



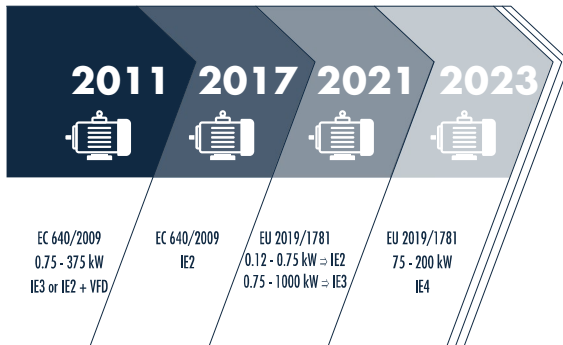
## Overview

# Soft starters

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## Soft starters

### Self-learning, intelligent diagnostics and easy to use

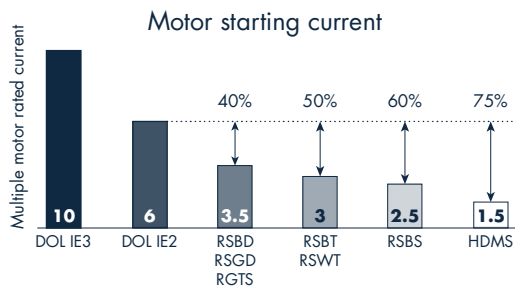


### New efficiency requirements for a.c induction motors (EU MEPS)

EU regulation EC 640/2009 related to minimum efficiency requirements for low voltage motors is being phased out and replaced by the EU 2019/1781.

The new regulation extends the requirement for motors with rated output power from 0.75kW to 1000 kW to reach the higher efficiency class IE 3.

As of July 2023, motors with rated power of >75kW and <200kW must even reach the higher efficiency class of IE4.



### Challenges caused by high efficiency motors

High efficiency motors are designed to reduce losses during motor operation by reducing rotor resistance. As a consequence there is a considerable increase in the locked rotor current.

Whereas starting an IE2 motor via direct on line (DOL) results in a starting current of about 6 times the motor rated current, with IE3 motors starting current can be as high as 10 times.

Such levels of starting current may cause increased machine stoppages due to tripping of protection circuits, oversizing of cables and fuses as well as disturbance on the voltage network.



### Minimising motor starting currents with soft starters

Carlo Gavazzi Soft Starters are already compatible with IE3 motors and can provide a typical 50% reduction with respect to a direct on line (DOL) start. A lower starting current avoids nuisance trips of protection devices and reduces all the mechanical shocks experienced during motor starts. All this results in less machine stoppages and a longer lifetime for your motors.

### Unique benefits of Carlo Gavazzi Soft Starters



#### Self-learning

Soft Starters integrate intelligent algorithms that adapt to the load requirements at every single start. As motors get old and/or the load requires more torque during start, the soft starter automatically adjusts its internal parameters to keep your motors running.



#### Current balancing

In the case of the two-phase controlled soft starters (RSGD, RSBD) the current imbalance is minimised to avoid nuisance tripping of protection devices.



#### Fewer user adjustments

Thanks to the self-learning algorithm, our soft starters require minimal user adjustments. This results in quicker commissioning and avoids field tampering.



#### Real-time diagnostics

Our soft starters continuously deliver data via Modbus. The data related to the motor energy consumption, running hours as well as the soft starter status can be used to diagnose malfunctions as well as quicker troubleshooting.



#### Energy saving

The soft starters are internally bypassed thereby reducing heat dissipation within the electrical panel.



#### More protection for your motors

By integrating additional monitoring functions, the soft starters can detect abnormal operating conditions to protect your motors.

## Specification tables

				Rated current												
Applications	Supply	Series	Voltage Range	12	16	25	32	37	45	55	70	85	90	95	100	
<b>General AC motors</b>	1-phase	<b>RGTS</b>	110 - 230 VAC	▼	▼	▼										
	3-phase	<b>RSGD</b>	220 - 600 VAC	▼	▼	▼	▼		▼	▼	▼	▼			▼	
<b>Scroll compressors</b>	1-phase	<b>HDMS</b>	110 - 230 VAC	▼		▼	▼	▼								
		<b>RSBS</b>	230 VAC				▼									
	3-phase	<b>RSBD</b>	220 - 400 VAC	▼	▼	▼	▼	▼	▼							
			220 - 600 VAC							▼	▼			▼		
		<b>RSBT</b>	220 - 400 VAC		▼	▼	▼									
			220 - 480 VAC						▼	▼				▼		
<b>Pumps and ventilators</b>	3-phase	<b>RSWT</b>	220 - 600 VAC	▼	▼	▼	▼	▼	▼	▼	▼		▼			

		1-phase			3-phase			
Functions		RGTS	HDMS	RSBS	RSGD	RSWT	RSBD	RSBT
<b>Control method</b>	Self-learning		▼		▼	▼	▼	▼
	Current limit		▼	▼	▼	▼	▼	▼
	Current/voltage ramp	▼			▼	▼		
	Torque control				▼			
<b>Topology</b>	Internal bypass		▼	▼	▼	▼	▼	▼
<b>Communication</b>	Modbus		○		○			○
	NFC		▼					
<b>Digital outputs</b>	Fault indication		▼	▼	▼	▼	▼	○
	Top of ramp		▼		▼	▼	▼	○
	Run status indication				○	○		
<b>Monitoring functions</b>	Wrong phase sequence				▼	▼	▼	▼
	Over- and under- voltage		▼	▼	▼	▼	▼	▼
	Phase loss (motor side)		▼	▼	▼	▼		
	Locked rotor		▼	▼	▼	▼	▼	▼
	Over-temperature		▼	▼	▼	▼	▼	▼
	Motor overload		▼		▼	▼	▼	▼
	Supply voltage imbalance				▼	▼	▼	▼
	Shorted power unit		▼	▼	▼	▼		
Thermistor (PTC) input				○	○			

▼ Available  
○ Optional or available on specific models only

# Overview

## Soft starters

### RSWT - Centrifugal pump and ventilator soft starters

#### Features

- Operational voltage: 220 - 600 VAC
- Rated operational current: 12 to 90 AAC
- Three phase controlled
- Hybrid switching - higher efficiency during operation
- Built-in diagnostic functions including electronic motor overload protection (Class 10)
- Relay outputs for fault indication and top of ramp
- Number of starts/hr: 20
- Easy to configure: only 3 adjustments required
- Compact dimensions



#### Automatic detection of motors at full speed condition

To further minimise torque shocks on the motor shafts and couplings the RSWT automatically detects when the motor is running at full speed. This functionality ensures that the internal bypass relays are only switched on when the motor current drops to a safe level thereby avoiding any electrical and mechanical surges during such a transition. Disturbances on the electrical network are eliminated and motor lifetime is prolonged.



#### Reduces water hammering in water pumps

RSWT's self-learning algorithm is active at every pump start and also during pump stopping. At every start and stop, the soft starter monitors variables such as voltage and current and automatically modifies its internal parameters to smoothen the ramp profile thereby eliminating pressure shocks.



#### Protects your pumps under all conditions

Functionality of RSWT goes beyond soft starting. Through a set of smart monitoring functions, RSWT continuously checks a set of critical variables to signal any abnormal conditions. Some of these functions include wrong phase sequence, current imbalance and electronic motor overload protection.



#### Minimises electrical and mechanical stresses

The RSWT controls the current on all the 3 phases. This control method ensures best in class current reduction and also eliminates current imbalance. The maximum current during start is limited to 3.5 times the full load current (FLC) setting. With a ramp-up setting range up to 20 sec, both low and medium inertia fans can be smoothly started with the RSWT.



	RSWT 45 mm	RSWT 75 mm	RSWT 120 mm
Housing (H x W x D)	Up to 16 A: 130 x 45 x 105 mm 25 A: 150 x 45 x 105 mm	180 x 75 x 221 mm	180 x 120 x 221 mm
Starts per hour	20	20	20
Controlled phases	3	3	3
Internally bypassed	Yes	Yes	Yes
Relay outputs	2	3	3
PTC input	No	Yes	Yes
Integrated overload protection (Class 10)	Yes	Yes	Yes
Approvals	CE - cULus Listed - CCC - EAC	CE - cULus Listed - CCC - EAC	CE - cULus Listed - CCC - EAC
<b>SELECTION GUIDE</b>	<b>RSWT XX YY ZZ V10</b>	<b>RSWT XX YY ZZ V11 J</b>	<b>RSWT XX YY ZZ V11 I</b>
<b>XX</b> Operational voltage	40 220 - 400 VAC - 50 / 60 Hz 60 220 - 600 VAC - 50 / 60 Hz	40 220 - 400 VAC - 50 / 60 Hz 60 220 - 600 VAC - 50 / 60 Hz	40 220 - 400 VAC - 50 / 60 Hz 60 220 - 600 VAC - 50 / 60 Hz
<b>YY</b> Rated current	12 AAC 16 AAC 25 AAC	32 AAC 37 AAC 45 AAC 55 AAC	70 AAC 90 AAC
<b>ZZ</b> Control voltage [RSWT40]	F0 24 VAC / DC E0 110 - 400 VAC	F0 24 VAC / DC E0 110 - 400 VAC	F0 24 VAC / DC E0 110 - 400 VAC
<b>ZZ</b> Control & supply voltage [RSWT60]	FF 24 VAC/DC GG 100 - 240 VAC	FF 24 VAC/DC GG 100 - 240 VAC	FF 24 VAC/DC GG 100 - 240 VAC
<b>J</b> Fan	without fan	1 with fan 0 without fan	with fan

# Soft starters

## RSGD - General purpose soft starters

### Features

- Operational voltage: 220 - 600 VAC
- Rated operational current: 12 to 100 AAC
- Two-phase controlled
- Hybrid switching - higher efficiency during operation
- Current balancing for improved load stability at start/stop
- Condition monitoring through Modbus RTU port
- Electronic motor overload protection (Class 10)
- Fully configurable via Modbus
- Torque control during soft stop
- Easy to configure: only 3 adjustments required
- Compact dimensions



### Adapts to load conditions to optimise motor starts

The RSGD uses a proprietary self-learning algorithm that adjusts the internal start parameters according to the load requirements. Whether the load connected to the motor shaft is low torque or high inertia, the RSGD is able to adjust the parameters at every start resulting in smoother motor starts under any load condition.



### Improves load stability with current balancing

The RSGD minimises motor audible noise during starts by balancing the currents on the motor phases. As a result the motor starts much smoother and voltage disturbances are also minimised reducing the possibility of trips on the fuses and circuit breakers.



### Monitors motor performance in real time

The integration of the serial communication allows the RSGD to exchange real-time data with the machine PLC. Data includes electrical variables as well as fault indication. Such data can be very useful during commissioning, during troubleshooting and preventive maintenance activities.



### Stops pumps smoothly with torque control

The RSGD uses torque control as the default soft stop. Torque control monitors both voltage and current to ensure that the motor performs a constant deceleration. This advanced approach eliminates pressure shocks and avoids water hammering.



	RSGD 45mm V.200	RSGD 45mm V.210	RSGD 75mm
Housing (H x W x D)	Up to 32 AAC: 106 x 45 x 125 mm 45 AAC: 130 x 45 x 125 mm	Up to 25 AAC: 106 x 45 x 125 mm 32 AAC to 45 AAC: 130 x 45 x 125 mm	45 / 55 / 70 / 85 AAC: 170 x 75 x 180 mm 100 AAC: 221 x 75 x 180 mm
Starts per hour (@ rated conditions)	Up to 20	Up to 20	10
Controlled phases	2	2	2
Internally bypassed	Yes	Yes	Yes
Relay outputs	2	2	3
PTC input	No	No	Yes
Electronic motor overload protection (Class 10)	No	Yes	Yes
Modbus RTU	No	No	Yes
Approvals	CE - cULus listed - CCC - EAC	CE - cULus listed - CCC - EAC	CE - cULus listed - CCC - EAC
<b>SELECTION GUIDE</b>	RSGD <b>XX YY ZZ V K</b> 200	RSGD <b>XX YY ZZ V K</b> 210	RSGD <b>XX YY ZZ V X 31 J C</b>
<b>XX</b> Operational voltage	<b>40</b> 220 - 400 VAC 50 / 60 Hz <b>60</b> 220 - 600 VAC 50 / 60 Hz	<b>40</b> 220 - 400 VAC 50 / 60 Hz <b>60</b> 220 - 600 VAC 50 / 60 Hz	<b>40</b> 220 - 400 VAC 50 / 60 Hz <b>60</b> 220 - 600 VAC 50 / 60 Hz
<b>YY</b> Rated current	<b>12</b> AAC <b>16</b> AAC <b>25</b> AAC <b>32</b> AAC <b>45</b> AAC	<b>12</b> AAC <b>16</b> AAC <b>25</b> AAC <b>32</b> AAC <b>45</b> AAC	<b>55</b> AAC <b>70</b> AAC <b>85</b> AAC <b>100</b> AAC
<b>ZZ</b> Control voltage [RSGD <b>40</b> ]	<b>FO</b> 24 VAC/DC <b>FO</b> 110 - 400 VAC <b>FF</b> 24 VAC/DC	<b>FO</b> 24 VAC / DC <b>FO</b> 110 - 400 VAC <b>FF</b> 24 VAC/DC	<b>FO</b> 24 VAC / DC <b>FO</b> 110 - 400 VAC <b>FF</b> 24 VAC/DC
<b>ZZ</b> Control & supply voltage [RSGD <b>60</b> ]	<b>GG</b> 100 - 240 VAC	<b>GG</b> 100 - 240 VAC	<b>GG</b> 100 - 240 VAC
<b>K</b> Heatsink	<b>D</b> No heatsink [12/16/25/32 AAC] models <b>X</b> External heatsink [45 AAC] models	<b>D</b> No heatsink [12 / 16 AAC] models <b>X</b> External heatsink [25/32/45 AAC] models	<b>X</b> External heatsink
<b>J</b> Fan	without fan	without fan	<b>1</b> with fan [100 AAC models only] <b>0</b> without fan

# Soft starters

## RGTS, RSBS, HDMS - 1 phase soft starters

### Features

- Operational voltage: Up to 230 VAC
- Rated operational current: 12 - 37 AAC
- RGTS: Fully solid state
- RSBS/HDMS: Hybrid switching - higher efficiency during operation
- HDMS: Condition monitoring through Modbus RTU port
- HDMS: Faster troubleshooting with NFC technology
- Easy to configure
- Compact dimensions



### A complete line of single phase soft starters

Carlo Gavazzi provides a wide range of single phase soft starters suitable for different motor types. The RGTS is suitable for permanent split capacitor (PSC) motors such as centrifugal pumps and ventilators. The RSBS is suitable for capacitor start motors including CSIR and CSCR type motors typically used in refrigeration and heat pump applications. The HDMS is suitable for CSCR motors primarily scroll compressors and submersible pumps as well as PSC motors with a starting time up to 1 sec.



### Quick commissioning

HDMS and RSBS do not require any user adjustments. The control algorithm automatically adjusts the starting torque required by the compressor. This results in a tamper-free design and faster commissioning. The RGTS is a more basic soft starter and requires user adjustment for initial torque and ramp-up time. In the case of the RGTS, the ramp-up time can be extended to 5 sec.



### Continuously adjusts to load requirements

Compressors starting conditions change with every start. Thanks to its advanced algorithm, the HDMS automatically adjusts its internal parameters at every start to adjust to the variable starting conditions.



### Identify deviations in the compressor performance

Compressor malfunctions can be detected through monitoring of specific electrical variables. The HDMS has a native Modbus RTU serial port for real-time data exchange with the PLC. Data such as current consumption and power factor can highlight problems on the compressor in real-time.



	RGTS	RSBS Gen 3	HDMS
Housing (H x W x D)	100.4 x 54 x 113 mm	81.4 x 135 x 70.6 mm	85.6 x 153 x 86.7 mm
Starts per hour (@ rated conditions)	10	10	10
Controlled phases	1	1	1
Internally bypassed	No	Yes	Yes
Relay outputs	0	1	2 (configurable)
PTC input	No	No	Yes
Electronic motor overload protection (Class 10)	No	No	Yes
Modbus RTU	No	No	Yes
Approvals	CE - cULus listed	CE - cULus listed - EAC	CE - cULus listed
<b>SELECTION GUIDE</b>	RGTS <b>XX YY ZZ V00</b>	RSBS <b>XX YY ZZ V23 C KK HP</b>	HDMS <b>XX YY ZZ V 2 KK</b>
<b>XX</b> Operational voltage	<b>24</b> 100 - 240 VAC 50 / 60 Hz	<b>23</b> 230 VAC 50 / 60 Hz	<b>23</b> 110 - 230 VAC 50 / 60 Hz
	<b>12</b> AAC	<b>32</b> AAC	<b>12</b> AAC
<b>YY</b> Rated current	<b>16</b> AAC		<b>25</b> AAC
	<b>25</b> AAC		<b>32</b> AAC
			<b>37</b> AAC
<b>ZZ</b> Control voltage		<b>A2</b> 230 VAC	<b>60</b> 110 - 230 VAC
<b>ZZ</b> Supply voltage	<b>0F</b> 24 VAC/DC	Internally supplied	Internally supplied
	<b>0G</b> 100 - 240 VAC		
		<b>00</b> External start capacitor	<b>20</b> Panel mount
		<b>10</b> 100 µF internal start capacitor	<b>21</b> DIN rail mount
		<b>17</b> 170 µF internal start capacitor	<b>20C</b> Panel mount + Modbus
<b>KK</b> Versions		<b>24</b> 240 µF internal start capacitor	<b>21C</b> DIN rail mount + Modbus

# Soft starters

## RSBD, RSBT - 3 phase scroll compressor soft starters

### Features

- Operational voltage: Up to 600 VAC
- Rated operational current: 12 - 95 AAC
- Patented self-learning algorithm
- Hybrid switching - higher efficiency during operation
- Two- and three-phase controlled versions
- No user adjustments required
- Condition monitoring through Modbus RTU port
- Compact dimensions



### Plug and play soft starters

The RSBD and RSBT soft starters are designed specifically for OEMs. They do not require any user adjustments for an error-free and fast installation.



### Optimised starts under all starting conditions

The self-learning algorithm is also implemented in both the RSBD and RSBT soft starters. This functionality allows the soft starters to dynamically change the start-up parameters to provide the optimal torque to start the compressor even under high differential starting pressures.



### Specifically designed for scroll compressors

The RSBD and RSBT soft starters are tailored for scroll compressor applications. The ramp-up time is internally limited to a maximum of 1 second to comply with scroll compressor manufacturers recommendations. Built-in monitoring functions provide additional protection to the compressor in case of abnormal operating conditions.



### Minimise load vibrations and eliminate light flickering

Another essential benefit of the RSBD and RSBT soft starters is that of current reduction. With the RSBD, typically the current reduction vs DOL is in the region of 40% and that of the RSBT can be up to 60%. The lower starting current results in lower voltage network disturbances and lower maintenance costs.



	RSBD 45 mm	RSBD 75 mm	RSBT 45 mm	RSBT 120 mm
Housing (H x W x D)	125 x 45 x 106 mm	170 x 75 x 150mm	V11: 125 x 45 x 81 mm V21/VCI: 125 x 45 x 103.5 mm	170 x 120 x 150 mm
Starts per hour (@ rated conditions)	12	12	12	12
Controlled phases	2	2	3	3
Internally bypassed	Yes	Yes	Yes	Yes
Relay outputs	2	3	1 (Option)	2
PTC input	No	No	No	No
Electronic motor overload protection (Class 10)	No	No	No	No
Modbus RTU	No	No	Option	Option
Approvals	CE - cULus listed - EAC	CE - cULus listed - EAC	CE - cULus listed - CCC - EAC	CE - cULus listed - CCC - EAC
SELECTION GUIDE	RSBD <b>XX YY ZZ</b> V61HP	RSBD <b>XX YY ZZ</b> V61HP	RSBT <b>XX YY ZZ V KK</b> HP	RSBT <b>XX YY ZZ V K</b>
<b>XX</b> Operational voltage	<b>40</b> 220 - 400 VAC 50/60 Hz	<b>40</b> 220 - 400 VAC 50/60 Hz <b>60</b> 220 - 600 VAC 50/60 Hz	<b>40</b> 220 - 400 VAC 50/60 Hz	<b>48</b> 220 - 480 VAC 50/60Hz
	<b>12</b> AAC	<b>55</b> AAC	<b>16</b> AAC	<b>55</b> AAC
	<b>16</b> AAC	<b>70</b> AAC	<b>25</b> AAC	<b>70</b> AAC
<b>YY</b> Rated operational current	<b>25</b> AAC	<b>95</b> AAC	<b>32</b> AAC	<b>95</b> AAC
	<b>32</b> AAC			
	<b>37</b> AAC			
<b>ZZ</b> Control voltage	<b>E</b> 110 - 400 VAC <b>F</b> 24 VAC / DC	<b>E</b> 110 - 400 VAC <b>F</b> 24 VAC / DC	<b>E</b> 110 - 400 VAC <b>F</b> 24 VAC / DC	<b>C</b> 24 VAC/DC & 110 - 400 VAC
<b>ZZ</b> Supply voltage		<b>FF</b> 24 VAC / DC (with <b>60</b> only) <b>GG</b> 100 - 240 VAC		
<b>KK</b> Versions			<b>11</b> No relay output <b>21</b> Relay output <b>C1</b> Modbus RTU	<b>0</b> Standard version <b>C</b> Modbus RTU



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