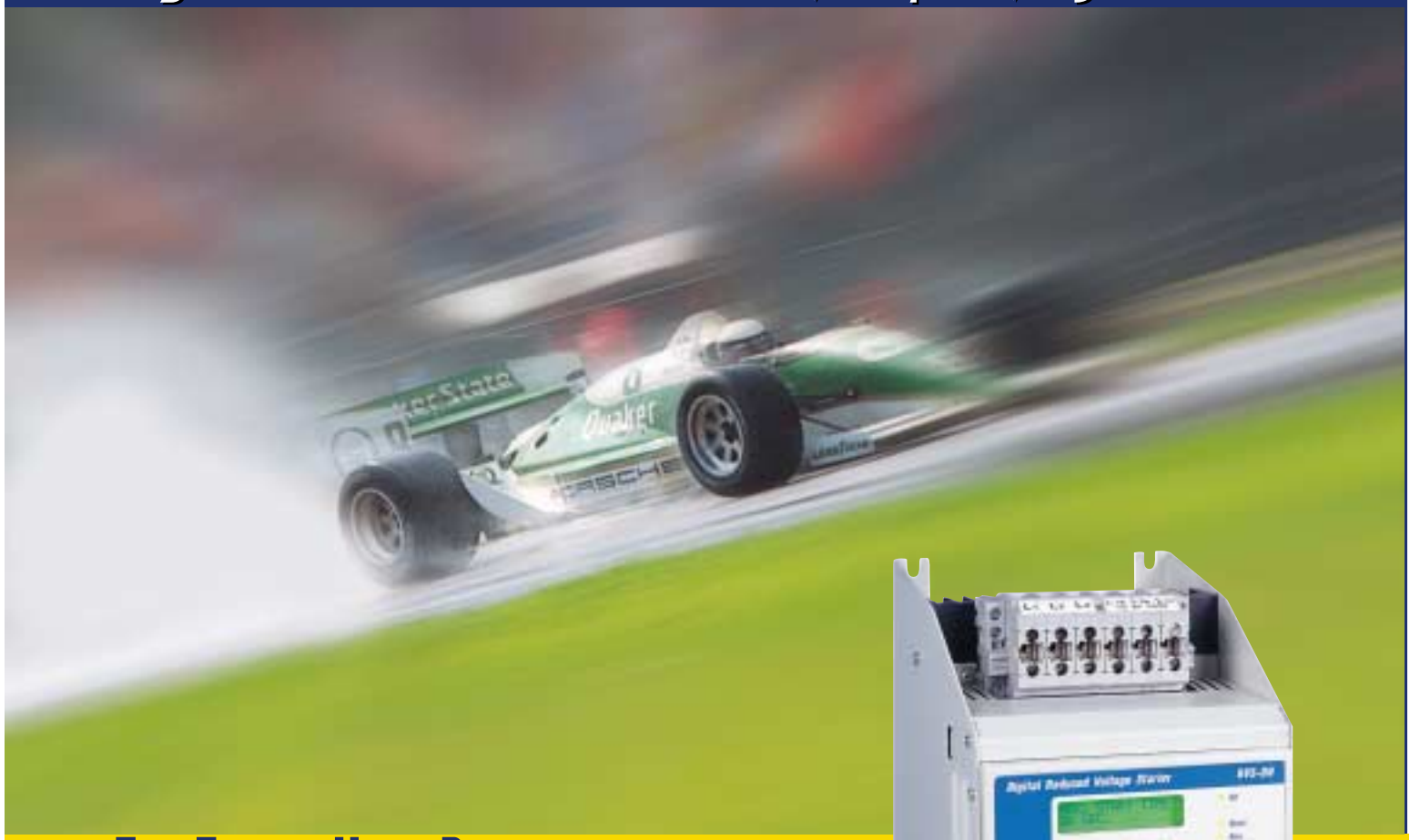
RVS-DN

Digital soft starter for AC motors, 8-2700A, 230-1000V



For Every New Beginning
You Need A Good Start

RVS-DN

SOLCON

RVS-DN Features

RVS-DN

The RVS-DN soft starter incorporates thyristors (SCR's) to start the motor by supplying a slowly increasing voltage, providing a soft start and smooth stepless acceleration while drawing the minimum current.

Advantages at a Glance

- Complete standard product line 8-3000A, 220-1000V (1)
- Heavy duty fully rated design
- Robust construction
- Soft, smooth, stepless acceleration and deceleration
- Second generation microprocessor circuitry
- Superior starting & stopping characteristics
- Comprehensive motor protection package
- User friendly
- Energy save
- Programmable Auto Reset
- Unique optional features - Motor Insulation Tester
  - RS-485 communication
  - Analogue output
  - Thermistor input

(1) For ratings larger than 3000A and higher than 1000V - consult factory.

Applications

Industrial

- Pumps
- Compressors
- Fans and centrifuges
- Conveyors, elevators and monorail systems
- Tachometer driven system
- Starting from weak power supply (diesel generators, long supply lines, etc)

Marine & Offshore

- Fans & Blowers
- Air compressors
- Water & ballast pumps
- Refrigeration compressors
- Radar antenna drive systems
- Limited power supply sources
- Hydraulic pump & power packs
- Thrusters (Bow, Center and Stern)
- Anchor motors (standard and multi-speed)

1000V for Mining, Quarry & Mixers

Digital, fiber optically controlled Soft Starter for 105-390A, Robust, Heavy Duty, Fully featured

Starting & Stopping

- Soft start and soft stop
- Current limiting
- Torque & current control - for optimized acceleration and decaleration
- Pump control program
- Dual adjustment - two start/stop characteristics
- Slow speed with electronic reversing
- Pulse start
- Linear acceleration (tacho feedback)

Motor & Starter Protection

- Too many starts & start inhibit time
- Long start time (Stall protection)
- Shear-pin (Jam) with adjustable delay
- Electronic overload with selectable curves
- Under current
- Phase loss
- Phase sequence and Under/Over frequency
- Under/Over voltage
- Load loss (motor not connected)
- External fault
- Shorted SCR
- Starter over temperature protection
- Motor insulation test (option)
- Motor thermistor (option)
- When using "Preparation for Bypass" all protection remains active

Control Circuitry

- Multifunction programmable I/O
- Opto isolated control inputs
- Auxiliary contact - C/O, upon start or O/C Shear-pin (1)
- Auxiliary contact - C/O, upon completion of acceleration
- Fault contact - C/O, upon fault, Trip or Trip Fail-safe
- Alarm contact - C/O, Motor insulation (option)
- Resetting - Front panel, remote hard wire or communication
- Communication RS485, option (2)
- Analogue output, option

(1) With adjustable delay
(2) MODBUS, MODBUS/TCP, PROFIBUS (or remote communication)

and many more

SOLCON

Internal Fan

Fan(s) operation method is controlled by an internal jumper.

Automatic Operation

Fan(s) operate automatically for five minutes after by-pass contactor closes or after a stop or trip.

Continuous Operation

Fan(s) operate continuously as long as Control Supply is connected.

External Control

Fan(s) operate when the external contact closes and stops when it opens.

From mains

To by-pass

Option

25
26
27 — Insulation alarm

Option

28
29 — Analogue output
30 — Ground
31
32 — Thermistor input

Option

22 NC
23 (-) RS485
24 (+) RS485

1 L Control Supply
2 ~ Fan Control
3 N Control Supply

I/O Programming

- Terminal 7
  Energy save, slow speed, remote reset
- Terminal 8
  Dual adjust, slow speed reverse, remote reset
- Immediate Relay
  Immediate relay or shear-pin alarm relay
- Fault Relay
  Fault Relay or Fault Fail-Safe

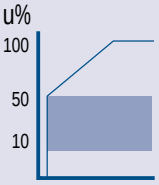
To Motor

SOLCON

Start-Stop Parameters

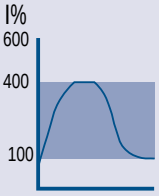
Initial Voltage

Determines motor's initial starting torque (the torque is directly proportional to the square of the voltage reduction).
Range: 10-50% Un
(extended range 10-80%)



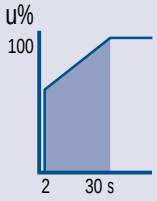
Current Limit

Determines motor's highest current during starting.
Range: 100-400% of FLA setting
(extended range 100-500%)



Acceleration Time

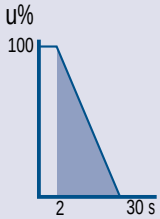
Determines motor's voltage ramp-up time, from initial to full voltage.
Range: 1-30 sec.
(extended range 1-90 sec)
(starting process can be extended to 240 sec.)



Deceleration Time

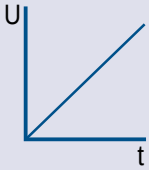
Used for controlled deceleration of high friction loads. When Soft Stop is initiated, starter output voltage is gradually ramped down.
Range: 2-30 sec.
(extended range 2-90 sec)

Typical applications - pumps, conveyors with fragile loads, etc.



Torque Control

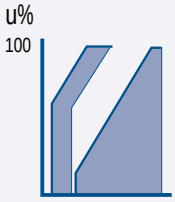
Providing linear increase of the torque through closed loop control of motor's voltage.



Dual Adjustment

Allows a second start/stop characteristic with a second FLA setting. Transfer to the secondary settings is obtained by remote contact.

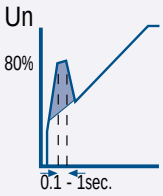
Typical applications - varying start/load conditions such as conveyors, mixers, pocket elevators and two speed motors with different power ratings.



Pulse Start

A pulse of 80% Un, without Current Limit, is initiated to break free the load. Thereafter, starting continues according to starting parameter settings.
Pulse duration range: 0.1-1 sec.

Typical applications - high inertia and high friction loads, sewage pumps, etc.

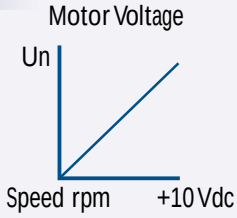


Tacho Feedback

Provides linear acceleration and deceleration curves, according to rpm feedback. A total of 12 tacho gain levels can be selected for enhanced closed loop starting and stopping.

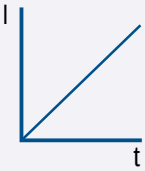
Typical applications - conveyors with elastic problems, wire drawing machines, etc.

An advanced Master-Slave Tacho feedback system can be supplied for applications requiring multi-motor drive systems (consult factory for detailed information).



Current Control

Unique circuitry provides closed loop control of the increasing current during acceleration. Providing linear current increase in relation to time.

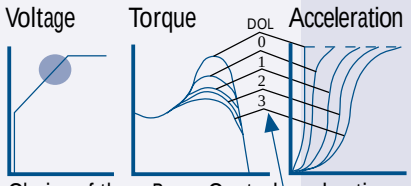


Pump Control

Two major problems are associated with starting and stopping of pumps (see our "Pump Control" leaflet).

Over-Pressure During Starting

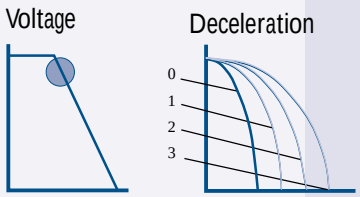
The sharp increase of torque towards end of acceleration can cause high pressure and damage the pipe system. The Pump Control enables selection between three special voltage ramp-up curves reducing peak torque.



Choice of three Pump Control acceleration curves

Water Hammer During Stopping

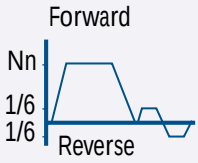
During Soft Stop - when voltage is decreasing, motor torque may fall below load torque causing abrupt stalling, instead of smoothly decreasing speed to zero. This will create the Water Hammer phenomenon resulting in a loud noise and damage to the pipe system.
The Pump Control feature enables selection between three special voltage ramp-down curves preventing stall condition and eliminating Water Hammer.



Choice of three Pump Control deceleration curves

Slow Speed with Electronic Reversing

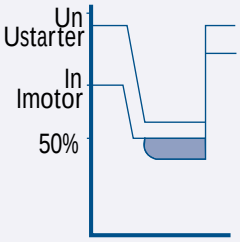
Motor can be operated at 1/6 nominal speed for 30 sec. Motor torque, while running at slow speed, is adjustable. Reversing direction is done by the starter. No upstream contactors are required.
(extended range 1-90 sec)



Typical applications are positioning, release of friction load by reversing rotation and for maintenance.

Energy Saving

Activated when motor is lightly loaded for extended periods of time. Supply voltage to the motor decreases (lowering the rotating magnetic field intensity), thus, reducing the reactive current and copper/iron losses.



Typical applications are compressors and machines running idle for extended periods of time.

Starting from Diesel Generators

When starting from a diesel-generator supply, the starting process can sometimes be disturbed due to instability of the generator voltage.
The RVS-DN incorporates a special characteristic for diesel generator starting which overcomes the instability in voltage and frequency.
This special starting characteristic becomes operative by setting a Dip switch and closing a remote contact.

Motor & Starter Protection

Motor Insulation (option)

Continuous testing of motor insulation level before motor is started. Two levels can be set for Alarm and Trip:
- Alarm , range 0.2-5 MΩ (delay 60 sec) with automatic reset
- Trip level, range 0.2-5 MΩ (instantaneous)

Note: Upstream contactor is required.
Protects motors operating in polluted, humid and corrosive environments, submersible pumps, stand-by motors, etc.

Thermistor Input (option)

Programmable for PTC or NTC, trips the starter when motor temperature rises above the set level.
Range:1-10KΩ, preset time delay 2 sec.

Too Many Starts

Determines maximum allowable number of starts during a preset period.
Range: Off, 1-10 starts. Start period 1-60 min

Start Inhibit

Determines time period during which starting is disabled after "Too many starts" trip. Trying to start the motor before "Start Inhibit Time" has elapsed will result in LCD displaying: "Wait Before Rst : ... MIN". Range : 1-60 min

Long Start Time - (Stall)

Trips the starter if motor does not reach full speed during "Maximum Start Time".
Range: 1 - 30 sec. (extended range 1-240 sec.)
Protects stalled motor from over heating or when settings are incorrect.

Shear - Pin (Jam)

Trips the starter in less than one cycle when current exceeds the set current levels.
Range: 200 - 850% of motor's FLA during running (1)
850% of motor FLA setting during starting (1)
850% of starter FLC at all times
(1) With adjustable delay.

Phase Loss and Under /Over Frequency

Trips the starter when one or two phases are missing for more than one second or when frequency is less than 40Hz or greater than 65Hz.

Under Voltage

Trips the starter when mains voltage is under or over the set level.
Range: 120-600V, Delay 1-10 sec.

Over Voltage

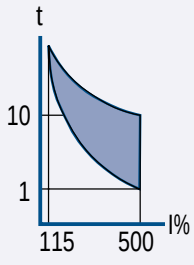
Trips the starter when mains voltage exceeds the set level.
Range: 150-750V, Delay 1-10 sec.

Phase Sequence

Trips the starter when phase sequence is wrong.
Options: Yes/No

Electronic Overload

Inverse time electronic overload incorporates a Thermal Memory Register which calculates heating, minus dissipation of the motor. When the thermal register fills up, the starter trips. The thermal register resets itself 15 minutes after motor stops.
Range: 75-150% of motor FLA, factory set at 115%.
Tripping curve is selectable at 5 x FLA.
Range: 1-10 sec.



Under Current

Trips the starter when motor current decreases below set level.
Range: Off, 20-90% of FLA.
Delay : 1- 40 sec.

Indicates motor is not loaded, broken belt or shaft, no water in a pipe system, etc.

Long Slow Speed Time

Trips the starter if motor operates at slow speed for longer than "Maximum Slow Speed Time", to protect the motor from over heating.
Range: 1-30 sec.
(extended range 1-90 sec)

Wrong Connections

Indicates when motor is not connected to Load terminals, or due to internal disconnection in the motor winding.

External Fault

Trips the starter when the external contact closes for more than 2 sec.

Shorted SCR

Trips the starter in case one or more SCRs have been shorted.

Heatsink Over-Temperature

Thermal sensors mounted on the heatsink trip the starter when heatsink temperature rises above 85°C.

Fault and Reset

Upon fault, the starter latches the Fault condition, disabling thyristor's firing. Fault Relay operates, Fault LED lights up and the LCD provides fault description.

When fault occurs followed by a voltage outage, fault condition is latched and reappears with voltage restoration.

Local Reset - can be performed by Reset key on front panel.

Remote Reset - can be performed through Terminals 7, 8 or through the communication.

Auto Reset - programmable for phase loss, Under and Over voltage Faults.

Communication Reset - enables remote resetting of all faults.

Additional Protection

Metal Oxide Varistors (MOV)

Metal Oxide Varistors are incorporated in the power section and in the Control Module to protect the SCRs and electronic circuitry from voltage spikes.

EMI/RFI Protection

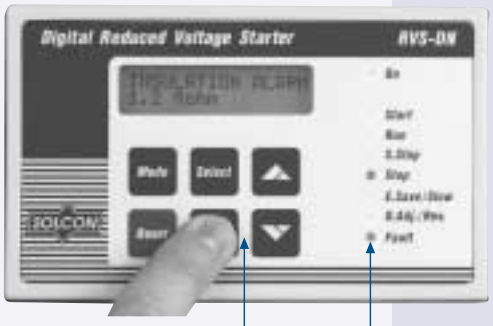
Appropriate filters are incorporated to prevent disturbances due to EMI/RFI, in compliance with the latest CE regulations.

Operation

Interactive LCD Display

The RVS-DN has a menu-driven user friendly display, for easy operation. Information is read directly off the LCD.

The upper line shows the name of the parameter, the lower line shows the set value which can be modified through the keypad.



User friendly allows accurate setting

LEDs - For easy operational status

- Illuminated LCD is optional

LCD Language Selection

Four languages can be selected:
English, French, German, Spanish

Software Lock

Parameter settings can be locked by an internal Dip switch to prevent tampering. When locked, pressing Store or ▼ ▲ keys causes the LCD to display "Unauthorized Access".

Easy Operation

For simple applications, a minimized mode of LCD display can be selected.

Maximized mode	Minimized mode
Display mode	Display mode
Main parameters	Main parameters
Start parameters	Start parameters
Stop parameters	Stop parameters
Dual adjustment	Statistical data
Energy save parameters	
Slow speed parameters	
I/O programming	
Fault parameters	
Communication parameters	

Informative, Diagnostics & Statistical Data

For better and safer operation the following information is displayed on LCD and transferred via the communication.

Display Mode

Quick view of the motor status and all stored parameters.

MOTOR CURRENT
320 % OF FLC

- Motor current in Percent of Full Load Ampere
- Motor Insulation level (option)

INSULATION
12 MOHM

Parameter Setting

Easy settings of all parameters:

- Main parameters
- Start parameters
- Stop parameters
- Dual Adjustment parameters
- Energy Saving parameters
- Slow Speed parameters
- I/O parameters
- Fault parameters
- Communication parameters

INITIAL VOLTAGE
20 %

MAX START TIME
21 SEC

Statistical and Fault Diagnostics

- Total run time
- Total number of starts
- Total number of trips
- Last start current and time
- Last trip and trip current

TOTAL RUN TIME
307 HOURS

LAST TRIP
UNDER CURRENT

Providing the user with a clear picture of motor and starter condition.

Communication (option)

MODBUS RTU

Enabling Setting, Control & Supervision (RS-485)

PROFIBUS DP

Enabling Control & Supervision

TCP/IP - MODBUS/TCP

Fully supported according to the "Specification 1.0" standard

Analogue Output (option)

Related to the operating current of the motor, programmable 0-10 Vdc, 4-20 mA, 0-20 mA and invertible.

Superior Construction

Heavy Duty, Fully Rated Design

The RVS-DN is designed to operate under the following conditions:

Max. ambient temp:	50° C
Max. starting current:	400% FLA
Max. starting time:	30 seconds
Max. starts per hour:	4 starts per hour at max. ratings. Up to 60 starts per hour at light load applications.

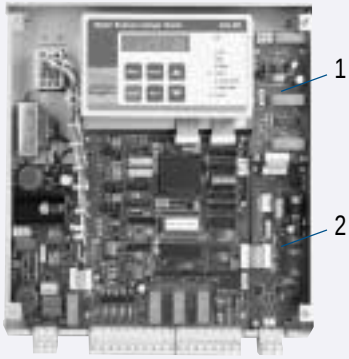
Plug-In Control Module

Field interchangeable Control Module for frame sizes B-E, reducing service time. The Control Module can also be remotely mounted through an extension cable or by using panel installation kit.

Optional Cards

In starter sizes B-G, two optional cards can be field installed:

1. Motor Insulation or Analogue I/O card
2. RS485 Communication card 3. Motor Insulation Card

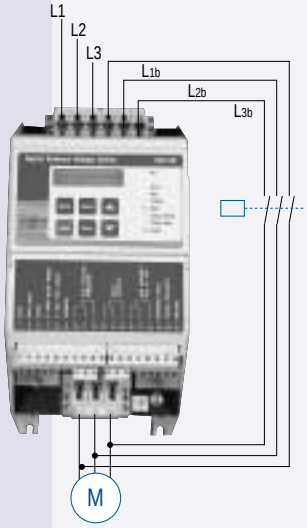


Preparation for By-Pass Contactor

Under normal operating conditions, the heat dissipated by an electronic soft starter causes heating of the enclosure and energy waste. This heating and energy waste can be eliminated by the use of a by-pass contactor, which by-passes the power section after completion of start-up, allowing motor current to flow through the by-pass contactor.
In order to maintain current protection after the by-pass contactor closes an optional feature "Preparations for By-pass Contactor" is available.

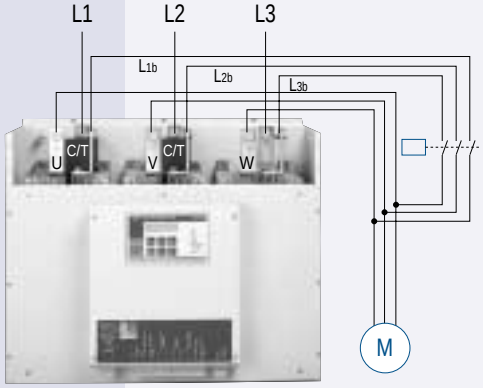
Frame Size A

Three additional terminals are added on line side, down stream the C/Ts for by-pass connection (must be factory supplied).



Frame Sizes B - E

Additional set of bus-bars are mounted on line side, down stream the C/Ts, for connection to the by-pass (can be field mounted).



Starter frame sizes C and D can be field modified to have line and load bus-bars at the bottom, consult our instruction manual.

RVS-DN Range

Ratings and Frame Sizes

Starter Type (Ampere)	Motor KW 400V	500V	690V	Frame Size	Dimensions (mm) W	H	D	Weight Kg
RVS-DN 8	4	5.5	7.5	A	153	310	170	4.5
RVS-DN 17	7.5	11	15		153	310	170	4.5
RVS-DN 31	15	18.5	22		153	310	170	6.8
RVS-DN 44	22	30	37		153	310	217	7.5
RVS-DN 58	30	37	55		153	310	217	7.5
RVS-DN 72	37	45	60		153	310	217	7.5
RVS-DN 105	55	75	90	B	274	385	238	15
RVS-DN 145	75	90	132		274	385	238	15
RVS-DN 170	90	110	160		274	385	238	15
RVS-DN 210	110	132	185 (2)	C	380	455	292	45
RVS-DN 310	160	220	250 (2)		380	455	292	45
RVS-DN 390	200	250	355 (2)		380	455	292	45
RVS-DN 460	250	315	450 (2)	D	380	555	292	65
RVS-DN 580	315	400	500 (2)		470	660	302	65
RVS-DN 820	450	600	950 (2)		470	710	302	65
RVS-DN 1100	630	800	1000	E	723	1100	370	170 (1)
RVS-DN 1400	800	900	1300		723	1100	370	170 (1)
RVS-DN 1800	950	1250	1500		723	1100	370	170 (1)
RVS-DN 2150	1250	1500	2000	F	750	1300	392	235 (1)
RVS-DN 2400	1400	1750	2250	G	900	1300	360	350 (1)
RVS-DN 2700	1550	2000	2500		900	1300	360	350 (1)

- Select starter according to motor's nominal current and starting condition (see Ordering Information on p. 11)
- RVS-DN 1400 - 2700 are fully rated when used with a by-pass contactor

(1) Consult factory for further details (2) UL approved starters have different dimensions


A


B


C


D


E

High Voltage Soft Starter

See our HRVS-DN catalogue

Analogue Soft Starter

See our RVS-AX, RVS-BX and SOLSTART catalogues

Ordering Information

Starter Selection:

1. Motor Current & Starting Conditions

Motor's Full Load Ampere (FLA) - as indicated on its name plate (even if the motor is not fully loaded).

2. Mains Voltage (+10% -15%), 50/60 Hz

Each starter is suitable for one of the following levels:

For :	220-440V	indicate -	400
	460-500V		480
	575-600V		600
	660-690V (1000V)		690 (1000)

3. Control Supply (+10% -15%) , 50/60 Hz

The Control Supply operates the electronic circuitry and fans.

For	10-120V	indicate -	120
	220-240V		230
	DC		DC voltage

4. Control Inputs

Control Input voltage (start, stop etc.) can either be the same as Control Supply above (standard), or by special order, 24-220V, AC or DC

5. Options (# option number for ordering)

- Communication - MODBUS Protocol (option # 3M)
- Communication - MODBUS /TCP Protocol (# 3MT)
- Communication - PROFIBUS Protocol (# 3P)
- Motor Insulation Tester (# 4)
- Thermistor input and Analogue Output (# 5)
- Special treatment - Consult factory (# 8)
- Preparation for by-pass contactor (# 9)
- Special width for size C, 536 mm (# A)
- Line/load bus-bars at the bottom, size C&D (# B)
- Remote LCD & key panel kit (# D)
- Illuminated LCD (# L)
- Lloyds Register ENV-1, ENV-2 Approval (# M)
- Special tacho feedback system (# T)
- UL and cUL approval (# U)

6. Control Panel

Example : RVS-DN 210 - 400 - 230 - 230 - 3+4 - S

1. Starter rating
2. Mains voltage
3. Control supply
4. Control inputs
5. Options
6. Front panel




Additional Products

Additional catalogues available from Solcon's product range

HRVS-DN
High Voltage Digital Soft-Starter
50-2500A, 1500-15000V

RVS-AX / RVS-DX
Analogue & Digital soft-starter

SOLSTART
Mininature soft-starter
For single & triple phase motors

RVS-BX / SEM-N
Basic electronic soft-starter
Basic electronic naval soft-starter

MPR 2000 / MPC 2000
Motor Protection Relay
Motor Protection Controller

MPR 6
Motor Protection Relay

HIU
Restart Relay

SMB
DC Injection brake

DPM 10
Digital Power Meter

PFC 10
Reactive Power Factor Controller

SU 124
Generator Control & Protection

DGC 2000
Digital Generator Control & Protection

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