Soft starters
Altistart 48 soft start - soft stop units

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Applications

The Altistart 48 soft start - soft stop unit is a controller with 6 thyristors which is used for the torque-controlled soft starting and stopping of three-phase squirrel cage asynchronous motors in the power range between 4 and 1200 kW.

It offers soft starting and deceleration functions along with machine and motor protection functions as well as functions for communicating with control systems. These functions are designed for use in state-of-the-art applications in centrifugal machines, pumps, fans, compressors and conveyors, which are primarily to be found in the construction, food and beverages and chemical industries. The high-performance algorithms of the Altistart 48 contribute significantly to its robustness, safety and ease of setup.

The Altistart 48 soft start - soft stop unit is a cost-effective solution which can:
■ Reduce machine operating costs by reducing mechanical stress and improving machine availability
■ Reduce the stress placed on the electrical distribution system by reducing line current peaks and voltage drops during motor starts
The Altistart soft start - soft stop unit offer comprises 2 ranges:
■ Three-phase voltages 230 to 415 V, 50/60 Hz
■ Three-phase voltages 208 to 690 V, 50/60 Hz
In each voltage range, the Altistart soft start - soft stop units are dimensioned for standard and severe applications.

Functions

The Altistart 48 soft start - soft stop unit (1) is supplied ready for use in a standard application with motor protection class 10 (see page 60526/5).
It comprises a built-in terminal (2) which can be used to modify programming, adjustment or monitoring functions in order to adapt and customise the application to meet individual customer requirements.

■ **Drive performance functions**:
□ Exclusive Altistart torque control (patented by Schneider Electric)
□ Constant control of the torque supplied to the motor during acceleration and deceleration periods (significantly reducing pressure surges)
□ Facility for adjusting the ramp and the starting torque
□ The starter can be bypassed using a contactor (3) at the end of the starting period whilst maintaining electronic protection (bypass function)
□ Wide frequency tolerance for generator set power supplies
□ The starter can be connected to the motor delta terminals in series with each winding

■ **Machine and motor protection functions**:
□ Built-in motor thermal protection
□ Processing of information from PTC thermal probes
□ Monitoring of the starting time
□ Motor preheating function
□ Protection against underloads and overcurrents during continuous operation

■ **Functions facilitating the integration of the unit into control systems**:
□ 4 logic inputs, 2 logic outputs, 3 relay outputs and 1 analogue output
□ Plug-in I/O connectors
□ Function for configuring a second motor and easy-to-adapt settings
□ Display of electrical values, the state of the load and the operating time
□ RS 485 serial link for connection to Modbus

Options

A remote terminal (4) can be mounted on the door of a wall-fixing or floor-standing enclosure.
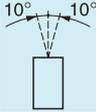PowerSuite advanced dialogue solutions:
■ PowerSuite Pocket PC with PPC type terminal (5),
■ PowerSuite software workshop (6).
A range of wiring accessories for connecting the starter to PLCs via a Modbus connection (7).
Bus communication and Ethernet, Fipio, DeviceNet and Profibus DP network communication options

Environment

Conformity to standards			The electronic starters have been developed and performance tested in accordance with international standards, in particular with the starter product standard EN/IEC 60947-4-2.
CE marking			Products have CE marking in accordance with the harmonised standard EN/IEC 60947-4-2.
Product approvals			UL, CSA Pending: DNV, C-Tick, Ghost, CCIB
Degree of protection	Starters ATS 48D17● to 48C11●		IP 20 (IP 00 in the absence of connections)
	Starters ATS 48C14● to 48M12● *(1)*		IP 00
Vibration resistance	Conforming to IEC 60068-2-6		1.5 mm from 2 to 13 Hz 1gn from 13 to 200 Hz
Shock resistance	Conforming to IEC 60068-2-27		15 g for 11 ms
Starter noise level *(2)*	Starters ATS 48D32● to D47●	**dBA**	52
	Starters ATS 48D62● to C11●	**dBA**	58
	Starters ATS 48C14● to C17●	**dBA**	50
	Starters ATS 48C21● to C32●	**dBA**	54
	Starters ATS 48C41● to C66●	**dBA**	55
	Starters ATS 48C79● to M12●	**dBA**	60
Fans	Starters ATS 48D17● and D22●		Natural convection
	Starters ATS 48D32● to M12●		Forced convection. The fans are activated automatically when a temperature threshold is reached. For flow rate see page 60523/5.
Ambient temperature around the unit	Operation	**°C**	- 10...+ 40 without derating (between + 40 and + 60, derate the nominal current of the Altistart by 2% for each °C).
	Storage, conforming to IEC 60947-4-2	**°C**	- 25...+ 70
Maximum relative humidity	Conforming to IEC 60068-2-3		95% without condensation or dripping water
Maximum ambient pollution	Conforming to IEC 60664-1		Level 3
Maximum operating altitude		**m**	1000 without derating (above this, derate the nominal current of the Altistart by 2.2% for each additional 100 m). Limit to 2000 m.
Operating position Maximum permanent angle in relation to the normal vertical mounting position			10° ⁄\‖\ 10°

Electrical characteristics

Operating category	Conforming to IEC 60947-4-2		AC-53a
Three-phase supply voltage	Starters ATS 48●●●Q	**V**	230 -15% to 415 + 10%
	Starters ATS 48●●●Y	**V**	208 - 15% to 690 + 10%
Frequency		**Hz**	50/60 ± 5% (automatic) 50 or 60 ± 20% (must be set)
Nominal starter current	Starters ATS 48●●●Q	**A**	17...1200
	Starters ATS 48●●●Y	**A**	17 to 1200
Motor power	Starters ATS 48●●●Q	**kW**	4 to 630
	Starters ATS 48●●●Y	**kW/HP**	5.5 to 900/5 to 1200
Voltage indicated on the motor rating plate	Starters ATS 48●●●Q	**V**	230 to 415
	Starters ATS 48●●●Y	**V**	208 to 690
Starter control circuit supply voltage	Starters ATS 48●●●Q	**V**	220 - 15% to 415 + 10%, 50/60 Hz
	Starters ATS 48●●●Y	**V**	110 - 15% to 230 + 10%, 50/60 Hz
Maximum control circuit consumption (with fans operating)	Starters ATS 48D17● to C17●	**W**	30
	Starters ATS 48C21● to C32●	**W**	50
	Starters ATS 48C41● to M12●	**W**	80
Relay output (2 configurable outputs)			3 relay outputs (R1, R2, R3), normally open contacts 1"N/O" Minimum switching capacity: 10 mA for ⎓ 6 V. Maximum switching capacity on inductive load: 1.8 A for ∿ 230 V and ⎓ 30 V (cos φ= 0.5 and L/R=20ms). Maximum nominal operating voltage ∿ 400 V. Factory setting: R1 assigned as the "fault relay" (configurable) R2 assigned as the "end of starting relay" to control the starter bypass relay R3 assigned as "motor powered" (configurable)

(1) Protective covers can be fitted to the power terminals of ATS 48C14● to C32● starters. ATS 48C41● to 48M12● starters have protection on the front panel and on the sides.
(2) Starters located 1 m away. The noise levels may change depending on the characteristics of the fans.

Presentation: pages 60520/2 and 60520/3	References: pages 60522/2 to 60522/5	Dimensions: pages 60523/2 to 60523/5	Schemes: pages 60524/2 to 60524/7

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Electrical characteristics (continued)

Logic inputs LI (2 configurable inputs)		4 logic inputs, impedance 4.3 kΩ, isolated: Stop, Run, LI3, LI4. + 24 V power supply (maximum 30 V) I max. 8 mA State 0 if U < 5 V and I < 2 mA State 1 if U > 11 V and I > 5 mA
Internal source available		1 x + 24 V output, isolated and protected against short-circuits and overloads. Accuracy ± 25%. Max. current 200 mA.
Logic outputs LO (configurable)		2 logic outputs LO1 and LO2 with 0 V common, compatible with level 1 PLC, according to standard IEC 65A-68. + 24 V power supply (minimum: +12 V, maximum: + 30 V). Maximum output current: 200 mA if supplied externally
Analogue output AO (configurable)		Current output 0-20 mA or 4-20 mA Maximum load impedance: 500 Ω Accuracy ± 5% of the maximum value
Input for PTC probe		Total resistance of probe circuit 750 Ω at 25°C, according to IEC 60 738-A
Maximum I/O connection capacity		2.5 mm² (AWG 12)
Communication		RS 485 multidrop serial link integrated in the starter, for Modbus, with RJ45 type connector Transmission speed 4800, 9600 or 19200 bps Maximum number of Altistart 48 connected: 18 Other uses: - connection to a remote terminal or - connection to a PC or - connection to other buses and networks via communication options.
Protection	Thermal	Built-in, starter and motor (calculated and/or thermal protection with PTC probes)
	Line protection	Phase failure, indicated by output relay
Current settings		The nominal motor current In can be adjusted from 0.4 to 1.3 times the starter nominal current. Adjustment of the maximum starting current from 1.5 to 7 times the motor In, limited to 5 times the starter nominal current.
Starting mode		By torque control with starter current limited to 5 In maximum. Factory setting: 4 In for standard operation on 15 s torque ramp
Stopping mode	Freewheel stop	"Freewheel" stop (factory setting)
	Controlled stop on torque ramp	Programmed between 0.5 and 60 s (for pump applications)
	Braked stop	Controlled dynamically by the flux

Electromagnetic compatibility EMC (1)

	Standards	Test levels	Examples (sources of interference)
Summary of immunity tests carried out with the Altistart 48	**IEC 61000-4-2 level 3** Electrostatic discharge: - by contact - in the air	 6 kV 8 kV	 Contact off an electrically charged individual
	IEC 61000-4-3 level 3 Radiated electromagnetic fields	 10 V/m	 Equipment transmitting radio frequencies
	IEC 61000-4-4 level 4 Rapid electrical transients: - power supply cables - control cables	 4 kV 2 kV	 Opening/closing of a contactor
	IEC 61000-4-5 level 3 Shock wave: - phase/phase - phase/earth	 1 kV 2 kV	 -
	IEC 61000-4-12 level 3 Damped oscillating waves	1 kV - 1 M Hz	Oscillating circuit on the line supply
Radiated and conducted emissions	According to IEC 60947-4-2, class A, on all starters		
	According to IEC 60947-4-2, class B, on starters up to 170 A: ATS 48D17● to 48C17●. Must be bypassed at the end of starting		

(1) The starters conform to product standard IEC 60947-4-2, in particular with regard to EMC. This standard ensures a level of immunity for products and a level of emitted interference. In steady state, the interference emitted is below that required by the standard. During acceleration and deceleration phases, low level loads may be affected by low frequency interference (harmonics). To reduce this interference, connect chokes between the line supply and the Altistart 48 (see page 60528/3).

Note:
■ Power factor correction capacitors can only be used upstream of the Altistart and only powered up at the end of starting.
■ The starter must be earthed to conform to the regulations concerning leakage currents (≤ 30 mA). When the use of an upstream "residual current device" for protection is required by the installation standards, an A-Si type device must be used. Check its compatibility with the other protective devices. If the installation involves several starters on the same line supply, each starter must be earthed separately.

Presentation:
pages 60520/2 and 60520/3

References:
pages 60522/2 to 60522/5

Dimensions:
pages 60523/2 to 60523/5

Schemes:
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Torque characteristics

Curves indicating changes in the torque depending on the starting current of a three-phase asynchronous motor.
Curves 1: direct line starting
Curves 2: starting in current limiting mode
Torque curve Ts1 indicates the total torque range available depending on the limiting current Is1.
Limiting the starting current Is to a preset value Is1 will reduce the starting torque Ts1 to a value which is almost equal to the square of currents Is1/Is.
Example:
For motor characteristics: Ts = 3 Tn for Is = 6 In,
limit the current to Is1 = 3 In (0.5 Is)
resulting in a starting torque Ts1 = Ts x (0.5)² = 3 Tn x 0.25 = 0.75 Tn

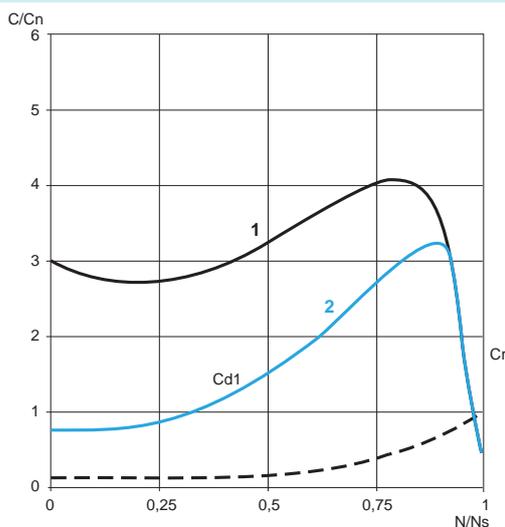## Starting current

1 Direct line starting current
2 Starting current limited to Is1
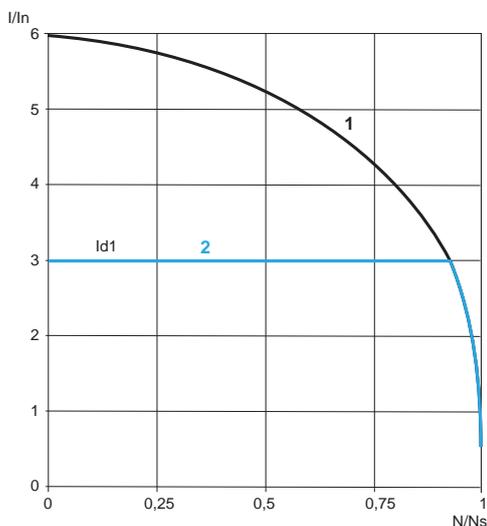
Starting torque

1 Direct line starting torque
2 Starting torque with current limited to Is1

Presentation:
pages 60520/2 and 60520/3

References:
pages 60522/2 to 60522/5

Dimensions:
pages 60523/2 to 60523/5

Schemes:
pages 60524/2 to 60524/7

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Conventional starting using current limitation or voltage ramp

With current limitation Is1, the accelerating torque applied to the motor is equal to the motor torque Ts1 minus the resistive torque Tr.
The accelerating torque increases in the starting range as the speed changes and is at its highest at the end of acceleration (curve 2).
This characteristic means that the load is taken up very abruptly, which is not recommended for pump type applications.

Example of speed curve for starting with current limitation
1 Current applied to the motor (i/In)
2 Motor speed N/Ns
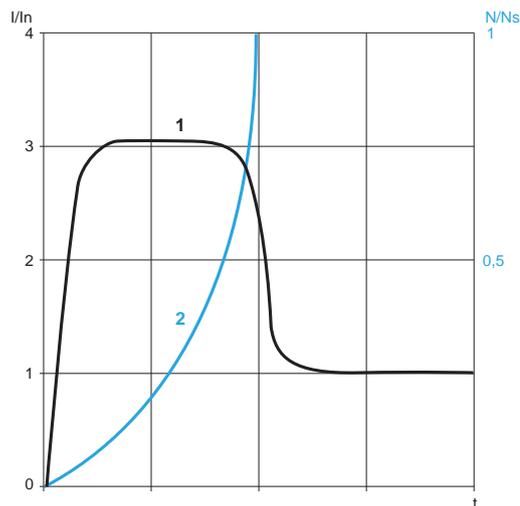
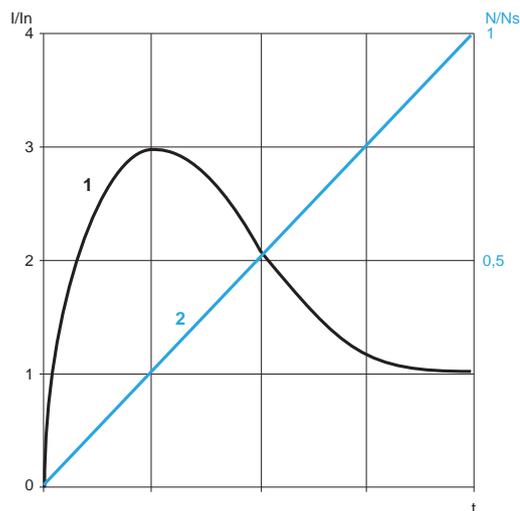## Starting with the Altistart 48

Torque control on the Altistart 48 applies the torque to the motor during the entire starting phase if the current required (curve 1) does not exceed the limiting current.
The accelerating torque can be virtually constant over the entire speed range (curve 2).
It is possible to set the Altistart in order to obtain a high torque on starting for a rapid motor speed rise whilst limiting its temperature rise, and a lower accelerating torque at the end of starting for gradual loading.
This control function is ideal for centrifugal pumps or for machines with high resistive torque on starting.

Example of speed curve for starting with torque control
1 Current applied to the motor (I/In)
2 Motor speed N/Ns

Stopping with the Altistart 48

■ Freewheel stop: the motor comes to a freewheel stop.
■ Decelerated stop: this type of stop is ideal for pumps and can be used to effectively reduce pressure surges. Torque control on the Altistart 48 reduces the effect of hydraulic transients even if the load increases. This type of control makes adjustment easy.
■ Braked stop: this type of stop is suitable for high inertia applications as it reduces the stopping time of the machine.