# Variable speed drives for asynchronous motors
Altivar 71

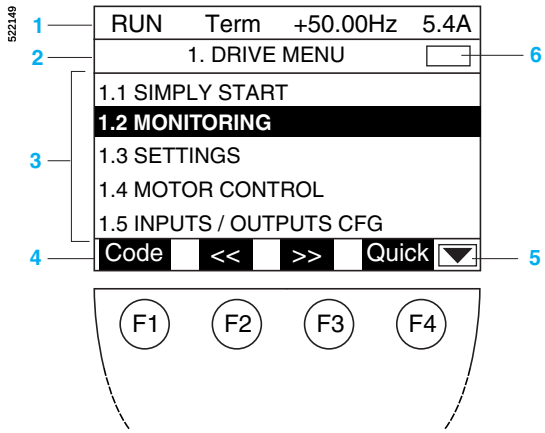
## Summary of functions

# Variable speed drives for asynchronous motors
Altivar 71

## Summary of functions (continued)

### Application functions (continued)

# Variable speed drives for asynchronous motors
Altivar 71


## Remote graphic display terminal functions

This display terminal is attached to the front of the drive. It includes the integrated 7-segment display terminal for drives supplied without a graphic display terminal.

■ **Description**

□ **Description of graphic display terminal**

1 Graphic display unit:
- 8 lines, 240 x 160 pixels
- large digit display that can be read from 5 m away
- bar chart display

2 Assignable function keys F1, F2, F3, F4:
- dialogue functions: direct access, help screens, navigation
- application functions: Local/Remote, preset speed

3 STOP/RESET key: local control of motor stopping/fault clearing

4 RUN key: local control of motor operation

5 Navigation button:
- Press to save the current value (ENT)
- Turn ± to increase or decrease the value, go to the next or previous line

6 FWD/REV key: reverses the direction of rotation of the motor

7 ESC key: aborts a value, parameter or menu to return to the previous option

***Note:*** *keys 3, 4 and 6 can be used to control the drive directly.*

□ **Description of graphic display unit**

1 Display line. Its content can be configured; the factory settings show:
- the drive status (e.g. RUN)
- the active control channel (e.g. “Term”: terminals)
- the frequency reference
- the current in the motor

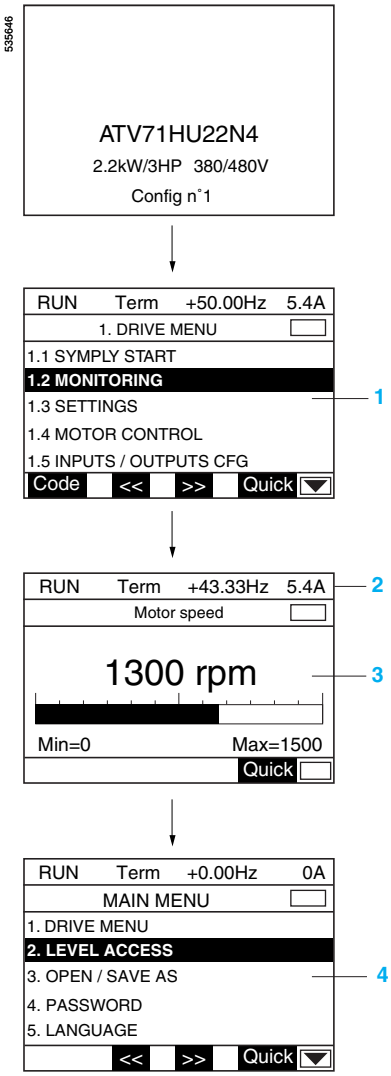
2 Menu line. Indicates the current menu or submenu.

3 Area displaying menus, submenus, parameters, values, bar charts, in the form of a scrolling window, with a maximum of 5 lines.
The line or value selected using the navigation button is displayed in reverse video (see example opposite).

4 Section displaying the functions assigned to the F1 to F4 keys and aligned with them, for example:
- >>: Horizontal scrolling to the right, or proceeding to the next menu or submenu, or, in the case of a value, decreasing the value, displayed in reverse video (see example opposite).
- <<: Horizontal scrolling to the left, or proceeding to the next menu or submenu, or, in the case of a value, increasing the value, displayed in reverse video
- Quick: Rapid access to a parameter from any screen when the Quick function is displayed above the F4 key
- HELP: Contextual help
- Code: Displays the selected parameter code
- Other functions (application functions) can be assigned to these keys via the 1.6 COMMAND menu.

5 ▭ : Means that this display window does not scroll further down.
▼ : Means that this display window can scroll further down.

6 ▲ : Means that this display window can scroll further up.
▭ : Means that this display window does not scroll further up.




## Remote graphic display terminal functions (continued)

■ **Navigation: accessing menus and parameters**

**Structure of main menus:**

1 Drive menu:

| Menu type | Function |
|---|---|
| 1.1 SIMPLY START | Simplified menu for a quick start |
| 1.2 MONITORING | Displays current values for motor, inputs/outputs and communication (command words, status words, etc.) |
| 1.3 SETTINGS | Accesses the adjustment parameters, which can be modified during operation |
| 1.4 MOTOR CONTROL | Accesses the motor parameters, including adjustment of motor control profiles |
| 1.5 INPUTS/OUTPUTS CFG | Configures the I/O and transforms signals |
| 1.6 COMMAND | Configures the command and reference channels |
| 1.7 APPLICATION FUNCT. | Configures the application functions (preset speeds, PID regulator, etc.) |
| 1.8 FAULT MANAGEMENT | Configures the fault management process |
| 1.9 COMMUNICATION | Configures the communication networks |
| 1.10 DIAGNOSTICS | Provides diagnostics for motor and drive, integrated test procedures, fault log |
| 1.11 IDENTIFICATION | Identifies the drive and the internal options |
| 1.12 FACTORY SETTINGS | Restores factory settings (completely or by parameter group) |
| 1.13 USER MENU | Accesses the parameters selected by the user |
| 1.14 PROGRAMMABLE CARD | Accesses the parameters for the Controller Inside programmable card |

2 Display line

3 Display screen: Displays values in the form of bar charts or digital values, depending on the extent of customization.

4 Main menu:

| Menu type | Function |
|---|---|
| 1. DRIVE MENU | See above (1 Drive menu) |
| 2. ACCESS LEVEL | 4 access levels: basic, limited, advanced, expert |
| 3. OPEN/SAVE AS | Transfers files between the graphic display terminal and the drive |
| 4. PASSWORD | Provides password protection for the configuration |
| 5. LANGUAGE | Choice of 6 languages available (English, German, Spanish, French, Italian and Chinese) |
| 6. MONITORING CONFIG. | Customizes the display line 2 and the display screen 3 (bar charts, digital values) |
| 7. DISPLAY CONFIG. | Configures how parameters are displayed: customization, selection for User menu, visibility, accessibility |

■ **Password**

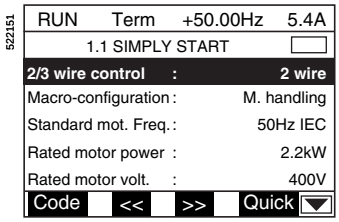
Altivar 71 drives allow individual parameters to be selected for password protection. Rights can be set for save operations and for loading the configuration.

## Integrated 7-segment display terminal

ATV 71●●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4…HD15N4 drives can be supplied without a graphic display terminal. In this case, they are equipped with an integrated 7-segment display terminal.
ATV 71P●●●N4Z drives are equipped as standard with an integrated 7-segment display terminal.
This can be used to:
- Display status and faults
- Access and modify parameters

## Start-up

The Altivar 71 drive is supplied ready for use for most applications.
When the drive is switched on, the menus for setting the language and access level appear automatically.




*Simply Start menu*

### ■ Simply Start menu

By accessing the Simply Start menu directly it is possible to:
- Pre-program the drive for an application:
  - Select the relevant macro-configuration
  - 2-wire/3-wire control
- Benefit from optimum motor performance:
  - Enter data from the motor rating plate
  - Auto-tuning
- Protect the motor by setting the drive's integrated electronic thermal overload relay

## Start-up (continued)

■ **Programming using macro-configurations**

Programming using macro-configurations offers the choice of seven options corresponding to the various business areas and applications:

- □ Start/stop
- □ Material handling
- □ General use
- □ Hoisting
- □ PID regulation
- □ Communication network connectivity
- □ Master/slave applications

Choosing one of these macro-configurations automatically assigns the functions, parameters and I/O, even in the case of option cards. Although the configuration is preset, it can still be modified, if necessary.

The Start/stop macro-configuration is set as the factory configuration.
The preset functions for each macro-configuration are given in the table below.

| Type of macro-configuration | | Start/stop | Material handling | General use | Hoisting | PID regulation | Communication network connectivity | Master/slave application |
|---|---|---|---|---|---|---|---|---|
| **Altivar 71 drive I/O** | | | | | | | | |
| **AI1** | | Ref. 1 channel | Ref. 1 channel | Ref. 1 channel | Ref. 1 channel | PID reference | Ref. 2 channel<br>Ref. 1 channel by bus | Ref. 1 channel |
| **AI2** | | Not assigned | Sum ref. 2 | Sum ref. 2 | Not assigned | PID feedback | Not assigned | Torque ref. 2 channel |
| **AO1** | | Motor freq. | Motor freq. | Motor freq. | Motor freq. | Motor freq. | Motor freq. | Signed torque |
| **2-wire** | **LI1** | Forward | Forward | Forward | Forward | Forward | Forward | Forward |
| | **LI2** | Reverse | Reverse | Reverse | Reverse | Reverse | Reverse | Reverse |
| | **LI3** | Not assigned | 2 preset speeds | JOG | Fault reset | PID integral reset | Ref 2 switch | Trq/spd switching |
| | **LI4** | Not assigned | 4 preset speeds | Fault reset | Ext fault | PID 2 preset ref. | Fault reset | Fault reset |
| | **LI5** | Not assigned | 8 preset speeds | Torque limit | Not assigned | PID 4 preset ref. | Not assigned | Not assigned |
| | **LI6** | Not assigned | Fault reset | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **3-wire** | **LI1** | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| | **LI2** | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| | **LI3** | Reverse | Reverse | Reverse | Reverse | Reverse | Reverse | Reverse |
| | **LI4** | Not assigned | 2 preset speeds | JOG | Fault reset | PID integral reset | Ref 2 switch | Trq/spd switching |
| | **LI5** | Not assigned | 4 preset speeds | Fault reset | Ext fault | PID 2 preset ref. | Fault reset | Fault reset |
| | **LI6** | Not assigned | 8 preset speeds | Torque limit | Not assigned | PID 4 preset ref. | Not assigned | Not assigned |
| **R1** | | Faulty | Faulty | Faulty | Faulty | Faulty | Faulty | Faulty |
| **R2** | | Not assigned | Not assigned | Not assigned | Brk control | Not assigned | Not assigned | Not assigned |
| **I/O extension card I/O** | | | | | | | | |
| **2-wire** | **LI7** | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **3-wire** | **LI7** | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **LI8 to LI14** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **LO1 to LO4** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **R3/R4** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **AI3, AI4** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **RP** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |
| **AO2** | | Motor current | Motor current | Motor current | Motor current | Motor current | Motor current | Motor current |
| **AO3** | | Not assigned | Signed torque | Not assigned | Signed torque | PID error | Not assigned | Motor freq. |
| **Graphic display terminal keys** | | | | | | | | |
| **F1 key** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Control via graphic display terminal | Not assigned |
| **F2, F3, F4 keys** | | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned | Not assigned |

# Variable speed drives for asynchronous motors
Altivar 71

## Start-up (continued)

■ **MONITORING menu**

The MONITORING menu can be used to display commands, the operation of the motor and the application via the drive, its I/O or the communication network connections.

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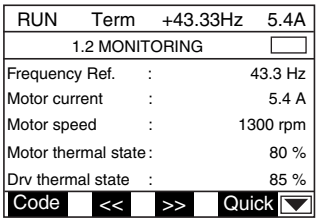
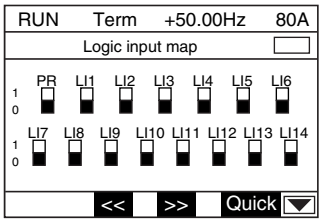
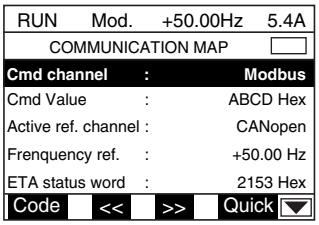



*Displaying physical values*




*Logic input map*




*Communication map*

## Configuration and settings

The SETTINGS menu can be used to configure all the drive's settings. Activating a function automatically provides access to the related settings on the same screen (the application functions are described on pages 60298/12 to 60298/33).

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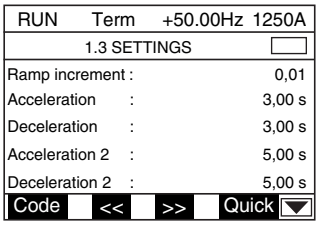
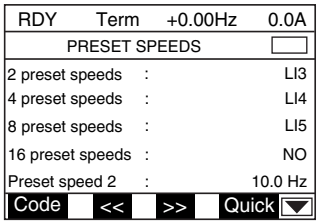
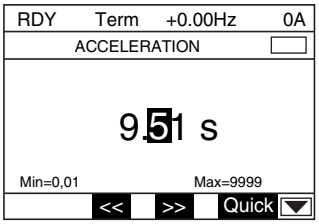



*Settings screen*




*Setting a function*




*Configuring a value*

## Operation

The display screen appears automatically every time the drive is turned on. There are various possibilities:

- One or two bar charts are displayed.
- One, two or five digital values are displayed.

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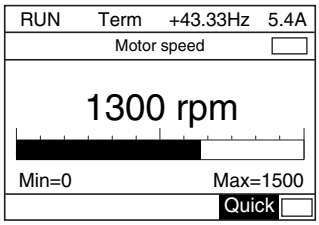
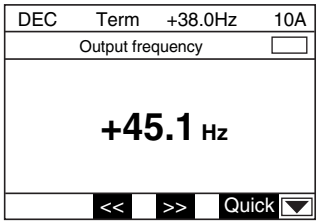
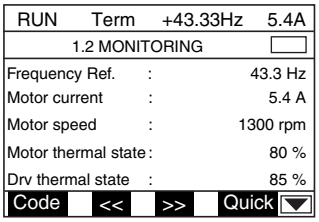



*1 bar chart*




*1 digital value*




*5 digital values*

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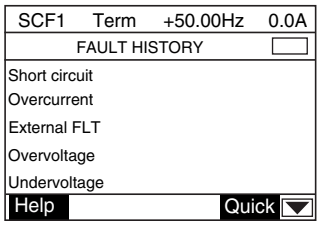


*Fault log*

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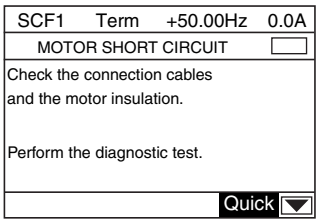


*Troubleshooting screen*

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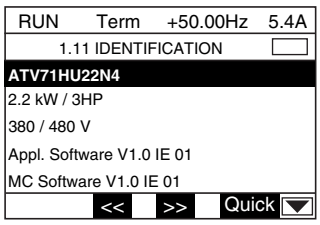


*Identification screen*

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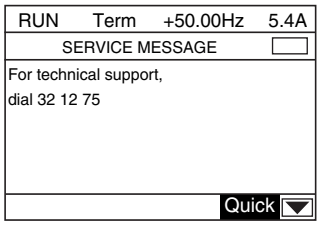


*Example of a customized message*

## Maintenance, diagnostics

New functions have been added to the Altivar 71 drive to enable it to provide quick and simple maintenance, ultimately boosting productivity:

### ■ Response to faults or alarms

It is possible to use the alarm management or drive operation configuration functions to take corrective actions before stopping the machine.

### ■ Fault log and help

When a fault occurs, a help screen is available to quickly identify the cause of the fault.
When a fault occurs, values such as speed, current, thermal state and timer are saved and restored in the fault log.
The last 8 faults are stored.

### ■ IDENTIFICATION menu

The IDENTIFICATION menu can be used to display the relevant serial numbers and software versions, thereby helping to manage the equipment base. This information, also available with the PowerSuite software workshop, can be exported to other database-type software applications.

### ■ Test functions

The Altivar 71 drive includes the following test functions:
□ Identifying any motor short-circuit before start-up
□ Running, via the graphic display terminal or PowerSuite software workshop, automatic procedures during maintenance operations to test:
- the motor
- the drive power components

The test results are shown on the graphic display terminal or using the PowerSuite software workshop.
It is also possible to write and read messages in the drive using the graphic display terminal or the PowerSuite software workshop.

### ■ Oscilloscope function

The Altivar 71 drive has an oscilloscope function, which produces traces that can be viewed using the PowerSuite software workshop.
The PowerSuite software workshop can also be used to carry out remote diagnostics via modem.

## Controlling the drive

■ **Via the drive I/O**

Control signals are transmitted via cable to the I/O. Functions are assigned to logic inputs, analog inputs, etc.
A logic input can be assigned to more than one function. This means that two functions can be controlled using a single signal, thereby limiting the number of inputs required.

The Altivar 71 drive I/O can be configured independently from each other.
For instance,
□ A time delay can be applied when it comes to reading the logic inputs, so as to avoid any bounce-back from certain switches.
□ Transforming incoming signals on the analog inputs can help the drive fully adapt to the control devices and applications:
- Minimum and maximum values for the input signal
- Input filtering in order to eliminate unwanted interference from the signals received
- Magnifying glass effect through delinearizing the input signal in order to increase the precision with small amplitude signals
- “Pedestal” and “Deadband” functions for signals in order to prevent low speed operations which can have an adverse effect on the application
- “Mid-point” function, which can be used from a unipolar input signal to obtain a bipolar output signal to control the speed and direction of rotation

□ Transforming analog outputs which transfer information sent by the drive to other devices (display units, drives, PLCs, etc.):
- voltage or current output signal
- minimum and maximum values for the output signal
- output signal filtering

Logic outputs can be delayed on activation and deactivation.
The output state can also be configured when the signal is active.
The frequency control signals are also transformed by the drive:
□ signal frequency minimum and maximum values (30 kHz on the extended I/O card’s RP input, 300 kHz maximum on the encoder interface card input).

■ **Via the remote graphic display terminal**

The rotation commands and references (torque, speed or PID) can be controlled via the graphic display terminal. Some application functions can also be assigned to the function keys F1, F2, F3 and F4 on the graphic display terminal. It is possible to manage a change in command and/or reference source (bumpless function) in different ways.
For example: two options are offered when switching from control via the terminals to control via the graphic display terminal:
□ stop the Altivar 71 drive, or
□ continue operation with a copy of the direction of rotation and reference

## Controlling the drive (continued)

■ **Via a communication network**

□ **I/O profile**

The I/O profile, which is quick and easy to use, can be used to control the Altivar 71 drive via the communication network, in the same way as via the I/O terminals.
When commands are sent via a network they are written in a command word.
This word behaves like virtual terminals containing logic inputs.
Application functions can be assigned to the bits of this word. More than one function can be assigned to the same bit.

The commands and references can come from different sources, such as the terminals, graphic display terminal or communication networks.
Each source can be set or switched individually using logic inputs or command word bits.

The I/O profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **CiA DSP 402 profile ("Device Profile Drives and Motion Control")**

This profile, from the CiA (CAN in Automation) organization, describes standard functions, parameters and operation for variable speed drives.
This standard is an extension of the Drivecom profile. The Altivar 71 drive complies with the CiA DSP 402 standard and it supports the following 2 modes in this profile: separate and not separate.

**Separate mode**

The Start/Stop commands and references can come from different sources.
E.g. the speed reference is transmitted by the Ethernet TCP/IP network and the Start/Stop commands by the logic signals wired on the terminals.

Each source can be set or switched individually using logic inputs or command word bits.

**Not separate mode**

The Start/Stop commands and references (speed, torque, PID, etc.) come from the same source (e.g. CANopen bus).

It is possible to replace this source by another one, using a logic input or command word bit.

The CiA DSP 402 profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **ODVA profile**

The ODVA profile is supported by the DeviceNet communication card.

# Variable speed drives for asynchronous motors
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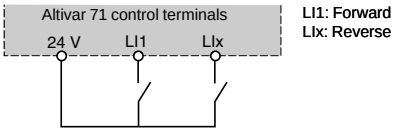
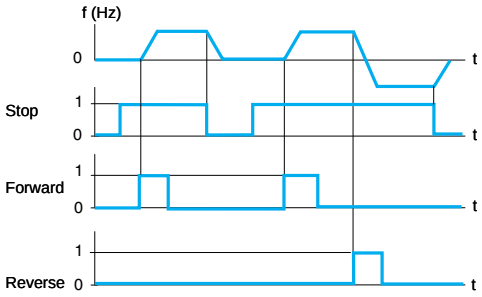
## Application functions

### ■ 2-wire control
This function is used to control the direction of operation by means of a stay-put contact.
It is enabled by means of 1 or 2 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:
- □ Detection of the state of the logic inputs
- □ Detection of a change in state of the logic inputs
- □ Detection of the state of the logic inputs with forward operation always having priority over reverse



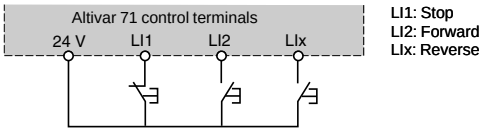

*Wiring diagram for 2-wire control*




*Example of 3-wire control operation*

### ■ 3-wire control
This function is used to control the operating and stopping direction by means of pulsed contacts.
It is enabled by means of 2 or 3 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.




*Wiring diagram for 3-wire control*

### ■ Phase rotation
This function can be used to reverse the direction of rotation without modifying the drive wiring.

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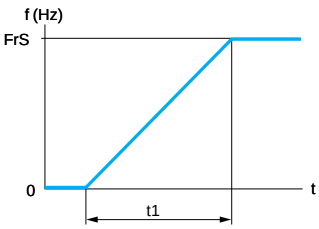
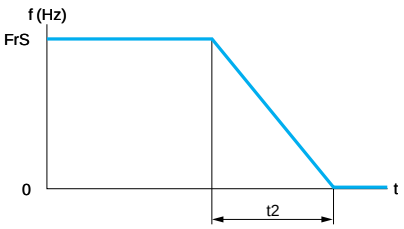
| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| RAMP | | | |
| Ramp shape | : | | Linear |
| Ramp increment | : | | 0.01 |
| Acceleration | : | | 3.92 s |
| Deceleration | : | | 0.54 s |
| Ramp 2 threshold | : | | 0.0 Hz |
| Code | | | Quick |

*Ramp settings*

### ■ Ramps
#### □ Acceleration and deceleration ramp times
This function is used to define acceleration and deceleration ramp times according to the application and the machine dynamics.




*Linear acceleration ramp*




*Linear deceleration ramp*

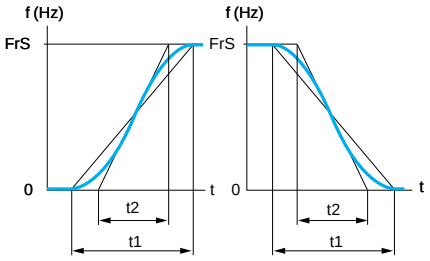
FrS: Nominal motor frequency
t1: Acceleration time
t2: Deceleration time
t1 and t2 can be set independently from 0.01 to 9999 s
(according to one of the following ramp increments: 0.01 s, 0.1 s or 1 s)
Factory setting: 3 s.

### □ Acceleration and deceleration ramp profile

Used to gradually increase the output frequency starting from a speed reference, following a linear profile or a preset profile.

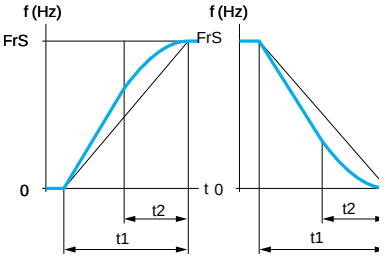
In the case of applications involving handling, packaging and passenger transport, the use of S ramps takes up mechanical play and eliminates jolts, and also limits “non-following” of speed during rapid transient operation of high-inertia machines. Selecting “linear”, “S”, “U” or customized profiles assigns both the acceleration and deceleration ramps.

**S ramps**



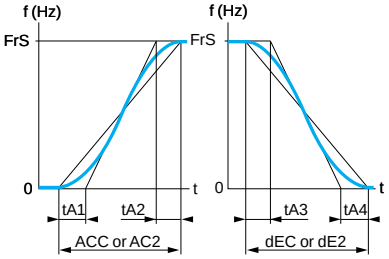

FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.

**U ramps**

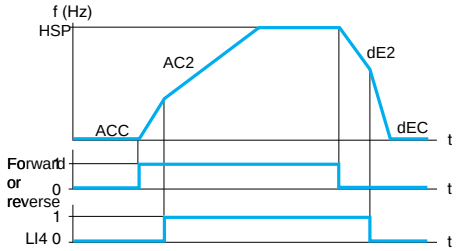



FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.

**Customized ramps**




FrS: Nominal motor frequency
tA1: Adjustable between 0 and 100% (of ACC or AC2)
tA2: Adjustable between 0 and (100% - tA1) (of ACC or AC2)
tA3: Adjustable between 0 and 100% (of dEC or dE2)
tA4: Adjustable between 0 and (100% - tA3) (of dEC or dE2)
ACC: Acceleration ramp 1 time
AC2: Acceleration ramp 2 time
dEC: Deceleration ramp 1 time
dE2: Deceleration ramp 2 time




*Example of switching using logic input LI4*

Acceleration 1 (ACC) and deceleration 1 (dEC):
- Adjustment 0.01 to 9999 s
- Factory setting 3 s

Acceleration 2 (AC2) and deceleration 2 (dE2):
- Adjustment 0.01 to 9999 s
- Factory setting 5 s

HSP: High speed.

### □ Ramp switching

This function is used to switch two acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
- a logic input
- a frequency threshold
- a combination of the logic input (or a command word bit) and the frequency threshold
- a command word bit

This function is suitable for:
- material handling with smooth starting and approach
- machines with fast steady state speed correction

### □ Automatic adaptation of deceleration ramp

Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function prevents the drive from locking in the event of an overbraking fault.
When this function is active and a short deceleration time has been set, the drive optimizes the motor power supply in order to achieve a high braking torque.

This function is suitable for all applications not requiring precise stopping and not using braking resistors.

Automatic adaption must be disabled for machines with a stop position on a ramp and using a braking resistor. This function is automatically disabled if the brake sequence is configured.

# Variable speed drives for asynchronous motors
Altivar 71

522165

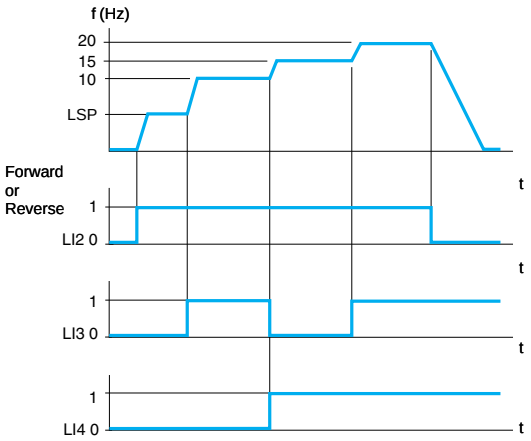
| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| PRESET SPEEDS | | | |
| 2 preset speeds | : | | LI3 |
| 4 preset speeds | : | | LI4 |
| 8 preset speeds | : | | LI5 |
| 16 preset speeds | : | | NO |
| Preset speed 2 | : | | 10.0 Hz |
| Code | << | >> | Quick |

*Preset speed settings*

## ■ Preset speeds

This can be used to switch preset speed references.
Choose between 2, 4, 8 or 16 preset speeds.
It is enabled by means of 1, 2, 3 or 4 logic inputs.
Preset speeds can be set in increments of 0.1 Hz, from 0 Hz to 500 Hz or 1000 Hz, depending on the rating.

This function is suitable for material handling and machines with several operating speeds.




The speed achieved with the LI3 and LI4 inputs at 0 is LSP or reference speed, resulting from the operations carried out on the references.

Factory settings:

1st speed: LSP (low speed or speed reference)

2nd speed: 10 Hz

3rd speed: 15 Hz

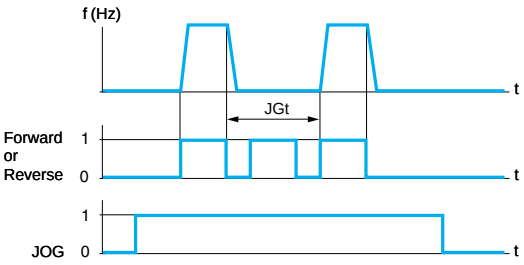
4th speed: 20 Hz

*Example of operation with 4 preset speeds and 2 logic inputs*

## ■ Jog operation

This can be used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
It is enabled by 1 logic input and pulses given by the operating direction command.

This function is suitable for machines with product insertion in manual mode (e.g. gradual movement of the mechanism during maintenance operations).




Speed reference: Adjustable from 0 to 10 Hz, factory setting 10 Hz.

JGt: minimum time between 2 pulses, which can be set between 0.5 and 2 s.

*Example of jog operation*

## ■ Limiting low speed operating time

The motor is stopped automatically after a period of operation at low speed (LSP) with a zero reference and a run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time). Factory setting 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.

Function suitable for automatic Stops/Starts.

■ **Motor control types**

□ **Flux vector control with sensor (FVC)**
In current mode, this control type can be used to obtain the best static and dynamic torque performance.

□ **Sensorless flux vector contro**l
In voltage mode, this control type can be used with a single motor or motors connected in parallel.
In current mode, this profile performs better than the previous type, but it cannot supply power to motors connected in parallel.

□ **2-point vector control**
The zone for operating at constant power can be optimized by defining an additional point in the control profile.
This function should be used with motors offering a two-part defluxing zone.
It can be used to limit the voltage at the motor terminals when the motor is being powered by a high line supply.

□ **Voltage/frequency ratio**
This control type is particularly suitable for special motors (high-speed motors, synchronized asynchronous motors, etc.). The ratio can be adjusted by 2 or 5 points and used to achieve output frequencies of up to 1000 Hz.

□ **ENA system**
This profile is reserved for unbalanced machines (presses, etc.). It can be used to reduce mechanical stress, power consumption and avoid the use of braking resistors.

□ **Synchronous motor**
This control type is exclusively reserved for controlling open loop synchronous permanent magnet motors with sinusoidal electromotive force (EMF).

■ **Using an incremental encoder**
The Altivar 71 drive uses encoder feedback to:
□ Operate in FVC closed loop control mode. In addition to the torque performance and speed accuracy it provides, the speed feedback can also be used to manage overspeed and slipping protection.
□ Improve the steady state speed accuracy and/or manage overspeed and slipping protection in the other control types (FVC open loop control mode and U/f ratio)
□ Manage only overspeed and slipping protection

■ **Encoder tests**
The Altivar 71 drive can detect encoder signal loss, as well as a mechanical break in the coupling between encoder and motor.

■ **Limiting motor overvoltage**
The Altivar 71 drive inverter bridge control can be used to limit overvoltage in the motor terminals, which is double the voltage level in the DC bus (Stressless PWM). This function is useful in cases where long lengths of cabling, rewound motors or motors in a low isolation class are involved.

■ **Auto tune**
Auto-tuning can be performed:
□ using a dialogue tool (graphical display terminal, PowerSuite software workshop, integrated 7-segment display terminal)
□ via a communication network
□ automatically every time the drive is switched on
□ by enabling a logic input

Auto-tuning is used to optimize application performance.
In Flux Vector Control mode (FVC closed loop and FVC open loop with current control), certain parameters are measured periodically.
Saving the motor thermal state can help to compensate exactly for the motor resistors, even after the drive has been switched off.

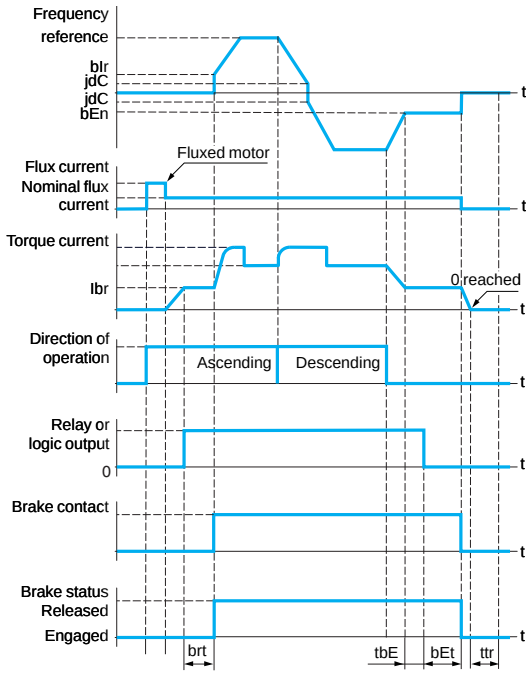
■ **Switching frequency, noise reduction**
The switching frequency setting permits a reduction in the noise generated by the motor for any application requiring a low level of noise.
The switching frequency is modulated randomly in order to avoid resonance.
This function can be disabled if it causes instability.
High frequency switching of the intermediate DC voltage can be used to supply the motor with a current wave that has little harmonic distortion.
The switching frequency can be adjusted during operation to reduce the noise generated by the motor.
Value: 1 to 16 kHz; factory setting 2.5 or 4 kHz, depending on the rating.

■ **Motor fluxing**
This can be used to obtain rapid high torque on start-up; magnetic flux needs to be already established in the motor.
There is a choice between open loop or closed loop operation.

In continuous mode, the drive automatically establishes the flux when it is powered up.

In non-continuous mode:
□ If a logic input or command word bit is assigned to the motor fluxing command, flux is established when the command is confirmed.
□ If neither a logic input nor a command word bit has been assigned, or if the latter are not active when a run command is given, fluxing occurs when the motor starts.

Fluxing is accelerated if a current higher than the nominal motor current is applied, then it is set to the value of the motor magnetizing current.




*Open loop vertical movement*

bEn: Brake engage frequency
bEt: Brake engage time
bIr: Initialization of ramp once the "brake release" time (brt) has expired
brt: Brake release time
Ibr: Brake release current
JdC: Reverse jump
tbE: Brake engage time
ttr: Restart time

***Note:** In open loop mode, feedback from an incremental encoder can be connected to the drive in order to directly detect overspeed and slipping.*

### ■ Brake control

This can be used to manage control of an electromagnetic brake in synchronization with starting and stopping the motor to avoid jolts and load slipping.
The brake control sequence is managed by the drive.

#### □ Movement type

The Altivar 71 drive adapts the brake control operation to the type of movement, whether vertical or horizontal, in order to achieve maximum torque performance and eliminate jolts.

#### □ Brake feedback via contact

By connecting a brake contact to the drive, it is possible to detect brake faults.
If the brake status does not match the relevant control (the contact must be open for a released brake), the drive locks when a fault occurs.

#### □ Brake release pulse

This can be used to set the torque for brake release when ascending (forward) or two release thresholds (one for ascending and the other for descending).

This function is only available for vertical movements.

#### □ Brake engage on reversal of operating direction

To prevent the speed from passing through zero when reversing the direction of rotation, the drive firstly requires the brake to be engaged at the end of deceleration and then for it to be released before accelerating in the other direction of rotation.

#### □ Brake engage request time delay

In the case of slewing movements, this function can be used, at the end of deceleration, to control how the brake is engaged when the torsional stress being exerted on the machine structure is zero.

#### □ Automatic DC injection

In the case of a horizontal movement, the DC injection at the end of deceleration can be used to prevent jolting when the brake is being engaged.

This function is only available for horizontal movements.

### ■ Limit switch management

This can be used to manage the operation of one or two limit switches (with 1 or 2 operating directions).
Each limit (forward, reverse) is associated with a logic input. The type of stop that occurs on detection of a limit can be configured as a stop on ramp, freewheel or fast stop.
Following a stop, the motor can restart in the opposite direction only.

### ■ Slack sling

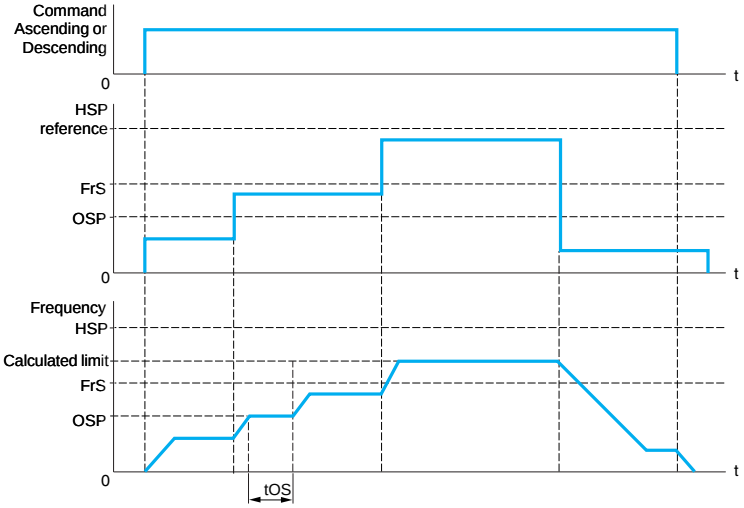
This is used to adapt the motor speed to the load depending on the minimum configured torque, either in speed reference mode or in current limiting mode.
A logic output can be assigned to this function to indicate the load value in relation to the configured torque value.

# Variable speed drives for asynchronous motors
Altivar 71

■ **High-speed hoisting**
This can be used to optimize cycle times for hoisting movements when the load is zero or small.
It allows operation at constant power (motor defluxing beyond the nominal motor frequency) in order to achieve a higher speed than the nominal speed, without exceeding the nominal motor current and thereby preventing the motor from overheating.

There are 2 possible operating modes:

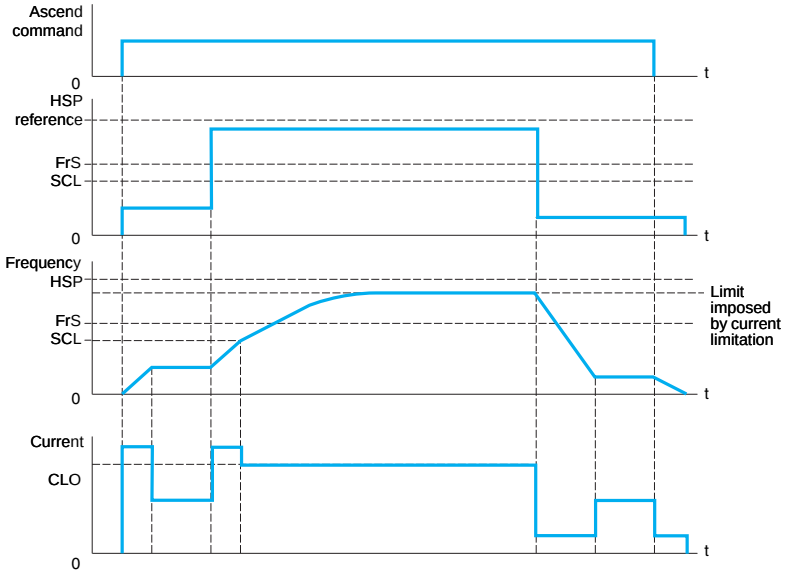
□ Speed reference mode: The maximum permitted speed is calculated by the drive at an imposed speed step so that the drive can measure the load.




*Speed reference mode*

FrS: Nominal motor frequency
HSP: High speed parameter
OSP: Adjustable speed step for load measurement
tOS: Load measuring time
Two parameters can be used to reduce the speed calculated by the drive, for ascending and descending.

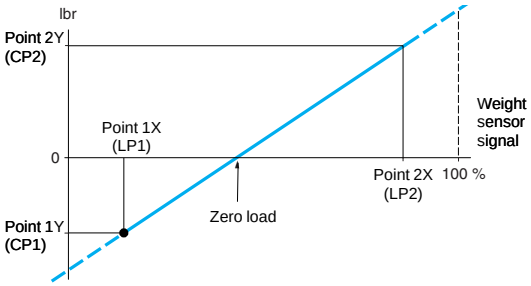
□ Current limiting mode: The maximum permitted speed is the speed at which the current is limited in the motor quadrant, ascending only. For descending, operation is always based on speed reference mode.




*Current limiting mode*

CLO: Current limitation for high speed-function
FrS: Nominal motor frequency
HSP: High speed parameter
SCL: Adjustable speed threshold above which current limitation is active

# Variable speed drives for asynchronous motors
Altivar 71




CP1, CP2, LP1, LP2: weight sensor calibration points

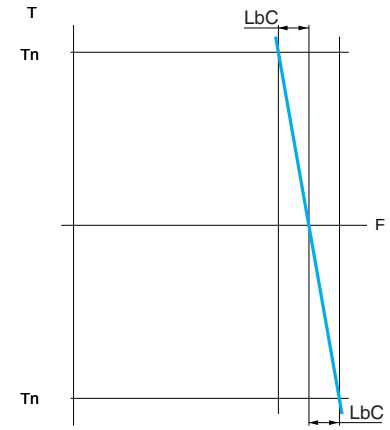
*This curve can represent a weight sensor on a lift winch, where a zero load is exerted on the motor when the load in the cabin is not zero.*

## ■ External weight measurement

This function uses the information supplied by a weight sensor via an analog input (usually a 4-20 mA signal) to adapt the current (Ibr) of the Brake logic control function.

Function suitable for applications involved in:
□ measuring the total weight of a hoisting winch and its load
□ measuring the total weight of a lift winch, the cabin and counterweight.

The current (Ibr) is adapted according to the curve opposite.




LbC: Load correction (Hz)

*Load sharing*

## ■ Load sharing

This function can be used for applications where several motors are mechanically linked in order to balance the loads of the different motors by adjusting the speed according to the torque on each motor.

## ■ Output contactor control and integrity check

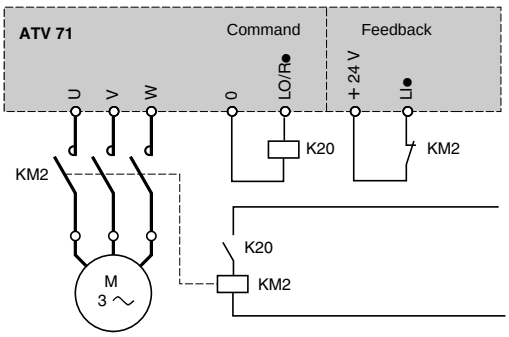
### □ Control

This allows the drive to control a contactor located between the drive and the motor.
The request to close the contactor is made when a run command appears.
The request to open the contactor is made when there is no current in the motor.

***Note:*** *If a DC injection braking function has been configured it should not be left operating too long in stop mode, as the contactor only opens at the end of braking.*

### □ Integrity check

This check is carried out by connecting a volt-free contact on each contactor to one of the drive's logic inputs.
The corresponding logic input should be at 1 when there is no run command and at 0 during operation.
When there is any inconsistency, the drive locks in fault mode if the output contactor does not close (LIx = 1) or gets stuck (LIx = 0). The time delay for when the drive locks in fault mode can be adjusted.




*Output contactor control and integrity check*

These sequences are commonly used in lift applications.
In order to increase the safety level and reduce the amount of maintenance work, it is recommended that the Altivar 71 drive's integrated "Power Removal" safety function is used.

## ■ Stop on thermal alarm

This can be used to:
□ Allow a movement to end before examining a thermal fault. There are two adjustable thresholds used to define the thermal state level which, when exceeded, makes a machine stop.
□ Prevent a new run command from being accepted as long as the drive and motor temperatures are not less than 100%.

Function suitable for lift applications: it can prevent people getting trapped if a lift gets stuck between two floors.

## ■ Evacuation following power failure

This can be used to control the reduced speed engine with a reduced voltage supply (220 V ≂, for example: uninterruptible power supply (UPS)), by preserving torque performance.

Function suitable for lift applications: When there is a power failure, it facilitates the evacuation of people trapped in a lift stuck between two floors.

522166

| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| +/- SPEED | | | |
| + speed assign. : | | | LI3 |
| - speed assign. : | | | LI4 |
| Ref. saved : | | | RAM |
| Code | | | Quick |

*+/- speed function settings*

### ■ Uncontrolled output cut

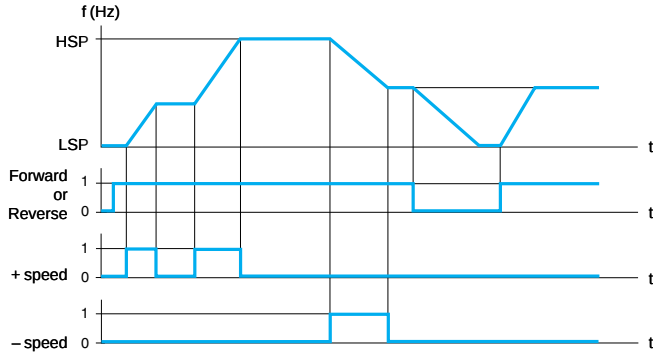
It is possible to configure output phase loss protection, which will allow the drive or motor circuit to be broken without the drive becoming locked in fault mode and facilitate a smooth restart after the motor has been reconnected. The output phase loss may also lock the drive, depending on the configuration.

### ■ +/- speed

Used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function). This function is suitable for centralized control of a machine with several sections operating in one direction or for control by a handling crane pendant control station with two operating directions.

Two types of operation are available:
□ Use of single action buttons: 2 logic inputs are required in addition to the operating direction(s).
□ Use of double action buttons: only 1 logic input assigned to + speed is required.

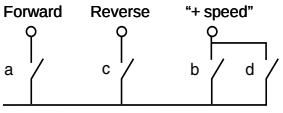
**Use of single action buttons**: 2 logic inputs are required in addition to the operating direction(s).




PV : low speed, HSP: high speed
*Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving*

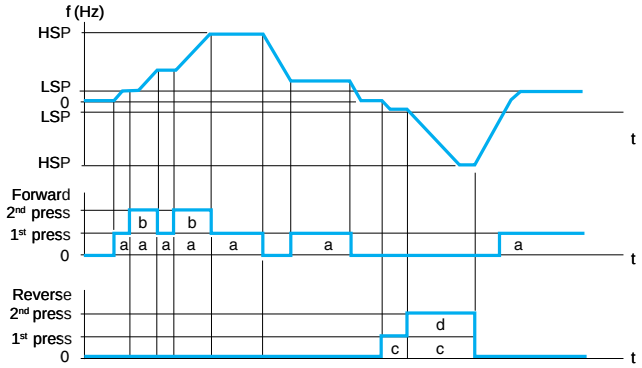
**Use of double action buttons**: only 1 logic input assigned to + speed is required.

Logic inputs:

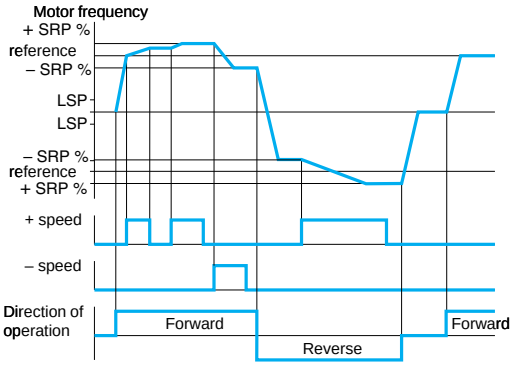



a and c: 1st press
b and d: 2nd press

| | Released (- speed) | 1st press (speed maintained) | 2nd press (+ speed) |
|---|---|---|---|
| Forward button | – | a | a and b |
| Reverse button | – | c | c and d |




PV : low speed, HSP: high speed
*Example with double action buttons and 1 logic input*
***Note:** This type of +/- speed control is incompatible with 3-wire control.*

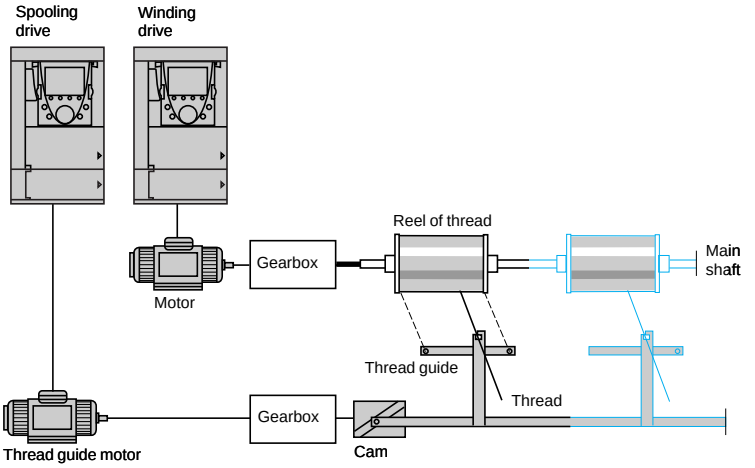



*Example of +/- speed around a 2-wire control reference*

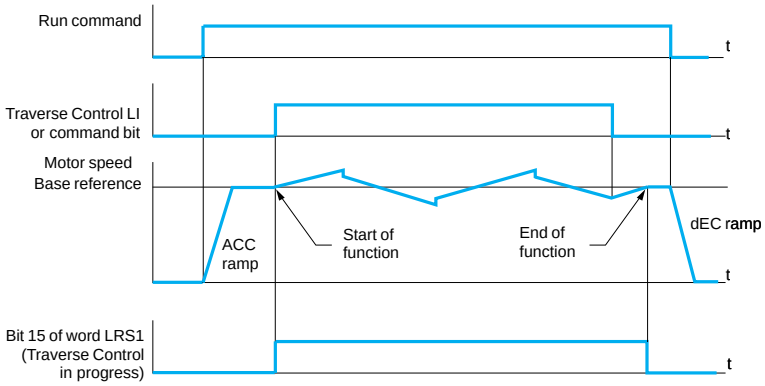
□ **Reference saving**
This function is associated with "+/- speed" control.
This can be used for reading and saving the last speed reference prior to the loss of the run command or line supply. The saved reference is applied the next time a run command is received.

□ **+/- speed around a reference**
The reference is given by Fr1 or Fr1b, including, if relevant, the summing, subtraction and multiplication functions, as well as the preset speeds.
During the run command the drive goes to the reference, following the acceleration and deceleration ramps (pressing +/- speed makes the speed vary around this reference according to acceleration ramp 2 and deceleration ramp 2).
+ or – speed variation around the reference is limited to a percentage of the reference (SRP parameter). When operation has stopped, the amended reference is not saved.
The maximum total reference is always limited by high speed (HSP parameter) and the minimum reference (LSP parameter).

■ **Spooling**
□ **Traverse control**
Function for winding reels of thread (in textile applications)

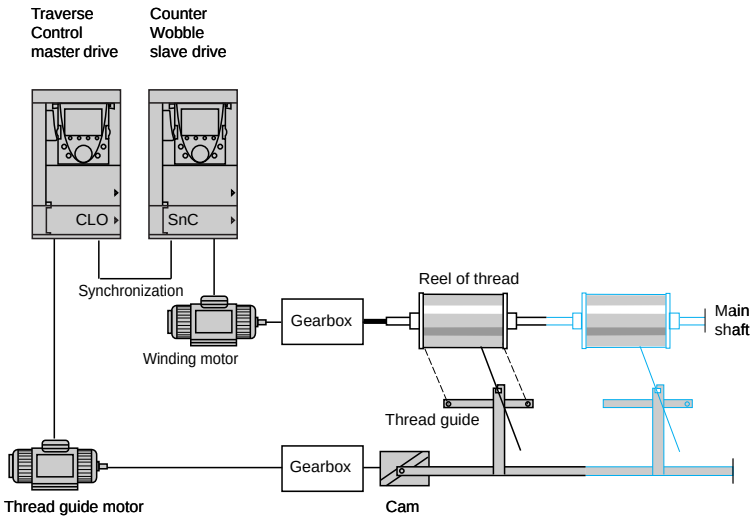



The cam rotation speed must follow a precise profile to ensure a steady, compact, linear reel is obtained.

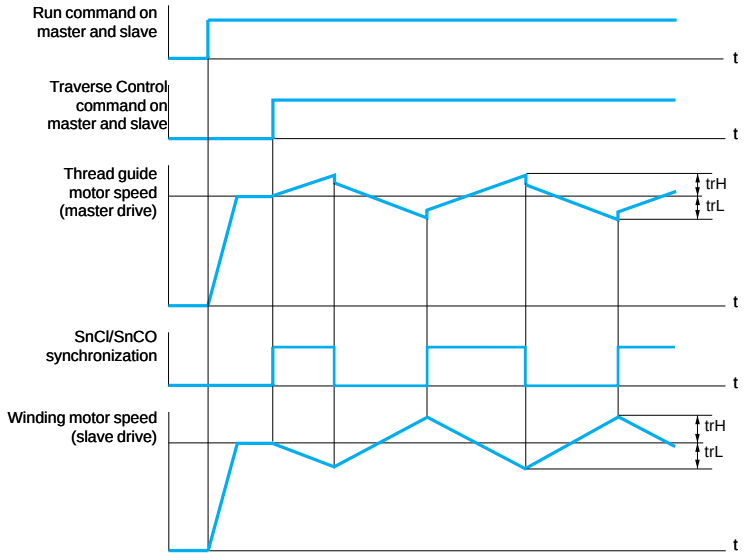



A function can also be used to reduce the base reference as the reel gets larger.

□ **Counter Wobble**




The Counter Wobble function is used in certain applications to obtain a constant thread tension when the Traverse Control function is producing considerable variations in speed on the thread guide motor.
The master drive controls the speed of the thread guide, while the slave drive controls the winding speed. The function assigns the slave a speed profile, which is in antiphase to that of the master. This means that synchronization is required, using one of the master's logic outputs and one of the slave's logic inputs.




■ **Automatic catching of a spinning load with speed detection** ("catch on the fly")
This function is used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or power off
□ fault reset or automatic restart
□ freewheel stop

On disappearance of the event, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed.
The speed detection time can reach 0.5 s.
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines for which the motor speed loss is negligible during a power failure (high-inertia machines such as centrifuges, etc.).

■ **Undervoltage management**
Depending on the application, it is possible to configure the Altivar 71's response to undervoltages or power failures.
If undervoltage occurs:
□ The Altivar 71 drive can continue operating with undervoltage levels up to -50% (adjustable threshold)
□ If the drive locks as a result, management of the fault relay can be configured (open or not). If the fault relay does not open an alarm is shown.

The Altivar 71 drive can also be configured to prevent the drive locking (using an alarm):
□ Controlled stop according to the type of stop configured
□ Deceleration based on a ramp which it automatically adapts to maintain the DC bus voltage, thereby preventing the drive from locking in fault mode
□ Instant IGBT (inverter bridge) loss followed by power supplied to the motor as soon as the line voltage has reappeared. This function can be used to prevent the Altivar 71 drive being reinitialized.

■ **Braking balance**
When several drives are connected on a common DC bus, this function can be used to adjust the braking thresholds in order to balance the braking powers between the various drives or braking units.

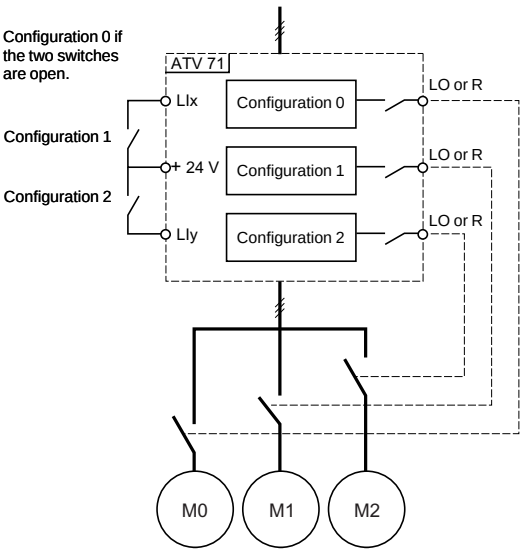
■ **Braking resistor thermal protection**
The Altivar 71 drive incorporates thermal protection for the braking resistor if it is not equipped with a thermal switch. If the resistor thermal state is too high an alarm can be assigned to the logic output or the drive may lock in fault mode, depending on how the function is programmed.

■ **Parameter set switching (multi-parameter)**
This can be used to switch 3 sets of 15 parameters maximum when the motor is running.
Each set can contain a different value for each of the parameters.
The sets are switched using 1 or 2 logic inputs or command word bits.

Function suitable for machines involving 2 or 3 manufacturing processes.

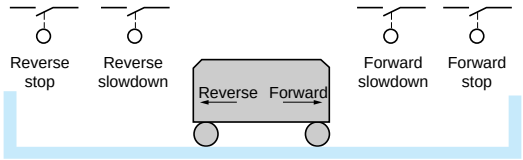
■ **Motor or configuration switching (multi-motor or multi-configuration)**
The Altivar 71 drive can have 3 configurations, which can be activated remotely, allowing it to adapt to:
□ 2 or 3 different motors or mechanisms in multi-motor mode. In this instance, the thermal state for all the motors is calculated and saved. This means that each motor is protected thermally.
□ 2 or 3 configurations for the same motor in multi-configuration mode. This function can also be used to save the current configuration in another memory zone, from which it can be retrieved.
Switching is carried out using 1 or 2 logic inputs, depending on the number of motors or configurations chosen (2 or 3).

Multi-motor and multi-configuration modes cannot be used together.

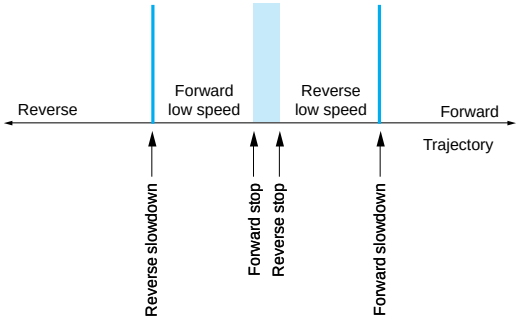



*Schematic diagram for multi-motor mode*

# Variable speed drives for asynchronous motors
Altivar 71



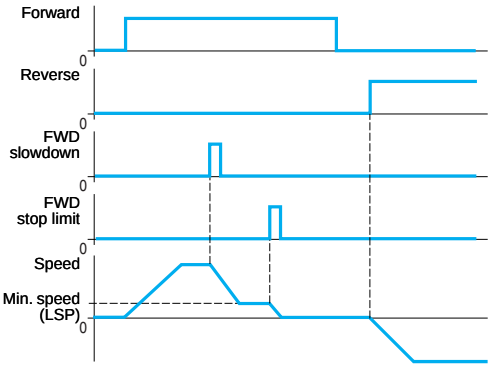

***Example 1:** limit switch positioning*
Slowdown and stopping occur when the sensor changes state (open contact). It is possible to assign a command word bit or a logic input to disable the function in order to be able restart or not stop on the position.




***Example 2:** positioning on a target zone*
The disable contact can be used to restart in order to get past the target.

## ■ Positioning on limit switches or position sensors

This can be used to manage positioning based on limit switches or position sensors.




Activating the slowdown contact or stop contact allows the device to start in the other direction, even at high speed.

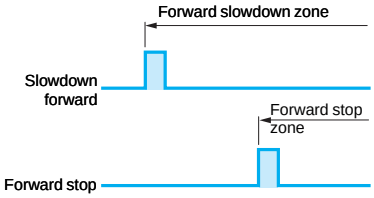
Slowdown mode can be configured:
□ The drive uses the validated ramp time
□ The drive calculates a ramp time according to the actual speed when the request to slow down is made. This calculation can be used to optimize the cycle time by limiting the time spent operating at low speed.

The stop type can also be configured:
□ stop on ramp
□ freewheel stop
□ fast stop

## ■ Short and long cam operation

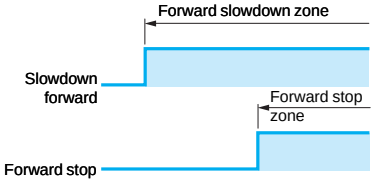
### □ Short cams

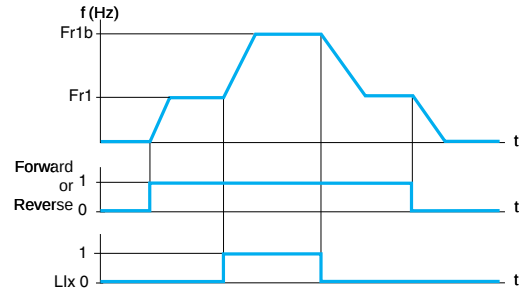
In this instance, when operating for the first time or after restoring the factory settings, the drive must initially be started outside the slowdown and stop zones in order to initialize the function.



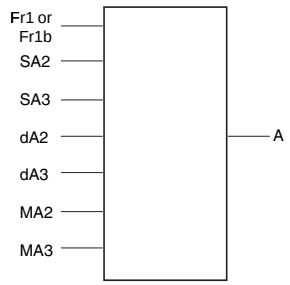

### □ Long cams

In this instance, there is no restriction, which means that the function is initialized across the whole trajectory.






*Example of reference switching*




*A: drive reference*
*SA2, SA3: summed inputs*
*dA2, dA3: subtraction inputs*
*MA2, MA3: multiplication inputs.*

## ■ Reference switching

Switching between two references (speed, torque, PID, etc.) can be enabled by:
- □ a logic input
- □ a command word bit

Reference 1 (Fr1) is active if the logic input (or command word bit) is at 0; reference 2 (Fr1b) is active if the logic input (or command word bit) is at 1.
References can be switched with the motor running.

Reference Fr1b, like Fr1, can originate from:
- □ an analog input (AI)
- □ a frequency control input (RP)
- □ the graphic display terminal
- □ the Modbus serial link or the CANopen machine bus
- □ a communication card
- □ the Controller Inside programmable card

## ■ Operations on references (summing, subtraction, multiplication)

Summing, subtraction and multiplication inputs can be activated simultaneously.

The drive reference is thus:
- □ reference of drive A = (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3

### □ Summing inputs

These can be used to add 2 to 3 references from different sources to Fr1 or Fr1b (see “Reference switching”).
The references to be added together are selected from all the possible types of reference.

For example:
Reference Fr1 or Fr1b from AI1
Reference SA2 from CANopen
Reference SA3 from a communication card
Reference of drive A = Fr1 or Fr1b + SA2 + SA3.

### □ Subtraction inputs

These can be used to subtract 2 to 3 references from different sources from Fr1 or Fr1b (see “Reference switching”).
The references to be subtracted are selected from all the possible types of reference.

For example:
Reference Fr1 or Fr1b from AI1
Reference dA2 from CANopen
Reference dA3 from a communication card
Reference of drive A = Fr1 or Fr1b - dA2 - dA3.

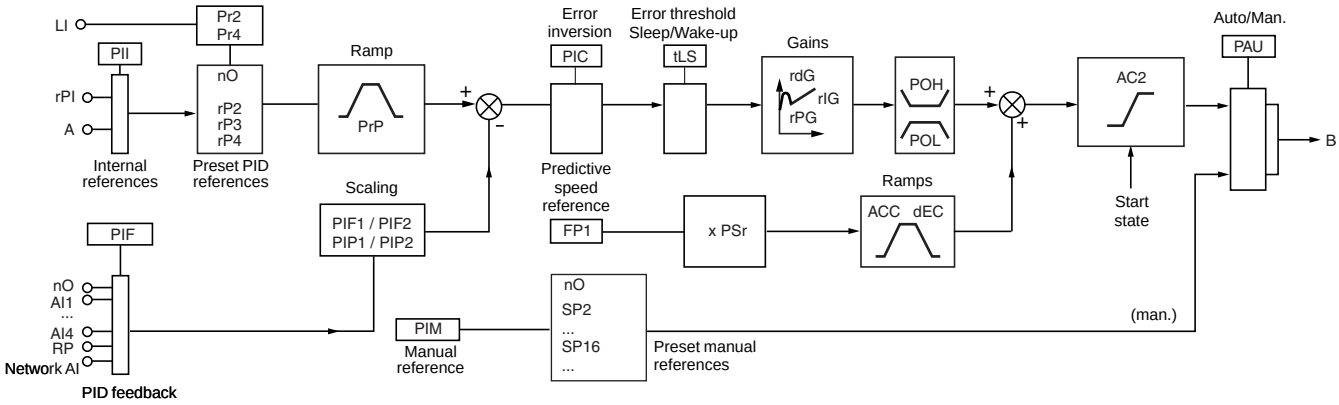
### □ Multiplication inputs

These can be used to multiply 2 to 3 references from different sources by Fr1 or Fr1b (see “Reference switching”).
The references to be multiplied are selected from all the possible types of reference.

For example:
Reference Fr1 or Fr1b from AI1
Reference MA2 from CANopen
Reference MA3 from a communication card
Reference of drive A = Fr1 or Fr1b x MA2 x MA3.

## ■ PID regulator

This can be used to regulate a process with a reference and feedback given by a sensor.
Function suitable for controlling traction on a winder.




ACC: Acceleration, DEC: Deceleration, LI: Logic inputs, B: Speed reference

### □ Internal references

- rPI: reference transmitted by the graphic display terminal or a communication network.
- A: reference given by Fr1 or Fr1b with the summing, subtraction and multiplication functions, as appropriate.

The “PII” parameter is used to choose between these two references.

### □ Preset PID references

2 or 4 PID references are available. Table showing combinations of selected PID references:

| LIx (Pr4) | LIy (Pr2) | Reference |
|---|---|---|
| 0 | 0 | rPI or A |
| 0 | 1 | rP2 |
| 1 | 0 | rP3 |
| 1 | 1 | rP4 |

### □ PID feedback

PID feedback can be assigned to one of the analog inputs (AI1 to AI4), the frequency control input (RP) or the encoder, depending on the option cards present. It can also be transmitted by a communication network (AI network).

### □ Predictive speed reference

This reference can come from the terminals (analog inputs, encoders, etc.), the graphic display terminal or a communication network.
This speed input gives an initial reference for starting.

### □ Auto/Man.

This can be used to switch from speed regulation mode (Man.) to PID regulation mode (Auto). A logic input or command word bit is used for switching.

**Speed regulation mode (Man.)**

The manual reference is transmitted via the terminals (analog inputs, encoder, preset speeds, etc.).
With manual switching, the speed reference changes according to the ACC and dEC ramp times.

**PID regulation mode (Auto)**

In automatic mode it is possible to:

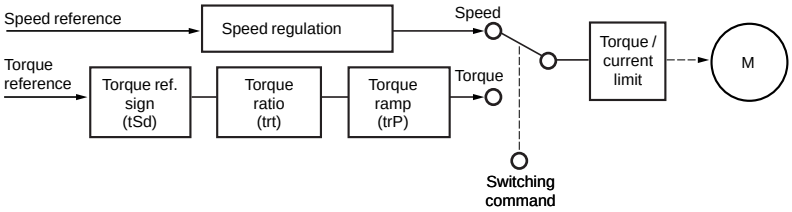
- adapt the references and feedback to the process (transformation)
- correct a PID inversion
- adjust the proportional, integral and derivative gains (Kp, Ki and Kd)
- shunt the integral
- use the “alarm” on the logic output or display it on the graphic display terminal, if the threshold is exceeded (Max. feedback, Min. feedback and PID error)
- display the PID reference, PID feedback, PID error and PID output on the graphic display terminal and assign them to an analog output
- apply a ramp (time = PrP) to the PID reference

The motor speed is limited to between LSP and HSP. It is displayed as process values.

■ **Torque control**

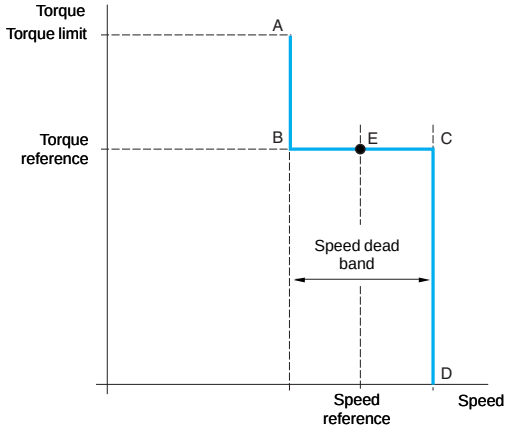
This supports torque control or speed regulation mode.
These two types of mode can be switched using a logic input or command word bit.

Function suitable for applications requiring traction control.




The torque reference is signed and has its own ramp. A torque ratio can be used to scale the reference. It can be transmitted via an analog input, frequency control input (RP input or encoder) or communication network.
The torque sign and value can be output to a logic output and an analog output.

In torque control mode the speed may vary within an adjustable dead band. When it has reached the lower or upper limit, the drive automatically switches to speed regulation mode (fallback position).
The regulated torque is no longer maintained, in which case two scenarios can occur:
□ The speed falls within the dead band; the torque takes the required value.
□ The torque does not return to the required value at the end of an adjustable time; the drive switches to fault or alarm mode, depending on the configuration.




The stop in torque control mode can be configured:
□ automatic switch to speed regulation mode
□ freewheel stop
□ stop at zero torque but still maintaining the flux in the motor for an adjustable period of time.

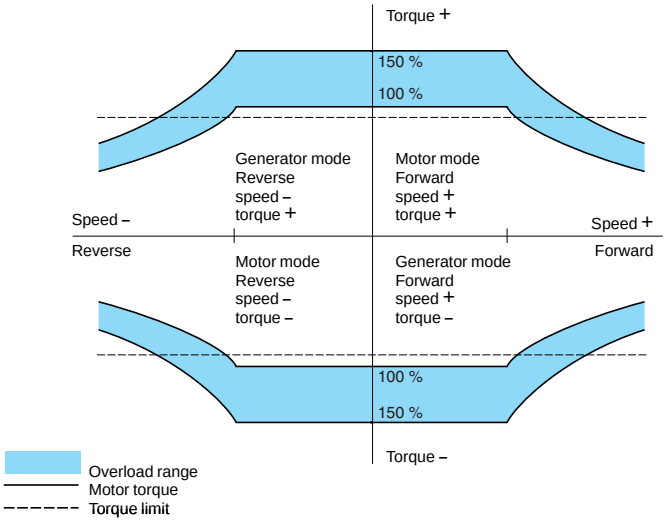
### ■ Torque limit

This can be used to limit the torque in the motor and generator quadrants using separate settings.

There are two types of torque limit:
- one with a value set by a parameter
- the other with a value given by an analog input, frequency control input or encoder.

When both torque limit types are enabled it is the lowest value which is read.
They can be switched using a logic input or command word bit.

This function is not available for voltage/frequency ratio.




The torque limit operates in both directions of rotation in motor or generator mode.

### ■ Torque or current limit detection

This function can be used to detect when the current or torque limit has been reached.
Depending on the configuration, it is possible to:
- use an alarm to signal this
- lock the drive after an adjustable period of time.

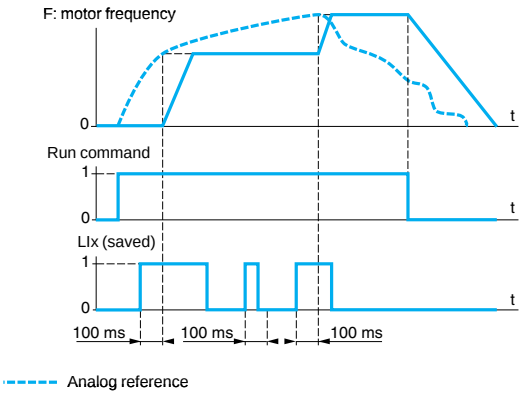
### ■ Current limit

A 2nd current limit can be configured between 0 and 1.65 times the drive nominal current and it can be used to limit the rise in motor temperature and the torque.
Switching between the two current limits can be enabled via:
- a logic input
- a command word bit

522170

| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| 2nd CURRENT LIMIT. | | | |
| I Limit. 2 activ. | : | | LI6 |
| I Limit. 2 value | : | | 6.4 A |
| Current limitation : | | | 7.9 A |
| Code | | | Quick |

*Configuring current switching*




*Example of how reference saving works*

■ **Reference saving**
This can be used to:
□ Read and save a speed reference level on the reference input using a command lasting longer than 0.1 s on a logic input
□ Control the speed of several drives alternately via a single analog reference and a logic input for each drive
□ Enable a line reference (serial link) on several drives via a logic input in order to synchronize movements by eliminating variations when the reference is sent
The reference is acquired 100 ms after the rising edge of the request.
A new reference is not then acquired until a new request is made.

522167

| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| STOP CONFIGURATION | | | |
| Type of stop | : | Ramp stop | |
| Freewheel assign. | : | NO | |
| Fast stop assign. | : | LI4 | |
| Ramp divider | : | 0 | |
| DC inject. assign. | : | NO | |
| Code | | Quick | |

*Configuring stop types*

■ **Stop types**
□ **Freewheel stop**
This stops the motor by resistive torque if the motor power supply is cut.

A freewheel stop is achieved:
- by configuring a normal stop command as a freewheel stop
(on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

□ **Fast stop**
This can be used to achieve a braked stop with an acceptable deceleration ramp time (divided by an adjustable coefficient from 0 to 10) for the drive/motor unit to avoid locking in the event of an overbraking fault. If the coefficient is equal to 0 the motor decelerates as fast as possible.

Used for conveyors with emergency stop electrical braking.
A fast stop is achieved:
- by configuring a normal stop as a fast stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

□ **Fastest possible stop**
If the ramp divider coefficient is equal to 0 the motor decelerates as fast as possible.

□ **DC injection stop**
This can be used to brake high-inertia machines at low speed or maintain torque on stopping.
A DC injection stop is achieved:
- by configuring a normal stop as a DC injection stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

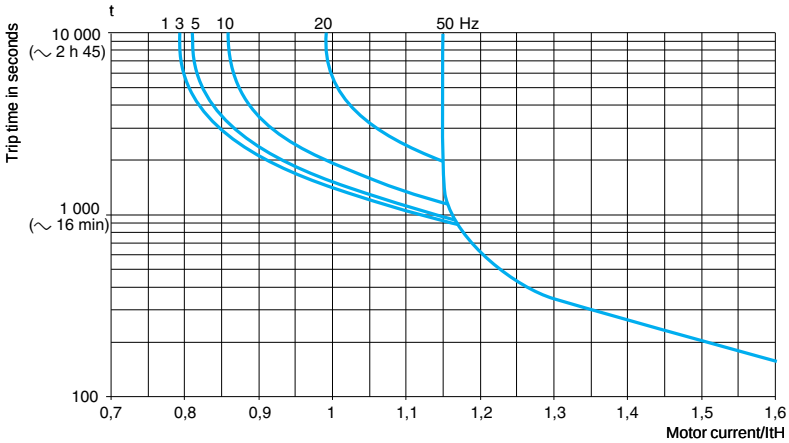
The DC value and the standstill braking time are adjustable.

■ **Motor thermal protection**
Motor thermal protection is provided by the drive:
□ directly, through PTC probes located in the motor windings
□ indirectly, via the integrated thermal relay. Indirect thermal protection is implemented via continuous calculation of its theoretical temperature rise.

The microprocessor calculates the theoretical temperature rise of the motor based on various elements:
□ the operating frequency
□ the current taken by the motor
□ the operating time
□ the maximum ambient temperature around the motor (40°C)
□ the type of motor ventilation (self-cooled or force-cooled)

Thermal protection can be adjusted from 0.2 to 1.5 times the nominal drive current. It must be adjusted to the nominal current indicated on the motor rating plate.

***Note:*** *The motor thermal state memory returns to zero when the drive control section is switched off.*




*Motor thermal protection curves*

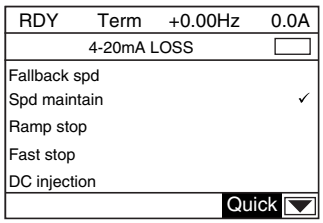
□ Self-cooled motors:
The tripping curves vary with the motor frequency.

□ Force-cooled motors:
Only the 50 Hz tripping curve should be considered, whatever the motor frequency.

■ **Drive thermal protection**
The drive thermal protection is provided by a PTC probe mounted on the heatsink or integrated in the power module.

■ **IGBT thermal protection**
The drive manages the switching frequency intelligently according to the IGBT temperature.
If the drive's current rating is exceeded (e.g.: current higher than the nominal drive current for a zero stator frequency), an alarm is displayed and a timer increases for as long the alarm is present.

522168




*Configuration of the drive's fault response*

■ **Configuring the drive's fault response (fault management)**
Different responses can be configured for the drive in the event of a resettable fault occurring:
□ freewheel stop
□ drive switches to the fallback speed
□ drive maintains the speed at which it was operating when the fault occurred until the fault disappears
□ stop on ramp
□ fast stop
□ DC injection stop
□ no stop (alarm activated)

**List of resettable faults:**
□ external fault
□ speed feedback loss
□ overspeed
□ slipping
□ output phase loss
□ auto-tuning fault
□ brake contactor feedback fault
□ encoder coupling
□ loss of 4-20mA
□ PTC probe
□ drive overheating
□ motor overload if the thermal state is less than 100%
□ line overvoltage
□ overbraking
□ current/torque limit
□ IGBT overheating
□ communication faults (Modbus, CANopen and other communication networks).

■ **Resetting resettable faults**
This can be used to remove the last fault using a logic input, command word bit or the STOP/RESET key on the graphic display terminal.
The restart conditions after a reset to zero are the same as those of a normal power-up.
List of resettable faults, see "Configuring the drive's fault response".
Line supply undervoltage and input phase loss faults are reset automatically when the line supply is restored.

Function suitable for applications where drives are difficult to access, such as when a drive is placed on a moving part.

■ **General reset (disables all faults)**
This function inhibits all faults, including thermal protection (forced operation), which can destroy the drive.

This function is suitable for applications where restarting may be crucial (conveyor in an oven, smoke extraction system, machines with solidifying products that need to be removed).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ↑ the logic input.

***Note:*** *Use of this function invalidates the guarantee.*

■ **Automatic restart**
This function enables the drive to be restarted automatically after it has locked in fault mode, provided the relevant fault has disappeared and the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The options for the restart process's duration are 5, 10 and 30 min., 1, 2, 3 hours and an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been powered off and on again.

The faults which permit this type of restart are:
□ line overvoltage
□ motor thermal overload
□ drive thermal overload
□ DC bus overvoltage
□ line phase failure
□ external fault
□ loss of 4-20mA
□ PTC probe
□ serial link
□ current or torque limit
□ output phase loss
□ line voltage too low. For this fault, the function is always active, even if it is not configured.
□ fault caused by CANopen machine bus, Modbus serial link or other commmunication networks. These faults are reset automatically as soon as the command word or frequency reference is sent to the drive.
For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and direction of operation must be maintained for this function.

This function is suitable for machines or installations which are in continuous operation or are not monitored, and where a restart will not endanger equipment or personnel in any way.

■ **PTC probe protection**
The probes can be connected directly to the drive control card or to the I/O option cards.
The way in which a temperature fault is recorded by the drive can be configured:
□ permanent record
□ only recorded when the drive's power section is switched on
□ only recorded when the motor is running

■ **IGBT testing**
When enabled, this function tests every IGBT and the motor connections in order to detect a short-circuit or an open circuit. This test is run every time the drive is powered on and before each motor start.

This function must not be enabled with machines with fast cycles in order to preserve the time for recording run commands.

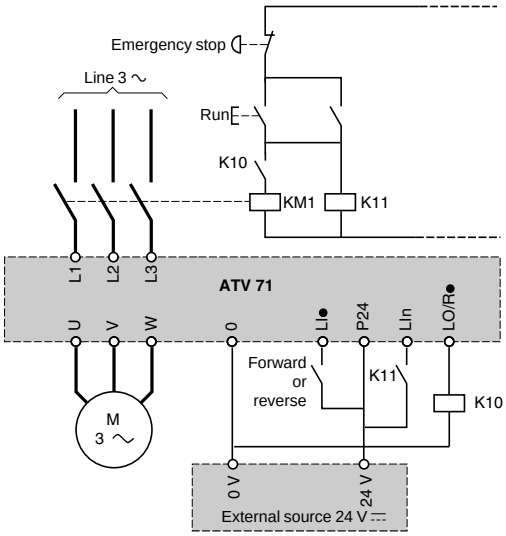
■ **Resetting operating time to zero**
The drive operating and power-up time can be reset.

■ **External fault**
This function can lead to the drive locking if a fault occurs in the machine.
This fault is flagged on the drive display unit. The fault is flagged if the signal is at 1 or 0, according to the function configuration.

# Variable speed drives for asynchronous motors
Altivar 71

■ **Line contactor control**
This can be used on each run command to close the line contactor and open it when the motor is no longer on. The drive control section must be powered without fail by an external 24 V ⎓ source.

This function must be used for simple sequences with a low number of Start/Stop operations (Start/Stop cycle longer than 60 seconds).




After a run command, if the line contactor is not closed the drive will lock after an adjustable period of time.

■ **Forced local mode**
Forced local mode imposes control via the terminals or graphic display terminal and disables all other control modes.
Switching to forced local mode may be activated via:
- a logic input
- a function key on the graphic display terminal

The following references and commands are available for forced local mode:
- references AI1, AI2, etc. and command via logic inputs
- reference and command via the graphic display terminal