output voltage is low.  
 During autotuning (**5.12** = 1 or 2), the value of the voltage offset is automatically stored in **5.23**.

**5.24** : Transient inductance

Adjustment range : 0 to 3200.0 mH  
 Factory setting : 0  
 During autotuning with rotation (**5.12** = 2), the transient inductance is stored in this parameter.

**5.25** : Stator inductance (Ls)

Adjustment range : 0 to 3200.0 mH  
 Factory setting : 150.0 mH  
 This is the motor stator inductance at rated flux.

**5.26** to **5.31** : Not used

**5.32** : Motor torque per amp (Kt)

Adjustment range : 0.01 to 320.00 NmA<sup>-1</sup>  
 Factory setting : 1.00 NmA<sup>-1</sup>  
 Indicates the motor torque per Amp of active current used by the drive in calculating the speed controller gains (**3.17** = 1).  
**Function not available.**

VMA 33/34 only



# VARMECA 30

## Variable speed motor or geared motor

MENU 5: MOTOR CONTROL

**5.33** : Motor volts per 1000 min<sup>-1</sup> (Ke) 

Adjustment range : 0 to 10000 V

Factory setting : 98 V

Used to set the motor voltage per 1000 min<sup>-1</sup>. Is used to adjust the current controller integral gain to prevent current peaks when the drive is enabled with a spinning motor.

**5.34** : Unit for displaying the speed (PAD option)

Adjustment range : 0 to 2

Factory setting : 1

5.34	PX LCD display	PAD display	Function
0	Hertz	Fr	Output frequency expressed in Hz (5.01)
1	min <sup>-1</sup>	SP	Motor speed expressed in min <sup>-1</sup> (5.04)
2	Customised	Cd	Customer unit defined using a coefficient determined in parameter 11.21 as follows: Cd = 5.04 motor speed in min <sup>-1</sup> x 11.21

**5.35** : Disable automatic adjustment of the switching frequency

Adjustment range : 0 or 1

Factory setting : 0

**0 (Automatic) (Auto):** In the event of increased temperature of the IGBTs, the switching frequency is automatically reduced.

**1 (Disabled) (no):** Automatic adjustment of the switching frequency is disabled. In this case, the drive trips if the temperature of the IGBTs is too high.

**5.36** to **5.50** : Not used**5.51** : q axis inductance 

Adjustment range : 0 to 999.9 mH

Factory setting : 150.0 mH

This is the motor stator inductance in quadrature with the total inductance L<sub>s</sub> (**5.25**), used to control a salient-pole synchronous motor.

**5.52** : Gearless optimisation

Adjustment range : 0 or 1

Factory setting : 0

**0 (Disabled) (OFF):** Optimisation deactivated.

**1 (Enabled) (On):** Optimisation activated. Used to obtain a more regular rotation at very low speed (the torque is lower, but "smoother").

**5.53** to **5.54** : Not used**5.55** : Motor type

Adjustment range : 0 to 95 (VMA 31/32 only)

Factory setting: 0

This parameter is used to select a motor type and its associated basic parameters (access reserved for LEROY-SOMER).

**5.56** : Thermal curve inflexion point (VMA 31/32 only)Adjustment range : 0 to F<sub>max</sub>

Factory setting: 0

(see curve below with **5.57**).

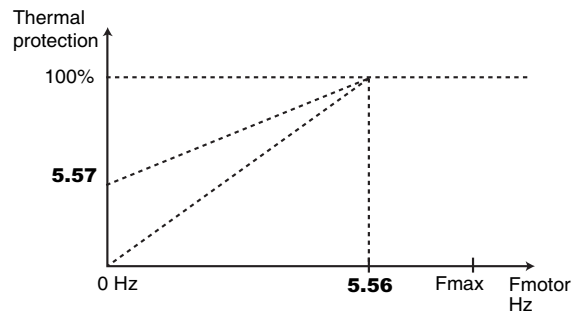
VMA 33/34 only

**5.57** : Thermal current value at 0 Hz (as a % of max. motor current) (VMA 31/32 only)

Adjustment range : 0 to 100%

Factory setting: 100

Parameter **5.57**, combined with **5.56**, is used to model thermal protection in the event of continuous use at low speed and ensure better protection of the motor.

**5.58** : Enable boost on starting

Adjustment range : 0 or 1

Factory setting : 0

**0 (OFF):** No action.

**1 (ON):** In open loop mode, voltage boost on starting (**5.15**) is active.

**5.59** : Not used**5.60** : Low speed switching frequency

Adjustment range : 0 to 5

Factory setting : 0

5.60	PX LCD display	PAD display
0	2 kHz	2 hH
1	2.5 kHz	2.5 hH
2	3 kHz	3 hH
3	4.5 kHz	4.5 hH
4	5.5 kHz	5.5 hH
5	6 kHz	6 hH

Used to set a switching frequency different from that set in **5.18**, when the motor frequency **5.01** has reached a threshold defined in **5.61**.

**CAUTION:**

**A high switching frequency reduces the magnetic noise, but it increases the motor temperature rise and the level of radio-frequency interference emission, and reduces the starting torque.**

**5.61** : Switching frequency change threshold

Adjustment range : 0.0 to 400.0 Hz

Factory setting : 0.0 Hz

If the motor frequency **5.01** is below the threshold set by **5.61**, the switching frequency selected by **5.60** is used. Otherwise, it is the switching frequency set in **5.18** which is active.

Reminder:  $F = (pp \times S)/60$ 

where F is the frequency in Hz, pp the number of poles and S the speed in min<sup>-1</sup>.

# VARMECA 30

## Variable speed motor or geared motor

### MENU 6: PROGRAMMABLE LOGIC AND TIMERS

## 6 - MENU 6: PROGRAMMABLE LOGIC AND TIMERS

### 6.1 - List of parameters in Menu 6

Parameter	Name	Type	Adjustment range	Factory setting	User setting
6.01	Stop mode	R-W	0 to 4	1	
6.02	Not used				
6.03	Mains loss mode	R-W	0 to 2	0	
6.04	Start/stop logic select	R-W	0 to 2	0	
6.05	Not used				
6.06	DC injection braking level	R-W	0 to <b>4.07</b>	100.0%	
6.07	DC injection braking time	R-W	0 to 25.0 s	1 s	
6.08	Hold zero speed	R-W	0 or 1	0	
6.09	Catch a spinning motor	R-W	0 to 3	0	
6.10	Enable reduced-voltage operation	R-W	0 or 1	0	
6.11*	Enable keypad forward key	R-W	0 or 1	CP version: 1 SET version: 0	
6.12*	Enable keypad stop key	R-W	0 or 1	1	
6.13*	Enable keypad reverse key	R-W	0 or 1	0	
6.14	Not used				
6.15	Drive enable	R-W	0 or 1	1	
6.16	Not used				
6.17	Reset energy meter	R-W	0 or 1	0	
6.18 and 6.19	Not used				
6.20	Powered-up time: years.days	RO/P	0 to 9.364 years, days	-	-
6.21	Powered-up time: hours.minutes	RO/P	0 to 23.59 hrs, min	-	-
6.22	Run time: years.days	RO/P	0 to 9.364 (years, days)	-	-
6.23	Run time: hours.minutes	RO/P	0 to 23.59 (hrs, min)	-	-
6.24	Energy meter: MWh	RO/P	0 to 999.9 MWh	-	-
6.25	Energy meter: kWh	RO/P	0 to 99.99 kWh	-	-
6.26 to 6.29	Not used				
6.30	Sequencing bit: Run forward	R-A	0 or 1	0	-
6.31	Sequencing bit: Jog	R-A	0 or 1	0	-
6.32	Sequencing bit: Run reverse	R-A	0 or 1	0	-
6.33	Sequencing bit: Forward/reverse	R-A	0 or 1	0	-
6.34	Sequencing bit: Run	R-A	0 or 1	0	-
6.35 to 6.38	Not used				
6.39	Sequencing bit: Stop	R-A	0 or 1	0	-
6.40 and 6.41	Not used				
6.42	Control word	R-W	0 to 32767	0	
6.43	Control word enable	R-W	0 to 3	0	
6.44 to 6.50	Not used				
6.51	Downstream contactor management	R-W	0 or 1	0	
6.52	Downstream contactor voltage	R-W	0 to 25.0%	3.0%	
6.53	Downstream contactor current threshold	R-W	0 to 100.0%	10.0%	
6.54	Downstream contactor status	RO/P	0 or 1	-	-

\* PAD option

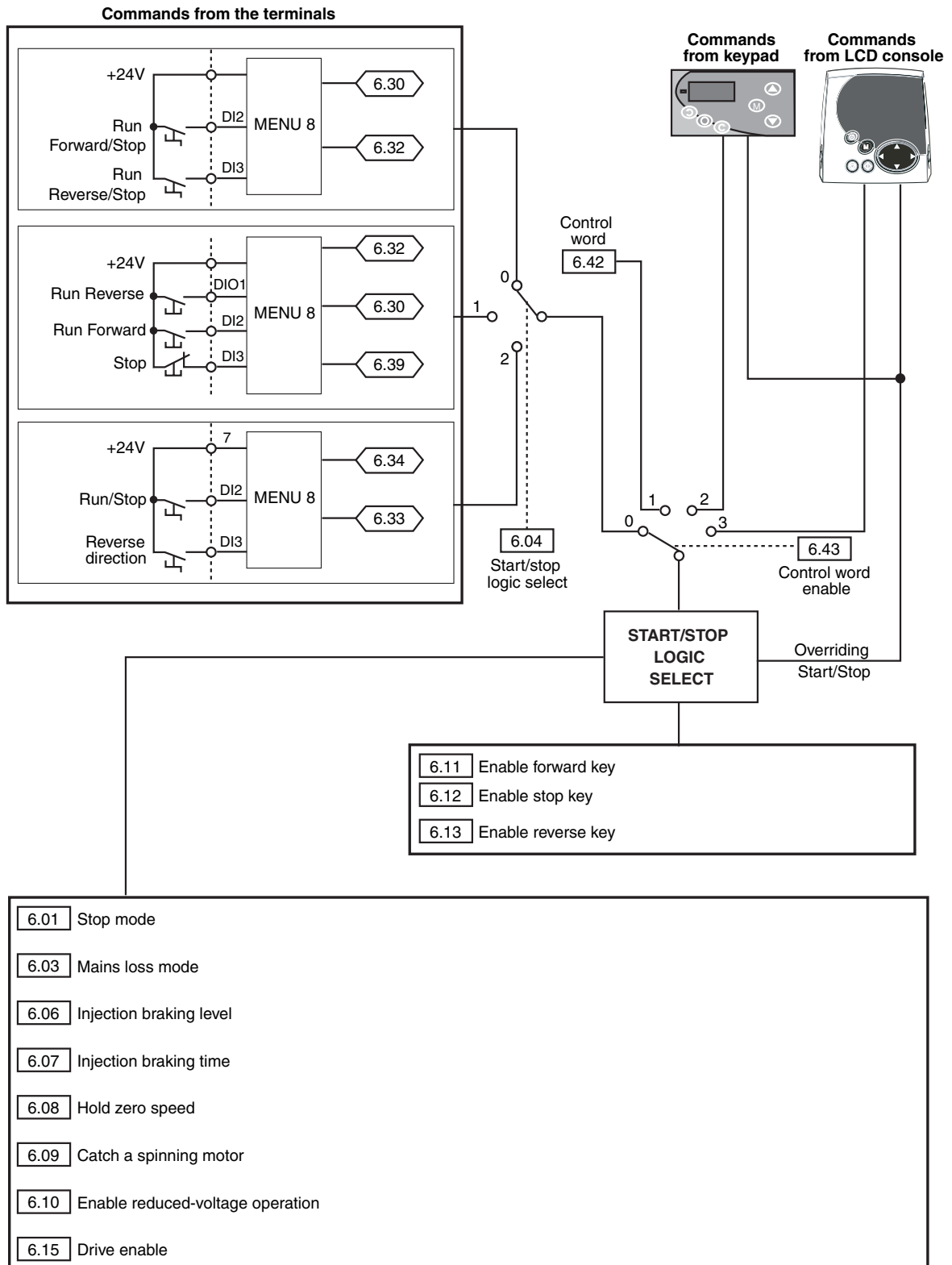
# VARMECA 30

## Variable speed motor or geared motor

### MENU 6: PROGRAMMABLE LOGIC AND TIMERS

## 6.2 - Menu 6 diagrams

### 6.2.1 - Programmable logic

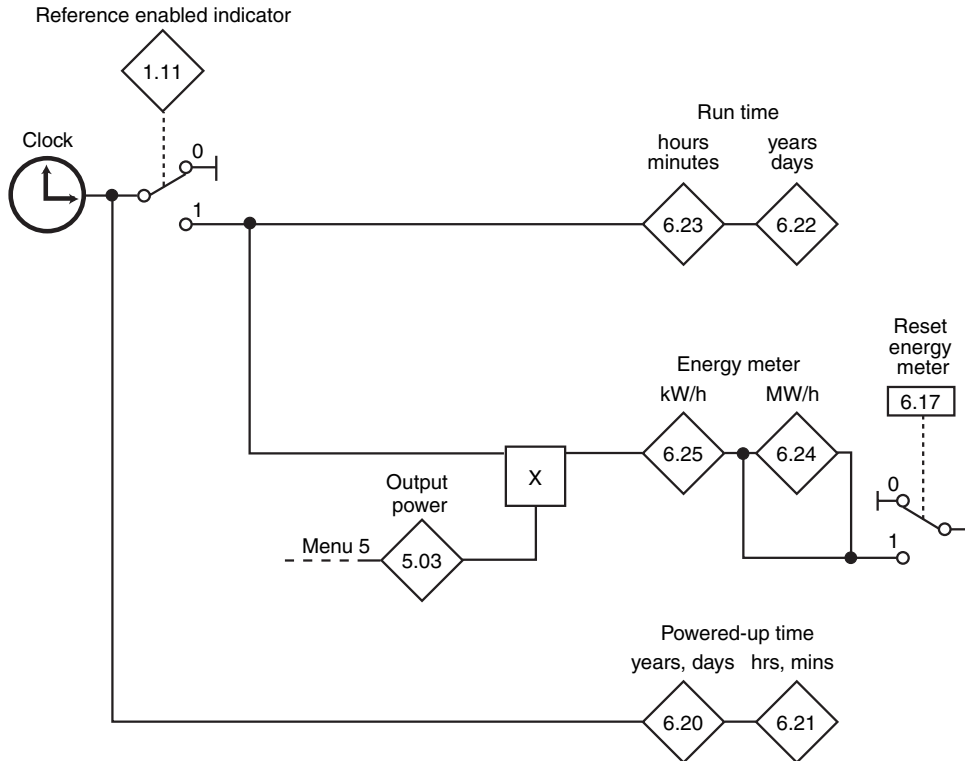


# VARMECA 30

## Variable speed motor or geared motor

MENU 6: PROGRAMMABLE LOGIC AND TIMERS

### 6.2.2 - Timer, energy meter and alarms



### 6.2.3 - Downstream contactor management

6.51	Downstream contactor management
6.52	Downstream contactor voltage
6.53	Downstream contactor current threshold

# VARMECA 30

## Variable speed motor or geared motor

### MENU 6: PROGRAMMABLE LOGIC AND TIMERS

## 6.3 - Explanation of parameters in menu 6

### 6.01 : Stop mode

Adjustment range :

6.01	Function
0	Freewheel stop
1	Stop on deceleration ramp.
2	Deceleration ramp + DC injection for a set period of time
3	Stop by DC injection braking for a set period of time and elimination at zero speed
4	Stop on DC injection for a set period of time

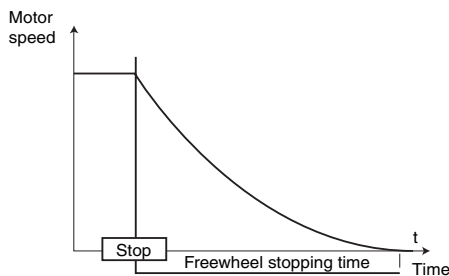
Factory setting : 1

#### 0 (Freewheel) (FrEE): Freewheel stop.

The power bridge is deactivated as soon as the stop command is given.

The drive cannot receive another run command for 2 s, the motor demagnetisation time.

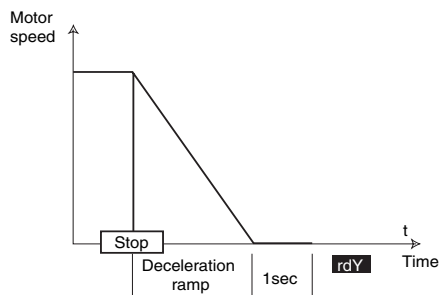
The display indicates "rdY" 2 seconds after the stop command. The machine stopping time depends on its inertia.



#### 1 (Ramp) (rAMP): Stop on deceleration ramp.

The drive decelerates the motor according to the deceleration mode chosen in parameter 2.04.

One second after the stop, the display indicates "rdY".

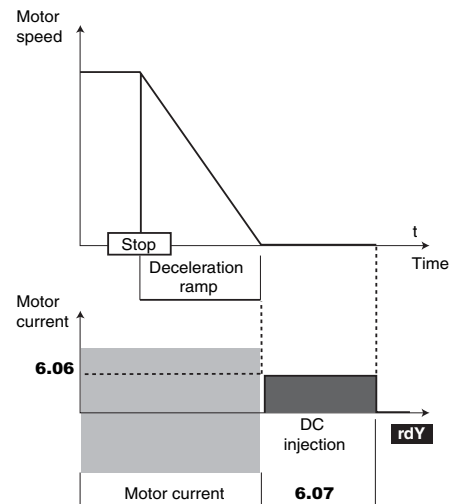


#### 2 (Ramp + DC) (rP.dC): Stop on deceleration ramp with DC injection for a set period of time.

The drive decelerates the motor according to the deceleration mode chosen in parameter 2.04.

When zero frequency is reached, the drive injects DC with an amplitude which can be set in parameter 6.06 for a time defined by parameter 6.07.

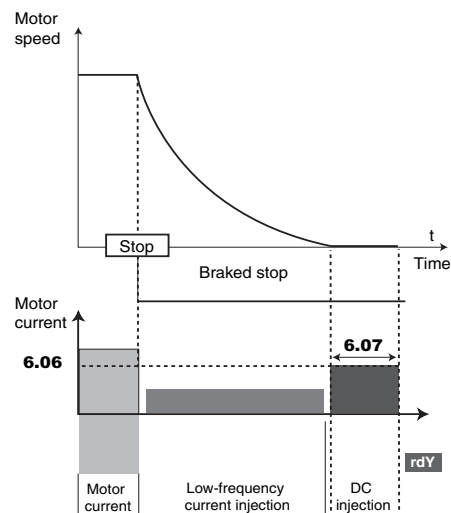
The drive then displays "rdY".



#### 3 (DC 0 speed) (dC-O): Stop by DC injection braking, and elimination at zero speed.

The drive decelerates the motor by setting a low frequency current until it reaches almost zero speed, which the drive detects automatically.

The drive then injects DC with an amplitude which can be set in parameter 6.06 for a time defined by parameter 6.07. The drive then displays "rdY". No run command can be taken into account until "rdY" is displayed.



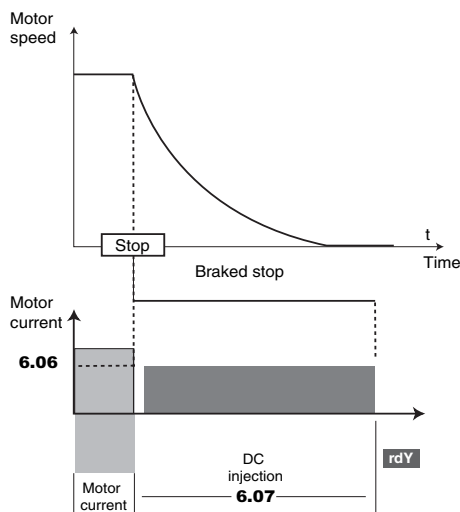
# VARMECA 30

## Variable speed motor or geared motor

MENU 6: PROGRAMMABLE LOGIC AND TIMERS

**4 (DC timed) (dC-t):** Stop on DC injection with a set period of time.

The drive decelerates the motor by setting a current defined by parameter **6.06** for a time defined by parameter **6.07**, and then the drive displays "rdY". No run command can be taken into account until "rdY" is displayed.



**6.02** : Not used

**6.03** : Mains loss mode

Adjustment range : 0 to 2

Factory setting : 0

6.03	Function
0	Transparent to micro-breaks
1	Deceleration down to stop
2	Deceleration down to stop (unless mains supply returns)

**0 (Disabled) (diS):** The drive does not take account of mains supply breaks and continues to operate while there is sufficient voltage on the DC bus.

**1 (Stop) (StOP):** In the event of a mains supply break, the drive will decelerate on a ramp, automatically calculated by the drive, so that the motor feeds back energy to the drive's DC bus and therefore continues to power its control electronics. Upon return to normal conditions, deceleration continues until the motor stops, but according to the deceleration mode configured in **2.04**.

**2 (Auto restart) (rd.th):** In the event of a mains supply break, the drive will decelerate on a ramp, automatically calculated by the drive, so that the motor feeds back energy to the drive's DC bus and therefore continues to power its control electronics. Upon return to normal conditions, the motor re-accelerates up to the reference speed.

**6.04** : Start/stop logic select

Adjustment range : 0 to 2

Factory setting : 0

Used to choose one of 3 Run/Stop command and Direction of rotation management modes.

**0 (Latched Run/Stop) (Lchd):**DI2 terminal used as FWD/Stop, DI3 terminal used as REV/Stop. Commands given via latched contacts.

**1 (Pulsed Run/Stop) (Puls):** DI2 terminal used as FWD, DI3 terminal used as Stop, DIO1 terminal used as REV. Commands given via pulsed contacts.

In this mode, the DI4 input can be assigned by the customer but only as a latched contact and the stop command via DI3 cannot be reassigned. To change from FWD to REV or vice versa, go via a stop command.

**2 (Run/Stop + Rev.Rot) (r.InP):**DI2 terminal used as Run/Stop, DI3 terminal used to select the direction of rotation. Commands given via latched contact.

These three configurations result in automatic assignment of the digital inputs. If, within a configuration, an input is not used by the application (no Reverse operation for example), the corresponding input can be reassigned using menu 8.

**Note:** Modifications to **6.04** must be made with the drive disabled.

**6.05** : Not used

**6.06** : DC injection braking level

Adjustment range : 0 to **4.07**

Factory setting : 100.0%

This parameter defines the level of current used for DC injection braking.

**CAUTION:**

**For efficient braking, the value of parameter 6.06 must be 60% minimum.**

**6.07** : DC injection braking time

Adjustment range : 0 to 25.0 s

Factory setting : 1 s

This parameter defines the DC injection braking time when **6.01** is at 2, 3 or 4.

**6.08** : Hold zero speed

Adjustment range : 0 or 1

Factory setting : 0

**0 (Disabled) (OFF):** The drive output is deactivated when the speed is zero.

**1 (Enabled) (On):** The drive output remains activated at zero speed in order to maintain the torque at standstill. The drive output is deactivated when **6.08** changes to 0. While maintaining the torque at standstill, the display indicates "StoP".

**Note:** When the drive is in the "StoP" state and the Run command has not been activated after one minute, the drive returns to the "rdy" state (drive output deactivated).

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## Variable speed motor or geared motor

### MENU 6: PROGRAMMABLE LOGIC AND TIMERS


**6.09** : Catch a spinning motor

Adjustment range : 0 to 3

Factory setting : 0

If this parameter is enabled (**6.09** = 1 to 3), when there is a run command or after a mains supply break, the drive executes a procedure to calculate the motor frequency and direction of rotation. It will automatically recalibrate the output frequency to the measured value and reaccelerate the motor up to the reference frequency.

6.09	PX LCD	PAD	Functions
0	Disabled	no	Catch a spinning motor function disabled
1	2 directions	On.2d	Enable catching of a spinning motor rotating clockwise or anti-clockwise
2	Clockwise	On.Fd	Enable catching of a spinning motor which is rotating clockwise only
3	Anti-clockwise	On.rS	Enable catching of a spinning motor which is rotating anti-clockwise only

 **• If the load is stationary at the time of the run command or when the mains supply returns, this operation may cause the machine to rotate in both directions before the motor accelerates.**

**• Before enabling this function, check that there is no danger to equipment and personnel.**

**6.10** : Enable reduced-voltage operation

Adjustment range : 0 or 1

Factory setting : 0 (VARMECA 310M = 1)

**0 (Disabled) (OFF):** The DC bus undervoltage detection thresholds are unchanged.

**1 (Enabled) (On):** Used to modify the DC bus undervoltage detection thresholds in 400 V (T) drives, so as to be at the same levels as 230 V drives. This enables a 400 V (T) rating to be supplied with 230 V if necessary, without tripping the drive.

**Note:** This parameter is not active for "TL" ratings (**6.10** is fixed at 1).

**6.11** : Enable keypad forward key (PAD option)

Adjustment range : 0 or 1

Factory setting : CP version = 1

SET version = 0

**0 (Disabled) (OFF):** Local control FWD key disabled.

**1 (Enabled) (On):** Local control FWD key enabled.

**6.12** : Enable keypad stop key (PAD option)

Adjustment range : 0 or 1

Factory setting : 1

**0 (Disabled) (OFF):** Local control Stop key disabled.

**1 (Enabled) (On):** Local control Stop key enabled.

If the Stop key is enabled, it is taken into account even if control is via the terminal block.

If a stop is ordered via the local console while a run command is present, the run command on the terminal block must be opened to authorise restarting.

**6.13** : Enable keypad reverse key (PAD option)

Adjustment range : 0 or 1

Factory setting : 0

**0 (Disabled) (OFF):** Local control REV key disabled.

**1 (Enabled) (On):** Enables the local control REV key.

**6.14** : Not used**6.15** : Drive enable

Adjustment range : 0 or 1

Factory setting : 1

**0 (Disabled) (diSb)**

**1 (Enabled) (Enab)**

**CAUTION:**

**Disabling via the drive terminals overrides (see 8.10)**

**6.15. If the drive is enabled via the terminals, the user can then enable or disable the drive using 6.15.**

**Note:** In bus control mode (**6.43** = 1), **6.15** is set automatically to 0.

**6.16** : Not used**6.17** : Reset energy meter

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF):** Reset inactive.

**1 (Yes) (On):** The counters **6.24** and **6.25** are reset to 0.

**6.18** and **6.19** : Not used **6.20** : Powered-up time: years.days

Adjustment range : 0 to 9.364 years, days

This parameter records for how many years and days the drive has been powered up.

 **6.21** : Powered-up time: hours.minutes

Adjustment range : 0 to 23.59 hrs, min

This parameter records for how many hours and minutes the drive has been powered up.

After 23.59, **6.21** returns to 0 and **6.20** is incremented by one day.

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## Variable speed motor or geared motor

### MENU 6: PROGRAMMABLE LOGIC AND TIMERS

#### 6.22 : Run time: years.days

Adjustment range : 0 to 9.364 (years, days)  
This parameter records the number of years and days of operation since the drive was first commissioned.

#### 6.23 : Run time: hours.minutes

Adjustment range : 0 to 23.59 (hrs, min)  
This parameter records the number of hours and minutes of operation since the drive was first commissioned.  
After 23.59, **6.23** returns to 0 and **6.22** is incremented by one day.

#### 6.24 : Energy meter: MWh

Adjustment range : 0 to 999.9 MWh  
This parameter records the energy consumption of the drive in MWh.  
This counter can be reset to 0 by changing parameter **6.17** to 1.

#### 6.25 : Energy meter: kWh

Adjustment range : 0 to 99.99 kWh  
This parameter records the energy consumption of the drive in kWh.  
This counter can be reset to 0 by changing parameter **6.17** to 1.

#### 6.26 to 6.29 : Not used

#### 6.30 to 6.34 and 6.39 : Start/stop logic sequencing bits

Adjustment range : 0 or 1  
Factory setting : 0

**0 (Inactive) (OFF)**

**1 (Active) (On)**

The drive's logic command manager (**6.04**) uses these bits as inputs rather than referring directly to the terminals. This allows the customer to define the use of each terminal of the drive according to the requirements of each application. Although these are read/write type parameters, they are volatile and are not stored when the drive is powered down. Each time the drive is powered up they will be reset to 0.

**6.30** : Run forward

**6.31** : Jog

**6.32** : Run reverse

**6.33** : Reversal Forward/reverse

**6.34** : Run/Stop

**6.39** : Stop

#### 6.35 to 6.38 : Not used

#### 6.40 and 6.41 : Not used

#### 6.42 : Control word

Adjustment range : 0 to 32767

Factory setting : 0

The control word is used to control the drive via a serial link. Each function has a corresponding binary code: VMA 33/34

Bit	Decimal conversion	Function	Equivalent parameter
0	1	Drive enable	<b>6.15</b>
1	2	Run forward	<b>6.30</b>
2	4	Jog	<b>6.31</b>
3	8	Run reverse	<b>6.32</b>
4	16	Forward/Reverse	<b>6.33</b>
5	32	Run	<b>6.34</b>
6	64	Reserved	
7	128	Reserved	
8	256	Analog ref./Preset ref.	<b>1.42</b>
9	512	Reserved	
10	1024	Reserved	
11	2048	Reserved	
12	4096	Reserved	
13	8192	Reset drive	<b>10.33</b>
14	16384	Reserved	

#### 6.42 new control word: VMA 31/32

Bit	Decimal conversion	Function	Equivalent parameter
0	1	Drive enable	<b>6.15</b>
1	2	Run forward	<b>6.30</b>
2	4	Jog	<b>6.31</b>
3	8	Run reverse	<b>6.32</b>
4	16	Reversed	
5	32	Analog ref./Preset ref.	on transition (0->1) pass from <b>1.14</b> to 3 on transition (1->0) pass from <b>1.14</b> to 1
6	64	Reset drive	on transition (0->1) pass from <b>10.38</b> to 100
7	128	Reserved	
8	256	Reserved	
9	512	Reserved	
10	1024	Reserved	
11	2048	Reserved	
12	4096	Reserved	
13	8192	Reserved	
14	16384	Reserved	

**6.42** is used to give commands to the drive. It should correspond to the binary sum of the commands to be given to the drive.

So that the control word can be taken into account, parameter **6.43** should be at 1.

#### 6.43 : Control word enable

Adjustment range : 0 to 3

Factory setting : 0



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**0 (Via terminal block) (terM):** The commands come from the terminal block.

**1 (Via bus) (buS):** The commands come from the control word **6.42**.

**2 (Keypad) (Pad):** The commands come from the keypad.

**3 (Console) (Lcd):** The commands come from the PX LCD console.

**Note:** Modifications to **6.43** must be made with the drive disabled.

**CAUTION:**

• The Stop keys on the keypads or the console, if enabled, are always taken into account irrespective of the origin of commands.

If a stop is caused by the Stop key on the keypad or the console while the origin of commands comes from the terminal block or the fieldbus (**6.43** = 0 or 1) and a run command is present, the run command must go back to 0 and then 1 in order to be taken into account.

• When a command via bus or console is enabled (**6.43** = 1 to 3), **8.10** = 0 (automatically), since the safety input cannot be used with this type of command.

• In command via bus mode (**6.43** = 1 (bus)), **6.15** is automatically set to 0 (diSb). When changing back to terminal block mode (**6.43** = 0), **6.15** must be set to 1 to enable the drive.

**6.44** to **6.50** : Not used

**6.51** : Downstream contactor management

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF):** Downstream contactor inactive.

**1 (Yes) (On):** Enables management of the downstream contactor (contactor between the drive and the motor). For safety reasons, in certain applications, a contactor placed on the drive output (u, v, w) disconnects the motor supply. Remote control of this contactor is independent of the drive and can deactivate or activate the motor supply with the enabled drive run command.

So that the drive does not detect a fault, **6.51** must be set to 1. The drive detects opening and closing of the contactor by inspecting the motor current.

When the motor current is less than the setting configured in **6.53**, the drive considers that the contactor is open and sends a phase-to-phase voltage (set by **6.52**).

When the contactor closes again, the DC voltage sent to the motor creates a current that enables the drive to detect the closure of the contactor and restart the motor (the motor accelerates up to the set speed reference).

**6.52** : Downstream contactor voltage

Adjustment range : 0 to 25.0% of **5.09**

Factory setting : 3.0% of **5.09**

When downstream contactor management is enabled (**6.51** at 1), the drive must detect whether or not the motor is connected. To do this, the drive applies a low voltage which can be set using **6.52**, as a percentage of the motor rated voltage. In general, the factory setting is suitable for most applications.

**6.53** : Downstream contactor current threshold

Adjustment range : 0 to 100.0% of **5.07**

Factory setting : 10.0% of **5.07**

When downstream contactor management is enabled, **6.53** sets the current detection threshold below which the drive considers the downstream contactor to be open.

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## Variable speed motor or geared motor

### MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

## 7 - MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

### 7.1 - List of parameters in Menu 7

Parameter	Name	Type	Adjustment range	Factory setting	User setting
7.01	ADI1 input level	RO/P	0 to 100.0% (analog)	-	-
			0.00% or 100.0% (digital)		
7.02	ADI2 input level	RO/P	0 to 100.0% (analog)	-	-
			0.00% or 100.0% (digital)		
7.03	ADIO3 input or output level	RO/P	0 to 100.0%	-	-
7.04 and 7.05	Not used				
7.06	ADI1 mode	R-W	0 to 7	6	
7.07	Not used				
7.08	ADI1 input scaling	R-W	0 to 2.50	1.00	
7.09	ADI1 input invert	R-W	0 or 1	0	
7.10	ADI1 input destination	R-W/P	<b>0.00 to 21.51</b>	<b>1.36</b>	
7.11	ADI2 mode	R-W	0 to 8	8	
7.12	ADI2 input scaling	R-W	0 to 2.50	1.00	
7.13	ADI2 input invert	R-W	0 or 1	0	
7.14	ADI2 input destination	R-W/P	<b>0.00 to 21.51</b>	<b>1.37</b>	
7.15	ADIO3 mode	R-W	0 to 10	10	
7.16	ADIO3 scaling	R-W	Input: 0 to 2.50	1.00	
			Output: 0 to 32.00		
7.17	ADIO3 input invert	R-W	0 or 1	0	
7.18	ADIO3 input destination/output source	R-W/P	<b>0.00 to 21.51</b>	<b>10.90</b>	
7.19 to 7.26	Not used				
7.27	ADI1 input current loop loss	RO/P	0 or 1	-	-
7.28	ADI2 input current loop loss	RO/P	0 or 1	-	-
7.29	ADIO3 input or output current loop loss	RO/P	0 or 1	-	-
7.30 to 7.32	Not used				
7.33	ADIO3 output control	R-W	0 to 4	0	
7.34	IGBT junction temperature	RO/P	0 to 200.0°C	-	-
7.35 to 7.57	Not used				
7.58	ADI1 min. threshold	R-W	0 to 1.00	0	
7.59	ADI2 min. threshold	R-W	0 to 1.00	0	
7.60	ADIO3 min. threshold	R-W	0 to 1.00	0	
7.61	Scaling block min. threshold	R-W	0 to 1.00	0	
7.62	Block scaling	R-W	0 to 2.50	1.00	
7.63	Scaling block invert	R-W	0 or 1	0	
7.64	Scaling block destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
7.65	PTC status	RO/P	0 or 1	-	-
7.66	Internal braking resistor temperature	RO/P	0 to 200.0°C	-	-
7.68	Scaling block source	R-W/P	<b>0.00 to 21.51</b>	<b>7.67</b>	
7.69	Scaling block read	RO/P	± 32000	-	-

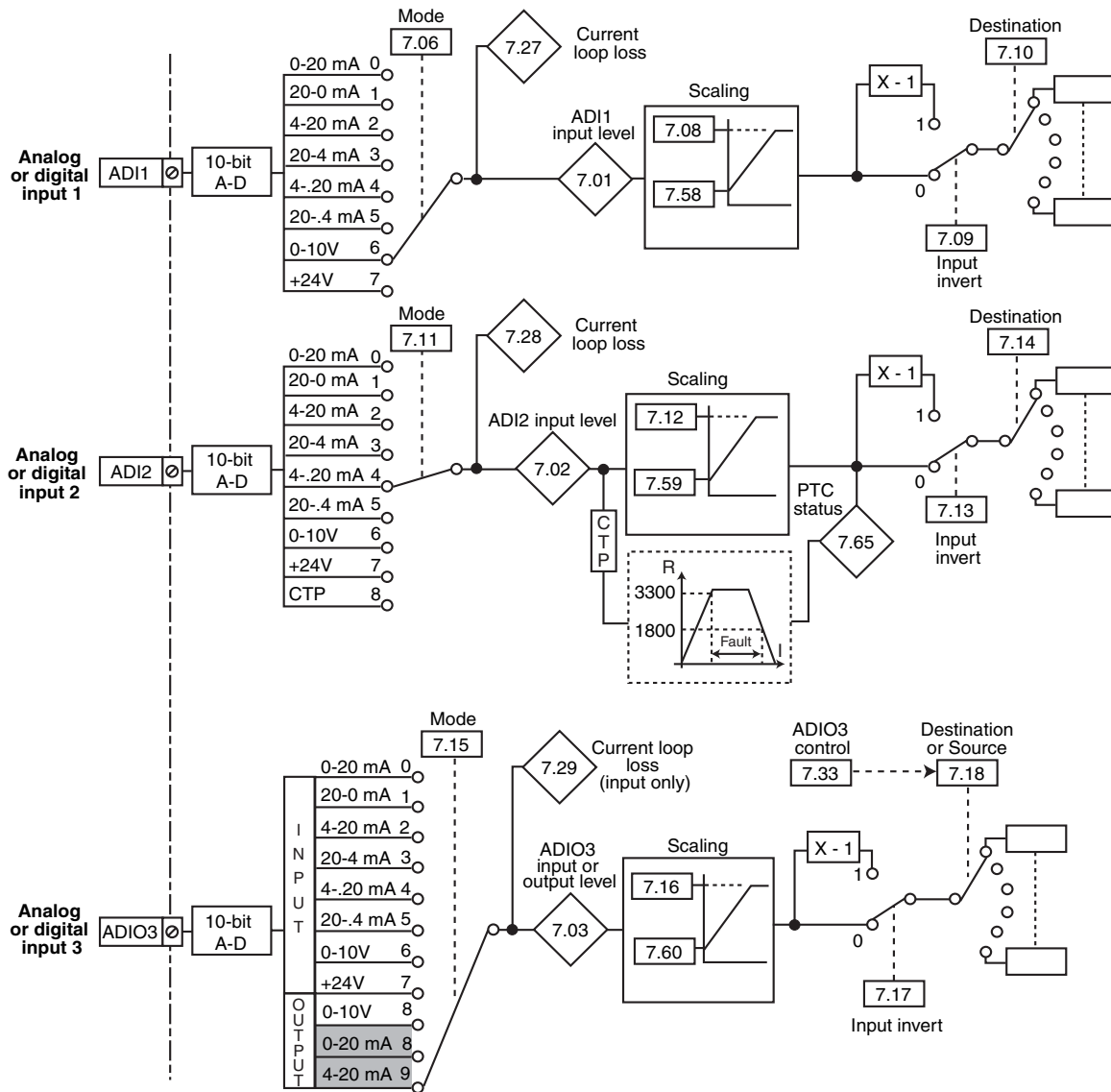
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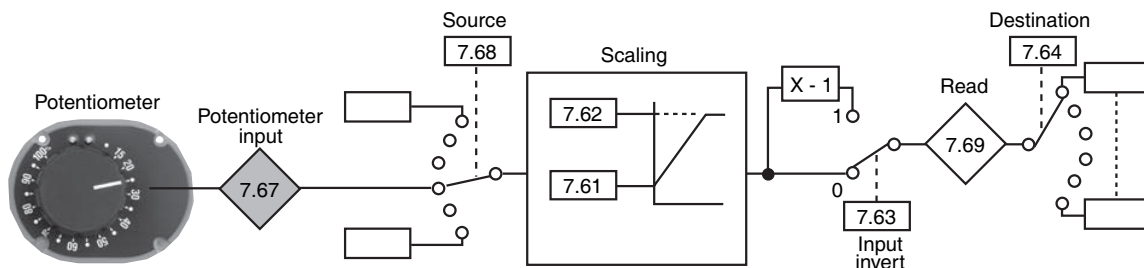
## Variable speed motor or geared motor MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

### 7.2 - Menu 7 diagram

#### 7.2.1 - Assignment of analog I/O



#### 7.2.2 - Scaling block



#### 7.2.3 - Temperature indications



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## Variable speed motor or geared motor

### MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

### 7.3 - Explanation of parameters in menu 7

**Note:** The sampling period is 6 ms for menu 7 inputs and outputs.

**7.01** and **7.02** : ADI1 and ADI2 input levels

Adjustment range

As analog inputs : 0 to 100% of the adjustment range of the parameter assigned to the input

As digital inputs : 0.00% (corresponds to logical 0) or 100.0% (corresponds to logical 1)

Used to read the value of the corresponding analog input or the state of the corresponding digital input.

This input uses an analog/digital converter with 10-bit resolution.

**7.03** : ADIO3 input or output level

Adjustment range : 0 to 100.0% of the adjustment range of the parameter assigned to the analog input or output.

Used to read the corresponding analog input or output. This input (or output) uses an analog/digital converter with 10-bit resolution.

**7.04** and **7.05** : Not used

**7.06** : ADI1 mode

Adjustment range : 0 to 7

Factory setting : 6

Used to define the type of signal on the ADI1 input.

7.06	PAD display	Description
0	0-20	0-20mA current signal, 0mA corresponds to the minimum reference
1	20-0	20-0mA current signal, 20mA corresponds to the minimum reference
2	4-20	4-20mA current signal with detection of signal loss. 4mA corresponds to the minimum reference
3	20-4	20-4mA current signal with detection of signal loss. 20mA corresponds to the minimum reference
4	4-.20	4-20mA current signal without of signal loss. 4mA corresponds to the minimum reference
5	20-.4	20-4mA current signal without of signal loss. 20mA corresponds to the minimum reference
6	uolt	<b>0-10V voltage signal</b>
7	d-In	The input is configured as a digital input

**7.07** : Not used

**7.08** and **7.12** : ADI1 and ADI2 input scaling

Adjustment range : 0 to 2.50

Factory setting : 1.00

These parameters are used, if necessary, to scale the analog inputs. However, this rarely proves necessary since the maximum input level (100%) automatically corresponds to the maximum value of the destination parameter.

Not used when the input is used as a digital input.

**7.09** and **7.13** : ADI1 and ADI2 input invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the input signal.

**0 (No) (OFF): Input signal not inverted.**

**1 (Yes) (On): Input signal inverted.**

**7.10** : ADI1 input destination

Adjustment range : **0.00** to **21.51**

Factory setting : **1.36**: Analog input 1 assigned to analog reference 1

This address should contain the number of the parameter it is wished to assign to input ADI1.

Only numerical parameters can be assigned if the input is configured as an analog input and bit parameters if the input is configured as a digital input.

If an unsuitable parameter is programmed, no assignment will be taken into account.

**Note:** When input ADI1 is configured as a digital input, only binary parameters will be taken into account. When input ADI1 is configured as an analog input, only variable parameters are taken into account.

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### MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

**7.11 : ADI2 mode**

Adjustment range : 0 to 8

Factory setting : 8

Used to define the type of signal on the ADI2 input.

7.11	PAD display	Description
0	0-20	0-20mA current signal, 0mA corresponds to the minimum reference
1	20-0	20-0mA current signal, 20mA corresponds to the minimum reference
2	4-20	4-20mA current signal with detection of signal loss. 4mA corresponds to the minimum reference
3	20-4	20-4mA current signal with detection of signal loss. 20mA corresponds to the minimum reference
<b>4</b>	<b>4-20</b>	<b>4-20mA current signal without detection of signal loss. 4mA corresponds to the minimum</b>
5	20-.4	20-4mA current signal without detection of signal loss. 20mA corresponds to the minimum reference
6	uolt	0-10V voltage signal
7	d-In	The input is configured as a digital input
8	PTC	The input is configured to manage the motor PTC sensors

**7.14 : ADI2 input destination**Adjustment range : **0.00** to **21.51**Factory setting : **0.00**: Analog input 2 assigned to analog reference 2

This address should contain the number of the parameter it is wished to assign to input ADI2.

Only numerical parameters can be assigned if the input is configured as an analog input and bit parameters if the input is configured as a digital input.

If an unsuitable parameter is programmed, no assignment will be taken into account.

**7.15 : ADIO3 mode**

Adjustment range : 0 to 10

Factory setting : 10

Used to define whether ADIO3 is used as an input or output and the type of signal used.

7.15	PAD display	Description
0	0-20	0-20mA current input, 0mA corresponds to the minimum reference
1	20-0	20-0mA current input, 20mA corresponds to the minimum reference
2	4-20	4-20mA current input with detection of signal loss. 4mA corresponds to the minimum reference
3	20-4	20-4mA current input with detection of signal loss. 20mA corresponds to the minimum reference
4	4-.20	4-20mA current input without detection of signal loss. 4mA corresponds to the minimum reference
5	20-.4	20-4mA current input without detection of signal loss. 20mA corresponds to the minimum reference
6	uolt	0-10V voltage input
7	d-In	The input is configured as a digital input
8	0-20 o	0-20mA current output, where 20mA corresponds to the maximum value of the assigned parameter
9	4-20 o	4-20mA current output, where 20mA corresponds to the maximum value of the assigned parameter
<b>10*</b>	<b>0-10 o</b>	<b>0-10V voltage output, where 10V corresponds to the maximum value of the assigned parameter</b>

**7.16 : ADIO3 scaling**

Adjustment range : Input: 0 to 2.50

Output: 0 to 32.00

Factory setting : 1.00

This parameter is used if necessary to scale the analog output (or input). However, this rarely proves necessary since the maximum value of the analog output (or input) automatically corresponds to the maximum value of the parameter which has been assigned.

**7.17 : ADIO3 input invert**

Adjustment range : 0 or 1

Factory setting : 0

Used to invert the input or output signal.

**0 (No) (OFF): Signal not inverted.****1 (Yes) (On): Signal inverted.****7.18 : ADIO3 input destination/output source**Adjustment range : **0.00** to **21.51**Factory setting : **10.90**

This address should contain the number of the parameter it is wished to assign to ADIO3.

Only numerical parameters can be addressed. If an unsuitable parameter is programmed, the corresponding output (or input) will take the value 0.

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## Variable speed motor or geared motor MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

**7.19** to **7.26** : Not used

**7.27** to **7.29** : ADI1 to ADIO3 current loop loss

Adjustment range : 0 or 1

In 4-20 mA current mode with detection of signal loss, this parameter goes to 1 when the analog signal goes below 3 mA.

**0 (Present) (On)**

**1 (Faulty) (OFF)**

**7.27** : corresponds to ADI1.

**7.28** : corresponds to ADI2.

**7.29** : corresponds to ADIO3. The detection does not operate if ADIO3 is used as an output.

**7.30** to **7.32** : Not used

**7.33** : ADIO3 output control

Adjustment range : 0 to 4

Factory setting : 0

This parameter is used to assign the ADIO3 function quickly when it is being used as an output.

**7.33** causes **7.18** to be configured automatically in accordance with the table below.

Value	PX LCD display	PAD display	ADIO3 function	Value of <b>7.18</b>
<b>0</b>	Motor spd.	SPd	Motor speed	<b>5.04</b>
1	Motor load	Ld	Motor load	<b>4.02</b>
2	Motor curr.	A	Motor current	<b>4.01</b>
3	Output power	Puur	Output power	<b>5.03</b>
4	Any	Adv	Any assignment	<b>0.00</b>

If ADIO3 is used as an input, **7.33** is forced to 4.

**7.34** : IGBT junction temperature

Adjustment range : 0 to 200.0°C

Indicates the measured temperature of the IGBT junction. The drives trips when the temperature reaches 110°C, and can be reset when the temperature falls below 100°C again.

**7.35** to **7.57** : Not used

**7.58** : ADI1 min. threshold

Adjustment range : 0 to 1.00

Factory setting : 0

This parameter is a multiplication coefficient applied to the maximum value of the ADI1 destination parameter. For a 0 value of the analog input, it is used to obtain a value different from the minimum value of the destination parameter.

Value 0 = (**7.58** x destination parameter max. value) + destination parameter min. value.

Example: ADI1 is assigned to a parameter with an adjustment range of 0 - 30000. If **7.58** = 0.01, 0 - 100% on ADI1 corresponds to 300 - 30000.

**7.59** : ADI2 min. threshold

Adjustment range : 0 to 1.00

Factory setting : 0

This parameter is a multiplication coefficient applied to the maximum value of the ADI2 destination parameter. For a 0 value of the analog input, it is used to obtain a value different from the minimum value of the destination parameter.

Value 0 = (**7.59** x destination parameter max. value) + destination parameter min. value.

Example: ADI2 is assigned to a parameter with an adjustment range of 0 - 30000. If **7.59** = 0.01, 0 - 100% on ADI2 corresponds to 300 - 30000.

**7.60** : ADIO3 min. threshold

Adjustment range : 0 to 1.00

Factory setting : 0

This parameter is a multiplication coefficient applied to the maximum value of the ADIO3 destination parameter. For a 0 value of the analog input, it is used to obtain a value different from the minimum value of the destination parameter.

Value 0 = (**7.60** x destination parameter max. value) + destination parameter min. value.

Example: ADIO3 is assigned to a parameter with an adjustment range of 0 - 30000. If **7.60** = 0.01, 0 - 100% on ADIO3 corresponds to 300 - 30000.

**Note:** This parameter applies only when ADIO3 is configured as an input.

**7.61** : Scaling block min. threshold

Adjustment range : 0 to 1.00

Factory setting : 0

This parameter is a multiplication coefficient applied to the maximum value of the block's destination parameter. For a zero value of the source parameter, it is used to obtain the minimum value of the destination parameter.

Value 0 = (**7.61** x destination parameter max. value) + destination parameter min. value.

Example: The potentiometer input is assigned to a parameter with an adjustment range of 0 - 30000. If **7.61** = 0.01, 0 - 100% on the potentiometer input corresponds to 300 - 30000.

**7.62** : Block scaling

Adjustment range : 0 to 2.50

Factory setting : 1.00

This parameter is used, if necessary, to scale the potentiometer input. However, this rarely proves necessary since the maximum level of the input automatically corresponds to the maximum value of the destination parameter.

**7.63** : Scaling block invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the polarity of the potentiometer input.

**0 (No) (OFF): Input not inverted.**

**1 (Yes) (On): Input inverted.**

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### MENU 7: ASSIGNMENT OF ANALOG INPUTS AND OUTPUTS

#### **7.64** : Scaling block destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

Used to define the destination of the reference coming from the potentiometer. With the local control option, the destination of the potentiometer input is assigned to parameter **1.36** (analog reference 1). In this case, **1.36** is unassigned from **7.10** (analog input 1). The destination can then be modified at any time by the user. In this case, **1.36** can then be assigned to another analog input.

#### **7.65** : PTC status

Adjustment range : 0 or 1

Indicates the status of the PTC sensor.

**0 (Not tripped) (OFF)**: PTC not tripped.

**1 (Tripped) (On)**: PTC tripped.

#### **7.66** : Internal braking resistor temperature

Adjustment range : 0 to 200.0°C

Indicates the temperature measured on the braking resistor. The drives trips when the temperature reaches 110°C, and can be reset when the temperature falls below 100°C again.

#### **7.68** : Scaling block source

Adjustment range : **0.00** to **21.51**

Factory setting : **7.67**

This parameter is used to select the source to be scaled.

If an unsuitable parameter is selected, the input value will be 0.

#### **7.69** : Scaling block read

Adjustment range :  $\pm 32000$

Used to read the output value.

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## Variable speed motor or geared motor

### MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

## 8 - MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

### 8.1 - List of parameters in Menu 8

Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>8.01</b>	DIO1 input or output state	RO/P	0 or 1	-	-
<b>8.02</b>	DI2 input state	RO/P	0 or 1	-	-
<b>8.03</b>	DI3 input state	RO/P	0 or 1	-	-
<b>8.04</b>	DI4 input state	RO/P	0 or 1	-	-
<b>8.05</b> and <b>8.06</b>	Not used				
<b>8.07</b>	Relay status	RO/P	0 or 1	-	-
<b>8.08</b>	Not used				
<b>8.09</b>	Drive enable indicator	RO/P	0 or 1	-	-
<b>8.10</b>	Drive enable mode select	R-W/P	0 or 1	1	
<b>8.11</b>	DIO1 input or output invert	R-W	0 or 1	0	
<b>8.12</b>	DI2 input invert	R-W	0 or 1	0	
<b>8.13</b>	DI3 input invert	R-W	0 or 1	0	
<b>8.14</b>	DI4 input invert	R-W	0 or 1	0	
<b>8.15</b> and <b>8.16</b>	Not used				
<b>8.17</b>	Relay source invert	R-W	0 or 1	0	
<b>8.18</b> and <b>8.19</b>	Not used				
<b>8.20</b>	Digital I/O read word	RO	0 to 511	-	-
<b>8.21</b>	DIO1 input destination/output source	R-W/P	<b>0.00 to 21.51</b>	<b>10.61</b>	
<b>8.22</b>	DI2 input destination	R-W/P	<b>0.00 to 21.51</b>	<b>6.30</b>	
<b>8.23</b>	DI3 input destination	R-W/P	<b>0.00 to 21.51</b>	<b>6.32</b>	
<b>8.24</b>	DI4 input destination	R-W/P	<b>0.00 to 21.51</b>	<b>09.30</b>	
<b>8.25</b> and <b>8.26</b>	Not used				
<b>8.27</b>	Relay source	R-W/P	<b>0.00 to 21.51</b>	<b>10.01</b>	
<b>8.28</b> to 8.30	Not used				
<b>8.31</b>	DIO1 input or output select	R-W	0 or 1	1	
<b>8.32</b> to <b>8.40</b>	Not used				
<b>8.41</b>	DIO1 control	R-W	0 to 9	0	
<b>8.42</b> to <b>8.49</b>	Not used				
<b>8.50</b>	Buffer block	RO	0 or 1	-	-
<b>8.51</b> to <b>8.60</b>	Not used				
<b>8.61</b>	Forward button state	RO/P	0 or 1	-	-
<b>8.62</b>	Stop button state	RO/P	0 or 1	-	-
<b>8.63</b>	Reverse button state	RO/P	0 or 1	-	-
<b>8.64</b> to <b>8.70</b>	Not used				
<b>8.71</b>	Forward button invert	R-W	0 or 1	0	
<b>8.72</b>	Not used				
<b>8.73</b>	Reverse button invert	R-W	0 or 1	0	
<b>8.74</b> to <b>8.80</b>	Not used				
<b>8.81</b>	Forward button destination	R-W	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>8.82</b>	Not used				
<b>8.83</b>	Reverse button destination	R-W	<b>0.00 to 21.51</b>	<b>0.00</b>	

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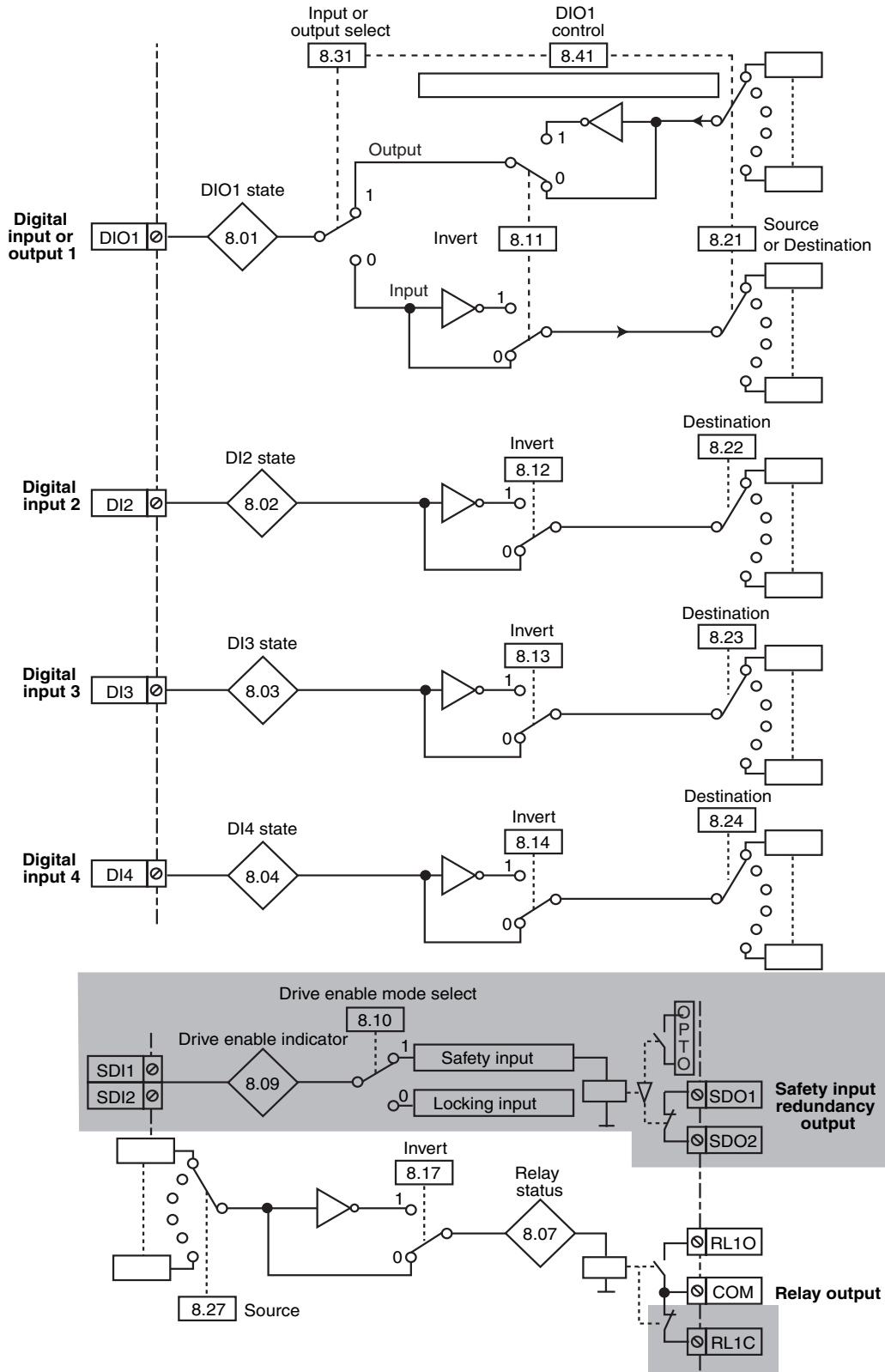


# VARMECA 30

## Variable speed motor or geared motor MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

### 8.2 - Menu 8 diagrams

#### 8.2.1 - Assignment of digital inputs and the relay output

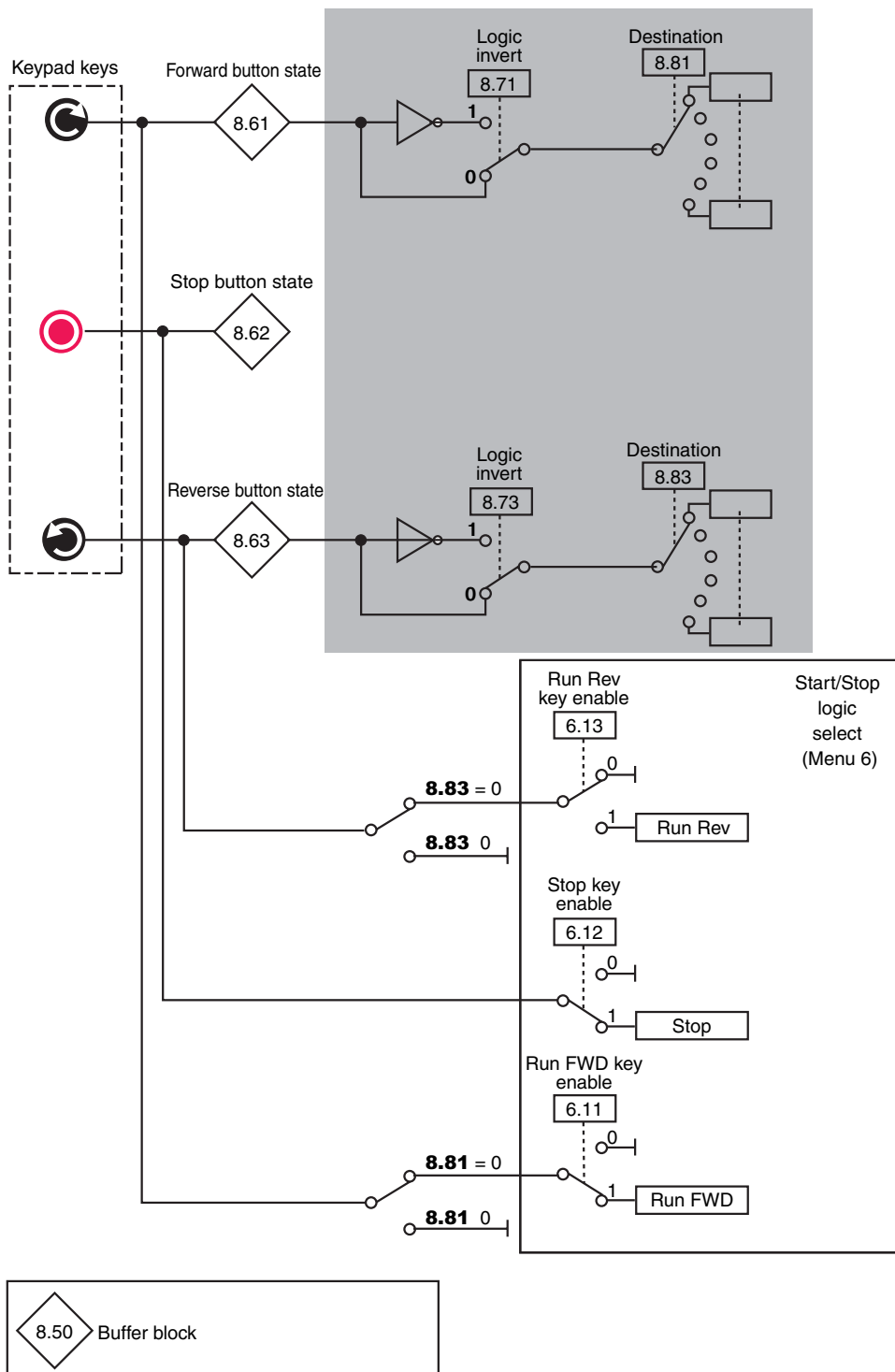


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## Variable speed motor or geared motor MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

### 8.2.2 - Local controls (PAD option)



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# VARMECA 30

## Variable speed motor or geared motor

### MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

### 8.3 - Explanation of parameters in menu 8

**Note:** The sampling period is 2 ms for digital inputs and outputs.

#### **8.01** : DIO1 input or output state

Adjustment range : 0 or 1

This parameter indicates the state of the input or output.

**0 (Inactive) (OFF):** Inactive.

**1 (Active) (On):** Active.

#### **8.02** : DI2 input state

Adjustment range : 0 or 1

This parameter indicates the state of the input.

**0 (Inactive) (OFF):** Inactive.

**1 (Active) (On):** Active.

#### **8.03** : DI3 input state

Adjustment range : 0 or 1

This parameter indicates the state of the input.

**0 (Inactive) (OFF):** Inactive.

**1 (Active) (On):** Active.

#### **8.04** : DI4 input state

Adjustment range : 0 or 1

This parameter indicates the state of the input.

**0 (Inactive) (OFF):** Inactive.

**1 (Active) (On):** Active.

**8.05** and **8.06** : Not used

#### **8.07** : Relay status

Adjustment range : 0 or 1

This parameter indicates the state of the output relay.

**0 (Open) (OPen):** RL1O open, RL1C closed.

**1 (Closed) (ClOs):** RL1O closed, RL1C open.

**8.08** : Not used

#### **8.09** : Drive enable indicator

Adjustment range : 0 or 1

This parameter indicates the state of the safety input (at the terminal block).

**0 (Inactive) (diSb):** Drive disabled.

**1 (Active) (Enab):** Drive enabled.

#### **8.10** : Drive enable mode select


Adjustment range : 0 or 1

Factory setting : 1

**0 (LOCK) (Enab):** The SDI input is used as a simple locking input.

**1 (SAFETY) (Secu):** The SDI input is used as a safety input. In order to conform to safety standard EN 954-1 category 3, the drive must be wired in accordance with the recommended diagram in the installation and commissioning manual ref. 3739.

**Note:** Modifications to **8.10** must be made with the drive disabled.

 **The safety input function is automatically disabled 8.10 = 0 (Enab) when the drive is controlled via the console.**

#### **8.11** : DIO1 input or output invert

Adjustment range : 0 or 1

Factory setting : 0 (VARMECA 31/32 = 1)

This parameter is used to invert the digital input or output.

**0 (No) (OFF):** Not inverted.

**1 (Yes) (On):** Inverted.

#### **8.12** : DI2 input invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the digital input.

**0 (No) (OFF):** Not inverted.

**1 (Yes) (On):** Inverted.

#### **8.13** : DI3 input invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the digital input.

**0 (No) (OFF):** Not inverted.

**1 (Yes) (On):** Inverted.

#### **8.14** : DI4 input invert

Adjustment range : 0 or 1

Factory setting : 0 (VARMECA 31/32 = 1)

This parameter is used to invert the digital input or output.

**0 (No) (OFF):** Not inverted.

**1 (Yes) (On):** Inverted.

**8.15** and **8.16** : Not used

#### **8.17** : Relay source invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the relay state.

**0 (No) (OFF):** Not inverted.

**1 (Yes) (On):** Inverted.

**CAUTION:**

**When the safety function is enabled 8.10 = 1 (sEcu), the value of 8.17 is fixed at 0, and cannot be modified.**

**8.18** and **8.19** : Not used

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## Variable speed motor or geared motor

### MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

#### 8.20 : Digital I/O read word

Adjustment range : 0 to 511

This parameter is used to determine the state of the I/O with a single read operation.

Each bit of this word represents the state of parameters **8.01** to **8.07**, **8.09**, and **8.61** to **8.63**.

Bit	0	1	2	3	4	5	6	7	8
State	<b>8.01</b>	<b>8.02</b>	<b>8.03</b>	<b>8.04</b>	<b>0</b>	<b>0</b>	<b>8.07</b>	<b>0</b>	<b>8.09</b>

#### 8.21 : DIO1 input destination/output source

Adjustment range : 0.00 to 21.51

Factory setting : **10.03**: Zero frequency  
(VARMECA 31/32 = **10.61**)

This parameter is used to select the destination of the input or the source of the output for DIO1.

Any non-protected "bit" type parameter can be assigned.

If an unsuitable parameter is addressed to an input or an output, no assignment is taken into account.

#### 8.22 : DI2 input destination

Adjustment range : **0.00** to **21.51**

Factory setting : **6.30**: Run FWD/Stop

This parameter is used to select the destination of input DI2. Any non-protected "bit" type parameter can be assigned to the input.

If an unsuitable parameter is addressed to an input or an output, no assignment is taken into account.

#### 8.23 : DI3 input destination

Adjustment range : **0.00** to **21.51**

Factory setting : **6.32**: Run REV/Stop

This parameter is used to select the destination of input DI3. Any non-protected "bit" type parameter can be assigned to the input.

If an unsuitable parameter is addressed to an input or an output, no assignment is taken into account.

**Note:** In pulsed mode, **6.04** = 1, **8.23** is frozen at **6.39**. To unfreeze it, the value of **6.04** must be modified.

#### 8.24 : DI4 input destination

Adjustment range : **0.00** to **21.51**

Factory setting : **1.41**: Selection of analog reference  
1 or 2  
(VARMECA 31/32 = **9.30**)

This parameter is used to select the destination of input DI4. Any non-protected "bit" type parameter can be assigned to the input.

If an unsuitable parameter is addressed to an input or an output, no assignment is taken into account.

#### 8.25 and 8.26 : Not used

#### 8.27 : Relay source

Adjustment range : **0.00** to **21.51**

Factory setting : **10.01**: Drive healthy

This parameter is used to select the source for the output relay.

Any non-protected "bit" type parameter can be assigned.

If an unsuitable parameter is addressed to an input or an output, no assignment is taken into account.

**CAUTION: When the safety function is enabled 8.10 = 1, the value of 8.27 is fixed at 10.01, and cannot be modified.**

#### 8.28 to 8.30 : Not used

#### 8.31 : DIO1 input or output select

Adjustment range : 0 or 1

Factory setting : 1 (VARMECA 31/32 = 0)

Used to configure terminal DIO1 as an input or output.

**0 (Input) (In):** Terminal configured as an input.

**1 (Output) (Out):** Terminal configured as an output.

#### 8.32 to 8.40 : Not used

#### 8.41 : DIO1 control

Adjustment range : 0 to 9

Factory setting : 0

This parameter is used to assign the DIO1 function quickly. Depending on the value of **8.41**, **8.21** and **8.31** are configured automatically in accordance with the table below.

8.41	LCD display	PAD display	DIO1 function	Value of 8.21	Value of 8.31
0	Zero spd.	n = 0	Zero speed output	<b>10.03</b>	<b>1</b>
1	At speed	At.SP	Reference reached output	<b>10.06</b>	<b>1</b>
2	Min. speed	Lo.SP	Minimum speed output	<b>10.04</b>	<b>1</b>
3	At load	At.Ld	Rated load reached output	<b>10.08</b>	<b>1</b>
4	Drive active	act	Drive active output	<b>10.02</b>	<b>1</b>
5	Gen. alarm	alar	Drive general alarm output	<b>10.19</b>	<b>1</b>
6	Current lim.	I.Lt	Current limit output	<b>10.09</b>	<b>1</b>
7	Jogging input	JoG	Jogging input	<b>6.31</b>	<b>0</b>
8	Reset input	rESE	Reset input	<b>10.33</b>	<b>0</b>
9	Any	Adv	Any assignment	<b>0.00</b>	<b>1</b>

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# VARMECA 30

## Variable speed motor or geared motor

### MENU 8: ASSIGNMENT OF DIGITAL INPUTS AND OUTPUTS

**8.42** to **8.49** : Not used

**8.50** : Buffer block

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

This parameter is used to make a link directly between a binary destination parameter and a binary source parameter.

**8.51** to **8.60** : Not used

**8.61** : Forward button state

Adjustment range : 0 or 1

This parameter indicates the state of the input.

**0 (Inactive) (OFF)**: Inactive.

**1 (Active) (On)**: Active.

**8.62** : Stop button state

Adjustment range : 0 or 1

This parameter indicates the state of the input.

**0 (Inactive) (OFF)**: Inactive.

**1 (Active) (On)**: Active.

To use this state and assign it to another function, disable the Stop function using **6.12** = 0.

**8.63** : Reverse button state

Adjustment range : 0 or 1

This parameter indicates the state of the input.

**0 (Inactive) (OFF)**: Inactive.

**1 (Active) (On)**: Active.

**8.64** to **8.70** : Not used

**8.71** : Forward button invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the digital input.

**0 (No) (OFF)**: Not inverted.

**1 (Yes) (On)**: Inverted.

**8.72** : Not used

**8.73** : Reverse button invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert the digital input.

**0 (No) (OFF)**: Not inverted.

**1 (Yes) (On)**: Inverted.

**8.74** to **8.80** : Not used

**8.81** : Forward button destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter is used to assign the destination of the input.

The user can modify the destination of the input at any time.

In this case, the input is automatically unassigned from the logic commands.

**8.82** : Not used

**8.83** : Reverse button destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter is used to assign the destination of the input.

The user can modify the destination of the input at any time.

In this case, the input is automatically unassigned from the logic commands.

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## Variable speed motor or geared motor

MENU 9: LOGIC FUNCTIONS, MOTORISED POT AND BINARY SUM

## 9 - MENU 9: LOGIC FUNCTIONS, MOTORISED POT AND BINARY SUM

### 9.1 - List of parameters in Menu 9

Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>9.01 - 9.02</b> <b>9.61 - 9.71</b>	Logic functions 1 to 4 output	RO	0 or 1	-	-
<b>9.03</b>	Motorised pot output	RO	± 100.0%	-	-
<b>9.04 - 9.14</b> <b>9.64 - 9.74</b>	Logic functions 1 to 4 source 1	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>9.05 - 9.15</b> <b>9.65 - 9.75</b>	Logic functions 1 to 4 source 1 invert	R-W	0 or 1	0	
<b>9.06 - 9.16</b> <b>9.66 - 9.76</b>	Logic functions 1 to 4 source 2	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>9.07 - 9.17</b> <b>9.67 - 9.77</b>	Logic functions 1 to 4 source 2 invert	R-W	0 or 1	0	
<b>9.08 - 9.18</b> <b>9.68 - 9.78</b>	Logic functions 1 to 4 output invert	R-W	0 or 1	0	
<b>9.09 - 9.19</b>	Not used				
<b>9.10 - 9.20</b> <b>9.60 - 9.70</b>	Logic functions 1 to 4 destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>9.11 to 9.13</b>	Not used				
<b>9.21</b>	Motorised pot mode	R-W	0 to 3	2	
<b>9.22</b>	Motorised pot bipolar select	R-W	0 or 1	0	
<b>9.23</b>	Motorised pot rate	R-W	0 to 250 s	20 s	
<b>9.24</b>	Motorised pot scale factor		0 to 2.50	1.00	
<b>9.25</b>	Motorised pot destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>9.26</b>	Motorised pot up	R-A	0 or 1	-	
<b>9.27</b>	Motorised pot down	R-A	0 or 1	-	
<b>9.28</b>	Motorised pot reset	R-W	0 or 1	0	
<b>9.29</b>	Binary sum ones input	R-A	0 or 1	-	-
<b>9.30</b>	Binary sum twos input	R-A	0 or 1	-	-
<b>9.31</b>	Binary sum fours input	R-A	0 or 1	-	-
<b>9.32</b>	Binary sum output	RO	0 to 39	-	-
<b>9.33</b>	Binary sum destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>9.34</b>	Binary sum offset	R-W	0 to 32	0	
<b>9.35 to 9.69</b>	Not used				
<b>9.62 and 9.63</b>	Not used				
<b>9.72 and 9.73</b>	Not used				

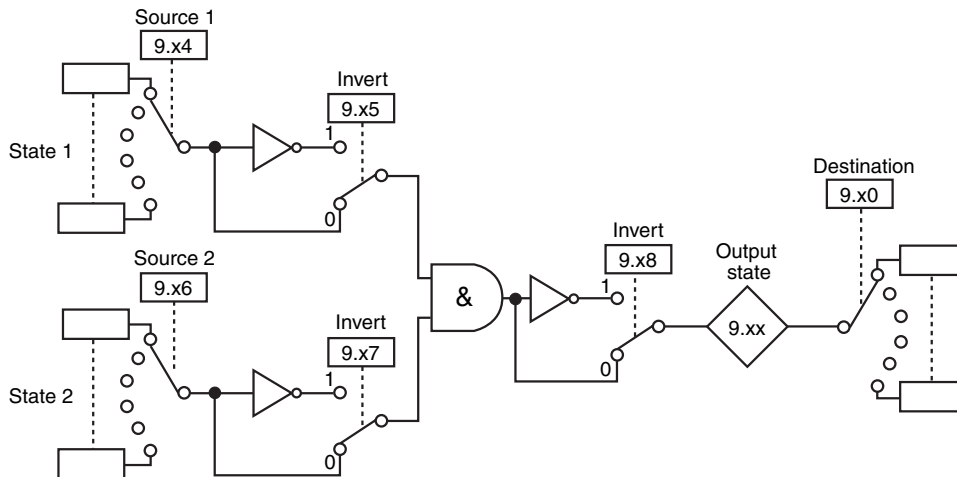
# VARMECA 30

## Variable speed motor or geared motor

MENU 9: LOGIC FUNCTIONS, MOTORISED POT AND BINARY SUM

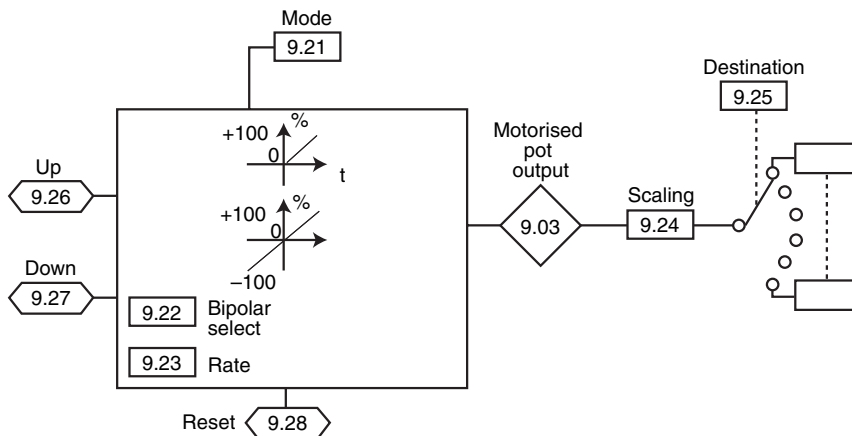
### 9.2 - Menu 9 diagrams

#### 9.2.1 - Logic functions

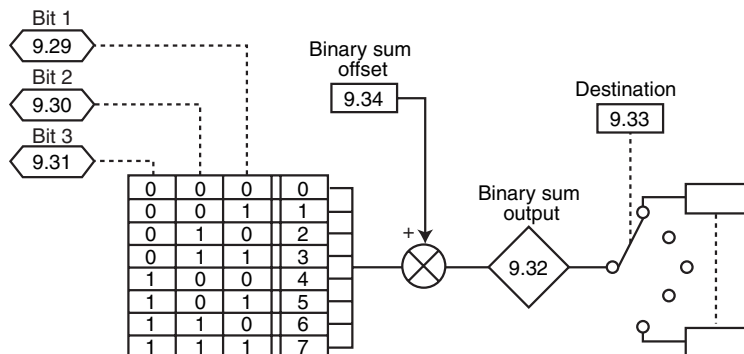


	Source 1	Source 2	Source 1 invert	Source 2 invert	Output invert	Output state	Source destination
Function 1	9.04	9.06	9.05	9.07	9.08	9.01	9.10
Function 2	9.14	9.16	9.15	9.17	9.18	9.02	9.20
Function 3	9.64	9.66	9.65	9.67	9.68	9.61	9.60
Function 4	9.74	9.76	9.75	9.77	9.78	9.71	9.70

#### 9.2.2 - Motorised pot function



#### 9.2.3 - Binary sum function



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## Variable speed motor or geared motor

### MENU 9: LOGIC FUNCTIONS, MOTORISED POT AND BINARY SUM

### 9.3 - Explanation of parameters in Menu 9

**9.01** : Logic function 1 output

**9.02** : Logic function 2 output

**9.61** : Logic function 3 output

**9.71** : Logic function 4 output

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

Indicate the state of the logic function outputs.

**9.03** : Motorised pot output

Adjustment range : ± 100.0%

**9.04** : Logic function 1 source 1

**9.14** : Logic function 2 source 1

**9.64** : Logic function 3 source 1

**9.74** : Logic function 4 source 1

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select source 1 of the logic functions.

Only "bit" type parameters can be used on these inputs.

If an unsuitable parameter is addressed on one of the inputs of function 1, the output will be frozen at 0.

**9.05** : Logic function 1 source 1 invert

**9.15** : Logic function 2 source 1 invert

**9.65** : Logic function 3 source 1 invert

**9.75** : Logic function 4 source 1 invert

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to invert source 1 of the logic functions.

**0 (No) (OFF): Source 1 not inverted.**

**1 (Yes) (On): Source 1 inverted.**

**9.06** : Logic function 1 source 2

**9.16** : Logic function 2 source 2

**9.66** : Logic function 3 source 2

**9.76** : Logic function 4 source 2

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select source 2 of the logic functions.

Only "bit" type parameters can be used on these inputs.

If an unsuitable parameter is addressed on one of the inputs of function 1, the output will be frozen at 0.

**9.07** : Logic function 1 source 2 invert

**9.17** : Logic function 2 source 2 invert

**9.67** : Logic function 3 source 2 invert

**9.77** : Logic function 4 source 2 invert

Adjustment range : 0 or 1

Factory setting : 0

These parameters are used to invert source 2 of the logic functions.

**0 (No) (OFF): Source 2 not inverted.**

**1 (Yes) (On): Source 2 inverted.**

**9.08** : Logic function 1 output invert

**9.18** : Logic function 2 output invert

**9.68** : Logic function 3 output invert

**9.78** : Logic function 4 output invert

Adjustment range : 0 or 1

Factory setting : 0

These parameters are used to invert the output of the logic functions.

**0 (No) (OFF): Output not inverted.**

**1 (Yes) (On): Output inverted.**

**9.09** and **9.19** : Not used

**9.10** : Logic function 1 output destination

**9.20** : Logic function 2 output destination

**9.60** : Logic function 3 output destination

**9.70** : Logic function 4 output destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters define the internal parameter which will be assigned by the output of the logic functions.

Only non-protected "bit" type parameters can be addressed.

If an unsuitable parameter is programmed, the destination will not be taken into account.

**9.21** : Motorised pot mode

Adjustment range : 0 to 3

Factory setting : 2

**0 (RESET/ACTIVE) (Rst.e):** The reference is reset to 0 on each power-up. The up/down and reset inputs are active at all times.

**1 (PREC/ACTIVE) (Pre.e):** On power-up, the reference is at the level it was on power-down. The up/down and reset inputs are active at all times.

**2 (RESET/INACTIVE) (Rst.d):** The reference is reset to 0 on each power-up. The up/down inputs are active only when the drive output is active. The reset input is active at all times.

**3 (PREC/INACTIVE) (Pre.d):** On power-up, the reference is at the level it was on power-down. The up/down inputs are active only when the drive output is active. The reset input is active at all times.



# VARMECA 30

## Variable speed motor or geared motor MENU 9: LOGIC FUNCTIONS, MOTORISED POT AND BINARY SUM

### 9.22 : Motorised pot bipolar select

Adjustment range : 0 or 1

Factory setting : 0

**0 (Positive) (Pos):** The up/down pot reference is limited to positive values (0 to 100.0%).

**1 (Bipolar) (biPo.):** The up/down pot reference can change from -100% to +100%.

### 9.23 : Motorised pot rate

Adjustment range : 0 to 250 s

Factory setting : 20 s

This parameter defines the time it takes for the up/down pot reference to change from 0 to 100.0%.

It will take twice as long to change from -100.0% to +100.0%.

Defines the sensitivity of the command.

### 9.24 : Motorised pot scale factor

Adjustment range : 0 to 2.50

Factory setting : 1.00

The maximum value of the up/down pot reference automatically takes the maximum value of the parameter to which it is assigned.

This parameter can therefore be used to adapt the maximum value of the up/down pot reference to the maximum value required by the application.

Example:

- The up/down reference is addressed to a preset reference.

- The maximum value of a preset reference is 32000 min<sup>-1</sup>.

- The maximum value of the up/down reference is required to correspond to 1500 min<sup>-1</sup>.

$$\Rightarrow 9.24 = \frac{1500}{32000} = 0,05$$

### 9.25 : Motorised pot destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter is used to define the numerical parameter that the up/down pot reference is going to control.

Example: The up/down pot reference is used as the speed reference. The up/down pot reference can be sent to a preset reference.

$$\Rightarrow 9.25 = 1.21.$$

### 9.26 : Motorised pot up

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

A digital input must be assigned to this parameter for controlling the motorised pot up function.

### 9.27 : Motorised pot down

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

A digital input must be assigned to this parameter for controlling the motorised pot down function.

### 9.28 : Motorised pot reset

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (No):** Reset inactive.

**1 (RESET) (RSET):** The motorised pot reference is reset to zero.

### 9.29 to 9.31 : Binary sum inputs

Adjustment range : 0 or 1

Used to modify remotely, using a combination of digital inputs, a parameter whose selection includes more than 2 possible choices.

**0 (Inactive) (OFF)**

**1 (Active) (On)**

**9.29:** Binary sum ones input.

**9.30:** Binary sum twos input.

**9.31:** Binary sum fours input.

9.31	9.30	9.29	Decimal conversion
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

### 9.32 : Binary sum output

Adjustment range : 0 to 39

Used to read the decimal value of the binary sum output.

### 9.33 : Binary sum destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00** (VARMECA 31/32 = **7.06**)

Used to define the parameter that the binary sum will control. Any bit, switch or numerical type parameter can be assigned to the binary sum.

### 9.34 : Binary sum offset

Adjustment range : 0 to 32

Factory setting : 0 (VARMECA 31/32 = 4)

Used to add an offset to the binary sum output.

### 9.35 to 9.59 : Not used

### 9.62 and 9.63 : Not used

### 9.72 and 9.73 : Not used

# VARMECA 30

## Variable speed motor or geared motor

### MENU 10: DRIVE STATES AND DIAGNOSTICS

## 10 - MENU 10: DRIVE STATES AND DIAGNOSTICS

### 10.1 - List of parameters in Menu 10

Parameter	Name	Type	Adjustment range	Factory setting	User setting
10.01	Drive healthy	RO/P	0 or 1	-	-
10.02	Drive active	RO/P	0 or 1	-	-
10.03	Zero speed	RO/P	0 or 1	-	-
10.04	Running at or below min speed	RO/P	0 or 1	-	-
10.05	Below set speed	RO/P	0 or 1	-	-
10.06	At speed	RO/P	0 or 1	-	-
10.07	Above set speed	RO/P	0 or 1	-	-
10.08	Load reached	RO/P	0 or 1	-	-
10.09	Drive output is at current limit	RO/P	0 or 1	-	-
10.10	Dynamic braking	RO/P	0 or 1	-	-
10.11	Braking IGBT active	RO/P	0 or 1	-	-
10.12	Braking resistor, overload alarm	RO/P	0 or 1	-	-
10.13	Direction commanded	RO/P	0 or 1	-	-
10.14	Direction running	RO/P	0 or 1	-	-
10.15	Loss mains supply				
10.16	Not used				
10.17	Overload alarm	RO/P	0 or 1	-	-
10.18	Drive over temperature alarm	RO/P	0 or 1	-	-
10.19	Drive warning	RO/P	0 or 1	-	-
10.20	Trip 1 (most recent trip)	RO/P	0 to 54	-	-
10.21	Trip 2	RO/P	0 to 54	-	-
10.22	Trip 3	RO/P	0 to 54	-	-
10.23	Trip 4	RO/P	0 to 54	-	-
10.24	Trip 5	RO/P	0 to 54	-	-
10.25	Trip 6	RO/P	0 to 54	-	-
10.26	Trip 7	RO/P	0 to 54	-	-
10.27	Trip 8	RO/P	0 to 54	-	-
10.28	Trip 9	RO/P	0 to 54	-	-
10.29	Trip 10 (oldest trip)	RO/P	0 to 54	-	-
10.30	Full power braking time	R-W	0 to 400.0 s	0 VMA 31/32 3 VMA 33/34	
10.31	Full power braking period	R-W	0 to 25.0 min	0	
10.32	Not used				
10.33	Drive reset	R-W	0 or 1	0	
10.34	No. of auto-reset attempts	R-W	If <b>10.91</b> =No (0): 0 to 5 If <b>10.91</b> =Yes (1): 0 to 100	2	
10.35	Auto-reset delay	R-W	0 to 25.0 s	1 s	
10.36	Hold drive healthy until last attempt	R-W	0 or 1	0	
10.37	Action on trip detection	R-W	0 or 1	0	
10.38	User trip	R-W/P	0 to 100	0	
10.39	Braking energy overload accumulator	RO/P	0 to 100.0%	-	-
10.40	Decimal value of binary states <b>10.01</b> to <b>10.15</b>	RO/P	0 to 16383	-	-
10.41 to 10.50	Not used				
10.51	V <sub>min</sub> alarm	RO	0 or 1	-	-
10.52	V <sub>max</sub> alarm	RO	0 or 1	-	-
10.53	Maximum speed	RO	0 or 1	-	-
10.54 to 10.57	User alarms 1 to 4	R-W	0 or 1	0	
10.58 to 10.60	Not used				
10.61	User trip 1	R-W	0 or 1	0	
10.62	Not used				
10.63	User trip 2	R-W	0 or 1	0	
10.64	Not used				
10.65	User trip 3	R-W	0 or 1	0	
10.66	Not used				
10.67	User trip 4	R-W	0 or 1	0	
10.68	Not used				
10.69	Trip active at standstill	R-W	0 or 1	1	
10.70	Trip auto-reset when powered	R-W	0 or 1	0	
10.71 to 10.89	Not used				
10.90	LED command			0	
10.91	Increase number of automatic trips	R-W	0 or 1	0	

# VARMECA 30

## Variable speed motor or geared motor

### MENU 10: DRIVE STATES AND DIAGNOSTICS

## 10.2 - Menu 10 diagrams

### 10.2.1 - Operating states

10.01	Drive healthy	10.17	Overload alarm
10.02	Drive active	10.18	Drive over temperature alarm
10.03	Zero speed	10.19	Drive warning
10.04	Running at or below min speed	10.20	Trip 1 (most recent trip)
10.05	Below set speed	10.21	Trip 2
10.06	At speed	10.22	Trip 3
10.07	Above set speed	10.23	Trip 4
10.08	Load reached	10.24	Trip 5
10.09	Drive output is at current limit	10.25	Trip 6
10.10	Regenerating braking	10.26	Trip 7
10.11	Braking IGBT active	10.27	Trip 8
10.13	Direction commanded	10.28	Trip 9
10.14	Direction running	10.29	Trip 10 (oldest trip)
		10.40	Decimal value of binary states <b>10.01 to 10.15</b>
		10.51	V <sub>min</sub> alarm
		10.52	V <sub>max</sub> alarm
		10.53	Maximum speed

# VARMECA 30

## Variable speed motor or geared motor

### MENU 10: DRIVE STATES AND DIAGNOSTICS

#### 10.2.2 - Braking resistor and trip management configuration

##### Braking IGBT active

- 10.12 Braking resistor, overload alarm
- 10.30 Full power braking time
- 10.31 Full power braking period
- 10.39 Braking energy overload accumulator

##### Trip management

- 10.33 Drive reset
- 10.34 No. of auto-reset attempts
- 10.35 Auto-reset delay
- 10.36 Hold drive healthy until last attempt
- 10.37 Action on trip detection
- 10.38 User trip
- 10.54 User alarm 1
- 10.55 User alarm 2
- 10.56 User alarm 3
- 10.57 User alarm 4
- 10.61 User trip 1
- 10.63 User trip 2
- 10.65 User trip 3
- 10.67 User trip 4
- 10.69 Trip active at standstill
- 10.70 Trip auto-reset when powered
- 10.91 Increase number of automatic trips

# VARMECA 30

## Variable speed motor or geared motor

### MENU 10: DRIVE STATES AND DIAGNOSTICS

## 10.3 - Explanation of parameters in Menu 10

### 10.01 : Drive healthy

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when the drive is not in the trip state. If parameter **10.36** is at 1, this bit will remain at 1 during the trip phase if an auto-reset is supposed to occur. Once the number of auto-resets is reached, the next trip will cause this bit to change to zero.

### 10.02 : Drive active

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**  
**1 (Active) (On)**

This parameter is at 1 when the drive output is active.

### 10.03 : Zero speed

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when the absolute value of the speed is less than or equal to the threshold defined by parameter **3.05**.

**10.03** changes back to 0 when the speed becomes greater than  $3.05 + 10 \text{ min}^{-1}$ .

### 10.04 : Running at or below min speed

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

In bipolar mode (**1.10** = 1), the operation of this parameter is identical to that of parameter **10.03**.

In unipolar mode (**1.10** = 0), this parameter is at 1 if the absolute value of the ramp output is less than or equal to the minimum speed  $1.07 + (30 \text{ min}^{-1}/\text{number of pairs of motor poles})$ .

**10.04** changes back to 0 when the speed becomes greater than  $1.07 + (30 \text{ min}^{-1}/\text{number of pairs of poles}) + 10 \text{ min}^{-1}$ . The minimum speed is defined by parameter **1.07**.

### 10.05 : Below set speed

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when the absolute value of the motor speed is greater than  $1.03 - (3.06 \div 2)$ .

**10.05** changes back to 0 when the speed becomes greater than  $1.03 - (3.06 \div 2) + 10 \text{ min}^{-1}$ .

### 10.06 : At speed

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when the absolute value of the motor speed is between  $1.03 - (3.06 \div 2)$  and  $1.03 + (3.06 \div 2)$ .

### 10.07 : Above set speed

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when the absolute value of the motor speed is greater than  $1.03 + (3.06 \div 2)$ .

**10.07** changes back to 0 when the speed becomes less than  $1.03 + (3.06 \div 2) - 10 \text{ min}^{-1}$ .

### 10.08 : Load reached

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when the active current **4.02** is greater than or equal to the rated active current.

Rated active current = **5.07** x **5.10**.

### 10.09 : Drive output is at current limit

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when drive current limiting is active.

### 10.10 : Dynamic braking

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when energy is being transferred from the motor to the DC bus (driving load).

### 10.11 : Braking IGBT active

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when energy is being dissipated in the optional braking resistor (provided it is connected).

### 10.12 : Braking resistor, overload alarm

Adjustment range : 0 or 1

**0 (No) (OFF)**  
**1 (Yes) (On)**

This parameter is at 1 when external resistance braking is active and the cumulative braking power exceeds 75% of **10.39**.

**Note:** This alarm depends on the values set in **10.30** and **10.31**.

### 10.13 : Direction commanded

Adjustment range : 0 or 1

**0 (Forward) (Fd):** The pre-ramp reference is negative (reverse).

**1 (Reverse) (rSe):** The pre-ramp reference is positive (forward).

# VARMECA 30

## Variable speed motor or geared motor

MENU 10: DRIVE STATES AND DIAGNOSTICS

**10.14** : Direction running

Adjustment range : 0 or 1

**0 (Forward) (Fd)**: The post-ramp reference is negative (reverse).

**1 (Reverse) (rSe)**: The post-ramp reference is positive (forward).

**Note**: Do not take this parameter into account with the motor stopped.

**10.15** and **10.16** : Not used

**10.17** : Overload alarm

Adjustment range : 0 or 1

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is at 1 when the motor current exceeds 110% of the programmed motor rated current and the cumulative overload exceeds 75% of the overload capacity of the motor. If the motor current is not reduced, the drive will trip on fault I x t, or will reduce the current automatically according to the protection mode configured in **4.16**.

**10.18** : Drive over temperature alarm

Adjustment range : 0 or 1

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is at 1 when the measured temperature of the IGBTs is higher than 100°C, or when the drive automatically reduces the configured switching frequency, owing to overheating of the heatsink.

**10.19** : Drive warning

Adjustment range : 0 or 1

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is at 1 when at least one of the alarms **10.12**, **10.17** or **10.18** is activated.

**10.20** to **10.29** : Storing of the last 10 trips

Adjustment range : 0 to 54

Contains the last 10 drive trips.

**10.20**: Indicates the most recent trip.

**10.29**: Indicates the oldest trip.

The possible trips are:

No.	LCD display	PAD display	Reason for trip
1	DC under volt	UU	DC bus under voltage
2	DC over volt	OU	DC bus overvoltage
3	Over current	OI.AC	Overcurrent at drive output
4	Brak. IGBT	OI.br	IGBT transistor overcurrent
6	Out Ph. loss	ph.AC	Loss of a motor phase with brake enabled
7	Over speed	OSP	Overspeed
18	Autotun.fail	tunE	Autotune fault
19	Brak. resist.	it.br	Braking resistor overload I x t
20	Motor I <sup>2</sup> t	it.AC	Motor overload I x t
21	Dv over heat	Oht1	IGBT overheating detected by internal sensor

No.	LCD display	PAD display	Reason for trip
22	BR over heat	Oht2	Internal braking resistor overheating detected by thermal sensor
24	Motor PTC	th	Motor thermal sensor has tripped
26	24V over Id	O.Ld1	Overload on the +24V power supply or digital
27	ADI1 loss	CL1	Loss of the current reference on analog input ADI1
28	ADI2 loss	CL2	Loss of the current reference on analog input ADI2
29	AIO3 loss	CL3	Loss of the current reference on analog input ADIO3
30	COM loss	SCL	Loss of serial link communication
31	EEPROM fail.	EEF	EEPROM fault or transfer problem with XPressKey (drive and key version different)
33	Stator res.	rS	Trip during the measurement of the stator
34	Fieldbus loss	Fbus	Disconnection of the fieldbus during operation or error detected by the bus option
35	Sec. disable	Secd	Safety input fault
36	U sign. loss	Enc1	Loss of channel U
37	V sign. loss	Enc2	Loss of channel V
38	W sign. loss	Enc3	Loss of channel W
41	User 1	tr01	User trip 1 via digital input
42	User 2	tr02	User trip 2 via digital input
43	User 3	tr03	User trip 3 via digital input
44	User 4	tr04	User trip 4 via digital input
45 to 51	User 5 to User 10	tr05 to tr10	User 5 trip via serial link to User 10 trip via serial link

VMA 33/34 only

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## Variable speed motor or geared motor

### MENU 10: DRIVE STATES AND DIAGNOSTICS

**10.30** : Full power braking time

Adjustment range : 0 to 400.0 s

Factory setting : 3.0 s (VMA 31/32 = 0)

This parameter defines for how long the braking resistor can withstand the maximum braking voltage (780 V or 390 V) without damage. It is used to determine the time before the drive trips due to braking overload.

**CAUTION:**

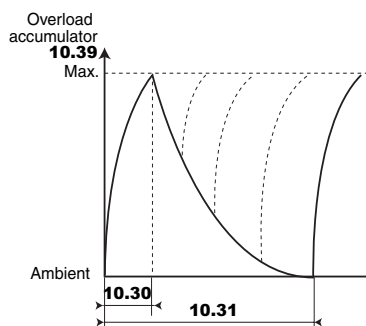
**If this parameter is left at 0, the braking resistor will not be protected.**

**10.31** : Full power braking period

Adjustment range : 0 to 25.0 min

Factory setting : 1.0 min (VMA 31/32 = 0)

This parameter defines the time interval that must elapse between two consecutive braking periods at full power as defined by parameter **10.30**. It is used to configure the thermal time constant for the resistor used.

**CAUTION:**

**If this parameter is left at 0, the braking resistor will not be protected.**

**10.32** : Not used**10.33** : Drive reset

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF)****1 (Yes) (On)**

This parameter changing from 0 to 1 causes a reset of the drive.

If a remote reset is necessary, a terminal must be assigned to this parameter.

If the drive trips due to IGBT overcurrent, at either the output bridge or the braking resistor, the drive cannot be reset for 10 seconds (IGBT recovery time) unless **10.91** = yes.

**10.34** : Number of auto-reset attemptsAdjustment range : if **10.91** = 0: 0 to 5if **10.91** = 1: 0 to 100

Factory setting : 0 (VARMECA 31/32 = 2)

**0: There will be no automatic reset. A command must be given.**

**1 to 5:** There will be as many automatic reset attempts as have been programmed.

When the counter reaches the permitted number of reset attempts, the drive finally locks. This last trip can only be reset via a command.

If no trips occur, the counter is decremented by one value every 5 minutes.

**10.35** : Auto-reset delay

Adjustment range : 0 to 25.0 s

Factory setting : 1.0 s

This parameter defines the time between the drive tripping and the automatic reset (subject to a minimum stop time for trips relating to overcurrents).

**10.36** : Hold drive healthy until last attempt

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): 10.01 (drive healthy) is reset to zero each time the drive trips, without taking account of any auto-resets that could occur.**

**1 (Yes) (On):** Parameter **10.01** is held at 1 during the trip phases which are reset automatically.

**10.37** : Action on trip detection

Adjustment range : 0 or 1

Factory setting : 0

**0 (Freewheel) (Free): Freewheel stop on all trip types.**

**1 (Controlled) (Ctld):** The drive will control deceleration before tripping on low-priority trips it.AC, Oht1, Oht2, th, OLd1, CL1, CL2, CL3, SCL, EEF, Fbus, tr05, tr10.

**10.38** : User trip

Adjustment range : 0 to 100

Factory setting : 0

This parameter is used to generate user trips, via the serial link.

Trips generated by the user will be indicated by trxx in the trip table, xx being the trip code. Only values  $\geq 45$  and  $\neq 51$  can generate a trip.

Users wishing to reset the drive via the serial link can do so by giving this parameter the value 100.

**10.39** : Braking energy overload accumulator

Adjustment range : 0 to 100.0%

This parameter gives an indication of the braking resistor temperature modelled according to parameters **10.30** and **10.31**. A zero value means that the resistor is close to the ambient temperature and 100% is the maximum temperature (trip level).

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## Variable speed motor or geared motor

### MENU 10: DRIVE STATES AND DIAGNOSTICS

#### **10.40** : Decimal value of binary states **10.01** to **10.15**

Adjustment range : 0 to 16383

This parameter is used with a serial communications interface. The value of this parameter is the addition of the drive bits provided for read-only mode, with the following binary weights:

- **10.01** =  $2^0$ ,
- **10.02** =  $2^1$ ,
- **10.03** =  $2^2$ ,
- **10.04** =  $2^3$ ,
- **10.05** =  $2^4$ ,
- **10.06** =  $2^5$ ,
- **10.07** =  $2^6$ ,
- **10.08** =  $2^7$ ,
- **10.09** =  $2^8$ ,
- **10.10** =  $2^9$ ,
- **10.11** =  $2^{10}$ ,
- **10.12** =  $2^{11}$ ,
- **10.13** =  $2^{12}$ ,
- **10.14** =  $2^{13}$ ,
- **10.15** =  $2^{14}$ .

**10.41** to **10.50** : Not used

#### **10.51** : $V_{\min}$ alarm

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

Changes to 1 when the motor speed (**5.04**) <  $V_{\min}$  (**1.07** or **21.02**) + **3.51** in open loop mode or speed (**3.02**) <  $V_{\min}$  (**1.07** or **21.02**) + **3.51** in closed loop mode.

**10.51** changes back to 0 when the speed becomes higher than (**5.04**) <  $V_{\min}$  (**1.07** or **21.02**) + **3.51** +  $10 \text{ min}^{-1}$  in open loop mode or higher than (**3.02**) <  $V_{\min}$  (**1.07** or **21.02**) + **3.51** +  $10 \text{ min}^{-1}$ .

**Note:** In bipolar mode, alarm **10.51** is not active.

#### **10.52** : $V_{\max}$ alarm

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

Changes to 1 when the motor speed (**5.04**) >  $V_{\max}$  (**1.06** or **21.01**) - **3.52** in open loop mode or speed (**3.02**) >  $V_{\max}$  (**1.06** or **21.01**) - **3.52** in closed loop mode.

**10.52** changes back to 0 when the speed is lower than (**5.04**) >  $V_{\max}$  (**1.06** or **21.01**) - **3.52** -  $10 \text{ min}^{-1}$  in open loop mode, or (**3.02**) >  $V_{\max}$  (**1.06** or **21.01**) - **3.52** -  $10 \text{ min}^{-1}$ .

#### **10.53** : Maximum speed

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

Changes to 1 when the motor speed (**5.04**) >  $V_{\max}$  (**1.06** or **21.01**) -  $15 \text{ min}^{-1}$ .

**10.53** changes back to 0 when the speed is lower than (**5.04**) >  $V_{\max}$  (**1.06** or **21.01**) - **3.53** -  $25 \text{ min}^{-1}$ .

**10.54** to **10.57** : User alarms 1 to 4

Adjustment range : 0 or 1

Factory setting : 0

**0 (Inactive) (OFF)**

**1 (Active) (On)**

When these parameters change to 1, the drive display alternates between the messages "Alar." and "USr(1to4)" (no tripping of the drive).

**Note:**

User alarm 1 overrides user alarm 2.

User alarm 2 overrides user alarm 3.

User alarm 3 overrides user alarm 4.

**10.58** to **10.60** : Not used

**10.61** : User trip 1

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): The drive has not tripped.**

**1 (Yes) (On):** The drive trips, may or may not control deceleration according to the configuration of **10.62** and generates a trip code tr01.

**Note:** Automatic reset (**10.34**) is not permitted.

**10.62** : Not used

**10.63** : User trip 2

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): The drive has not tripped.**

**1 (Yes) (On):** The drive trips, may or may not control deceleration according to the configuration of **10.64** and generates a trip code tr02.

**Note:** Automatic reset (**10.34**) is not permitted.

**10.64** : Not used

**10.65** : User trip 3

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): The drive has not tripped.**

**1 (Yes) (On):** The drive trips, may or may not control deceleration according to the configuration of **10.66** and generates a trip code tr03.



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### MENU 10: DRIVE STATES AND DIAGNOSTICS

**10.66** : Not used

**10.67** : User trip 4

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): The drive has not tripped.**

**1 (Yes) (On):** The drive trips, may or may not control deceleration according to the configuration of **10.68** and generates a trip code tr04.

**10.68** : Not used

**10.69** : Trip active at standstill

Adjustment range : 0 or 1

Factory setting : 1

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is used to make drive trips active at standstill. The trips concerned are: UU, phAC, tunE, EnC, Oht2, itAC, th, CL1, CL2, CL3, oht1.

**10.70** : Trip auto-reset when powered

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is used to automatically reset the trip with power "UU" applied.

**10.71** to **10.89** : Not used

**10.90** : LED command

Adjustment range : 0 to 1000

In the PUMP preset configuration (**11.46** = 8), this parameter is used to check output ADI03:

- **10.90** is at 0 when **10.01** is at 1 (drive healthy)

- **10.90** is at 1000 when **10.01** is at 0 (drive faulty)

- **10.90** changes alternately from 600 to 1000 when **10.09** is at 1 (current limiting active).

**10.91** : Increase number of automatic trips

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (ON)**

**1 (Yes) (OFF)**

This parameter is used to obtain more automatic trip resets. When it is enabled, the maximum value of **10.34** changes from 5 to 100.

In addition, the 10-second delay before detection of IGBT overcurrent (OIAC) is no longer taken into account (see **10.33**). The delay is then set by **10.35**.

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## Variable speed motor or geared motor

MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

### 11 - MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

#### 11.1 - List of parameters in Menu 11

Parameter	Name	Type	Adjustment range	Factory setting		User setting
				VMA31/32	VMA33/34	
11.01	Parameter 46 set-up	R-W	0.00 to 21.51	6.03	6.04	
11.02	Parameter 47 set-up	R-W	0.00 to 21.51	0.00	8.10	
11.03	Parameter 48 set-up	R-W	0.00 to 21.51	11.60	7.15	
11.04	Parameter 49 set-up	R-W	0.00 to 21.51	0.00	7.33	
11.05	Parameter 50 set-up	R-W	0.00 to 21.51	0.00	8.41	
11.06	Parameter 51 set-up	R-W	0.00 to 21.51	-	1.05	
11.07	Parameter 52 set-up	R-W	0.00 to 21.51	-	1.10	
11.08	Parameter 53 set-up	R-W	0.00 to 21.51	-	1.29	
11.09	Parameter 54 set-up	R-W	0.00 to 21.51	-	1.30	
11.10	Parameter 55 set-up	R-W	0.00 to 21.51	-	2.04	
11.11	Parameter 56 set-up	R-W	0.00 to 21.51	10.34	2.06	
11.12	Parameter 57 set-up	R-W	0.00 to 21.51	10.35	2.07	
11.13	Parameter 58 set-up	R-W	0.00 to 21.51	6.01	6.01	
11.14	Parameter 59 set-up	R-W	0.00 to 21.51	-	6.09	
11.15	Parameter 60 set-up	R-W	0.00 to 21.51	-	5.18	
11.16	Parameter 61 set-up	R-W	0.00 to 21.51	-	5.06	
11.17	Parameter 62 set-up	R-W	0.00 to 21.51	-	5.11	
11.18	Parameter 63 set-up	R-W	0.00 to 21.51	-	5.12	
11.19	Parameter 64 set-up	R-W	0.00 to 21.51	-	11.42	
11.20	Parameter 65 set-up	R-W	0.00 to 21.51	-	11.43	
11.21	Customer unit	R-W	0 to 9.999	1.000		
11.22	Unit displayed at power-up	R-W	0 to 5	0		
11.23	Serial address	R-W	0 to 247	1		
11.24	Serial mode	RO/P	0 or 1	-		-
11.25	Baud rate	R-W	0 to 9	6		
11.26	Minimum comms transmit delay	R-W	0 to 250 ms	2		
11.27	Modbus RTU frame format	R-W	0 to 3	0		
11.28	Not used					
11.29	Software version	RO/P	1.00 to 9.99	-		-
11.30	User security code	R-W	0 to 9999	0		
11.31	User drive mode	R-W	0 to 3	1		
11.32	Drive current rating	RO/P	1.5 to 75.0 A	-		-
11.33	Drive voltage rating	RO/P	200 to 480 V	-		-
11.34 to 11.40	Not used					
11.41	Status mode time-out	R-W	10 to 250 s	045/240 s		
11.42	Parameter cloning	R-W	0 to 3	0		
11.43	Load defaults	R-W/P	0 to 2	0		
11.44	Parameter-setting level	R-W	0 to 2	1		
11.45	Motor 2 parameters select	R-W	0 or 1	0		
11.46	Preset configuration select	R-W/P	0 to 13	CP version = 11 Other = 0		
11.47	Display duration in alternating mode	R-W	0 to 250 s	5 s		
11.48	Last preset configuration	RO	0 to 12	-		-
11.49	Parameter displayed at power-up	R-W	0.00 to 21.51	0.00		
11.50 to 11.57	Not used					
11.58	Control Pad version	LE				
11.59	Drive variant	R-W	0 to 99	-		
11.60	Product code	RO/P	0 to 32000	-		-
11.61	Advanced menus code	R-W	0 to 9999	149		
11.62	Not used					
11.63	Timeout on RJ45	R-W	0 to 25.0 s	0		
11.64	Save EEPROM parameters	R-W	0 or 1	0		
11.65	Menu of parameters to be saved in EEPROM	R-W	0 to 21	0		

VMA 33/34 only

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## Variable speed motor or geared motor

### MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

#### 11.2 - Menu 11 diagram

##### Menu 0 configuration

11.01	Parameter <b>46</b> set-up	11.11	Parameter <b>56</b> set-up
11.02	Parameter <b>47</b> set-up	11.12	Parameter <b>57</b> set-up
11.03	Parameter <b>48</b> set-up	11.13	Parameter <b>58</b> set-up
11.04	Parameter <b>49</b> set-up	11.14	Parameter <b>59</b> set-up
11.05	Parameter <b>50</b> set-up	11.15	Parameter <b>60</b> set-up
11.06	Parameter <b>51</b> set-up	11.16	Parameter <b>61</b> set-up
11.07	Parameter <b>52</b> set-up	11.17	Parameter <b>62</b> set-up
11.08	Parameter <b>53</b> set-up	11.18	Parameter <b>63</b> set-up
11.09	Parameter <b>54</b> set-up	11.19	Parameter <b>64</b> set-up
11.10	Parameter <b>55</b> set-up	11.20	Parameter <b>65</b> set-up

##### Drive configuration

11.29	Software version	11.33	Drive voltage rating
11.31	User drive mode	11.48	Last preset configuration
11.32	Drive current rating	11.59	Drive variant

##### Parameter setting

11.30	User security code
11.42	Parameter cloning
11.44	Parameter-setting level

##### Display

11.21	Customer unit
11.22	Unit displayed at power-up
11.41	Status mode time-out
11.47	Display duration in alternating mode
11.49	Parameter displayed at power-up

##### Serial link

11.23	Serial address
11.24	Serial mode
11.25	Baud rate
11.26	Minimum comms transmit delay
11.27	Modbus RTU frame format
11.63	Timeout on RJ45

##### Miscellaneous

11.43	Load defaults
11.45	Motor 2 parameters select
11.46	Preset configuration select
11.64	Save parameters in EEPROM
11.65	Menus of parameters to be saved in EEPROM

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## Variable speed motor or geared motor MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

### 11.3 - Explanation of parameters in Menu 11

#### 11.01 to 11.20 : Menu 0 set-up

Adjustment range : **0.00** to **21.51**

Factory setting : See table below.

These parameters are used, in order, to define parameters **46** to **65** in menu 0. These parameters are independent of the preset configuration.

Parameter	Default value		Menu 0 destination
	VMA 31/32	VMA 33/34	
<b>11.01</b>	<b>6.03</b>	<b>6.04</b>	<b>46</b>
<b>11.02</b>	<b>0.00</b>	<b>8.10</b>	<b>47</b>
<b>11.03</b>	<b>11.60</b>	<b>7.15</b>	<b>48</b>
<b>11.04</b>	<b>0.00</b>	<b>7.33</b>	<b>49</b>
<b>11.05</b>	<b>0.00</b>	<b>8.41</b>	<b>50</b>
<b>11.06</b>	<b>1.05</b>	<b>1.05</b>	<b>51</b>
<b>11.07</b>	<b>1.10</b>	<b>1.10</b>	<b>52</b>
<b>11.08</b>	<b>1.29</b>	<b>1.29</b>	<b>53</b>
<b>11.09</b>	<b>1.30</b>	<b>1.30</b>	<b>54</b>
<b>11.10</b>	<b>2.04</b>	<b>2.04</b>	<b>55</b>
<b>11.11</b>	<b>10.34</b>	<b>2.06</b>	<b>56</b>
<b>11.12</b>	<b>10.35</b>	<b>2.07</b>	<b>57</b>
<b>11.13</b>	<b>06.01</b>	<b>6.01</b>	<b>58</b>
<b>11.14</b>	<b>6.09</b>	<b>6.09</b>	<b>59</b>
<b>11.15</b>	<b>5.18</b>	<b>5.18</b>	<b>60</b>
<b>11.16</b>	<b>5.06</b>	<b>5.06</b>	<b>61</b>
<b>11.17</b>	<b>5.11</b>	<b>5.11</b>	<b>62</b>
<b>11.18</b>	<b>5.12</b>	<b>5.12</b>	<b>63</b>
<b>11.19</b>	<b>11.42</b>	<b>11.42</b>	<b>64</b>
<b>11.20</b>	<b>11.43</b>	<b>11.43</b>	<b>65</b>

#### 11.21 : Customer unit

Adjustment range : 0 to 9.999

Factory setting : 1.00

This is a multiplication coefficient applied to the motor speed for expressing the speed in a unit defined by the user (see **5.34**).

Example: to obtain a reading in m/min for an application where the product is moving 200 mm for each motor revolution ==> **11.21** = 0.2.

#### 11.22 : Unit displayed at power-up

Adjustment range : 0 to 5

Factory setting : 0

**0 (Speed) (Spd):** On power-up, the speed is displayed. The unit depends on the setting of **5.34** (frequency in Hz, speed in  $\text{min}^{-1}$  or a unit defined by the user).

**1 (Load) (Load):** On power-up, the load is displayed.

The unit displayed depends on the setting of **4.21** (motor load as a % or output current in A).

**2 (Speed/Load) (SP.Ld):** Alternately displays the speed and load, or the current. The display time for each value can be configured in **11.47**.

**3 (USER) (USER):** On power-up, the user parameter selected by **11.49** is displayed.

**4 (Speed/User) (SP.US):** On power-up, the speed and the user parameter selected by **11.49** are displayed alternately.

**5 (Load/User) (Ld.US):** On power-up, the load and the user parameter selected by **11.49** are displayed alternately.

#### 11.23 : Serial address

Adjustment range : 0 to 247

Factory setting : 1

Used to define the drive address in the case of control or monitoring via the serial link in Modbus RTU. Avoid values including a zero since these are used for addressing groups of drives.

#### 11.24 : Serial mode

Adjustment range : 0 or 1

Protocol used for communication via the serial link.

**0 (LS NET) (LSnt):** LS Net protocol.

**1 (Modbus RTU) (rtu):** Modbus RTU protocol.

#### 11.25 : Baud rate

Adjustment range : 0 to 9

Factory setting : 6

Used to select the data transfer speed in Modbus RTU.

11.25	LCD display (kbaud)	LED display (baud)
0	0.3	300
1	0.6	600
2	1.2	1200
3	2.4	2400
4	4.8	4800
5	9.6	9600
<b>6</b>	<b>19.2</b>	<b>19200</b>
7	38.4	38400
8	57.6	57600
9	115.2	115200

**Note:** If CT Comms Cable is used, the baud rate is limited to 38400 baud.

#### 11.26 : Minimum comms transmit delay

Adjustment range : 0 to 250 ms

Factory setting : 2 ms

As the serial link is 2-wire type, Rx is connected to Tx and Rx\ to Tx\ . A communication fault may occur if the receiver answers a request before the transmitter has had time to switch. Parameter **11.26** is used to insert a time between reception and data return. After transmitting a request, the drive requires 1.5 ms before receiving the next command. The adjustment step is 2 ms.

#### 11.27 : Modbus RTU frame format

Adjustment range : 0 to 3

Factory setting : 0

**0 (NONE,2STOP) (OP.2S):** No parity, 2 stop bits

**1 (NONE,2STOP) (OP.1S):** No parity, 1 stop bit

**2 (EVEN,STOP) (eP.1S):** Even parity, 1 stop bit

**3 (ODD1STOP) (oP.1S):** Odd parity, 1 stop bit

#### 11.28 : Not used

#### 11.29 : Software version

Adjustment range : 1.00 to 9.99

Indicates the drive software version.

# VARMECA 30

## Variable speed motor or geared motor

### MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

#### 11.30 : User security code

Adjustment range : 0 to 9999

Factory setting : 0

If this parameter is other than 0 and **11.44** is set to 2 (Loc), no parameter modification can take place. To modify a parameter, the user must enter a code equivalent to the value of **11.30**.

#### 11.31 User drive mode

Adjustment range : 0 to 3

Factory setting : 0

This parameter is used to select the control mode.

**0 (OPEN LOOP) (oP.LP):** The drive is controlled in open loop mode. The open loop control mode is defined by parameter **5.14**.

**1 (OPEN LOOP) (oP.LP):** The drive is controlled in open loop mode. The open loop control mode is defined by parameter **5.14**.

**2 (C.L.Vector) (cL.LP):** The drive controls an induction motor in closed loop flux vector control mode. The encoder type and control mode are defined by parameter **3.38**.

**3 (SERVO) (SruO):** The drive controls a servo motor. The encoder type and control mode are defined by parameter **3.38**.

The operating mode can only be selected when the drive is stopped.

**Note:** The change from open loop mode (**11.31** = 0 or 1) to closed loop mode (**11.31** = 2 or 3), or vice versa, causes a return to factory settings of parameters **12.45** brake engage frequency or brake engage speed, and **12.46** magnetisation time delay/speed threshold.

#### 11.32 : Drive current rating

Adjustment range : 1.5 to 75.0 A

This parameter indicates the drive rated current corresponding to the permitted total motor current.

#### 11.33 : Drive voltage rating

Adjustment range : 200 to 480 V

This parameter indicates the drive rated voltage.

#### 11.34 to 11.40 : Not used

#### 11.41 : Status mode time-out

Adjustment range : 10 to 250 s

Factory setting : 240 s (VMA 31/32 : 45 s)

In parameter-setting mode, if there is no action on the keypad for the time set in **11.41**, the display automatically returns to read mode. When the user returns to parameter-setting mode, the display is positioned on the last parameter accessed.

#### 11.42 : Parameter cloning

Adjustment range : 0 to 3

Factory setting : 0

Disable the drive before performing parameter cloning or transfer with XPressKey (SDI2 terminal open). Then, connect XPressKey to the drive's serial link.

**0 (No) (no): No action.**

**1 (Key to Drive) (rEad):** When this parameter is stored at 1, the display alternates between "rEad" and "hEy?" ". Confirm the transfer of parameters into the drive by pressing the "Key" button. When the transfer is complete, the parameter reverts to 0. The rEad function can also be activated via the pushbutton located on the copy key. A first press on the button corresponds to parameter **11.42** changing to 1 and a second press causes confirmation. Press the button on the key within 10 seconds after selecting 1 in **11.42**.

**2 (Drive to Key) (Prog):** When this parameter is stored at 2, the display alternates between "Prog" and "hEy?" ". Confirm the transfer of parameters into XPressKey by pressing the Key button on the XPressKey. When the transfer is complete, the parameter reverts to 0. Press the button on the Key within 10 seconds after selecting 2 in **11.42**.

**3 (Auto key save) (Auto):** Any modification of a parameter is automatically saved to the copy key. The action is confirmed at the time of storing (M key). No data is written to the copy key on a return to factory settings.

#### CAUTION:

• The copy key contains parameters relating to the drive rating. If the parameters are copied into a drive with a different rating, the parameters relating to the drive and the motor characteristics will not be copied and the alarm "C.rtg" will flash on the display. If the user confirms the transfer by pressing the Key button on the XPressKey, the parameters are transferred into the drive, apart from the "motor" parameters (**06, 07, 08, 31 and 32**).

• Do not transfer parameters with the XPressKey between two drives with different voltage/frequency ("T" drive to a "TL" or vice versa, and "TL-50Hz" drive to "TL-60Hz" and vice versa).

#### 11.43 : Load defaults

Adjustment range : 0 to 2

Factory setting : 0 (VARMECA 31/32 = 0 to 1)

#### CAUTION:

Disable the drive before changing **11.43**.

**0 (No) (No): Return to factory settings is not performed.**

**1 (50Hz mains) (Eur):** Configures the drive to factory settings for 50 Hz mains supply.

**2 (60Hz mains) (USA):** Configures the drive to factory settings for 60 Hz mains supply.

#### 11.44 : Parameter-setting level

Adjustment range : 0 to 2

Factory setting : 1

This parameter determines the access level in menu 0.

11.44	PX LCD display	PAD display	Access level
0	Level 1	L1	Access to parameters <b>01 to 10</b>
1	Level 2	L2	Access to parameters <b>01 to 80</b>
2	Read only	Loc	All parameters can be read, but none can be modified, unless a code equal to parameter <b>11.30</b> is entered at the time of accessing the parameter.

The locking procedure using a security code is described in section 4.3.6 of the installation and commissioning manual ref. 3776.

VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

### MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

#### 11.45 : Motor 2 parameters select

Adjustment range : 0 or 1

Factory setting : 0

This parameter is used to select the parameter set corresponding to the characteristics of motor 2.

11.45 = 0 (Motor 1) (Mot1)	11.45 = 1 (Motor 2) (Mot2)	Description
1.06	21.01	Maximum reference clamp
1.07	21.02	Minimum reference clamp
1.14	21.03	Reference selector
2.11	21.04	Acceleration ramp
2.21	21.05	Deceleration ramp
5.06	21.06	Rated frequency
5.07	21.07	Rated current
5.08	21.08	Rated speed
5.09	21.09	Rated voltage
5.10	21.10	Rated power factor (cos φ)
5.11	21.11	Number of motor poles
5.17	21.12	Stator resistance
5.23	21.13	Voltage offset
5.24	21.14	Transient inductance
-	21.15	Motor 2 parameters active
5.25	21.24	Stator inductance (Ls)
5.33	21.30	Motor volts per 1000 min <sup>-1</sup> (Ke)
5.51	21.51	q axis inductance

#### CAUTION:

- Switching from one set of motor parameters to the other is performed with the drive disabled.
- When the parameter set for motor 2 is selected, all punctuation marks on the display are lit except for the comma which is off.

#### 11.46 :Preset configuration select

Adjustment range : 0 to 13

Factory setting : 0

Used to select a configuration which automatically assigns the I/O and defines parameters **11** to **24**.

**Note:** Modifications to **11.46** must be made with the drive disabled.

**11.46** is stored permanently. If one of the parameters concerned is modified by the user after automatic configuration, **11.46** automatically switches to mode 13 (OPEN).

Value	VARMECA 30	PXLCD display	LED display
0	Standard	S T A N D A R D	S t d
1	Standard with 3 wire control	S T A N D A R D + P L S	P U L S
2	Standard with PID enabled	S T A N D A R D + P I D	P I D
3	1 analog reference + 3 preset speeds	3 P S + 1 A N A L O G .	C 0 1
4	2 analog reference + 3 preset speeds + brake control	3 P S 1 A N . B R A K E	C 0 2
5	8 preset speeds	8 P S	C 0 3
6	Correction of a reference using the local control knob or local/remote	L O C A L D I S T .	C 0 4
7	2 preset speeds proportional to the reference	2 P S P R O P . B	C 0 5
8	Pump and fan management	P U M P S § F A N S	C 0 6
9	Torque control with speed regulation	T O R Q . C O N T R O L	C 0 7
10	Faster / slower + brake control	F A S T , S L B R A K E	C 0 8
11	Faster / slower without brake control	F A S T . S L O W E R	C 0 9
12	Motorised potentiometer	D I G I T A L P O T .	C 1 0
13	Open	O P E N	C 1 1

VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

MENU 11: SERIAL LINK - DRIVE CHARACTERISTICS - MISCELLANEOUS

### 11.47 : Display duration in alternating mode

Adjustment range : 0 to 250 s

Factory setting : 5 s

In alternating display mode, **11.22** = 2, used to define for how long each value is displayed.

### 11.48 : Last preset configuration

Adjustment range : 0 to 12

**0 Standard**

**1 Standard with 3 wire control**

**2 Standard with PID enabled**

**3 1 analog reference + 3 preset speeds**

**4 2 analog references + 3 preset speeds + brake control**

**5 8 preset speeds**

**6 Correction of a reference using the local control knob or local/remote**

**7 2 preset speeds proportional to the reference**

**8 Pump management**

**9 Torque control with speed regulation**

**10 Faster / slower + brake control**

**11 Faster / slower without brake control**

**12 Motorised potentiometer**

This parameter stores and indicates the last preset configuration selected by **11.46**. Value 13 (Open) is not taken into account.

### 11.49 : Parameter displayed at power-up

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter is used to select the parameter to be displayed at power-up (see **11.22**).

**11.50** to **11.57** : Not used

### 11.58 : Control Pad version

Adjustment range : 0 to 32000.

### 11.59 : Drive variant

Adjustment range : 0 to 99

Indication of the drive type.

**0 (Display) (N)**: Drive with display only. Parameters can be set only via the LCD console or a PC.

**1 (Local control) (CP)**: Drive fitted with local controls (1 FWD key (⊙), 1 REV key (⊙), 1 Stop key (⊙) and 1 potentiometer). The parameters are set as described above.

**2 (6 keys) (SEt)**: Drive fitted with 6 keys (1 FWD key (⊙), 1 REV key (⊙), 1 Stop key (⊙) one (⬆) key, 1 (⬇) key and one Mode key (Ⓜ)). The user menu parameters can be set using the ⬆, ⬇ and Ⓜ keys. Advanced parameters can be accessed via the LCD console or PC.

**3 to 99**: Reserved.

**CAUTION:**

**After modifying this parameter, return to factory settings (see 11.43).**

### 11.60 : Product code

Adjustment range : 0 to 32000

This product code gives information on the drive rating, size, hardware version and variant.

When the nameplate is not visible, this code can be given to your LEROY-SOMER contact.

### 11.61 : Advanced menus code

Adjustment range : 0 to 9999

Factory setting : 149

This parameter is used to limit access to menus 1 to 21 when setting the parameters via the LCD console.

If this parameter is not equal to 0, the value of parameter

**11.61** must be entered to enable switching from Menu 0 to Menu 1.

In factory settings mode, simply enter value 149 to access all the menus.

### 11.62 : Not used

### 11.63 : Timeout on RJ45

Adjustment range : 0 to 25.0 s

Factory setting : 0

Used to generate the "SCL" trip if no communication has taken place within the time period set by this parameter.

The value 0 deactivates monitoring of the communication on the drive's RJ45 connector.

### 11.64 : Save parameters in EEPROM

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is used to store in EEPROM the values of drive parameters that have been changed via the fieldbus.

- Select the menu(s) to be saved using **11.65** (set **11.65** = 0 to save all the menus).

- Confirm the save using **11.64** = 1 (On).

- Saving completed is indicated by **11.64** reverting to 0 (OFF).

### 11.65 : Menus of parameters to be saved in EEPROM

Adjustment range : 0 to 21

Factory setting : 0

This parameter is used to select the menu(s) to be saved. Set **11.65** = 0 to save all the menus (see **11.64**).









# VARMECA 30

## Variable speed motor or geared motor


MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

### 12 - MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

#### 12.1 - List of parameters in Menu 12

Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>12.01 - 12.02</b> <b>12.61 - 12.71</b>	Threshold detector 1 to 4 output	RO	0 or 1	-	-
<b>12.03 - 12.23</b> <b>12.63 - 12.73</b>	Threshold detector 1 to 4 source	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>12.04 - 12.24</b> <b>12.64 - 12.74</b>	Threshold detector 1 to 4 level	R-W	0 to 100.0%	0	
<b>12.05 - 12.25</b> <b>12.65 - 12.75</b>	Threshold detector 1 to 4 hysteresis	R-W	0 to 25.0%	0	
<b>12.06 - 12.26</b> <b>12.66 - 12.76</b>	Threshold detector 1 to 4 output invert	R-W	0 or 1	0	
<b>12.07 - 12.27</b> <b>12.67 - 12.77</b>	Threshold detector 1 to 4 destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>12.08 - 12.28</b>	Variable selector 1 and 2 source 1	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>12.09 - 12.29</b>	Variable selector 1 and 2 source 2	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>12.10 - 12.30</b>	Variable selector 1 and 2 mode	R-W	0 to 9	0	
<b>12.11- 12.31</b>	Variable selector 1 and 2 destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>12.12- 12.32</b>	Variable selector 1 and 2 output	RO/P	± 100.00%	-	-
<b>12.13- 12.33</b>	Variable selector 1 and 2 source 1 scaling	R-W	± 4.000	1.000	
<b>12.14- 12.34</b>	Variable selector 1 and 2 source 2 scaling	R-W	± 4.000	1.000	
<b>12.15- 12.35</b>	Variable selector 1 and 2 control	R-W	0 to 100.00	0	
<b>12.16</b> to <b>12.22</b>	Not used				
<b>12.36</b> to <b>12.39</b>	Not used				
<b>12.40</b>	Brake release	RO	0 or 1	-	
<b>12.41</b>	Brake controller enable	R-W	0 to 3	0	
<b>12.42</b>	Upper current threshold	R-W	0 to 200%	10%	
<b>12.43</b>	Lower current threshold	R-W	0 to 200%	10%	
<b>12.44</b>	Brake release frequency	R-W	0 to 20.0 Hz	1.0 Hz	
<b>12.45</b>	Brake apply frequency	 R-W	0 to 20.0 Hz	2.0 Hz	
	Brake apply speed	 R-W	0 to 100 min <sup>-1</sup>	5 min <sup>-1</sup>	
<b>12.46</b>	Magnetisation time delay	 R-W	0 to 25.00 s	0.10 s 	
	Brake apply speed delay	 R-W		0.30 s 	
<b>12.47</b>	Post-brake release delay	R-W	0 to 25.00 s	0.10 s	
<b>12.48</b>	Brake apply delay	 R-W	0 to 25.00 s	1.00 s	
<b>12.49*</b>	Enable position controller during brake release	 R-W	0 or 1	0	
<b>12.50</b>	Not used				
<b>12.51</b>	Manual brake release	R-W	0 or 1	0	

\*Function not available.

 VMA 33/34 only



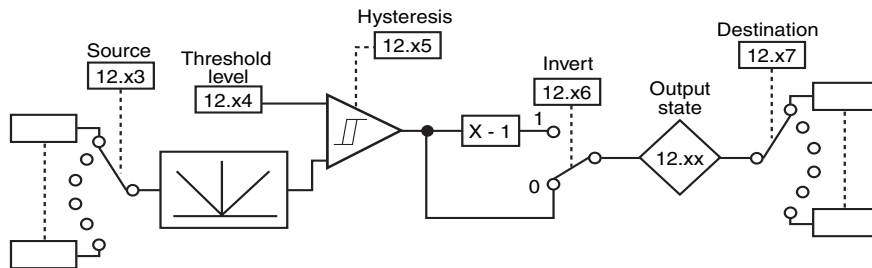
# VARMECA 30

## Variable speed motor or geared motor

MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

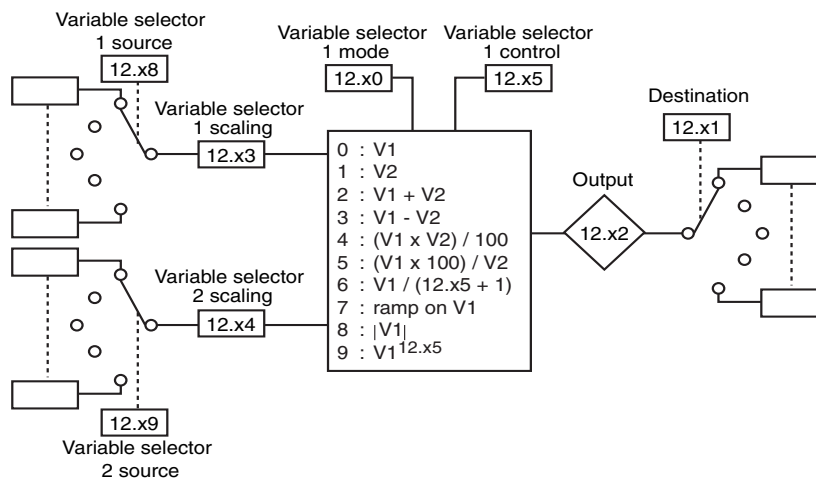
### 12.2 - Menu 12 diagrams

#### 12.2.1 - Threshold detectors



	Source	Threshold level	Hysteresis	Output state	Invert	Destination
Threshold	<b>12.03</b>	<b>12.04</b>	<b>12.05</b>	<b>12.01</b>	<b>12.06</b>	<b>12.07</b>
Threshold	<b>12.23</b>	<b>12.24</b>	<b>12.25</b>	<b>12.02</b>	<b>12.26</b>	<b>12.27</b>
Threshold	<b>12.63</b>	<b>12.64</b>	<b>12.65</b>	<b>12.61</b>	<b>12.66</b>	<b>12.67</b>
Threshold	<b>12.73</b>	<b>12.74</b>	<b>12.75</b>	<b>12.71</b>	<b>12.76</b>	<b>12.77</b>

#### 12.2.2 - Processing of internal variables



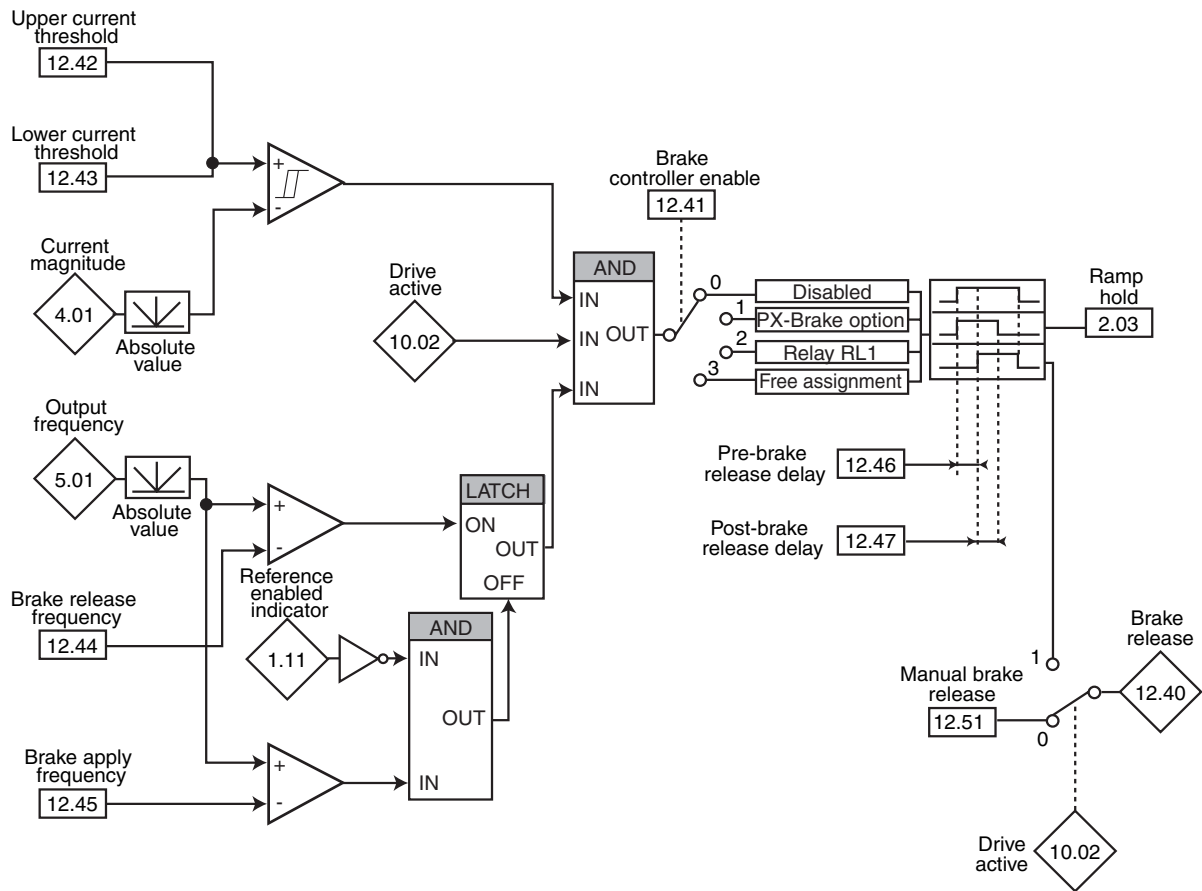
	Variable 1 source	Variable 1 scaling	Variable 2 source	Variable 2 scaling	Function selection	Associated parameter	Output destination	Output
Block 1	<b>12.08</b>	<b>12.13</b>	<b>12.09</b>	<b>12.14</b>	<b>12.10</b>	<b>12.15</b>	<b>12.11</b>	<b>12.12</b>
Block 2	<b>12.28</b>	<b>12.33</b>	<b>12.29</b>	<b>12.34</b>	<b>12.30</b>	<b>12.35</b>	<b>12.31</b>	<b>12.32</b>

# VARMECA 30

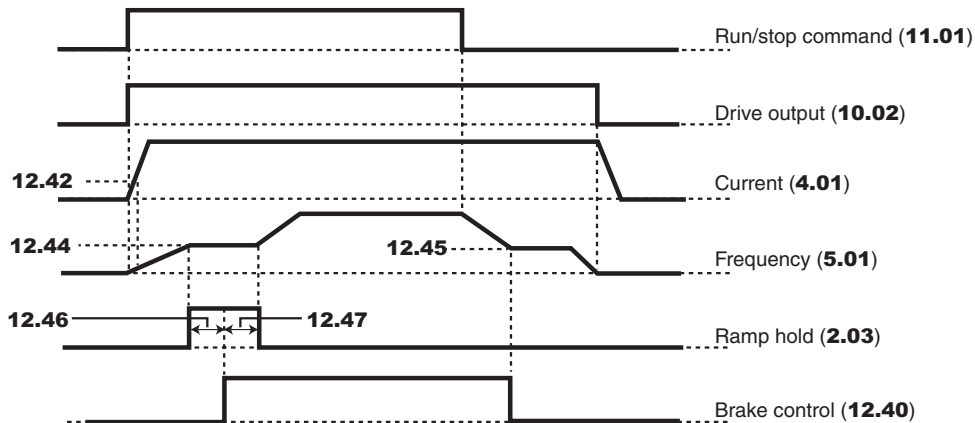
## Variable speed motor or geared motor

### MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

#### 12.2.3 - Brake control in open loop mode



#### Sequencing

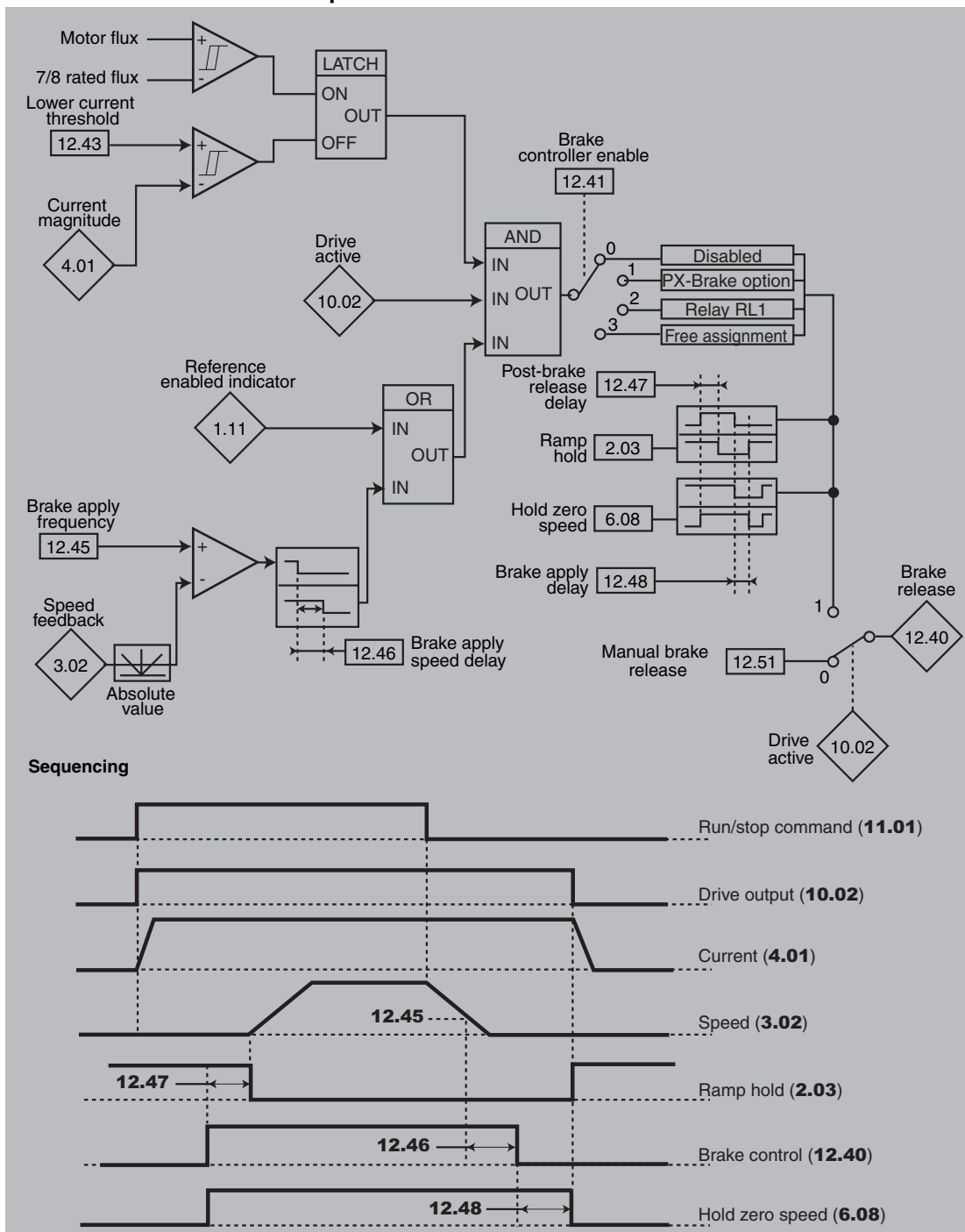


# VARMECA 30

## Variable speed motor or geared motor

### MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

#### 12.2.4 - Brake control in closed loop mode



VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

### MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

#### 12.3 - Explanation of parameters in Menu 12

**12.01** : Threshold detector 1 output

**12.02** : Threshold detector 2 output

**12.61** : Threshold detector 3 output

**12.71** : Threshold detector 4 output

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**: The input variable is less than or equal to the detector threshold.

**1 (Active) (On)**: The input variable is greater than the detector threshold.

**12.03** : Threshold detector 1 source

**12.23** : Threshold detector 2 source

**12.63** : Threshold detector 3 source

**12.73** : Threshold detector 4 source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters define the variable that is to be compared to the configured threshold.

The absolute value of the variable is used. Only non-bit parameters can be programmed as the source.

If an unsuitable parameter is programmed, the input value is taken equal to 0.

**12.04** : Threshold detector 1 level

**12.24** : Threshold detector 2 level

**12.64** : Threshold detector 3 level

**12.74** : Threshold detector 4 level

Adjustment range : 0 to 100.0%

Factory setting : 0

These parameters are used to set the detector trip threshold.

The threshold is expressed as a percentage of the maximum value of the compared variable.

**12.05** : Threshold detector 1 hysteresis

**12.25** : Threshold detector 2 hysteresis

**12.65** : Threshold detector 3 hysteresis

**12.75** : Threshold detector 4 hysteresis

Adjustment range : 0 to 25.0%

Factory setting : 0

These parameters define the window within which the detector output will not change state.

The output will change to 1 when the variable reaches the value of the threshold + (hysteresis/2).

The output will change to 0 when the variable goes below the value of the threshold - (hysteresis/2).

The hysteresis is expressed as a percentage of the maximum value of the compared variable.

**12.06** : Threshold detector 1 invert

**12.26** : Threshold detector 2 invert

**12.66** : Threshold detector 3 invert

**12.76** : Threshold detector 4 invert

Adjustment range : 0 or 1

Factory setting : 0

These parameters are used to invert the detector output.

**0 (No) (OFF)**: Output not inverted.

**1 (Yes) (On)**: Output inverted.

**12.07** : Threshold detector 1 destination

**12.27** : Threshold detector 2 destination

**12.67** : Threshold detector 3 destination

**12.77** : Threshold detector 4 destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters define the internal parameter which will be assigned by the detector output.

Only bit type parameters can be programmed.

If an unsuitable parameter is programmed, the output is not sent to any address.

**12.08** : Variable selector 1 source 1

**12.28** : Variable selector 2 source 1

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters define the source parameter for variable 1 to be processed.

Only "numerical" parameters (read-only) can be assigned.

If an unsuitable parameter is selected, the value of the variable will be 0.

# VARMECA 30

## Variable speed motor or geared motor

### MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

**12.09** : Variable selector 1 source 2

**12.29** : Variable selector 2 source 2

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters define the source parameter for variable 2 to be processed.

Any "numerical" parameter (read-only) can be assigned.

If an unsuitable parameter is selected, the value of the variable will be 0.

**12.10** : Variable selector 1 mode

**12.30** : Variable selector 2 mode

Adjustment range : 0 to 9

Factory setting : 0

These parameters are used to define the function of the internal variables processing block.

	PX LCD	PAD	Comment
0	S=V1	In1	Used to transfer an internal variable
1	S=V2	In2	Used to transfer an internal variable
2	S=V1+V2	IP2	Addition of 2 variables
3	S=V1-V2	I-2	Subtraction of 2 variables
4	S=V1xV2/100	IM2	Multiplication of 2 variables
5	S=V1/V2x100	Id2	Division of 2 variables: S = (V1x100)/V2
6	S=filter/V1	Filt	Creation of a first-order filter: S = V1/( <b>12.x5</b> + 1)
7	S=Ramped V1	raMP	Creation of a linear ramp. <b>12.x5</b> is used to adjust the value of the ramp
8	S=abs(V1)	abso	Absolute value
9	S=V1^( <b>12.x5</b> )	Puur	V1 to the power <b>12.x5</b> : S=V1 <sup><b>12.x5</b></sup>

• If **12.10** or **12.30** is equal to 2, 3, 4 or 5:

When the result of the calculation is greater than 32767, the output **12.11** or **12.31** is limited at 32767.

When the result of the calculation is less than -32768, the output **12.11** or **12.31** is limited at -32768.

•plf **12.10** or **12.30** is equal to 5:

To avoid a calculation error if V2 = 0, the result of the operation will be 0.

•plf **12.10** or **12.30** is equal to 7:

The ramp time defined by **12.15** or **12.35** corresponds to the time for changing from 0 to 100% of the maximum value of the source parameter.

•plf **12.10** or **12.30** is equal to 9:

To avoid a calculation error, the absolute value of the signal V1 is taken before calculating its square root or cube root.

**12.11** : Variable selector 1 destination

**12.31** : Variable selector 2 destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select the destination of the processed variable.

Any non-protected "non-bit" parameter can be assigned.

If an unsuitable parameter is selected, the value of the variable taken into account is zero.

**12.12** : Variable selector 1 output

**12.32** : Variable selector 2 output

Adjustment range : ± 100.00%

Indicates the value of the function output as a percentage of the adjustment range for the destination parameter.

**Note:** When **12.11** or **12.3** is assigned to **0.00**, the adjustment range for **12.12** or **12.32** is ± 32000.

**12.13** : Variable selector 1 source 1 scaling

**12.33** : Variable selector 2 source 1 scaling

Adjustment range : ± 4.000

Factory setting : 1.000

Used to scale variable 1 before processing.

**CAUTION:**

The value at the scaling output can only be between -32767 and +32767. Take this into account according to the adjustment range of the source parameter.

**12.14** : Variable selector 1 source 2 scaling

**12.34** : Variable selector 2 source 2 scaling

Adjustment range : ± 4.000

Factory setting : 1.000

Used to scale variable 2 before processing.

**CAUTION:**

The value at the scaling output can only be between -32767 and +32767. Take this into account according to the adjustment range of the source parameter.

**12.15** : Variable selector 1 control

**12.35** : Variable selector 2 control

Adjustment range : 0 to 100.00

Factory setting : 0

Depending on its function, the internal variables processing block may require an associated parameter.

If the block is used to implement a first-order filter, the associated parameter is used as a coefficient; if it is used to generate a ramp, this parameter is used to adjust the value of the ramp (in seconds). The ramp time corresponds to the time for changing from 0 to 100% of the maximum value of the source parameter.

If the block is used as a power, this parameter is used as follows:

Function	Associated parameter value
V1 <sup>2</sup>	2.00
V1 <sup>3</sup>	3.00
√V1	12.00
<sup>3</sup> √V1	13.00

**12.16** to **12.22** : Not used

**12.36** to **12.39** : Not used

**12.40** : Brake release

Adjustment range : 0 or 1

Indicates the state of the brake control output.

**0 (Engaged) (OFF):** The brake is not controlled (released).

**1 (Released) (On):** The brake is controlled (engaged).

# VARMECA 30

## Variable speed motor or geared motor

### MENU 12: THRESHOLD DETECTORS, VARIABLE SELECTORS AND BRAKE CONTROL FUNCTION

#### 12.41 : Brake controller enable

Adjustment range : 0 to 3

Factory setting : 0

Used to enable brake control and to select to which digital output it will be assigned.

**0 (Disabled) (dis): Brake control is not enabled.**

**1 (To contact) (COn):** Brake control is enabled and routed to the integrated brake contactor option or DIO1 on VARMECA 31/32.

**2 (To relay) (rEl):** Brake control is enabled and routed to the relay. In this case, the "drive healthy" indication is rerouted to digital output DIO1 (**8.27 = 12.40** and **8.21 = 10.01**).

**3 (Any assign.) (USEr):** Brake control is enabled. The output is not assigned automatically; it is up to the user to select the destination for parameter **12.40**.

**CAUTION:**

The safety function overrides brake control. If **8.10 = 1** then **12.41 = 2**, brake control is enabled, but the relay remains assigned to **10.01** "Drive healthy" and **12.41** changes to **3** "Any assignment". Consequently, disable the safety function by **8.10 = 0** before setting **12.41 = 2**.

#### 12.42 : Upper current threshold

Adjustment range : 0 to 200%

Factory setting : 10%

Used to set the current threshold at which the brake will be controlled. This current level should ensure sufficient torque at the time the brake is released.

#### 12.43 : Lower current threshold

Adjustment range : 0 to 200%

Factory setting : 10%

Used to set the current threshold below which brake control will be disabled (brake engaged). It should be set so that loss of the motor power supply is detected.

#### 12.44 : Brake release frequency

Adjustment range : 0 to 20.0 Hz

Factory setting : 1.0 Hz

Used to set the frequency threshold at which the brake will be controlled. This frequency level should provide sufficient torque to drive the load in the correct direction at the time the brake is released. This threshold is usually set at a value slightly above the frequency corresponding to motor slip at full load.

Example:

-  $1500 \text{ min}^{-1} = 50 \text{ Hz}$

- Rated on-load speed =  $1470 \text{ min}^{-1}$

- Slip =  $1500 - 1470 = 30 \text{ min}^{-1}$

- Slip frequency =  $30/1500 \times 50 = 1 \text{ Hz}$

#### 12.45 : Brake apply frequency or speed

Adjustment range : 0 to 20.0 Hz , 0 to 100  $\text{min}^{-1}$

Factory setting : 2.0 Hz , 5  $\text{min}^{-1}$

Used to set the frequency or speed threshold at which brake control will be deactivated. This threshold enables the brake to be applied before zero speed so as to avoid load veering while the brake is being engaged.

If the frequency or speed drops below this threshold when no stop request has been made (change of direction of rotation), brake control will remain activated. This exception is used to avoid the brake being applied when passing through zero speed.

#### 12.46 : Brake apply time delay

Adjustment range : 0 to 25.00 s

Factory setting : 0.10 s  and 0.30 s

: This time delay is triggered when all the conditions for brake release have been met. It allows enough time to establish an adequate level of reactive current in the motor and to ensure that the slip compensation function is fully activated. When this time delay has elapsed, brake control is enabled (**12.40 = 1**).

For the full duration of this time delay, the ramp applied to the reference is held constant (**2.03 = 1**).

: This time delay is used to delay the brake engage command in relation to the passage below the minimum speed threshold (**12.45**). It is useful for avoiding repeated oscillation of the brake when being used around 0 speed.

#### 12.47 : Post-brake release delay

Adjustment range : 0 to 25.00 s

Factory setting : 0.10 s

This time delay is triggered when brake control is enabled. It is used to allow time for the brake to release before unlocking the ramp (**2.03 = 0**).

#### 12.48 : Brake apply time delay

Adjustment range : 0 to 25.00 s

Factory setting : 0

This time delay is used to maintain the torque at standstill (**6.08 = 1**) while the brake is engaged. When this time delay has elapsed, the drive output is deactivated.

#### 12.49 : Enable position controller during brake release

Adjustment range : 0 or 1

Factory setting : 0

**0 (Disabled) (OFF):** The ramp is held when the drive output is not active, until the post-brake release delay (**12.47**) has expired. This allows the speed reference to remain at 0 until the brake is released.

**1 (Enabled) (On):** Position controller enabled while the ramp is held. This function avoids the load moving during the brake release phase.

**Function not available.**

#### 12.50 : Not used

#### 12.51 : Manual brake release

Adjustment range : 0 or 1

Factory setting : 0

**0 (Inactive) (OFF)**

**1 (Active) (On)**

When the drive output is active (**10.02 = 1**), the brake control output **12.40** is enabled when the release conditions determined by the brake control are met. When the drive output is inactive, the brake control output **12.40** is forced to 1 if **12.51** is at 1.

VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

### MENU 14: PID CONTROLLER

## 13 - MENU 14: PID CONTROLLER

### 13.1 - List of parameters in Menu 14

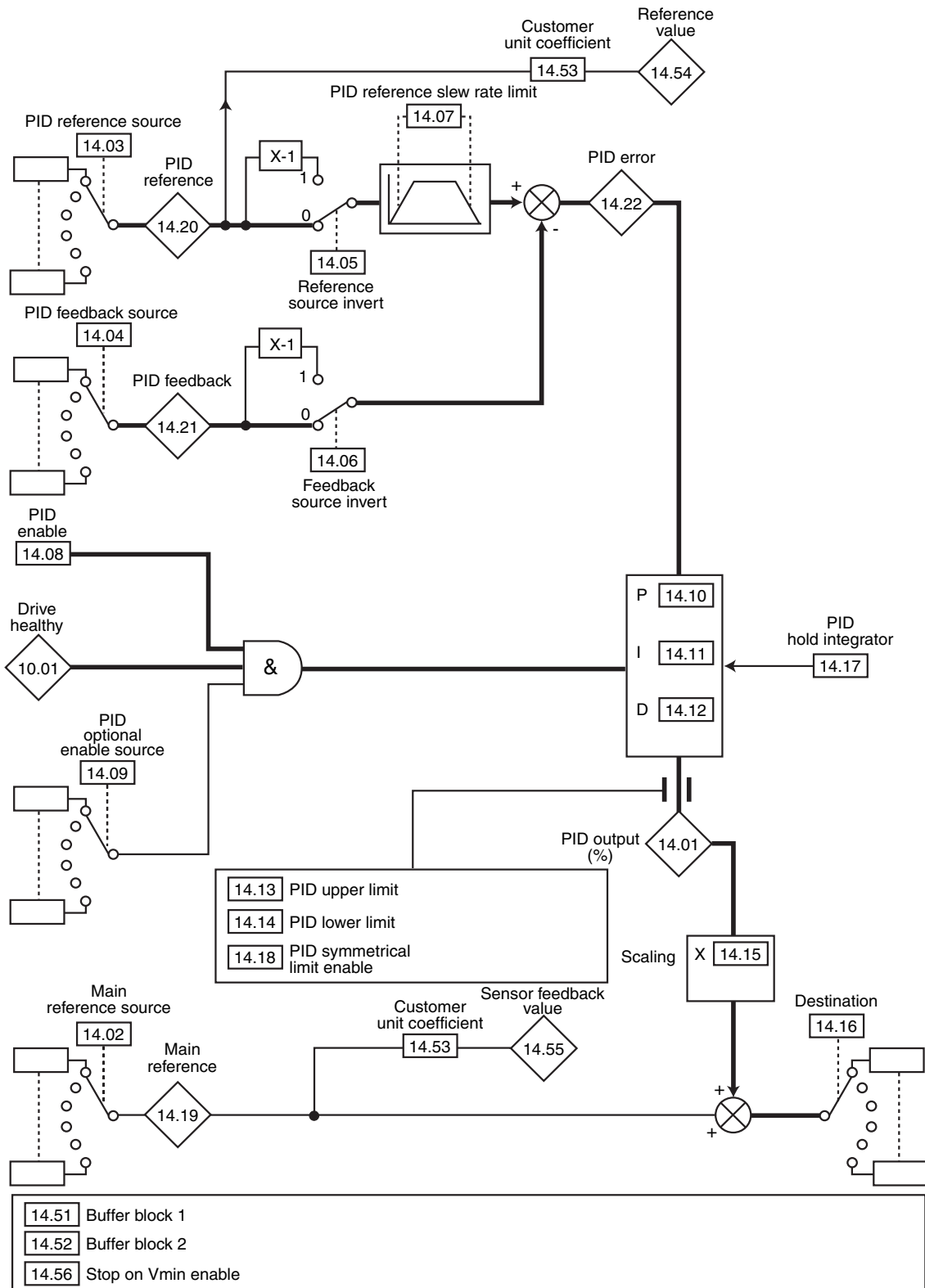
Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>14.01</b>	PID output	RO/P	± 100.0%	-	-
<b>14.02</b>	PID main reference source	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>14.03</b>	PID reference source	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>14.04</b>	PID feedback source	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>14.05</b>	PID reference source invert	R-W	0 or 1	0	
<b>14.06</b>	PID feedback source invert	R-W	0 or 1	0	
<b>14.07</b>	PID reference slew rate limit	R-W	0 to 600.0 s	0	
<b>14.08</b>	PID enable	R-W	0 or 1	0	
<b>14.09</b>	PID optional enable source	R-W/P	<b>0.00 to 21.51</b>	<b>10.01</b>	
<b>14.10</b>	PID P gain	R-W	0 to 320.00	10.00	
<b>14.11</b>	PID I gain	R-W	0 to 320.00	5.00	
<b>14.12</b>	PID D gain	R-W	0 to 2.50	0	
<b>14.13</b>	PID upper limit	R-W	0 to 100.0 %	100.0%	
<b>14.14</b>	PID lower limit	R-W	± 100.0%	-100.0%	
<b>14.15</b>	PID scaling	R-W	0 to 2.50	1.00	
<b>14.16</b>	PID destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>14.17</b>	PID hold integrator	R-W	0 or 1	0	
<b>14.18</b>	PID symmetrical limit enable	R-W	0 or 1	0	
<b>14.19</b>	PID main reference	RO/P	± 100.0%	-	-
<b>14.20</b>	PID reference	RO/P	± 100.0%	-	-
<b>14.21</b>	PID feedback	RO/P	± 100.0%	-	-
<b>14.22</b>	PID error	RO/P	± 100.0%	-	-
<b>14.23</b> to <b>14.50</b>	Not used				
<b>14.51</b>	Buffer block 1	R-W	±100.00%	0	
<b>14.52</b>	Buffer block 2	R-W	±100.00%	0	
<b>14.53</b>	Customer unit coefficient	R-W	0 to 30	1	
<b>14.54</b>	Reference value	RO/P	±32000	-	-
<b>14.55</b>	Sensor feedback value	RO/P	±32000	-	-
<b>14.56</b>	Stop on Vmin enable	R-W	0 or 1	0	

# VARMECA 30

## Variable speed motor or geared motor

MENU 14: PID CONTROLLER

### 13.2 - Menu 14 diagram





# VARMECA 30

## Variable speed motor or geared motor

### MENU 14: PID CONTROLLER

## 13.3 - Explanation of parameters in Menu 14

### 14.01 : PID output

Adjustment range :  $\pm 100.0\%$

This parameter indicates the level of the PID controller output before scaling.

### 14.02 : PID main reference source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter defines the variable which acts as the main reference for the PID controller.

Only non-bit parameters can be programmed as the source. If an unsuitable parameter is programmed, the input value is taken equal to 0.

All PID variables are automatically scaled so that these variables have an adjustment range of  $\pm 100.0\%$  or 0 to 100.0% if they are unipolar.

### 14.03 : PID reference source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter defines the variable which acts as a reference for the PID controller.

Only non-bit parameters can be programmed as the source. If an unsuitable parameter is programmed, the input value is taken equal to 0.

All PID variables are automatically scaled so that these variables have an adjustment range of  $\pm 100.0\%$  or 0 to 100.0% if they are unipolar.

### 14.04 : PID feedback source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

This parameter defines the variable which acts as the feedback for the PID controller.

Only non-bit parameters can be programmed as the source. If an unsuitable parameter is programmed, the input value is taken equal to 0.

All PID variables are automatically scaled so that these variables have an adjustment range of  $\pm 100.0\%$  or 0 to 100.0% if they are unipolar.

### 14.05 and 14.06 : PID source invert

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): Input not inverted.**

**1 (Yes) (On): Input inverted.**

These parameters are used to invert the sign of the PID reference and feedback (**14.05**: PID reference source invert, **14.06**: PID feedback source invert).

### 14.07 : PID reference slew rate limit

Adjustment range : 0 to 600.0 s

Factory setting : 0

This parameter defines the time required by the PID reference to go from 0 to 100.0% after a sudden change at the input from 0 to 100%. A change from -100.0% to +100.0% will require twice this time.

### 14.08 : PID enable

Adjustment range : 0 or 1

Factory setting : 0

**0 (Disabled) (OFF): The PID controller is disabled.**

**1 (Enabled) (On): The PID controller is enabled.**

**CAUTION:**

**Should the values of 14.10, 14.11 and 14.12 be modified, set 14.08 to 0 first and then back to 1 so that this change is taken into account by the drive.**

### 14.09 : PID optional enable source

Adjustment range : **0.00** to **21.51**

Factory setting : **10.01**

This parameter is used to enable the PID controller on a condition in addition to **14.08**.

For the PID controller to be enabled, **14.08**, **10.01** and the additional condition must be at 1.

Only bit parameters can be assigned.

If an unsuitable parameter is chosen, the input will automatically take the value 1 to avoid blocking the enable output.

**Note:** Parameter **0.00** does not block the enable output.

### 14.10 : PID P gain

Adjustment range : 0 to 320.00

Factory setting : 10.00

This is the proportional gain applied to the PID error.

After modifying this parameter, refer to **14.08**.

**Note:** The gain values configured for a V2.20 drive must not be kept for a V3.10 drive (the adjustment range is completely different for these 2 software versions).

### 14.11 : PID I gain

Adjustment range : 0 to 320.00

Factory setting : 5.00

This is the gain applied to the PID error before integration.

After modifying this parameter, refer to **14.08**.

**Note:** The gain values configured for a V2.20 drive must not be kept for a V3.10 drive (the adjustment range is completely different for these 2 software versions).

### 14.12 : PID D gain

Adjustment range : 0 to 2.50

Factory setting : 0

This is the gain applied to the PID error before differentiation.

After modifying this parameter, refer to **14.08**.

### 14.13 : PID upper limit

Adjustment range : 0 to 100.0%

Factory setting : 100.0%

This parameter is used to limit the maximum value of the PID output (see **14.18**).

### 14.14 : PID lower limit

Adjustment range :  $\pm 100.0\%$

Factory setting : -100.0%

This parameter is used to limit the maximum negative value or the minimum positive value of the PID output.

This parameter is inactive if **14.18** = 1.

# VARMECA 30

## Variable speed motor or geared motor

### MENU 14: PID CONTROLLER

**14.15** : PID scaling

Adjustment range : 0 to 2.50

Factory setting : 1.00

This parameter is used to scale the PID output before it is added to the main reference.

The sum of the two references will automatically be re-scaled according to the adjustment range of the parameter to which it is addressed.

**14.16** : PID destinationAdjustment range : **0.00** to **21.51**Factory setting : **0.00**

Used to define the parameter to which the PID output is addressed.

Only non-protected non-bit parameters can be assigned.

If an unsuitable parameter is assigned, the output is not sent to any address.

If the PID output is to act on the speed, it is recommended to address it to a preset reference.

**14.17** : PID hold integrator

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF):** Integration is carried out normally when the PID loop is activated.

**1 (Yes) (On):** The value of the integrator is frozen and remains at this value until **14.17** goes back to 0.

In both cases, when the PID loop is deactivated, the value of the integrator is reset to 0.

**14.18** : PID symmetrical limit enable

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF):** Inactive.

**1 (Yes) (On):** **14.13** and **14.14** take the same value and it is **14.13** which is effective.

**14.19** : PID main referenceAdjustment range :  $\pm 100.0\%$ 

This parameter indicates the value of the main reference.

**14.20** : PID referenceAdjustment range :  $\pm 100.0\%$ 

This parameter indicates the value of the PID reference.

**14.21** : PID feedbackAdjustment range :  $\pm 100.0\%$ 

This parameter indicates the value of the PID feedback.

**14.22** : PID errorAdjustment range :  $\pm 100.0\%$ 

This parameter indicates the error between the main reference and the feedback.

**14.23** to **14.50** : Not used**14.51** : Buffer block 1Adjustment range :  $\pm 100.00\%$ 

Factory setting : 0

This parameter is used to assign an analog input to the PID reference or feedback.

**14.52** : Buffer block 2Adjustment range :  $\pm 100.00\%$ 

Factory setting : 0

This parameter is used to assign an analog input to the PID reference or feedback.

**14.53** : Customer unit coefficient

Adjustment range : 0 to 30

Factory setting : 1

This parameter is a multiplying coefficient allowing the PID reference and PID feedback to be displayed as a customer value (**14.54** and **14.55**).

**14.54** : Reference valueAdjustment range :  $\pm 32000$ 

This parameter indicates the value of the PID reference in customer units (scaled using **14.53**).

**14.55** : Sensor feedback valueAdjustment range :  $\pm 32000$ 

This parameter indicates the value of the PID feedback in customer units (scaled using **14.53**).

**14.56** : Stop on Vmin enable

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF)**

**1 (Yes) (On)**

This parameter is used to enable the automatic run/stop function when preset configuration **05** = **11.46** = 8.

During operation, if **14.56** = 1 and the flow rate is a minimum (min. speed) for a time period set by **16.15** (parameter set automatically when the configuration is enabled), the pump stops.

# VARMECA 30

## Variable speed motor or geared motor

MENU 16: PLC FUNCTIONS

## 14 - MENU 16: PLC FUNCTIONS

### 14.1 - List of parameters in Menu 16

Parameter	Name	Type	Adjustment range	Factory setting	User setting
<b>16.01 - 16.11</b> <b>16.21 - 16.31</b>	Timer relays 1 to 4 output state	RO	0 or 1	-	-
<b>16.02 - 16.12</b> <b>16.22 - 16.32</b>	Timer relays 1 to 4 input source	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>16.03 - 16.13</b> <b>16.23 - 16.33</b>	Timer relays 1 to 4 type	R-W	0 or 1	0	
<b>16.04 - 16.14</b> <b>16.24 - 16.34</b>	Timer relays 1 to 4 unit of time	R-W	0 to 2	0	
<b>16.05 - 16.15</b> <b>16.25 - 16.35</b>	Timer relays 1 to 4 value	R-W	0 to 60.0	0	
<b>16.06 to 16.08</b>	Not used				
<b>16.09 - 16.19</b> <b>16.29 - 16.39</b>	Timer relays 1 to 4 output destination	R-W	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>16.10 - 16.20</b> <b>16.30 - 16.40</b>	Timer relays 1 to 4 inverted output state	RO/P	0 or 1	-	-
<b>16.16 to 16.18</b> <b>16.26 to 16.28</b> <b>16.36 to 16.38</b>	Not used				
<b>16.41 - 16.51</b> <b>16.61 - 16.71</b>	Latching relays 1 to 4 output state	RO	0 or 1	-	-
<b>16.42 - 16.52</b> <b>16.62 - 16.72</b>	Latching relays 1 to 4 ON source	R-W	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>16.43 - 16.53</b> <b>16.63 - 16.73</b>	Latching relays 1 to 4 OFF source	R-W	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>16.44 - 16.54</b> <b>16.64 - 16.74</b>	Latching relays 1 to 4 OFF source inversion	R-W	0 or 1	0	
<b>16.45 to 16.48</b> <b>16.50</b> <b>16.55 to 16.58</b> <b>16.60</b> <b>16.65 to 16.68</b> <b>16.70</b> <b>16.75 to 16.78</b>	Not used				
<b>16.49 - 16.59</b> <b>16.69 - 16.79</b>	Latching relays 1 to 4 output destination	R-W	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>16.80</b>	Current counter value	RO	0 to 9999	-	-
<b>16.81</b>	Counter output state	RO	0 or 1	-	-
<b>16.82</b>	Upcounting counter input	R-A	0 or 1	-	-
<b>16.83</b>	Downcounting counter input	R-A	0 or 1	-	-
<b>16.84</b>	Counter output trip threshold	R-W	0 to 9999	0	
<b>16.85</b>	Initial counter values	R-W	0 to 9999	0	
<b>16.86</b>	Counter power-up status	R-W	0 or 1	0	
<b>16.87</b>	Counter enable source	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	
<b>16.88</b>	Counter initialisation	R-W	0 or 1	0	
<b>16.89</b>	Counter output destination	R-W/P	<b>0.00 to 21.51</b>	<b>0.00</b>	

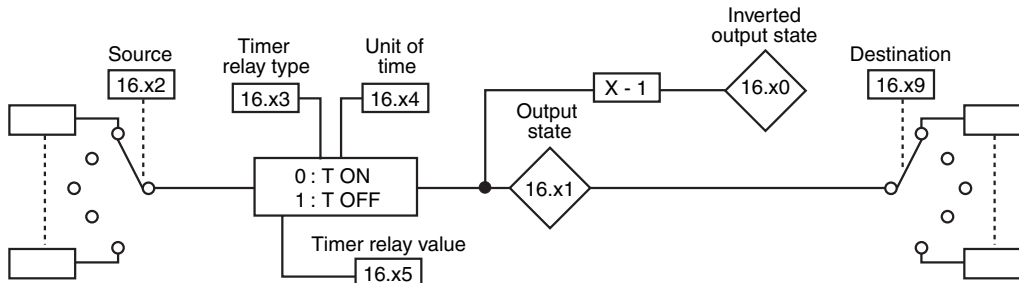
# VARMECA 30

## Variable speed motor or geared motor

MENU 16: PLC FUNCTIONS

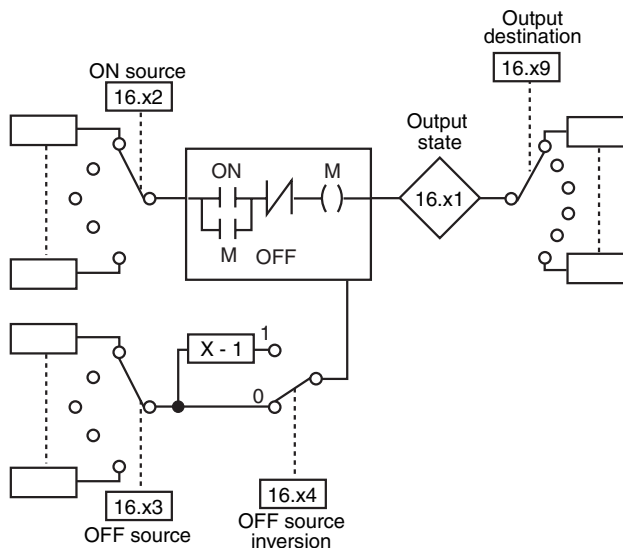
### 14.2 - Menu 16 diagrams

#### 14.2.1 - Timer relays



	Source	Timer type selection	Time delay	Unit of time	Output state	Inverted output state	Destination
Timer 1	<b>16.02</b>	<b>16.03</b>	<b>16.05</b>	<b>16.04</b>	<b>16.01</b>	<b>16.10</b>	<b>16.09</b>
Timer 2	<b>16.12</b>	<b>16.13</b>	<b>16.15</b>	<b>16.14</b>	<b>16.11</b>	<b>16.20</b>	<b>16.19</b>
Timer 3	<b>16.22</b>	<b>16.23</b>	<b>16.25</b>	<b>16.24</b>	<b>16.21</b>	<b>16.30</b>	<b>16.29</b>
Timer 4	<b>16.32</b>	<b>16.33</b>	<b>16.35</b>	<b>16.34</b>	<b>16.31</b>	<b>16.40</b>	<b>16.39</b>

#### 14.2.2 - Latching relays



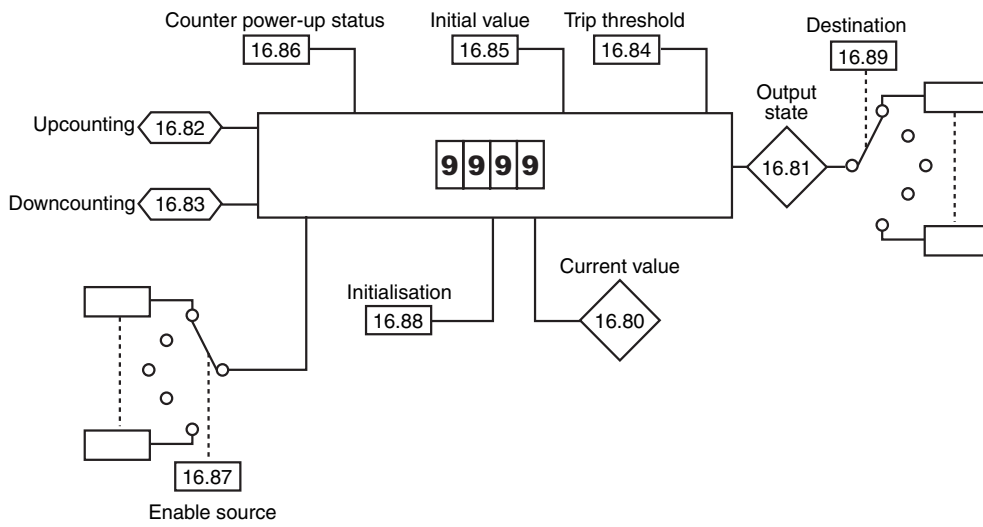
	ON source	OFF source	OFF source inversion	Output state	Output destination
LR 1	<b>16.42</b>	<b>16.43</b>	<b>16.44</b>	<b>16.41</b>	<b>16.49</b>
LR 2	<b>16.52</b>	<b>16.53</b>	<b>16.54</b>	<b>16.51</b>	<b>16.59</b>
LR 3	<b>16.62</b>	<b>16.63</b>	<b>16.64</b>	<b>16.61</b>	<b>16.69</b>
LR 4	<b>16.72</b>	<b>16.73</b>	<b>16.74</b>	<b>16.71</b>	<b>16.79</b>

# VARMECA 30

## Variable speed motor or geared motor

MENU 16: PLC FUNCTIONS

### 14.2.3 - Counter



# VARMECA 30

## Variable speed motor or geared motor

MENU 16: PLC FUNCTIONS

### 14.3 - Explanation of parameters in Menu 16

**16.01** : Timer relay 1 output state

**16.11** : Timer relay 2 output state

**16.21** : Timer relay 3 output state

**16.31** : Timer relay 4 output state

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

These parameters indicate the state of the timer relay outputs.

**16.02** : Timer relay 1 input source

**16.12** : Timer relay 2 input source

**16.22** : Timer relay 3 input source

**16.32** : Timer relay 4 input source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select the source for the timer relay inputs.

Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed to an input, the input will be frozen at 0.

**16.03** : Timer relay 1 type

**16.13** : Timer relay 2 type

**16.23** : Timer relay 3 type

**16.33** : Timer relay 4 type

Adjustment range : 0 or 1

Factory setting : 0

**0 (On-delay) (On):** The relay is used for on-delay timing. The output changing to 1 is delayed in relation to the input changing to 1.

**1 (Off-delay) (OFF):** The relay is used for off-delay timing. The output changing to 0 is delayed in relation to the input changing to 0.

**16.04** : Timer relay 1 unit of time

**16.14** : Timer relay 2 unit of time

**16.24** : Timer relay 3 unit of time

**16.34** : Timer relay 4 unit of time

Adjustment range : 0 to 2

Factory setting : 0

**0 (Second) (Sec):** The unit of time for the timer relay is the second.

**1 (Minute) (Min):** The unit of time for the timer relay is the minute.

**2 (Hour) (hour):** The unit of time for the timer relay is the hour.

**16.05** : Timer relay 1 value

**16.15** : Timer relay 2 value

**16.25** : Timer relay 3 value

**16.35** : Timer relay 4 value

Adjustment range : 0 to 60.0

Factory setting : 0

These parameters are used to set the timer delay period. The unit depends on the configuration of **16.04**, **16.14**, **16.24** and **16.34**.

**16.06** to **16.08** : Not used

**16.09** : Timer relay 1 output destination

**16.19** : Timer relay 2 output destination

**16.29** : Timer relay 3 output destination

**16.39** : Timer relay 4 output destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select the destination for the timer relay outputs.

Only "bit" type parameters can be assigned to these outputs. If an unsuitable parameter is addressed to an output, the output will be frozen at 0.

**16.10** : Timer relay 1 inverted output state

**16.20** : Timer relay 2 inverted output state

**16.30** : Timer relay 3 inverted output state

**16.40** : Timer relay 4 inverted output state

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

These parameters indicate the state of the inverted output of the timer relays.

**16.16** to **16.18** : Not used

**16.26** to **16.28**

**16.36** to **16.38**

**16.41** : Latching relay 1 output state

**16.51** : Latching relay 2 output state

**16.61** : Latching relay 3 output state

**16.71** : Latching relay 4 output state

Adjustment range : 0 or 1

These parameters indicate the state of the latching relay outputs.

# VARMECA 30

## Variable speed motor or geared motor

MENU 16: PLC FUNCTIONS

**16.42** : Latching relay 1 ON source

**16.52** : Latching relay 2 ON source

**16.62** : Latching relay 3 ON source

**16.72** : Latching relay 4 ON source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select the enable source for the latching relays. A pulse on an input causes the corresponding output to change to 1.

Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed to an input, the input will be frozen at 0.

**16.43** : Latching relay 1 OFF source

**16.53** : Latching relay 2 OFF source

**16.63** : Latching relay 3 OFF source

**16.73** : Latching relay 4 OFF source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select the disable source for the latching relays. A pulse on an input causes the corresponding output to change to 0.

Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed to an input, the input will be frozen at 0.

**16.44** : Latching relay 1  
OFF source inversion

**16.54** : Latching relay 2  
OFF source inversion

**16.64** : Latching relay 3  
OFF source inversion

**16.74** : Latching relay 4  
OFF source inversion

Adjustment range : 0 or 1

Factory setting : 0

These parameters are used to invert the OFF source for the latching relays.

**0 (No) (OFF)**: Source not inverted.

**1 (Yes) (On)**: Source inverted.

**16.45** to **16.48** , **16.50** : Not used

**16.55** to **16.58** , **16.60**

**16.65** to **16.68** , **16.70**

and **16.75** to **16.78**

**16.49** : Latching relay 1 output destination

**16.59** : Latching relay 2 output destination

**16.69** : Latching relay 3 output destination

**16.79** : Latching relay 4 output destination

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

These parameters are used to select the destination for the latching relay outputs.

Only "bit" type parameters can be assigned to these outputs. If an unsuitable parameter is addressed to an output, the output will be frozen at 0.

**16.80** : Current counter value

Adjustment range : 0 to 9999

Indicates the current value of the counter.

**16.81** : Counter output state

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**: The current value of the counter is less than the trip threshold.

**1 (Active) (On)**: The current value of the counter has reached the trip threshold.

**16.82** : Upcounting counter input

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

A pulse on this input increments the counter value by 1.

**Note**: Only inputs DI2, DI3 and DI4 can be assigned to this parameter, and the frequency is 5 kHz maximum.

**16.83** : Downcounting counter input

Adjustment range : 0 or 1

**0 (Inactive) (OFF)**

**1 (Active) (On)**

A pulse on this input decrements the counter value by 1.

**Note**: Only inputs DI2, DI3 and DI4 can be assigned to this parameter, and the frequency is 5 kHz maximum.

**16.84** : Counter output trip threshold

Adjustment range : 0 to 9999

Factory setting : 0

Used to determine the trip threshold that will cause the counter output to change to 1.

**16.85** : Initial counter value

Adjustment range : 0 to 9999

Factory setting : 0

Used to determine a threshold value from which the counter will upcount or downcount.

**16.86** : Counter power-up status

Adjustment range : 0 or 1

Factory setting : 0

**0 (Prev. val.) (Prec)**: On power-up, the counter takes the value it had before power-down.

**1 (Reset to 0) (0)**: On power-up, the counter takes the value of **16.85**.

**16.87** : Counter enable source

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

Used to select the internal bit that enables upcounting or downcounting. While this input is not enabled, pulses on the upcount and downcount inputs are not taken into account.

Only "bit" type parameters can be programmed. If an unsuitable parameter is addressed, the input will be frozen at 0.

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## Variable speed motor or geared motor

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**16.88 : Counter initialisation**

Adjustment range : 0 or 1

Factory setting : 0

**0 (No) (OFF): Inactive.**

**1 (Yes) (On):** Causes initialisation of the counter to the initial value.

**16.89 : Counter output destination**

Adjustment range : **0.00** to **21.51**

Factory setting : **0.00**

Determines the internal parameter that will be assigned by the counter output.

Only "bit" type parameters can be programmed.

If an unsuitable parameter is assigned, the output is not sent to any address.






# VARMECA 30

## Variable speed motor or geared motor


MENU 21: OPERATING PARAMETERS FOR A SECOND MOTOR

### 15 - MENU 21: OPERATING PARAMETERS FOR A SECOND MOTOR

#### 15.1 - List of parameters in Menu 21

Parameter	Name		Type	Adjustment range	Factory setting	User setting
<b>21.01</b>	Motor 2 maximum reference clamp		R-W	0 to 32000 min <sup>-1</sup>	Eur: 1500 min <sup>-1</sup> USA: 1800 min <sup>-1</sup>	
<b>21.02</b>	Motor 2 minimum reference clamp		R-W/P	0 to 32000 min <sup>-1</sup>	0	
<b>21.03</b>	Motor 2 reference selector		R-W	0 to 4	0	
<b>21.04</b>	Motor 2 acceleration rate		R-W	0 to 600.0 s/1000 min <sup>-1</sup>	3.0 s/1000 min <sup>-1</sup>	
<b>21.05</b>	Motor 2 deceleration rate		R-W	0 to 600.0 s/1000 min <sup>-1</sup>	5.0 s/1000 min <sup>-1</sup>	
<b>21.06</b>	Motor 2 rated frequency		R-W	0 to 400.0 Hz	Eur: 50.0 Hz USA: 60.0 Hz	
<b>21.07</b>	Motor 2 rated current		R-W	0 to drive rated current (A)	Motor rated current (A) corresponding to the drive rating	
<b>21.08</b>	Motor 2 rated speed		R-W	0 to 9999 min <sup>-1</sup>	Motor rated speed (min <sup>-1</sup> ) corresponding to the drive rating	
<b>21.09</b>	Motor 2 rated voltage		R-W	0 to 480 V	Eur L: 200 V USA L: 230 V Eur H: 400 V USA H: 460 V	
<b>21.10</b>	Motor 2 rated power factor (cos φ)		R-W	0 to 1.00	0.85	
<b>21.11</b>	Motor 2 number of poles		R-W	0 to 4	0	
<b>21.12</b>	Motor 2 stator resistance		R-W	0 to 32.000 Ω	0	
<b>21.13</b>	Motor 2 voltage offset		RO	0 to 25.5V	-	
<b>21.14</b>	Motor 2 inductance		R-W	0 to 3200.0 mH	0	
<b>21.15</b>	Motor 2 parameters active		RO/P	0 or 1	-	
<b>21.16</b> to <b>21.23</b>	Not used					
<b>21.24</b>	Motor 2 stator inductance L <sub>S</sub>		R-W	0 to 3200.0 mH	150.0 mH	
<b>21.25</b> to <b>21.29</b>	Not used					
<b>21.30*</b>	Motor volts per 1000 min <sup>-1</sup> (Ke)		R-W	0 to 10000 V	98 V	
<b>21.31</b> to <b>21.50</b>	Not used					
<b>21.51</b>	q axis inductance		R-W	0 to 999.9 mH	150.0 mH	

\* Function not available in version V3.0.

 VMA 33/34 only

# VARMECA 30

## Variable speed motor or geared motor

### MENU 21: OPERATING PARAMETERS FOR A SECOND MOTOR

#### 15.2 - Explanation of parameters in Menu 21

##### 21.01 : Motor 2 maximum reference clamp

Adjustment range : 0 to 32000 min<sup>-1</sup>

Factory setting : Eur = 1500 min<sup>-1</sup>  
USA = 1800 min<sup>-1</sup>

This parameter defines the maximum speed in both directions of rotation.

This parameter is equivalent to 1.06 for motor 1.



• Before setting the maximum limit, check that the motor and the driven machine can withstand it.

##### 21.02 : Motor 2 minimum reference clamp

Adjustment range : 0 to 32000 min<sup>-1</sup>

Factory setting : 0

In unipolar mode, this parameter defines the minimum speed.

##### CAUTION:

This parameter is inactive during jog operation.

This parameter is equivalent to 1.07 for motor 1.

##### 21.03 : Motor 2 reference selector

Adjustment range : 0 to 4

Factory setting : 0

**0 (Via terminal block) (SEL):** The speed reference is selected by combining the digital inputs assigned to parameters 1.41 and 1.42.

**1 (Analog input 1) (Ana1):** The speed reference comes from analog input 1.

**2 (Analog input 2) (Ana2):** The speed reference comes from analog input 2.

**3 (Preset ref.) (Pr):** The speed reference comes from preset references.

**4 (Console) (Pad):** No speed reference is taken into account.

This parameter is equivalent to 1.14 for motor 1.

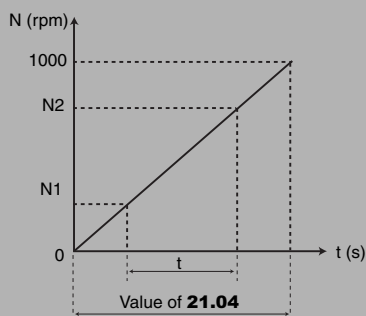
##### 21.04 : Motor 2 acceleration rate

Adjustment range : 0 to 600.0 s/1000 min<sup>-1</sup>

Factory setting : 3.0 s/1000 min<sup>-1</sup>

Sets the time for acceleration from 0 to 1000 min<sup>-1</sup>.

$$21.04 = \frac{t(s) \times 1000 \text{ min}^{-1}}{(N2 - N1) \text{ min}^{-1}}$$



This parameter is equivalent to 2.11 for motor 1.

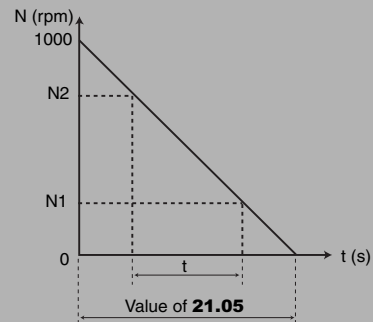
##### 21.05 : Motor 2 deceleration rate

Adjustment range : 0 to 600.0 s/1000 min<sup>-1</sup>

Factory setting : 5.0 s/1000 min<sup>-1</sup>

Sets the time for deceleration from 1000 min<sup>-1</sup> to 0.

$$21.05 = \frac{t(s) \times 1000 \text{ min}^{-1}}{(N2 - N1) \text{ min}^{-1}}$$



This parameter is equivalent to 2.21 for motor 1.

##### 21.06 : Motor 2 rated frequency

Adjustment range : 0 to 400.0 Hz

Factory setting : Eur = 50.0 Hz

USA = 60.0 Hz

This is the point at which motor operation changes from constant torque to constant power.

In standard operation, it is the frequency indicated on the motor nameplate.

This parameter is equivalent to 5.06 for motor 1.

##### 21.07 : Motor 2 rated current

Adjustment range : 0 to drive rated current (A)

Factory setting : Motor rated current corresponding to the drive rating

This is the value of the motor rated current indicated on the nameplate. Above this value the motor is overloaded.

This parameter is equivalent to 5.07 for motor 1.

##### 21.08 : Motor 2 rated speed

Adjustment range : 0 to 9999 min<sup>-1</sup>

Factory setting : Motor rated speed corresponding to the drive rating

This is the on-load speed of the motor indicated on the nameplate.

This parameter is equivalent to 5.08 for motor 1.

# VARMECA 30

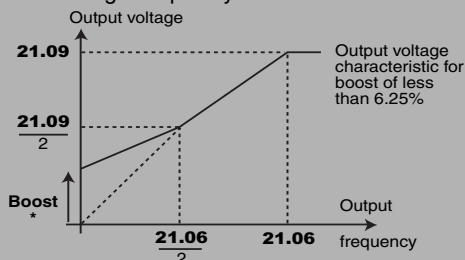
## Variable speed motor or geared motor

### MENU 21: OPERATING PARAMETERS FOR A SECOND MOTOR

**21.09** : Motor 2 rated voltage

Adjustment range : 0 to 480 V  
 Factory setting : **Eur L: 200 V**  
                           USA L = 230 V  
                           **Eur H: 400 V**  
                           USA H: 460 V

Defines the voltage/frequency ratio as follows:



\* If fixed boost has been selected **5.14** = 2.  
**This parameter is equivalent to 5.09 for motor 1.**

**21.10** : Motor 2 power factor (Cos φ)

Adjustment range : 0 to 1.00  
 Factory setting : 0.85  
 The power factor is measured automatically during a level 2 autotune phase (see **5.12**) and set in this parameter. If it has not been possible to carry out the autotune procedure, enter the Cos φ value indicated on the motor nameplate.  
**This parameter is equivalent to 5.10 for motor 1.**

**21.11** : Motor 2 number of poles

Adjustment range : 0 to 4  
 Factory setting : 0  
**0 (AUTO) (Auto)**  
**1 (2POLES) (2P)**  
**2 (4POLES) (4P)**  
**3 (6POLES) (6P)**  
**4 (8POLES) (8P)**  
 When this parameter is at 0 (Auto), the drive automatically calculates the number of poles according to the rated speed (**21.08**) and the rated frequency (**21.06**). However, the value can be entered directly as number of pairs of poles.

21.11	Motor rated speed min <sup>-1</sup>	Number of poles
1	3000	2
2	1500	4
3	1000	6
4	750	8

**This parameter is equivalent to 5.11 for motor 1.**

**21.12** : Motor 2 stator resistance

Adjustment range : 0 to 32.000Ω  
 Factory setting : 0  
 This parameter stores the motor stator resistance for flux vector control mode (see parameter **5.14**).  
 The stator resistance value is only read if **5.14** = 0.  
 If the stator resistance cannot be measured (motor not connected, value higher than the max. rating) an "rS" trip occurs.  
 During autotuning (**5.12** = 1 or 2), the value of the stator resistance is automatically stored.  
**This parameter is equivalent to 5.17 for motor 1.**

**21.13** : Motor 2 voltage offset

Adjustment range : 0 to 25.5 volts  
 This voltage offset is measured by the drive (see parameter **5.14**). It is used to correct imperfections in the drive, especially voltage drops in the IGBTs and idle times. This parameter has an important role in low-speed operation, i.e. when the drive output voltage is low.  
 During autotuning (**5.12** = 1 or 2), the value of the voltage offset is automatically stored.  
**This parameter is equivalent to 5.23 for motor 1.**

**21.14** : Motor 2 inductance

Adjustment range : 0 to 3200.0 mH  
 Factory setting : 0  
 During autotuning with rotation (**5.12** = 2), the transient inductance is stored in this parameter.  
**This parameter is equivalent to 5.24 for motor 1.**

**21.15** : Motor 2 parameters active

Adjustment range : 0 or 1  
**0 (Inactive) (OFF)**  
**1 (Active) (On)**  
**21.15** changes from 0 to 1 when the motor 2 parameters are active.  
 They are taken into account when **11.45** is set to 1 and the drive is disabled or in the trip state. During drive operation, **11.45** can be set to 1, but the characteristics of motor 2 are not taken into account. This parameter can be assigned to a digital output, in order to control closing of the contactor of the second motor when the characteristics of motor 2 are enabled.

**21.16** to **21.23** : Not used

**21.24** : Motor 2 stator inductance L<sub>S</sub>

Adjustment range : 0 to 3200.0 mH  
 Factory setting : 150.0 mH  
 This is the motor stator inductance at rated flux.  
**This parameter is equivalent to 5.25 for motor 1.**

**21.25** to **21.29** : Not used

**21.30** : Motor volts per 1000 min<sup>-1</sup> (Ke)

Adjustment range : 0 to 10000 V  
 Factory setting : 98 V  
 Used to set the motor voltage per 1000 min<sup>-1</sup>. Is used to adjust the current controller integral gain to prevent current peaks when the drive is enabled with a spinning motor.  
**This parameter is equivalent to 5.33 for motor 1.**  
**Function not available.**

**21.31** to **21.50** : Not used

**21.51** : q axis inductance

Adjustment range : 0 to 999.9 mH  
 Factory setting : 150.0 mH  
 This is the motor stator inductance in quadrature with the total inductance L<sub>s</sub> (**21.24**), used to control a salient-pole synchronous motor.  
**This parameter is equivalent to 5.51 for motor 1.**

# VARMECA 30

## Variable speed motor or geared motor

OPERATION WITH MODBUS RTU

## 16 - OPERATION WITH MODBUS RTU

### 16.1 - Serial link

As standard, the VARMECA 30 incorporates an RS485/2-wire serial link port accessible via an RJ45 connector.

#### 16.1.1 - Location and connection

connector

1	Do not connect
2	Rx Tx
3	0V
4	+24V
5	0V
6	Enable Tx
7	Rx Tx
8	Do not connect

Connector



#### 16.1.2 - Protocols:

The drive handles the following protocols:

- Modbus RTU
- LS Net

The drive automatically recognises the protocol used, and this can be read in **11.24** "Serial mode".

#### 16.1.3 - Parameter setting

Depending on the application, the following parameters must be modified.

- 11.23**: Serial address
- 11.25**: Serial link baud rate
- 11.27**: Modbus frame format

For more information on these parameters, refer to menu 11, section 11.3.

#### 16.1.4 - Networking

The VARMECA 30 serial port allows the drive to communicate with a 2-wire RS485 network.

- The network must then be connected in a "daisy-chain" (and not a star).
- At minimum, terminals 2, 3 and 7 and the shielding must be connected.

The CT Comms cable option allows a PC to be connected directly to the VARMECA 30. This cable, with a 9-pin SUB-D connector at one end and an RJ45 at the other, incorporates an isolated RS232/RS485 converter.

#### CAUTION:

**Do not use this cable for networking several VARMECA 30s (the "24 V"s must not be linked).**

## 16.2 - Parameter setting using the PC

The VMA SOFT parameter-setting software makes it very easy to set up the VARMECA 30 from a PC.

- Quick configuration: the drive parameters are set very quickly using a "quick configuration" screen.
  - Supervision during commissioning: the various data concerning operation can be supervised on a single screen.
  - Storing files: all parameter files can be saved, thus making it possible to copy an existing setting very quickly.
- To connect the PC to the VARMECA 30, use the CT Comms cable option described opposite or use a 2-wire RS232/RS485 converter (e.g. Amplicon 485 FI).

For PCs equipped with USB ports, ask your usual LEROY-SOMER contact.

## 16.3 - Control word and status word

VARMECA 30 control commands can be managed using a single parameter **6.42**, called the "control word".

This is because the value of 6.42 corresponds to a word in which each bit is associated with a command. The command is enabled when the bit is at 1, and disabled when the bit is at 0. To enable commands using the control word, set **6.43** = 1 (control commands via the terminals are no longer active), when the drive is disabled.

Parameter **10.40**, called the status word, is used to group together data on the drive. The value of **10.40** corresponds to a 15-bit word, and each bit is associated with a drive status parameter.

#### 10.40: Status word

Bits of status word <b>10.40</b>	Corresponding parameters	Drive status
0	<b>10.01</b>	Drive healthy
1	<b>10.02</b>	Drive active
2	<b>10.03</b>	Zero speed
3	<b>10.04</b>	Running at or below min
4	<b>10.05</b>	Below set speed
5	<b>10.06</b>	At speed
6	<b>10.07</b>	Above set speed
7	<b>10.08</b>	Load reached
8	<b>10.09</b>	Drive output is at current limit
9	<b>10.10</b>	Dynamic braking
10	<b>10.11</b>	Braking IGBT active
11	<b>10.12</b>	Braking resistor alarm
12	<b>10.13</b>	Direction commanded
13	<b>10.14</b>	Direction running
14	<b>10.15</b>	Mains loss

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## Variable speed motor or geared motor

OPERATION WITH MODBUS RTU

### 16.4 - MODBUS RTU

#### 16.4.1 - General

The MODBUS RTU protocol is a master-slave type protocol (a single master per network).

Description	Characteristics
Normal physical layer for multi-drop operation	2-wire RS485
Bit stream	Standard UART asynchronous symbols with Non-Return to Zero (NRZ)
Symbol	Each symbol consists of: 1 start bit 8 data bits (least significant bit transmitted first) 1 or 2 stop bits according to <b>11.27</b>
Baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 baud

**Note:** If the CT Comms cable is used, the baud rate is limited to 38400 baud.

Exchanges are initiated by the master, which sends its request: if the slave concerned has understood it, it sends its response. Each frame (question or response) contains four types of information:

- The address of the slave concerned which receives the question frame (request from the master) or the address of the slave which sends the response frame (encoded in one byte)
- The function code which selects a command (read or write words, bits, etc.) for the question and response frames (encoded in one byte)
- The data field containing the parameters relating to the command (encoded in "n" bytes)
- The CRC for the frame, calculated in sixteen bits, which is used to detect transmission errors

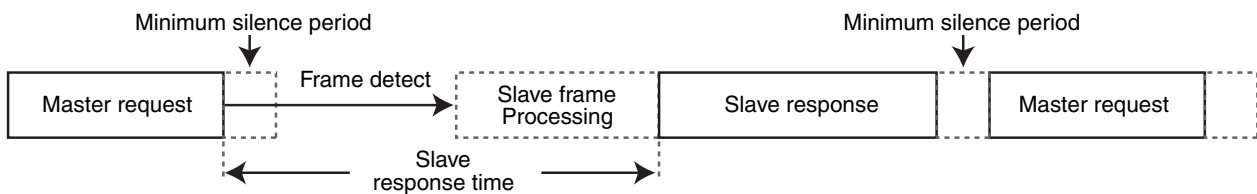
The frame is terminated with a minimum silence period, equivalent to the transmission time for 3.5 characters (e.g. at 19200 baud, the silence period must be at least  $1/19200 \times 11 \text{ bits} \times 3.5$ , i.e. 2 ms). This silence period indicates the end of the message, and the slave can start to process the transmitted data.

All data are encoded in hexadecimal.

Slave address	Function code	Message data	16-bit CRC	Silence interval
---------------	---------------	--------------	------------	------------------

#### 16.4.2 - Description of exchanges

All requests from the master will result in a response from a single slave. The slave will respond within the maximum permitted time (the minimum response time will never be less than the silence period).



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### 16.4.3 - Parameter assignment

VARMECA 30 drives are configured using a **menu.parameter** notation. The "menu" and "parameter" indices can take the values 0 to 99. Menu.parameter is assigned to a MODBUS RTU register **menu x 100 + parameter**.

In order to assign the parameters correctly, the slave increments (+1) the address of the received register.

Example: X = menu; Y = parameter

Drive parameter	Register address (protocol level)
<b>X.Y</b>	$(X \times 100) + (Y - 1)$
<b>Examples:</b>	
<b>1.02</b>	101
<b>1.00</b>	99
<b>0.01</b>	0
<b>12.33</b>	1232

### 16.4.4 - Data encoding

MODBUS RTU uses a "big-endian" representation for the addresses and data items (except for the CRC which is "little-endian"). This means that, when a numerical quantity "bigger" than one byte is transmitted, the most significant byte is sent first.

For example:

16-bits 0x1234 would be: 1<sup>st</sup> 2<sup>nd</sup> ...  
0x12 0x34

### 16.4.5 - Function codes

The function code determines the context and data format of the message.

Function code		Description
Decimal	Hexadecimal	
3	03	Read multiple 16-bit registers or words
6	06	Write single 16-bit register or word
16	10	Write multiple 16-bit registers or words
23	17	Read and write multiple 16-bit registers or words

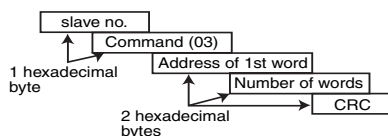
#### •pFunction code 3: Read multiple

Reading of a contiguous register area. The slave sets an upper limit on the number of registers that can be read. If the limit is exceeded, the slave does not respond.

**Note:** 99 parameters maximum can be read.

#### Frame sent by the Master:

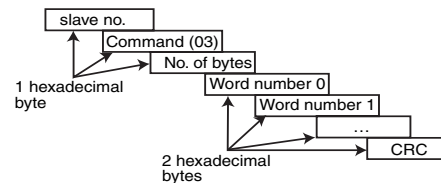
Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x03
2	Start word address MS byte
3	Start word address LS byte
4	Number of words to be read MS byte
5	Number of words to be read LS byte
6	CRC LS byte
7	CRC MS byte



#### Frame returned by the slave:

Bytes	Description
0	Slave address
1	Function code 0x03
2	Number of bytes to be read
3	Word 0 MS byte
4	Word 0 LS byte
5	Word 1 MS byte
6	Word 1 LS byte
...	...
n	CRC LS byte
n + 1	CRC MS byte

Where n = 3 + number of bytes to be read.

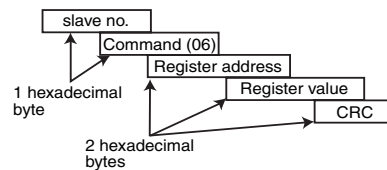


#### •pFunction code 6: Write single register

Writing of a value to a single 16-bit register. The normal response is an "echo" of the request, after the register has been written to.

#### Frame sent by the Master:

Bytes	Description
0	Slave address (0 to 247)
1	Function code 0x06
2	Register address MS byte
3	Register address LS byte
4	Register value MS byte
5	Register value LS byte
6	CRC LS byte
7	CRC MS byte



#### Frame sent by the slave:

Bytes	Description
0	Slave address
1	Function code 0x06
2	Register address MS byte
3	Register address LS byte
4	Register value MS byte
5	Register value LS byte
6	CRC LS byte
7	CRC MS byte

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**• Function code 16: Write multiple**

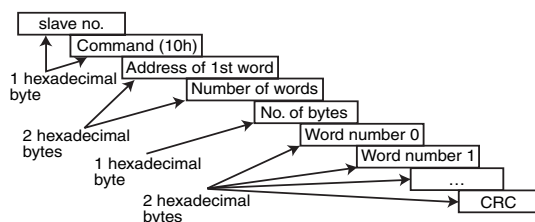
Writing of a contiguous register area. The slave sets an upper limit on the number of registers that can be written. If the limit is exceeded, the slave does not respond.

**Note:** 12 parameters maximum can be written.

**Frame sent by the Master:**

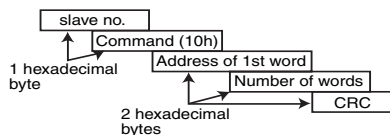
Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x10
2	Start word address MS byte
3	Start word address LS byte
4	Number of words to be written MS byte
5	Number of words to be written LS byte
6	Number of bytes to be written
7	Word 0 to be written MS byte
8	Word 0 to be written LS byte
9	Word 1 to be written MS byte
10	Word 1 to be written LS byte
...	...
n	CRC LS byte
n + 1	CRC MS byte

Where  $n = 7 + \text{number of bytes to be written}$ .



**Frame returned by the slave:**

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x10
2	Start word address MS byte
3	Start word address LS byte
4	Number of words written MS byte
5	Number of words written LS byte
6	CRC LS byte
7	CRC MS byte



**• Function code 23: Read/write**

Writing and reading of two contiguous register areas. The slave sets an upper limit on the number of registers that can be written. If the limit is exceeded, the slave does not respond.

**Note:** 99 parameters maximum can be read and 10 parameters maximum can be written.

**Frame sent by the Master:**

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x17
2	Start word to be read address MS byte
3	Start word to be read address LS byte
4	Number of words to be read MS byte
5	Number of words to be read LS byte
6	Start word to be written address MS byte
7	Start word to be written address LS byte
8	Number of words to be written MS byte
9	Number of words to be written LS byte
10	Number of bytes to be written
11	Word 0 MS byte
12	Word 0 LS byte
13	Word 1 MS byte
14	Word 1 LS byte
...	...
n	CRC LS byte
n + 1	CRC MS byte

Where  $n = 11 + \text{number of bytes to be written}$ .

**Frame returned by the slave:**

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x17
2	Number of bytes to be read
3	Word 0 MS byte
4	Word 0 LS byte
5	Word 1 MS byte
6	Word 1 LS byte
...	...
n	CRC LS byte
n + 1	CRC MS byte

Where  $n = 3 + \text{number of bytes to be read}$ .

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### 16.4.6 - Example

Drive address = 11.

Reading of 3 parameters from **1.08**.

0108 becomes 0107 which is equal to 006B in hexadecimal (Modbus address = parameter address - 1).

#### • Request

	Example (hex)	RTU (binary)
Slave address	B	0000 1011
Function	03	0000 0011
Start word address (MS)	00	0000 0000
Start word address (LS)	6B	0110 1011
Number of words (MS)	00	0000 0000
Number of words (LS)	03	0000 0011
Check		CRC (16 bits)
Total bytes:		8

#### • Response

	Example (hex)	RTU (binary)
Slave address	B	0000 1011
Function	03	0000 0011
Number of bytes	06	0000 0110
Word 0 (MS byte)	02	0000 0010
Word 0 (LS byte)	2B	0010 1011
Word 1 (MS byte)	00	0000 0000
Word 1 (LS byte)	00	0000 0000
Word 2 (MS byte)	00	0000 0000
Word 2 (LS byte)	63	0110 0011
Check		CRC (16 bits)
Total bytes:		11

### 16.4.7 - Wait time

In MODBUS RTU, when the master sends a message to a slave, it sets a wait time between the end of its request and the start of the response from the slave, which makes it possible to detect any missing response.

### 16.4.8 - Exceptions

If the message is incorrect and the frame is not received, or if the CRC is faulty, then the slave will not produce an exception, and in this case the master will not obtain a response from the slave ("timeout"). If a write request (function code 16 or 23) exceeds the maximum size accepted by the slave, then the slave will reject the message. No exception will be transmitted and the master will not obtain a response.

### 16.4.9 - CRC

This control word is used to detect transmission errors. It is calculated in 16 bits from all the bytes of the question and response frames.

Algorithm:

START

CRC = 0xFFFF

Number of bytes processed = 0

Next byte = first byte

REPEAT

{

Byte to be processed = next byte;

CRC = CRC XOR byte to be processed

REPEAT eight times

{

IF (CRC odd) then

CRC = CRC/2 XOR

0xA001

else

CRC = CRC/2

}

Number of bytes processed = Number of bytes processed + 1

}

WHILE(Number of bytes processed ≤ Number of bytes to be processed)

END.



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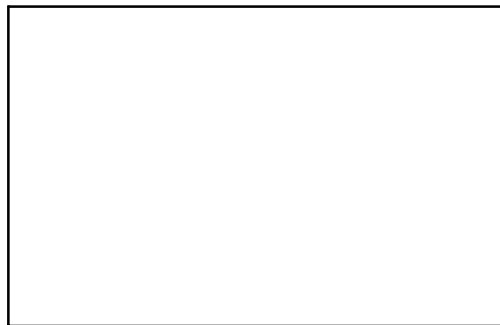
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