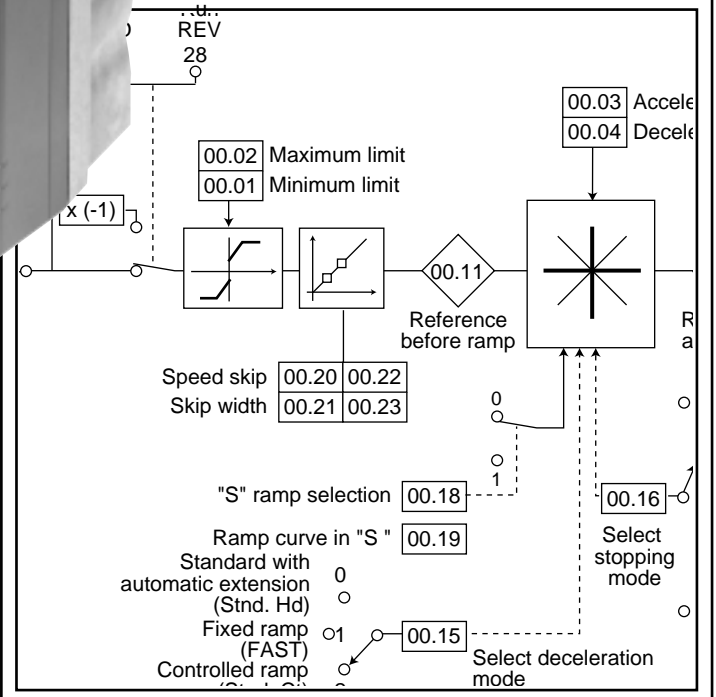


This manual must be given to the end user



UMV 4301

**Open and closed loop speed controllers
for asynchronous and synchronous motors**

Settings and synoptic views

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

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.

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CAUTION

For the user's own safety, this speed controller must be connected to an approved earth (B terminal).

If an accidental start of the installation represents a risk for personnel or the machinery to be driven, it is imperative that the equipment is supplied via an isolating device and a circuit-breaking device (power contactor) which can be controlled by an external safety system (emergency stop, fault detector).

The speed controller is fitted with safety devices which can stop the speed controller and therefore stop the motor. The motor itself can become jammed for mechanical reasons. Finally, voltage fluctuations, and in particular power cuts, can also cause the motor to switch off.

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 speed controller which is the subject of this manual is a component 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 the responsibility of the manufacturer of the machine, 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 devices to ensure the safety of equipment and personnel.

Use of the speed controller for lifting : special instructions must be followed when implementing this application. These instructions are provided in a specific manual which is available on request. It is the responsibility of the user to request this manual from his usual LEROY-SOMER contact.

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

.....

Manual corresponding to software version **3.00 and 3.01**

Update of manual 2465-4.33/c -3.97


For more recent software versions, refer to the enclosed leaflet or contact LEROY-SOMER

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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

SAFETY AND OPERATING INSTRUCTIONS FOR SPEED CONTROLLERS (In accordance with the low voltage directive 73/23/EEC modified by 93/68/EEC)

 • Throughout the manual, this symbol warns against consequences which may arise from inappropriate use of the speed controller, 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, speed controllers can contain live bare parts, either moving or rotating, as well as hot surfaces, during operation.

Unjustified removal of protections, 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

Speed controllers 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 speed controllers) cannot be regarded as circuit-breaking devices and certainly not as isolating devices.

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

Speed controllers 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.

Speed controllers must be protected against 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.

Speed controllers contain parts which are sensitive to electrostatic stress 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 speed controllers which are powered up, national accident prevention specifications must be respected.

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 speed controller. These instructions must be followed in all cases, even if the speed controller 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 incorporating speed controllers must be fitted with additional protection and monitoring devices as laid down in the current relevant safety regulations : law on technical equipment, accident prevention regulations, etc. Modification of speed controllers using control software is permitted.

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

During operation, all doors and protective devices must remain closed.

7 - Service and maintenance

Refer to the manufacturer's documentation.

This manual must be given to the end user.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

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Open and closed loop speed controllers for asynchronous and synchronous motors

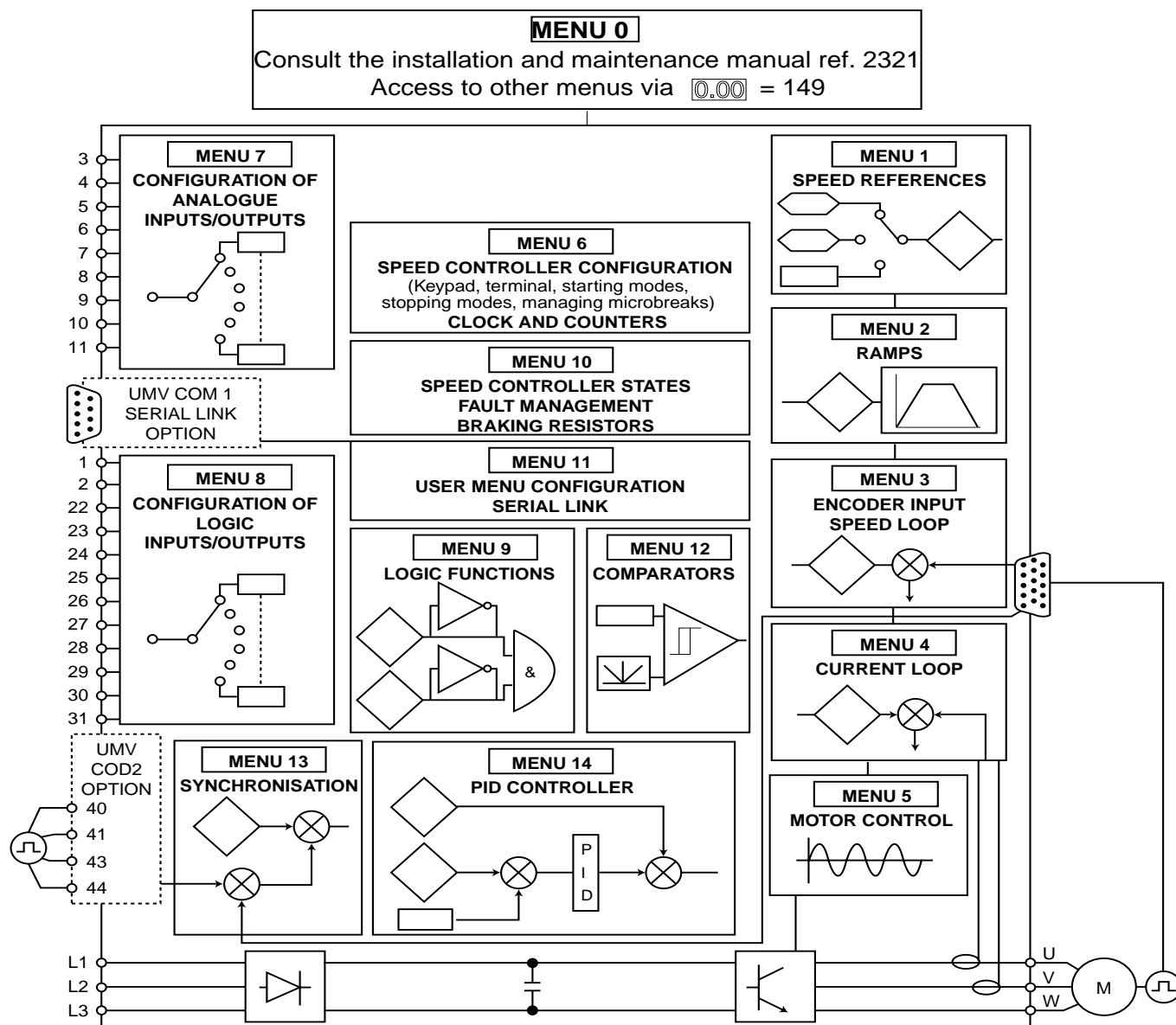
PREFACE



CAUTION

- This technical manual complements the Installation and Maintenance manual, ref 2321.
- It is essential that before entering any settings for the controller all installation, connection and commissioning instructions contained in the document ref. 2321, have been scrupulously adhered to.
- Both documents are supplied together with the speed controller. If either one is missing, please request it from your usual LEROY-SOMER contact.

MENU ORGANISATION



UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

CONTENTS

| | Pages |
|---|----------|
| 1 - MENU 1 : SPEED REFERENCE : Selections, limits and filters | |
| 1.1 - List of Menu 1 parameters | 9 - 10 |
| 1.2 - Menu 1 synoptic views | 12 - 13 |
| 1.3 - Explanation of menu 1 parameters | 14 to 17 |
| 2 - MENU 2 : RAMPS | |
| 2.1 - List of Menu 2 parameters | 19 |
| 2.2 - Menu 2 synoptic views | 20 - 21 |
| 2.3 - Explanation of menu 2 parameters | 22 to 24 |
| 3 - MENU 3 : ENCODER INPUT AND SPEED LOOP | |
| 3.1 - List of Menu 3 parameters | 25 - 26 |
| 3.2 - Menu 3 synoptic views | 27 - 28 |
| 3.3 - Explanation of menu 3 parameters | 29 to 32 |
| 4 - MENU 4 : CURRENT LOOP - TORQUE REGULATION | |
| 4.1 - List of Menu 4 parameters | 33 |
| 4.2 - Menu 4 synoptic views | 35 - 36 |
| 4.3 - Explanation of menu 4 parameters | 37 - 38 |
| 5 - MENU 5 : MOTOR CONTROL | |
| 5.1 - List of Menu 5 parameters | 39 - 40 |
| 5.2 - Menu 5 synoptic views | 41 - 42 |
| 5.3 - Explanation of menu 5 parameters | 43 to 47 |
| 6 - MENU 6 : MANAGEMENT OF LOGIC CONTROLS AND COUNTERS | |
| 6.1 - List of Menu 6 parameters | 49 |
| 6.2 - Menu 6 synoptic views | 50 - 51 |
| 6.3 - Explanation of menu 6 parameters | 52 to 57 |
| 7 - MENU 7 : ASSIGNING ANALOGUE INPUTS AND OUTPUTS | |
| 7.1 - List of Menu 7 parameters | 59 |
| 7.2 - Menu 7 synoptic views | 60 - 61 |
| 7.3 - Explanation of menu 7 parameters | 62 to 64 |
| 8 - MENU 8 : ASSIGNING LOGIC INPUTS AND OUTPUTS | |
| 8.1 - List of Menu 8 parameters | 65 |
| 8.2 - Menu 8 synoptic views | 66 - 67 |
| 8.3 - Explanation of menu 8 parameters | 68 - 69 |
| 9 - MENU 9 : LOGIC FUNCTIONS AND +SPEED, -SPEED COMANDS | |
| 9.1 - List of Menu 9 parameters | 71 |
| 9.2 - Menu 9 synoptic views | 72 - 73 |
| 9.3 - Explanation of menu 9 parameters | 74 - 75 |
| 10 - MENU 10 : SPEED CONTROLLER STATES AND DIAGNOSTICS | |
| 10.1 - List of Menu 10 parameters | 77 |
| 10.2 - Menu 10 synoptic views | 78 - 79 |
| 10.3 - Explanation of menu 10 parameters | 80 to 83 |
| 11 - MENU 11 : SETTING MENU 0 - SERIAL LINK - CONTROLLER CHARACTERISTICS | |
| CHARACTERISTICS | |
| 11.1 - List of Menu 11 parameters..... | 85 |
| 11.2 - Menu 11 synoptic views..... | 86 |
| 11.3 - Explanation of menu 11 parameters | 87 to 89 |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

CONTENTS (CONT.)

| | Pages |
|---|------------|
| 12 - MENU 12 : PROGRAMMABLE THRESHOLDS | |
| 12.1 - List of Menu 12 parameters | 91 |
| 12.2 - Menu 12 synoptic view..... | 92 |
| 12.3 - Explanation of menu 12 parameters | 93 |
| 13 - MENU 13 : SYNCHRONISATION AND INDEXING | |
| 13.1 - List of Menu 13 parameters | 95 |
| 13.2 - Menu 13 synoptic views | 97 to 99 |
| 13.3 - Explanation of menu 13 parameters | 100 to 102 |
| 14 - MENU 14 : PID CONTROLLER | |
| 14.1 - List of Menu 14 parameters | 103 |
| 14.2 - Menu 14 synoptic views | 104 |
| 14.3 - Explanation of menu 14 parameters | 105 - 106 |
| 15 - MENU 15 : RESERVE | 108 |
| 16 - MENU 16 : SMALL OPTION MODULE PARAMETER SETTING | 108 |
| 17 - MENU 17 : LARGE OPTION MODULE PARAMETER SETTING | 108 |
| 18 - MENU 18 : APPLICATION-SPECIFIC PARAMETERS | 108 |
| 19 - MENU 19 : APPLICATION-SPECIFIC PARAMETERS | 108 |
| 20 - MENU 20 : APPLICATION-SPECIFIC PARAMETERS | 109 |

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

www.DataSheet4U.com

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1 - MENU 1 : SPEED REFERENCE : Selection, limits and filters













1.1 - List of Menu 1 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|--------------|---|------|------|--|------------------------|--------------|
| 1.01 | Read speed reference before limits | RO | | ±1000.0 Hz | - | - |
| | | | & | ±30000 min ⁻¹ | | |
| 1.02 | Read speed reference before frequency skips | RO | | ±1000.0 Hz | - | - |
| | | | & | ±30000 min ⁻¹ | | |
| 1.03 | Read speed reference before ramp | RO | | ±1000.0 Hz | - | - |
| | | | & | ±30000 min ⁻¹ | | |
| 1.04 | Speed reference offset | R/W | | ±1000.0 Hz | 0.0 Hz | |
| | | | & | ±30000 min ⁻¹ | 0 min ⁻¹ | |
| 1.05 | Jog reference | R/W | | 0 to 400.0 Hz | 1.5 Hz | |
| | | | & | 0 to 4000 min ⁻¹ | 50 min ⁻¹ | |
| 1.06 | Maximum speed or frequency limit | R/W | | 0 to 1000.0 Hz | 50.0 Hz | |
| | | | | 0 to 30000 min ⁻¹ | 1500 min ⁻¹ | |
| | | | | | 3000 min ⁻¹ | |
| 1.07 | Maximum speed or frequency limit | R/W | | 0 to <input type="text" value="1.06"/> | 0.0 Hz | |
| | | | & | | 0 min ⁻¹ | |
| 1.08 | Selection of a negative minimum speed | R/W | | 0 or 1 | 0 | |
| 1.09 | Selection of speed reference offset | R/W | | 0 or 1 | 0 | |
| 1.10 | Selection of bi-directional mode | R/W | | 0 or 1 | 0 | |
| 1.11 | Start command indicator | RO | | 0 or 1 | - | - |
| 1.12 | Direction of rotation indicator | RO | | 0 or 1 | - | - |
| 1.13 | Jog operation indicator | RO | | 0 or 1 | - | - |
| 1.14 | Selection of speed references | R/W | | 0 to 5 | 0 | |
| 1.15 | Selection of preset speeds | R/W | | 0 to 9 | 0 | |
| 1.16 | Preset speeds cycle time | R/W | | 0 to 400.0s | 10.0s | |
| 1.17 | Reference via keyboard | R/W | | <input type="text" value="1.07"/> to <input type="text" value="1.06"/> | 0.0 Hz | |
| | | | & | | 0 min ⁻¹ | |
| 1.18 | Precision reference (integer) | R/W | | ±1000.0 Hz | 0.0 Hz | |
| | | | & | ± 30000 min ⁻¹ | 0 min ⁻¹ | |
| 1.19 | Precision reference (decimal) | R/W | | 0 to 0.099 Hz | 0.000 Hz | |
| | | | & | 0 to 0.99 min ⁻¹ | 0.00 min ⁻¹ | |
| 1.20 | Precision reference enable | R/W | | 0 or 1 | 0 | |
| 1.21 to 1.28 | Preset speed 1 to Preset speed 8 | R/W | | ±1000.0 Hz | 0.0 Hz | |
| | | | & | ± 30000 min ⁻¹ | 0 min ⁻¹ | |
| 1.29 | Skip speed 1 | R/W | | 0 to 1000.0 Hz | 0.0 Hz | |
| | | | & | 0 to 30000 min ⁻¹ | 0 min ⁻¹ | |
| 1.30 | Width of skip speed 1 | R/W | | 0 to 5.0 Hz | 0.5 Hz | |
| | | | & | 0 to 50 min ⁻¹ | 5 min ⁻¹ | |
| 1.31 | Skip speed 2 | R/W | | 0 to 1000.0 Hz | 0.0 Hz | |
| | | | & | 0 to 30000 min ⁻¹ | 0 min ⁻¹ | |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

List of Menu 1 parameters (cont.)

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|--------------|--|------|---|-------------------------------|---------------------|--------------|
| 1.32 | Width of skip speed 2 | R/W |  | 0 to 5.0 Hz | 0.5 Hz | |
| | | |  &  | 0 to 50 min ⁻¹ | 5 min ⁻¹ | |
| 1.33 | Skip speed 3 | R/W |  | 0 to 1000.0 Hz | 0.0 Hz | |
| | | |  &  | 0 to 30000 min ⁻¹ | 0 min ⁻¹ | |
| 1.34 | Width of skip speed 3 | R/W |  | 0 to 5.0 Hz | 0.5 Hz | |
| | | |  &  | 0 to 50 min ⁻¹ | 5 min ⁻¹ | |
| 1.35 | Skip speed zone indicator | RO | | 0 or 1 | - | |
| 1.36 | Analogue speed reference 1 | R/A | | ± 1.06 or - 1.07 to + 1.06 | - | |
| 1.37 | Analogue speed reference 2 | R/A | | ± 1.06 or - 1.07 to + 1.06 | - | |
| 1.38 | Speed reference adjustment | R/A | | ±100.0 % | - | |
| 1.39 | Speed reference from Synchro mode | RO |  | ±1000.0 Hz | - | - |
| | | |  &  | ±30000 min ⁻¹ | | |
| 1.40 | Selection of speed reference from synchro mode | RO | | 0 or 1 | - | |
| 1.41 to 1.47 | Selection of reference via logic inputs | R/A | | 0 or 1 | - | |
| 1.48 | Preset speed cycle reset | R/W | | 0 or 1 | 0 | |
| 1.49 | Selected reference indicator | RO | | 1 to 5 | - | |
| 1.50 | Selected preset speed indicator | RO | | 1 to 8 | | |

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

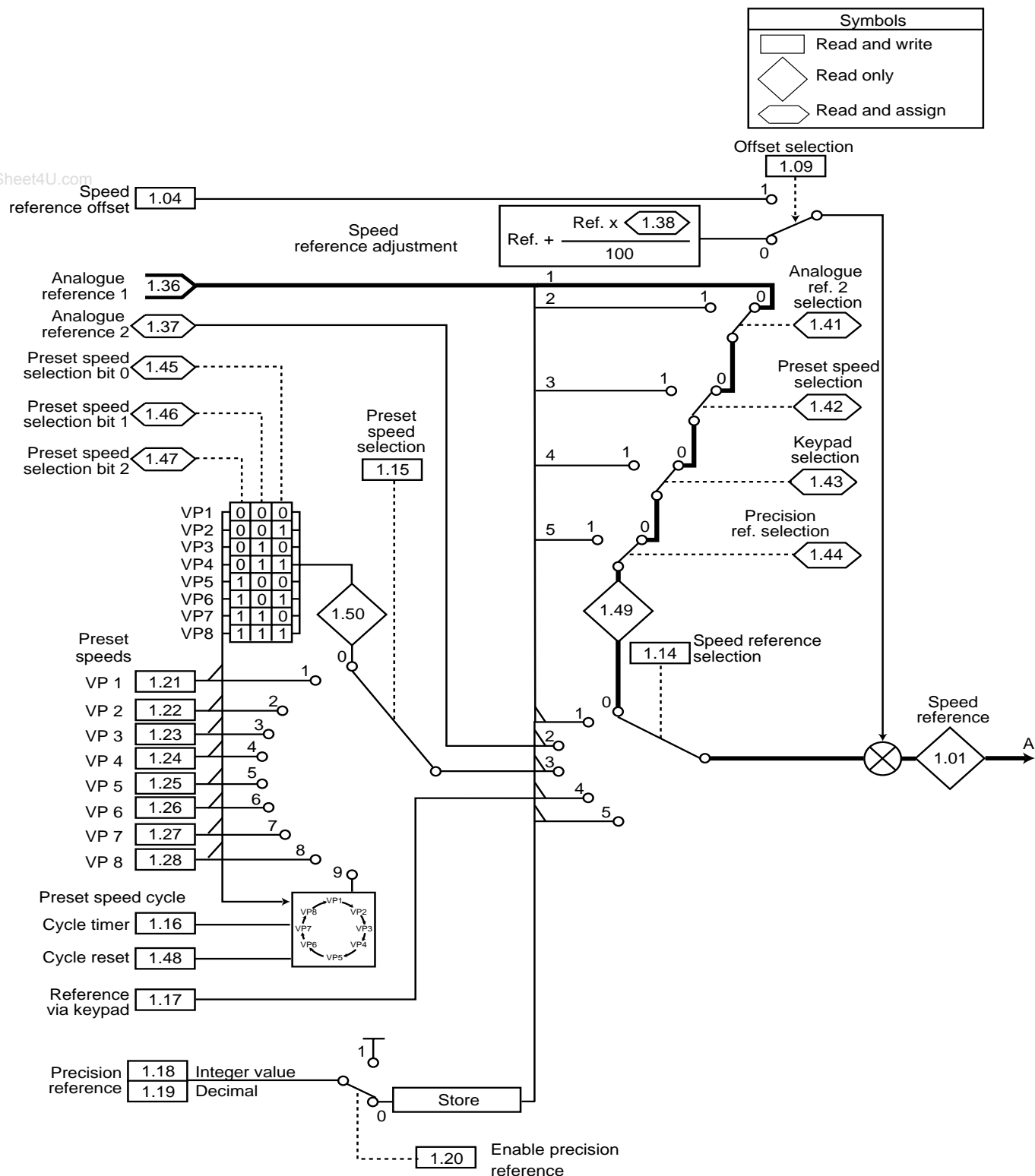
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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1.2 - Menu 1 synoptic views

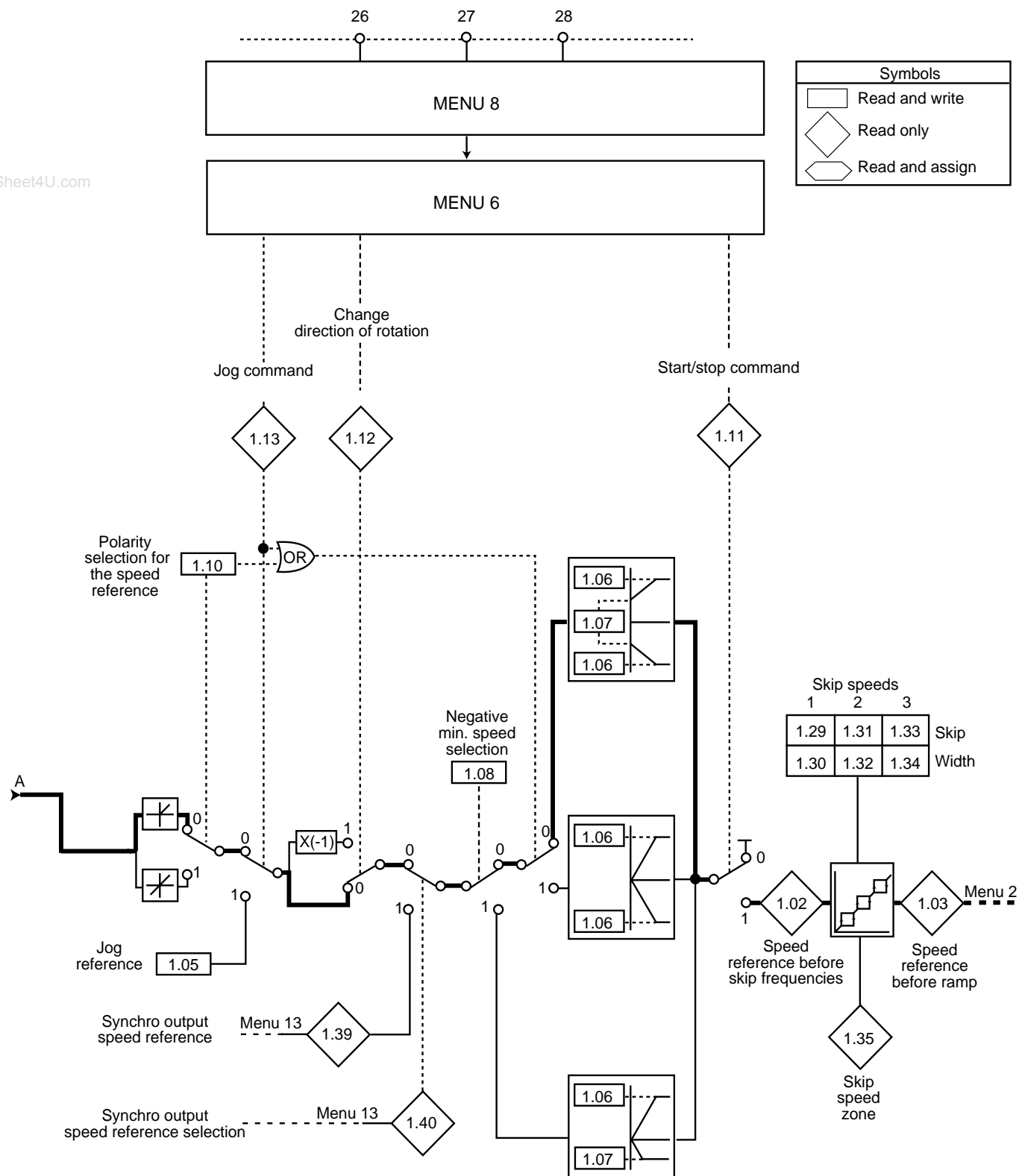
1.2.1 - Selection of the speed reference



UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1.2.2 - Limits and filters






UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1.3 - Explanation of parameters in menu 1

Symbols :

- open loop 
- closed loop 
- servo mode 

1.01 : Read speed reference before limits

- Adjustment range :
-  : ± 1000.0 Hz
 -  } : ± 30000 min⁻¹
 -  }

Indicates the speed reference value.







1.02 & **1.03** : Read speed reference before ramp

- Adjustment range :
-  : ± 1000.0 Hz
 -  } : ± 30000 min⁻¹
 -  }

1.02 : Indicates the speed reference after the limits but before frequency skips.

1.03 : Indicates the speed reference after frequency skips but before the acceleration or deceleration ramps.

1.04 : Offset speed reference

- Adjustment range :
-  : ± 1000.0 Hz
 -  } : ± 30000 min⁻¹
 -  }
- Factory setting :
-  : 0.0 Hz
 -  } : 0 min⁻¹
 -  }







This reference is added to the selected reference if parameter **1.09** is at 1. It can be used to correct the main reference selected to obtain a precise setting.

1.05 : Jog reference

- Adjustment range :
-  : 0 to 400.0 Hz
 -  } : 0 to 4000 min⁻¹
 -  }
- Factory setting :
-  : 1.5 Hz
 -  } : 50 min⁻¹
 -  }


Speed reference used for jog operation.



1.06 : Maximum speed limit

- Adjustment range :
-  : 0 to 1000.0 Hz
 -  } : 0 to 30000 min⁻¹
 -  } (See **3.21**)
- Factory setting :
-  : 50.0 Hz
 -  : 1500 min⁻¹
 -  : 3000 min⁻¹







If parameter **1.08** is at 0, this parameter sets the maximum limit for both directions of rotation.

When **1.08** is at 1, this is the maximum limit in forward operation only.

 : Sets the maximum frequency. Slip compensation may cause a slightly higher output frequency.

 &  : Sets the maximum speed.

1.07 : Minimum speed or frequency limit

- Adjustment range : If **1.08** = 0 : 0 to **1.06**
- If **1.08** = 1
-  : 0 to -1000.0 Hz
 -  } : 0 to -30000 min⁻¹
 -  } (See **3.21**)
- Factory setting :
-  : 0.0 Hz
 -  } : 0 min⁻¹
 -  }

If parameter **1.08** is at 0, this parameter sets the minimum limit in uni-directional mode.

Inactive when operating in jog or bi-directional mode.

When parameter **1.08** is at 1, this is the negative minimum limit in reverse operation.

1.08 : Selection of a negative minimum speed

Adjustment range : 0 or 1

Factory setting : 0

0 : The minimum limit **1.07** can be between 0 and the maximum limit. In this case, the adjustment range of the reference will be between **1.07** and **1.06** in forward operation and - **1.07** and - **1.06** in reverse operation.

1 : Parameter **1.07** is used as a maximum limit in reverse operation. The adjustment range for the reference is then from **1.07** in reverse operation to **1.06** in forward operation.

CAUTION : Operation in Jog or in bi-directional mode invalidates the minimum limit.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1.09 : Selection of speed reference offset

Adjustment range : 0 or 1

Factory setting : 0

0 : The speed reference offset added to the selected reference corresponds to the value which can be adjusted by parameter **1.38**.

1 : The offset takes the value of parameter **1.04**.

1.10 : Selection of bi-directional mode

Adjustment range : 0 or 1

Factory setting : 0

0 : All negative references are treated as zero.

1 : Enables the direction of rotation to be changed using the reference polarity.

1.11 to 1.13 : Drive control indicators

Adjustment range : 0 or 1

These indicators are used to enable the control commands.

1.11 : 0 = Stop
: 1 = Run

1.12 : 0 = Forward
: 1 = Reverse

1.13 : 0 = Jog not confirmed
: 1 = Jog confirmed

1.14 : Selection of speed reference

Adjustment range : 0 to 5

Factory setting : 0

This parameter is used to select the speed reference. It functions as follows :

0 : Selection of the reference via logic inputs

1 : Analogue reference 1

2 : Analogue reference 2

3 : Reference using preset speeds

4 : Reference via keypad

5 : Precision reference

When this parameter is at 0, the reference used depends on the enabling of logic inputs assigned to parameters

1.41 to **1.44**.

1.41 : Selects analogue reference 2

1.42 : Selects preset speeds

1.43 : Selects reference via keypad

1.44 : Selects precision reference

- If all these parameters are at 0, analogue reference 1 will be selected.

- If more than one of these parameters is at 1, it is the highest parameter which is taken into account.

1.15 : Selection of preset speeds

Adjustment range : 0 to 9

Factory setting : 0

This parameter is used to select the preset speeds. It functions as follows :

0 : Selection of preset speeds via logic inputs

1 : Preset speed 1

2 : Preset speed 2

3 : Preset speed 3

4 : Preset speed 4

5 : Preset speed 5

6 : Preset speed 6

7 : Preset speed 7

8 : Preset speed 8

9 : Automatic preset speed cycle

When this parameter is at 0, the required preset speed is selected and is linked to the logic inputs assigned to the parameters **1.45** to **1.47**.

Selection is made according to the following table.

| 1.45 | 1.46 | 1.47 | selected preset speed |
|------|------|------|-----------------------|
| 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 2 |
| 0 | 1 | 0 | 3 |
| 1 | 1 | 0 | 4 |
| 0 | 0 | 1 | 5 |
| 1 | 0 | 1 | 6 |
| 0 | 1 | 1 | 7 |
| 1 | 1 | 1 | 8 |

When this parameter is at 9, the speed controller performs an automatic cycle VP1 --> VP2 ----- VP7 --> VP8 --> VP1 ----- . Parameter 01.16 then enables the time switching from one speed to another to be adjusted.

1.16 : Preset speed cycle times

Adjustment range : 0 to 400.0 s

Factory setting : 10.0s

When an automatic cycle is selected (**1.15** = 9), this parameter sets the time for switching from one preset time to another.

When parameter **1.48** goes to 1, the cycler is reset to 0 and preset speed 1 is selected.

1.17 : Reference via keypad

Adjustment range :

| 1.08 | 1.10 | Adjustment range |
|------|------|---|
| 0 | 0 | 1.07 to 1.06 (1.07 > 0) |
| 0 | 1 | ± 1.06 |
| 1 | 0 | 0 to 1.06 |
| 1 | 1 | 1.07 to 1.06 (1.07 ≤ 0) |

Factory setting : 0

This parameter is used to adjust the reference when adjustment via keypad is selected (**1.14** = 4). Use the D key to increase the reference and the E key to reduce it.

The reference value is stored during a power cut and is automatically reinitialised when the power is restored.

On a return to factory settings **1.17** is reset to zero.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1.18 , 1.19 : Precision reference

Adjustment range :

| | 1.18 | 1.19 |
|---|---------------------------|-----------------------------|
| | ± 1000.0 Hz | 0 to 0.099 Hz |
| & | ± 30000 min ⁻¹ | 0 to 0.99 min ⁻¹ |

Factory setting :

| | 1.18 | 1.19 |
|---|---------------------|------------------------|
| | 0.0 Hz | 0.000 Hz |
| & | 0 min ⁻¹ | 0.00 min ⁻¹ |

: Normally, the frequency reference cannot have a resolution greater than 0.03 Hz. Using the precision reference enables a resolution of 0.001 Hz to be obtained. In this case, **1.18** is used to adjust the integer value of the reference and **1.19** the decimal value.

and : The precision reference enables a resolution of 0.01 min⁻¹ to be obtained.

1.19 always has a positive value, the final precision reference being **1.18** + **1.19**, **1.19** adds a value to **1.18** when this is positive and subtracts a value when **1.18** is negative.

1.20 : Enabling the precision reference

Adjustment range : 0 or 1

Factory setting : 0

Since the precision reference is adjusted by 2 parameters, **1.20** is used to avoid the reference being used unexpectedly while it is being updated.

0 : The precision reference is stored in the memory.

1 : The precision reference is enabled.

1.21 to 1.28 : Preset speeds

Adjustment range : : ± 1000.0 Hz

} : ± 30000 min⁻¹

Factory setting : : 0.0 Hz

} : 0 min⁻¹

1.21 to **1.28** respectively enable preset speeds VP1 to VP8 to be defined.

1.29 , 1.31 : Skip speeds

1.33

Adjustment range : : 0 to 1000.0 Hz

} : 0 to 30000 min⁻¹

Factory setting : : 0.0 Hz

} : 0 min⁻¹

Three skip speeds are available to avoid critical machine speeds. When a parameter is at 0, the function is deactivated.

1.30 , 1.32 : Width of skip speeds

1.34

Adjustment range : : 0 to 5.0 Hz

} : 0 to 50 min⁻¹

Factory setting : : 0.5 Hz

} : 5 min⁻¹

These parameters define the width of the skip around the avoided speed. The total skip speed is therefore equal to the threshold set ± skip width.

1.35 : Skip speed zone indication

Adjustment range : 0 or 1

This parameter is at 1 when the selected reference is found within the skip speed zones.

In this case, the motor speed does not correspond to the required reference.

1.36 , 1.37 : Analogue speed references 1 and 2

Adjustment range : **1.08** = 0 : ± **1.06** Hz

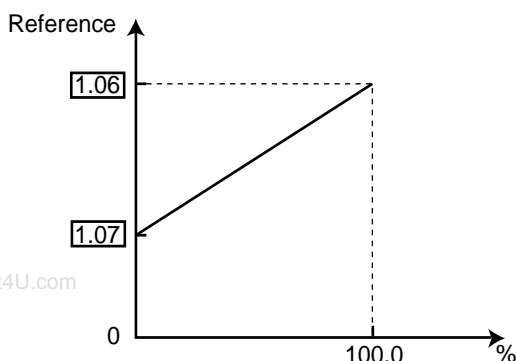
1.08 = 1 : - **1.07** to + **1.06** Hz

The analogue inputs assigned to these parameters are automatically scaled so that 100.0 % of the input corresponds to the maximum speed. Equally input level 0 % corresponds to the minimum reference (**1.07**).

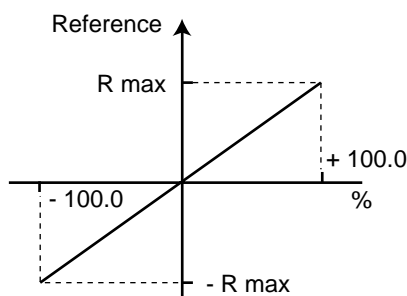
UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

Uni-directional mode ($\boxed{1.08} = \boxed{1.10} = 0$)



Bi-directional mode ($\boxed{1.10} = 1$)



$\boxed{1.08} = 0$, $R \max = \boxed{1.06}$.

$\boxed{1.08} = 1$, $R \max =$ the higher of $\boxed{1.06}$ or $\boxed{1.07}$

$\boxed{1.38}$: **Adjustment of speed reference**

Adjustment range : $\pm 100.0\%$

An offset, proportional to the selected reference can be added to this reference. The multiplication coefficient is determined by the analogue input assigned to parameter $\boxed{1.38}$.

Final ref. $\boxed{1.01} =$ selected ref. $\times (1 + \frac{\boxed{1.38}}{100})$.

$\boxed{1.39}$: **Speed reference from synchro mode**

Adjustment range : $\boxed{1}$: ± 1000.0 Hz
 $\boxed{2}$ } : ± 30000 min⁻¹
 $\boxed{3}$ }

In synchro mode (menu 13) this parameter is used as a priority speed reference.

$\boxed{1.40}$: **Selection of the speed reference from synchro mode**

Adjustment range : 0 or 1

This parameter is at 1 when synchro mode has been enabled (menu 13) and $\boxed{1.39}$ is then used as a priority speed reference.

$\boxed{1.41}$ to $\boxed{1.47}$: **Selection of the reference via logic inputs**

Adjustment range : 0 or 1

These parameters are used to check the selection of the reference via logic inputs (see parameters $\boxed{1.14}$ and $\boxed{1.15}$)

$\boxed{1.41}$: Selection of analogue reference 2

$\boxed{1.42}$: Selection of preset speeds

$\boxed{1.43}$: Selection of reference via keypad

$\boxed{1.44}$: Selection of precision reference

$\boxed{1.45}$: Selection of preset speeds bit 0

$\boxed{1.46}$: Selection of preset speeds bit 1

$\boxed{1.47}$: Selection of preset speeds bit 2

$\boxed{1.48}$: **Preset speed cycle reset**

Adjustment range : 0 or 1

Factory setting : 0

When this parameter is set to 1, the preset speed cycler ($\boxed{1.15} = 9$) is reset to zero. In this case the reference returns to preset speed 1. This parameter can be used to check the start of a cycle via logic input.

$\boxed{1.49}$: **Selected reference indicator**

Adjustment range : 1 to 5

Shows the reference which has been selected.

$\boxed{1.50}$: **Selected preset speed indicator**

Adjustment range : 1 to 8

Shows the selected preset speed.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

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Open and closed loop speed controllers for asynchronous and synchronous motors

2 - MENU 2 : RAMPS

2.1 - List of Menu 2 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|--------------|---|------|------|--|---|--------------|
| 2.01 | Frequency or speed reference after ramp | RO | | ±1000.0 Hz | - | |
| | | | & | ±30000 min ⁻¹ | - | |
| 2.02 | Enable ramps | R/W | & | 0 or 1 | 1 | |
| 2.03 | Ramp integration locking | R/W | | 0 or 1 | 0 | |
| 2.04 | Deceleration mode | R/W | | 0 to 2 | 2 | |
| 2.05 | Acceleration ramp adjustment range | R/W | | 0 or 1 | 0 | |
| | | | | | 1 | |
| 2.06 | Enable S ramp | R/W | | 0 or 1 | 0 | |
| 2.07 | S ramp curve | R/W | | 0 to 3000.0 s ² /100 Hz | 3.1 s ² /100Hz | |
| | | | | 0 to 30.000 s ² /1000 min ⁻¹ | 1.5 s ² /1000 min ⁻¹ | |
| | | | | | 0.03 s ² /1000 min ⁻¹ | |
| 2.08 | DC bus voltage threshold | R/W | | 0 to 800 volts | 700 volts | |
| 2.09 | Selection of different FWD/REV ramps | R/W | | 0 or 1 | 0 | |
| 2.10 | Selection of acceleration ramps | R/W | | 0 to 9 | 0 | |
| 2.11 to 2.14 | Acceleration ramp 1 to Acceleration ramp 4 | R/W | | 0 to 3200.0 s/100 Hz | 5.0 s/100Hz | |
| | | | | 0 to 3200.0 s/1000 min ⁻¹ | 2.0 s/1000 min ⁻¹ | |
| | | | | 0 to 32.000 s/1000 min ⁻¹ | 0.2 s/1000 min ⁻¹ | |
| 2.15 | Acceleration Ramp FWD 5 or REV 1 | R/W | | 0 to 3200.0 s/100 Hz | 5.0 s/100Hz | |
| 2.16 | Acceleration Ramp FWD 6 or REV 2 | | | 0 to 3200.0 s/1000 min ⁻¹ | 2.0 s/1000 min ⁻¹ | |
| 2.17 | Acceleration Ramp FWD 7 or REV 3 | | | 0 to 32.000 s/1000 min ⁻¹ | 0.2 s/1000 min ⁻¹ | |
| 2.18 | Acceleration Ramp FWD 8 or REV 4 | | | | | |
| 2.19 | Jog Acceleration Ramp | R/W | | 0 to 3200.0 s/100 Hz | 0.2 s/100Hz | |
| | | | | 0 to 3200.0 s/1000 min ⁻¹ | 0.0 s/1000 min ⁻¹ | |
| | | | | 0 to 32.000 s/1000 min ⁻¹ | 0.0 s/1000 min ⁻¹ | |
| 2.20 | Selection of deceleration ramps | R/W | | 0 to 9 | 0 | |
| 2.21 to 2.24 | Deceleration ramp 1 to Deceleration ramp 4 | R/W | | 0 to 3200.0 s/100 Hz | 10.0 s/100Hz | |
| | | | | 0 to 3200.0 s/1000 min ⁻¹ | 2.0 s/1000 min ⁻¹ | |
| | | | | 0 to 32.000 s/1000 min ⁻¹ | 0.2 s/1000 min ⁻¹ | |
| 2.25 | Deceleration Ramp FWD 5 or REV 1 | R/W | | 0 to 3200.0 s/100 Hz | 10.0 s/100Hz | |
| 2.26 | Deceleration Ramp FWD 6 or REV 2 | | | 0 to 3200.0 s/1000 min ⁻¹ | 2.0 s/1000 min ⁻¹ | |
| 2.27 | Deceleration Ramp FWD 7 or REV 3 | | | 0 to 32.000 s/1000 min ⁻¹ | 0.2 s/1000 min ⁻¹ | |
| 2.28 | Deceleration Ramp FWD 8 or REV 4 | | | | | |
| 2.29 | Jog Deceleration Ramp | R/W | | 0 to 3200.0 s/100 Hz | 0.2 s/100Hz | |
| | | | | 0 to 3200.0 s/1000 min ⁻¹ | 0.0 s/100Hz | |
| | | | | 0 to 32.000 s/1000 min ⁻¹ | 0.0 s/1000 min ⁻¹ | |
| 2.30 | Selection of reverse deceleration ramp | R/W | | 0 to 4 | 0 | |
| 2.31 | Selection of reverse acceleration and deceleration ramp | R/W | | 0 to 4 | | |
| 2.32 to 2.41 | Selection of ramps via analogue inputs | R/A | | 0 or 1 | 0 | |

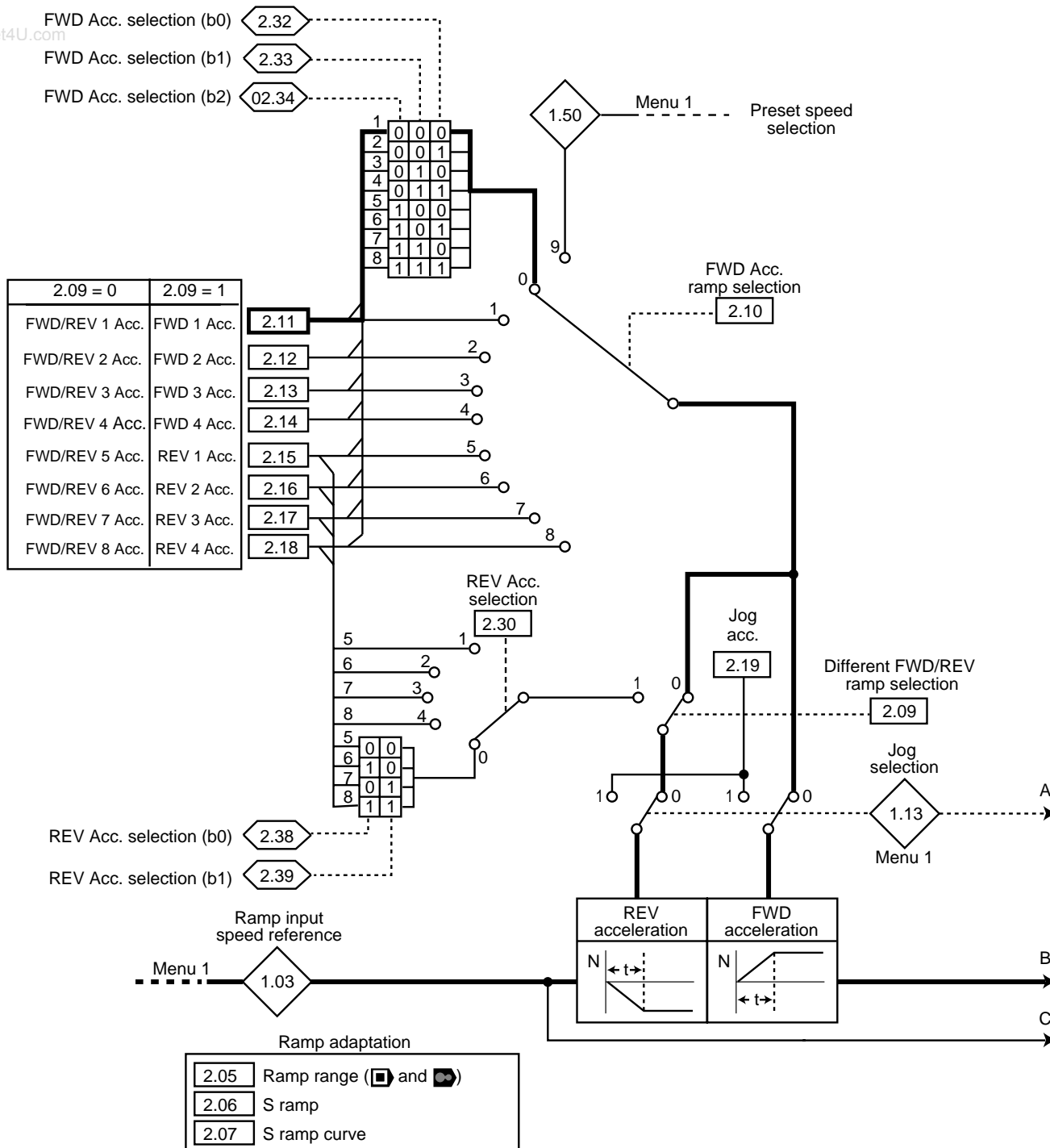
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2.2 - Menu 2 synoptic views

2.2.1 - Acceleration ramps

| Symbols | |
|---------|-----------------|
| | Read and write |
| | Read only |
| | Read and assign |

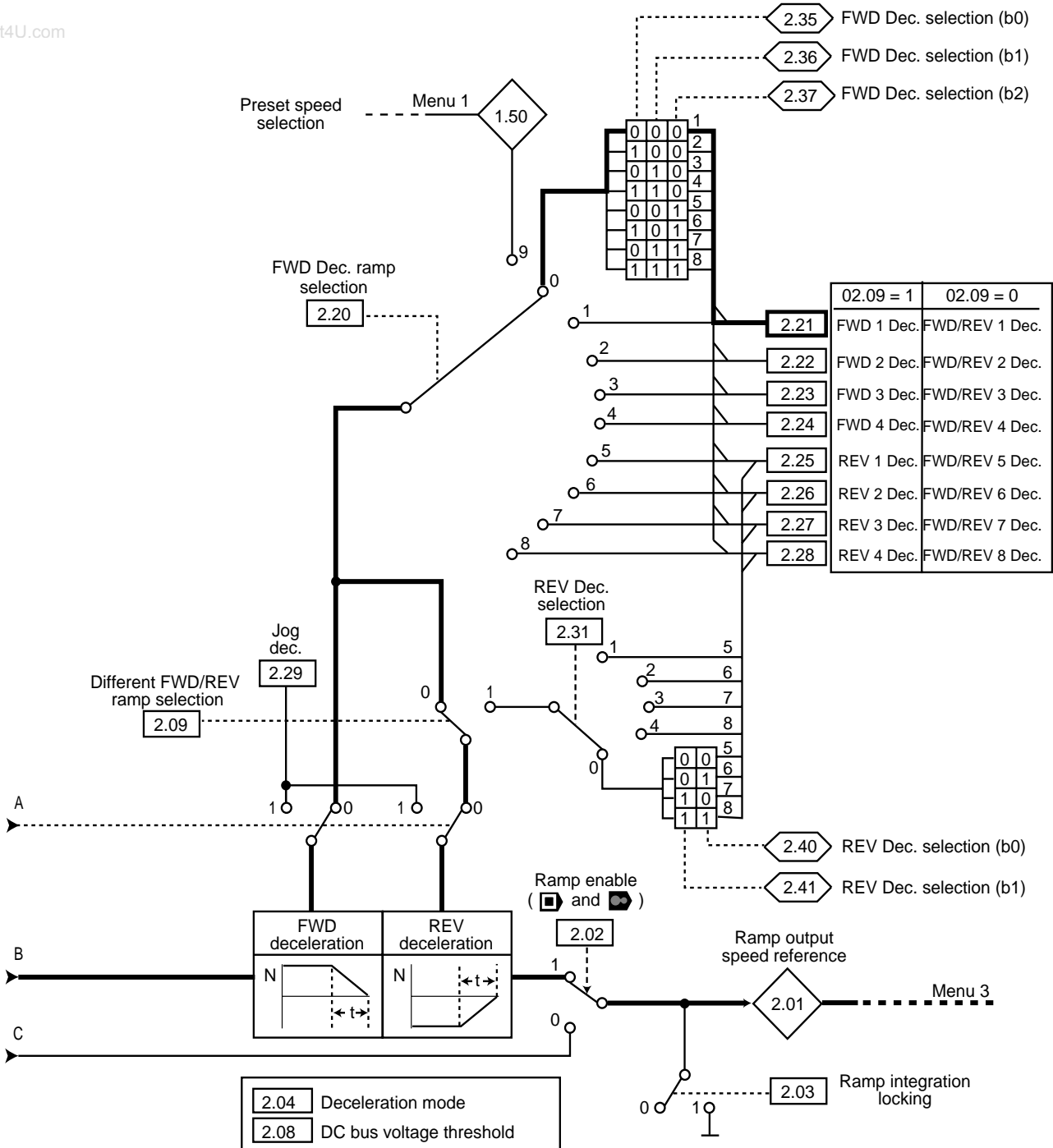


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2.2.2 - Deceleration ramps

| Symbols | |
|---------|-----------------|
| | Read and write |
| | Read only |
| | Read and assign |




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2.3 - Explanation of menu 2 parameters

Symbols :

- open loop 

- closed loop 

- servo mode 

2.01 : Frequency or speed reference after ramp

Adjustment range :  : ± 1000.0 Hz
 } : ± 30000 min⁻¹


In increments of 0.1Hz or min⁻¹ measurement of the setting after ramps. Used for diagnostics.

2.02  &  : Ramp enabling

Adjustment range : 0 or 1

Factory setting : 1

0 : Ramps inhibited.

1 : Ramps enabled.

CAUTION : On a stop command ramp short-circuiting is not active.

2.03 : Ramp integration locking

Adjustment range : 0 or 1

Factory setting : 0

0 : Ramp unblocked.

1 : The ramp is blocked and acceleration (or deceleration) is interrupted.

ATTENTION : Ramp integration cannot be locked on a stop command.

2.04 : Selection of deceleration mode

Adjustment range : 0 to 2

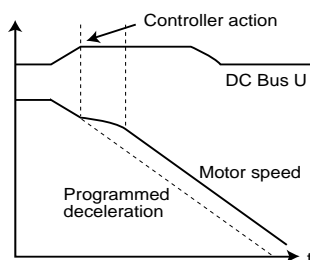
Factory setting : 2

In increments of 1



0 : Stnd Hd - Standard deceleration ramp with time extension to avoid DC bus overvoltage fault.

1 : FAST - deceleration relative to time up to the current limit. With a drive load, a braking resistance option is essential.


2 : Stnd Ct - Deceleration ramp with DC bus voltage check. Suitable for lightly loaded machines and allowing more flexibility than the stnd.Hd. setting.



CAUTION : If a braking resistance is connected to the controller, **2.04** must be set to "FAST".

2.05  &  : Adjustment range of the acceleration ramp

Adjustment range : 0 or 1

Factory setting :  : 0

 : 1

In closed loop mode, this parameter is used to select the adjustment range for the acceleration ramp.

0 : 0.0 to 3200.0 sec.

1 : 0.000 to 32.000 sec.

2.06 : S ramp enabling

Adjustment range : 0 or 1

Factory setting : 0

0 : The ramp is linear.



1 : A curve (defined in **2.07**) at the start and end of the ramp avoids load swings.

CAUTION :


The S ramp is deactivated during controlled decelerations (**2.04** : Stnd.Ct).


2.07 : S ramp curve range


Adjustment range :  : 0 to 3000.0 s²/ 100 Hz

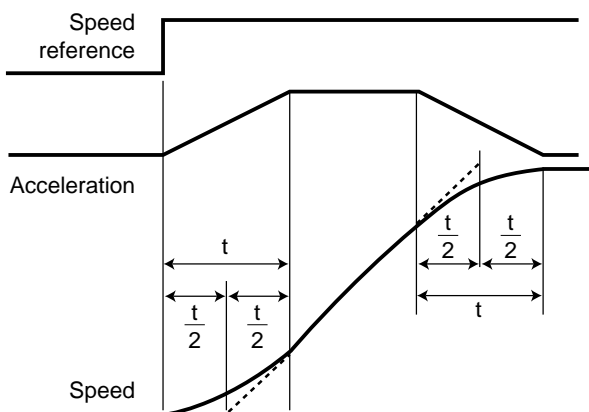
 } : 0 to 30.000s²/1000 min⁻¹


Factory setting :

 : 3.1s²/100 Hz in⁻¹

 : 1.5s²/1000 min⁻¹

 : 0.03s²/1000 min⁻¹



$t = \text{2.07} + \text{2.11}$ for acceleration,

$t = \text{2.07} + \text{2.21}$ for deceleration.

The value of **2.07** determines the maximum acceleration and deceleration slope, at the start and at the end of the speed change. Compared with a linear ramp, the S ramp increases the total value of t, (t/2 at the start and end of the linear ramp).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

2.08 : DC bus voltage threshold

Adjustment range : 0 to 800 Volts

Factory setting : 700 Volts

This threshold is used when the speed controller is configured in deceleration mode 0 (Std.Hd) or 2 (Std.Ct).

In mode 0, if this threshold is too low, the deceleration ramp does not reduce and the machine does not stop. If the threshold is too high and there are no resistances connected, the speed controller trips on a DC bus overvoltage ("O U" fault).

In mode 2, if this threshold is too low, the machine makes a freewheel stop. If this threshold is too high and there are no resistances connected, the speed controller trips on a DC bus overvoltage ("O U" fault).

The minimum value of this parameter must be greater than the voltage of the DC bus obtained with the maximum mains voltage. ($V_{bus} = V_{mains} \times \sqrt{2}$).

2.09 : Selection of different FWD/REV ramps

Adjustment range : 0 or 1

Factory setting : 0

This parameter enables different acceleration or deceleration ramps to be obtained for each direction of rotation.

0 : 8 forward and reverse acceleration and deceleration ramps.

1 : 4 forward acceleration and deceleration ramps, 4 reverse acceleration and deceleration ramps.

2.10 : Selection of acceleration and deceleration ramps

Adjustment range : 0 to 9

Factory setting : 0

These parameters are used to select the acceleration and deceleration ramps as follows :

0 : Selection of ramps via logic inputs

2.09 = 0 **2.09** = 1

- 1 : Ramp selection FWD/REV 1 FWD 1
- 2 : Ramp selection FWD/REV 2 FWD 2
- 3 : Ramp selection FWD/REV 3 FWD 3
- 4 : Ramp selection FWD/REV 4 FWD 4
- 5 : Ramp selection FWD/REV 5 REV 1
- 6 : Ramp selection FWD/REV 6 REV 2
- 7 : Ramp selection FWD/REV 7 REV 3
- 8 : Ramp selection FWD/REV 8 REV 4
- 9 : Association of ramps with preset speeds

When parameter **2.10** is at 0, the acceleration ramp depends on the value of parameters **2.32** to **2.34**, and similarly when **2.20** is at 0 the deceleration ramp depends on the state of parameters **2.35** to **2.37**.

These parameters are used as input logic commands in order that ramps can be selected by external command. The ramp selected depends of the following combination of inputs :

| ACC 2.34 | DEC 2.37 | ACC 2.33 | DEC 2.36 | ACC 2.32 | DEC 2.35 | Ramp selected |
|-------------|-------------|-------------|-------------|-------------|-------------|------------------|
| 0 | | 0 | | 0 | | 1 |
| 0 | | 0 | | 1 | | 2 |
| 0 | | 1 | | 0 | | 3 |
| 0 | | 1 | | 1 | | 4 |
| 1 | | 0 | | 0 | | 5 |
| 1 | | 0 | | 1 | | 6 |
| 1 | | 1 | | 0 | | 7 |
| 1 | | 1 | | 1 | | 8 |

When parameters **2.10** or **2.20** are at 9, acceleration ramp **2.10** or deceleration ramp **2.20** are automatically adapted to the selected preset speed.

2.11 to 2.18 : Acceleration ramps

Adjustment range : : 0 to 3200.0s/100 Hz

: 0 to 3200.0s/1000 min⁻¹

: 0 to 32.000s/1000 min⁻¹

Factory setting : : 5.0s/100 Hz

: 2.0s/1000 min⁻¹

: 0.2s/1000 min⁻¹

In increments of 0.1s.

Adjustment of the time to accelerate from 0 to 100 Hz or from 0 to 1000 min⁻¹.

$$\begin{aligned} \text{Value of ramp (s)} &= \frac{t(\text{s}) \times 100 \text{ Hz}}{(F2-F1) \text{ Hz}} \\ \text{Value of ramp (s)} &= \frac{t(\text{s}) \times 1000 \text{ min}^{-1}}{(V2-V1) \text{ min}^{-1}} \end{aligned}$$

| Parameter | Function | |
|-----------|-----------------|-----------------|
| | 2.09 = 0 | 2.09 = 1 |
| 2.11 | FWD/REV 1 Acc. | FWD 1 Acc. |
| 2.12 | FWD/REV 2 Acc. | FWD 2 Acc. |
| 2.13 | FWD/REV 3 Acc. | FWD 3 Acc. |
| 2.14 | FWD/REV 4 Acc. | FWD 4 Acc. |
| 2.15 | FWD/REV 5 Acc. | REV 1 Acc. |
| 2.16 | FWD/REV 6 Acc. | REV 2 Acc. |
| 2.17 | FWD/REV 7 Acc. | REV 3 Acc. |
| 2.18 | FWD/REV 8 Acc. | REV 4 Acc. |

Parameter **2.09** is used to configure the controller, either for 8 acceleration ramps in both directions of rotation, or 4 forward acceleration ramps and 4 reverse acceleration ramps.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

2.19 : Jog acceleration ramp

- Adjustment range :
- : 0 to 3200.0 s/100 Hz
 - : 0 to 3200.0 s/1000 min⁻¹
 - : 0 to 32.000 s/1000 min⁻¹
- Factory setting :
- : 0.2 s/100 Hz
 - } : 0.0 s/1000 min⁻¹
 - }

2.21 to 2.28 : Deceleration ramps

- Adjustment range :
- : 0 to 3200.0 s/100 Hz
 - : 0 to 3200.0 s/1000 min⁻¹
 - : 0 to 32.000 s/1000 min⁻¹
- Factory setting :
- : 10.0 s/100 Hz
 - : 2.0 s/1000 min⁻¹
 - : 0.2 s/1000 min⁻¹

In increments of 0.1s.

Adjustment of the time to decelerate from 100 Hz to 0 or from 1000 min⁻¹ to 0.

Value of ramp (s) = $\frac{t(s) \times 100 \text{ Hz}}{(F2-F1) \text{ Hz}}$

} Value of ramp (s) = $\frac{t(s) \times 1000 \text{ min}^{-1}}{(V2-V1) \text{ min}^{-1}}$

}

| | | |
|------|----------------|------------|
| 2.21 | FWD/REV 1 Dec. | FWD 1 Dec. |
| 2.22 | FWD/REV 2 Dec. | FWD 2 Dec. |
| 2.23 | FWD/REV 3 Dec. | FWD 3 Dec. |
| 2.24 | FWD/REV 4 Dec. | FWD 4 Dec. |
| 2.25 | FWD/REV 5 Dec. | REV 1 Dec. |
| 2.26 | FWD/REV 6 Dec. | REV 2 Dec. |
| 2.27 | FWD/REV 7 Dec. | REV 3 Dec. |
| 2.28 | FWD/REV 8 Dec. | REV 4 Dec. |

Parameter **2.09** is used to configure the speed controller, either to obtain 8 deceleration ramps in both directions of rotation, or 4 forward deceleration ramps and 4 reverse deceleration ramps.

2.29 : Jog deceleration ramp

- Adjustment range :
- : 0 to 3200 s/100 Hz
 - : 0 to 3200.0 s/1000 min⁻¹
 - : 0 to 32.000 s/1000 min⁻¹
- Factory setting :
- : 0.2 s/100 Hz
 - } : 0.0 s/1000 min⁻¹
 - }

2.30 : Selection of reverse acceleration and deceleration ramp

- Adjustment range : 0 to 4
- Factory setting : 0
- When parameter **2.09** is at 1 so that different forward and reverse ramps can be obtained, these parameters are used to select the reverse acceleration ramps and deceleration ramps as follows :
- 0 : Selection of ramps via logic inputs**
- 1 : Selection of reverse ramp 1
 - 2 : Selection of reverse ramp 2
 - 3 : Selection of reverse ramp 3
 - 4 : Selection of reverse ramp 4

When parameter **2.30** is at 0, the reverse acceleration ramp selected depends on the value of parameters **2.38** and **2.39**, and similarly when **2.31** is at 0, the reverse acceleration ramp selected depends on the value of parameters **2.40** and **2.41**.

These parameters enable ramps to be selected via an external command as follows :

| ACC | DEC | ACC | DEC | Ramp selected |
|------|------|------|------|---------------|
| 2.39 | 2.41 | 2.38 | 2.40 | |
| 0 | | 0 | | REV 1 |
| 0 | | 1 | | REV 2 |
| 1 | | 0 | | REV 3 |
| 1 | | 1 | | REV 4 |

2.32 to 2.41 : Selection of ramps via logic inputs

Adjustment range : 0 or 1

These parameters are used for selecting ramps via an external command.

- 2.32** : bit 0 of FWD/REV Acc or. FWD Acc. selection
- 2.33** : bit 1 of FWD/REV Acc or FWD Acc. selection
- 2.34** : bit 2 of FWD/REV Acc. selection
- 2.35** : bit 0 of FWD/REV Dec. or FWD Dec. select.
- 2.36** : bit 1 of FWD/REV Dec. or FWD Dec. select.
- 2.37** : bit 2 of FWD/REV Dec. selection
- 2.38** : bit 0 of REV Acc. selection
- 2.39** : bit 1 of REV Acc. selection
- 2.40** : bit 0 of REV Dec. selection
- 2.41** : bit 1 of REV Dec. selection

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

3 - MENU 3 : ENCODER INPUT AND SPEED LOOP






3.1 - List of Menu 3 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|------|---|------------------------|--------------|
| 3.01 | Final speed reference | RO | | ±1000.0 Hz | - | - |
| | | | & | ±30000 min ⁻¹ | | |
| 3.02 | Speed feedback | RO | & | ±30000 min ⁻¹ | - | - |
| 3.03 | Speed error | RO | & | ±30000 min ⁻¹ | - | - |
| 3.04 | Speed loop output | RO | & | ±Max. current limit | - | - |
| 3.05 | Zero speed threshold | R/W | | 0 to 20.0 Hz | 1.0 Hz | |
| | | | & | 0 to 200 min ⁻¹ | 5 min ⁻¹ | |
| 3.06 | Speed reached alarm low threshold | R/W | | 0 to 1000.0 Hz | 1.0 Hz | |
| | | | & | 0 to 30000 min ⁻¹ | 5 min ⁻¹ | |
| 3.07 | Speed reached alarm high threshold | R/W | | 0 to 1000.0 Hz | 1.0 Hz | |
| | | | & | 0 to 30000 min ⁻¹ | 5 min ⁻¹ | |
| 3.08 | Overspeed threshold | R/W | | 0 to 1000.0 Hz | 1000.0 Hz | |
| | | | | 0 to 30000 min ⁻¹ | 2000 min ⁻¹ | |
| | | | | | 4000 min ⁻¹ | |
| 3.09 | Speed reached alarm condition selection | R/W | | 0 or 1 | 0 | |
| 3.10 | Speed loop proportional gain | R/W | & | 0 to 32000 | 200 | |
| 3.11 | Speed loop integral gain | R/W | & | 0 to 32000 | 100 | |
| 3.12 | Speed loop derivative gain | R/W | & | 0 to 32000 | 0 | |
| 3.13 | Frequency tracking selection | R/W | | 0 or 1 | 0 | |
| 3.14 | Scaling of frequency reference | R/W | | 0 to 1.000 | 1.000 | |
| 3.15 | Scaling frequency reference | R/W | | 0.001 to 1.000 | 1.000 | |
| 3.16 | Enable frequency output | R/W | | 0 or 1 | 0 | |
| 3.17 | Frequency output adaptation (x 1536) | R/W | | 0 or 1 | 1 | |
| 3.18 | Frequency output adaptation (x 192) | R/W | | 0 or 1 | 0 | |
| 3.19 | Additional speed input | R/W | & | 0 to the greater of 1.06 or 1.07 min ⁻¹ | 0 min ⁻¹ | |
| 3.20 | Selection of additional speed input | R/W | & | 0 or 1 | 0 | |
| 3.21 | Number of points per encoder rev. | R/W | & | 256 to 4096 | 1024 | |
| | | | | | 4096 | |
| 3.22 | Encoder/frequency input selection | R/W | | 0 or 1 | 1 | |
| | | | & | | 0 | |
| 3.23 | Encoder supply voltage selection | R/W | | 0 or 1 | 0 | |
| 3.24 | Encoder impedance adaptation | R/W | | 0 or 1 | 0 | |
| 3.25 | Encoder phase control | R/W | | 0 or 1 | 0 | - |
| 3.26 | Read encoder speed | RO | | ±30000 min ⁻¹ | - | - |

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List of Menu 3 parameters (cont.)

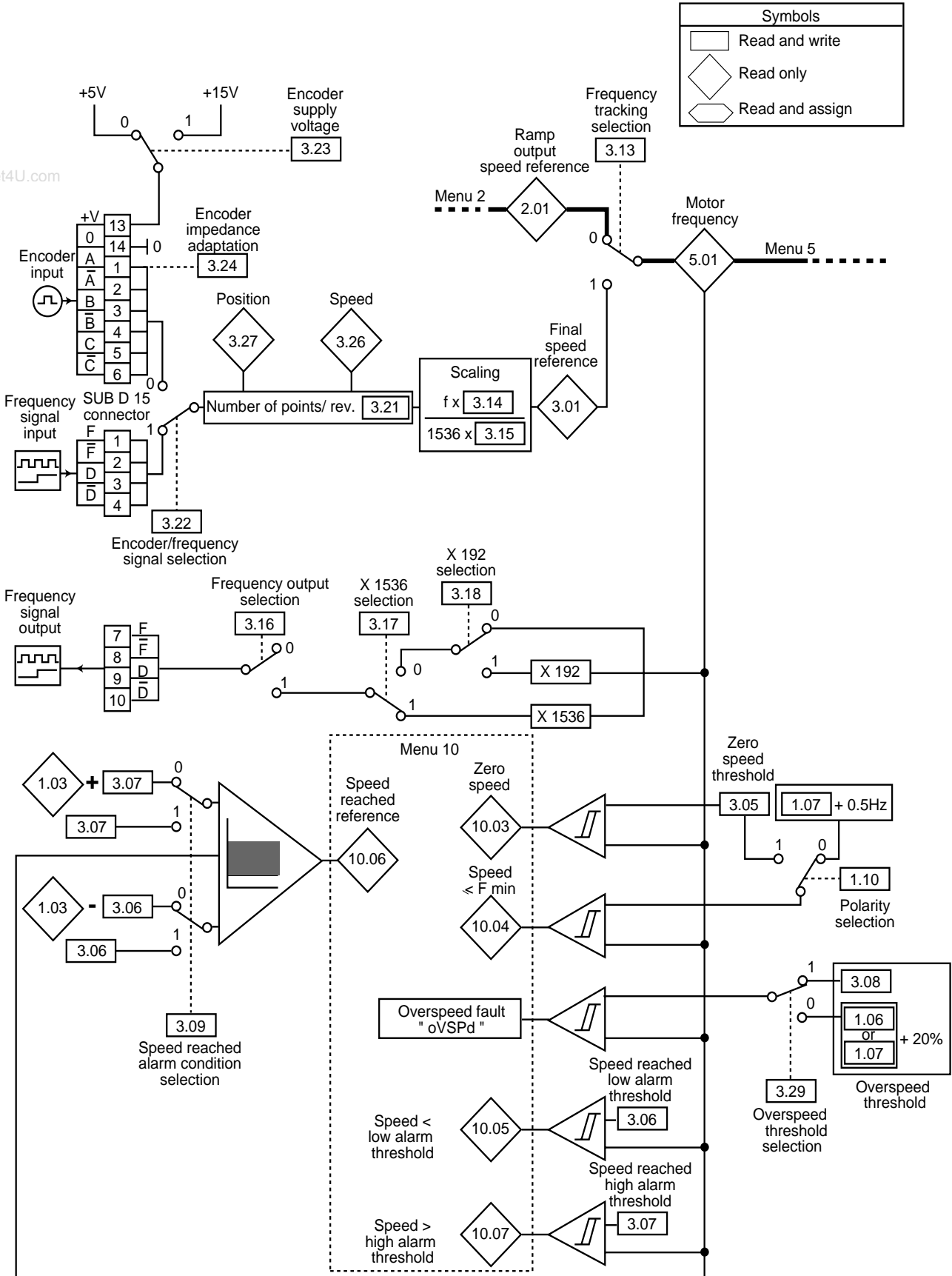
| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---------------------------------|------|---|-----------------------|-----------------|--------------|
| 3.27 | Read encoder position | RO | | 0 to 16383/16384 rev. | - | - |
| 3.28 | Encoder lead/lag | R/W |  | 0 to 6143/6143 rev. | 0 | - |
| 3.29 | Overspeed threshold selection | R/W |  | 0 or 1 | 0 | |
| 3.30 | Window on speed feedback filter | R/W |  &  | 0 to 10.0 ms | 0.0 ms | |
| 3.31 | Disable ENCPH 9 fault | R/W |  | 0 or 1 | 0 | |

UMV 4301

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3.2 - Synoptic views Menu 3

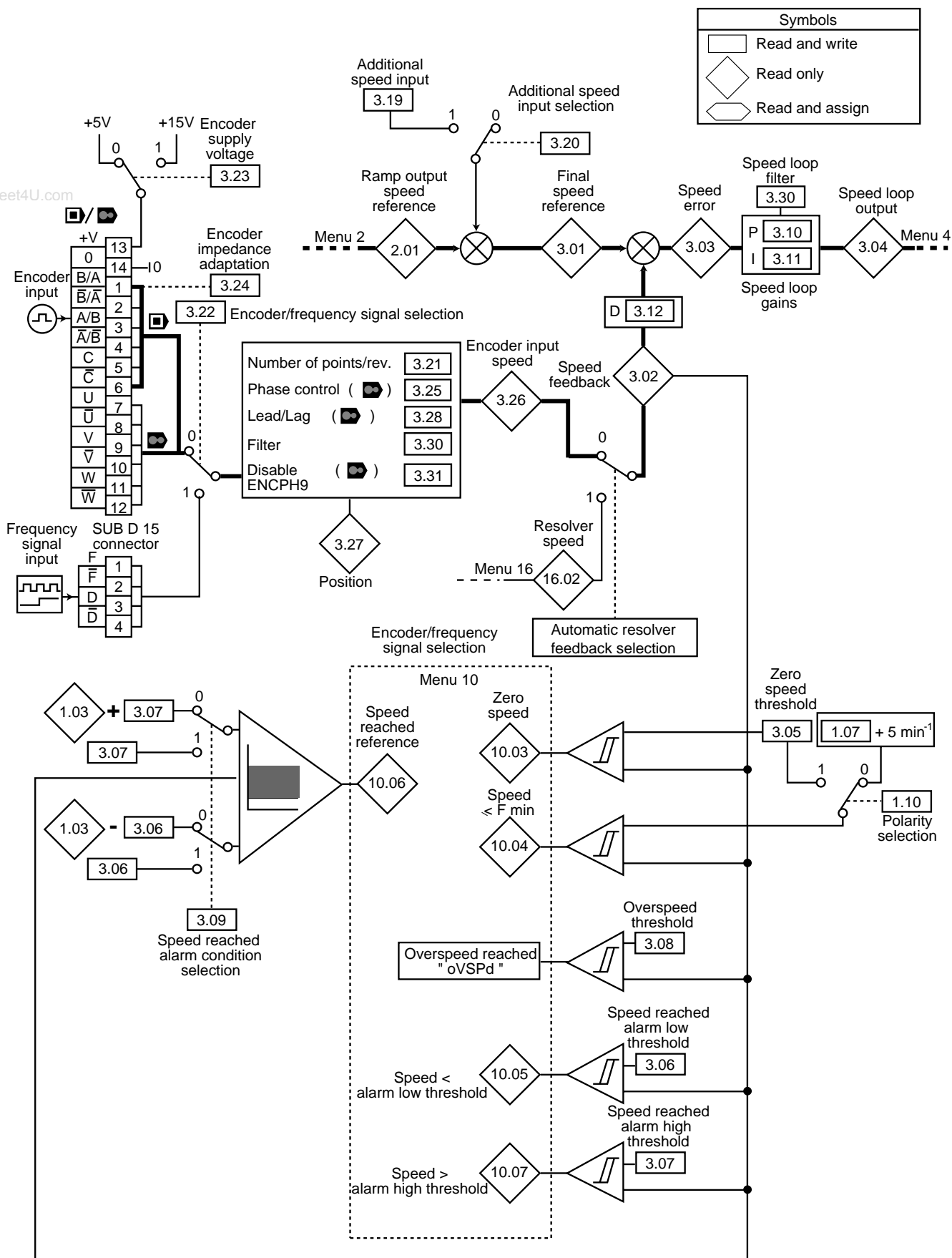
3.2.1 - Frequency reference via encoder input ()



UMV 4301

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3.2.2 - Encoder input and speed loop (&)






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3.3 - Explanation of parameters in menu 3


Symbols :



- open loop 
- closed loop 
- servo mode 

3.01 : Final speed reference

Adjustment range :  : ± 1000.0 Hz
 } : ± 30000 min⁻¹


 : This parameter allows the final frequency reference to be read when the reference is given via a signal connected on the main encoder input.

For all other operating modes  remains at 0.

 &  : The final speed reference read represents the sum of the main speed reference at the end of the ramp and the additional speed input, if this is enabled. When the controller is locked, the final speed reference is at 0.

3.02 & : Speed feedback

Adjustment range : ± 30000 min⁻¹

This parameter allows the actual speed to be read from either the motor encoder or from the RLV UMV option when a resolver is used as speed feedback. In the latter case, selection is automatic.

3.03 & : Speed error

Adjustment range : ± 30000 min⁻¹

The speed error is the difference between the final speed reference and the speed feedback after correction by the speed loop regulator.




3.04 & : Speed loop output




Adjustment range : \pm current max limit.





The speed loop output determines the torque reference required to define the active current.

3.05 : Zero speed threshold

Adjustment range :  : 0 to 20.0 Hz
 } : 0 to 200 min⁻¹





Factory setting :  : 1.0 Hz
 } : 5 min⁻¹



 : If motor frequency  is less than or equal to the level defined by this parameter, the zero speed alarm  is at 1, if not, it is at 0.

 &  : If speed feedback  is less than or equal to the level defined by this parameter, the zero speed alarm  is at 1, if not, it is at 0.

3.06 : Speed reached alarm low threshold




Adjustment range :  : 0 to 1000.0 Hz
 } : 0 to 30000 min⁻¹



Factory setting :  : 1.0 Hz
 } : 5 min⁻¹


Defines the lower limit for the speed reached alarm. . See parameter  for operation of the alarm.

3.07 : Speed reached alarm high threshold

Adjustment range :  : 0 to 1000.0 Hz
 } : 0 to 30000 min⁻¹


Factory setting :  : 1.0 Hz
 } : 5 min⁻¹


Defines the upper limit for the speed reached alarm. See parameter  for operation of the alarm.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

3.08 : Overspeed threshold

Adjustment range : : 0 to 1000.0 Hz
 & } : 0 to 30000 min⁻¹

Factory setting : : 1000.0 Hz
 : 2000 min⁻¹
 : 4000 min⁻¹

Defines the frequency () or the speed (&) above which the controller will trigger an overspeed fault. In open loop mode the adjustment of **3.08** is only effective if **3.29** = 1.

3.09 : Speed reached alarm condition selection

Adjustment range : 0 or 1
 Factory setting : 0

This parameter is used to enable the frequency reached () or speed reached (&) alarm signalled at parameter **10.06**.

The alarm can be controlled in 2 modes :

0 : : frequency reached alarm

10.06 is at 1 when

$$(\mathbf{1.03} - \mathbf{3.06}) < \mathbf{5.01} < (\mathbf{1.03} + \mathbf{3.07}) .$$

& : speed reached alarm

10.06 is at 1 when

$$(\mathbf{1.03} - \mathbf{3.06}) < \mathbf{3.02} < (\mathbf{1.03} + \mathbf{3.07}) .$$

1 : : frequency reached alarm

10.06 is at 1 when

$$\mathbf{3.06} < \mathbf{5.01} < \mathbf{3.07} .$$

& : speed reached alarm

10.06 is at 1 when

$$\mathbf{3.06} < \mathbf{5.01} < \mathbf{3.07} .$$

3.10 & : Speed loop proportional gain

Adjustment range : 0 to 32000
 Factory setting : 200
 Controls motor speed stability when sudden reference variations occur.

Increase the proportional gain until the motor vibrates, then reduce the value from 20 to 30 %, checking that the motor is stable on sudden variations of the speed reference, both at no-load and on-load.

3.11 & : Speed loop integral gain

Adjustment range : 0 to 32000
 Factory setting : 100
 Controls motor speed stability on a load impact. Increase the integral gain to obtain the same on-load speed as at no-load on a load impact.

3.12 & : Speed loop derivative gain

Adjustment range : 0 to 32000
 Factory setting : 0
 In increments of 1.
 Controls motor speed stability when sudden reference variations occur or when the load is shed. Reduces speed overshoots. Normally, leave the setting at 0.

3.13 : Frequency tracking selection

Adjustment range : 0 or 1
 Factory setting : 0
 This parameter enables a reference signal connected on the main encoder input to be used as a reference.
0 : Frequency tracking inhibited.
1 : Frequency tracking enabled.

3.14 : Scaling of frequency reference

3.15
 Adjustment range : **3.14** : 0 to 1.000
3.15 : 0.001 to 1.000

Factory setting : 1.000
 The frequency reference from the encoder input can be scaled using the following formula :

$$\mathbf{3.01} = \left(\frac{\text{Encoder input frequency}}{1536} \right) \times \left(\frac{\mathbf{3.14}}{\mathbf{3.15}} \right)$$

The encoder input frequency can be calculated using the formula :

$$F = 2 \times \frac{\text{Speed of rotation}}{60} \times \text{No. of encoder points}$$

3.16 : Enable frequency output

Adjustment range : 0 or 1
 Factory setting : 0
 This parameter is used to enable the function which is used to obtain an image of the motor frequency on the main encoder input. This then becomes a frequency output.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

3.17 : Output frequency adaptation

3.18

Adjustment range : 0 or 1
 Factory setting : **3.17** : 1

3.18 : 0

Depending on the use required, the image of the output frequency can be multiplied by 1 or 192 or 1536 by combining parameters **3.17** & **3.18** as follows :

| 3.17 | 3.18 | Ratio |
|------|------|--------|
| 0 | 0 | x 1 |
| 0 | 1 | x 192 |
| 1 | 0 | x 1536 |
| 1 | 1 | x 1536 |

3.19 & : Additional speed input

Adjustment range : 0 to the greater of **1.06** or **1.07** min⁻¹

Factory setting : 0 min⁻¹

This additional speed input is an additional reference which is not assigned by the ramps. It can also be used as an error correction input when the synchronisation function (Menu 13) is used.

3.20 & : Additional speed input selection

Adjustment range : 0 or 1

Factory setting : 0

0 : Additional speed input inhibited.

1 : Additional speed input enabled.

3.21 : Number of points per encoder rev.

Adjustment range : 256 to 4096

Factory setting : } : 1024
 }
 : 4096

The value of **3.21** depends on the maximum speed of the motor adjustable in **1.06** or **1.07**.

| 3.21 maximum | Max. permitted speed (min ⁻¹) |
|--------------|---|
| 4096 | 0 - 3000 |
| 2048 | 3001 - 6000 |
| 1024 | 6001 - 12000 |
| 512 | 12001 - 24000 |
| 256 | 24001 - 30000 |

This parameter is used to configure the number of encoder points in the controller.

An incorrect value for this parameter will result in incorrect reading of the motor speed and thus a controller malfunction.

3.22 : Encoder / frequency input selection

Adjustment range : 0 or 1

Factory setting : : 1

} : 0

0 : The reference is provided by an encoder (A, B) connected on the main encoder input.

1 : The reference is provided by a Frequency/Direction signal (F, D) connected on the main encoder input.

& **0** : Speed feedback is provided by the motor encoder connected on the main encoder input or speed feedback is provided by a resolver connected on the RLV - UMV option and an encoder is used on the main input to provide an additional menu 13 function (synchro).

1 : Speed feedback is provided by a resolver connected on the RLV - UMV option and a Frequency / Direction (F.D) signal is used on the main encoder input to provide an additional menu 13 function (Synchro etc).

3.23 : Encoder supply voltage selection

Adjustment range : 0 or 1

Factory setting : 0

0 : Supply voltage +5 V

1 : Supply voltage +15 V.

• A +15 V supply voltage will destroy an encoder intended for use with a +5 V supply voltage.

3.24 : Encoder impedance adaptation

Adjustment range : 0 or 1

Factory setting : 0

When the encoder is connected to a single controller, the inputs should be loaded with a 120 Ω resistor in series with a 100 nF capacitor. Where the encoder signal is used by several controller simultaneously, only the input of the furthest controller from the encoder must be loaded.

0 : Encoder input charge activated.

1 : Encoder input charge deactivated.

3.25 : Encoder phase control

Adjustment range : 0 or 1

Factory setting : 0

This test is used to check the phase lead/lag between the encoder (or the resolver) and the motor.

In the case of an imbalance, the controller compensates automatically.

The test must be performed on a machine at no-load by setting **3.25** to 1, releasing the controller and giving the start command.

This parameter is automatically reset to 0 when the test procedure has been completed.

• This test turns the motor at low speed for one motor revolution. Check that there is no risk of danger to people or equipment.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

3.26 : Read encoder speed

Adjustment range : $\pm 30000 \text{ min}^{-1}$

This parameter indicates the speed of the machine when the encoder is connected on the main encoder input.

3.27 : Read encoder position

Adjustment range : 0 to 16383/16384 revolutions

This parameter indicates the encoder position connected on the main encoder input.

The measurement is taken at the point where the encoder was positioned on powering up the controller.

3.28 : Encoder phase lead /lag

Adjustment range : 0 to 6143/6143 revolutions

This parameter indicates the results of the encoder lead/lag test.

It is memorised when the controller is powered down and is only modified when the lead/lag test is run again.

! • Phase lead/lag can be entered manually but an incorrect value may cause the motor to turn in the wrong direction or a controller fault.

3.29 : Selection of the overspeed threshold

Adjustment range : 0 or 1

Factory setting : 0 ms

0 : the overspeed threshold (forward or reverse) is the value set in 1.06 (or 1.07) + 20 %.

1 : the overspeed threshold is as set in 3.08 .

3.30 : Filter on speed feedback window

Adjustment range : 0 to 10 ms

Factory setting : 0 ms

This parameter adjusts the width of the user window for the filter which has been added to the speed loop. This filter is used to minimise of the current drawn with a high inertia load and when a high gain is required on the speed loop.

3.31 : Disable ENC PH9 trip

Adjustment range : 0 or 1

Factory setting : 0

The ENC PH9 fault occurs when torque is applied with an incorrect sign and the motor is therefore subjected to uncontrolled acceleration.

0 : Trip enabled

1 : Trip disabled

CAUTION : With some special configurations, the controller may suddenly trip on "ENC PH9", notably during very short accelerations with the motor under reduced load.
























If this occurs, disable the ENC PH9 trip.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

4 - MENU 4 : CURRENT LOOP - TORQUE REGULATION

4.1 - List of Menu 4 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|-------------------------------------|------|---|---|-----------------|--------------|
| 4.01 | Total motor current | RO | | 0 to controller max. current (A) | - | - |
| 4.02 | Active motor current | RO | | ± controller max current | - | - |
| 4.03 | Final torque reference | RO | | ± 100% active In (<input type="text" value="5.07"/> x <input type="text" value="5.10"/>) | - | - |
| 4.04 | Current reference | RO | | ± 100% active In | - | - |
| 4.05 | Motor current limit | R/W |  &   | 0 to max. active current (% active In) | 150.0% | |
| | | | | | 175.0% | |
| 4.06 | Generator current limit | R/W |  &   | 0 to max. active current (% active In) | 150.0% | |
| | | | | | 175.0% | |
| 4.07 | Symmetrical current limit | R/W |  &   | 0 to max. active current (% active In) | 150.0% | |
| | | | | | 175.0% | |
| 4.08 | Torque reference | R/W | | ± 100% active In | 0 | |
| 4.09 | Torque offset | R/W | | ± 100% active In | 0 | |
| 4.10 | Torque offset selection | R/W | | 0 or 1 | 0 | |
| 4.11 | Torque regulation mode selection | R/W |  | 0 or 1 | 0 | |
| | | |  &  | 0 to 4 | 0 | |
| 4.12 | Current loop filter | R/W | | 0 to 250 ms | 0 ms | |
| 4.13 | Current loop proportional gain | R/W |  | 0 to 30000 | 20 | |
| | | |  | | 150 | |
| | | |  | | 130 | |
| 4.14 | Current loop integral gain | R/W |  | 0 to 30000 | 40 | |
| | | |  | | 2000 | |
| | | |  | | 1200 | |
| 4.15 | Motor thermal time constant | R/W |  &  | 0 to 400.0 s | 89.0 s | |
| | | |  | | 7.0 s | |
| 4.16 | Motor protection mode selection | R/W | | 0 or 1 | 0 | |
| 4.17 | Motor magnetising current | RO | | ± controller max. current | - | - |
| 4.18 | Priority current limit | RO | | 0 to max. active current (%active In) | - | - |
| 4.19 | Overload integration | RO | | 0 to 100.0% | - | - |
| 4.20 | Selection of torque regulation mode | RO |  &  | ± 100% | - | - |
| | | |  | | | |

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

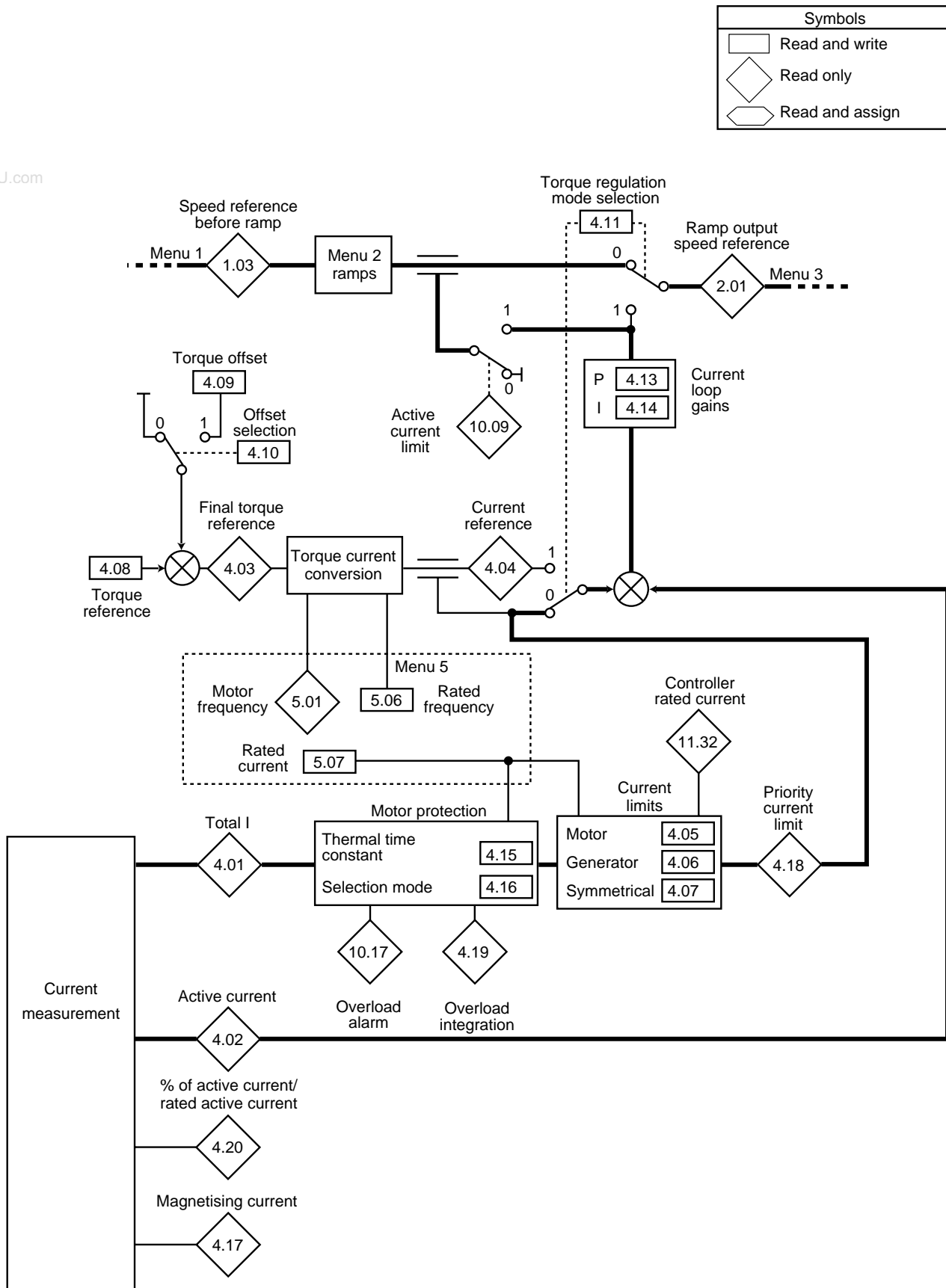
www.DataSheet4U.com

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

4.2 - Menu 4 synoptic views

4.2.1 - Open loop ()






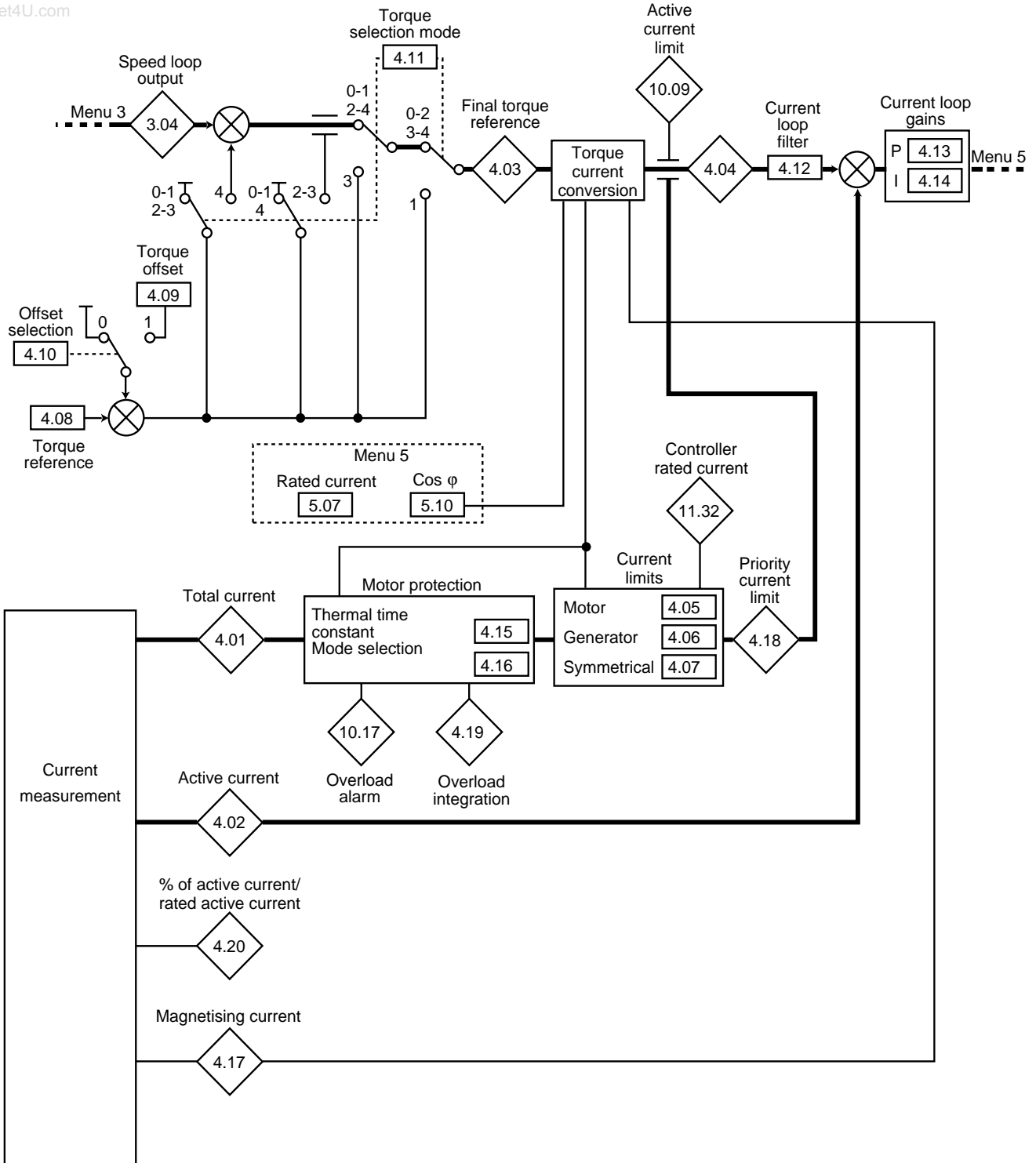
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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

4.2.2 - Closed loop (&)

| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |






UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

4.3 - Explanation of menu 4 parameters




Symbols :

- open loop 
- closed loop 
- servo mode 

4.01 : Total motor current






Adjustment range : 0 to controller max. current (A)
 Reads the rms current in each output phase of the controller.
 This is the result of the vectorial sum on the magnetising current and the active current.

4.02 : Motor active current




Adjustment range : \pm controller max. current (A)
 Reads the active current delivered by the controller.
 The active current provides a fairly precise image of the motor torque between 5 Hz and 50 Hz () and between 0 min⁻¹ and the motor rated speed ( and ).

A negative value indicates operation in generator mode with driving load whereas a positive value indicates operation in motor mode.

4.03 : Final torque reference


Adjustment range : ± 100 % active In
 In torque regulation mode, the final torque reference is the sum of the torque reference () and the torque offset () if it is enabled. In speed regulation mode ( & ) it is the result of the speed loop output (). This reference is then converted to a current reference in order to establish the active current supplied by the controller.


4.04 : Current reference


Adjustment range : ± 100 % active In
 The current reference is the result of conversion of the final torque reference () corrected by the current limits () to (.


4.05 to 4.07 : Active current limits



Adjustment range : 0 to max. active current (1)
 (% active In)

Factory setting :  } : 150.0 %
 }
 } : 175.0 %



In motor mode, the active current limit () applies to both directions of rotation when torque is required by the load.

In generator mode, the active current limit () applies to both directions of rotation for a driving load.

Symmetrical active current limiting () only has priority over motor limiting and generator limiting if it is at a level below the two previous parameters.

 : In frequency regulation mode ( = 0), the output frequency is automatically adjusted in order to respect the current limits.

(1) The current limits are **active current** limits when the maximum current allowed by the controller is a **total current**. As a result, the maximum active current available corresponds to the maximum total current less the magnetising current.

The maximum value of parameters () to () can therefore take the following value :

$$I_{\text{max. active}} = \frac{\sqrt{I_{\text{max. total}}^2 - I_{\text{magnetising}}^2}}{\text{active In}} \times 100 \%$$

$$I_{\text{max. total}} = 150 \% \text{ controller In } (\text{img alt="square icon with vertical line" data-bbox="775 417 795 431"/})$$

$$175 \% \text{ controller In } (\text{img alt="square icon with horizontal line" data-bbox="775 434 795 448"/} \ \& \ \text{img alt="square icon with diagonal line" data-bbox="825 434 845 448"/})$$

$$I_{\text{active}} = I_{\text{motor}} \times \cos \varphi$$

$$I_{\text{magnetising}} = \sqrt{I_{\text{motor}}^2 - I_{\text{active}}^2}$$

Note : max. active current is limited to 400 % active In.

4.08 : Torque reference

Adjustment range : ± 100 % active In
 Factory setting : 0 %
 Main torque reference when the controller is configured for torque regulation.



4.09 : Torque offset


Adjustment range : ± 100 % active In
 Factory setting : 0 %
 This parameter enables an additional torque reference to be added to the main torque reference.

4.10 : Torque offset enable

Adjustment range : 0 or 1
 Factory setting : 0
 When this parameter is at 1, the torque offset is added to the main torque reference.

4.11 : Torque control selection

 :
 Adjustment range : 0 or 1
 Factory setting : 0
0 : Frequency control with current limiting via parameter (.

1 : Torque control. The frequency reference is no longer active and the torque reference can be given by analogue reference 2 (if it is programmed for the torque reference, parameter (.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

& :

Adjustment range : 0 to 4

Factory setting : 0

0 : Speed control with current limiting via parameter

4.07 .

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

With zero resistive torque the motor goes into over-speed, and will trip when the threshold set in **3.08** is reached.

2 : Torque control with speed limiting. The torque reference can be given by analogue reference 2 (if it is programmed for the torque reference, parameter **4.08**) with speed limiting via analogue reference 1.

3 : Torque control for simple winder/unwinder applications (see manual ref. 2465).

4 : Reserved.

• **In torque control without speed control** (**4.11** = 1) the machine races if the resistive torque becomes zero. It is therefore essential to check that parameters **3.08** & **3.29** () relating to overpeed safety are set to ensure the safety of people and equipment.

4.12 & : **Current loop filter**

Adjustment range : 0 to 250 ms

Factory setting : 0 ms

This filter can be used to induce a time constant designed to reduce any noise which may be generated by the speed loop.

It causes a delay in the speed loop. In order to improve the stability of the system, it is possible to reduce the speed loop gains, provided the time constant is increased.

4.13 : **Current loop proportional gain**

4.14 : **Current loop integral gain**

Adjustment range : 0 to 30000

Factory setting :

| | 4.13 | 4.14 |
|--|------|------|
| | 20 | 40 |
| | 150 | 2000 |
| | 130 | 1200 |

In view of a number of factors internal to the controller, oscillations may occur in the following cases :

- Frequency regulation with current limiting around the rated frequency and on load impacts.
- Torque regulation on lightly loaded machines and around the rated speed.

- On a mains break or on a controlled deceleration ramp when DC bus regulation is required.

To decrease these oscillations, it is advisable to perform the following operations, in the order given :

- increase the proportional gain **4.13**,

- reduce the integral gain **4.14**.

4.15 : **Motor thermal time constant**

Adjustment range : 0 to 400.0 s

Factory setting : } : 89.0 s
 } : 7.0 s

This parameter is used to define the motor thermal protection.

It is calculated according to the maximum time during which the motor can withstand 150 % I_N .

$$\mathbf{4.15} = \frac{\text{Maximum time at } 150\% I_N}{0.674}$$

4.16 : **Motor protection mode**

Adjustment range : 0 or 1

Factory setting : 0

0 : The controller trips when the threshold defined in parameter **4.15** is reached.

1 : The current limit is automatically reduced to below 100 % I_N when the threshold defined in parameter **4.15** is reached.

4.17 : **Motor magnetising current**

Adjustment range : \pm controller max. current

Reads the magnetising current.

4.18 : **Priority current limit**

Adjustment range : 0 to max. active current (% active I_n)

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

4.19 : **Overload integration**

Adjustment range : 0 to 100 %

When the level of the total current exceeds 105 % of the motor rated current (**5.07** x 1.05), the integrator increases until it reaches 100 %. The controller then trips on an "It Ac" fault or reduces the limit current.

4.20 : **Percentage of active current**

Adjustment range : \pm 100 % of the rated active current.

This parameter enables the active current produced to be read as a % of the rated active current.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

5 - MENU 5 : MOTOR CONTROL

5.1 - List of Menu 5 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|--|------|------|---|------------------------|--------------|
| 5.01 | Motor frequency | RO | | 1.07 to 1.06 ± slip | - | - |
| 5.02 | Motor voltage | RO | | 0 to 528 volts | - | - |
| 5.03 | Motor power | RO | | ± [controller max. current x 5.09 x √3/1000] Kw | - | - |
| 5.04 | Motor speed | RO | | ±6000 min ⁻¹ (5.22 = 0) ±60000 min ⁻¹ (5.22 = 1) | - | - |
| 5.05 | DC bus voltage | RO | | 0 - 830 Volts | - | - |
| 5.06 | Motor rated frequency | R/W | & | 0 - 1000.0 Hz | 50.0 Hz | |
| 5.07 | Motor rated current | R/W | | 0 to controller rated curr. (A) | controll. rated curr. | |
| 5.08 | Motor rated speed (at full load) | R/W | | 0 to 6000 min ⁻¹ (5.22 = 0) 0 to 60000 min ⁻¹ (5.22 = 1) | 0 min ⁻¹ | |
| | | | | 0 to 30000 min ⁻¹ | 1450 min ⁻¹ | |
| 5.09 | Motor rated voltage | R/W | & | 0 to 480 Volts | 400 Volts | |
| 5.10 | Power factor (cos φ) | R/W | & | 0 to 1.000 | 0.920 | |
| | | | | | 1.000 | |
| 5.11 | Number of motor poles | R/W | & | 2 to 32 | 4 | |
| | | | | | 6 | |
| 5.12 | Autocalibration selection | R/W | | 0 or 1 | 0 | |
| 5.13 | Dynamic U/f selection | R/W | | 0 or 1 | 0 | |
| 5.14 | Control mode | R/W | | 0 to 3 | 1 | |
| 5.15 | Boost | R/W | | 0 to 25.0% of 5.09 | 3.0% | |
| 5.16 | Jog boost | R/W | | 0 to 25.0% of 5.09 | 3.0% | |
| 5.17 | Stator resistance | R/W | | 0 to 32.000 Ω | 0.000 Ω | |
| 5.18 | Switching frequency | R/W | | 3 - 4.5 - 6 - 9 - 12 kHz | 3 kHz | |
| 5.19 | High stability modulation mode | R/W | | 0 or 1 | 0 | |
| 5.20 | Quasi-squared modulation mode | R/W | | 0 or 1 | 0 | |
| 5.21 | Operational stability at constant power | R/W | | 0 or 1 | 1 | |
| 5.22 | Speed resolution at 10 min ⁻¹ | R/W | | 0 or 1 | 0 | |
| 5.23 | Voltage offset | RO | | 0 to 25.5 Volts | - | - |
| 5.24 | Motor inductance | R/W | & | 0 to 320.00 mH (≤ 16 T) 0 to 32.000 mH (≥ 22 T) | 0.0 mH | - |
| 5.25 | Doubling of motor frequency | R/W | | 0 or 1 | 0 | |
| 5.26 | Cross-coupling compensation | R/W | & | 0 or 1 | 0 | |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

List of Menu 5 parameters (continued)




| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|--|------|------|---|---|--------------|
| 5.27 | Slip compensation | R/W | | 0 or 1 | 0 | |
| | Automatic optimisation of rated speed | R/W | & | 0 or 1 | 0 | |
| 5.28 | Torque compensation in reduced flux zone | R/W | | 0 or 1 | 0 | |
| 5.29 | Inflection point n°1 on flux curve | R/W | | 0 to 100% of rated flux | 50% | |
| 5.30 | Inflection point n°2 on flux curve | R/W | | 0 to 100% of rated flux | 75% | |
| 5.31 | Voltage regulation gain | R/W | | 0 to 30 | 1 | |
| 5.32 | End of rated speed adjustment | R/W | & | 0 to 0.99 ¹ /100 min ⁻¹ | 0.0 ¹ /100 min ⁻¹ | |
| 5.33 | Thermal protection modelling | R/W | | 0 or 1 | 0 | |

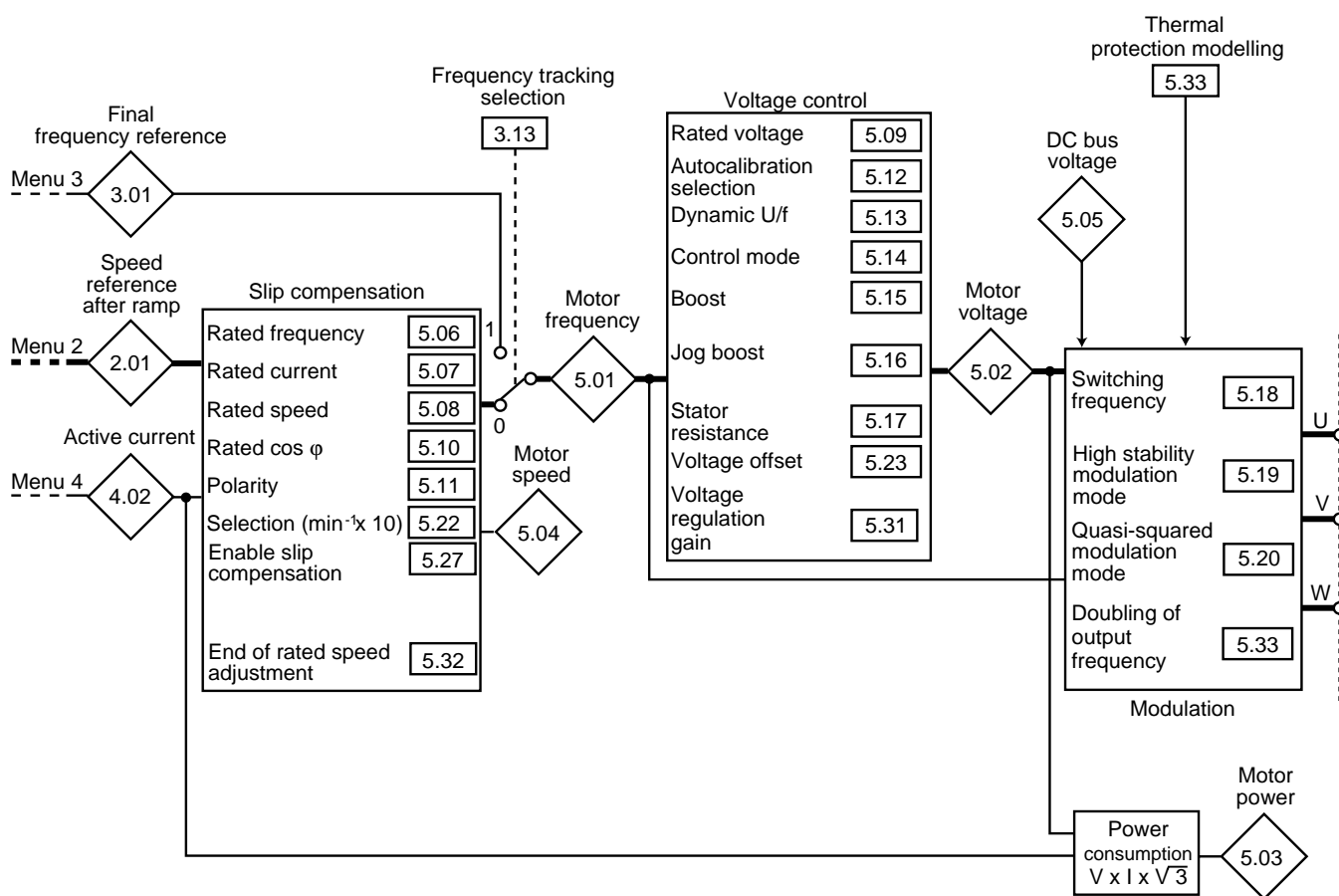
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Open and closed loop speed controllers for asynchronous and synchronous motors

5.2 - Synoptic views Menu 5

5.2.1 - Open loop ()




| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |



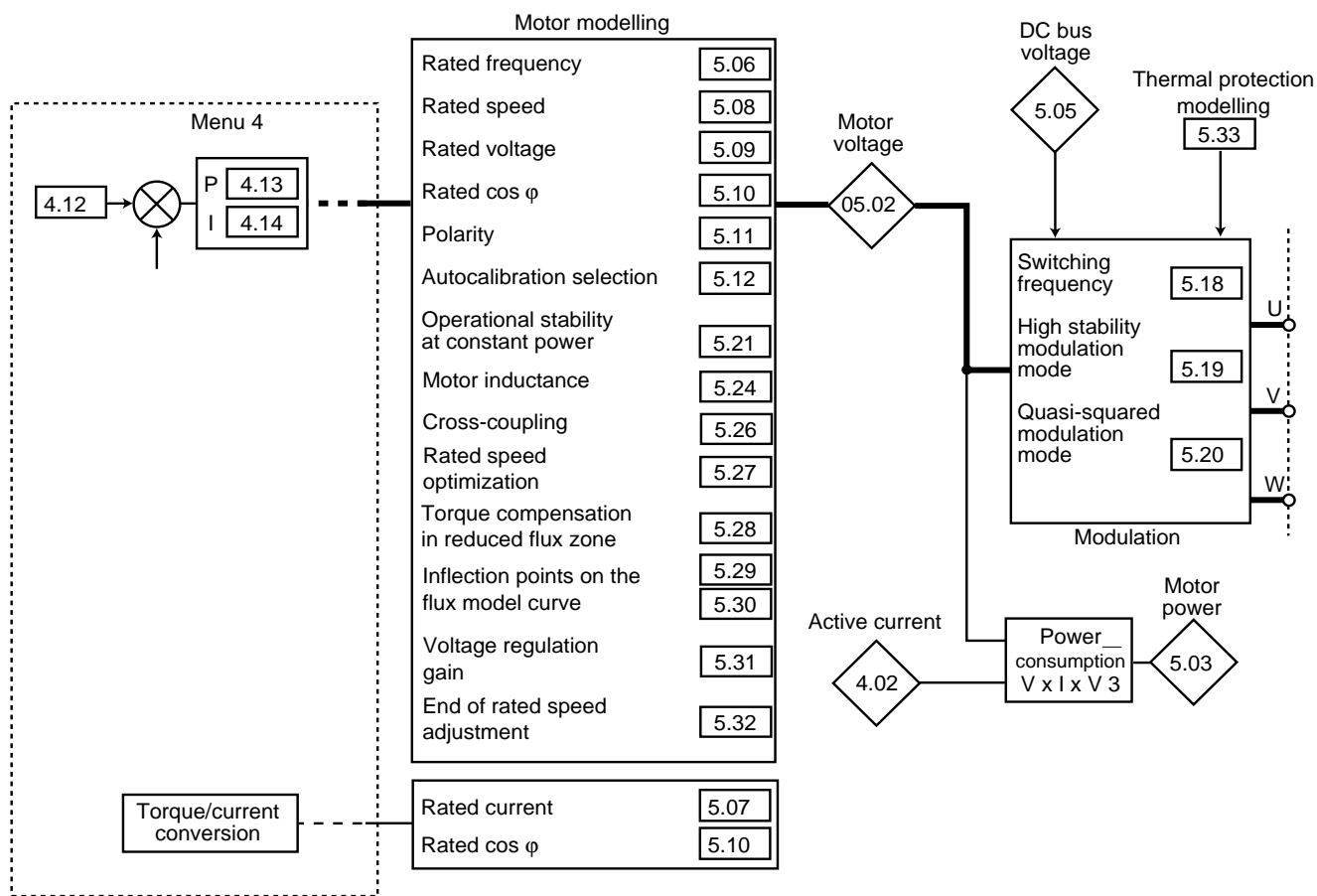
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Open and closed loop speed controllers for asynchronous and synchronous motors

5.2.2 - Closed loop (&)

| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |

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Open and closed loop speed controllers for asynchronous and synchronous motors

5.3 - Explanation of menu 5 parameters

Symbols :

- open loop 
- closed loop 
- servo mode 

5.01 : Motor frequency

Adjustment range : to ± slip.

is the controller output frequency. This is the sum of the reference after the ramp and slip compensation.

$$\boxed{5.01} = \boxed{2.01} + (\text{rated slip}) \times \frac{\boxed{4.02}}{100}$$

5.02 : Motor voltage

Adjustment range : 0 to 528 Volts
Rms voltage at the controller output.

5.03 : Motor power

Adjustment range : ± (I max. control.) × × $\frac{\sqrt{3}}{1000}$ kW

is the calculated motor active power.

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

If this parameter is assigned to an analogue output via menu 7, 10V corresponds to the maximum power measurable by the controller (max. I = 150% or 175% of controller rated I).

5.04 : Motor speed

Adjustment range : ± 6000 min⁻¹ if = 0

± 60000 min⁻¹ if = 1

The motor speed is calculated using the after ramp reference (in Hz because operating in open loop mode) or using the final frequency reference when operating in frequency tracking mode (reference signal on encoder input : = 1).

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

$$\boxed{5.04} (\text{min}^{-1}) = 60 \times \boxed{2.01} (\text{Hz}) / (\boxed{5.11} / 2) \text{ if } \boxed{3.13} = 0$$

$$\text{or } = 60 \times \boxed{3.01} (\text{Hz}) / (\boxed{5.11} / 2) \text{ if } \boxed{3.13} = 1$$

In the first case, precision depends on the accuracy of the slip compensation setting.

In the second case, there will be an error caused by slipping.



5.05 : DC bus voltage

Adjustment range : 0 - 830 Volts

Indicates the measurement of the DC bus voltage.

: Motor rated frequency

Adjustment range :  } : 0 to 1000.0 Hz
 } : not used
 : not used

Factory setting :  } : 50.0 Hz
 }

In increments of 0.1 Hz.

This is the point where the motor operation changes from constant torque to constant power.

In standard operation, it is the frequency given on the motor nameplate.

Not used in servo mode.

: Motor rated current



Adjustment range :  } : 0 to I_n controller (A)
 } : not used
 }


Factory setting : In controller


This is the motor rated current value given on the nameplate. Overload starts from this value.

In Servo mode, the setting of is the STALL CURRENT given on the motor nameplate.


: Motor rated speed

Adjustment range :  : 0 to 6000 min⁻¹ (= 0)
 : 0 to 60000 min⁻¹ (= 1)

 : 0 to 30000 min⁻¹

 : not used




Factory setting :  : 0 min⁻¹



 : 1450 min⁻¹

In increments of 1.

This is the on-load motor speed given on the nameplate.

: Motor rated voltage

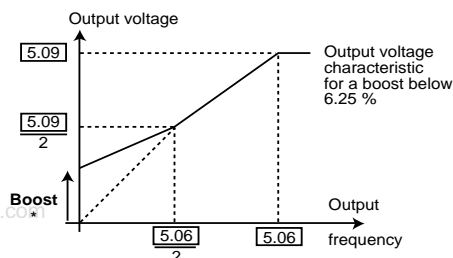
Adjustment range :  } : 0 to 480 V
 } : not used
 }

Factory setting :  } : 400 V
 }

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

5.1 : Is used to define the voltage/frequency characteristic as follows :



* If fixed boost is selected (**5.14** = 3).

In open loop vector control mode (**5.14** = 0, 1 or 2) or closed loop mode, the motor rated voltage controls the flux in the motor.

Not used in servo mode.

5.10 : Power factor (Cos φ)

Adjustment range : **5.10** } : 0 to 1.000
5.10 }
5.10 }

Factory setting : **5.10** } : 0.920
5.10 }
5.10 } : 1.000

In increments of 0.01.

The cos φ is measured automatically during the self-calibration phase and set in this parameter. If the self-calibration procedure has not been performed, enter the cos φ value from the motor nameplate.

Set 1 for Servo mode.

5.11 : Motor polarity

Adjustment range : 2 to 32 poles

Factory setting : **5.11** } : 4 poles
5.11 }
5.11 } : 6 poles

In increments of 2 :

| Motor rated speed min ⁻¹ | Number of motor poles |
|--|-----------------------|
| 3000 | 2 |
| 1500 | 4 |
| 1000 | 6 |
| 750 | 8 |

5.12 : Self-calibration

Adjustment range : 0 or 1

Factory setting : 0

1 : When started up for the first time, is used to measure the motor characteristics (magnetising current, cos φ, leakage inductance, etc).

This operation must be performed with the motor uncoupled. The controller drives the motor at 2/3 its rated speed then stops.

In servo mode, the motor performs one complete revolution then stops.

! • During the self-calibration phase, the controller supplies the motor, causing it to rotate. Check that this operation does not affect safety.

• Self-calibration should be performed each time the operating mode is modified.

5.13 : Selection of dynamic U/f mode

Adjustment range : 0 or 1

Factory setting : 0

0 : The U/F ratio is set and adjusted by the basic frequency (**5.06**).

1 : Dynamic U/F ratio

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

5.14 : Selection of the control mode

Adjustment range : 0 to 3

Factory setting : 1

Modes 0 to 2 are used for vector control. Mode 3 corresponds to U/f control with a fixed boost (**5.15**).

The difference between modes 0 to 2 is the method used to identify the motor parameters, in particular the stator resistance. These parameters vary with the motor temperature and thus according to the motor operating cycle.

0 : Ur S mode : The stator resistance and the voltage offset are measured each time the controller is enabled. Parameters **5.17** (stator resistance) and **5.23** (voltage offset) are read-only.

These measurements are only valid if the machine is stationary, with totally reduced flux. The measurement is only taken when the run command is given less than 2 seconds after the previous stop.

This is the highest performance vector control mode. However, the operating cycle must be compatible with the 2 seconds required between a stop command and a new run command.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

1 : Ur I mode : The stator resistance **5.17** and the voltage offset **5.23** are only measured each time the controller is powered up.

5.17 and **5.23** are read-only.

These measurements are only valid if the machine is stationary when it is powered down.

2 : Ur mode : Neither the stator resistance **5.17** nor the voltage offset **5.23** is measured.

This mode offers the lowest performance level. It is only used when the 2 preceding modes are not compatible with the operating cycle.

If this is the case, at start-up, Ur S or Ur I mode is used to read the values measured in **5.17** and **5.23** and then use them in Ur mode for normal operation.

3 : Fd Mode : Voltage-frequency ratio with fixed boost set by parameter **5.15**.

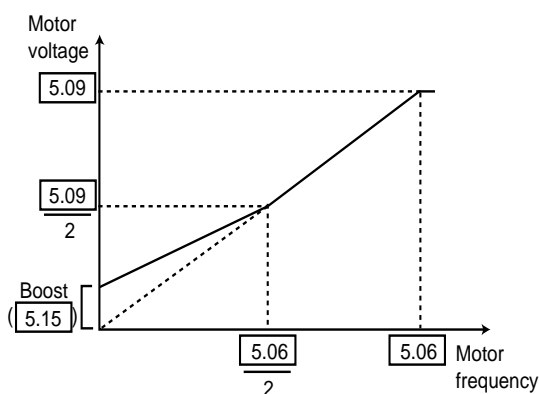
⚠ In mode 1 (Ur1), on power-up, a voltage is applied briefly to the motor without a run command being given. For safety reasons no electrical circuit should be accessible once the controller is powered up.

5.15  : Starting torque (Boost)

Adjustment range : 0 to 25.0 % of Un motor (**5.09**)

Factory setting : 3.0 % Un motor

For operation in U/f mode, (**5.14** at 3:Fd) parameter **5.15** is used to overflux the motor at low speed so that it will supply more torque on starting. This is a percentage of the motor rated voltage (**5.09**).



5.16  &  : Jog Boost

Adjustment range : 0 to 25.0 % of Un motor

Factory setting : 3.0 % of Un motor

This boost is used in U/f control when Jog operation is enabled.

5.17  : Stator resistance

Adjustment range : 0 to 32.000 Ω

Factory setting : 0.000 Ω




This parameter stores the stator resistance of the motor for control in vector mode (see parameter **5.14**).

The value of the stator resistance is only read if **5.14** = 0 or 1.

If the stator resistance cannot be measured (motor not connected, value greater than the maximum calibration value) an "rS" trip appears.

5.18 : Switching frequency

Adjustment range :

   } 3 - 4.5 - 6 - 9 - 12 kHz

Factory setting : 3 kHz

Sets the PWM switching frequency and the sampling frequency of the digital and analogue inputs according to the following table :

| Setting kHz | Sampling frequency | |
|----------------|---------------------|---------------------|
| | A conditions kHz | B conditions kHz |
| 3 | 3 | 3 |
| 4,5 | 4,5 | 2,2 |
| 6 | 6 | 3 |
| 9 | 4,5 | 2,25 |
| 12 | 6 | 3 |

Sampling frequency of the digital and analogue inputs

- A conditions :
 - open loop operation with frequency control,
 - closed loop operation with torque control.
- B conditions :
 - open loop operation with control of the analogue inputs by current signal,
 - closed loop operation with speed control.

WARNING : It is necessary to derate the output current as a function of the switching frequency and the rating of the UMV 4301. See table 1.3.2.

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

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

5.19 : Enable high stability modulation mode

Adjustment range : 0 or 1

Factory setting : 0

0 : Function disabled.

1 : In open loop mode, instabilities may occur :

- at 50 % of the motor rated frequency for an underloaded motor,
- close to and above the motor rated speed, when it is underloaded or has a very high load.

This function enables instabilities to be eliminated.

It also enables a slight reduction in controller temperature rise in open or closed loop operation.

On the other hand, use of this mode may cause a slight increase in motor noise.

5.20 : Enable quasi-squared modulation mode

Adjustment range : 0 or 1

Factory setting : 0

0 : Function disabled.

1 : The maximum voltage of the controller output is increased, and the motor torque is also higher. This suits applications where a reduced time for speed build-up (on cycles) is sought.

However, the motor torque may present very slight ripples when it is lightly loaded.

This modulation mode also enables special types of operation such as having an output frequency of 1000 Hz with a low switching frequency : 3 kHz.

5.21 : Stability during operation at constant power

Adjustment range : 0 or 1

Factory setting : 1

0 : Function disabled.

1 : Enables a reduction in the flux loop gain and can be used to reduce or even eliminate instabilities which may occur with operation in a reduced flux zone, ie. at constant power.

5.22 : Selection of speed resolution at 10 min⁻¹

Adjustment range : 0 or 1

Factory setting : 0

0 : Speed resolution = 1 min⁻¹.

1 : Speed resolution = 10 min⁻¹.

5.23

5.23 : Voltage offset

Adjustment range : 0 to 25.5 volts

This voltage offset is measured by the controller (see parameter 5.14). It allows controller imperfections to be corrected, notably voltage drops in the IGBTs and dead times. This parameter plays an important role in low speed operation, that is to say when the output voltage of the controller is low.

5.24

5.24 : Motor inductance

Adjustment range : 0 to 320.00 mH for 1.5 T to 16 T
0 to 32.00 mH for 22 T to 120 T

Factory setting : 0 mH

0 : The value stored in this parameter must be the total leakage induction of the motor. This value is measured during the self-calibration test. It is used to optimise the rated speed (see 5.27) and for cross-coupling. (see 5.26)

1 : This value is not measured, but the value of the parameter is used when parameter 5.26 = 1. The correct value must therefore be entered : enter half the phase-phase inductance of the motor used (see motor catalogue).

5.25

5.25 : Selection of doubling the output frequency

Adjustment range : 0 or 1

Factory setting : 0

0 : Function disabled

1 : Doubles the output frequency but does not modify any readings (for example 5.01 indicates the same value for 5.25 = 1 or 5.25 = 0).

! • Selection of this parameter causes the motor speed to be doubled. It is the responsibility of the user to ensure that this can be tolerated by the system.

5.26

5.26 : Cross-coupling compensation

Adjustment range : 0 or 1

Factory setting : 0

0 : Function disabled

1 : In closed loop vector mode, there is interaction between the flux and the torque on transients. This may lead to instabilities which can be eliminated by enabling this function. The effects are only significant for a switching frequency of 3KHz, which is why this parameter can only be enabled for this frequency. In servo mode this phenomenon also exists but especially with high speeds (6000 min⁻¹) and may cause an overcurrent trip.

For this parameter to operate the correct inductance value must be entered in parameter 5.24 that is to say the total phase inductance (half the phase - phase inductance).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

5.27 : Enable slip compensation

Adjustment range : 0 or 1

Factory setting : 0

0 : Slip compensation disabled.

1 : Slip compensation enabled.

Compensation is only activated if the motor rated speed has been correctly set in parameter **5.08**.

CAUTION :

This parameter must be at 1 to achieve good performance at low speed. However, it may produce instability with high inertia applications, in which case leave **5.27** = 0.

& : Automatic optimisation of motor rated speed

Adjustment range : 0 or 1

Factory setting : 0

0 : Optimisation of rated speed disabled.

1 : Allows correction of any gaps caused by motor temperature by modifying **5.08. If necessary, this corrected value can be stored. Automatic optimisation requires that the motor leakage inductance stored in **5.24** is accurate.**

Note that optimisation is not active when the speed is less than the rated speed divided by 8 and the motor load is less than the rated load divided by 8.

5.28 : Disabling the torque compensation in reduced flux zone

Adjustment range : 0 or 1 zone

Factory setting : 0

0 : In speed regulation mode there is no torque compensation in the reduced flux zone.

1 : In speed regulation mode, enables torque compensation in the reduced flux zone in order to maintain system stability.

5.29 : Inflection points 1 and 2 on the flux curve

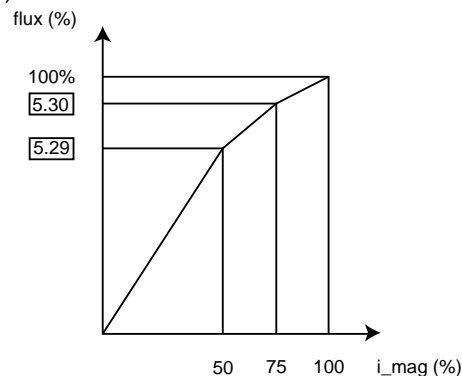
Adjustment range : 0 to 100 % of rated flux

Factory setting : **5.29** = 50 % of rated flux

5.30 = 75 % of rated flux

A simulation of motor saturation avoids torque jerks at the start of reduced flux.

Parameters **5.29** & **5.30** define the inflection points for the magnetising current flux curve (see diagram below)



5.29 & **5.30** are measured during self-calibration.

5.31 : Voltage regulation gain

Adjustment range : 0 to 30

Factory setting : 1

This parameter sets the gain for the voltage regulation used during mains failure or during the standard deceleration ramp. 1 is the value of the gain used with previous versions. Higher values are required for applications where several controllers are linked via the DC bus and where one controller is master in relation to the others. This parameter allows for the loss of gain due to the higher capacity of the DC bus to be compensated, a consequence of parallel operation.

5.32 & : End of rated speed setting

Adjustment range : 0.0 to 0.99 ¹/₁₀₀ min⁻¹

Factory setting : 0 ¹/₁₀₀ min⁻¹

This parameter is used to refine the rated speed set in parameter **5.08**, the rated speed becomes **5.08** + **5.32**.

Mainly used for high power motors as slip is low. Automatic optimisation also affects this parameter.

5.33 : Enable thermal protection modelling

Adjustment range : 0 or 1

Factory setting : 0

0 : Current limiting as a function of switching frequency

1 : Switching frequency is automatically adjusted according to the thermal simulation. Based on an ambient temperature of 40 °C, when the junction temperature of the transistors (read in **7.32) reaches 145 °C, the switching frequency is reduced. The permitted changes are from 12 KHz to 6 KHz, from 6KHz to 3 KHz and from 9 KHz to 4.5 KHz. This change of frequency reduces the losses and the junction temperature is thus reduced. If the temperature rises above 145 °C, the controller trips on "0h1".**

The switching frequency set in parameter **5.18** is not modified.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

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Open and closed loop speed controllers for asynchronous and synchronous motors

6 - MENU 6 : MANAGEMENT OF LOGIC COMMANDS AND COUNTERS

6.1 - List of Menu 6 parameters

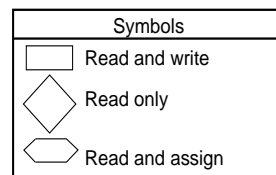
| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|------|-------------------------------------|-------------------------|--------------|
| 6.01 | Stopping mode | R/W | | 0 to 4 | 1 | |
| | | | | 0 to 3 | | |
| | | | | | | |
| 6.02 | Automatic starting mode | R/W | | 0 to 2 | 0 | |
| 6.03 | Microbreak management | R/W | | 0 to 2 | 0 | |
| 6.04 | Logic command | R/W | | 0 to 4 | 4 | |
| 6.05 | Minimum jog duration | R/W | | 0 to 25.0 s | 0.0 s | |
| 6.06 | DC injection braking level | R/W | | 0 to 4.05 | 100 % | |
| 6.07 | DC injection braking time | R/W | | 0 to 25.0 s | 5.0 s | |
| 6.08 | Standstill torque | R/W | & | 0 or 1 | 0 | |
| | | | | | 1 | |
| 6.09 | Flying restart | R/W | | 0 or 1 | 0 | |
| | | | & | | 1 | |
| 6.10 | Flying restart ramp | R/W | | 0 to 25.0 s/100 Hz | 5.0 s/100 Hz | |
| 6.11 | Enable keypad Start key | R/W | | 0 or 1 | 0 | |
| 6.12 | Enable keypad Stop key | R/W | | 0 or 1 | 0 | |
| 6.13 | Enable keypad FWD/REV key | R/W | | 0 or 1 | 0 | |
| 6.15 | Controller unlocking | R/W | | 0 or 1 | 1 | |
| 6.16 | Cost of kWh (in currency units) | R/W | | 0 to 600.0 unit/kWh | 0.0 unit/Kwh | |
| 6.17 | Energy meter reset | R/W | | 0 or 1 | 0 | |
| 6.18 | Running time before alarm 1 | R/W | | 0 to 30000 h | 0 h | |
| 6.19 | Alarm 1 and counter reset | R/W | | 0 or 1 | 0 | |
| 6.20 | Running time before alarm 2 | R/W | | 0 to 30000 h | 0 h | |
| 6.21 | Alarm 2 and counter reset | R/W | | 0 or 1 | 0 | |
| 6.22 | Time counter (years, days) | RO | | 0 to 30.365 Years,days | - | - |
| 6.23 | Time counter (hours, minutes) | RO | | 0 to 23.59 h,min | - | - |
| 6.24 | Energy meter (MWh) | RO | | 0 to 30000 MWh | - | - |
| 6.25 | Energy meter (kWh) | RO | | 0 to 999.9 kWh | - | - |
| 6.26 | Running cost per hour (in currency units) | RO | | 0 to 32000 unit/hour | - | - |
| 6.27 | Time before alarm 1 | RO | | 0 to 30000 h | - | - |
| 6.28 | Time before alarm 2 | RO | | 0 to 30000 h | - | - |
| 6.29 | Assign controller unlocking terminal | RO | | 0 or 1 | - | - |
| 6.30 | Logic commands for sequential bit 0 | R/A | | 0 or 1 | 0 | - |
| 6.31 | Logic commands for sequential bit 1 | R/A | | 0 or 1 | 0 | - |
| 6.32 | Logic commands for sequential bit 2 | R/A | | 0 or 1 | 0 | - |
| 6.33 | Logic commands for sequential bit 3 | R/A | | 0 or 1 | 0 | - |
| 6.34 | Assign Start/Stop terminal | R/A | | 0 or 1 | 0 | - |
| 6.35 | Forward limit switch input | R/A | | 0 or 1 | - | - |
| 6.36 | Reverse limit switch input | R/A | | 0 or 1 | - | - |
| 6.37 | Voltage applied during flying restart | R/W | | 0 to 100.0 % of motor rated voltage | 25.0 % of motor voltage | |
| 6.38 | Time to return to ref. frequency | R/W | | 0 to 2.50 s | 0.25 s | |

UMV 4301

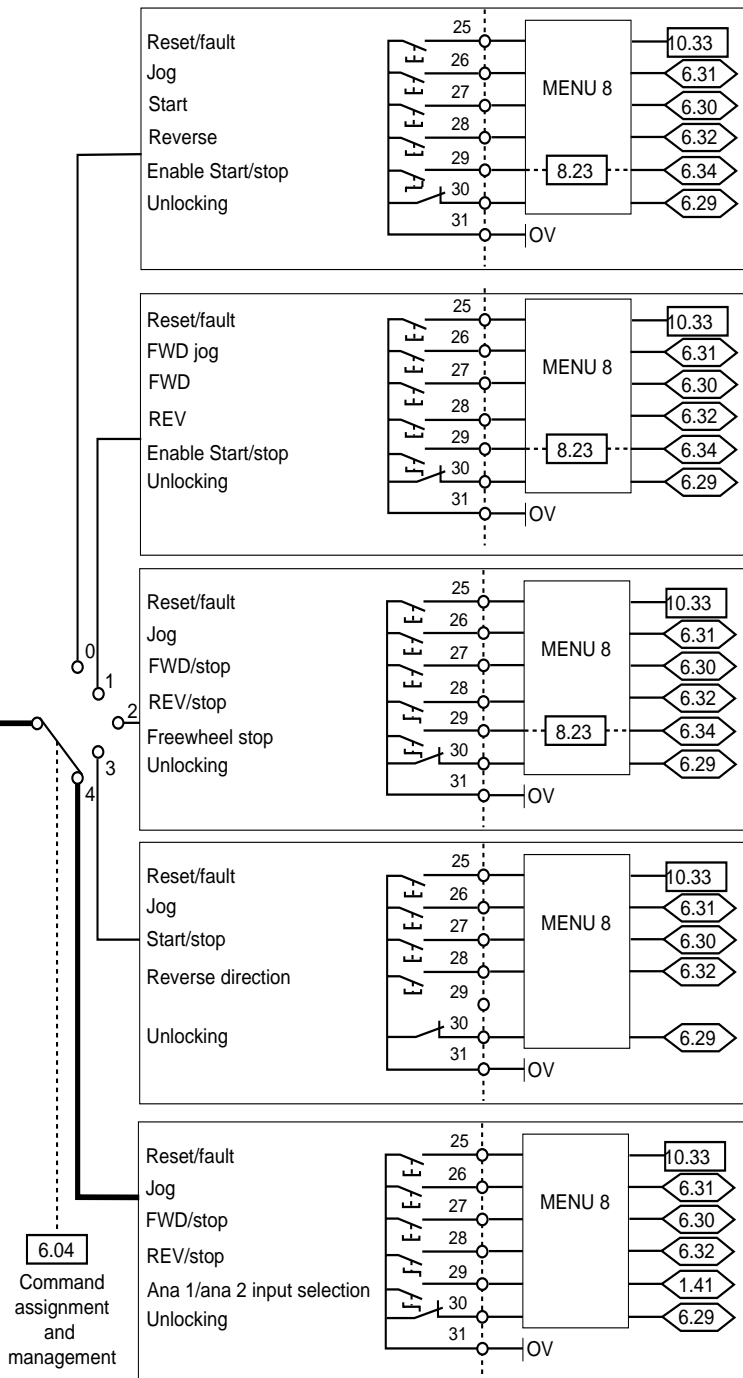
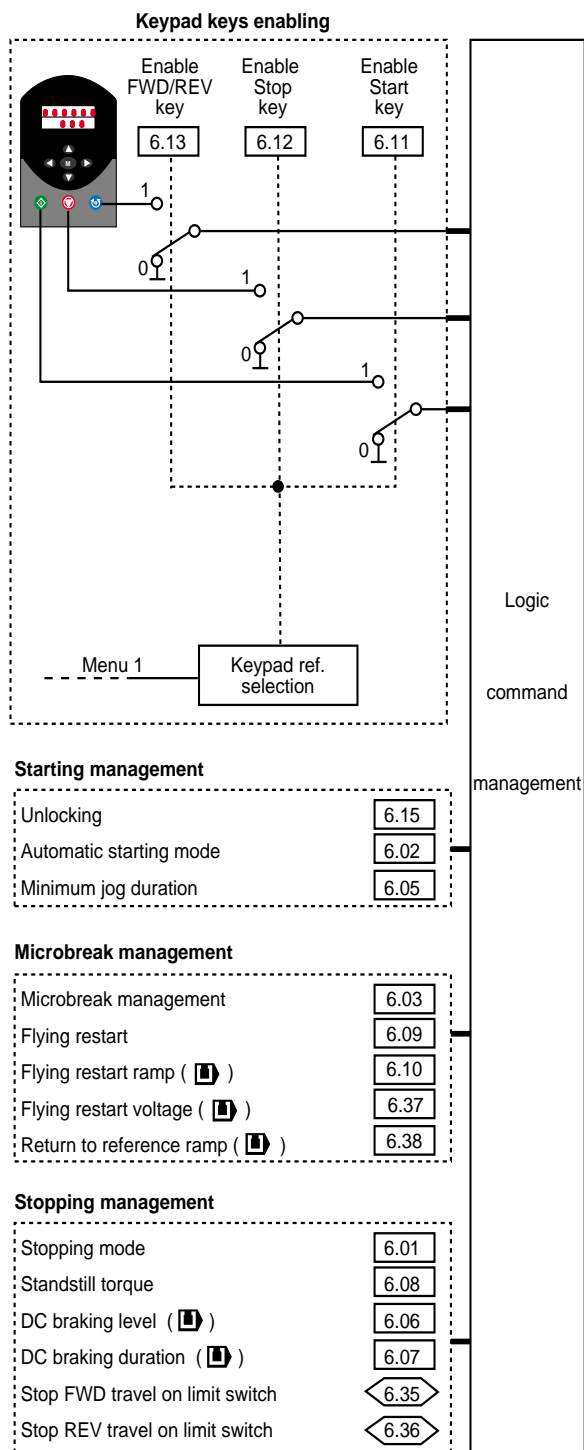
Open and closed loop speed controllers for asynchronous and synchronous motors

6.2 - Menu 6 synoptic views

6.2.1 - Management of logic commands






Automatic configuration of terminal block

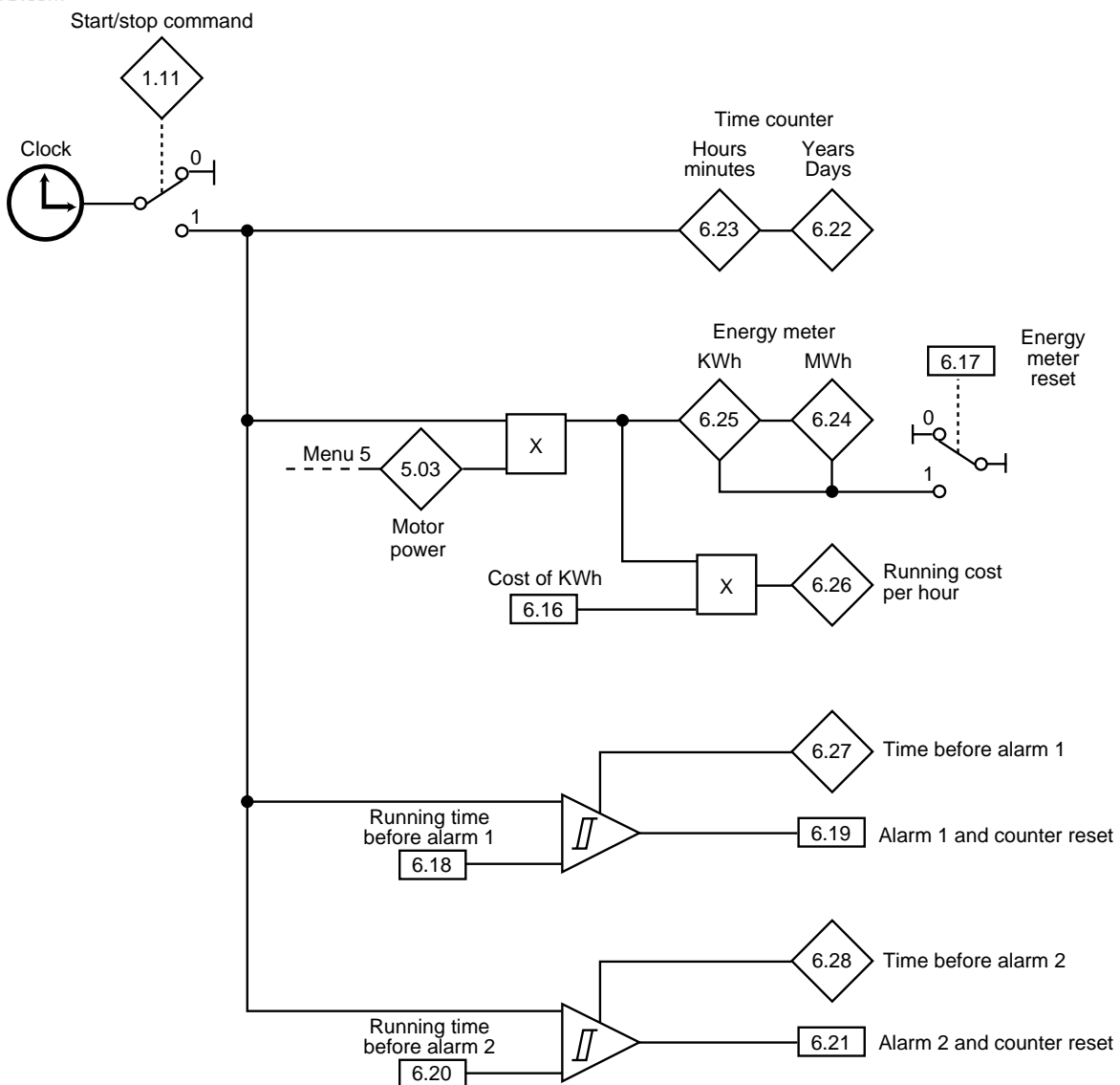


UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

6.2.2 - Time counter, energy meter and alarms

| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |




UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

6.3 - Explanation of menu 6 parameters

Symbols :

- open loop 

- closed loop 

- servo mode 

6.01 : Selection of the stopping mode

Adjustment range :

 :

| Setting | Display | Function |
|---------|---------|--|
| 0 | COAST | Freewheel stop |
| 1 | rp | Stop on deceleration ramp |
| 2 | rp. dcl | Deceleration ramp + DC injection for 1s |
| 3 | dcl | Stop by DC injection braking and elimination at zero speed |
| 4 | td. dcl | Stop by DC injection (fixed time) |

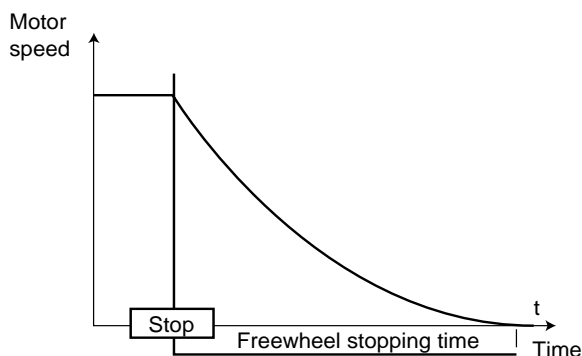
 }
 } :

| Setting | Display | Function |
|---------|---------|-----------------------------|
| 0 | COAST | Freewheel stop |
| 1 | rp | Stop on deceleration ramp |
| 2 | no. rp | Stop without ramp |
| 3 | rp. Pos | Orientation stop (indexing) |


Factory setting :  } : 1 (rp)
 } : 2 (no.rp)

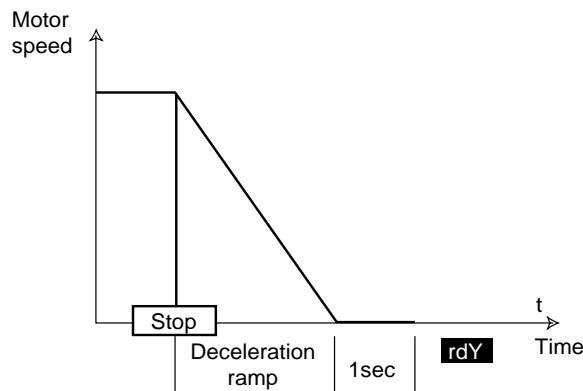

0 (COAST) : Freewheel stop

The power bridge is deactivated as soon as there is a stop command. The controller cannot receive a new start command for 2s, which is the motor demagnetising time. The display shows rdY 2s after the stop command. The stopping time of the machine depends on its inertia.





1 (rp) : Stop on deceleration ramp

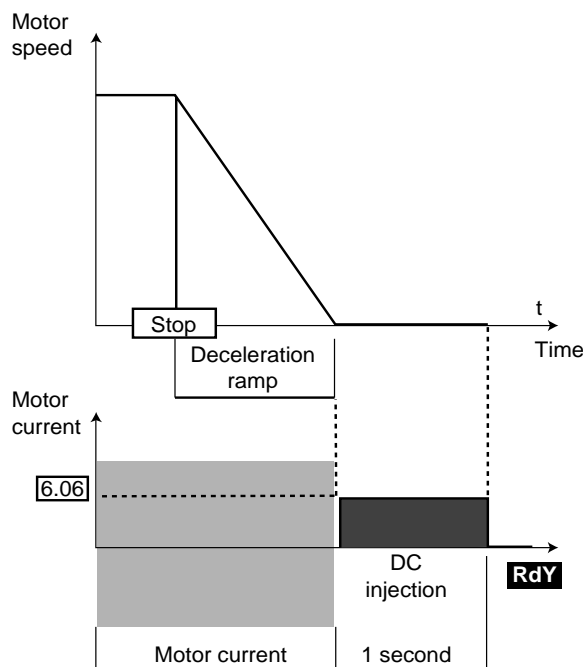
The controller decelerates the motor according to the deceleration mode selected in parameter  2.04 . One second after stopping, the display indicates rdY.



2 (rp.dcl) : Stop on deceleration ramp with DC injection for 1s

The controller decelerates the motor according to the deceleration mode selected in parameter  2.04 . When zero frequency is reached, the controller injects direct current with an amplitude which can be set by parameter  6.06 for 1 second.

The controller then displays rdY.



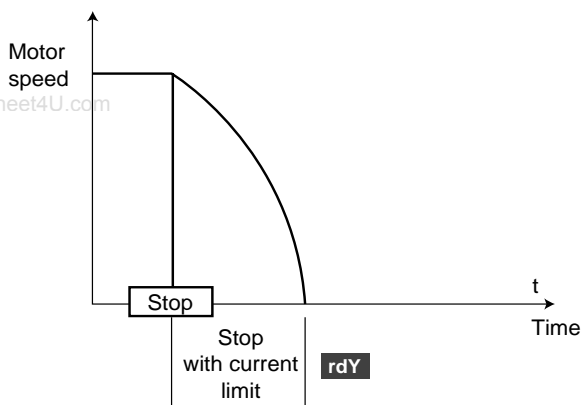
UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

2 (no.rp) : Stop without ramp

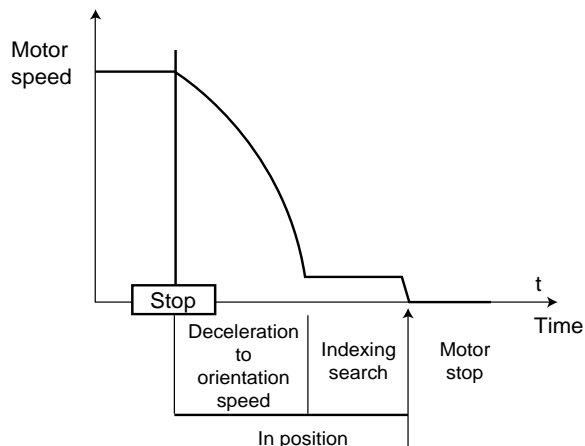
The controller stops the motor with the current limit set by **4.07**.

When the motor stops, the display indicates rdY.



3 (rp.POS) : Orientation stop (indexing)

The controller stops the motor with the current limit defined by **4.07**. The motor is stopped when the shaft is in the required position.

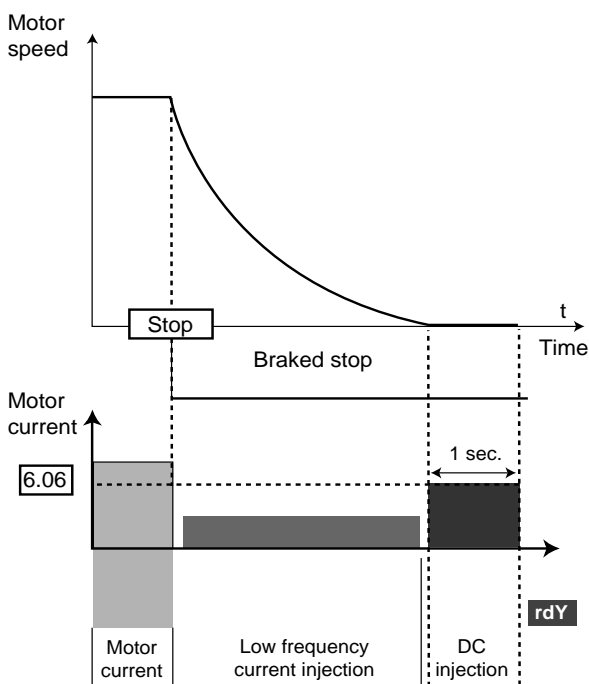


CAUTION : Position parameters can be set in menu 13 (parameters **13.08, **13.11** and **13.12**)**

3 (dcl) : Stop by DC injection braking, and elimination at zero speed

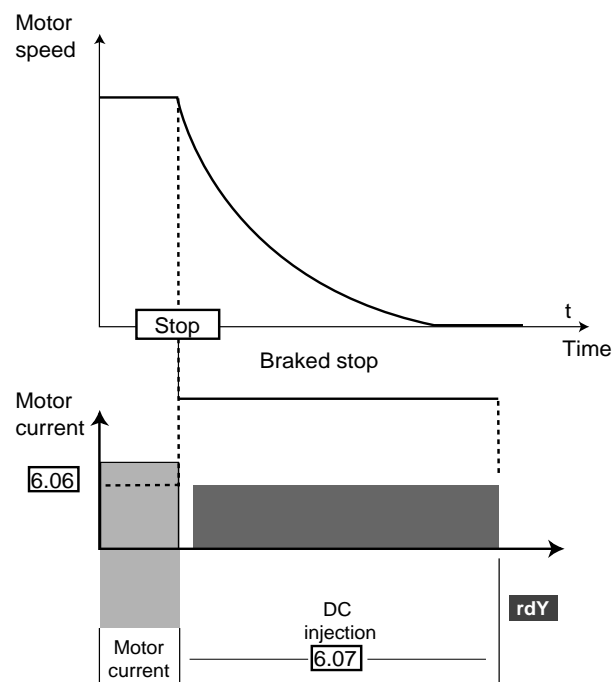
The controller decelerates the motor by applying a low frequency current until almost zero speed which the controller detects automatically.

The controller then injects direct current at an amplitude set by parameter **6.06** for 1 second. The controller then displays rdY. No start command can be taken into account until rdY is displayed.



4 (td. dcl) : DC injection stop with fixed time

The controller decelerates the motor by applying a current defined by parameter **6.06** for a time defined by parameter **6.07** then the controller displays rdY. No start command can be taken into account until rdY is displayed.



UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

6.02 : Automatic starting mode

Adjustment range : 0 to 2
Factory setting : 0

| | | |
|---|------|------------------------------------|
| 0 | diS | On change of state |
| 1 | ALYS | Automatic on power-up |
| 2 | PddP | Depends on state when powered down |

diS : The controller never starts automatically on power-up. A start command is always required.

ALYS : The controller starts automatically on power-up, if the controller is unlocked and the start command is enabled.

PddP : The state of the controller at power-down is memorised. If the controller was running when the power was lost, the controller restarts automatically when the voltage is reapplied (provided it is unlocked and the start command is enabled). If the controller was stopped at power-down, it will not restart automatically.

This parameter is not operational if 6.04 = 2 - 3 or 4 as in these 3 modes, the start inputs must remain enabled for the controller to operate.

6.03 : Microbreak management

Adjustment range : 0 to 2
Factory setting : 0

| | | |
|---|---------|-------------------------------|
| 0 | diS | Transparent to microbreaks |
| 1 | StoP | Decelerate to a standstill |
| 2 | ridE.th | Decelerate until mains return |

diS : The controller is not affected by mains breaks and continues to operate as long as the DC bus voltage is sufficient.

Stop : In the event of a mains failure, the controller decelerates on a ramp, automatically calculated by the controller, so that the motor returns energy to the controller DC bus and therefore continues to power its control electronics. On return to normal conditions, deceleration continues until the motor stops.

ridE.th : In the event of a mains failure, the controller decelerates on a ramp, automatically calculated by the controller, so that the motor returns energy to the controller DC bus and therefore continues to power its control electronics. On return to normal conditions, the motor reaccelerates up to the speed setpoint.

In closed loop mode 6.03 is 0 or 2.

6.04 : Assigning and managing logic commands

Adjustment range : 0 to 4
Factory setting : 4

5 controller control modes are available. The terminal block configuration for each value of 6.04 is given in section 6.2.1.

5 sequential bits, 6.30 to 6.34, the function of which depends on the control mode selected (6.04), are assigned to the controller logic inputs via menu 8.

| Mode | 6.30 | 6.31 | 6.32 | 6.33 | 6.34 |
|------|----------------|---------|-------------------|---------|-------------------|
| 0 | Start | Jog | Reverse direction | - | Enable Start/Stop |
| 1 | FWD | FWD Jog | REV | REV Jog | Enable Start/Stop |
| 2 | FWD | Jog | REV | - | Enable Start/Stop |
| 3 | Start/Stop | Jog | Reverse direction | - | - |
| 4 | FWD Start/Stop | Jog | REV Start/Stop | - | - |

- Notes :**
- In mode 0, the FWD/REV and Start keys on the keypad, if they are enabled, have priority over terminals 27 and 28.
 - In mode 1, terminals 27 and 28 have priority over the FWD/REV and Start keys on the keypad if these are enabled.
 - In mode 2 to 4, the terminals must be maintained to be enabled. The FWD/REV and Start keys on the keypad are not therefore operational.
 - In jog mode, first give the jog command then enable the FWD or REV command.
 - In modes 0 to 3, assignment of 6.34 to terminal 29 is not automatic, set parameter 8.23 to 6.34

6.05 : Minimum jog duration

Adjustment range : 0 to 25.0 s
Factory setting : 0.0 s

This parameter can be used to define a minimum step-by-step time which corresponds to one pulse on a "jog operation" input.

This parameter is not operational if 6.04 = 2 - 3 or 4.

6.06 : DC injection braking level

Adjustment range : 0 to 4.05
Factory setting : 100.0 %

In open loop control mode this parameter defines the level of current used for DC injection braking.

CAUTION :

For effective braking, the value of parameter 6.06 must be at least 60 %.

6.07 : DC injection braking time

Adjustment range : 0 to 25.0 s
Factory setting : 5.0 s




This parameter defines the duration of braking by low frequency current when 6.01 = td-dcl.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

6.08 : Standstill torque

Adjustment range : 0 or 1

Factory setting :  } : 0
 } : 0
 : 1




0 : Switches the motor off on stopping.

1 : The controller will maintain the standstill torque after a stop command rather than locking the output bridge. The controller will be in the " StoP " state when it is stopped rather than " rdY ".

⚠ In this configuration, voltage is present at the motor terminals when it is stopped.


6.09 : Flying restart

Adjustment range : 0 or 1

Factory setting :  : 0
 } : 1
 } : 1



0 : Flying restart disabled

1 : Flying restart enabled

 : If this parameter is enabled, when a Start command is given or after a mains failure, the controller executes a procedure to calculate the frequency and direction of rotation of the motor. It automatically resets the output frequency to the measured value and reaccelerates the motor up to the reference frequency.

⚠ • If the load is stationary at the moment the Start command is given or when the mains returns, this operation may cause the machine to rotate in both directions before the motor accelerates.

• Before enabling this function, ensure that there is no danger to people or equipment.

 &  : This is performed in closed loop mode by synchronising the ramp output with the actual rotation speed of the motor when the controller receives the start command.

6.10 : Flying restart ramp

Adjustment range : 0 to 25.0 s/100 Hz

Factory setting : 5.0 s/100 Hz

This parameter defines the ascending frequency ramp during the flying restart test.

Set a low value for low inertia applications to ensure a precise measurement.

Set a higher value in high inertia applications to avoid overvoltage trips.

6.11 : Enable keypad Start key

Adjustment range : 0 or 1

Factory setting : 0

0 : Start Key disabled.

1 : Enables the Start key on the keypad. This parameter is automatically at 1 when the keypad reference is selected.

6.12 : Enable keypad Stop key

Adjustment range : 0 or 1

Factory setting : 0

0 : Stop Key disabled.

1 : Enables the Stop key on the keypad. This parameter is automatically at 1 when the keypad reference is selected.

6.13 : Enable keypad FWD/REV key

Adjustment range : 0 or 1

Factory setting : 0

0 : FWD/REV key disabled

1 : Enable the Forward/Reverse key on the keypad.

6.15 : Controller unlocking

Adjustment range : 0 or 1

Factory setting : 1

0 : Controller locked.

1 : Controller unlocked.

6.16 : Cost of kWh

Adjustment range : 0 to 600.0 unit / kWh

Factory setting : 0.0 unit / kWh

When this parameter is set to the local currency, parameter [6.26](#) enables the running costs to be read instantaneously.

6.17 : Reset energy meter

Adjustment range : 0 or 1

Factory setting : 0

When this parameter is at 1, parameters [6.24](#) and

[6.25](#) are reset to 0.

6.18 : Operating time before alarm 1

Adjustment range : 0 to 30000 h

Factory setting : 0 h

Used to set the operating time before an alarm is tripped.

6.19 : Alarm 1 and counter reset

Adjustment range : 0 or 1

Factory setting : 0

This parameter goes to 1 when the operating time before alarm 1 has elapsed.

Resetting this parameter to zero will return the counter to its initial value ([6.18](#)).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

6.20 : Operating time before alarm 2

Adjustment range : 0 to 30000 h
 Factory setting : 0 h
 Used to set the operating time before an alarm is tripped.

6.21 : Alarm 2 and counter reset

Adjustment range : 0 or 1
 Factory setting : 0
 This parameter goes to 1 when the operating time before alarm 2 has elapsed.
 Resetting this parameter to zero will return the counter to its initial value (6.20).

6.22 : Time counter (years, days)

Adjustment range : 0 to 30.365 Years, days
 This parameter logs the operating years and days since the controller was first commissioned.

6.23 : Hour counter (hours, minutes)

Adjustment range : 0 to 23.59 h, min
 This parameter logs the operating hours and minutes since the controller was first commissioned.

After 23.59, 6.23 returns to 0 and 6.22 is incremented by 1 day.

6.24 : Energy meter (MWh)

Adjustment range : 0 to 30000 MWh
 This parameter logs the controller energy consumption 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 999.9 kWh
 This parameter logs controller energy consumption in kWh.
 This counter can be reset to 0 by changing parameter 6.17 to 1.

6.26 : Running costs

Adjustment range : 0 to 32000 unit / hour
 Instantaneous reading of the hourly running cost of the controller. It is essential that parameter 6.16 is set correctly.

6.27 : Time before alarm 1

Adjustment range : 0 to 30000 h
 This parameter indicates the operating time remaining before the controller trips alarm 1.

6.28 : Time before alarm 2

Adjustment range : 0 to 30000 h
 This parameter indicates the operating time remaining before the controller trips alarm 2.

6.29 : Controller unlocking terminal

Adjustment range : 0 or 1
 If parameter 8.09 is at 1, terminal 30 becomes a locking input. In this case, parameter 6.29 is at 0 when the controller is locked and at 1 when it is unlocked.
 If parameter 8.09 = 0, parameter 6.29 remains permanently at 1.

6.30 to 6.33 : Sequential bits

6.34 : Start/Stop bit

Adjustment range : 0 or 1
 Factory setting : 0
 The logic commands manager for the controller (6.04) uses these bits as inputs rather than referring directly to the terminals. This allows the customer to define the use of each controller terminal depending on the requirements of each application. Although these parameters are read / write, they are volatile and are not memorised on power-down. Each time the controller is powered up they are reset to 0.

6.30 : Logic commands for sequential bit 0

6.31 : Logic commands for sequential bit 1

6.32 : Logic commands for sequential bit 2

6.33 : Logic commands for sequential bit 3

6.34 : Start/Stop terminal assignment

6.35 and 6.36 : Limit switch inputs

Adjustment range : 0 or 1
 These parameters, when they are at 1, cause the controller to stop. They can be used as limit switches.

6.35 stops the controller when it is operating in a forward direction.

6.36 stops the controller when it is operating in a reverse direction.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

6.37 : Voltage applied during the flying restart procedure

Adjustment range : 0 to 100.0 % of motor rated voltage
Factory setting : 25.0 %

This parameter fixes the voltage applied during the flying restart procedure. Too high a value causes current limiting and may generate a trip, but too low a value creates problems with detection at at low speeds.

6.38 : Time to return to the reference frequency

Adjustment range : 0 to 2.50 s
Factory setting : 0.25 s

When the flying restart procedure is complete, the controller gradually increases the voltage of the value set in **6.37** to the voltage which corresponds to the reference frequency. This parameter is used to set the ramp. Too short a time causes undesirable current peaks whereas too long a time is to be avoided on applications where the speed decreases rapidly.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes






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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

7 - MENU 7 : ASSIGNING ANALOGUE INPUTS AND OUTPUTS

7.1 - List of Menu 7 parameters

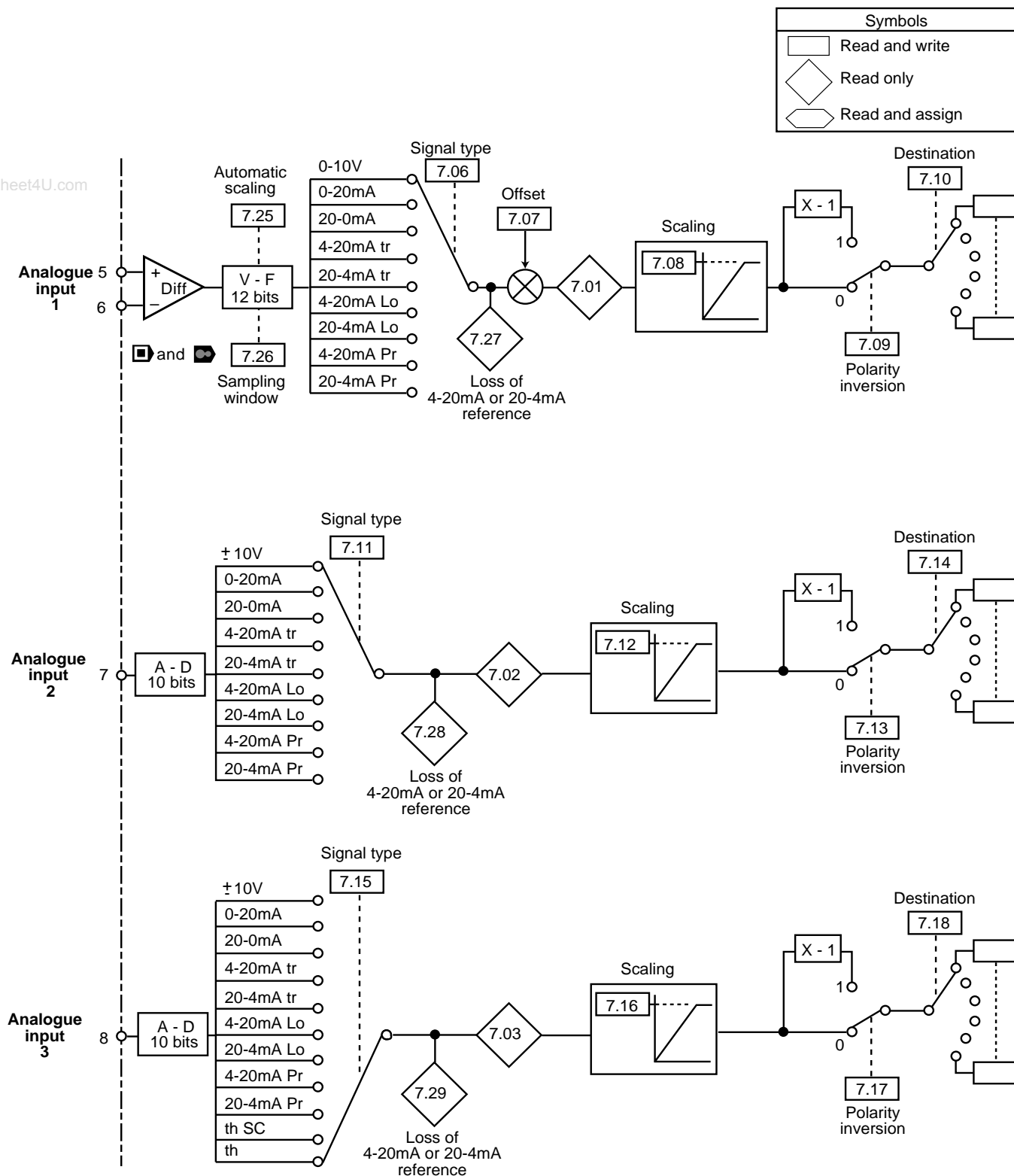
| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|---|------------------|-----------------|--------------|
| 7.01 | Analogue input 1 | RO | | ±100.0 % | - | - |
| 7.02 | Analogue input 2 | RO | | ±100.0 % | - | - |
| 7.03 | Analogue input 3 | RO | | ±100.0 % | - | - |
| 7.04 | Heatsink temperature | RO | | 0 to 100°C | - | - |
| 7.05 | Ambient temperature | RO | | 0 to 100°C | - | - |
| 7.06 | Selection of signal type on analogue input 1 | R/W | | 0 to 8 | 0 | |
| 7.07 | Analogue input 1 offset | R/W | | ± 10.000 % | 0.000 % | |
| 7.08 | Scaling of analogue input 1 | R/W | | 0 to 4.000 | 1.000 | |
| 7.09 | Analogue input 1 inversion bits | R/W | | 0 or 1 | 0 | |
| 7.10 | Assignment of analogue input 1 | R/W | | 0.00 to 20.50 | 1.36 | |
| 7.11 | Selection of signal type on analogue input 2 | R/W | | 0 to 8 | 0 | |
| 7.12 | Scaling of analogue input 2 | R/W | | 0 to 4,000 | 1.000 | |
| 7.13 | Analogue input 2 inversion bits | R/W | | 0 or 1 | 0 | |
| 7.14 | Assignment of analogue input 2 | R/W | | 0.00 to 20.50 | 1.37 | |
| 7.15 | Selection of signal type on analogue input 3 | R/W | | 0 to 10 | 10 | |
| 7.16 | Scaling of analogue input 3 | R/W | | 0 to 4.000 | 1.000 | |
| 7.17 | Analogue input 3 inversion bits | R/W | | 0 or 1 | 0 | |
| 7.18 | Assignment of analogue input 3 | R/W | | 0.00 to 20.50 | 0.00 | |
| 7.19 | Analogue output 1 source | R/W |  | 0.00 to 20.50 | 5.01 | |
| | | |  &  | | 3.02 | |
| 7.20 | Scaling of analogue output 1 | R/W | | 0 to 4.000 | 1.000 | |
| 7.21 | Selection of signal type on analogue output 1 | R/W | | 0 to 2 | 0 | |
| 7.22 | Source analogue output 2 | R/W | | 0.00 to 20.50 | 4.02 | |
| 7.23 | Scaling of analogue output 2 | R/W | | 0 to 4.000 | 1.000 | |
| 7.24 | Selection of signal type on analogue output 2 | R/W | | 0 to 2 | 0 | |
| 7.25 | Automatic scaling of analogue input 1 | R/W | | 0 or 1 | 0 | |
| 7.26 | Analogue input 1 sampling window | R/W |  &  | 0 to 5.0 ms | 4.0 ms | |
| 7.27 | Loss of 4-20mA on analogue input 1 | RO | | 0 or 1 | - | - |
| 7.28 | Loss of 4-20mA on analogue input 2 | RO | | 0 or 1 | - | - |
| 7.29 | Loss of 4-20mA on analogue input 3 | RO | | 0 or 1 | - | - |
| 7.30 | Analogue output refresh time. | R/W | | 0 or 1 | 0 | |
| 7.31 | EPS option module present | RO | | 0 or 1 | - | - |
| 7.32 | IGBT junction temperature | RO | | 0 to 150°C | - | - |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

7.2 - Menu 7 synoptic views

7.2.1 - Assigning analogue inputs

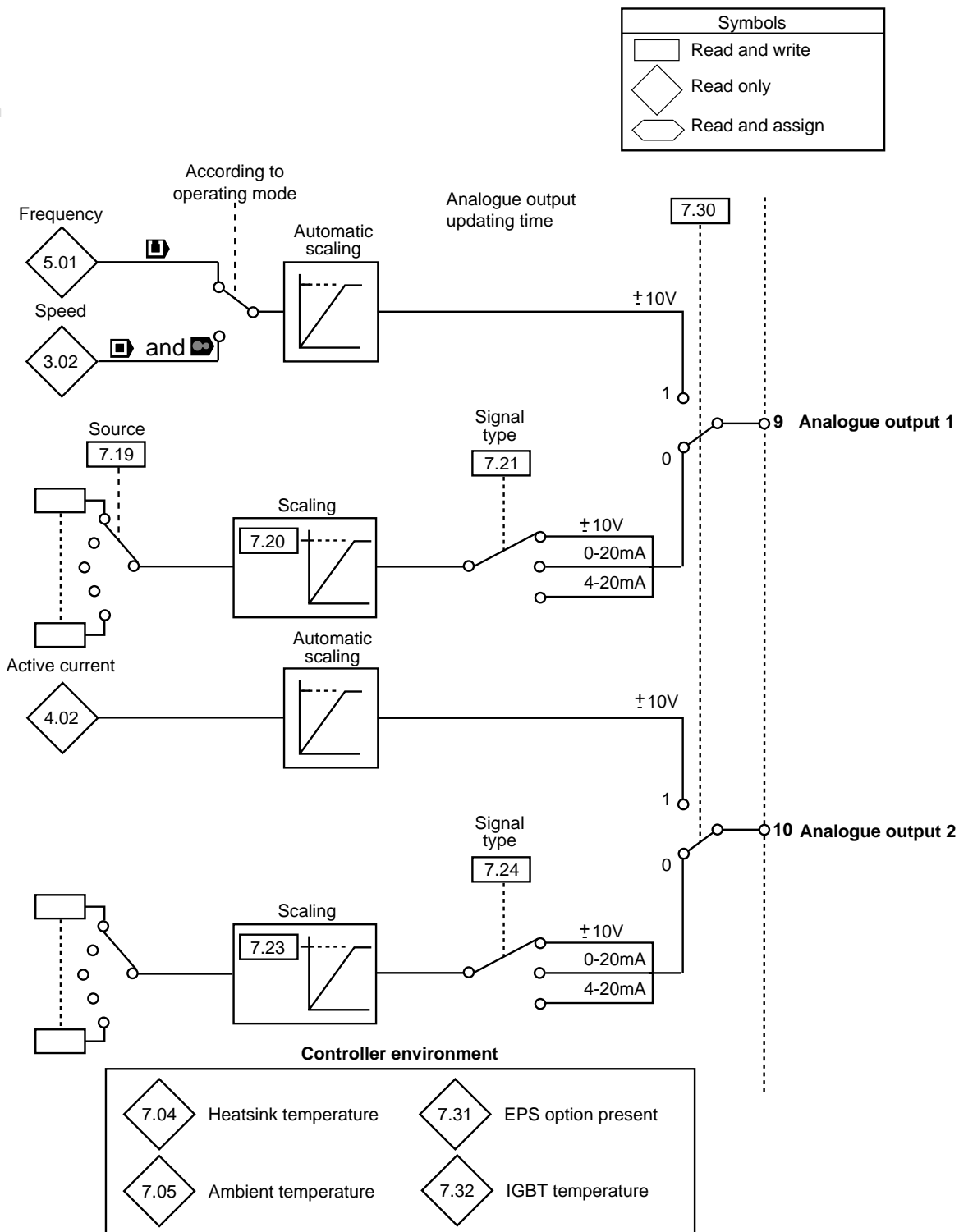


UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

7.2.2 - Assigning analogue inputs Speed controller environment

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










7.3 - Explanation of menu 7 parameters

Symbols :

- open loop 
- closed loop 
- servo mode 

to : Analogue inputs

Adjustment range : $\pm 100.0\%$ of the adjustment range of the parameter assigned to the analogue input.

- Enables the corresponding analogue input to be read.
- Analogue input 1 uses a Voltage-Frequency converter with a resolution of 12 bits + sign and with improved immunity to noise. Inputs 2 and 3 use an Analogue - Digital converter with a resolution of 10 bits + sign.
- The sampling period of the analogue inputs depends on the switching frequency ().
- This is 5.5 ms for a switching frequency of 3, 6 or 12 kHz and 7.4 ms for all other cases.
- If the analogue inputs are assigned to the frequency reference () or speed reference ( & ) via parameters  or  , the sampling period is reduced to 1.4 ms (or 1.9 ms) for the frequency reference () and to 345 μ s (or 460 μ s) for the speed reference ( & ).
- If the analogue inputs are assigned to the torque reference (), the sampling period will be 345 μ s (or 460 μ s).
- The sampling period of analogue input 1 can be assigned via the sampling window set in parameter  .

The adjustment range for the parameters is $\pm 100\%$ for voltage inputs and 0 - 100 % for current inputs.

: Heatsink temperature

Adjustment range : 0 to 100 °C

Reads the temperature measured by the heatsink. If it reaches 98 °C the controller trips and only allows restarting when the temperature has fallen below 94 °C.


: Ambient temperature


Adjustment range : 0 to 100 °C


Reads the ambient temperature taken around the control card. If it reaches 70 °C the controller trips and only allows restarting when the temperature has fallen below 65 °C.

, : Selection of signal type analogue inputs

Adjustment range : 0 to 8 on analogue inputs 1 and 2
0 to 10 on analogue input 3

Factory setting :  = Volt (0)

 = Volt (0)

 = th (10)

Each of the three analogue inputs can be configured differently.

| | | |
|----|---------|--|
| 0 | VOLt | Voltage input ± 10 V |
| 1 | 0-20 | 0-20 mA |
| 2 | 20-0 | 20-0 mA |
| 3 | 4-20.tr | 4-20 mA (trips if signal lost) |
| 4 | 20-4.tr | 20-4 mA (trips if signal lost) |
| 5 | 4-20.Lo | 4-20 mA (min. speed if signal lost) |
| 6 | 20-4.Lo | 20-4 mA (min. speed if signal lost) |
| 7 | 4-20.Pr | 4-20 mA (speed before trip if signal lost) |
| 8 | 20-4.Pr | 20-4 mA (speed before trip if signal lost) |
| 9 | th.SC | Thermistor with tripping on detection of short-circuit |
| 10 | th | Thermistor without short-circuit detection |

Note : For the 4-20 mA or 20-4 mA modes the threshold for signal loss is 3 mA.

: Analogue input 1 offset

Adjustment range : $\pm 10.000\%$ of the reference full scale.

Factory setting : 0.000 %

This parameter is used to add or subtract a fixed value at analogue input 1.

, : Scaling of analogue inputs

Adjustment range : 0 to 4.000

Factory setting : 1.000

These parameters can be used to scale the analogue inputs. However, this is rarely necessary, given that the maximum input level (100 %) automatically corresponds to the maximum value of the destination parameter.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

7.09 , **7.13** : Input inversion bits
7.17

Adjustment range : 0 or 1
Factory setting : 0
This parameter is used to reverse the polarity of the input signal.
0 : Input signal not reversed.
1 : Input signal reversed.

7.10 , **7.14** : Assigning analogue inputs
7.18


Adjustment range : **0.00** to **20.50**



Factory setting : **7.10** = **1.36**
: Analogue input 1 assigned to speed reference 1
7.14 = **1.37**
: Analogue input 2 assigned to speed reference 2
7.18 = **0.00**
: Analogue input 3 assigned to managing motor probes



These addresses must contain the number of the parameter which is to be assigned to the analogue inputs.
Only analogue parameters can be assigned.
If an unsuitable parameter is programmed, there will be no assignment.

7.19 , **7.22** : Analogue output sources

Adjustment range : **0.00** to **20.50**

Factory setting :  **7.19** = **5.01**
(Output frequency)

  } **7.19** = **3.02**
(Measured speed)

  } **7.22** = **4.02**
(Active current)

These addresses must contain the number of the parameter which is to be addressed at the analogue outputs.
Only analogue parameters can be addressed.
If an unsuitable parameter is programmed, the corresponding analogue output takes the value 0.

7.20 **7.23** : Scaling of the analogue outputs

Adjustment range : 0 to 4.000
Factory setting : 1.000
These parameters may be used to scale the analogue outputs. However, this is rarely necessary, given that the maximum value of the analogue output automatically corresponds to the maximum value of the parameter which is assigned to the analogue output.

7.21 , **7.24** : Selection of signal type on analogue outputs

Adjustment range : 0 to 2
Factory setting : 0
Each of the 2 analogue outputs can be configured in 3 ways.




| 0 | VOLt | Output range $\pm 10V$ |
|---|------|-------------------------|
| 1 | 0-20 | Output range 0 to 20 mA |
| 2 | 4-20 | Output range 4 to 20 mA |



For current outputs, negative values of a parameter are equal to the minimum output value (0 or 4 mA).
Refresh time : see **7.30**

7.25 : Automatic scaling of analogue input 1

Adjustment range : 0 or 1
Factory setting : 0
0 : Automatic scaling disabled.
1 : Automatic scaling of analogue input 1.
The value of the analogue input at the moment of scaling is considered to be the maximum value.
The input voltage or current must be greater than 25 % of the maximum voltage or current (2.5 V or 5 mA) at the moment of scaling.
The maximum value is memorised automatically when the controller is switched off.
Automatic scaling can be cancelled by repeating the procedure with an input signal less than 15 % of the maximum value (1.5 V or 4.6 mA).
Scaling must be performed while the motor is stopped.
Parameter **7.25** is automatically reset to 0 when scaling is completed.

7.26  &  : Analogue input 1 sampling window

Adjustment range : 0 to 5.0 ms
Factory setting : 4.0 ms
This parameter affects low speed performance and the response time on sudden variation in the speed reference. Low values give a good dynamic response but instability at low speed. Higher values result in good operation at low speed but dynamic performance is reduced. A compromise must be found between low speed operation and the dynamic response. This parameter is only used in special cases where parameters  **1.36** ,  **1.37** or  **3.19** are assigned to analogue input 1.

 **7.27** to  **7.29** : Loss of 4-20mA signal

Adjustment range : 0 or 1
These parameters change to 1 when in 4-20 mA current mode, the signal on the analogue input falls below 3 mA.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

7.30 : Analogue output refresh time.


Adjustment range : 0 or 1



Factory setting : 0

0 : The refresh time is 5.5 ms for a switching frequency of 3 or 6 or 12 kHz or 7 ms for all other switching frequencies.

In this case, the source can be any analogue parameter, scaling is possible and the output can be configured for voltage or current.

1 : Refresh time is 345 μ s (or 460 μ s) but the following restrictions must be considered :

Analogue output 1 :  The source can only be frequency (). The output can only be voltage and ± 10 V corresponds to ± 125 Hz when is less than ± 100 Hz. Otherwise ± 10 V corresponds to ± 1000 Hz.
eg : if = 50 Hz, the output is 4 V.
if = 150 Hz, the output is 1.5 V.

 &  : The source can only be the image of the speed from the encoder ().
The output can only be voltage and is limited to 5.5 V which corresponds to a speed of 3000 min^{-1} with a 4096 pt encoder.
eg. : For a speed of 1500 min^{-1} with a 1024 pt encoder, the output is 1.375 V).

Analogue output 2 : The source can only be the active current (). The output can only be voltage and ± 10 V corresponds to $\pm I_{\text{max}}$ controller trip (215 % of controller rated current).

7.31 : Indication of presence of EPS UMV option

Adjustment range : 0 or 1

Factory setting : 0

0 : Option not present.

1 : The EPS UMV option is installed in the controller.
The presence of the EPS UMV option deactivates the controller analogue input. The EPS UMV option precision analogue input can then be used.

This module must never be handled when the controller is powered up.

7.32 : IGBT junction temperature

Adjustment range : 0 to 150 $^{\circ}\text{C}$




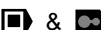
This parameter indicates the junction temperature of the IGBT. As this temperature has been calculated on the basis of an ambient temperature of 40 $^{\circ}\text{C}$, the minimum value which can be read is 40 $^{\circ}\text{C}$. Reading is only possible if the modelling parameter is enabled (= 1).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

8 - MENU 8 : ASSIGNING LOGIC INPUTS AND OUTPUTS

8.1 - List of Menu 8 parameters

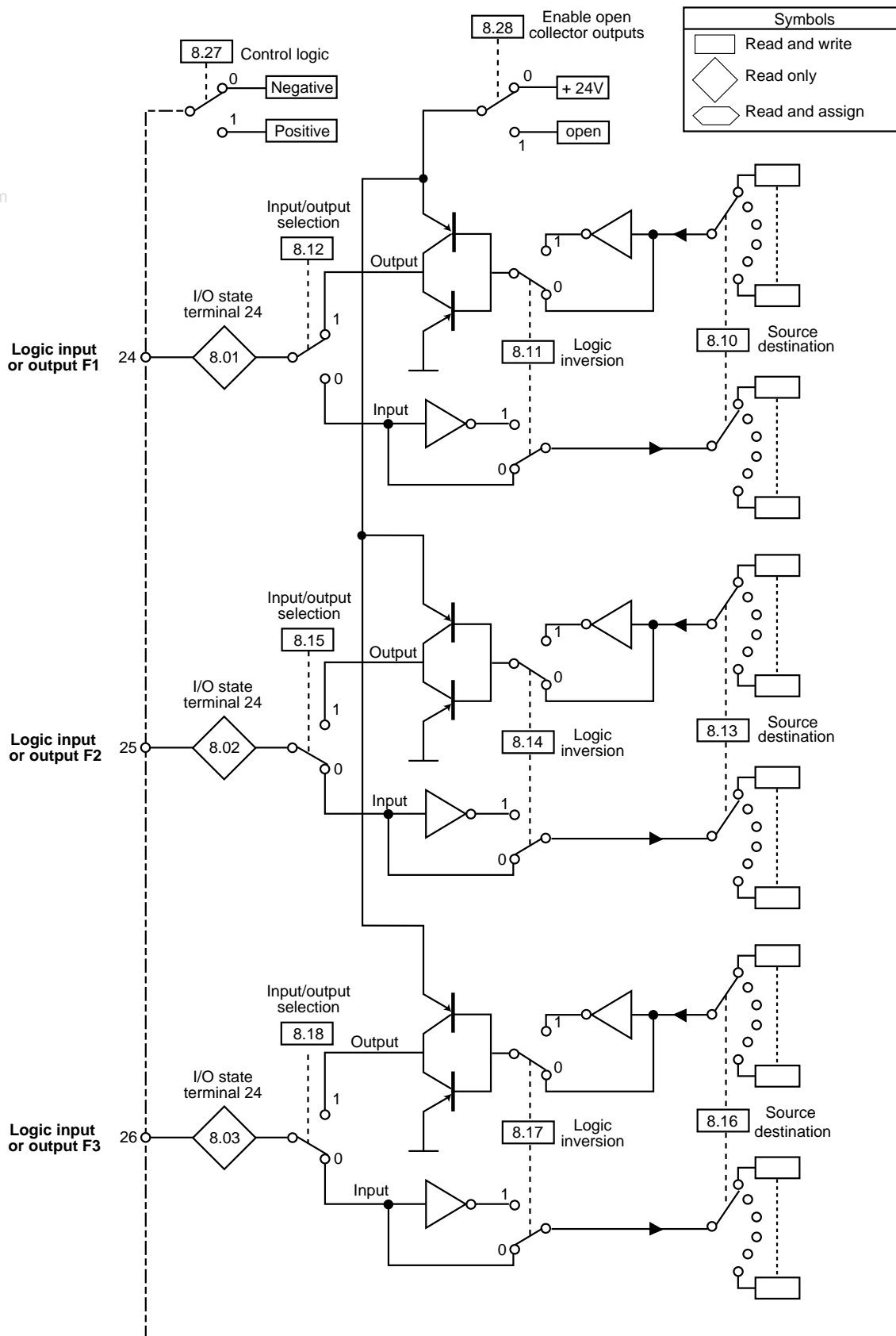
| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|---|------------------|-----------------|--------------|
| 8.01 | Read the state of the input or output on terminal 24 | RO | | 0 or 1 | - | - |
| 8.02 | Read the state of the input or output on terminal 25 | RO | | 0 or 1 | - | - |
| 8.03 | Read the state of the input or output on terminal 26 | RO | | 0 or 1 | - | - |
| 8.04 | Read the state of the input on terminal 27 | RO | | 0 or 1 | - | - |
| 8.05 | Read the state of the input on terminal 28 | RO | | 0 or 1 | - | - |
| 8.06 | Read the state of the input on terminal 29 | RO | | 0 or 1 | - | - |
| 8.07 | Read the state of the locking input or external trip on terminal 30 | RO | | 0 or 1 | - | - |
| 8.08 | Read the state of the relay output | RO | | 0 or 1 | - | - |
| 8.09 | Select input on terminal 30 | R/W |  | 0 or 1 | 0 | |
| | | |  | | 1 | |
| 8.10 | Destination of input or source of output on terminal 24 | R/W |  | 0.00 to 20.50 | 10.06 | |
| | | |  | | 10.03 | |
| 8.11 | Inversion of logic input or output on terminal 24 | R/W | | 0 or 1 | 0 | |
| 8.12 | Configuration of terminal 24 as an input or output | R/W | | 0 or 1 | 1 | |
| 8.13 | Destination of input or source of output on terminal 25 | R/W | | 0.00 to 20.50 | 10.33 | |
| 8.14 | Inversion of logic input or output on terminal 25 | R/W | | 0 or 1 | 0 | |
| 8.15 | Configuration of terminal 25 as an input or output | R/W | | 0 or 1 | 0 | |
| 8.16 | Destination of input or source of output on terminal 26 | R/W | | 0.00 to 20.50 | 6.31 | |
| 8.17 | Inversion of logic input or output on terminal 26 | R/W | | 0 or 1 | 0 | |
| 8.18 | Configuration of terminal 26 as an input or output | R/W | | 0 or 1 | 0 | |
| 8.19 | Destination of input on terminal 27 | R/W | | 0.00 to 20.50 | 6.30 | |
| 8.20 | Inversion of logic input or output on terminal 27 | R/W | | 0 or 1 | 0 | |
| 8.21 | Destination of input on terminal 28 | R/W | | 0.00 to 20.50 | 6.32 | |
| 8.22 | Inversion of logic input or output on terminal 28 | R/W | | 0 or 1 | 0 | |
| 8.23 | Destination of input on terminal 29 | R/W | | 0.00 to 20.50 | 1.41 | |
| 8.24 | Inversion of logic input or output on terminal 29 | R/W | | 0 or 1 | 0 | |
| 8.25 | Source of relay output | R/W | | 0.00 to 20.50 | 10.01 | |
| 8.26 | Relay output logic inversion | R/W | | 0 or 1 | 0 | |
| 8.27 | Control logic polarity | R/W | | 0 or 1 | 0 | |
| 8.28 | Enable open collector outputs | R/W | | 0 or 1 | 0 | |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

8.2 - Menu 8 synoptic views

8.2.1 - Assigning logic inputs/outputs






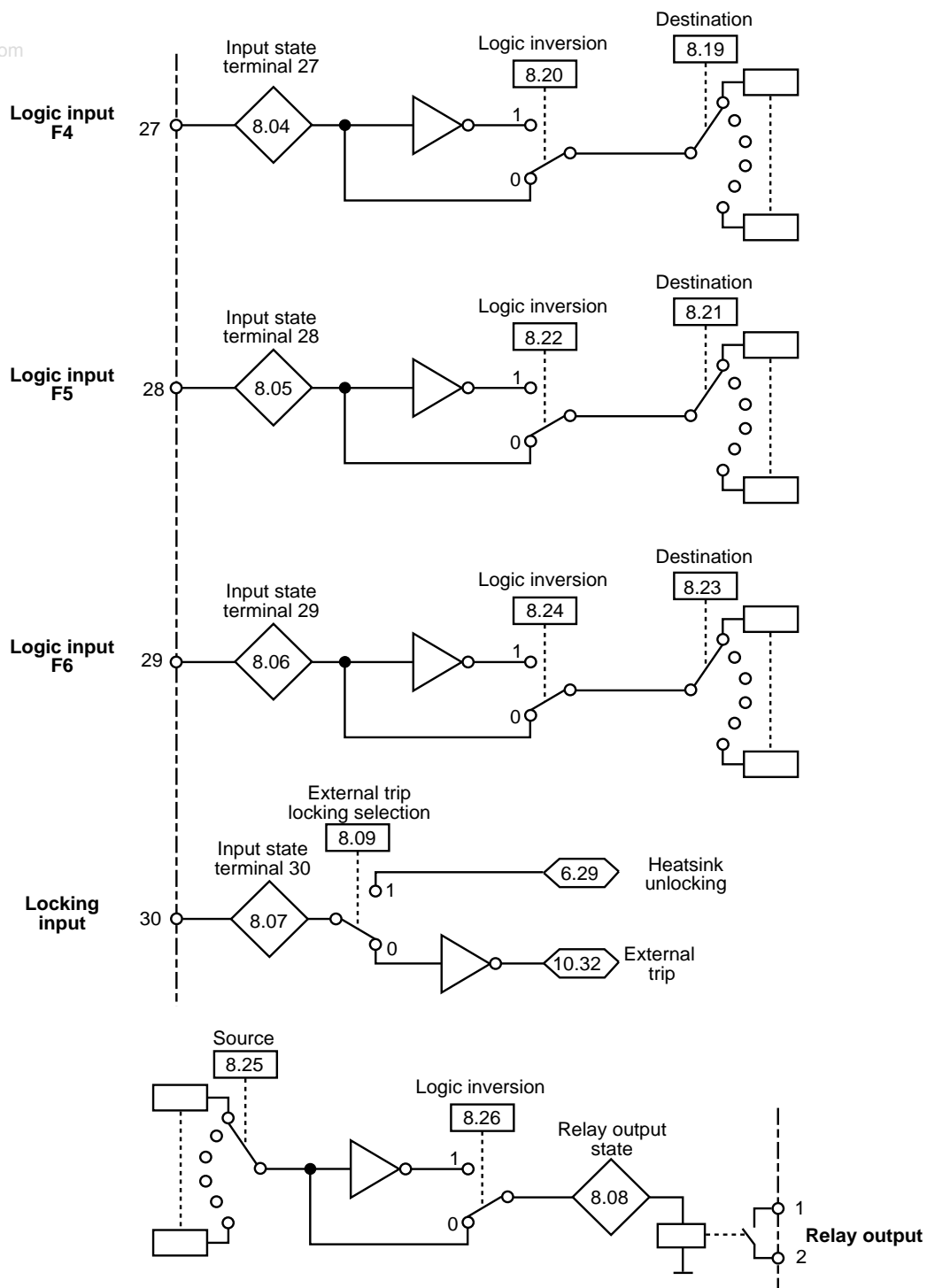
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8.2.2 -Assigning logic inputs and relay outputs

| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |






UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

8.3 - Explanation of menu 8 parameters

Symbols :

- open loop 
- closed loop 
- servo mode 

Terminals 24 to 26 can be configured as inputs or outputs, but terminals 27 to 29 can only be inputs. All six are fully configurable. Additionally, terminal 30 is a dedicated input which can be used as a locking input or as an external trip input. If both are required, then terminal 30 must be used as a locking input and one of the other inputs must be programmed to control the external trip (it will be necessary to invert the input logic to avoid tripping when the input terminal is activated). The logic inputs are sampled and the logic outputs updated every 8 ms.

 to  : **Reading the state of the inputs or outputs on terminals 24 to 26**

Adjustment range : 0 or 1

These parameters indicate the state of the inputs if the terminals are configured as inputs, or the state of the outputs if they are configured as outputs.

Inputs :


0 : Not activated


1 : Activated

Outputs



0 : Blocked

1 : Open

 = State of terminal 24

 = State of terminal 25

 = State of terminal 26


 to  : **Reading the state of the inputs on terminals 27 to 29**


Adjustment range : 0 or 1


These parameters indicate the state of the inputs :

0 : Not activated

1 : Activated

 = State of terminal 27

 = State of terminal 28

 = State of terminal 29

 : **Reads the state of terminal 30**

Adjustment range : 0 or 1

This parameter indicates the state of terminal 30 :

0 : Not activated

1 : Activated

 : **Reads the state of the output relay**

Adjustment range : 0 or 1

This parameter indicates the state of the output relay (terminals 1 and 2) :

0 : Relay open.

1 : Relay closed.

 : **Selection of the input on terminal 30**

Adjustment range : 0 or 1

Factory setting :  : 0

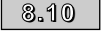
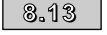
 : 1

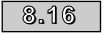
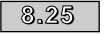
 : 1

Terminal 30 on the controller can be configured either as a locking input, or as an external trip input.

0 : External trip



1 : Locking


 ,  : **Destination of inputs or source of outputs on terminals 24 to 26 and output relay**


 , 


Adjustment range : to

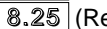
Factory setting :

 (Term. 24) :  : (Output speed reached)

 } (Zero speed)

 (Term. 25) : (Reset input)

 (Term. 26) : (Jog input)

 (Relay) : (Controller not tripped)

These parameters are used to select the destination of the input if the terminal is configured as an input or the output source if the terminal is configured as an output.

All unprotected " bit " type parameters can be assigned to the inputs or outputs.

If an unsuitable parameter is addressed to an input or output, no assignment takes place.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

8.19 , **8.21** : Destination of the inputs of terminals 27 to 29
8.23

Adjustment range : **0.00** to **20.50**

Factory setting :

8.19 (Term. 27) : **6.30** (FWD/Stop input)

8.21 (Term. 28) : **6.32** (REV/Stop input)

8.23 (Term. 29) : **1.41** (Select Speed ref. input)

These parameters are used to select the destination of the logic inputs.

All unprotected " bit " type parameters can be assigned to the inputs.

If an unsuitable parameter is addressed to an input, no assignment takes place.

8.11 , **8.14** : Inversion of logic inputs or outputs
8.17 , **8.20**

8.22 , **8.24**

8.26

Adjustment range : 0 or 1

Factory setting : 0

8.11 - Terminal 24

8.14 - Terminal 25

8.17 - Terminal 26

These parameters are used to invert the logic inputs or outputs

8.20 - Terminal 27

8.22 - Terminal 28

8.24 - Terminal 29

These parameters are used to invert the logic inputs

8.26 - Relay output : This parameter is used to invert the relay output

0 : Input or output not inverted.

1 : Input or output inverted.

8.12 , **8.15** : Configuration of terminals 24 to 26 as inputs or output
8.18

Adjustment range : 0 or 1

Factory setting : **8.12** (Terminal 24) : 1 (Output)

: **8.15** (Terminal 25) : 0 (Input)

: **8.18** (Terminal 26) : 0 (Input)

These parameters are used to configure terminals 24 to 26 as inputs or outputs.

0 : Terminal configured as an input.

1 : Terminal configured as an output.

8.27 : Control logic polarity

Adjustment range : 0 or 1

Factory setting : 0

This parameter allows positive or negative control logic to be selected.

0 : Negative logic, the input is activated when the terminal is at a low level (< 5 V).

1 : Positive logic, the input is activated when the terminal is at a high level (> 15 V).

8.28 : Open collector outputs

Adjustment range : 0 or 1

Factory setting : 0

Enables the +24 V logic circuits to be deactivated when creating OR functions with open collector outputs on several controllers.

0 : +24 V activated.

1 : +24 V deactivated.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

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Open and closed loop speed controllers for asynchronous and synchronous motors

9 - MENU 9 : LOGIC AND FASTER / SLOWER COMMAND FUNCTIONS

9.1 - List of Menu 9 parameters

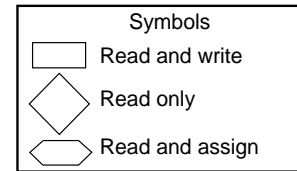
| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|------|------------------|-----------------|--------------|
| 9.01 | Read the state of the output for logic function 1 & 2 | RO | | 0 or 1 | - | - |
| 9.02 | Read the state of the output for logic function 3 & 4 | RO | | 0 or 1 | - | - |
| 9.03 | Read the reference from the motorised potentiometer function | RO | | ± 100.0 % | - | - |
| 9.04 | Source of input 1 for function 1 & 2 | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.05 | Logic inversion of input 1 for function 1 & 2 | R/W | | 0 or 1 | 0 | |
| 9.06 | Source of input 2 for function 1 & 2 | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.07 | Logic inversion of input 2 for function 1 & 2 | R/W | | 0 or 1 | 0 | |
| 9.08 | Logic inversion of the output for function 1 & 2 | R/W | | 0 or 1 | 0 | |
| 9.09 | Time delay of output for function 1 & 2 | R/W | | 0 to 25.0 s | 0.0 s | |
| 9.10 | Destination of output for function 1 & 2 | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.11 | Not used | | | | | - |
| 9.12 | Not used | | | | | - |
| 9.13 | Not used | | | | | - |
| 9.14 | Source of input 3 for function 3 & 4 | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.15 | Logic inversion of input 3 for function 3 & 4 | R/W | | 0 or 1 | 0 | |
| 9.16 | Source of input 4 for function 3 & 4 | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.17 | Logic inversion of input 4 for function 3 & 4 | R/W | | 0 or 1 | 0 | |
| 9.18 | Logic inversion of the output for function 3 & 4 | R/W | | 0 or 1 | 0 | |
| 9.19 | Time delay of output for function 3 & 4 | R/W | | 0 to 25.0 s | 0.0 s | |
| 9.20 | Destination of output for function 3 & 4 | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.21 | Selection of automatic reset of the faster/slower command reference | R/W | | 0 or 1 | 0 | |
| 9.22 | Selection of the faster/slower reference polarity | R/W | | 0 or 1 | 0 | |
| 9.23 | Ramp time of the faster/slower command reference | R/W | | 0 to 250 s | 20 s | |
| 9.24 | Scaling the faster/slower command reference | R/W | | 0 to 4.000 | 1.000 | |
| 9.25 | Destination of the faster/slower command reference | R/W | | 0.00 to 20.50 | 0.00 | |
| 9.26 | Faster input | R/A | | 0 or 1 | 0 | - |
| 9.27 | Slower input | R/A | | 0 or 1 | 0 | - |
| 9.28 | Manual reset of the faster/slower command reference | R/W | | 0 or 1 | 0 | |
| 9.29 | Binary input 1 of the binary/decimal converter | R/A | | 0 or 1 | 0 | - |
| 9.30 | Binary input 2 of the binary/decimal converter | R/A | | 0 or 1 | 0 | - |
| 9.31 | Binary input 3 of the binary/decimal converter | R/A | | 0 or 1 | 0 | - |
| 9.32 | Read decimal output | RO | | 0 to 7 | - | - |
| 9.33 | Destination of decimal output | R/W | | 0.00 to 20.50 | 0.00 | |

UMV 4301

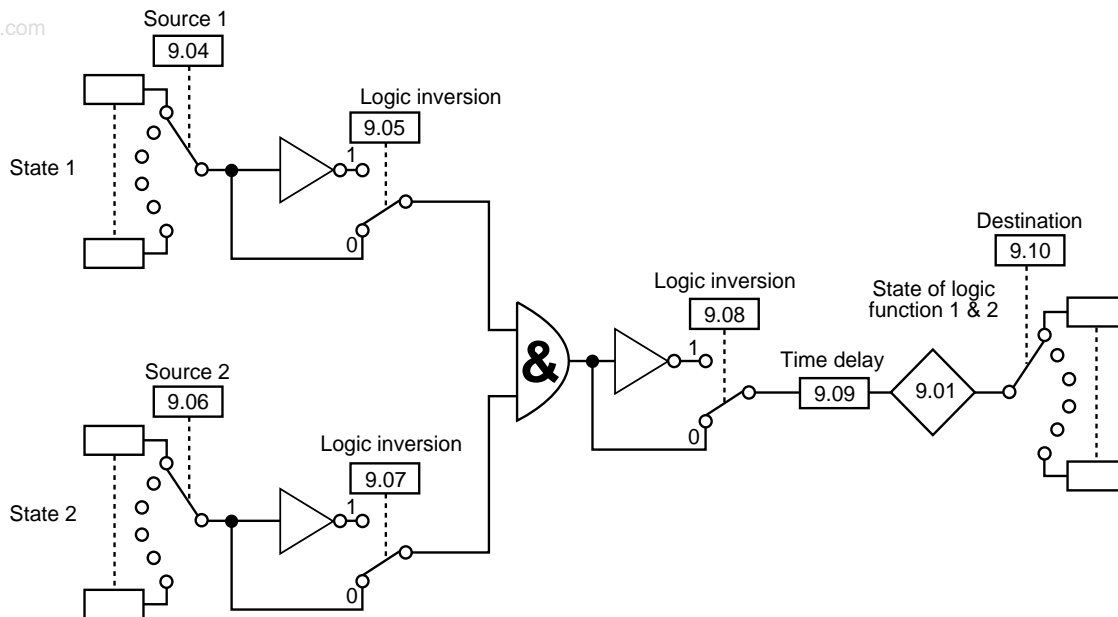
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9.2 - Menu 9 synoptic views

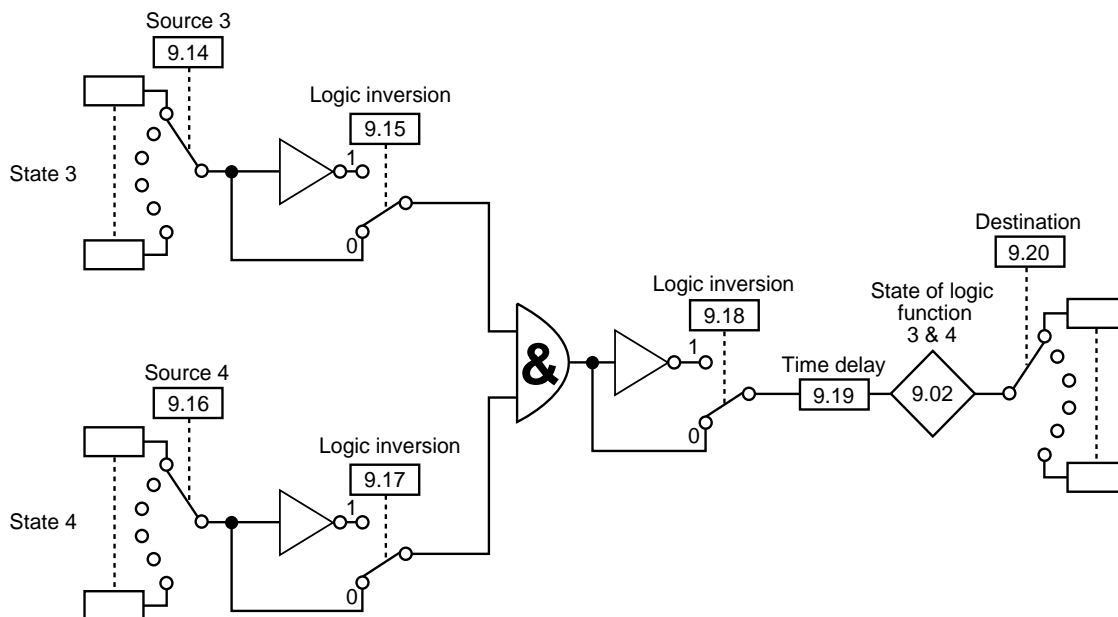
9.2.1 - Logic functions



Logic function 1 & 2



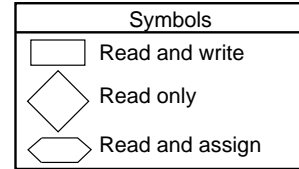
Logic function 3 & 4



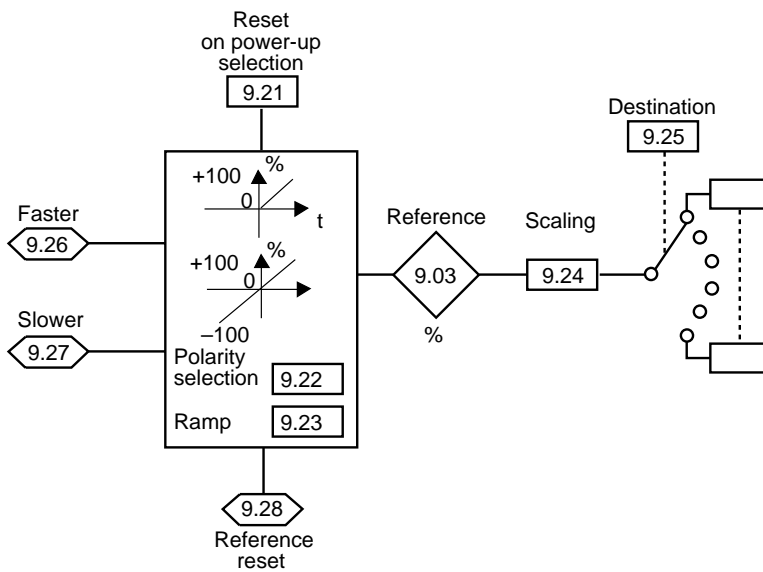
UMV 4301

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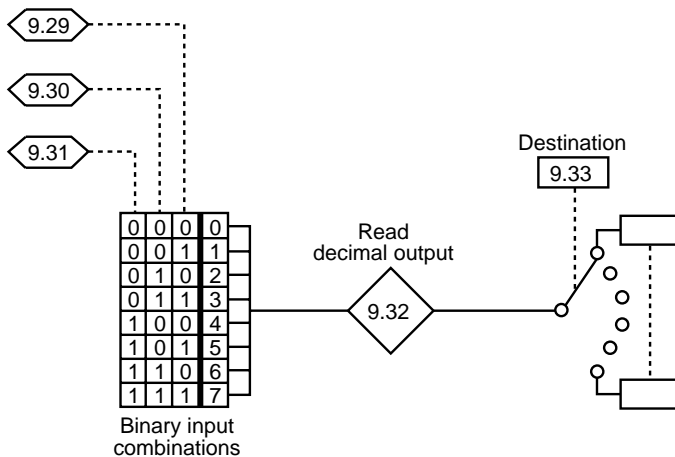
9.2.2 - Faster/slower and binary/decimal converter function



Faster/slower function



Binary/decimal converter function




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9.3 - Explanation of menu 9 parameters

Symbols :

- open loop 


- closed loop 


- servo mode 


 ,  : **Read the state of the logic function output**

Adjustment range : 0 or 1

These parameters indicate the state of the output of both programmable logic functions. This output can be addressed to a logic output when configuring the source of the appropriate logic output in Menu 8.

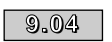
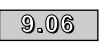
 : Logic function 1 output

 : Logic function 2 output

 : **Read the reference from the faster/slower command**

Adjustment range : $\pm 100.0\%$

Indicates the level of the reference from the motorised potentiometer before scaling.

 ,  : **Sources for AND function inputs**

 , 

Adjustment range : to

Factory setting :

(Source 1 function 1 & 2) :

(Source 2 function 1 & 2) :

(Source 3 function 3 & 4) :

(Source 4 function 3 & 4) :

These parameters are used to select the input sources for AND logic functions.

Only " bit " type parameters can be used on these inputs. If 2 unsuitable parameters are addressed on 2 inputs of an AND function, the AND function output will freeze at 0.

If only 1 unsuitable parameter is addressed on 1 of the 2 AND function inputs, this input will be forced to 1.

, : **Logic inversion of AND function inputs**

,

Adjustment range : 0 or 1

Factory setting :

(Inversion of input 1 of function 1 & 2) : 0

(Inversion of input 2 of function 1 & 2) : 0

(Inversion of input 3 of function 3 & 4) : 0

(Inversion of input 4 of function 3 & 4) : 0

These parameters are used to inverse the logic on AND function inputs.

0 : Input not inverted.

1 : Input inverted.

, : **Logic inversion of AND function outputs**

Adjustment range : 0 or 1

Factory setting :

(Inversion of the function 1 & 2 output) : 0

(Inversion of the function 3 & 4 output) : 0

These parameters are used to invert the logic on AND function outputs.

0 : Output not inverted.

1 : Output inverted.

, : **Time delay for AND function outputs**

Adjustment range : 0 to 25.0 s

Factory setting :

(Time delay of output for function 1&2) : 0.0 s

(Time delay of output for function 3&4) : 0.0 s

These parameters enable time delays for AND function outputs.

This time delay is only used when the output is switching from 0 to 1 (On delay).

, : **Destination of AND function outputs**

Adjustment range : to

Factory setting : (Function 1&2 output) :

(Function 3&4 output) :

These parameters define the internal parameters which are assigned by the AND function outputs.

Only unprotected " bit " type parameters can be addressed.

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

UMV 4301

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9.21 : Selection of automatic reset of the faster/slower command reference

Adjustment range : 0 or 1
Factory setting : 0

0 : The faster/slower command reference will, on power-up, be at the same level as when it was powered down.

1 : The faster/slower command reference is reset each time the controller is powered up.

9.22 : Selection faster/slower reference polarity

Adjustment range : 0 or 1
Factory setting : 0

0 : the faster/slower command reference is limited to positive values (0 to 100.0 %).

1 : the faster/slower command reference may change from -100 % to +100 %.

9.23 : Ramp time faster/slower command reference

Adjustment range : 0 to 250 s
Factory setting : 20 s

This parameter defines the time required for the faster/slower command reference to change from 0 to 100.0 %.

The time must be doubled for it to change from -100.0 % to +100.0 %.

Defines the command sensitivity.

9.24 : Scaling of the faster/slower command reference


Adjustment range : 0 to 4.000
Factory setting : 1.000

The maximum value of the faster/slower command reference automatically takes the maximum value of the analogue reference to which it is assigned.

This parameter enables the maximum value of the faster/slower command reference to be adapted to the maximum value required by the application.

Example :

- The faster/slower reference is addressed to a preset frequency.

- In , the maximum value of a preset frequency is 1000 Hz.

- The maximum value of the faster/slower reference needs to correspond to 50 Hz.

$$\Rightarrow 9.24 = \frac{50}{1000} = 0.05.$$

9.25 : Destination of the faster/slower command reference

Adjustment range : to

Factory setting :

This parameter is used to define the analogue parameter which the faster/slower command reference will control.

• Example 1 : The faster/slower command reference is used as a speed reference. The faster/slower command reference can be sent to a preset speed.

$$\Rightarrow 9.25 = 1.21.$$

• Example 2 : The faster/slower command reference is used to adjust the speed of a machine. The faster/slower command reference can be sent to the speed reference offset.

$$\Rightarrow 9.25 = 1.04.$$

9.26 and 9.27 : Faster/slower inputs

Two logic inputs must be assigned to these command parameters for the faster/slower function.

 : Faster input.

 : Slower input.


9.23 : Manual reset of the faster/slower command reference


Adjustment range : 0 or 1
Factory setting : 0


When this parameter is at 1, the faster/slower command reference is reset.

9.29 , 9.30 , 9.31 Binary / decimal converter binary inputs

- Assign 1 logic input to obtain decimal conversion 0 or 1.
- Assign 2 logic inputs to obtain decimal conversion 0 to 3.
- Assign 3 logic inputs to obtain decimal conversion 0 to 7.

 : Binary summing input 1.

 : Binary summing input 2.

 : Binary summing input 4.

Using a combination of logic inputs, enables remote modification of a parameter where the selection includes more than 2 possible choices.

9.32 : Reading the decimal output

Adjustment range : 0 to 7

Used to read the value of the binary converter output.

9.33 : Decimal output destination

Adjustment range : to

Factory setting :

This parameter is used to define the parameter which the decimal output will control.

Example : - Torque control comprises 5 operating modes (0 to 4).

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10 - Menu 10 : SPEED CONTROLLER STATES AND DIAGNOSTICS

10.1 - List of Menu 10 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|--|------|------|------------------|-----------------|--------------|
| 10.01 | Controller ready | RO | | 0 or 1 | - | - |
| 10.02 | Controller output active | RO | | 0 or 1 | - | - |
| 10.03 | Zero speed | RO | | 0 or 1 | - | - |
| 10.04 | Minimum speed | RO | | 0 or 1 | - | - |
| 10.05 | Speed lower than speed reached alarm low threshold | RO | | 0 or 1 | - | - |
| 10.06 | Speed reached | RO | | 0 or 1 | - | - |
| 10.07 | Speed higher than speed reached alarm high threshold | RO | | 0 or 1 | - | - |
| 10.08 | Rated load | RO | | 0 or 1 | - | - |
| 10.09 | Active current limit | RO | | 0 or 1 | - | - |
| 10.10 | Dynamic braking | RO | | 0 or 1 | - | - |
| 10.11 | Resistance braking | RO | | 0 or 1 | - | - |
| 10.12 | Overload alarm, braking resistance | RO | | 0 or 1 | - | - |
| 10.13 | Reverse rotation requested | RO | | 0 or 1 | - | - |
| 10.14 | Reverse rotation | RO | | 0 or 1 | - | - |
| 10.15 | Mains not present | RO | | 0 or 1 | - | - |
| 10.16 | Motor overheating trip | RO | | 0 or 1 | - | - |
| 10.17 | It overheating alarm | RO | | 0 or 1 | - | - |
| 10.18 | Controller overheating alarm | RO | | 0 or 1 | - | - |
| 10.19 | Ambient temperature alarm | RO | | 0 or 1 | - | - |
| 10.20 | Trip - 1 | RO | | 0 to 200 | - | - |
| 10.21 | Trip - 2 | RO | | 0 to 200 | - | - |
| 10.22 | Trip - 3 | RO | | 0 to 200 | - | - |
| 10.23 | Trip - 4 | RO | | 0 to 200 | - | - |
| 10.24 | Trip - 5 | RO | | 0 to 200 | - | - |
| 10.25 | Trip - 6 | RO | | 0 to 200 | - | - |
| 10.26 | Trip - 7 | RO | | 0 to 200 | - | - |
| 10.27 | Trip - 8 | RO | | 0 to 200 | - | - |
| 10.28 | Trip - 9 | RO | | 0 to 200 | - | - |
| 10.29 | Trip - 10 | RO | | 0 to 200 | - | - |
| 10.30 | Maximum duration of resistance braking | R/W | | 0 to 400.0 s | 0.0 s | |
| 10.31 | Maximum cycle of resistance braking | R/W | | 0 to 25.0 min | 0.0 min | |
| 10.32 | External trip | RO | | 0 or 1 | - | - |
| 10.33 | Reset | R/W | | 0 or 1 | 0 | |
| 10.34 | Number of trips reset automatically | R/W | | 0 to 5 | 0 | |
| 10.35 | Time delay before automatic trip reset | R/W | | 0 to 25.0 s | 1.0 s | |
| 10.36 | Controller ready state maintained during automatic reset | R/W | | 0 or 1 | 0 | |
| 10.37 | Minor trips | R/W | | 0 or 1 | 0 | |
| 10.38 | User trips | R/W | | 0 to 200 | 0 | |
| 10.39 | Braking resistance overload integration | RO | | 0 to 100.0 % | - | - |
| 10.40 | Decimal value of binary states from 10.01 to 10.15 | RO | | 0 to 32767 | - | - |
| 10.41 | Standby + 24 V of EPS module active | RO | | 0 or 1 | - | - |
| 10.42 | IGBT junction temperature above 135 °C | RO | | 0 or 1 | - | - |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

10.2 - Menu 10 synoptic views

10.2.1 - Operating states

| | | | |
|-------|--|-------|--|
| 10.01 | Controller ready | 10.17 | It overheating alarm |
| 10.02 | Controller output active | 10.18 | Controller overheating alarm |
| 10.03 | Zero speed | 10.19 | Ambient temperature alarm |
| 10.04 | Minimum speed | 10.20 | Trip - 1 |
| 10.05 | Speed lower than speed reached alarm low threshold | 10.21 | Trip - 2 |
| 10.06 | Speed reached | 10.22 | Trip - 3 |
| 10.07 | Speed higher than speed reached alarm high threshold | 10.23 | Trip - 4 |
| 10.08 | Rated load | 10.24 | Trip - 5 |
| 10.09 | Active current limit | 10.25 | Trip - 6 |
| 10.10 | Dynamic braking | 10.26 | Trip - 7 |
| 10.11 | Resistance braking | 10.27 | Trip - 8 |
| 10.12 | Overload alarm, braking resistance | 10.28 | Trip - 9 |
| 10.13 | Reverse rotation requested | 10.29 | Trip - 10 |
| 10.14 | Reverse rotation | 10.32 | External trip |
| 10.15 | Mains not present | 10.40 | Decimal value of binary state 10.01 to 10.15 |
| 10.16 | Motor overheating trip | 10.41 | + 24 V of EPS module active |
| | | 10.42 | IGBT T° above 135°C |

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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

10.2.2 - Braking resistance and fault management configuration

Resistance braking

- | | |
|-------|---|
| 10.30 | Maximum braking time |
| 10.31 | Minimum time between two braking cycles |
| 10.39 | Resistance overload integration |

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Trip management




- | | |
|-------|---|
| 10.33 | Reset |
| 10.34 | Number of automatic resets |
| 10.35 | Time delay before automatic reset |
| 10.36 | Trip output management during automatic reset |
| 10.37 | Deceleration control on minor trips |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors


10.3 - Explanation of menu 10 parameters

Symbols :

- open loop 
- closed loop 
- servo mode 

: Controller ready

Adjustment range : 0 or 1

This parameter is at 1 when the controller is not tripped. If parameter  is at 1, this bit remains at 1 during the trip phase if automatic reset is required. Once the number of automatic resets is reached, the next trip resets this bit to zero.


: Controller running

Adjustment range : 0 or 1

This parameter is at 1 when the controller output is active.

: Zero speed



Adjustment range : 0 or 1





In open loop control this parameter is at 1 when the absolute value of the ramp output is less than or equal to the threshold defined by parameter .

In closed loop control, the speed feedback is taken into account.

: Operation at speed less than or equal to the minimum threshold

Adjustment range : 0 or 1

In bi-directional mode ( = 1) this parameter operates identically to parameter .






In uni-directional mode ( = 0) this parameter is at 1 if the absolute value of the ramp output is less than or equal to the minimum frequency + 0.5 Hz () or if the speed feedback is less than or equal to the minimum speed + 5 min⁻¹ ( & ).

The minimum speed is defined by parameter .

The parameter is only operational when the controller is running.

: Speed less than speed reached alarm low threshold







Adjustment range : 0 or 1

This parameter is at 1 when the absolute value of the ramp output () or speed feedback ( & ) is less than the " Speed reached " window defined by parameters  and .

The parameter is only operational if the controller is running.

: Speed reference reached






Adjustment range : 0 or 1

This parameter is at 1 when the absolute value of the ramp output () or the speed feedback ( and ) is within the " Speed reached " window defined by parameters ,  and .

The parameter is only operational if the controller is running.

: Speed higher than the speed reached alarm high threshold

Adjustment range : 0 or 1



This parameter is at 1 when the absolute value of the ramp output () or speed feedback ( and ) is greater than the " Speed reached " window defined by parameters  and .

The parameter is only operational if the controller is running.

: Motor rated active current reached

Adjustment range : 0 or 1

This parameter is at 1 when the active current is greater than or equal to the rated active current.

Rated active current =  x .

: Active current limit

Adjustment range : 0 or 1

This parameter is at 1 when the controller is current limited.

: Generator mode

Adjustment range : 0 or 1

This parameter is at 1 when energy is transferred from the motor to the DC bus (driving load).

: Dynamic braking active

Adjustment range : 0 or 1

This parameter is at 1 when energy is dissipated in the optional braking resistance (provided this is connected).

: Dynamic braking alarm

Adjustment range : 0 or 1

This parameter is at 1 when dynamic braking is active and where the cumulative braking energy exceeds 75 %.

: Indication of requested rotation direction

Adjustment range : 0 or 1

This parameter is at 1 if the reference before the ramp is negative (reverse).

It is reset if the reference before the ramp is positive (forward).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

10.14 : Indication of direction of operation

Adjustment range : 0 or 1

: This parameter is at 1 if the reference after the ramp is negative (reverse direction).

It is reset if the reference after the ramp is positive (forward direction).

& : The speed feedback is taken into account rather than the reference after the ramp.

10.15 : Mains lost

Adjustment range : 0 or 1

This parameter is at 1 when the controller input voltage is less than 380 V -10 %.

10.16 : Motor overheating

Adjustment range : 0 or 1

This parameter is at 1 when the motor probe exceeds the tripping threshold.

10.17 : Overload alarm

Adjustment range : 0 or 1

This parameter is at 1 when the motor current exceeds 105 % of the programmed motor rated current and the cumulative overload exceeds 75 % of the motor overload capacity. If the motor current is not reduced, the controller will trigger a l x t trip.

10.18 : Heatsink temperature alarm

Adjustment range : 0 or 1

This parameter is at 1 when the temperature of the heatsink exceeds 90 °C and the controller is still overloaded.

10.19 : Ambient temperature alarm

Adjustment range : 0 or 1

This parameter is at 1 when the ambient temperature exceeds 65 °C.

10.20 to 10.29 : Memorising of last 10 trips

Adjustment range : 0 to 200

Contains the last 10 controller trips.

10.20 : indicates the most recent trip.

10.29 : indicates the oldest trip.

Possible trips are :

| N° | Mnemonic Display | Reason for trip |
|----------|------------------|---|
| 1 | UU | DC bus undervoltage |
| 2 | OU | DC bus overvoltage |
| 3 | OI. AC | Overcurrent at controller output |
| 4 | OI. br | Braking resistance overcurrent |
| 5 | PS | Internal power supply fault |
| 6 | Et | Forced external trip |
| 7 | OV. Spd | Overspeed |
| 8 | Prc 2 | Microprocessor 2 fault when CAP UMV option card is used |
| 9 | SEP | Fault on option card : - ES UMV - COD 2 UMV - RLV UMV |
| 10 | ENC. OVL | Encoder ASIC fault (power supply, frequency and direction) |
| 11 | ENC. PH1 | Loss of phase U on servo encoder |
| 12 | ENC. PH2 | Loss of phase V on servo encoder |
| 13 | ENC. PH3 | Loss of phase W on servo encoder |
| 14 | ENC. PH4 | Incorrect connection of U, V, W phases of servo encoder |
| 15 | ENC. PH5 | Encoder channel A missing |
| 16 | ENC. PH6 | Encoder channel B missing |
| 17 | ENC. PH7 | Inversion of encoder channels A and B Inversion of U, V, W phases between the motor and the controller |
| 18 | ENC. PH8 | Interruption of self-calibration |
| 19 | it. br | Braking resistance overload |
| 20 | it. AC | Motor overload l x t |
| 21 | Oh 1 | Thermal simulation of the heatsink as a function of l x t |
| 22 | Oh 2 | Heatsink overheating detected by thermal probe (above 90 °C) |
| 23 | OA | Overheating of the control card |
| 24 | th | Tripping of the motor thermal probe |
| 25 | thS | PTC short-circuit of the motor thermal probe (terminal 8) with input configured for THS |
| 26 | OP.OVLd | Overload of + 24 V power supply or logic outputs |
| 27 | CL1 | Loss of current reference on analogue input 1 with parameter 7.06 set at (4-20 tr or 20-4 tr) |
| 28 | CL2 | Loss of current reference on analogue input 2 with parameter 7.11 set at (4-20 tr or 20-4 tr) |
| 29 | CL3 | Loss of current reference on analogue input 3 with parameter 7.15 set at (4-20 tr or 20-4 tr) |
| 30 | SCL | Loss of serial link communication |
| 31 | EEF | EEPROM fault |
| 32 | Ph | Loss of a power supply phase |
| 33 | rs | Trip during measurement of the stator resistance |
| 40 to 49 | tr xx | Specific user trips with the serial link |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

| N° | Mnemonic Display | Reason for trip |
|------------|------------------|---|
| 100 | Tr 100 | This is not a fault - See 10.38 |
| 101 to 158 | | Trips specific to size 5 controllers. |
| 180 | SEP. Dis | There is no small module option but the controller thinks there is, as an MPO has been inserted and then removed. To reset, save and then switch off. On switching back on the trip will no longer exist. |
| 181 | ENC. PH9 | Servo mode fault, torque is being applied with an incorrect sign. |
| 182 | FSH Err. | The COPY UMV module is corrupt, all data must be re-entered. |
| 183 | FSH Dal | The COPY UMV module is empty. |
| 184 | FSH TYP | The controller rating does not correspond to the controller rating stored in the COPY UMV module. |
| 185 | FSH . ACC | The COPY UMV module cannot be written to. |
| 186 | FSH . LO | Transferring data to the controller: menu 20 data available but no large module option connected. |
| 187 | FSH 20 | Transferring data to the controller: large module option is connected but no data to transfer. |
| 188 to 200 | trxx | Specific user trips |

10.30 : Maximum braking time at full power

Adjustment range : 0 to 400.0 s

Factory setting : 0.0 s

This parameter defines the time during which the braking resistance can withstand maximum braking voltage (780V) without being damaged. It is used to define the time before tripping on braking overload.

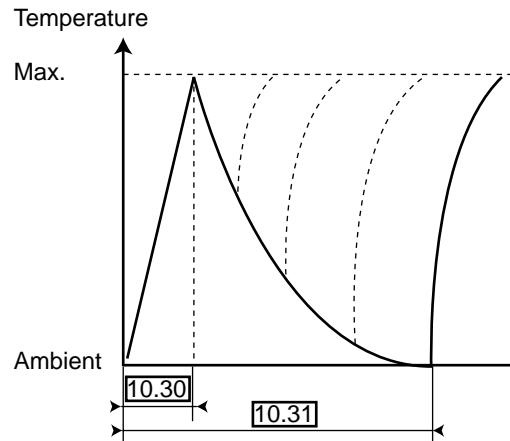
CAUTION : If this parameter is left at 0, there will be no braking resistance protection.

10.31 : Interval between braking periods at full power

Adjustment range : 0 to 25.0 min

Factory setting : 0.0 min

This parameter defines the time interval which must elapse between two consecutive braking periods at full power such as described by parameter **10.30**. It is used to set the thermal time constant for the resistance used.



CAUTION : If this parameter is left at 0, there will be no braking resistance protection.

10.32 : External trip

Adjustment range : 0 or 1

This parameter is at 1 when the "External trip" input is at 0. If parameter **8.09** is at 0, the "External trip" input corresponds to terminal 30.

If terminal 30 is used as a "locking" input (**8.09** = 1), another terminal may be used as the external trip input, reversing the signal to avoid tripping when the input is at 1.

10.33 : Controller reset

Adjustment range : 0 or 1

Factory setting : 0

Switching of this parameter from 0 to 1 causes the controller to reset.

If a remote reset is required, a terminal must be assigned to this parameter.

If the controller trips on a IGBT overcurrent, either at the output bridge or the braking transistor, the controller cannot be reset for 10 seconds (IGBT recovery time).

10.34 : Number of automatic resets

Adjustment range : 0 to 5

Factory setting : 0

0 : There is no automatic reset. A command must be given.

1 to 5 : Cause as many automatic resets as have been programmed.

When the counter reaches the permitted number of resets, the controller is locked. The last trip can only be reset on a command.

The counter is reset when the next trip is not of the same type as the previous one or when no trip has occurred for 5 minutes.

There is no automatic reset on an external trip (Et).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

10.35 : Time delay before automatic reset

Adjustment range : 0 to 25.0 s

Factory setting : 1.0 s

This parameter defines the time between the controller trip occurring and the automatic reset (with the exception of minimum stop times for trips associated with overcurrents).

10.36 : Operating state maintained until definitive tripping

Adjustment range : 0 or 1

Factory setting : 0

0 : 10.01 (Controller ready) is reset each time the controller trips, without taking into account any automatic resets which may occur.

1 : Parameter 10.01 is maintained at 1 for the trip phases which are reset automatically.

10.37 : Control of deceleration on minor faults

Adjustment range : 0 or 1

Factory setting : 0

0 : Freewheel stop on any fault

1 : The controller controls deceleration before tripping on minor fault between 20 and 30 inclusive, as defined in the list 10.20 to 10.29.

10.38 : User trips

Adjustment range : 0 to 200

Factory setting : 0

This parameter is used to generate tripping on user faults arising from the large module option or via the serial link.

Valid fault codes are 27 to 99, any value less than 27 will generate an existing fault.

Trips generated by the user are indicated by trxx in the trip table, xx being the trip code.

Users who wish to reset the controller via the serial link or from intelligent module options may do so by giving this parameter a value of 100.

10.39 : Image of braking resistance temperature

Adjustment range : 0 to 100.0 %

This parameter indicates the temperature of the braking resistance modelled according to parameters 10.30 and 10.31. A zero value signifies that the resistance is close to the ambient temperature and 100 % is the maximum temperature (trip level).

10.40 : Designation of state

Adjustment range : 0 to 32767

Unit :

This parameter is used with a serial communication interface. The value of this parameter is the sum of the controller bits used for read-only, 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 : + 24 V of EPS module active

Adjustment range : 0 or 1

Factory setting : 0

This parameter is at 1 when the EPS UMV option module supplies +24 V to the controller.

10.42 : IGBT junction temperature above 135 °

Adjustment range : 0 or 1

Factory setting : 0

This parameter goes to 1 when the thermal protection modelling has calculated a junction temperature above 135 °C (see also parameters 5.18, 5.23 and 7.32).

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

11 - MENU 11 : SETTING MENU 0 - SERIAL LINK - CONTROLLER CHARACTERISTICS

11.1 - List of Menu 11 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|--|------|------|-------------------------------|-----------------|--------------|
| 11.01 | Setting parameter 11 of menu 0 | R/W | | 0.00 to 20.50 | 1.03 | |
| 11.02 | Setting parameter 12 of menu 0 | R/W | | 0.00 to 20.50 | 2.01 | |
| 11.03 | Setting parameter 13 of menu 0 | R/W | | 0.00 to 20.50 | 4.02 | |
| 11.04 | Setting parameter 14 of menu 0 | R/W | | 0.00 to 20.50 | 1.05 | |
| 11.05 | Setting parameter 15 of menu 0 | R/W | | 0.00 to 20.50 | 2.04 | |
| 11.06 | Setting parameter 16 of menu 0 | R/W | | 0.00 to 20.50 | 6.01 | |
| 11.07 | Setting parameter 17 of menu 0 | R/W | | 0.00 to 20.50 | 4.11 | |
| 11.08 | Setting parameter 18 of menu 0 | R/W | | 0.00 to 20.50 | 2.06 | |
| 11.09 | Setting parameter 19 of menu 0 | R/W | | 0.00 to 20.50 | 2.07 | |
| 11.10 | Setting parameter 20 of menu 0 | R/W | | 0.00 to 20.50 | 1.29 | |
| 11.11 | Setting parameter 21 of menu 0 | R/W | | 0.00 to 20.50 | 1.30 | |
| 11.12 | Setting parameter 22 of menu 0 | R/W | | 0.00 to 20.50 | 1.31 | |
| 11.13 | Setting parameter 23 of menu 0 | R/W | | 0.00 to 20.50 | 1.32 | |
| 11.14 | Setting parameter 24 of menu 0 | R/W | | 0.00 to 20.50 | 7.06 | |
| 11.15 | Setting parameter 25 of menu 0 | R/W | | 0.00 to 20.50 | 7.11 | |
| 11.16 | Setting parameter 26 of menu 0 | R/W | | 0.00 to 20.50 | 7.14 | |
| 11.17 | Setting parameter 27 of menu 0 | R/W | | 0.00 to 20.50 | 8.27 | |
| 11.18 | Setting parameter 28 of menu 0 | R/W | | 0.00 to 20.50 | 4.13 | |
| 11.19 | Setting parameter 29 of menu 0 | R/W | | 0.00 to 20.50 | 4.14 | |
| 11.20 | Setting parameter 30 of menu 0 | R/W | | 0.00 to 20.50 | 6.13 | |
| 11.21 | Scaling of parameter 0.30 | R/W | | 0 to 4.000 | 1.000 | |
| 11.22 | Parameter displayed on power-up | R/W | | 0.00 to 0.50 | 0.10 | - |
| 11.23 | Serial link address | R/W | | 0 to 9.9 | 1.1 | |
| 11.24 | Type of communication | R/W | | AnSi 2, AnSi 4, Output, Input | AnSi 4 | |
| 11.25 | Transmission speed via serial link | R/W | | 4800, 9600 or 19200 Bauds | 4800 Bauds | |
| 11.26 | Communication delay in 2-wire mode | R/W | | 0 to 255 ms | 0 ms | |
| 11.27 | Source/Destination of variable to be transferred | R/W | | 0.00 to 20.50 | 0.00 | |
| 11.28 | Scaling of variable | R/W | | 0 to 4.000 | 1.000 | |
| 11.29 | Software version (V.XX.XX._ _) | RO | | 1.00 to 99.99 | - | - |
| 11.30 | User security code | R/W | | 0 to 255 | 149 | |
| 11.31 | Choice of operating mode | R/W | | OPEN LP, CL Vect, Servo | OPEN LP | |
| 11.32 | Controller rated current | RO | | 2.10 to 220.0 A | - | - |
| 11.33 | Controller rated voltage | RO | | 220 to 525 V | - | - |
| 11.34 | Software version (V._ _._ _XX) | RO | | 00 to 99 | - | - |
| 11.35 | Reserved for size 5 controller | | | - | - | - |
| 11.36 | Low-speed fan | RO | | 0 or 1 | - | - |
| 11.37 | Preset configuration selected | RO | | 0 to 8 | - | - |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

11.2 - Menu 11 synoptic views

Menu 0 configuration (User menu)

| | | | | | |
|-------|------------------|------|-------|---------------------------------|------|
| 11.01 | Define parameter | 0.11 | 11.12 | Define parameter | 0.22 |
| 11.02 | Define parameter | 0.12 | 11.13 | Define parameter | 0.23 |
| 11.03 | Define parameter | 0.13 | 11.14 | Define parameter | 0.24 |
| 11.04 | Define parameter | 0.14 | 11.15 | Define parameter | 0.25 |
| 11.05 | Define parameter | 0.15 | 11.16 | Define parameter | 0.26 |
| 11.06 | Define parameter | 0.16 | 11.17 | Define parameter | 0.27 |
| 11.07 | Define parameter | 0.17 | 11.18 | Define parameter | 0.28 |
| 11.08 | Define parameter | 0.18 | 11.19 | Define parameter | 0.29 |
| 11.09 | Define parameter | 0.19 | 11.20 | Define parameter | 0.30 |
| 11.10 | Define parameter | 0.20 | 11.21 | Scale parameter | 0.31 |
| 11.11 | Define parameter | 0.21 | 11.22 | Parameter displayed on power-up | |

Serial link

| | | | |
|-------|---------------------|-------|----------------------------------|
| 11.23 | Serial link address | 11.26 | 2-wire mode |
| 11.24 | Communication type | 11.27 | Source / Destination of variable |
| 11.25 | Transmission speed | 11.28 | Scaling of variable |

Controller configuration




| | | | |
|-------|--------------------------------|-------|-------------------------------------|
| 11.29 | Software version (V.XX.XX._ _) | 11.32 | Controller rated current |
| 11.34 | Software version (V._ _ _ _XX) | 11.33 | Controller rated voltage |
| 11.30 | User security code | 11.36 | Special UMV 4301 with low-speed fan |
| 11.31 | Operating mode | 11.37 | Preset configuration selected |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

11.3 - Explanation of menu 11 parameters

Symbols :

- open loop 
- closed loop 
- servo mode 
- Miscellaneous

11.01 to **11.20** : **Setting menu 0**

Adjustment range : **0.00** to **20.50**

These parameters define the parameters of programmable menu 0.

Factory setting :

| Parameter | Parameter definition | Factory setting |
|--------------|----------------------|-----------------|
| 11.01 | 0.11 | 1.03 |
| 11.02 | 0.12 | 2.01 |
| 11.03 | 0.13 | 4.02 |
| 11.04 | 0.14 | 1.05 |
| 11.05 | 0.15 | 2.04 |
| 11.06 | 0.16 | 6.01 |
| 11.07 | 0.17 | 4.11 |
| 11.08 | 0.18 | 2.06 |
| 11.09 | 0.19 | 2.07 |
| 11.10 | 0.20 | 1.29 |
| 11.11 | 0.21 | 1.30 |
| 11.12 | 0.22 | 1.31 |
| 11.13 | 0.23 | 1.32 |
| 11.14 | 0.24 | 7.06 |
| 11.15 | 0.25 | 7.11 |
| 11.16 | 0.26 | 7.14 |
| 11.17 | 0.27 | 8.27 |
| 11.18 | 0.28 | 4.13 |
| 11.19 | 0.29 | 4.14 |
| 11.20 | 0.30 | 6.13 |

11.21 : **Scaling of parameter** **11.20**

Adjustment range : 0 to 4.000

Factory setting : 1.000

If a "Read only" type analogue parameter is addressed in **11.20**, this parameter enables units to be adapted to a particular value.

Eg : Speed image : **11.20** = **3.02**.

In **11.21** set the coefficient to convert to m/min.

CAUTION : Since the factory setting for **11.20** is **6.13**, scaling via **11.21** is inoperative.

11.22 : **Parameter displayed on power-up**

Adjustment range : **0.00** to **0.50**

Factory setting : **0.10**

Defines the parameter which is displayed when the controller is powered up.

0.10 corresponds to the motor speed.

11.23 : **Serial link address**

Adjustment range : 0 to 9.9

Factory setting : 1.1

Used for ANSi communications to define the address of the controller. Any value including a zero must be avoided as these are used for addressing groups of controllers.

This parameter is only effective when a large option module is installed (COM1 UMV, CAP UMV, etc).

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

11.24 : Type of communication

Adjustment range : AnSi 2, AnSi 4, OUtPUt, INPUt

Factory setting : AnSi 4

This is the serial port operating mode.

0 : AnSi 2 : 2-wire " half duplex " serial link.

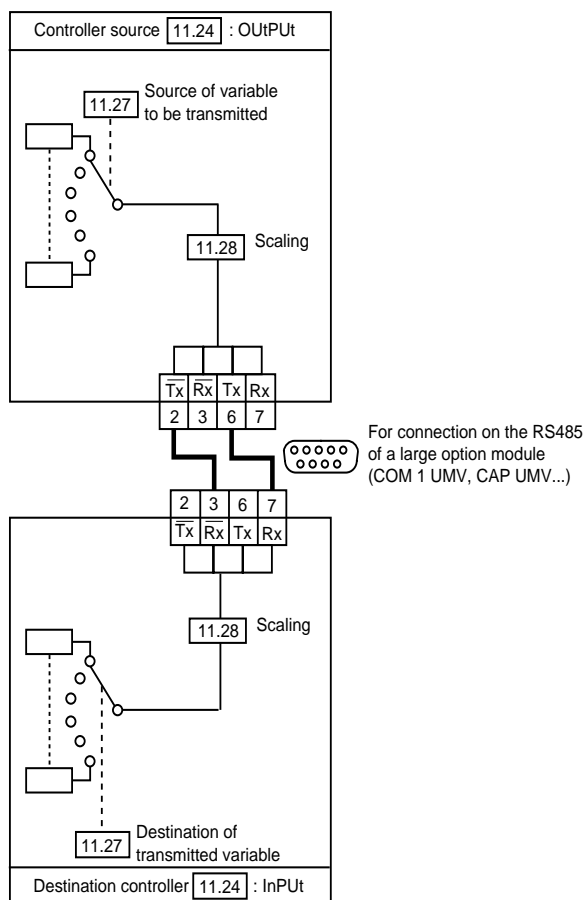
1 : AnSi 4 : 4-wire "half duplex" serial link.

2 : OUtPUt : Output variable defined by 11.27

(CT protocol).

3 : INPUt : Input variable defined by 11.27

Modes 2 and 3 are used to send a variable from one controller to another. To do this, a large COM 1 UMV or CAP UMV option module is required.



The data is transferred at a frequency in the order of 140 Hz.

Once the data is sent, a serial link fault will occur if there is a line break and if the last data bit transmitted is not 0.

11.25 : Transmission speed

Adjustment range : 4800, 9600 or 19200 bauds

Factory setting : 4800 Bauds

Used for ANSI communications to select the data transfer speed.

11.26 : Communication delay in " 2-wire " mode

Adjustment range : 0 to 255 ms

Factory setting : 0 ms

As the ANSI protocol used is the " half duplex " type, it is possible to connect RX and TX together as well as RX and TX and thus make the serial link operate with just 2 wires. This may cause a communication fault if the receiver responds to a request before the transmitter has had time to switch from transmission to reception. Parameter 11.26 enables a time to be introduced between the reception and transmission of data. The resolution of the delay is 5 ms if 11.26 = 1 to 5 ms, and the actual time will be 5 ms. If 11.26 = 6 to 10 ms, the actual time will be 10 ms.

11.27 : Source/destination of variable to be transferred

Adjustment range : 0.00 to 20.50

Factory setting : 0.00

This parameter is used to define the source of the variable to be transferred if 11.24 has been set to mode 2 or the destination of the variable to be transferred if 11.24 has been set to mode 3.

In mode 3, no new destination will be taken into account until after the controller has been reset.

Only non-bit parameters can be assigned.

If an unsuitable parameter is assigned, no source or destination will be taken into account.

11.28 : Scaling of the variable

Adjustment range : 0 to 4.000

Factory setting : 1.000

This parameter is used to scale the variable to be transferred.

In most cases this scaling is unnecessary, as the maximum value for the variable automatically takes the maximum value of the source or destination.

11.29 : Software version (V.XX.XX.__) of the flash memory

Adjustment range : 1.00 to 99.99

Indicates the first 2 digits of the software version installed in the controller.

11.30 : User security code

Adjustment range : 0 to 255

Factory setting : 149

This parameter enables a personal security code to be entered which prevents any parameter modification.

The personal code can only be read when it is edited. At any other time, only code 149 which is displayed.

Do not use code 0.

To access the parameters, enter the personal code selected in parameter 0.00.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

11.31 : Operating mode

Adjustment range : OPEn.LP, CL.VECt, SErVO, Regen
Factory setting : OPEn.LP

0 : OPEn.LP : Open loop mode with vector control or in U/F.

1 : CL.VECt : Closed vector loop with encoder.

2 : SErVO : Servo with synchronous motor.

3 : Regen : Regenerative mode.

- This parameter allows the control mode to be selected.
- The control mode cannot be modified until the code 1253 has been entered in the parameter of any menu **xx.00**.

• The factory settings are automatically adjusted depending on the operating mode selected.

• Returning to factory settings does not alter the operating mode.

• The operating mode can only be selected when the controller is stopped.

CAUTION : Although the controller is supplied with the operating mode positioned at 0 (OPEn.LP), any return to factory setting, after modification of the operating mode, will not affect this parameter. It will remain in the selected operating mode.

11.32 Controller rated current

Adjustment range : 2.10 to 220.0 A

This parameter indicates the controller rated current which corresponds to the total permitted motor current.

11.33 Controller rated voltage

Adjustment range : 220 to 525V

This parameter indicates the controller rated voltage.

11.34 Software version (V._._.XX) and main memory index

Adjustment range : 1 to 99

Indicates the third digit of the software version installed in the controller.

11.35 : Parameter reserved for size 5 controllers

11.36 : Controller with low-speed fans

Adjustment range : 0 or 1

Factory setting : 0

0 : Standard UMV 4301

1 : Special UMV 4301 fitted with low-speed fans. As this type of controller has to be significantly derated due to the reduced cooling, it is only available for very specialised applications.

11.37 : Selected preset configuration

Adjustment range : 0 to 8

Factory setting : 0

Used to display the preset configuration which has been selected.

0 : Factory setting

1 : Simplified local/remote operation

2 : Faster/slower command

3 : Preset speeds

4 : Torque control

5 : PID regulation

6 : Axis control

7 : Braking control

8 : Electrical shaft.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

www.DataSheet4U.com

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

12 - MENU 12 : PROGRAMMABLE THRESHOLDS




12.1 - List of Menu 12 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|------|------------------|-----------------|--------------|
| 12.01 | State of comparator 1 output | RO | | 0 or 1 | - | - |
| 12.02 | State of comparator 2 output | RO | | 0 or 1 | - | - |
| 12.03 | Source of variable used on comparator 1 | R/W | | 0.00 to 20.50 | 0.00 | |
| 12.04 | Comparator 1 threshold adjustment | R/W | | 0 to 100.0 % | 0.0 % | |
| 12.05 | Comparator 1 threshold hysteresis | R/W | | 0 to 25.0 % | 0.0 % | |
| 12.06 | Logic inversion of comparator 1 output | R/W | | 0 or 1 | 0 | |
| 12.07 | Destination of comparator 1 output | R/W | | 0.00 to 20.50 | 0.00 | |
| 12.08 | Not used | | | | | - |
| 12.09 | Not used | | | | | - |
| 12.10 | Not used | | | | | - |
| 12.11 | Not used | | | | | - |
| 12.12 | Not used | | | | | - |
| 12.13 | Source of variable used on comparator 2 | R/W | | 0.00 to 20.50 | 0.00 | |
| 12.14 | Comparator 2 threshold adjustment | R/W | | 0 to 100.0 % | 0.0 % | |
| 12.15 | Comparator 2 threshold hysteresis | R/W | | 0 to 25.0 % | 0.0 % | |
| 12.16 | Logic inversion of comparator 2 output | R/W | | 0 or 1 | 0 | |
| 12.17 | Destination of comparator 2 output | R/W | | 0.00 to 20.50 | 0.00 | |

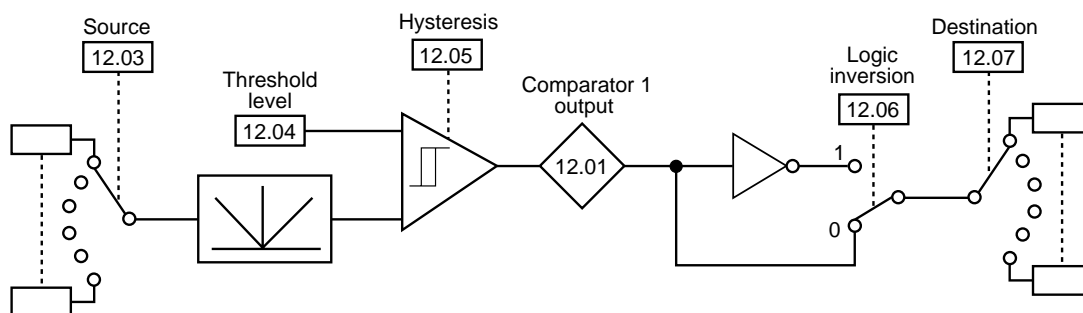
UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

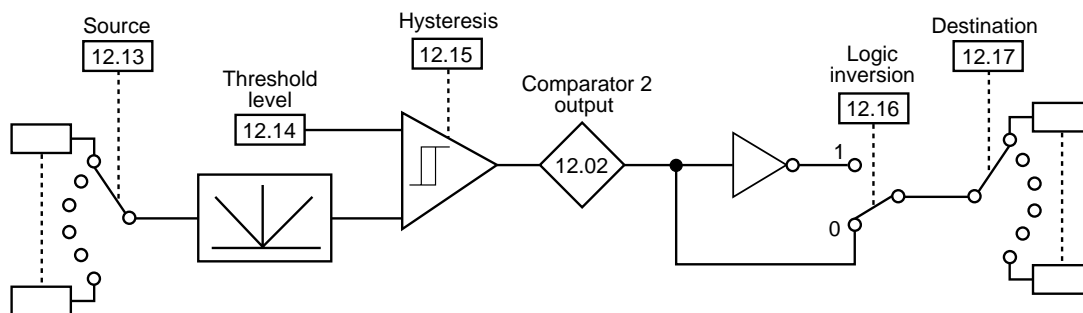
12.2 - Synoptic view Menu 12

| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |

Comparator 1



Comparator 2






UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

12.3 - Explanation of menu 12 parameters

Symbols :


- open loop 
- closed loop 
- servo mode 

& : State of comparator outputs

Adjustment range : 0 or 1

These parameters indicate whether the input variables are above (1) or below (0) the programmed thresholds.

 : Comparator 1 output.

 : Comparator 2 output.

& : Sources of variables

Adjustment range : to

Factory setting :

These parameters define the variable which is to be compared to the programmed threshold.

The absolute value of the variable is taken into account.

Only non-bit parameters can be programmed as sources.

If an unsuitable parameter is programmed, the input value is taken as equal to 0.

 : Comparator source 1.

 : Comparator source 2.

& : Threshold adjustment

Adjustment range : 0 to 100.0 %

Factory setting : 0.0 %

These parameters are used to adjust the thresholds of the comparators.

The thresholds are expressed as a percentage of the maximum value of the compared variable.

 : Comparator 1 threshold.

 : Comparator 2 threshold.

& : Threshold hysteresis

Adjustment range : 0 to 25.0 %

Factory setting : 0.0 %

These parameters define the window within which the comparator output does not change state.

The output goes to 1 when the variable reaches the + threshold value (hysteresis /2).

The output goes to 0 when the variable goes below the the - threshold value (hysteresis /2).

The hysteresis is expressed as a percentage of the maximum value of the compared variable.

& : Logic inversion

Adjustment range : 0 or 1

Factory setting : 0

These parameters are used to invert the comparator outputs.

0 : Output not inverted.

1 : Output inverted.

 : Comparator 1 output inversion.

 : Comparator 2 output inversion.

& : Destination of the comparator output

Adjustment range : to

Factory setting :

These parameters define the internal parameters which will be assigned by the comparator outputs.

Only bit type parameters can be programmed.

If an unsuitable parameter is programmed the output is not addressed anywhere.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes















www.DataSheet4U.com

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

13 - MENU 13 : SYNCHRONISATION AND INDEXING

13.1 - List of Menu 13 parameters

| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|--|------|--|---|--|--------------|
| 13.01 | Position loop error | RO | | $\pm 16384/16384$ revs. | - | - |
| 13.02 | Reference encoder speed | RO | | ± 100.0 % | - | - |
| 13.03 | Max. encoder speed | R/W |  &   | 0 to 30000 min ⁻¹ | 1500 min ⁻¹ 3000 min ⁻¹ | |
| 13.04 | Scaling | R/W | | 0 to 4.000 | 1.000 | |
| 13.05 | Selection of input unit | R/W |  &  | 0 or 1 | 0 | |
| 13.06 | Reference input destination | R/W | | <input type="text" value="0.00"/> to <input type="text" value="20.50"/> | <input type="text" value="0.00"/> | |
| 13.07 | Synchronisation ratio | R/W | | 0 to 4.000 | 1.000 | |
| 13.08 | Synchronisation mode | R/W |   &  | 0 to 2 0 to 6 | 0 | |
| 13.09 | Position loop gain | R/W | | 0 to 4.000 | 0.100 | |
| 13.10 | Position error correction speed limit | R/W | | 0 to 250 min ⁻¹ | 150 min ⁻¹ | |
| 13.11 | Reference indexing position | R/W |  &  | 0 to 4095/4096 revs. | 0/4096 revs. | |
| 13.12 | Indexing window | R/W |  &  | 0 to 200/4096 revs. | 20 /4096 revs. | |
| 13.13 | Encoder sampling time | R/W |  &  | 0 to 5.0 ms | 4.0 ms | |
| 13.14 | Reset reference encoder revolution counter | R/W | | 0 or 1 | 0 | |
| 13.15 | Reset feedback encoder revolution counter | R/W | | 0 or 1 | 0 | |
| 13.16 | Reference encoder revolution counter | RO | | 0 to 16384 revs. | - | - |
| 13.17 | Feedback encoder revolution counter | RO | | 0 to 16384 revs. | - | - |
| 13.18 | End of indexing signal | RO | | 0 or 1 | - | - |
| 13.19 | Inversion of reference feedback | R/W | | 0 or 1 | 0 | - |

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

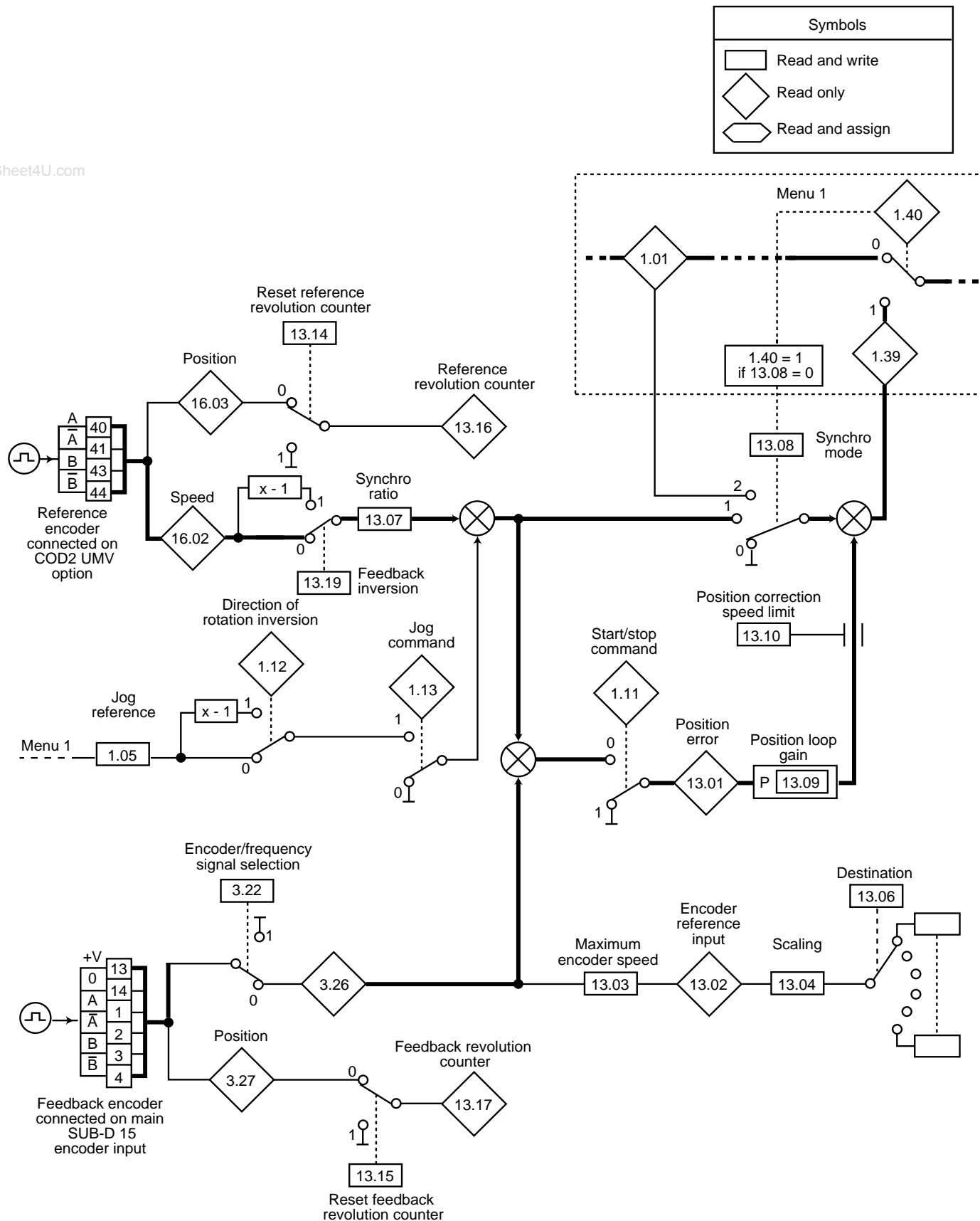
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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

13.2 - Menu 13 synoptic views

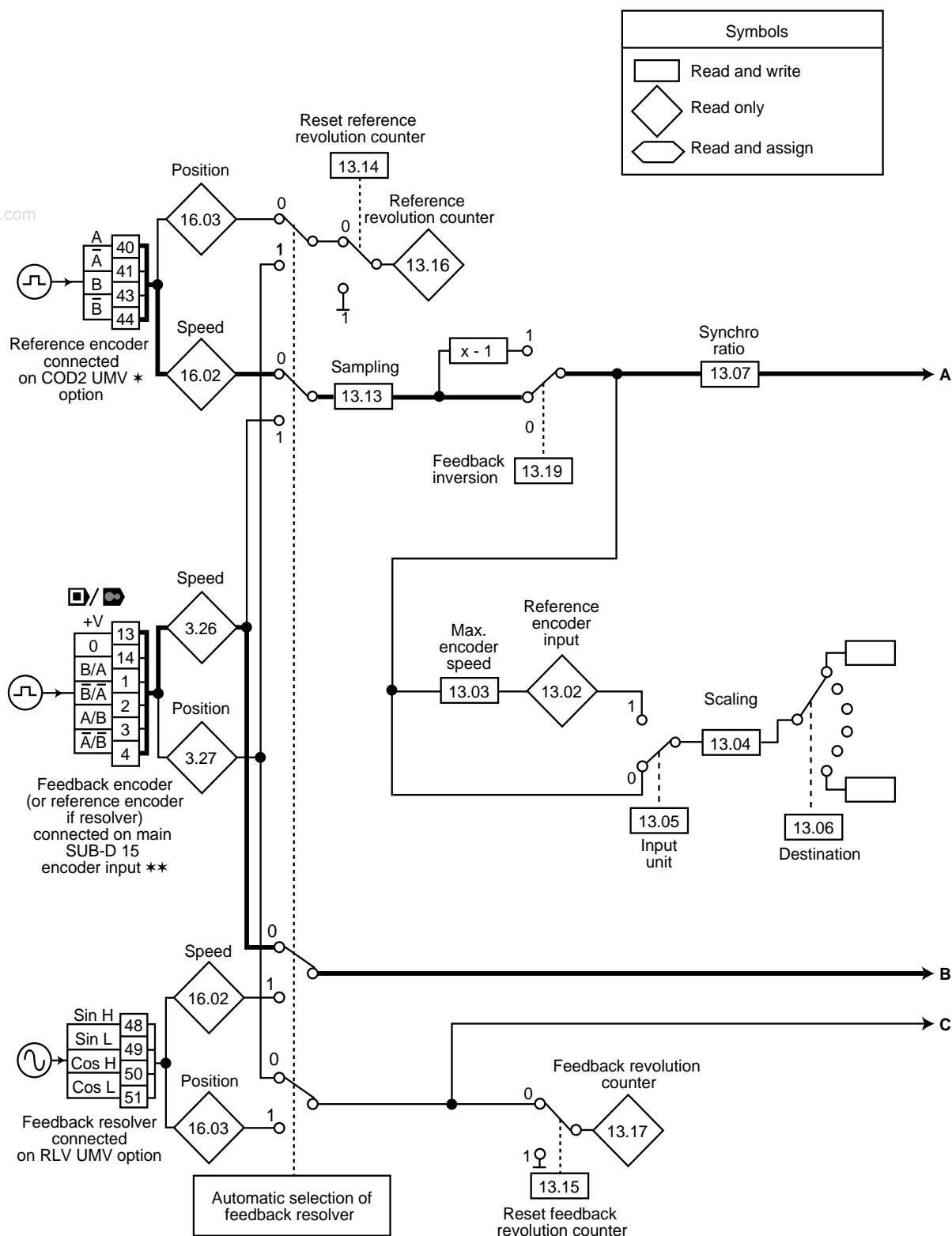
13.2.1 - Open loop ()



UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

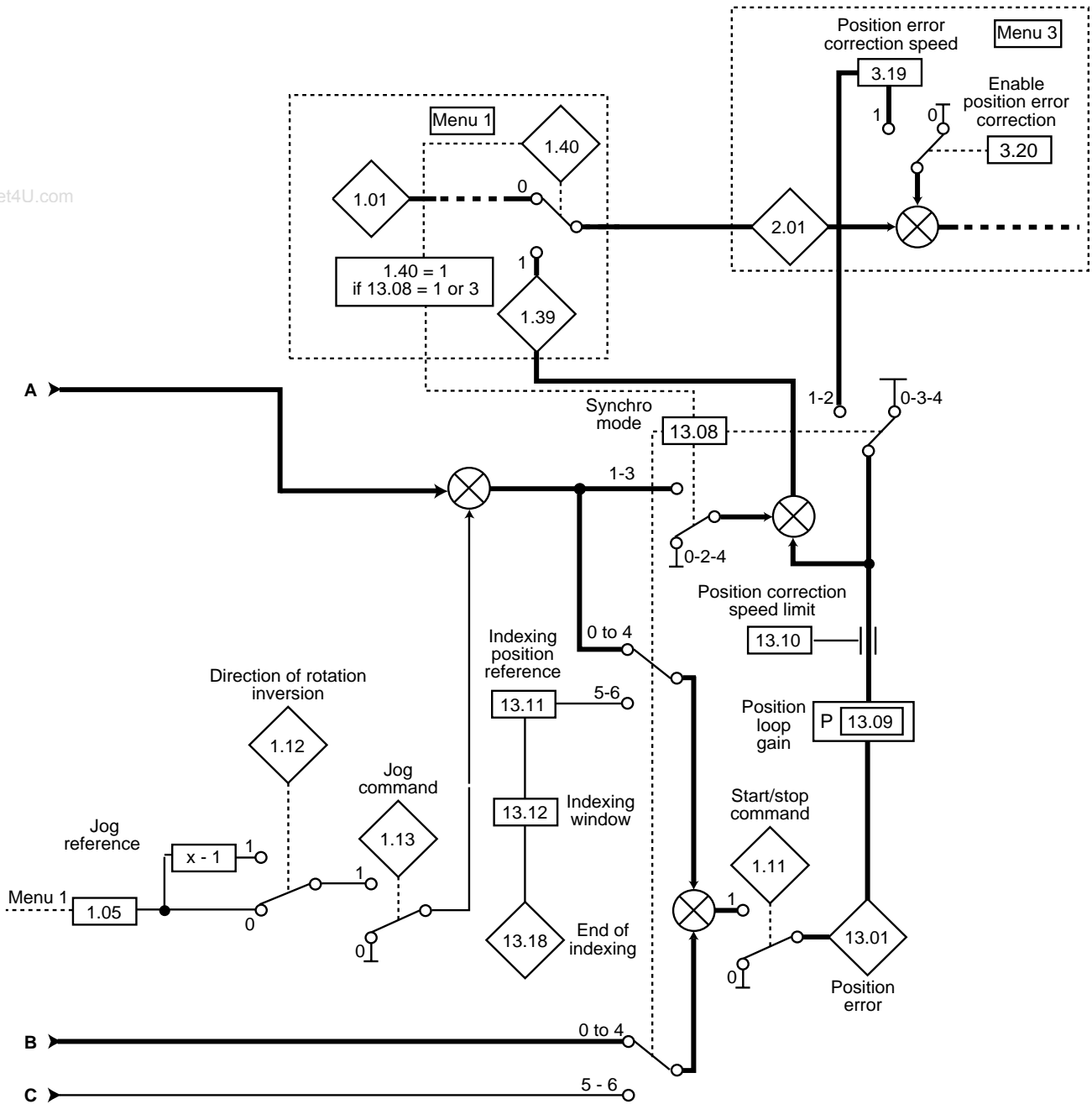
13.2.2 - Closed loop (&)



UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

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* Refer to menu 16 of the COD2 UMV manual for how to set encoder characteristics.




** Refer to menu 3 for how to set encoder characteristics.


UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

13.3 - Explanation of menu 13 parameters

Symbols :

- open loop 
- closed loop 
- servo mode 



In open loop mode () this menu enables a frequency signal connected on the encoder 1 input (15-pin Sub D) to be used as a speed reference.



: Position loop error

Adjustment range : $\pm 16384/16384$ revolutions
 This parameter indicates the position error when position control is used.
 The adjustment range of this parameter is ± 1 revolution.
 If the position error exceeds one revolution, the parameter display a 'one revolution' error and the sign corresponding to the direction of the error.

: Encoder reference input

Adjustment range : $\pm 100.0\%$



 : This parameter indicates the speed of the encoder feedback connected on the main encoder 1 input expressed as a percentage of the maximum speed programmed in parameter .




 : This parameter indicates the speed of the reference encoder connected on the COD2 UMV option expressed as a percentage of the maximum speed programmed in parameter .

: Encoder max. speed

Adjustment range : 0 to 30000 min^{-1}


Factory setting :  } : 1500 min^{-1}
 }
 : 3000 min^{-1}



 : This parameter must correspond to the maximum speed possible on feedback encoder 1 when this input is used as a speed reference.
 When the speed of feedback encoder 1 is equal to this value, parameter  indicates 100 %.

 &  : This parameter must correspond to the maximum speed possible on the encoder input which provides the reference.
 When the speed on the reference encoder input is equal to this value, parameter  indicates 100 %.

: Scaling

Adjustment range : 0 to 4.000
 Factory setting : 1.000

 : Can be used to scale the feedback encoder input when this is used as a speed reference.


 &  : Can be used to scale the encoder input which is used as a reference.

& : Selection of input unit



Adjustment range : 0 or 1
 Factory setting : 0


When the reference encoder input is used only as a reference, the value can be a percentage of the maximum value which the input can take or a direct value in min^{-1} .

0 : min^{-1} .

1 : % .

: Reference input destination

Adjustment range :  to 

Factory setting : 

This parameter is used to define the assignment of the encoder reference.

Only non-bit, unprotected parameters can be programmed.




If an unsuitable parameter is programmed, the input is not programmed anywhere.

: Synchronisation ratio

Adjustment range : 0 to 4.000
 Factory setting : 1.000

This parameter enables a ratio other than 1 to be obtained between the reference encoder and the feedback.



: Synchronisation mode




Adjustment range :  : 0 to 2
 } : 0 to 6



Factory setting : 0

0 : Deactivated.

1 : Position synchronisation with speed reference from the reference encoder and error correction from the position loop.

- The final speed reference is addressed in parameter  and parameter  which enables this reference to be set to 1 automatically.

-  &  : the additional speed reference necessary for correction of the error is addressed in parameter .

Set parameter  to 1 to confirm the error correction.

- Synchronisation mode performs best when the speed of the reference encoder is high.

In position synchronisation mode, the controlled motor goes into overspeed to catch-up the position error.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

2 : Position synchronisation with error correction only.

- **1** : The speed reference **1.39** only comprises the speed necessary for correction of the position error.

- Parameter **1.40** which enables this reference is set to 1 automatically.

- **2** & **3** : The speed reference necessary for correction of the position error is addressed in parameter **3.19**.

Set parameter **3.20** to 1 to confirm the error correction.

- Synchronisation mode is used when the speed of the reference encoder is insufficient to achieve good synchronisation. In this case, a main speed reference from menu 1 (**1.01**) can be added to the error correction.

3 : **4** & **5** : Speed synchronisation with speed reference from the reference encoder and error correction from the position loop.

- Identical to 1 but speed synchronisation only.

- In speed synchronisation, if there is an offset between the controlled motor and the reference encoder (overload, inertia etc), the position error is cancelled when the controlled motor reaches the reference speed.

4 : **6** & **7** : Not operational

5 : **8** & **9** : Indexing on a stop command

- If deceleration mode rP.POS is selected (parameter **6.01**), the controller immobilises the motor on a stop command at the position established in parameter **13.11**.

6 : **10** & **11** : Indexing on a start command or on a stop command

- Identical to 5 but also allows indexing on a start command.

- To do this, enable maintain standstill torque (parameter **6.08**).

Indexing procedure :

- The controller accelerates (mode 6) or decelerates (mode 5 and 6) until it reaches the speed set in **13.10** and in the direction in which the motor was turning before the indexing command.

- When the speed is reached, the ramps are cancelled automatically.

- When the position of the motor is close to the position requested, the speed reference goes to 0 and the position loop is enabled.

- When the speed required for error correction is less than 2 min^{-1} and the position of the motor is within the window determined by **13.11** and **13.12**, indexing is complete.

13.09 : Position loop gain

Adjustment range : 0 to 4.000

Factory setting : 0.100

Gain applied to the position loop for position error correction.

13.10 : Position error correction speed limit

Adjustment range : 0 to 250 min^{-1}

Factory setting : 150 min^{-1}

This parameter is used to limit the speed added to the speed reference required to catch up the position error.

In closed loop mode, this parameter is also used as the speed reference during indexing.

13.11 **12** & **13** : Indexing reference

Adjustment range : 0 to 4095 / 4096 revolutions

Factory setting : 0 revolution

This parameter defines the encoder position when stopped.

13.12 **14** & **15** : Indexing window

Adjustment range : 0 to 200/4096 revolutions

Factory setting : 20/4096 revolutions

During the indexing phase, completion is signalled when the absolute speed value is less than 2 min^{-1} and the position of the encoder is between (**13.11** - **13.12**) and (**13.11** + **13.12**).

13.13 **16** & **17** : Sampling

Adjustment range : 0 to 5.0 ms

Factory setting : 4.0 ms

The resolution of a speed measurement from an encoder depends on the sampling time.

Increasing the sampling time improves the resolution but increases the response time.

A compromise must be found between good resolution and an acceptable dynamic response.

For a multi-channel encoder, the resolution is given by :

$$\frac{\text{Number of channels} \times 4 \times \text{max speed} \times \mathbf{13.13}}{60,000}$$

13.14 : Reference encoder revolution counter reset

Adjustment range : 0 or 1

Factory setting : 0

When this parameter is set to 1, parameter **13.16** is reset.

13.15 : Reset feedback encoder revolution counter

Adjustment range : 0 or 1

Factory setting : 0

When this parameter is set to 1, parameter **13.17** is reset.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

13.16 : Reference encoder revolution counter

Adjustment range : 0 to 16384 revolutions

This variable is incremented for each revolution in a clockwise direction and decremented for each revolution in an anti-clockwise direction.

When the parameter reaches its maximum value, it returns to 0, not to the maximum value of the opposite sign.

13.17 : Feedback encoder revolution counter

Adjustment range : 0 to 16,384 revolutions

This variable is incremented for each revolution in a clockwise direction and decremented for each revolution in an anti-clockwise direction. When the parameter reaches its maximum value, it returns to 0, not to the maximum value of the opposite sign.

13.18 : End of indexing signal

Adjustment range : 0 or 1

Indicates that indexing has successfully been completed. Goes to 1 when the absolute speed value is less than 2 min^{-1} and the position is within the window defined by parameters 13.11 and 13.12 .

13.19 : Inversion of reference feedback

Adjustment range : 0 or 1

Factory setting : 0

The reference feedback can be inverted by setting this parameter to 1.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

14 - MENU 14 : PID CONTROLLER




14.1 - List of Menu 14 parameters

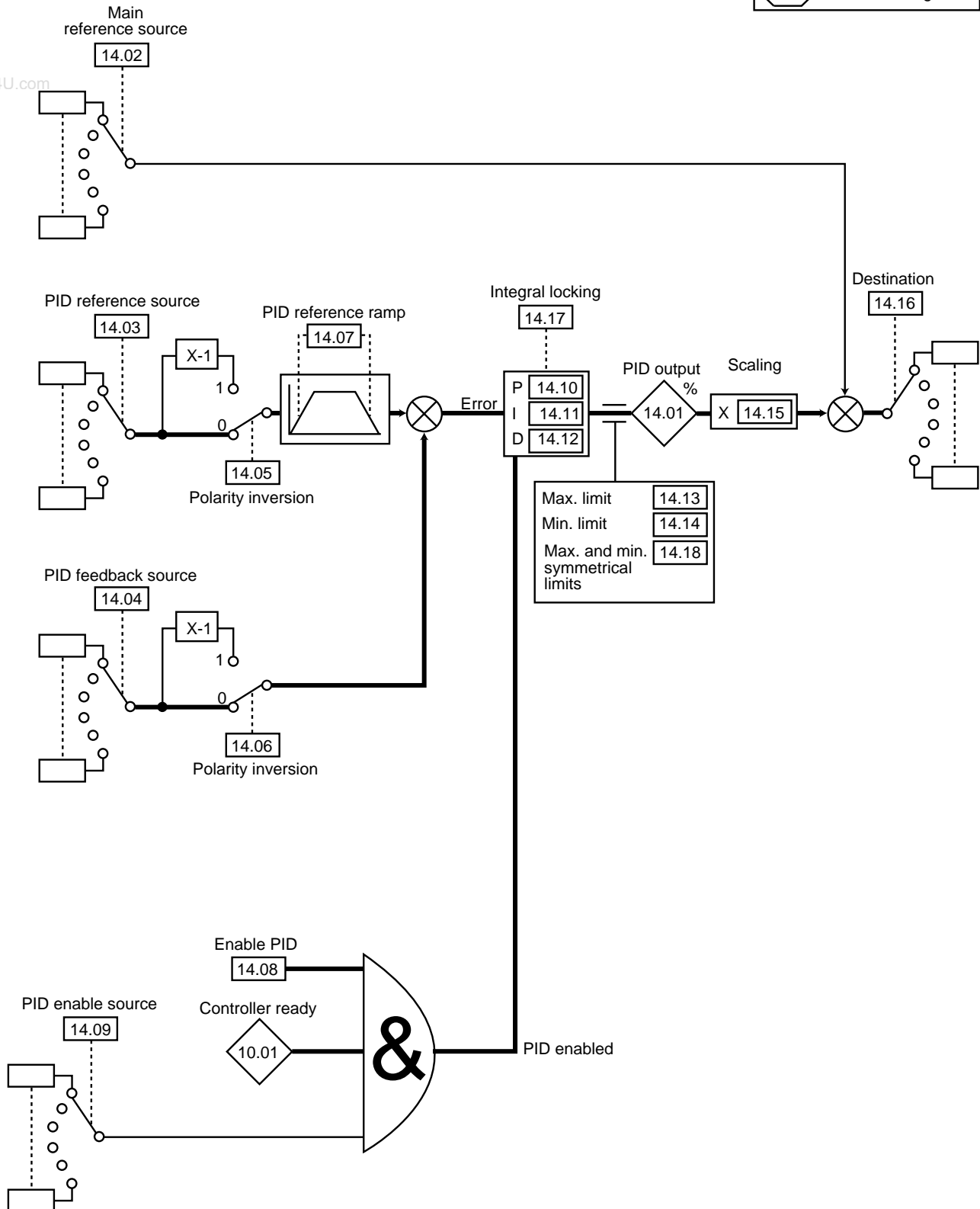
| Parameter | Description | Type | Mode | Adjustment range | Factory setting | User setting |
|-----------|---|------|------|------------------|-----------------|--------------|
| 14.01 | PID output | RO | | ±100.0 % | - | - |
| 14.02 | Main PID reference sources | R/W | | 0.00 to 20.50 | 0.00 | |
| 14.03 | PID reference sources | R/W | | 0.00 to 20.50 | 0.00 | |
| 14.04 | PID feedback sources | R/W | | 0.00 to 20.50 | 0.00 | |
| 14.05 | PID reference polarity inversion | R/W | | 0 or 1 | 0 | |
| 14.06 | PID feedback polarity inversion | R/W | | 0 or 1 | 0 | |
| 14.07 | PID reference ramp | R/W | | 0 to 3200.0 s | 0.0 s | |
| 14.08 | PID enabling | R/W | | 0 or 1 | 0 | |
| 14.09 | PID enable additional condition | R/W | | 0.00 to 20.50 | 0.00 | |
| 14.10 | PID proportional gain | R/W | | 0 to 4.000 | 1.000 | |
| 14.11 | PID integral gain | R/W | | 0 to 4.000 | 0.500 | |
| 14.12 | PID derivative gain | R/W | | 0 to 4.000 | 0.000 | |
| 14.13 | PID high limit | R/W | | 0 to 100.0% | 100.0% | |
| 14.14 | PID low limit | R/W | | ± 100.0% | -100.0% | |
| 14.15 | Scaling of PID output | R/W | | 0 to 4.000 | 1.000 | |
| 14.16 | PID output destination | R/W | | 0.00 to 20.50 | 0.00 | |
| 14.17 | Integral locking | R/W | | 0 or 1 | 0 | |
| 14.18 | Symmetry of the PID high and low limits | R/W | | 0 or 1 | 0 | |

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

14.2 - Menu 14 synoptic view

| Symbols | |
|---|-----------------|
|  | Read and write |
|  | Read only |
|  | Read and assign |






UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

14.3 - Explanation of menu 14 parameters

Symbols :

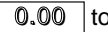

- open loop 
- closed loop 
- servo mode 


14.01 : PID output

Adjustment range : $\pm 100.0\%$

This parameter indicates the level of the PID regulator output before scaling.

14.02 to 14.04 : PID reference sources

Adjustment range :  0.00 to  20.50

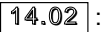
Factory setting :  0.00

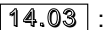
These parameters define the variables which are used as references for the PID regulator.

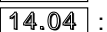
Only non-bit parameters can be programmed as sources.

If an unsuitable parameter is programmed, the value of the input is taken as 0.

All PID variables are automatically scaled so that these variables have an adjustment range of $\pm 100.0\%$ or from 0 to 100.0 % if they are uni-directional.

 14.02 : Main reference source to be added to the PID output.

 14.03 : PID reference source.

 14.04 : PID feedback source.

14.05 & 14.06 : Inversion of input sign

Adjustment range : 0 or 1

Factory setting : 0

These parameters are used to invert the PID reference and feedback signs.

0 : Input not inverted.

1 : Input inverted.

 14.05 : Inversion of PID reference.

 14.06 : Inversion of PID feedback.

14.07 : PID reference ramp

Adjustment range : 0 to 3200.0 s

Factory setting : 0.0 s

This parameter defines the time required for the PID reference to change from 0 to 100.0 % after a sudden variation of the input from 0 to 100 %. A variation of -100.0 % to +100.0 % will required double this time.

14.08 : PID enabling

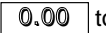

Adjustment range : 0 or 1


Factory setting : 0

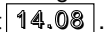
0 : The PID regulator is deactivated.

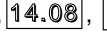
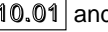
1 : The PID regulator is activated.

14.09 : Additional condition for PID enabling

Adjustment range :  0.00 to  20.50

Factory setting :  0.00

This parameter allows the PID regulator to be enabled with an additional condition at  14.08.

For the PID regulator to be enabled,  14.08,  10.01 and as the additional condition must all be at 1.

Only bit parameters can be assigned.

If an unsuitable parameter is selected, the input automatically takes the value 1 to avoid blocking the enable output.

14.10 : PID proportional gain

Adjustment range : 0 to 4.000

Factory setting : 1.000

This is the proportional gain applied to the PID error.

14.11 : PID integral gain

Adjustment range : 0 to 4.000

Factory setting : 0.500

This is the gain applied to the PID error before integration.

14.12 : PID derivative gain

Adjustment range : 0 to 4.000

Factory setting : 0.000

This is the gain applied to the PID error before derivation.

14.13 : PID high limit

Adjustment range : 0 to 100.0 %

Factory setting : 100.0 %

This parameter is used to limit the maximum value of the PID output.

14.14 : PID low 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.

14.15 : Scaling of the PID output

Adjustment range : 0 to 4.000

Factory setting : 1.000

This parameter is used to scale the PID output before adding it to the main reference.

The sum of the two references will be automatically re-scaled as a function of the adjustment range of the parameter to which it is addressed.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

14.16 : PID output destination

Adjustment range : 0.00 to 20.50

Factory setting : 0.00

Used to define the parameter to which the PID output is addressed.

Only non-bit and unprotected parameters can be assigned.

If an unsuitable parameter is assigned, the output will not be addressed anywhere.

If the PID output is suppose to affect the speed, it is advisable to address it to a preset speed.

If the PID output is suppose to correct the speed, it is advisable to address it to the speed offset (1.04).

14.17 : Integral locking

Adjustment range : 0 or 1

Factory setting : 0

0 : Integration is reset to 0 each time the PID loop is deactivated.

1 : The value of the integrator is retained each time the PID loop is deactivated.

14.18 : Symmetry of the PID high and low limits

Adjustment range : 0 or 1

Factory setting : 0

When 14.18 is set to 1, 14.13 and 14.14 take the same value and it is 14.13 which is used.

UMV 4301
Open and closed loop speed
controllers for asynchronous and
synchronous motors

Notes

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UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

15 - MENU 15 : RESERVED

Special menu : Consult Leroy-Somer.

16 - MENU 16 : SMALL OPTION MODULE PARAMETER SETTING

- The controller automatically provides access to special parameters, which vary depending on the option used.
- On a mains failure, the controller memorises the type of integrated option.
- On power return, if the type of option is different to that memorised, the controller signals a fault. If there is no longer an option module, the controller does not allow access to the corresponding special parameters.

16.01 : Type of integrated option

Adjustment range : 0 to 100

This parameter indicates a code which corresponds to the option integrated in the controller.

0 : No integrated option.

1 : ES UMV : Additional I/O.

2 : COD2 UMV : Second encoder input.

3 : RLV UMV : Resolver feedback.

4 : SINCOS UMV : SINCOS encoder interface.

All other parameters in Menu 16 depend on the integrated option.

Refer to the manual for the relevant option.

17 - MENU 17 : LARGE OPTION MODULE PARAMETER SETTING

- The controller automatically provides access to special parameters, which vary depending on the option used.
- On a mains failure, the controller memorises the type of integrated option.
- On power return, if the type of option is different to that memorised, the controller signals a fault. If there is no longer an option module, the controller does not allow access to the corresponding special parameters.

17.01 : Type of integrated option

Adjustment range : 0 to 100

This parameter indicates a code which corresponds to the option integrated in the controller.

Code 0 signifies that no large option module is integrated.

17.02 : Software versions of integrated option

Adjustment range : 0.00 to 99.99

Indicates the software version of the integrated option.

All other parameters in Menu 17 depend on the integrated option.

Refer to the manual for the relevant option.

Parameters relating to the COM1 UMV serial link option can be accessed in Menu 11.

18 - MENU 18 : APPLICATION-SPECIFIC PARAMETERS

- When a large option module is integrated, this menu is used to assign the specific parameters required for configuring special applications.
- Parameters 11 to 50 are memorised at the same time as other controller parameters.
- Parameter 1 is memorised each time the controller is powered down.
- Menu 18 parameters are given in the manual for the application program developed in the large option module.

19 - MENU 19 : APPLICATION-SPECIFIC PARAMETERS N

- When a large option module is integrated, this menu is used to assign the specific parameters required for configuring special applications.
- Parameters 11 to 50 are memorised at the same time as other controller parameters.
- Parameter 1 is memorised each time the controller is powered down.
- Menu 19 parameters are given in the manual for the application program developed in the large option module.

UMV 4301

Open and closed loop speed controllers for asynchronous and synchronous motors

20 - MENU 20 : APPLICATION-SPECIFIC PARAMETERS

- When a large option module is integrated, this menu is used to assign the specific parameters required for configuring special applications.
- Parameters 11 to 50 are memorised at the same time as other controller parameters.
- Parameter 1 is memorised each time the controller is powered down.
- Menu 20 parameters are given in the application program developed in the large option module.
- Menu 20 parameters are saved in the option module and not in the controller, unlike the parameters for menus 18 and 19.

Notes



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