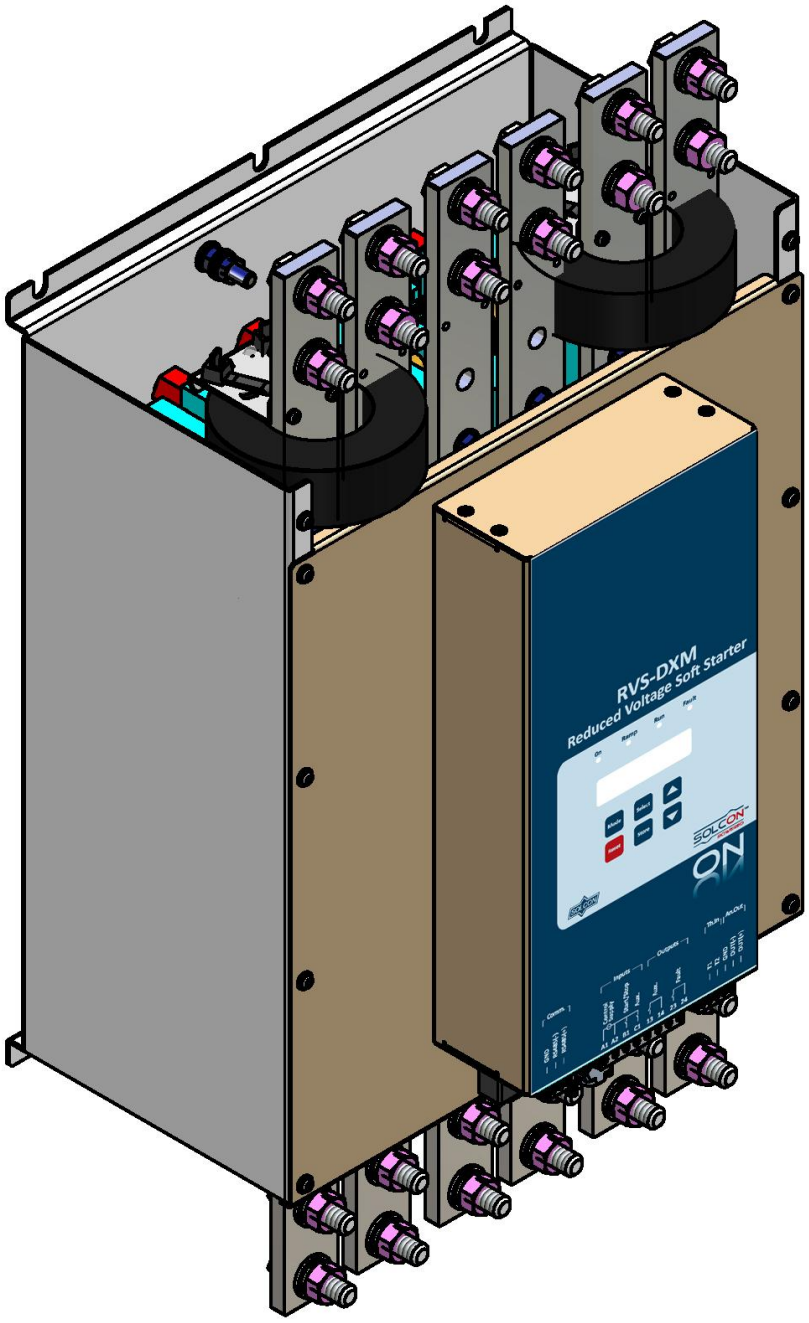
RVS-DXM

Digital Soft Starter with Internal ByPass
210-1100A, 208-600V



Instruction Manual

Ver. 03/04/2012

RVS-DXM Instruction Manual

1. TABLE OF CONTENT

2. SAFETY & WARNINGS

2.1 Safety

	**1**	Read this manual carefully before operating the equipment and follow its instructions.
	2	Installation, operation and maintenance should be in strict accordance with this manual, national codes and good practice.
	3	Installation or operation not performed in strict accordance with these instructions will void manufacturer's warranty.
	4	Disconnect all power inputs before servicing the soft-starter and/or the motor.
	5	After installation, check and verify that no parts (bolts, washers, etc) have fallen into the starter.
	6	During shipping, the soft-starter might have been roughly handled, therefore, it is recommended to initialize the soft-starter by connecting supply voltage prior to operating the soft-starter with a motor.

2.2 Attention

	**1**	This product was designed for compliance with IEC 947-4-2 for class A equipment.
	2	RVS-DXM 210 – 1,100A are designed to meet UL and cUL requirements.
	3	Use of the product in domestic environments may cause radio interference, in which case, the user may be required to employ additional mitigation methods.
	4	Utilization category is AC-53a or AC53b, Form 1. For further information, see Technical Specification

2.3 Warnings

	**1**	Internal components and PCBs are at mains potential when the RVS-DXM is connected to mains. This voltage is extremely dangerous and will cause death or severe injury if contacted.
	2	When RVS-DXM is connected to mains, even if control voltage is disconnected and motor is stopped, full voltage may appear on starter's output and motor's terminals.
	3	The starter must be grounded to ensure correct operation, safety and to prevent damage.
	4	Check that Power Factor capacitors and overvoltage devices are not connected to the output side of the soft starter.
	5	Do not interchange line and load connections

The company reserves the right to make any improvements or modifications to its products without prior notice.

3. TECHNICAL DATA

3.1 Introduction

The RVS-DXM is a fourth generation, highly sophisticated and reliable starter designed for use with standard three-phase, three-wire, squirrel cage, induction motors.
It provides the best method of reducing current and torque during motor starting.
The RVS-DXM starts the motor by supplying a slowly increasing voltage, providing soft start and smooth acceleration, while drawing the minimum current necessary to start the motor.
The RVS-DXM is equipped with internal bypass controlled by its micro-controller. The bypass closes after the end of the starting process, thus reducing heating and saving power.

3.2 Rating and frames sizes

Starter FLC [A]	Dimensions [MM]			Weight [KG]		
	H	W	D	Option 33(1)	Option 36/63(1)	Option 66(1)
210,240, 310	643	365	277	37.0	38.5	40.0
360, 414, 477	631	510	298	38.0	39.5	41.5
515	691	480	302	42.2	44.5	46.7
590	791	480	302	50.6	53.0	55.5
720, 840	791	510	305	54.0	57.5	60.0
960, 1100	814.6	558	316	75.5	80.0	85.0

Notes:

Refer to section 5 on page 16 for detailed dimensions.
(1) Refer to General Options in Ordering Information section 3.3.4 on page 6 for more details.

3.3 Starter Selection

The starter should be selected in accordance with the following criteria:

3.3.1 Motor current & Starting Conditions

Select the starter according to motor's Full Load Ampere (FLA) - as indicated on its nameplate (even if the motor will not be fully loaded).
The RVS-DXM is designed to operate under the following maximum conditions:

Ambient Temperature [^{0}C]	Starting Current [A]	Acceleration Time [sec]
50	350%xIn	30
	400%xIn	5

Max. Starts per Hour: One (1) starts per hour at maximum ratings and four (4) starts per hour when fan option is installed. Starts evenly spread on the hour.
Note:
For very frequent starts (inching applications) the inching current should be considered as the Full Load Current (FLC) (consult factory).

3.3.2 ***Mains Voltage (line to line)***

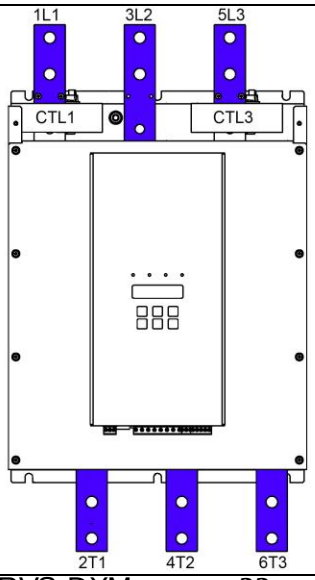
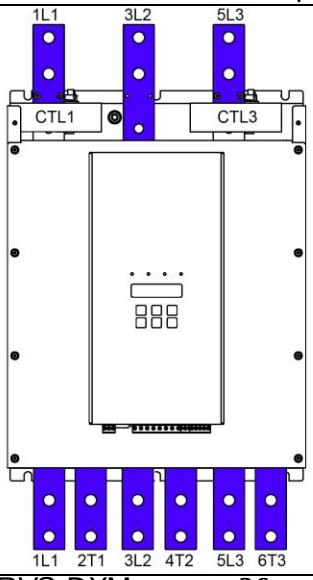
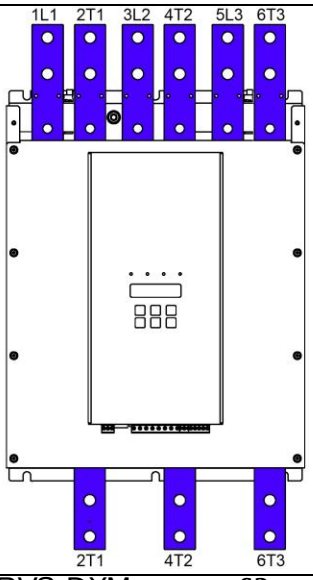
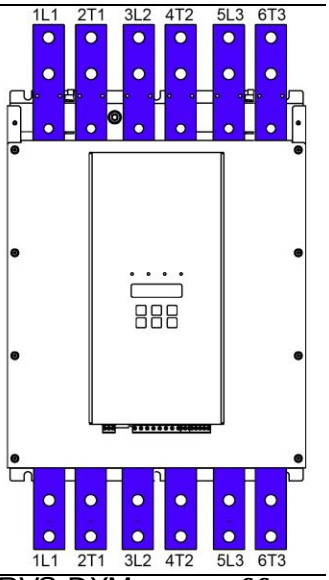
Two Main Voltage levels are available: 400V (applies for 208 – 400 VAC, 50/60Hz, +10% -15%) and 600V (applies for 440 – 600 VAC, 50/60Hz, +10% -15%)

3.3.3 ***Control Voltage***

The Control Voltage (terminals A1(~) – A2 (N) operates the electronic circuitry and the bypass.
Two voltage levels are available:
230VAC + 10%-15%, 50/60 Hz
115VAC+ 10%-15%, 50/60 Hz

3.3.4 ***Bus bars arrangement***

The RVS-DXM can be delivered in 4 different options thus makes its installation in the cabinet more flexible:

			
RVS-DXM ··· ··· ··· **33** ·	RVS-DXM ··· ··· ··· **36** ·	RVS-DXM ··· ··· ··· **63** ·	RVS-DXM ··· ··· ··· **66** ·

Note:
When either RVS-DXM ··· ··· ··· **63** · or RVS-DXM ··· ··· ··· **66** · are ordered CTL1 and CTL3 should be installed by the cabinet builder upstream the RVS-DXM. Refer to section 8.1 page 53.

3.3.5 ***Other Options***

More options are available for the RVS-DXM. (Refer to section 3.3.6 on page 7.):
Communication, Analog card, harsh environment treatment, Remote panel, UL & cUL approval.

3.3.6 Ordering Information

RVS-DXM	210-	400-	230-	3M-	S
	Full load Current	Mains Voltage	Control Voltage	Options	Front Panel

Full load Current	
Specify	**Description**
Starter's FLC [A]	210, 240, 310, 360, 414, 477, 515, 590, 720, 840, 960, 1100

Mains Voltage	
Specify	**Description**
400	208 – 400 VAC, 50/60Hz , +10% -15%
600	440 – 600 VAC, 50/60Hz , +10% -15%
690	Not available at this stage.

Control Voltage	
Specify	**Description**
115	115 VAC, 50/60Hz, +10% -15%
230	230 VAC, 50/60Hz +10% -15%
Note:	• Control voltage can not be modified on site.

Options	
Specify	**Description**
3M	Communication RS-485 Board (MODBUS) (1)
3P	Communication Profibus Board (1)
3D	Communication DevieNet Board(1)
5	Analog card – Thermistor in and Analog out
8	Harsh environment treatment
D	IP-54 Remote Keypad. (supplied with 1.5 m cable)
F	Unit supplied with fan(3)
33	3 Inputs and 3 Outputs Bus bars(2)
66	6 Input/Output Bus bars on Bottom side and 6 Input/Output Bus bars on Top side (2)
36	3 Input Bus bars on Top side and 6 Input/Output Bus bars on Bottom side (2)
63	6 Input/Output Bus bars on Top side and 3 output Bus bars on Bottom(2)
TIN	Tin Plated Busbars. Available with option 33 only. (Consult Factory)
RU	Russian display
U	UL & CUL approval (Consult Factory)
Notes:	• Options should be factory installed. • (1) One option can be installed – either 3M (MODBUS) or 3P (Profibus) or 3D (DeviceNet) • (2)One option can be installed – either 33 or 66 or 36 or 63 • When option 5 is ordered, either 3M or 3P must be ordered as well. • When either 3P, 3M or 3D are ordered, option 5 must be ordered as well. • (3)In RVS-DXM 960A and 1100A models fans must be fitted
Front Panel	
Specify	**Description**
S	Standard

Example:
RVS-DXM rated 840A, mains voltage- 230V, control voltage- 115V, Modbus communication card, Analog card, Harsh environment treatment and standard front panel:
RVS-DXM 840 - 400 - 115 - 3M+5+8 - 66 - S

4. RECOMMENDED WIRING SCHEME

4.1 Mains and Control Description

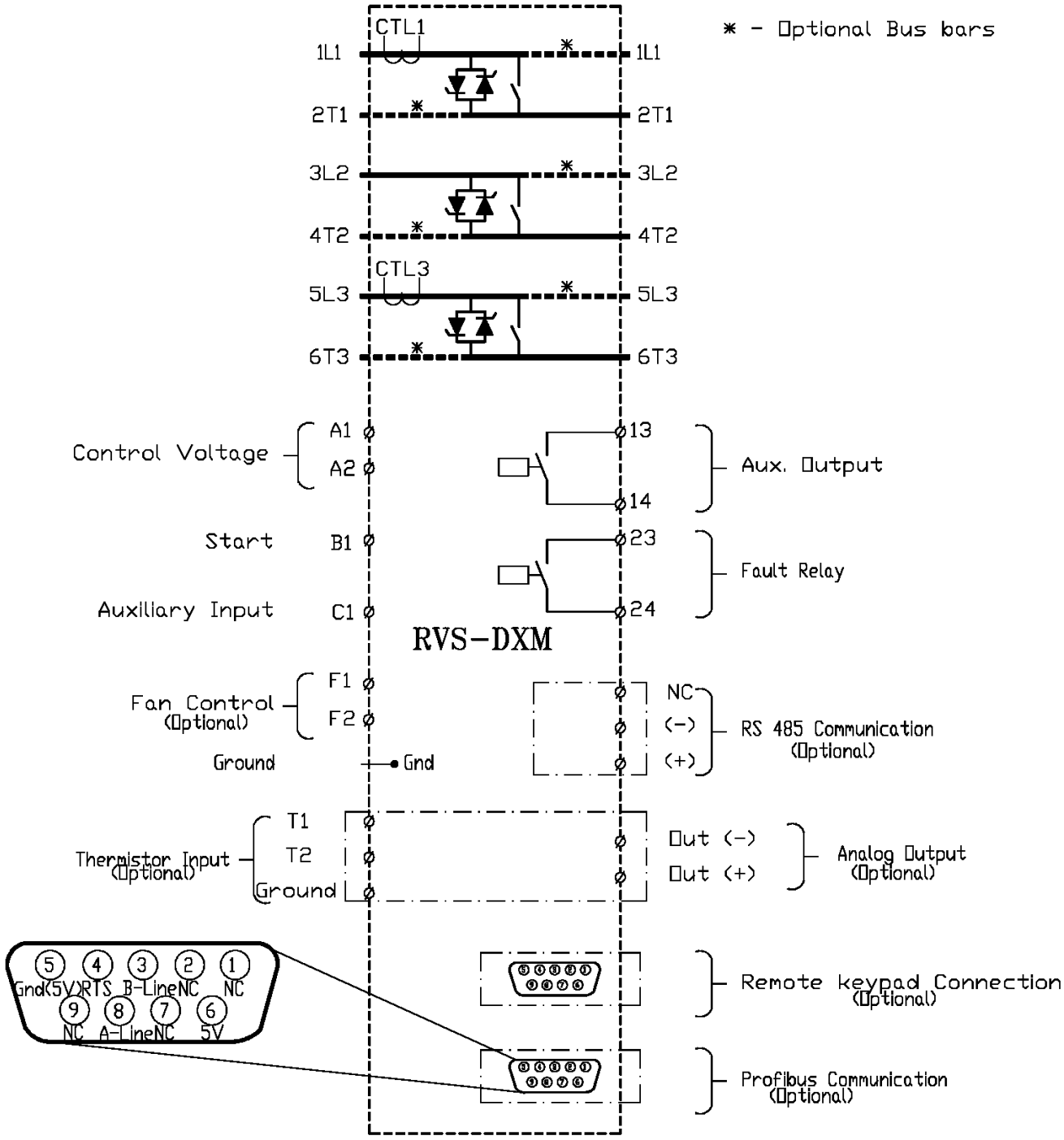
Refer to drawing on page 11

Indication	Description	Remarks
1L1, 3L2, 5L3	Connection to mains voltage up to 600V BUS BARS ARE MADE OF ALUMINUM	Thyristor's PIV rating, internal circuitry and insulation defines two voltage levels: **400V** for 208-400V +10%/ -15% 50/60Hz **600V** for 440-600V +10% /-15% 50/60Hz **Note:** 1L1, 3L2, 5L3 Bus bars are made of aluminium. Suitable connection method should be applied.
2T1, 4T2, 6T3	Connection to motor	**Note:** 2T1, 4T2, 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.
G	Connection to ground	For proper operation and for safety reasons soft RVS-DXM must be properly grounded.
Terminal A2	Control phase	The control voltage operates the electronic circuitry and the optional fans.
Terminal A1	Control neutral (return)	Two control voltages are available: **115** for 115V +10%/ -15% 50/60Hz **230** for 230V +10%/ -15% 50/60Hz This voltage can be from a grounded or ungrounded mains system.
Terminal B1	Input – START command.	Input from a N.O. contact. To SOFT START the motor, close contact between A2 and B1. To SOFT STOP the motor open contact between A2 and B1. If Deceleration time is set to a value other than 0 seconds the motor will soft stop. If Deceleration time is set to 0 seconds the motor will stop immediately. (Refer to section 7.6.5 on page 39). If Aux Input is set as Start / Stop, then terminal B1 is used as momentary N.O. Start input and input C1 is used as maintained N.C Stop input. (Refer to section 7.6.9 on page 46) For emergency stop of the motor disconnect control voltage from A1, A2 terminals. **Note:** To reset a fault the START command must be removed.
Terminal C1	Input – Auxiliary Input.	Input from a N.O. contact. Input from a maintained contact, connected between terminals A2 and C1 to operate as programmed input. Aux. Input can be programmed as one of six options: (1) Dual Adjust (2) Generator Function (3) Slow Speed / Reverse (4) External fault (5) Remote reset after fault has been removed. (6) Start / Stop. Terminal C1 can be used as a maintained N.C Stop input and terminal B1 as momentary N.O. Start input. For Aux. Input programming refer to section 7.6.9 on page 46.

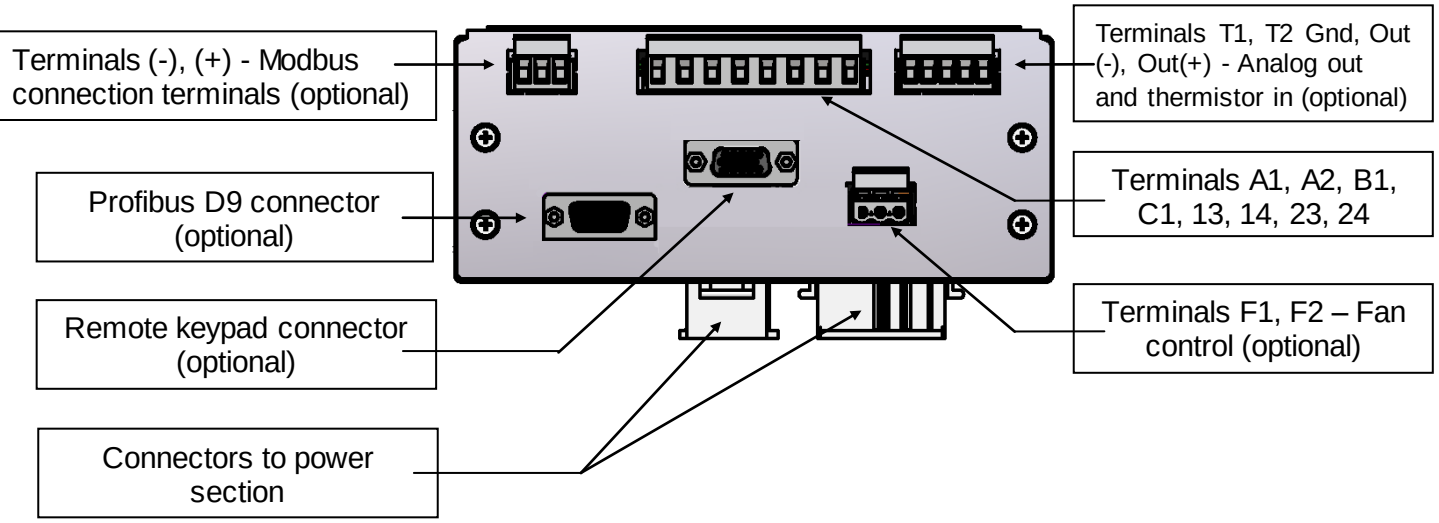
Indication	Description	Remarks
Terminal F1 & Terminal F2	Fan control	An external jumper, connected between terminals F1 and F2 enables controlling the operation of the optional fans. When F1 & F2 are connected the fans will operate. **Caution!!** These terminals carry 115VAC or 230VAC!
Terminal T1	Thermistor input (T1) (optional)	Thermistor input is programmable as a PTC or NTC type thermistor. The trip value is adjustable between 1-10Kohm, preset delay of 2 Sec. Connect thermistor and/or Analog output shield to ground terminal. Analog output (0-10VDC or 0-20mA or 4-20mA) reflects motor current and is related to 2xFLA. i.e., Full scale (10VDC or 20mA) is related to 2xFLA. **Note**: • Refer to section 8.2 page 53 for analog output dip switch setting. • Refer to section 7.6.9 on page 46 for analog output programming. • Refer to section 7.6.8 on page 44 for thermistor input programming.
Terminal T2	Thermistor input (T2) (optional)	
Terminal Ground	Ground (optional)	
Terminal Out (-)	Analog output (-) (optional)	
Terminal Out (-)	Analog output (+) (optional)	
Terminal 13 & Terminal 14	Programmable Auxiliary output relay (N.O.)	Voltage free, N.O , 8A, 250VAC, 1800VA max. The contact incorporates 0-60 seconds On & Off delays. The auxiliary output relay can be programmed to operate in two modes: 1. IMMEDIATE - Close its contact at start signal (after programmed “on delay” time has elapsed) and open its contact at the end of deceleration time (if any) (after programmed “off delay” time has elapsed). 2. END OF ACCEL. - Close its contact at end of soft start (after programmed “on delay” time has elapsed) and open its contact at the beginning of soft stop (if any) (after programmed “off delay” time has elapsed). The relay contact will open also in case of a fault or upon control supply outage. This output is generally used to: (1) Release the brake of a brake motor. (2) Interlocking with other systems. (3) Signalling. For Aux. output programming refer to section 7.6.9 on page 46.
Terminal 23 & Terminal 24	Programmable Fault Output relay (N.O.)	Voltage free 8A, 250VAC, 2000VA max. changes its position upon fault. The contact is programmable to function as FAULT or FAULT-FAIL SAFE.

Indication	Description	Remarks
		When the FAULT function is selected, the relay is energized upon fault. The contact returns to its original position when one of the following occurs: • The fault has been removed and RVS-DXM was reset • Disconnection of Control Supply When the FAULT-FAIL SAFE function is selected, the relay is energized immediately when the Control Supply is connected and de-energizes when one of the following occurs: • Fault • Control Supply disconnection Refer to section 7.6.9 page 46 for FAULT RELAY TYPE programming.
Terminal NC	No connection (optional)	• Standard RS485, half duplex with Modbus protocol, baud rate 1200, 2400, 4800, 9600 BPS. • Twisted shielded pair should be used. Connect shield to ground on the PLC/Computer side. • Up 32 units can be connected for Modbus RS485 communication. For reliable communication, units should be installed in the vicinity of 200m maximum, from the first to the last unit. • Refer to section 7.6.10 page 48 for programming. • Consult the communication manual (ask factory).
Terminal (-)	RS-485 communication (-) (optional)	
Terminal (+)	RS-485 communication (+) (optional)	
D-9 connector	Profibus communication (optional)	• Profibus DPV0 and DPV1, up to 12 MBPS. • D type 9 pin connector is applied. • Control, monitoring and setting parameters can be achieved via the Profibus connection. • Setting is possible only when DPV1 is implemented. • Refer to section 7.6.11 page 49 for programming. • Consult the Profibus manual (request from the factory).
D-9 connector	Remote Keypad connection (optional)	When remote keypad is installed connect its D9 plug to this D9 connector.

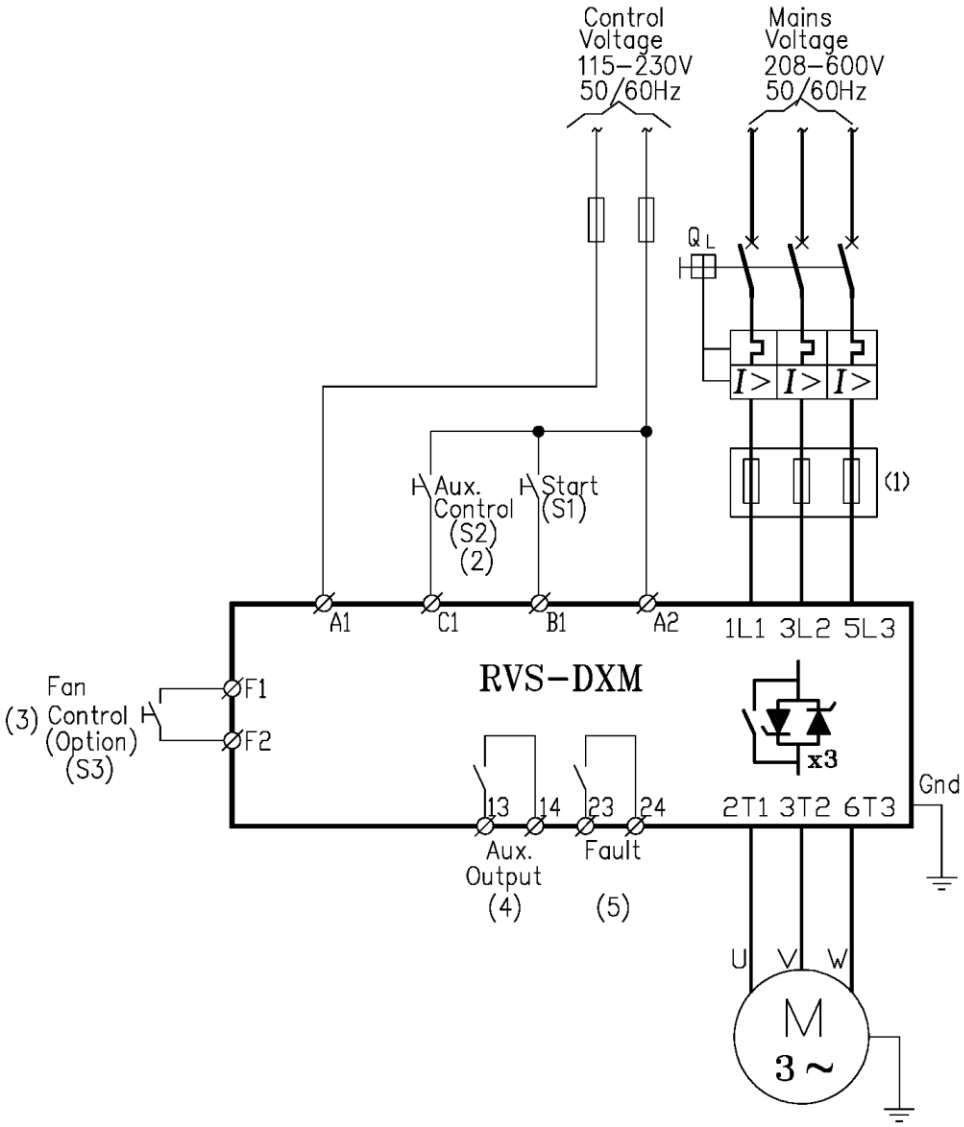
4.2 Input/Output Indication



4.2.1 Bottom View of the Control Module



4.3 **Typical wiring diagram**

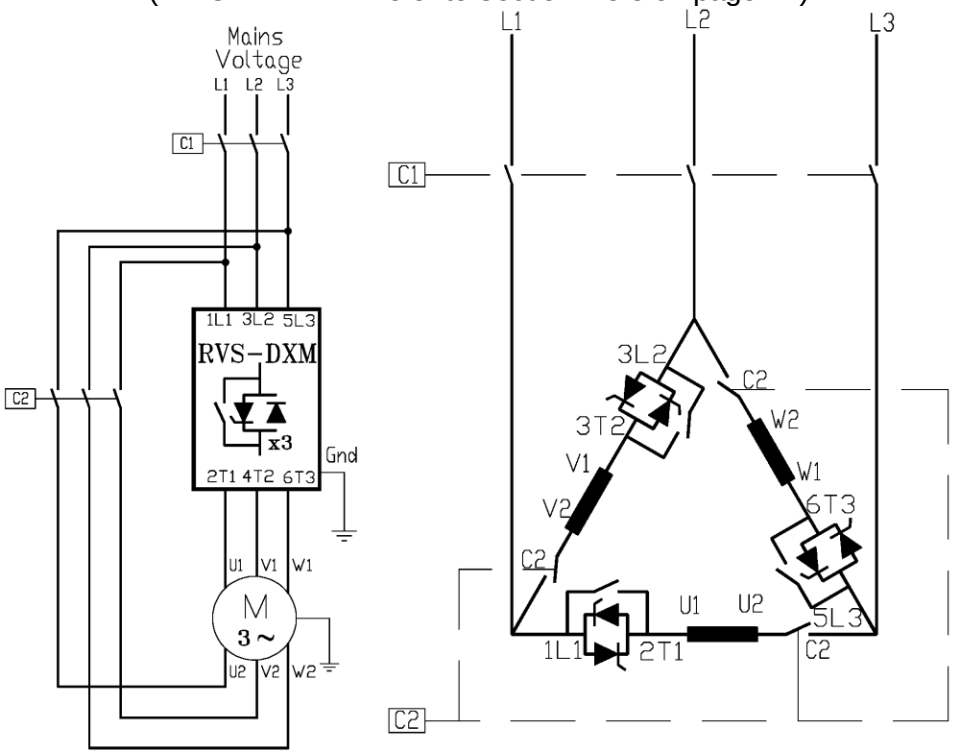


Notes:

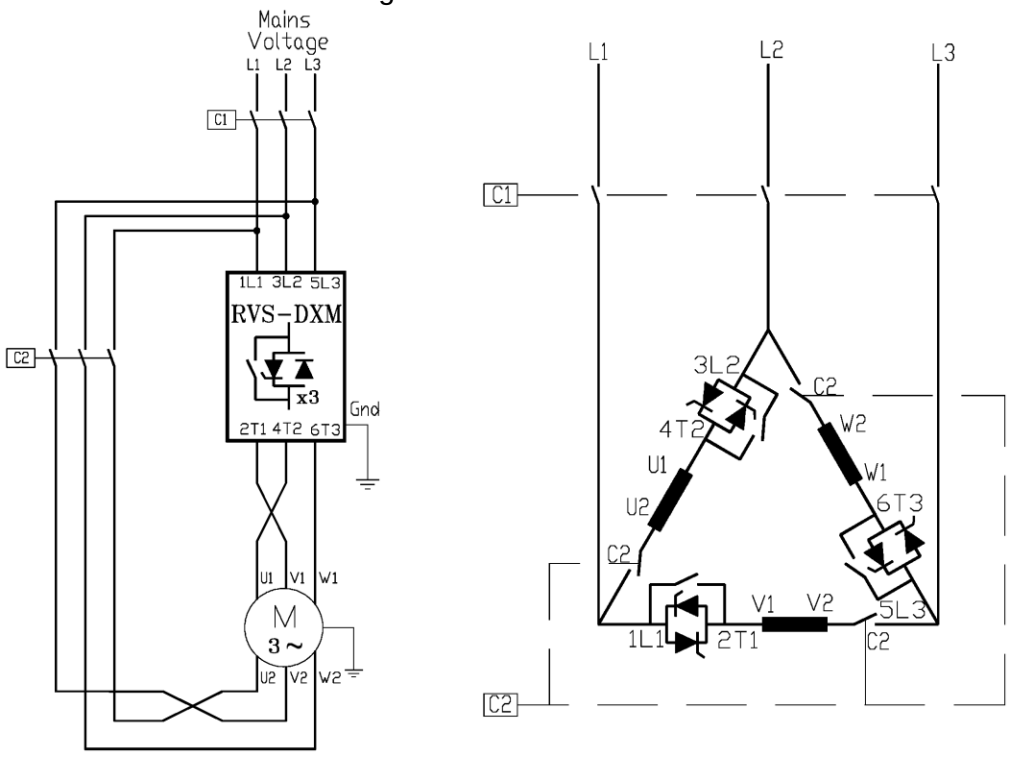
(1) - Use fuses for type 2 coordination. Refer to section 4.5.1 on page 14
(2) - For Aux. input programming refer to section 7.6.9 on page 46
Note: The use of solid state relays to control the digital inputs B1 and C1 is prohibited
(3) – Close auxiliary contact between F1 to F2 when fan control is required. Only possible when fan option is installed.
(4) - For Aux. output programming refer to section 7.6.9 on page 46
(5) - Fault relay can function as a “Fault” relay or as a “Fail-Safe” relay. For Fault relay programming refer to section 7.6.9 on page 46
(6) - When emergency Stop switch is required it is recommended to trip a series contactor or the feeding circuit breaker. (Not shown)
(7) – Mains voltage of 208-600V available to all models. (need to be specified)
(8) - 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.

4.4 **Power wiring scheme for "Inside-Delta" Connection**

(IMPORTANT! - Refer to section 4.5.3 on page 14)



Connecting RVS-DXM INSIDE DELTA



Reverse speed with RVS-DXM connected INSIDE DELTA.

Notes:

When installing the RVS-DXM INSIDE DELTA. it is highly recommended to use a line contactor (C1) or INSIDE DELTA. contactor (C2) in order to avoid a destruction of the motor in case of a shorted SCR in the RVS-DXM.

If a contactor is connected Inside the Delta (C2) only, motor terminals are "live" (full voltage) even when contactor is open.

4.5 Wiring Notes

WARNINGS!	When mains voltage is connected to the RVS-DXM, even if control voltage is disconnected, full voltage may appear on the starter load terminals. Therefore, for isolation purposes, it is necessary to connect an isolating device before the starter.
	Power factor correction capacitors and overvoltage devices must not be installed on starters load side. When required, install capacitors or overvoltage devices on starter's line side.

4.5.1 Short Circuit Protection

For "type 2 coordination", use fuses for semiconductor protection to protect the RVS-DXM from a short circuit. Fuses for semiconductor protection give excellent results because they have low I^2t values and high interruption ratings.

Recommended fuse selection procedure:

(1) **Fuse rated voltage**: Choose minimum fuse rated voltage which is above the rated voltage of the mains.

(2) **Fuse rated current:** Select a fuse which is able to carry 7 times the rated RVS-DXM current for 30 seconds (this is double the maximum RVS-DXM current for the maximum acceleration time).

(3) **Fuse I^2t:** Verify that the I^2t value of the fuse is less than or equal to the I^2t value of the thyristor in the RVS-DXM as shown in the table below.

RVS-DXM Model	Max. Thyristor I^2t [A2Sec]	RVS-DXM Model	Max. Thyristor I^2t [A2Sec]
210	135,500	515	1,820,000
240	135,500	590	1,820,000
310	845,000	720	1,820,000
360	845,000	840	1,820,000
414	1,130,000	960	4,260,000
477	1,130,000	1100	4,260,000

4.5.2 Transient Protection

Line transient voltages can cause a malfunction of the starter and damage to the thyristors. All RVS-DXM starters incorporate Metal Oxide Varistors (MOV) to protect from normal line voltage spikes.

When higher transients are expected, additional external protection should be used (consult factory).

4.5.3 "Inside-Delta" mode

4.5.3.1 General information

When the RVS-DXM is installed "Inside Delta", the individual phases of the Starter are connected in series with the individual motor windings (6 conductor connections as with the star-delta starter). The soft starter must only conduct about 67 % (=1\1.5) of the rated motor current. This ensures the use of a significantly smaller device.

For example:

For a motor with a rated current of 1050A motor, a 1100A starter will be selected to operate "In-Line".
For "Inside Delta" starter, we calculate (1050 x 67% = 703A) and select a 720A starter.
Less heat dissipates in the cabinet vs. the standard "In-Line" connection.

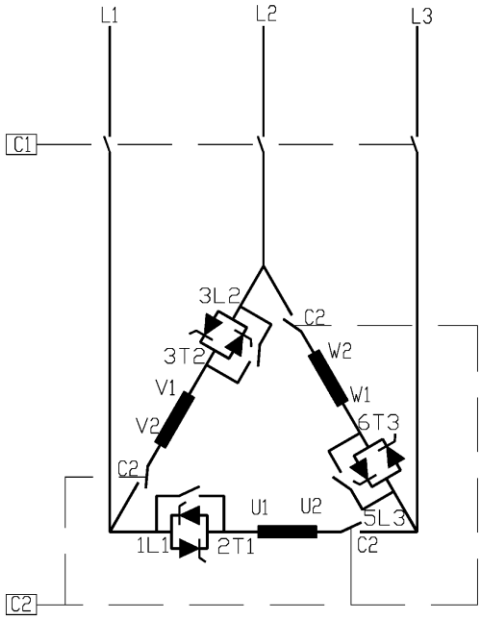
4.5.3.2 Notes on "Inside Delta" connection

- "Inside Delta" requires 6-wire to the motor.
- Wrong motor connection will cause serious damage to the motor windings.
- When installing the RVS-DXM "inside delta" it is highly recommended to use a contactor in series to the RVS-DXM or upstream (after motor protection) in order to avoid a destruction of the motor in case of a shorted SCR in the RVS-DXM.

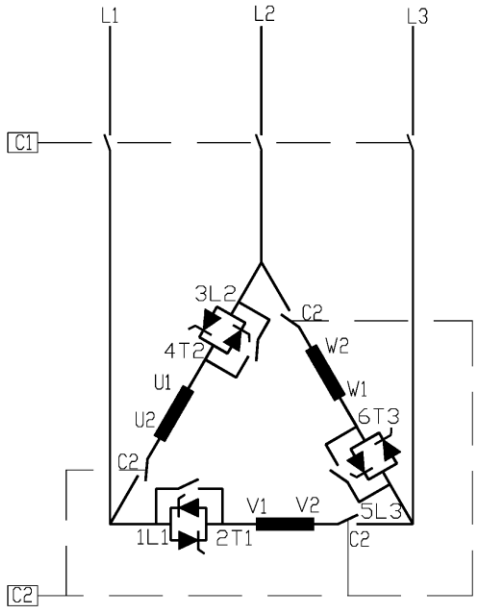
- The sinusoidal shape of the current is imperfect (since each phase is separately fired and not influenced by other phase firing).
  As a result, higher harmonic content is incurred (THD), which can be as high as twice the THD value as in the standard “In-Line”.
- Higher motor heating is expected for the same motor size (due to the higher THD).
- Phase sequence must be correct; otherwise, “Phase Sequence fault” will trip the starter immediately (without any damage).
- Higher torques can not be obtained
- Factory preset - features and functions when “Inside Delta” mode is configured:
  - No Pulse Start.
  - No curve selection (Curve 0 !! only).
  - No Slow Speed
  - No Phase sequence “Off” mode

Note :
For a high starting torque process, it is recommended to use the starter in the “In Line” connection.

WARNINGS!	**Beware!** Wrong connection of the starter or the Motor, will seriously damage the motor.
	When using “Inside delta” connection: 1. It is highly recommended to use a contactor in series to the RVS-DXM or upstream (after motor protection) in order to avoid a destruction of the motor in case of a shorted SCR in the RVS-DXM. 2. If Contactor is connected Inside the Delta, motor terminals are “live” (full voltage) even when contactor is open.



RVS-DXM connected INSIDE DELTA



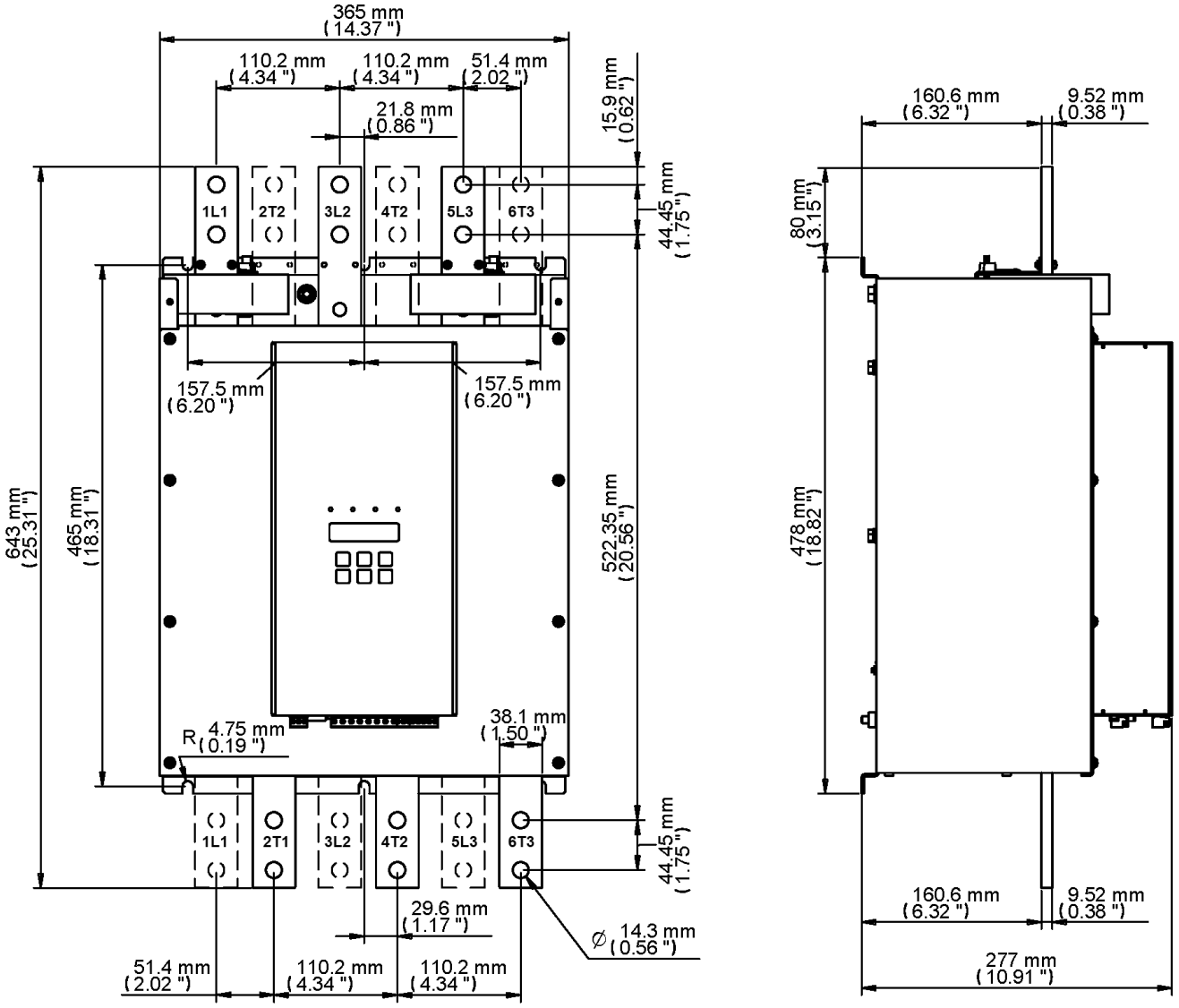
Speed reverse with RVS-DXM connected INSIDE DELTA

(1) C1 is a line contactor.
(2) C2 is an “Inside Delta” contactor.
(3) U1-U2, V1-V2, W1-W2 are motor’s windings.
(4) L1-U, L2-V, L3-W are RVS-DXM controlled phases.
Refer also to section 4.4 page 13.

Note:
Motor terminals are marked as follows:

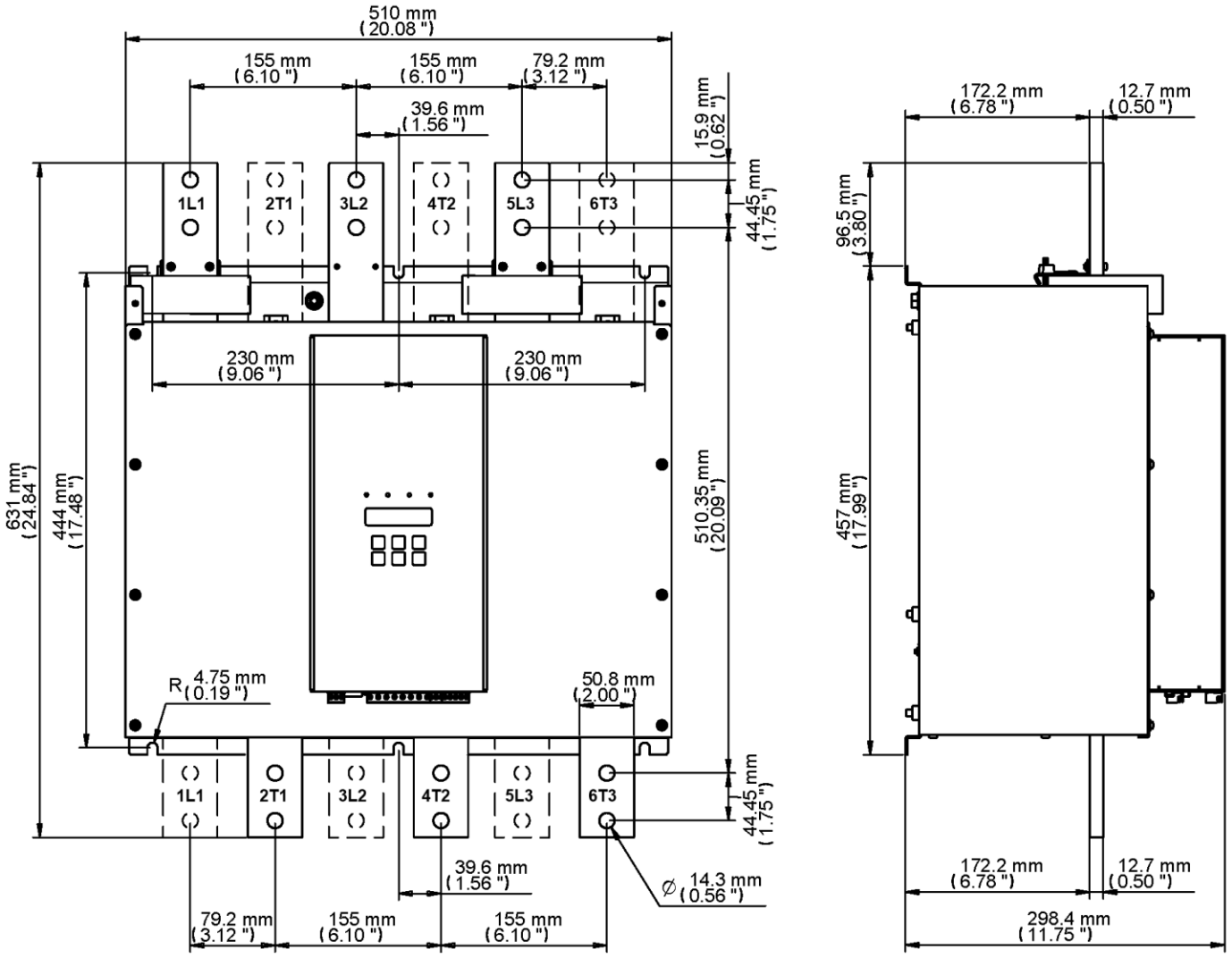
ASA (USA)	BS	VDE	IEC
T1 - T4	A1-A2	U - X	U1 - U2
T2 - T5	B1-B2	V - Y	V1 - V2
T3 - T6	C1-C2	W - Z	W1 - W2

5. DIMENSIONS



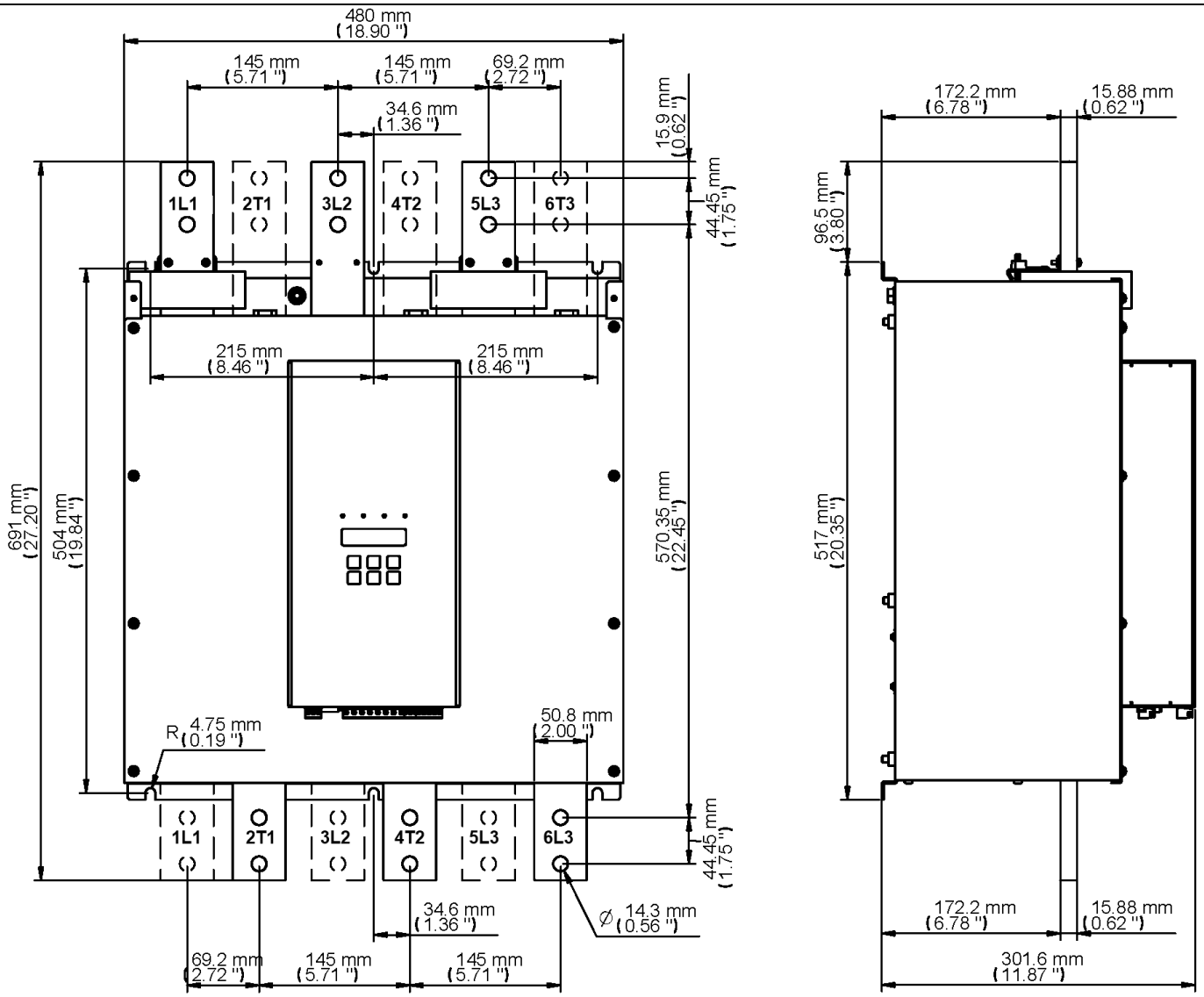
RVS-DXM 210A, 240A, 310A

Note: 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.



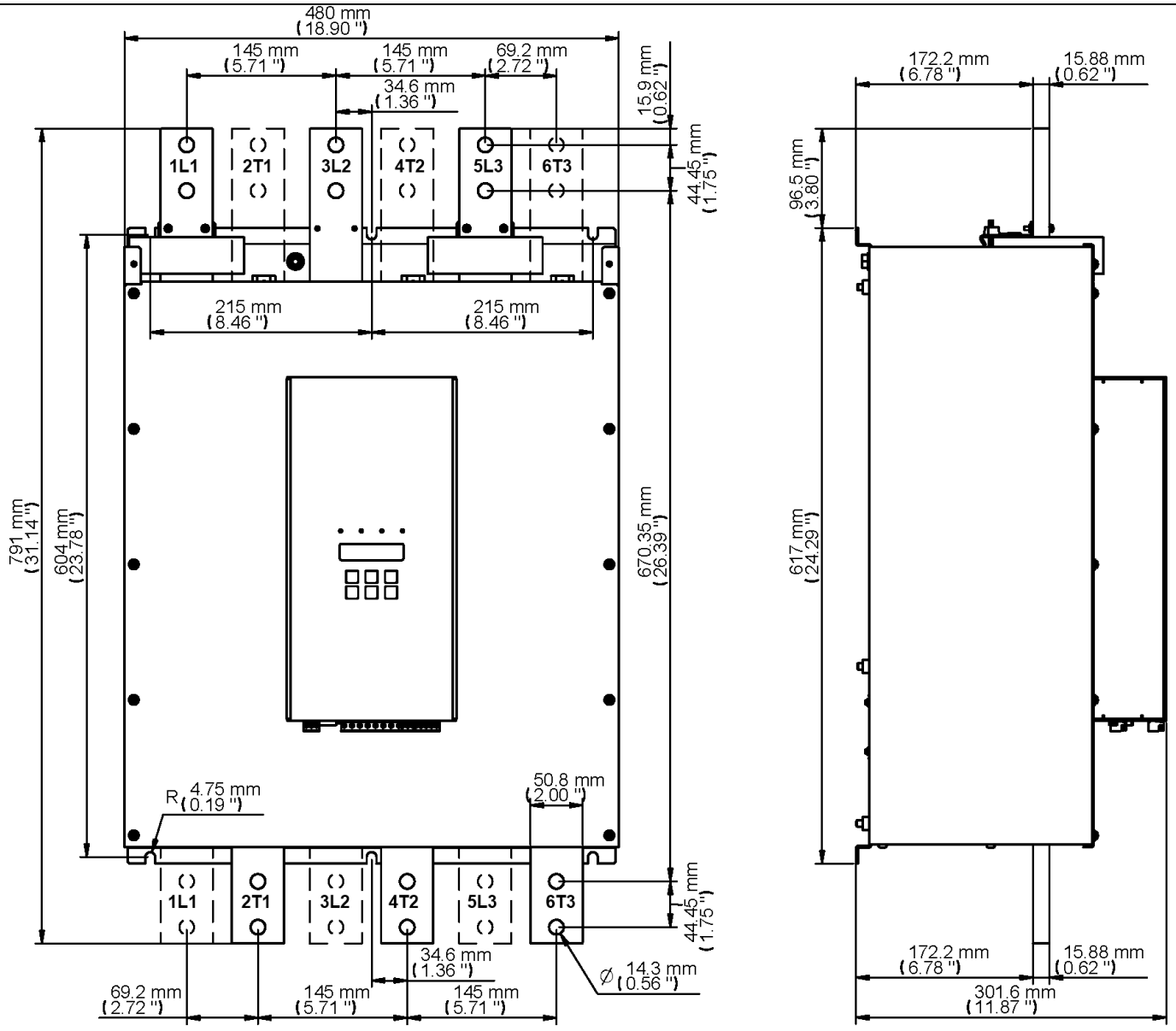
RVS-DXM 360A, 414A, 477A

Note: 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.



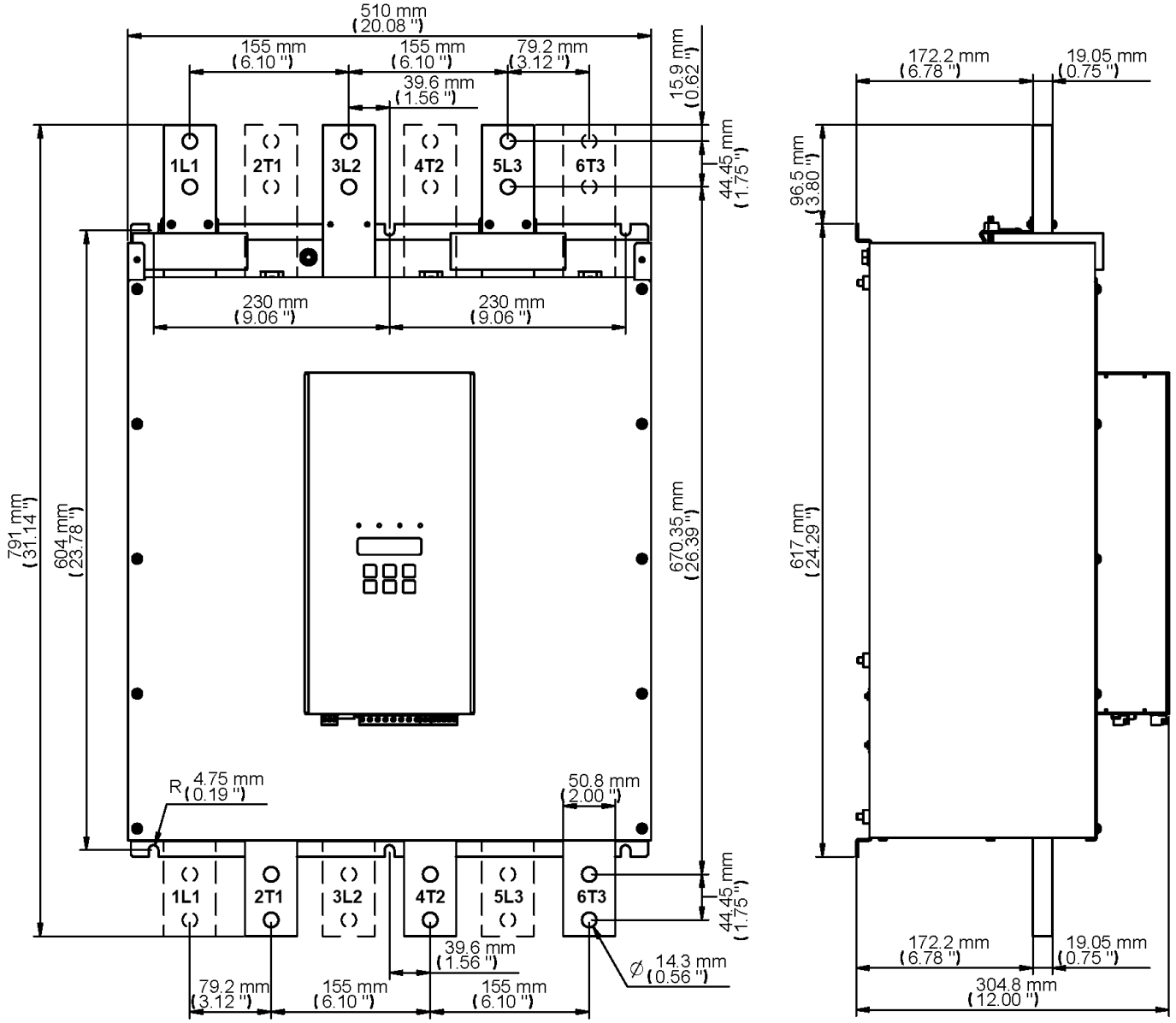
RVS-DXM 515A

Note: 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.



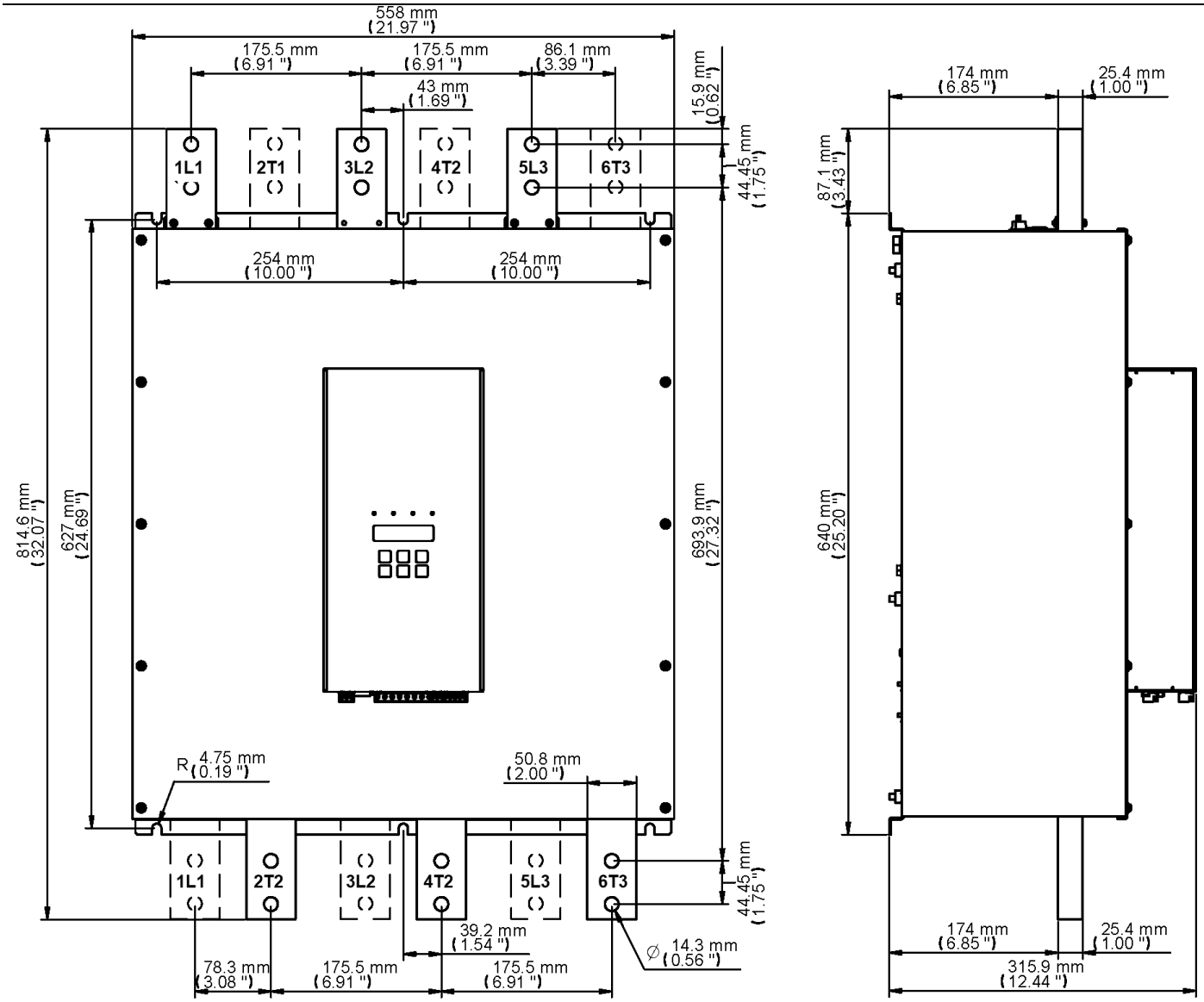
RVS-DXM 590

Note: 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.



RVS-DXM 720A 840A

Note: 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.



RVS-DXM 960A 1100A

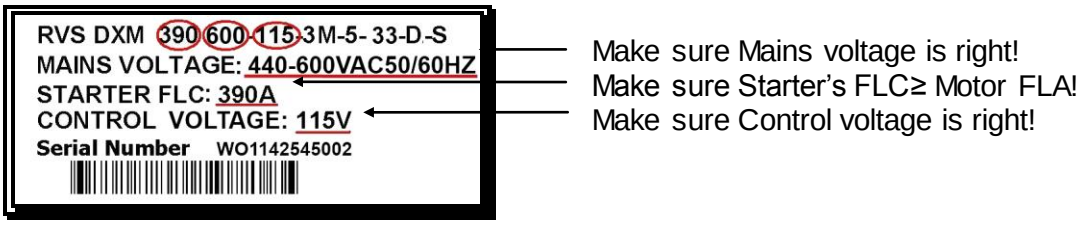
Note: 1L1, 3L2, 5L3, 2T1, 3T2 and 6T3 Bus bars are made of aluminium. Suitable connection method should be applied.

6. INSTALLATION

WARNING!	Do not interchange line and load connections

6.1 Prior to Installation

Check that Motor's Full Load Ampere (FLA) is lower than, or equal, to the starter's Full Load Current (FLC) and that Mains and Control voltages are as indicated on the starter's side label.
Make sure Starter's FLC≥ Motor FLA!



RVS-DXM label - example

6.2 Mounting

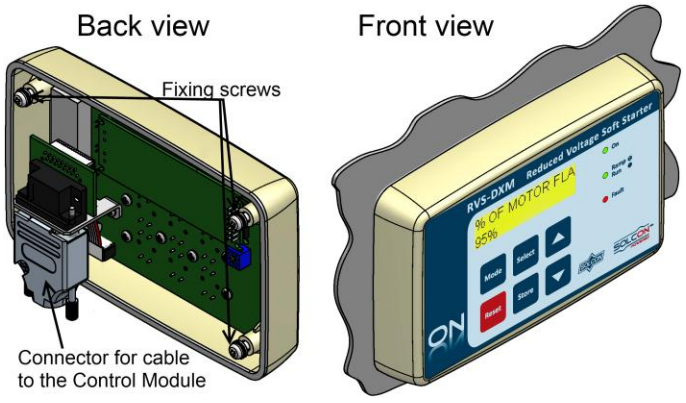
The starter must be mounted vertically. Allow sufficient space (at least 100mm) above and below the starter for suitable airflow.
It is recommended to mount the starter directly on the rear metal plate for better heat dissipation.

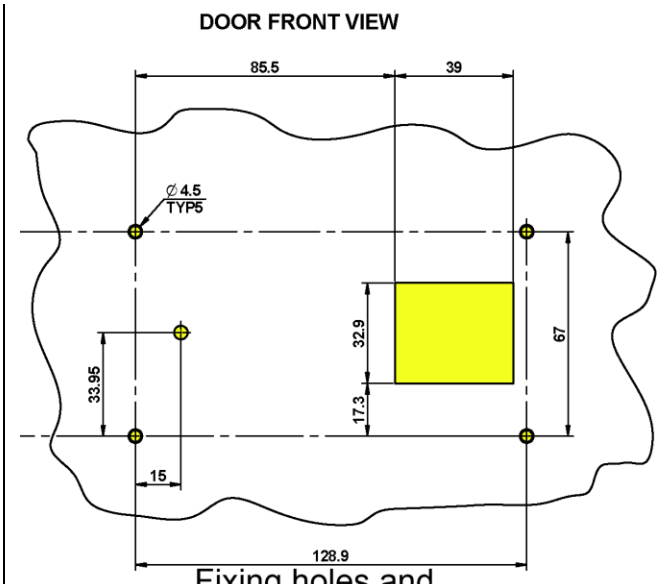
Note:
Do not mount the RVS-DXM directly on the rear metal plate in case a ventilation fan or ventilation opening is on the back side of the RVS-DXM.

Do not mount the starter near heat sources.
Surrounding air temperature in the cabinet should not exceed 40ºC
Protect the starter from dust and corrosive atmospheres.

Note: For harsh environments (sewage treatment plants, etc.), it is recommended to order the starter with printed circuit board coating. Refer to section 3.3.6 on page 7 for ordering information.

6.2.1 IP-54 Remote Keypad Installation





Fixing holes and
opening in the door

6.3 Temperature range & heat dissipation

The starter is rated to operate over a temperature range of -10ºC (14ºF) to + 40ºC (104ºF).
Relative non-condensed humidity inside the enclosure should not exceed 95%.

ATTENTION!	Operating at surrounding air temp. (Inside the cabinet) higher than 40ºC may cause damage to the starter.

Starter's heat dissipation while motor is running and the internal bypass relays are closed is typically less than 0.4 x In (in watts). During soft start and soft stop, heating is approximately three times the actual starting current (In watts).

Example: For a 100A motor, heat dissipation is less than 40 watts while running and during starting (for example at 350A), heat dissipation is approximately 1050 watts.

Important note: If motor is frequently started, cabinet should be designed for the higher heat dissipation.

Internal enclosure heating can be reduced through the use of additional ventilation.

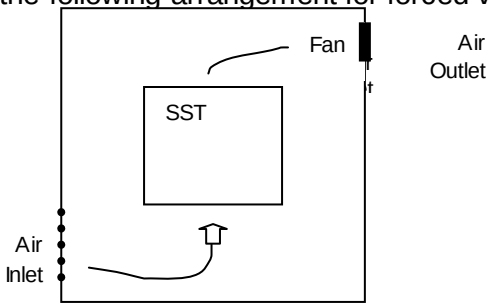
6.3.1 Calculating the enclosure size, for non-ventilated metallic enclosure

$$\text{Area } (m^2) = \frac{0.12 \times \text{Total heat dissipation [Watts]}}{60 - \text{External ambient temp. [ºC]}}$$

Where: **Area [m^2]** - Surface area that can dissipate heat (front, sides, top).
Total heat dissipation [Watt] – The total heat dissipation of the starter and other control devices in the enclosure. If starter is frequently started, average power should be used.

6.3.2 Additional Ventilation

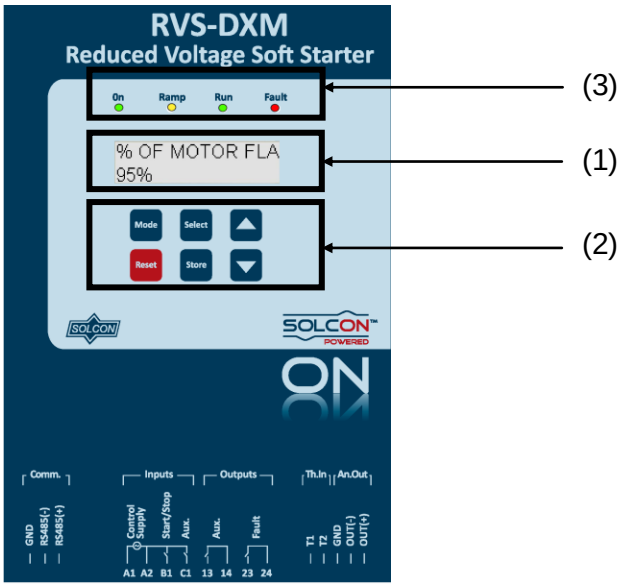
Use the following arrangement for forced ventilation of the RVS-DXM's enclosure:

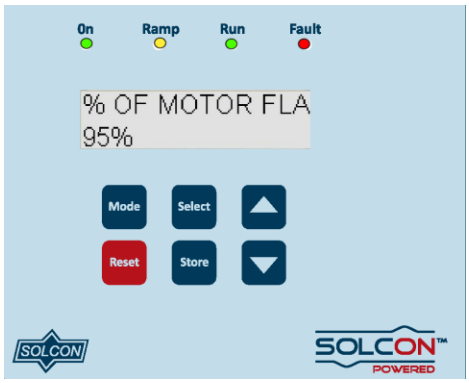


7. CONTROL KEYPAD

The control keypad is the link between the Soft Starter and the user.
The RVS-DXM control keypad features:

(1) Two lines of 16 alphanumeric characters each (with five selectable languages – English, French, German, Spanish and Turkish)
(2) Six push-buttons (**Mode**, **Reset**, **Select**, **Store**, Up (▲) and down (▼) keys).
(3) Four indication LEDs (*On*, *Ramp*, *Run* and *Fault*)





Close view

7.1 LCD Arrangement

CURRENT LIMIT 390%

Upper line displays function.
Lower line displays setting and\or measured values.

7.2 Push-buttons

Mode	Scrolls through the display and programming menus of the RVS-DXM. **Note**: Pressing **Mode** continuously increases the speed at which the parameters change.
Select	When a mode name is displayed, pressing this button drills down to the parameters for that mode. When a parameter is displayed, pressing this button scrolls to the next parameter.
▲	Allows the operator to increment adjusted values shown in the display. Operator should press this button once to increment one value, or continuously to rapidly increment values up to the maximum value.
▼	Allows the operator to decrement adjusted values shown in the display. Operator should press this button once to decrement one value, or continuously to rapidly decrement values up to the minimum value.
Store	Stores modified parameters **only** when you have scrolled through all parameters and STORE ENABLE XXXXXX PARAMETERS is displayed. After you store a parameter successfully DATA SAVED OK will display. **Note**: Pressing this button at any other time has no effect.
Reset	Resets the RVS-DXM after a fault has been dealt with **and** the start command has been removed. This cancels the fault displayed and allows you to restart the motor.

7.3 Status LEDs.

●	Green	*On*	Lights when Control Supply voltage is connected to the RVS-DXM.
●	Yellow	*Ramp*	Lights during soft start and soft stop process, indicating that motor supply voltage is ramping up or down.
●	Green	*Run*	Lights after completion of starting process, indicating that motor is receiving full voltage.
●	Red	*Fault*	Lights upon operation of any of the built-in protection.

7.4 Reviewing and Modifying Parameters

Press the **Mode** key several times until you reach the required mode page.
Press the **Select** key to review parameters for this mode.

Once you reach the required parameter, use the ▼ or ▲ keys to modify its value.
To store the new parameters, press the **Select** key until the STORE ENABLE message displays and then press the **Store** key. The DATA SAVED OK message will display for 2 seconds.

7.5 Special Actions Performed in TEST/MAINTENANCE Mode

7.5.1 Run Self Test

Press the **Mode** and ▼ keys simultaneously.
The LCD will display:

```
TEST/MAINTENANCE
***OPTIONS***
```

Press the **Select** key.
The LCD will display:

```
RUN SELF TEST?
PUSH UP ARROW
```

Press the ▲ key.
The LCD will display:

```
SELF TEST PASSED
```

And after a few seconds the LCD will display:

```
% OF MOTOR FLA
I<0.1 FLC
```

7.5.2 View Software Version

Press the **Mode** and ▼ keys simultaneously.
The LCD will display:

```
TEST/MAINTENANCE
***OPTIONS***
```

Press the **Select** key **twice**.
The LCD will display:

```
BTL-R-17/05/2009
STRT.DXM-310111
```

Press the **Mode** and ▼ keys simultaneously to exit the TEST/MAINTENANCE mode.
The LCD will display:

```
% OF MOTOR FLA
I<0.1 FLC
```

7.5.3 Obtain Default Parameters

Press the **Mode** and ▼ keys simultaneously.
The LCD will display:

TEST/MAINTENANCE ***OPTIONS***

Press the **Select** key **three times**.
The LCD will display:

STORE ENABLE DEFAULT PARAMET.

Press the **Store** + **Mode** keys simultaneously.
The LCD will display:

DATA SAVED OK

And after a few seconds the LCD will display:

% OF MOTOR FLA I<0.1 FLC

CAUTION!	Obtaining DEFAULT PARAMETERS erases all previously modified settings and requires the operator to **reprogram** all parameters that differ from the factory default. **Note**: It is especially important to reprogram the **FLC** (as shown on the label of the RVS-DXM), **FLA** and RATED LINE VOLT. value again.

7.5.4 Reset Statistical Data

Press the **Mode** and ▼ keys simultaneously.
The LCD will display:

TEST/MAINTENANCE ***OPTIONS***

Press the **Select** key **four times**.
The LCD will display:

RESET STATISTICS

Press the **Reset** + **Store** keys simultaneously.
The LCD will display:

DATA SAVED OK

And after a few seconds the LCD will display:

STATISTICAL DATA - **** -

Press the **Mode** and go back to:

% OF MOTOR FLA I<0.1 FLC

7.5.5 Calibrate Voltage, Current and (Factory Use Only!)

Press the **Mode** and ▼ keys simultaneously.
the LCD will display:

TEST/MAINTENANCE ***OPTIONS***.

Press the **Select** key **five times**.
The LCD will display:

VOLTAGE ADJUST. X VOLT

Press the **Select** key.
The LCD will display:

CURRENT ADJUST. 5% OF FLC

Press the **Select** key.
The LCD will display

POWER FACTOR 0.71

Press the **Mode** and ▼ keys simultaneously to exit the TEST/MAINTENANCE mode.

7.6 Mode Pages

Upon initiation of the starter, the LCD displays motor's operating current:

% OF MOTOR FLA 0%

By pressing the **Mode** key all mode pages can be reviewed:

MAIN PARAMETERS - **** -	
START PARAMETERS - **** -	
STOP PARAMETERS - **** -	
DUAL ADJUSTMENT PARAMETERS	These pages are skipped if RVS-DXM is programmed to "MINIMIZED MODE" and are shown only in "MAXIMIZED MODE" (Refer to section 7.6.3 on page 31 for information on changing from "MINIMIZED MODE" to "MAXIMIZED MODE")
SPECIAL FEATURES PARAMETERS	
FAULT PARAMETERS - **** -	
I/O PROGRAMMING PARAMETERS	
COMM PARAMETERS - **** -	
STATISTICAL DATA - **** -	

7.6.1 ***Overview of All Mode Pages and Factory Defaults***

				Appears only in MAXIMIZED MODE[1]
% OF MOTOR FLA XX%	**MAIN PARAMETERS**	**START PARAMETERS**	**STOP PARAMETERS**	**DUAL ADJUSTMENT PARAMETERS**
Refer page 30	Refer page 31	Refer page 35	Refer page 39	Refer page 41
AMP. VOLT 0 0	LANGUAGE: ENGLISH	SOFT START CURVE 0(STANDARD)	SOFT STOP CURVE 0(STANDARD)	DA: INIT. VOLT. 30%
OPTION CARD Not Installed	STARTER FLC 58 AMP.	PULSE TIME 0 SEC.	DEC. TIME 0 SEC.	DA: CUR. LIMIT 400% OF FLA
POWER [2]	MOTOR FLA 58 AMP.	INITIAL VOLTAGE 30 %	FINAL TORQUE 0 (MIN.)	DA: ACC. TIME 10 SEC.
POWER FACTOR	RATED POWER 30KW	CURRENT LIMIT 400% OF FLA	STORE ENABLE STOP PARAMETERS	DA: DEC. TIME 0 SEC.
	CONNECTION TYPE LINE	ACC. TIME 10 SEC.		DA: MOTOR FLA 31 AMP.
	RATED LINE VOLT. 400 VOLT	MAX. START TIME 30 SEC.		STORE ENABLE D. ADJ PARAMETERS
	UNDERCURR. TRIP 0% OF FLA	NUMBER OF STARTS 10		
	UNDERCURR. DELAY 10 SEC.	STARTS PERIOD 30 MIN.		
	O/C – SHEAR PIN 850% OF FLA	START INHIBIT 15 MIN.		
	O/C DELAY 0.5 SEC.	STORE ENABLE START PARAMETERS		
	OVERLOAD CLASS IEC CLASS 10			
	OVERLOAD PROTECT ENABLE WHILE RUN			
	UNDERVOLT. TRIP 75%			
	UNDERVOLT. DELAY 5 SEC.			
	OVERVOLT. TRIP 120 %			
	OVERVOLT. DELAY 2 SEC.			
	DISPLAY MODE MINIMIZED			
	PARAMETERS LOCK NOT LOCKED			
	STORE ENABLE MAIN PARAMETERS			

(1) - Refer to section 7.6.3 on page 31 for information on changing from “MINIMIZED MODE” (Factory default) to “MAXIMIZED MODE”.

Appears only in MAXIMIZED MODE[1]	Appears only in MAXIMIZED MODE[1]	Appears only in MAXIMIZED MODE[1]	Appears only in MAXIMIZED MODE[1]	
SPECIAL FEATURES PARAMETERS	**FAULT PARAMETERS**	**I/O PROGRAMMING PARAMETERS**	**COMM. PARAMETERS**	**STATISTICAL DATA**
Refer page 42	Refer page 44	Refer page 46	Refer page 48	Refer page 50
SLOW SPEED TORQ. 8	PHASE LOSS Y/N YES	PROG. INPUT C1 REMOTE RESET	COMM. PROTOCOL MODBUS	TOTAL ENERGY 0 KWH
MAX SLOW SP TIME 30 SEC.	PHASE SEQ. Y/N NO	FAULT RELAY TYPE FAULT	BAUD RATE 9600 (MODBUS)	LAST STRT PERIOD NO DATA
WIDER SETTINGS DISABLE	INSULATION ALARM OFF	PROG. AUX. RELAY IMMEDIATE	PARITY CHECK EVEN	LAST START MAX I NO DATA
STORE ENABLE SPECIAL FEATURES	INSULATION TRIP OFF	RELAY ON DELAY 0 SEC.	SERIAL LINK NO. OFF	TOTAL RUN TIME 0 HOURS
	AUTO RESET NO	RELAY OFF DELAY 0 SEC.	S. LINK PAR. SAVE DISABLE	TOTAL # OF START 0
	THERMISTOR TYPE PTC	AN. OUT. PARAMETER I, 0...200% OF FLA	SER. LINK CONTROL DISABLE	LAST TRIP NO DATA
	THERMISTOR TRIP OFF	STORE ENABLE I/O PROG. PARAM.	MODBUS TIMEOUT OFF	TRIP CURRENT 0 % OF FLA
	UNDER CUR. RESET OFF		FRONT COM ADDRES OFF	TOTAL # OF TRIPS 0
	STORE ENABLE FAULT PARAMETERS		STORE ENABLE COMM. PARAMETERS	PREVIOUS TRIP -2 NO DATA
			Applicable when Optional Modbus or DeviceNet is ordered. ↑	▪ ▪ ▪
			Applicable when Optional Profibus Is ordered. ↓	
			COMM. PROTOCOL PROFIBUS	PREVIOUS TRIP -9 NO DATA
			BAUD RATE AUTO (PROFIBUS)	
			PARITY CHECK AUTO (PROFIBUS)	
			PROFI.NETWORK ID OFF	
			S. LINK PAR. SAVE DISABLE	
			SER. LINK CONTROL DISABLE	
			MODBUS TIMEOUT OFF	
			FRONT COM ADDRES OFF	
			STORE ENABLE COMM. PARAMETERS	

Appears when in TEST/MAINTENANCE[2]
TEST/MAINTENANCE ***OPTIONS* Display and default values**
RUN SELF TEST? PUSH UP ARROW
BTL-R-29/05/2008 STRT.DX-250608
STORE ENABLE DEFAULT PARAMETERS
RESET STATISTICS
VOLTAGE ADJUST X VOLT
CURRENT ADJUST 5% OF FLC
POWER FACTOR 0.71

[1] - Refer to section 7.6.3 on page 31 for information on changing from "MINIMIZED MODE" (Factory default) to "MAXIMIZED MODE".
[2] - Refer to section 7.5 on page 25 for entering TEST/MAINTENANCE mode.

7.6.2 ***Display Mode – page 0***

% OF MOTOR FLA XX%	Displays in MINIMIZED MODE and MAXIMIZED MODE (Refer to section 7.6.3 page 31)	
Display and default values	**Range**	**Description**
% OF MOTOR FLA I<0.1 FLC		Displays operating current as a percentage of motor FLA (Full Load Ampere). Starter's Default Display. After pressing **Mode** or **Select** keys, a time delay is initiated. Following the delay, the LCD returns to display "% OF MOTOR FLA".
AMP. VOLT 0 0		Displays Motors current and mains voltage.
OPTION CARD Not Installed	NOT INSTALLED/ INSTALLED	Displays whether option cards are installed in the RVS-DXM.
POWER 30kw		When power metering option is installed, displays active POWER drawn by the motor.
POWER FACTOR 0.9		When power metering option is installed, displays POWER FACTOR of motors power.

Note:
In this page parameters cannot be programmed.

7.6.3 ***Main Parameters – page 1***

MAIN PARAMETERS - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (Refer below for changing modes)		
Display and default values	**Range**	**Description**	**Remarks**
LANGUAGE: ENGLISH	SPANISH GERMAN FRENCH ENGLISH TURKCE RUSSIAN (Optional)	Sets Starter's language	
STARTER FLC 58 AMP.	8–1100A	Sets starter's FLC (Full load current)	Starter's FLC should be as shown on starter's Name plate. (Refer to section 6.1 on page 22)
MOTOR FLA 58 AMP.	50-100% of STARTER FLC	Sets motor's FLA (Full load Ampere)	Should be programmed as shown on motor's name plate. **Note**: When the RVS-DXM is installed Inside Delta set MOTOR FLA = <*rated motor current*>/1.73.
RATED POWER 30KW	1-3000KW	Sets motor's POWER	Rated motor power is used for analog output reference. When analog card is installed, full scale of the readings (20mA or 10V as per dip-switches settings on the analog card) are related to 200%FLA. (2x rated motor current) or 200% of rated power or POWER FACTOR. Refer to section 7.6.9 on page 46 for analog output programming.
CONNECTION TYPE LINE	LINE, INSIDE DELTA	Sets Starter's connection type.	Factory preset – features and functions when "INSIDE DELTA" mode is configured: No Pulse Start. No Curve selection (CURVE 0!!). No slow speed. No phase sequence "off" mode. Refer to section 4.5.3 on page 14 for further information
RATED LINE VOLT. 400 VOLT	220-690V	Sets rated LINE VOLTAGE.	
UNDERCURR. TRIP 0% OF FLA	0%=off; 20-90% of FLA	Sets UNDER CURRENT TRIP protection.	Trips the starter when motor current drops blow set level for a time longer than UNDER CURRENT DELAY
UNDERCURR. DELAY 10 SEC.	1-40sec.	Sets the time delay for the UNDER CURRENT TRIP protection	

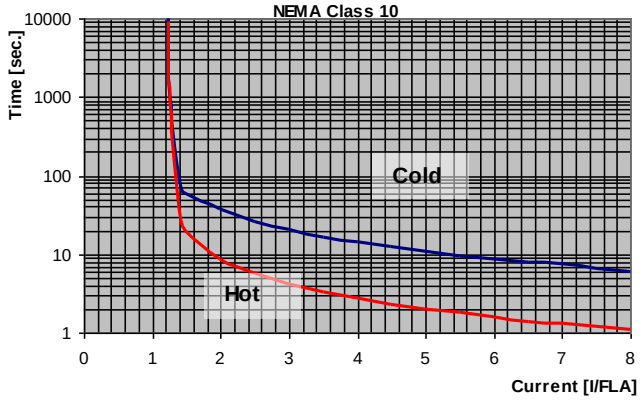
<table>
<tr><td>MAIN PARAMETERS
- **** -</td><td colspan="3">Displays in MINIMIZED MODE and MAXIMIZED MODE
(Refer below for changing modes)</td></tr>
<tr><td>Display and default values</td><td>Range</td><td>Description</td><td>Remarks</td></tr>
<tr><td>O/C – SHEAR PIN
200% OF FLA</td><td>100-850% of motor’s FLA setting</td><td>Sets OVER CURRENT SHEAR PIN protection</td><td rowspan="2">becomes operational when starter is energized and has three trip functions:
<u>At all time</u> - IF I > 850% of FLC - trips the starter within 1 cycle. (Overrides the value of O/C – SHEAR PIN setting)
<u>At starting process</u> - IF I > 850% of FLA - trips the starter after O/C DELAY (see here after)
<u>At run time</u> - IF I > O/C – SHEAR PIN setting of FLA - trips the starter after O/C DELAY
<u>Important Note</u>: The O/C SHEAR PIN is not intended to replace the fast acting fuses, required to protect the thyristors (Refer to fuse table in section 4.5.1 on page 14)</td></tr>
<tr><td>O/C DELAY
0.5 SEC.</td><td>0.0 –5sec.</td><td>Sets O/C – SHEAR PIN delay time</td></tr>
<tr><td>OVERLOAD CLASS
IEC CLASS 10</td><td>IEC CLASS 10/
IEC CLASS 20/
NEMA CLASS 10/
NEMA CLASS 20/
NEMA CLASS 30/</td><td>Sets OVERLOAD curve.</td><td>Sets OVERLOAD CLASS characteristics
Sets OVERLOAD PROTECT functionality.
The RVS-DXM allows motor protection according to IEC class 5 or 10 or according to NEMA class 10 ,20 or 30.
Tripping curves are shown on section 7.6.3.1 page 34.
The OVERLOAD protection incorporates a THERMAL CAPACITY register that calculates heating minus dissipation of the motor.
The RVS-DXM trips when the register fills up. (THERMAL CAPACITY=100%)
The time constant, in seconds, for cool down after overload trip is:
<table>
<tr><th>Class</th><th>10</th><th>20</th><th>30</th></tr>
<tr><td>IEC</td><td>320</td><td>640</td><td>-</td></tr>
<tr><td>NEMA</td><td>280</td><td>560</td><td>840</td></tr>
</table>
</td></tr>
<tr><td>OVERLOAD PROTECT
ENABLE WHILE RUN</td><td>DISABLE/
ENABLE WHILE RUN/
ENABLE</td><td></td><td>The overload protection can be set to protect the motor as set in the OVERLOAD PROTECT parameter:
ENABLE – motor is protected at all time.
ENABLE WHILE RUN – motor is protected only when in Run.
DISABLE – motor is not overload protected by the soft starter.
<u>Note:</u>
In order to restart after OVERLOAD trip, the thermal register should be 50% or less.</td></tr>
<tr><td>UNDERVOLT. TRIP
75%</td><td rowspan="2">50-90% of RATED LINE VOLT.</td><td>Sets UNDER VOLTAGE TRIP.</td><td rowspan="2">Trips the starter when mains voltage drops below the set level for a time longer than UNDERVOLT DELAY.
<u>Note</u>:
Becomes operational only after Start signal.
When voltage drops to zero (voltage outage) the starter will trip immediately, overriding the delay.</td></tr>
<tr><td>UNDERVOLT. DELAY
5 SEC.</td><td>1–10sec.</td><td>Sets UNDERVOLT TRIP DELAY.</td></tr>
<tr><td>OVERVOLT. TRIP
120 %</td><td rowspan="2">110-125% of RATED LINE VOLT.</td><td>Sets OVER VOLTAGE TRIP.</td><td rowspan="2">Trips the starter when mains voltage increases above the set level for a time longer than OVEERVOLT DELAY.</td></tr>
<tr><td>OVERVOLT. DELAY
2 SEC.</td><td>1–10sec.</td><td>Sets OVERVOLT</td></tr>
</table>

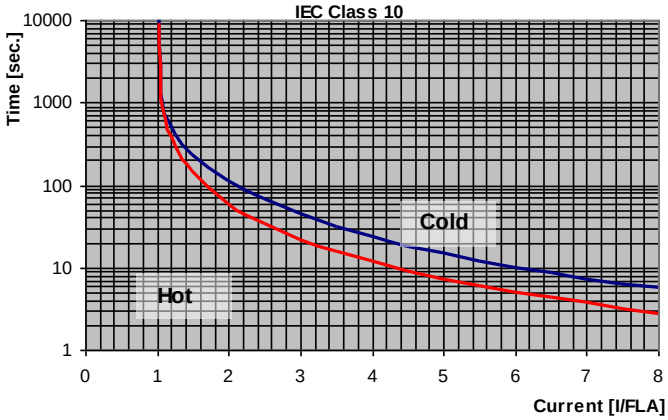
MAIN PARAMETERS - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (Refer below for changing modes)		
Display and default values	**Range**	**Description**	**Remarks**
		TRIP DELAY.	
DISPLAY MODE MINIMIZED	MINIMIZED/ MAXIMIZED	Sets Display Mode	For operation convenience, there are two display modes: MINIMIZED – Display of pre-selected parameters for standard applications. MAXIMIZED – Display of all possible parameters. Setting Display Mode to MINIMIZED will minimize the LCD displays. (Refer to section 7.47.6 on page 25 for more details)
PARAMETERS LOCK NOT LOCKED	NOT LOCKED/ LOCKED	Locks or unlocks parameter modifications.	The software lock prevents undesired parameter modification. When locked, upon pressing **Store** , ▼ or▲ keys, the LCD displays: UNAUTHORIZED ACCESS
STORE ENABLE MAIN PARAMETERS		Storing modified parameters	To store selected parameters, press Store key. **Note**: Storing selected parameters is possible only when *RAMP* LED does not lit. Storing cannot be done when Soft Starting or Soft Stopping. When parameters have been correctly stored, the LCD will read: DATA SAVED OK **This concludes MAIN PARAMETER settings.** Pressing Select key after “DATA SAVED OK” returns to the first display in this mode. **Note:** In case of a failure in parameter storing, the LCD displays: STORAGE ERROR In this case Refer to section 9 – “TROUBLE SHOOTING” on page 60.

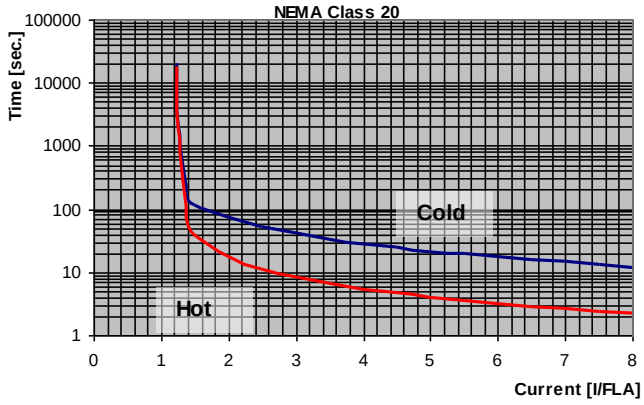
7.6.3.1 Tripping Curves of the Integrated Overload Protection

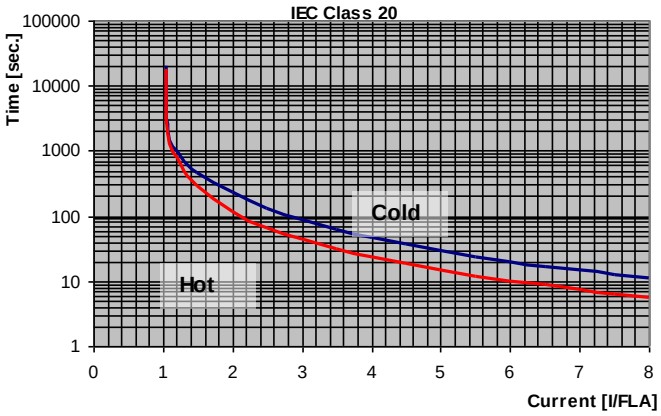
The RVS-DXM allows motor protection according to IEC class 10 or 20 OR according to NEMA class 10, 20, or 30.

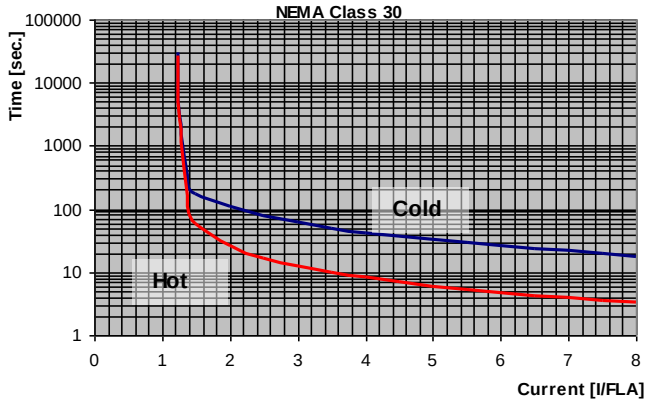
NEMA & IEC Class OVERLOAD curves



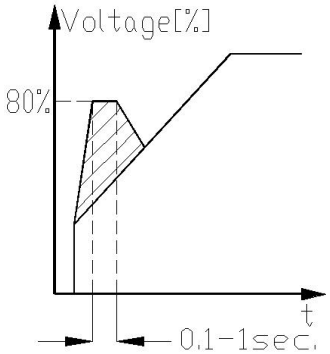


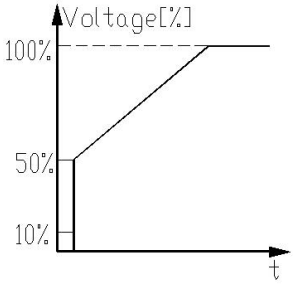
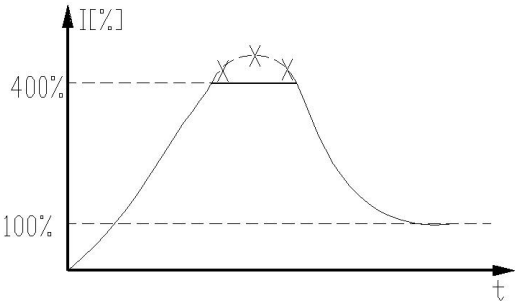


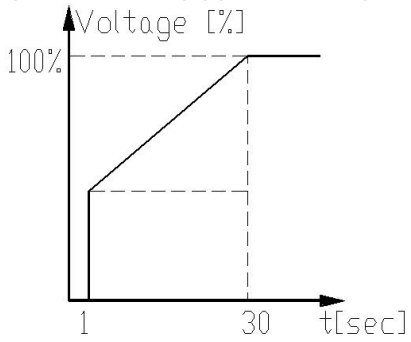




7.6.4 ***Start Parameters – page 2***

START PARAMETERS - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (refer to section 7.6.3 on page 31 for changing mode)		
Display and default values	**Range**	**Description**	**Remarks**
SOFT START CURVE 0(STANDARD)	4 (TORQUE) 3 !! 2 !! 1 !! 0 (STANDARD)	Sets starter's SOFT START CURVE.	Refer to section 7.6.4.1 on page 38. **Note:** When RVS-DXM is connected "Inside-Delta", only CURVE 0 is applied.
PULSE TIME 0 SEC.	0 – 1.0 SEC.	Sets starter's PULSE START TIME. PULSE START level is 80% Un.	Intended to start high friction loads, requiring high starting torque for a short time. A pulse of 80% Un, without Current Limit, is initiated to break the load free. Pulse duration is adjustable, 0.1 – 1sec. After this pulse, the voltage is ramped down to INITIAL VOLTAGE setting, before ramping up again to full voltage according to START PARAMETERS settings.  **Note:** When RVS-DXM is connected "Inside-Delta", PULSE START can not be activated.
INITIAL VOLTAGE 30 % INITIAL CURRENT 100 %	10-50% After reaching 50% display changes to: INITIAL CURRENT 100-400% **Note:** The range of the INITIAL VOLTAGE can be extended to 5-80% by using the WIDER	Sets motor's INITIAL STARTING VOLTAGE. (Motor's **torque** is directly proportional to the square of the voltage)	This adjustment also determines the inrush current and mechanical shock. A setting that is too high may cause high initial mechanical shock and high inrush current (even if CURRENT LIMIT is set low, as the INITIAL VOLTAGE setting overrides CURRENT LIMIT setting). A setting that is too low may result in prolonged time until motor begins to turn. In general, this setting should ensure that the motor begins turning immediately after start signal.

START PARAMETERS - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (refer to section 7.6.3 on page 31 for changing mode)		
	SETTING as described in section 7.6.7 page 42.		**Note:** When INITIAL VOLTAGE is set above 50% (it's maximum value), display changes to INITIAL CURRENT. When INITIAL CURRENT is set, starter causes current ramp instead of voltage ramp. 
CURRENT LIMIT 400% OF FLA	100-400% **Note:** Range can be extended to 100-500% by using the WIDER SETTING as described in section 7.6.7 page 42.	Sets motor's highest current during starting.	A too high setting will cause greater current drawn from mains and faster acceleration. A setting that is too low may prevent motor from completing acceleration process and reaching full speed. In general, this setting should be set to a high enough value in order to prevent stalling. **Note:** CURRENT LIMIT is not operating during Run and Soft stop. 
ACC. TIME 10 SEC.	1-30sec. **Note:** Range can be	Sets ACCELERATION TIME of the	Determines motor's voltage ramp-up time, from initial to full voltage.

START PARAMETERS - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (refer to section 7.6.3 on page 31 for changing mode)		
	extended to 1-90sec. by using the WIDER SETTING as described in section 7.6.7 page 42.	motor.	It is recommended to set ACCELERATION TIME to the minimum acceptable value (approx. 5 sec).  **Notes:** Since CURRENT LIMIT overrides ACC. TIME, when CURRENT LIMIT is set low, starting time will be longer than the preset ACC. TIME. When motor reaches full speed before voltage reaches nominal, ACC. TIME setting is overridden, causing voltage to quickly ramp-up to nominal. Using starting curves 1, 2, 3 prevents quick ramp up.
MAX. START TIME 30 SEC.	1-30sec. **Note:** Range can be extended to 1-250sec.by using the WIDER SETTING as described in section 7.6.7 page 42.	Sets MAXIMUM START TIME	The maximum allowable start time, from Start signal to end of acceleration process. If voltage does not reach full voltage/speed during this time (e.g. because of too low CURRENT LIMIT setting), the starter will trip the motor. LCD displays “LONG START TIME” message.
NUMBER OF STARTS 10	OFF, 1-10	Sets NUMBER OF STARTS permitted During STARTS PERIOD (see below).	Limits the NUMBER OF STARTS during the period of time defined by STARTS PERIOD. If you try to start even one more time within that period the START INHIBIT period will take effect.
STARTS PERIOD 30 MIN.	1–60min.	Sets STARTS PERIOD during which NUMBER OF STARTS is being counted.	During the START INHIBIT period the WAIT BEFORE RST XX MIN message will be displayed.
START INHIBIT 15 MIN.	1–60min.	Sets START INHIBIT time which, before elapsed, motor can not be restarted.	
STORE ENABLE START PARAMETERS			Same as STORE ENABLE MAIN PARAMETERS on page 33.

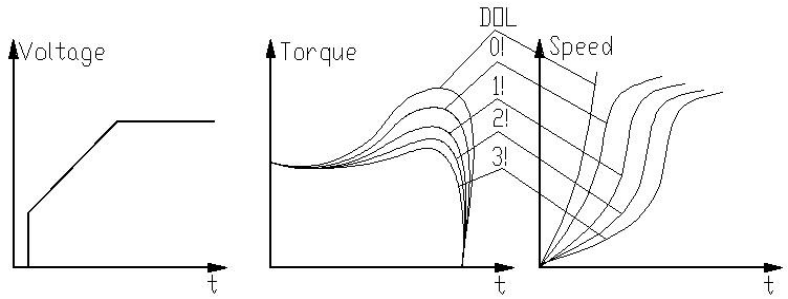
7.6.4.1 *Soft start parameters*

The RVS-DXM incorporates 4 “Starting Curves”, enabling selection the suitable torque curve:

Start Curve 0 – Standard curve (Default). The most stable and suitable curve for the motor, preventing prolonged starting and motor overheating.

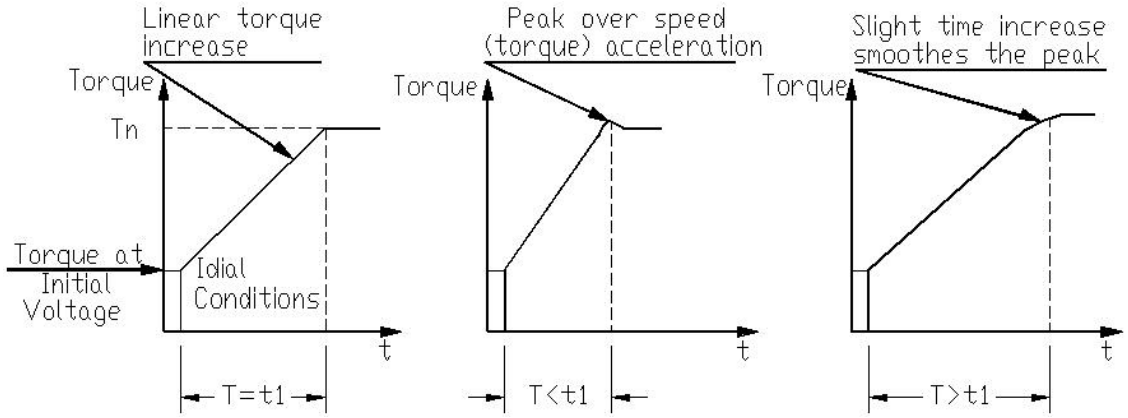
Note:
When RVS-DXM is connected “Inside-Delta”, only CURVE 0 is applied.

Start curves 1-3 - “Pump Control” - Induction motors produce peak torque of up to 3 times the rated torque towards the end of starting process. In some pump applications, this peak may cause high pressure in the pipes.
Start Curves 1, 2, 3 – During acceleration, before reaching peak torque, the Pump Control Program automatically controls the voltage ramp-up, reducing peak torque.



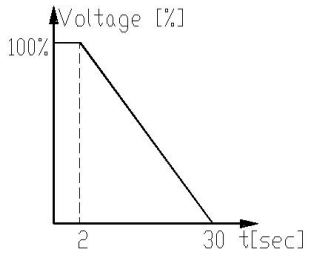
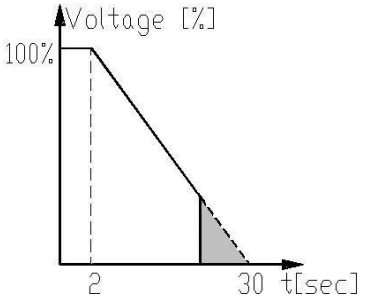
Choice of three pump control acceleration curves: 0!, 1!, 2!, 3!

Start Curve 4 (Torque) – Torque Controlled acceleration, provides a smooth time controlled torque ramp for the motor and the pump.



Note:
Always start with Start Curve 0. If towards end of acceleration, peak torque is too high (pressure is too high), proceed to Curve 1, 2, 3 or 4 if necessary.

*7.6.5 **Stop Parameters – page 3***

STOP PARAMETERS - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (refer to section 7.6.3 on page 31 for changing mode)		
Display and default values	**Range**	**Description**	**Remarks**
SOFT STOP CURVE 0(STANDARD)	4 (TORQUE) 3 !! 2 !! 1 !! 0 (STANDARD)	Sets starter's SOFT STOP CURVE.	Refer to section 7.6.5.1 on page 39
DEC. TIME 0 SEC.	0 – 30sec. **Note:** Range can be extended to 90sec. by using the WIDER SETTING as described in section 7.6.7 page 42.	Sets DECELERATION TIME of the motor.	Used for controlled deceleration of high friction loads. Determines motor's voltage ramp down time. 
FINAL TORQUE 0 (MIN.)	0 (min.) – 10 (max.)	Sets FINAL TORQUE during Soft Stop.	Determines torque towards end of SOFT STOP. If current is still flowing after speed is softly reduced to zero, increase FINAL TORQUE setting. 
STORE ENABLE STOP PARAMETERS			Same as STORE ENABLE MAIN PARAMETERS on page 33.

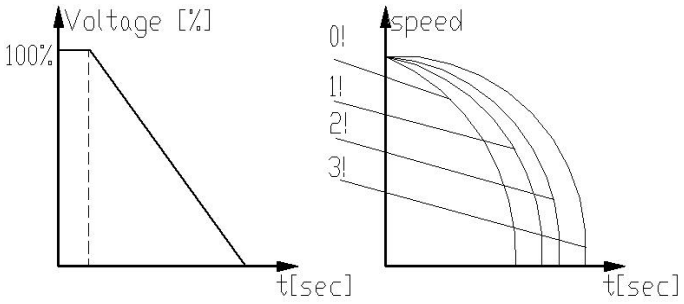
7.6.5.1 Soft stop parameters

The RVS-DXM incorporates 4 "Starting Curves", enabling selection the suitable torque curve:

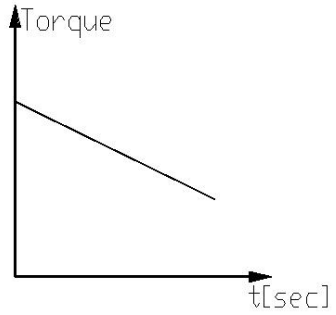
Stop Curve 0 – Standard curve (Default) – voltage is linearly reduced from nominal to zero.
The most stable and suitable curve for the motor, preventing prolonged stopping and motor overheating.

Stop curves 1, 2, 3 Pump Control – In some pump applications, when pumping to a higher level, a considerable part of the torque is constant and does not decrease with speed.
It may happen that during deceleration process, when voltage is decreasing, motor torque quickly falls below load torque abruptly (instead of smoothly decreasing speed to zero) closing the valve and causing Water Hammer.
Curves 1, 2 and 3 are intended to prevent Water Hammer phenomenon. In pump applications, load torque decreases in square relation to the speed, thus correct control of voltage reduction reduces torque adequately to smoothly decelerate to a stop.
Note:

It is recommended that for all standard applications (not pumps), Stop Curve 0 will be used.
To reduce Water Hammer select STOP CURVE 1, than 2 or 3, if necessary.



Curve 4 - Torque Curve - Provides linear deceleration of the torque. In certain loads, linear torque deceleration can result in close to linear speed deceleration.
The RVS-DXM Torque Control does not require any external torque or speed sensor (tacho-gen. etc.).



*7.6.6 **Dual Adjustment Parameters – page 4***

DUAL ADJUSTMENT PARAMETERS	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)	
Display and default values	**Description**	**Remarks**
		When selecting GEN. START/STOP in mode I/O PROGRAMMING PARAMETERS on page PROG. INPUT C1 DUAL ADJUST (refer to section 7.6.9.1on page 47) the following display appears: D. ADJ: GENERATOR PARAMETERS
DA: INIT. VOLT. 30% DA: INIT. CURRENT 100%	Sets motor's INITIAL STARTING VOLTAGE **in DA mode.** (Motor's **torque** is directly proportional to the square of the voltage)	Refer to section 7.6.4 on page 35 parameter: INITIAL VOLTAGE.
DA: CUR. LIMIT 400% OF FLA	Sets motor's highest current during starting **in DA mode.**	Refer to section 7.6.4 on page 35 parameter: CURRENT LIMIT.
DA: ACC. TIME 10 SEC.	Sets ACCELERATION TIME of the motor **in DA mode.**	Refer to section 7.6.4 on page 35 parameter: ACC. TIME.
DA: DEC. TIME 0 SEC.	Sets DECELERATION TIME of the motor **in DA mode.**	Refer to section 7.6.5 on page 39 parameter: DEC. TIME.
DA: MOTOR FLA 31 AMP.	Sets motor's FLA (Full load Ampere) **in DA mode.**	Refer to section 7.6.3 on page 30 parameter: MOTOR FLA.
STORE ENABLE D. ADJ PARAMETERS		Same as STORE ENABLE MAIN PARAMETERS on page 33.

*7.6.7 **Special features Parameters – page 5***

SPECIAL FEATURES PARAMETERS	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)		
Display and default values	**Range**	**Description**	**Remarks**
SLOW SPEED TORQ. 8	1(MIN.) – 10(MAX.)	Sets SLOW SPEED TORQUE.	**Note:** When RVS-DXM is connected "Inside-Delta" SLOW SPEED TORQUE is not available.
MAX SLOW SP TIME 30 SEC.	1–30sec. **Note:** Range can be extended to 250sec. by using the WIDER SETTING as described in section 7.6.7 page 42.	Sets maximum time for SLOW SPEED TORQUE operation.	
WIDER SETTINGS DISABLE	DISABLE/ ENABLE	Enables wider range of parameter settings.	**For use in very special occurrences. Do not set to ENABLE unless starter is significantly larger then motor**! See detailed explanation next page.
STORE ENABLE SPECIAL FEATURES			Same as STORE ENABLE MAIN PARAMETERS on page 33.

7.6.7.1 WIDER SETTINGS Parameters:

Parameter	WIDER SETTINGS Disabled	WIDER SETTINGS Enabled
INITIAL VOLTAGE	10-50%	5[1] -80%
CURRENT LIMIT	100-400%	100-500%
ACCELERATION TIME	1-30 seconds	1-90 seconds
DECELERATION TIME	0-30 seconds	0-90 seconds
MAX. START TIME	1-30 seconds	1-250 seconds
PHASE LOSS Y/N	Yes[2]	Yes/No[2]
MAX SLOW SP TIME	1-30 seconds	1-250 seconds
O/C or WRONG CON protection in Inside Delta mode.	Protection active in normal set[3]	Protection active in high set[3]
OVERLOAD TRIP protection.	OVERLOAD TRIP will be active after Run LED is Lit. (Motor is at full voltage) [4]	OVERLOAD TRIP will be active after MAX. START TIME has elapsed. [4]

Notes:

(1) Setting the INITIAL VOLTAGE to lower than 10% is not practical for loaded motors.
(2) Refer to section 7.6.8 page 44. See PHASE LOSS protection and refer to the warning below.
(3) Refer to section 9 page 60. See O/C or WRONG CON protection.
(4) In order to avoid OVERLOAD TRIP in special cases (very high inertia loads), where at the end of the acceleration process, although motor is at full voltage (Run LED is Lit) and the current does not reduce to nominal, set WIDER SETTINGS to ENABLE causing the OVERLOAD TRIP to be active only after MAX. START TIME has elapsed.

WARNING! Operator's responsibility!	1. WIDER SETTINGS are for use in very special applications only! **Do not** set WIDER SETTINGS to ENABLE unless RVS-DXM is significantly larger than the motor! When using WIDER SETTINGS for the RVS-DXM **you must** be extremely careful to avoid damaging the motor or RVS-DXM. 2. Only cancel PHASE LOSS protection when the operator is sure that no real phase loss exists and PHASE LOSS protection is activated. This situation can occur in rare cases when there is no real fault but the RVS-DXM recognizes unusual behaviour like when THDV (Total Harmonic Distortion in Voltage) in the network is high. If this is a true case of PHASE LOSS then after cancelling PHASE LOSS protection the motor will single phase and most likely be tripped by the over load protection mechanism.

7.6.8 ***Fault Parameters – page 6***

FAULT PARAMETERS - **** -	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)		
Display and default values	**Range**	**Description**	**Remarks**
PHASE LOSS Y/N YES	YES **Note:** Range can be extended to YES/**NO** by using the WIDER SETTING as described in section 7.6.7 page 42.	Sets PHASE LOSS trip	PHASE LOSS protection trips the RVS-DXM when 1 or 2 phases are missing. **Notes:** If RVS-DXM trips on PHASE LOSS do the following: (1) Verify that phase voltages are within the required range of the voltages. (2) If you are sure that no real phase loss exists, you can set PHASE LOSS Y/N protection to NO. This situation can occur in rare cases when there is no real fault but the RVS-DXM recognizes unusual behaviour like when Total Harmonic Distortion in Voltage (THDV) in the network is high. (3) If this is a true case of PHASE LOSS then after setting PHASE LOSS Y/N protection to NO the motor will single phase and most likely be tripped by the over load protection mechanism. (4) Phase loss might not be detected in motor operating under a light load.
PHASE SEQ. Y/N NO	NO/YES	Sets PHASE SEQUANCE trip	When RVS-DXM is connected “Inside-Delta”, PHASE SEQUANCE protection is always activated.
INSULATION ALARM OFF	OFF, 0.2–5Mohm	Sets INSULATION ALARM level.	Consult factory for availability.
INSULATION TRIP OFF	OFF, 0.2–5Mohm	Activates INSULATION ALARM trip.	Consult factory for availability.
AUTO RESET NO	NO/YES	Sets starter’s AUTO RESET mode of operation.	Starter can be automatically reset for UNDER VOLTAGE and PHASE LOSS faults. (Refer to section 7.6.3 on page 31 for details on adjusting UNDER VOLTAGE and PHASE LOSS faults) To start the motor after UNDER VOLTAGE and PHASE LOSS faults have disappeared, stop the START signal to terminal B1 and recommence the signal to terminal B1. AUTO RESET function has a non-programmed time delay of 60 seconds.
THERMISTOR TYPE PTC	PTC/NTC	Sets input THERMISTOR TYPE	Available only when analog card is installed.
THERMISTOR TRIP OFF	OFF, 0.1–10Kohm	Sets starter’s THERMISTOR TRIP mode of operation.	
UNDER CUR. RESET OFF	10–120min., OFF.	Sets starter’s UNDER	Starter can be automatically reset for UNDER CURRENT fault. (Refer to section 7.6.3 on

FAULT PARAMETERS - **** -	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)		
Display and default values	**Range**	**Description**	**Remarks**
		CURRENT RESET time delay.	page 31 for details on adjusting UNDER CURRENT TRIP) To start the motor after UNDER CURRENT fault has disappeared, stop the START signal to terminal B1 and recommence the signal to terminal B1. A time delay (After START signal is stopped) can be programmed to activate the UNDER CURRENT RESET time.
STORE ENABLE FAULT PARAMETERS			Same as STORE ENABLE MAIN PARAMETERS on page 33.

7.6.9 ***I/O Programming Parameters – page 7***

I/O PROGRAMMING PARAMETERS	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)		
Display and default values	**Range**	**Description**	**Remarks**
PROG. INPUT C1 REMOTE RESET	START/STOP; REMOTE RESET; EXTERNAL FAULT; SLOW SPD/REVERSE; GEN. START/STOP; DUAL ADJUSTMENT;	Sets TERMINAL C1 function	Refer to section 7.6.9.1 on page 47.
FAULT RELAY TYPE FAULT	FAULT, FAULT – FAIL SAFE	Sets FAULT RELAY mode of operation.	When configured to FAULT the internal relay is energized upon fault. When configured to FAULT-FAIL SAFE the relay is **de**-energized upon fault. In this mode, while normal operation, the fault relay is energized. Relay will also **de**-energize upon control power outage.
PROG. AUX. RELAY IMMEDIATE	IMMEDIATE/ END OF ACCEL.	Sets starter's AUX. RELAY mode of operation.	When configured to IMMEDIATE – the AUX. RELAY closes its contact at start signal (after programmed "on delay" time has elapsed) and open its contact at the end of deceleration time (if any) (after programmed "off delay" time has elapsed). When configured to END OF ACCEL. -the AUX. RELAY closes its contact at end of soft start (after programmed "on delay" time has elapsed) and open its contact at the beginning of soft stop (if any) (after programmed "off delay" time has elapsed).
RELAY ON DELAY 0 SEC.	0–60sec.	Sets starter's AUX. RELAY on delay time.	
RELAY OFF DELAY 0 SEC.	0–60sec.	Sets starter's AUX. RELAY off delay time	
AN. OUT PARAMETER I, 0...200% OF FLA	I, 0...200% OF FLA P, 0...200% OF Pn POWER FACTOR	Sets ANALOG OUTPUT mode of operation.	Available only when analog card is installed. When analog card is installed, full scale of the readings (20mA or 10V as per dip-switches settings) are related to 200%FLA. (2x rated motor current) or 200% of rated power or POWER FACTOR.
STORE ENABLE I/O PROG. PARAM.			Same as STORE ENABLE MAIN PARAMETERS on page 33.

7.6.9.1 PROG. INPUT C1

Terminal C1 can be programmed to operate in various modes:

TERMINAL C1 programmed function	Description
START/STOP	C1 is a maintained stop input to the RVS-DXM, while B1 is a momentary start input to the RVS-DXM.
REMOTE RESET	C1 is used as REMOTE RESET to reset all RVS-DXM faults. The RESET command will take affect only if START command is stopped.
EXTERNAL FAULT	C1 is used as an input to the RVS-DXM enabling the user to stop the motor in case of an external fault. When C1 is closed motor will stop and *Fault* LED will lit.
SLOW SPD/REVERSE	While C1 is in "ON", the motor will start slow speed forward. If C1 is moved to "OFF" (while RVS-DXM still in "ON"), the motor will slow speed reverse. For adjusting the SLOW SPEED TORQUE and MAX. SLOW SPEED TIME refer to section 7.6.7 on page 42. **Note:** It is not possible to start the motor in “SLOW SPEED“ REVERSE”.
GEN. START/STOP	C1 is used to load start & stop parameters from the D. ADJ: GENERATOR PARAMETERS Page. In this mode of operation the RVS-DXM will start the motor even though “WRONG CONNECTION” failure occurs. Refer to section 7.6.6 on page 41.
DUAL ADJUSTMENT	C1 is used to load start & stop parameters from the DUAL ADJUSTMENT PARAMETERS Page. Refer to section 7.6.6 on page 41.

7.6.10 ***Comm. Parameters – page 8- Applicable with Optional Modbus & DeviceNet Comm.***

Note: When DeviceNet option is required an external unit, DeviceNet to Modbus Gateway is required. This gateway is connected via 2 wires to the optional Modbus terminals.

COMM.PARAMETERS - **** -	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)	
Display and default values	**Range**	**Description**
COMM. PROTOCOL MODBUS	MODBUS	Sets RVS-DXM communication PROTOCOL. Applicable when the optional communication card is installed.
BAUD RATE 9600 (MODBUS)	1200, 2400, 4800, 9600	Sets RVS-DXM BAUD RATE.
PARITY CHECK EVEN	EVEN, ODD, NO	Sets RVS- DX communication PARITY CHECK.
SERIAL LINK NO. OFF	OFF,1 – 247	Sets RVS- DX communication SERIAL LINK NO. **Note**: If optional, external DeviceNet to Modbus Gateway is supplied set this parameter to 1.
S. LINK PAR. SAVE DISABLE	ENABLE/ DISABLE	Enables parameters modification via serial communication **Note**: If optional, external DeviceNet to Modbus Gateway is supplied set this parameter to ENABLE/DISABLE as required.
SER. LINK CONTROL DISABLE	ENABLE/ DISABLE	Enables start, stop, reset etc… via serial communication. **Note**: If optional, external DeviceNet to Modbus Gateway is supplied set this parameter to ENABLE/DISABLE as required.
MODBUS TIME OUT OFF	0.1-60 SEC., OFF	Sets MODBUS TIME OUT. If no valid Modbus communication during MODBUS TIME OUT, the RVS-DXM will trip. Trip occurs only if the following conditions exist: • SER. LINK CONTROL is set to ENABLE • SERIAL LINK NO. is not set to OFF If MODBUS TIME OUT is set to OFF protection is disabled.
FRONT COM ADDRES OFF	OFF,1 – 247	Future enhancement
STORE ENABLE COMM. PARAMETERS		Same as STORE ENABLE MAIN PARAMETERS on page 33. **Note:** After changing communication parameters and storing them, control power must be switched off and on to load new communication parameters.

7.6.11 ***Comm. Parameters – page 8 - Applicable with Optional Profibus Comm.***

COMM.PARAMETERS - **** -	Displays in MAXIMIZED MODE only (refer to section 7.6.3 on page 31 for changing mode)	
Display and default values	**Range**	**Description**
COMM. PROTOCOL PROFIBUS	PROFIBUS	Sets RVS-DXM communication PROTOCOL. Applicable when the optional communication card is installed.
BAUD RATE AUTO (PROFIBUS)		User can not change BAUD RATE value. Max. rate is 12 mega bit per second (MBPS).
PARITY CHECK AUTO (PROFIBUS)		User can not change PARITY CHECK settings.
PROFI. NETWORK ID OFF	OFF,1 – 126	Sets the Profibus network ID. When set to OFF the Profibus card will not function.
S. LINK PAR. SAVE DISABLE	ENABLE/ DISABLE	Enables parameter modification via serial communication
SER. LINK CONTROL DISABLE	ENABLE/ DISABLE	Enables start, stop, reset etc… via serial communication
MODBUS TIME OUT OFF	OFF	Do not change this parameter! Must be set to OFF.
FRONT COM ADDRES OFF	OFF,1 – 247	Future enhancement
STORE ENABLE COMM. PARAMETERS		Same as STORE ENABLE MAIN PARAMETERS on page 33. **Note:** After changing communication parameters and storing them, control power must be switched off and on to load new communication parameters.

7.6.12 ***Statistical Data – page 9***

STATISTICAL DATA - **** -	Displays in MINIMIZED MODE and MAXIMIZED MODE (refer to section 7.6.3 on page 31 for changing mode)	
Display and default values	**Range**	**Description**
TOTAL ENERGY 0 KWH		Displays total energy drawn by the motor in KWH.
LAST STRT PERIOD NO DATA		Displays last starting time in seconds. Starting time is the duration until motor's current reaches nominal.
LAST STRT MAX I NO DATA		Displays last starting maximum starting current.
TOTAL RUN TIME 0 HOURS		Displays Motor's total run time.
TOTAL # OF START 0		Displays total number of starts.
LAST TRIP NO DATA		Displays motor's last trip cause.
TRIP CURRENT 0 % OF FLA		Displays motor's current when motor was tripped by the RVS-DXM.
TOTAL # OF TRIPS 0		Displays total number of trips.
PREVIOUS TRIP -2 NO DATA		Displays the motor's trip history.
PREVIOUS TRIP -3 NO DATA		
PREVIOUS TRIP -4 NO DATA		
PREVIOUS TRIP -5 NO DATA		
PREVIOUS TRIP -6 NO DATA		
PREVIOUS TRIP -7 NO DATA		
PREVIOUS TRIP -8 NO DATA		
PREVIOUS TRIP -9 NO DATA		

7.7 **Non adjustable protection anf fault Resetting**

7.7.1 ***Phase loss (and Under / Over Frequency)***

Becomes operational when starter is energized and protects motor from single phasing. Trips the starter when 1 or 2 phases are missing for more than 1 sec.
Starter will also trip when frequency is less than 45 or greater than 65Hz.

Note:
Phase loss might not be detected in lightly loaded motors.

7.7.2 Phase Sequence

Becomes operational when starter is energized, provided this protection has been activated, trips the starter when phase sequence is wrong.
Refer to section 7.6.8 on page 44 parameter PHASE SEQ. Y/N.

7.7.3 Shorted SCR or Wrong Connections

Becomes operational after start signal. Trips if motor is not properly connected to starter's Load terminals, when Internal disconnection in the motor winding is detected, or when one or more SCRs have been shorted.

7.7.4 Heat-sink Over Temperature

Thermal sensors are mounted on the Heat-sink and trip the starter when temperature rises above 85ºC.

WARNING!	The over temperature protection is designed to operate under normal conditions e.g. in the event of extended low overload, insufficient ventilation – fan stoppage or air flow blockage. Incorrect starter selection, frequent starting at max. conditions, or repeated starting under fault conditions can cause SCR's overheating and failure before the heat-sink reaches 85°C to trip the thermal sensors.

7.7.5 External Fault

If Aux. Input contact - C1 is programmed as an External Fault (Refer to section 7.6.9.1 on page 47 for details on programming Input C1), the RVS-DXM will trip if contact closes for more than 2 sec.
External Fault becomes operational when starter is energized.

7.7.6 Fault and Reset

When any of the protections operate, the starter locks in a fault condition, disabling thyristors firing. Fault LED lights up, fault description is displayed on the LCD and Fault Relay operates.
For local resetting, after fault has been removed, press **Reset** key.
Remote resetting can be done through Aux. Input, if programmed as REMOTE RESET. (Refer to section 7.6.9.1 on page 47 for details on programming Input C1)
When Fault occurs, followed by a voltage outage, fault condition is latched and reappears upon voltage restoration.
Note:
Resetting (Local, Remote, Serial Link or Auto Reset) is not possible as long as **Start** signal exists.

7.7.7 Auto Reset

UNDER VOLTAGE and PHASE LOSS, faults can be set to Auto-Reset (Refer to section 7.6.8 on page 44).
The starter will reset itself 60 seconds after voltage was fully restored provided no start signal exists.
UNDER CURRENT fault can be set to Auto-Reset (Refer to section 7.6.8 on page 44).
The starter will reset itself when a programmed time delay has elapsed provided no start signal exists.

7.8 Timing Occurrence Table

Timing And Occurrence	Active During			
	Start	Run	Stop	Soft Stop
Too many starts with Start Inhibit period	√			
Electronic Overload with Curve selection	√	√		
O/C Shear Pin (Jam)				
Starter Protection – trip immediately at 850% FLC	√	√		√
Motor Protection – trip function				
During Start – factory set at 850% FLA in less than 1 cycle (*).	√			√
During Run – adjust. 200 – 850% FLA within 1 cycle (*).		√		
Under current adjustable time delay		√		
Phase Loss	√	√		√
Phase sequence	√			
Under voltage with adjustable time delay. Time delay is override in case of “No-Volt”.	√	√		√
Over voltage with adjustable time delay	√	√		√
Long start time (Stall protection)	√			
Shorted SCR or Wrong connection	√			√
External fault – input from a N.O. contact	√	√	√	√
SCR protection by Metal Oxide Varistors (MOV)	√	√	√	√
Starter over-temperature	√	√	√	√
Starter internal test, when “On” LED is lit.	√	√	√	√
Motor Insulation test - Not Available (Consult Factory)			√	
Motor Thermistor – Not Available (Consult Factory)	√	√	√	√

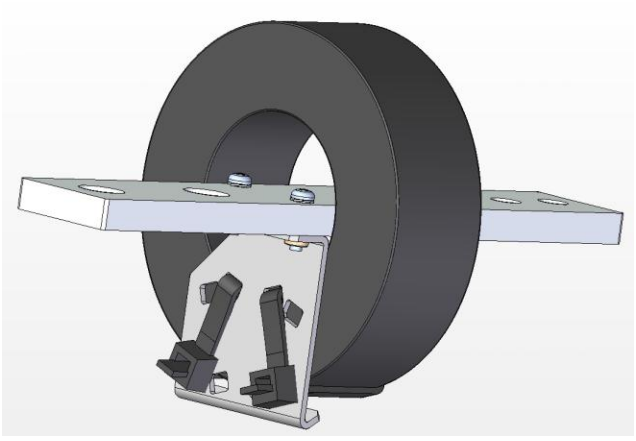
8. STARTING PROCEDURE

Note:
It is necessary to connect a motor to load terminals otherwise S.SCR or WRONG CONNECTION Protection is activated. Other loads such as light bulbs, resistors, etc. may also cause WRONG CONNECTION Fault.

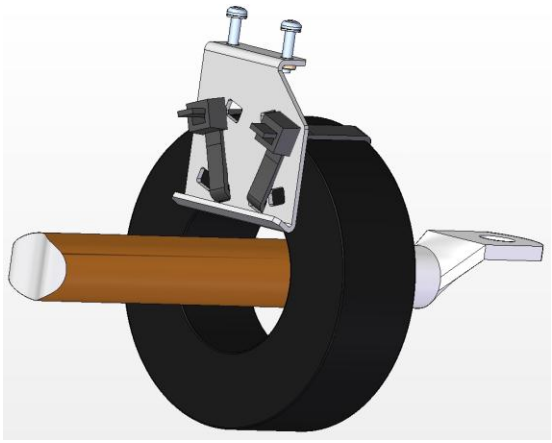
	1	When mains voltage is connected to the RVS-DXM, even if control voltage is disconnected, full voltage may appear on the starter load terminals. Therefore, for isolation purposes, it is necessary to connect an isolating device before (upstream) the starter.
	2	Power factor correction capacitors or overvoltage protection devices must not be installed on starters load side. When required, install it on starter's line side.
	3	When using "Inside delta" connection, wrong connection of the starter or the motor, will seriously damage the motor; therefore make sure motor is connected properly!
	4	Do not interchange line and load connections
	5	Before starting the motor verify its rotation direction. If needed, disconnect the rotor from the mechanical load and verify the right rotation direction.
	6	Prior to Start up procedure make sure that line voltage and control voltage match the ones shown on the starter's name plate.
	7	When start signal is initiated and a motor is not connected to load terminals, the SHORT SCR or WRONG CONNECTION protection will be activated.

8.1 CTs mounting

When either RVS-DXM ··· ··· ··· **63** · or RVS-DXM ··· ··· ··· **66** · are ordered CTL1 and CTL3 should be installed by the cabinet builder upstream the RVS-DXM. The CTs are delivered with a holding bracket which enables installation with either cable or busbar running through the CTs:



CT installation on a busbar



CT installation with a cable

8.2 Setting Dip switch for analog-out option

Dip switches allow selection between: 0-10VDC, 0-20mA, 4-20mA

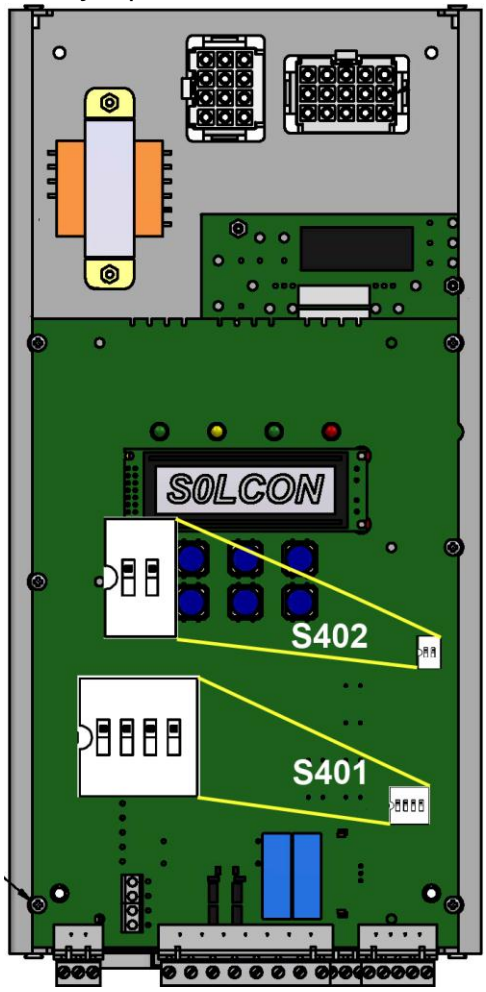
Analogue value can be programmed via the key pad in I/O PROGRAMMING PARAMETERS page to one of the values as follows: (refer to section 7.6.9 on page 46.)

A. 0….200% of FLA (Default setting)
B. 0….200% of Pn
C. Power factor

In order to set the Dip switches properly do the following:

1. Disconnect control voltage from the control module and disconnect mains as well.

2. Disconnect all terminals at the bottom side of the control module
3. Dismantle the front cover of the control module by removing 4 screws on top side of the control module and 4 screws at the bottom of the control module.
4. Identify dip switches S401 and S402 as shown in the picture below:



5. Set the dip switches according to the below table:

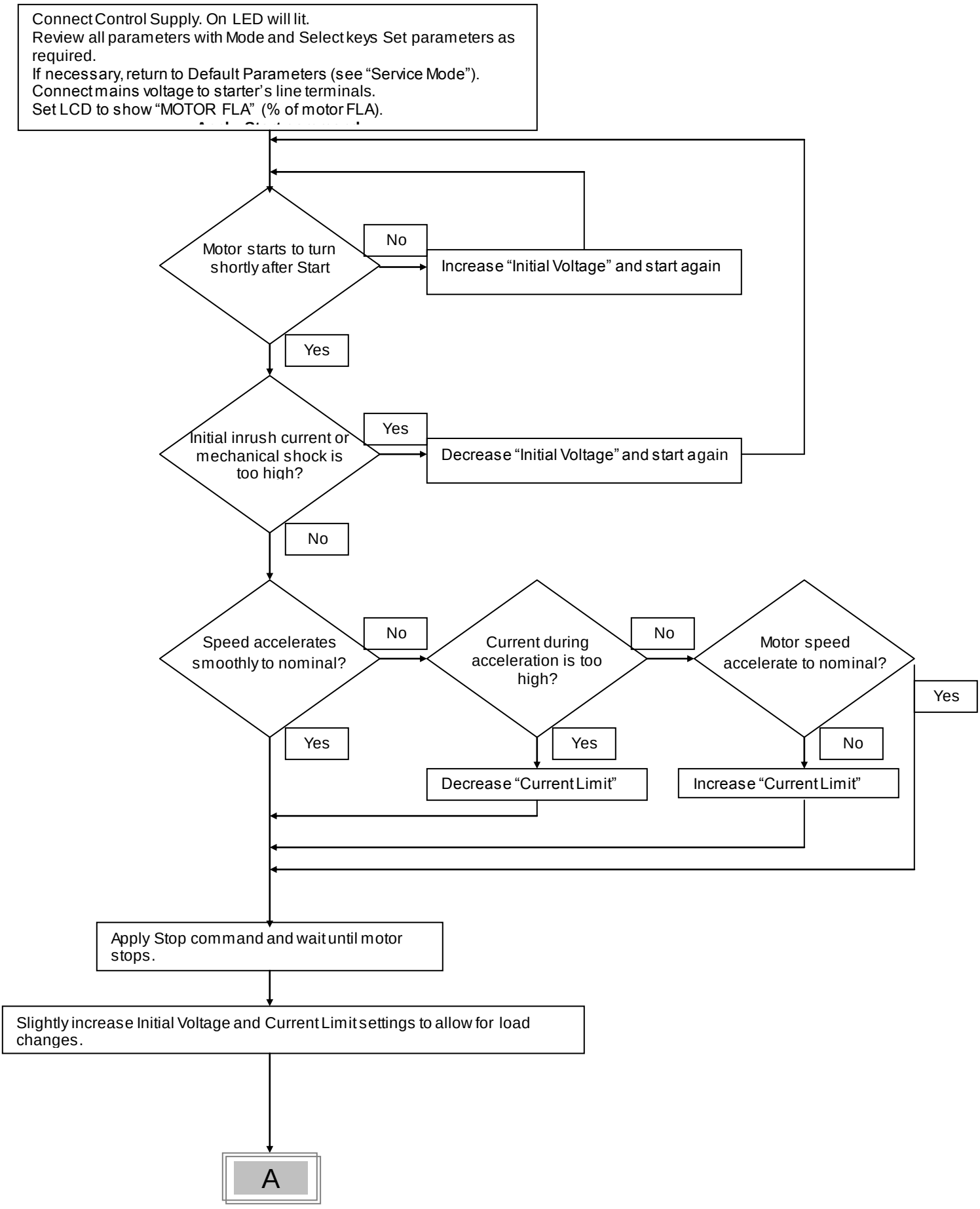
Dip Switch No.	4-20 mA*	0-20 mA	0-10VDC
Dip-Sw. S401A	On	On	Off
Dip-Sw. S401B	On	On	Off
Dip-Sw. S401C	Off	Off	On
Dip-Sw. S401D	Off	Off	On
Dip-Sw. S402A	On	Off	Off
Dip-Sw. S402B	No use	No use	No use

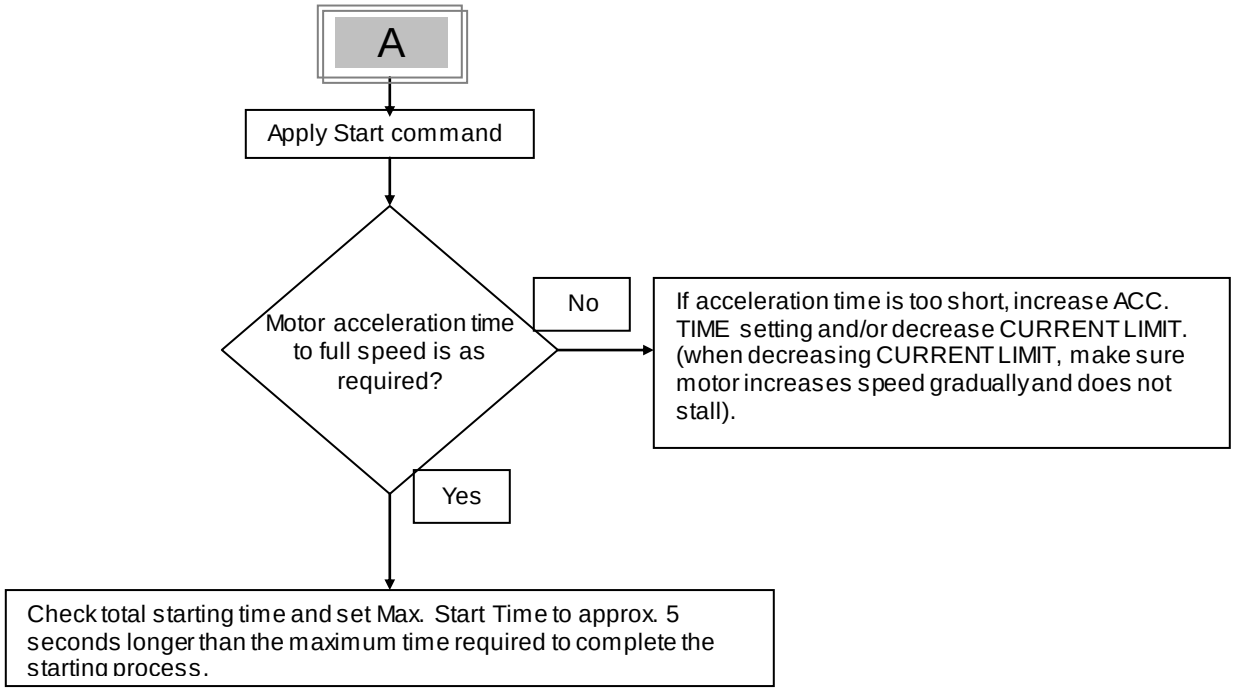
* Factory default setting

Notes:

- It is important that the RVS-DXM is properly grounded and control module is tightly fastened to the power section.
- Use twisted shielded cable for thermistor connection.

8.3 **Standard starting procedure**

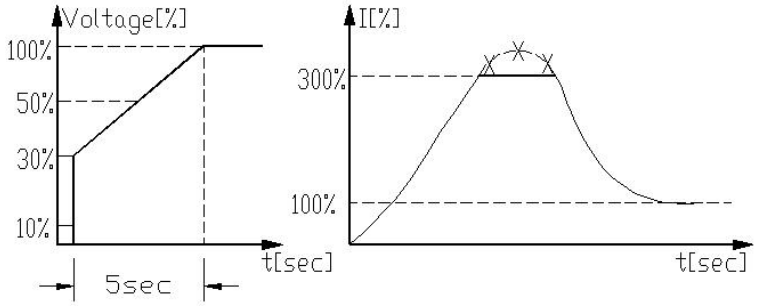




8.4 Examples of starting curves

8.4.1 ***Light Loads-Pumps, Fans, etc.***

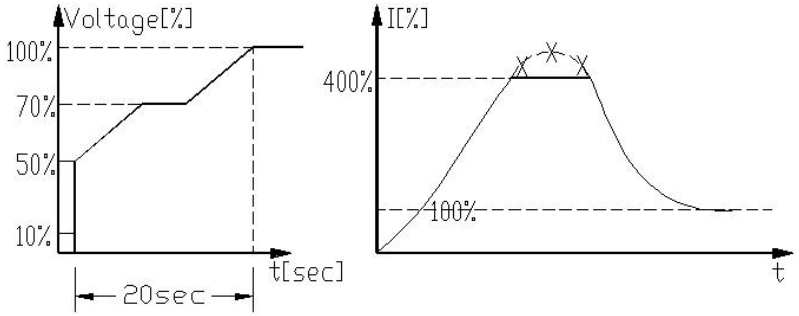
INITIAL VOLTAGE – set to 30% (Factory Default)
CURRENT LIMIT – set 300%
ACCELERATION TIME – set 5 sec



Voltage quickly increases to the INITIAL VOLTAGE value and then gradually ramps-up to nominal. Current simultaneously and smoothly increases to reach CURRENT LIMIT setting or less, before smoothly decreasing to the operating current. Motor speed will accelerate to full speed quickly and smoothly.

8.4.2 ***High Inertia Loads – Fans, Centrifuges, etc***

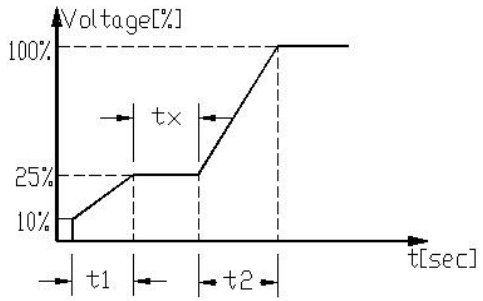
INITIAL VOLTAGE – set 50%
CURRENT LIMIT – set 400%
ACCELERATION TIME – set 20 sec



Voltage and current increase until current reaches CURRENT LIMIT. The voltage is held at this value until motor is close to nominal speed, then current will begin to decrease. The RVS-DXM continues to ramp-up the voltage until reaching nominal. Motor speed smoothly accelerates to full speed.

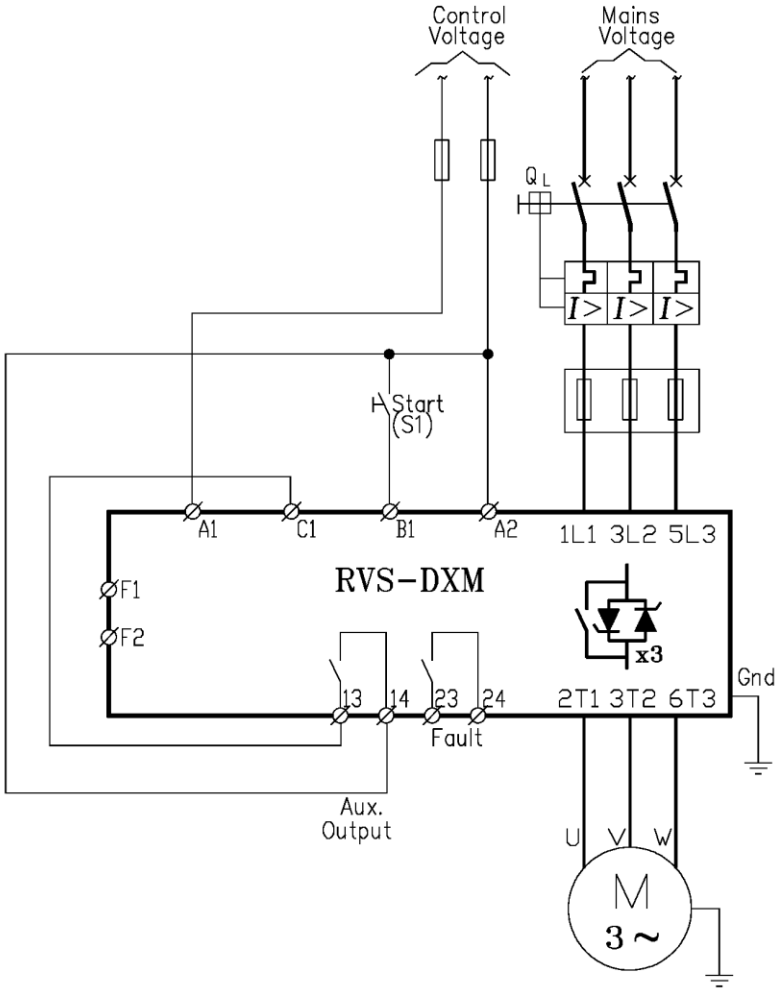
8.4.3 ***Special starting – Using Dual Adjustment***

For using DUAL ADJUSTMENT automatically, connect AUX. RELAY in series to Aux. Input as shown in section 8.4.3.1 on page 58.
Program PROG. AUX. RELAY to IMMEDIATE and program RELAY ON DELAY to tx.
Program PROG. INPUT C1 to DUAL ADJUSTMENT.
Program Standard parameters and DUAL ADJUSTMENT parameters as shown in the table below.
Using t o starting characteristics, the starter will accelerate to reach 200% current limit. After tx (PROG. AUX. RELAY DELAY) voltage to PROG. INPUT C1 is switched on, using the DUAL ADJUSTMENT characteristic to complete acceleration.
Useful to prevent initial high acceleration. (Applications: Submersible pumps, Drum fans with resonating frequency, etc).



	Standard Parameter	Dual Adjustment Parameter
INITIAL VOLTAGE	10%	25%
ACCELERATION TIME	t1 = 2-30 sec	t2 = 2-30 sec
CURRENT LIMIT	200%	300-400%
PROG. AUX. RELAY DELAY	tx = 1-60 sec.	-----

8.4.3.1 *Special starting – Using Dual Adjustment – wiring scheme*



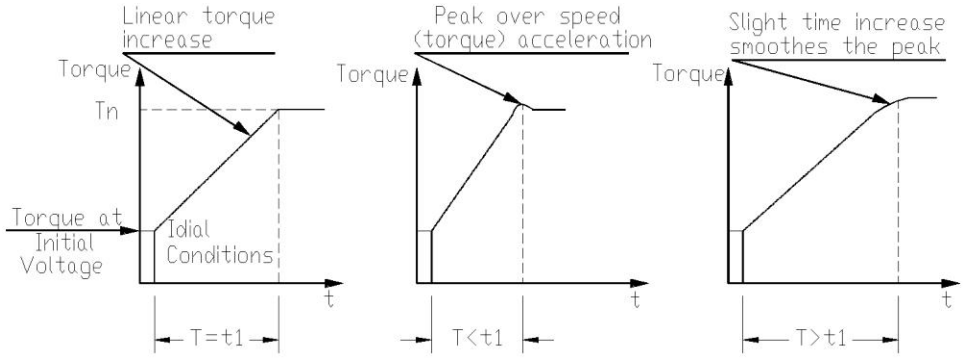
Notes:

(1) - Program PROG. INPUT C1 to DUAL ADJUST
(2) - Program PROG. AUX. RELAY to IMMEDIATE and program RELAY ON DELAY to tx.
Refer to section 7.6.9 on page 46 for details on I/O programming.

8.4.4 ***Choosing a suitable Pump Curve (centrifugal Pumps)***

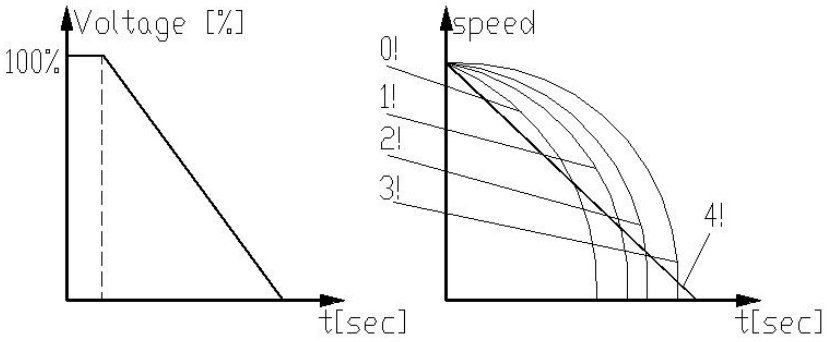
8.4.4.1 *Starting Curve*

- Adjust MAIN PARAMETERS as necessary (FLA, FLC, etc..)
- Set STARTING CURVE, ACCELERATION TIME, CURRENT LIMIT, and INITIAL VOLTAGE to their default values (curve 0, 10 sec., 400% and 30% respectively).
- Start the pump while watching the pressure gauge as the pump starts and look for overshooting ("Pressure Surge") of the gauge needle above the target pressure. In case of over pressure, choose a peak torque reduction curve (Pump Control curve 1!).
- Set START CURVE 1!, increase ACCELERATION TIME to 15 seconds and reduce CURRENT LIMIT to 350%. Start the pump and watch the pressure gauge while the pump starts.
- In most cases, overshooting is reduced. If the overshoot persists, increase ACCELERATION TIME to 25 seconds (confirm with motor manufacturer) and try again.
- If the overpressure persists, increase START CURVE setting to 2!, or 3!, if necessary. Each increase in START CURVE setting will reduce the Peak Torque, thus, reducing the overpressure and preventing the "Pressure Surge" during start.
- To increase starting time above these maximums, employ "Special Starting" for these techniques (Consult factory).



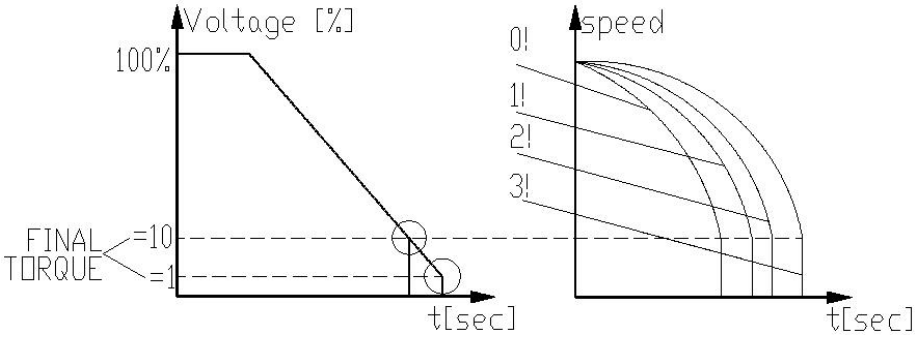
8.4.4.2 Stopping Curve

- Adjust MAIN PARAMETERS as necessary (FLA, FLC, etc..)
- Set STOP CURVE and DECELERATION TIME, to their default values (curve 0, 10 sec., respectively).
- Stop the pump, watching the pressure gauge and check valve as the pump stops. Look for overshooting ("Water Hammer") of the gauge (abruptly stops the pump and the motor).
- Select STOP CURVE 1, increase DECELERATION TIME to 15 seconds. Stop the pump and watch the pressure gauge and the rate of closing of the check valve as the pump stops. Abrupt stopping of the pump and motor will cause a loud audible noise emitted from the check valve.
- In most cases, "Water Hammer" is reduced. If the "Water Hammer" persists, increase the time to 25 seconds (confirm with motor manufacturer) and try again.
- If the "Water Hammer" persists, increase STOP CURVE setting to 2!, or 3!. Each increase in STOP CURVE will reduce the abrupt stop of the pump, thus, preventing the "Water Hammer" phenomenon.



8.4.4.3 Final torque during soft-stopping a pump motor

While decelerating, the check valve may close before DECELERATION TIME has elapsed, thus, allowing current to flow through stator winding causing unnecessary heat. Select FINAL TORQUE sensitivity to 1, and stop the pump, confirm that current stopped flowing through the motor shortly after the check valve closed. If current still flows more than 3-5 seconds after check valve closure, increase FINAL TORQUE up to 10 if necessary, to stop current flow earlier



9. TROUBLE SHOOTING

Upon fault – motor stops, *Fault* LED lights and Fault Relay operates. The LCD shows TRIP: and fault description. (for example: TRIP: UNDER CURRENT).

Fault Massage	Cause and trouble shooting
TOO MANY STARTS	Trips the starter if number of starts, during START PERIOD exceeds the preset number. *Wait until motor and starter cool down – according to START INHIBIT setting.* *For more information on adjusting START PERIOD and START INHIBIT refer to section 7.6.4 on page 35.*
LONG START TIME	Trips the starter if output voltage does not reach nominal at the present MAX. START TIME. *Check FLA, FLC, and MAX START TIME settings. Increase INITIAL VOLTAGE, CURRENT LIMIT & MAX. START TIME or decrease ACCELERATION TIME as necessary.* *For more information on FLC & FLA refer to section 7.6.3 on page 31 (MAIN PARAMETERS).* *For more information on adjusting START PARAMATERS refer to section 7.6.4 on page 35.*
O/C – SHEAR PIN	Trips the starter when: Instantaneously when current exceeds 8.5 x Starter FLC. (not programmable) During starting when current exceed 8.5 x Motor FLA. (not programmable) During running when current exceeds 100-850%.(programmable value) O/C Shear-Pin has a programmable delay of 0-5 seconds where the starter detects the fault and does not trip before time delay has elapsed (delay is override when current reaches 8.5 x Starter FLC). *Check that motor is not installed or Jammed.* *Check FLA, FLC settings.* *Check motor and cable connections.* *Perform a "Megger" test to verify motor and cable's condition.* *For more information on FLC,FLA & O/C – SHEAR PIN refer to section 7.6.3 on page 31 (MAIN PARAMETERS).* CAUTION Check that "Meger" maximum voltage is no more than 500V !!
O/C or WRONG CON.	Trips the soft RVS-DXM when connected Inside Delta and Wrong connection or if over current is detected by the RVS-DXM. *Verify that the motor is not stalled or shorted and check cables and wiring.* *Verify that motor and RVS-DXM are connected exactly as shown in section 4.5.3.2 page 14.* *If circuitry is 100% confirmed it is possible to start when WIDER SETTINGS are ENABLED. Refer to* section 7.6.7 page 42. *If a fault occurs again consult the factory. The operator is advised to try operating one time only. Note that it is useless to try starting in this mode more than once.*
OVERLOAD	Trips the starter when current exceed the OVERLOAD TRIP level and thermal register has filled up. *Check FLA, FLC and Overload settings, check motor current, wait 15 minutes to let motor and starter cool down before restarting.* *For more information on FLC, FLA & OVERLOAD settings refer to section 7.6.3 on page 31 (MAIN PARAMETERS).*

Fault Massage	Cause and trouble shooting
UNDER CURRENT	Trips the starter when line current drops below the preset level for the preset time. *Check UNDER CURRENT TRIP and TIME DELAY settings, check line currents through L1, L2, L3.* *For more information on UNDER CURRENT settings refer to section 7.6.3 on page 31 (MAIN PARAMETERS).*
UNDER/NO VOLTAGE	Trips the starter when line voltage drops below the preset level for the preset time. *Check UNDER VOLTAGE TRIP and TIME DELAY settings, check line voltages on L1, L2, L3. When voltage drops to zero, the starter trips immediately with no delay.* For more information on UNDER VOLTAGE settings refer to section 7.6.3 on page 31 (MAIN PARAMETERS).
OVER VOLTAGE	Trips the starter when line voltage increases above a preset level for a preset time. *Check OVER VOLTAGE TRIP and TIME DELAY settings, check line voltage on L1, L2, L3.* *For more information on OVER VOLTAGE settings refer to section 7.6.3 on page 31 (MAIN PARAMETERS).*
PHASE LOSS	Trips the starter if 1 or 2 phases are missing. • *Check voltages are within the required range voltages and frequency is within the range of 45-65Hz.* • *If all previous actions are do not solve the problem and the you are sure that no real phase loss exists, you can set PHASE LOSS Y/N protection to NO. This situation can occur in rare cases when there is no real fault but the RVS-DXM recognizes unusual behaviour like when Total Harmonic Distortion in Voltage (THDV) in the network is high.* • *If this is a true case of PHASE LOSS then after setting PHASE LOSS Y/N protection to NO the motor will single phase and most likely be tripped by the over load protection mechanism.* • *Phase loss might not be detected in motor operating under a light load.* *For PHASE LOSS protection setting refer to section 7.6.8 page 44.*
PHASE SEQUENCE	Trips the starter if line phase sequence is wrong. *Check line phase sequence, and if wrong, swap two wires on line side. If motor now rotates in the wrong direction, swap two wires on load side.*
S. SCR OR WR. CONNECTION	Trips the starter when one or more motor phases are not properly connected to starter's load terminals, in case of internal disconnection in motor winding or if any SCR is short-circuited or when motor windings are shorted. *Check with an ohmmeter between L1-U, L2-V, L3-W; resistance > 20 KΩ.* *Check for no voltage on terminals U, V, W (from parallel system or an independent bypass). SCRs may fail due to:* ▪ *High short current not protected by proper fuses* ▪ *High voltage spikes not protected by proper external Varistors.* ▪ *Frequent starting at maximum conditions or fault conditions.* *If required, may be eliminated by using generator mode (programming AUX. IN PROG INPUT parameters accordingly)* *For more information on programming AUX. IN PROG INPUT refer to section 7.6.9 on page 46(I/O PROGRAMMING PARAMETERS).* ***Note**:* *Shorted SCR and Wrong Connection faults are not active in Generator mode.*

Fault Massage	Cause and trouble shooting
OVER TEMPERATURE	Heat-sink over-temperature. Trips the starter when heat-sink temp. rises above 85˚C. *Check that motor starting is not too frequent.*
EXTERNAL FAULT **In MAXIMIZED display Mode**	Trips the starter when a N.O contact between Aux. input terminals 13, 14 closes for over two seconds. *Check contact position and cause of closure.* *For more information on programming AUX. IN PROG INPUT refer to section 7.6.9 on page 46(I/O PROGRAMMING PARAMETERS).*
SLOW SPEED TIME	Slow speed time is exceeded. *Check the settings of MAX SLOW SP TIME.* *For more information on programming MAX SLOW SP TIME refer to section 7.6.7 on page 42 (SPECIAL FEATURES PARAMETERS).* ***Note:*** *Motor and RVS-DXM may be overheated when operating at slow speed for an extended period.*
WRONG PARAMETERS	Parameters not transferred from RAM to EEPROM or vice versa. After replacing the EPROM with a new software version or after power up. *Press MODE and ▼ simultaneously, than press STORE and MODE simultaneously. By doing that, you are loading factory defaults to the RVS-DXM. Now program all parameters into the RVS-DXM like in a first start-up procedure.* *(If Fault LED is on, press **Reset** after WRONG PARAMETERS).*
MODBUS TIME OUT	If no valid Modbus communication during MODBUS TIME OUT, the RVS_DXM will trip. Trip occurs only if the following conditions exist: • SER. LINK CONTROL is set to ENABLE • SERIAL LINK NO. is not set to OFF *For MODBUS TIME OUT settings refer to section 7.6.10 page 48.*
COMM. PORT FAILED	Trips the RVS-DXM if, when controlled via Profibus communication link, the communication cable is torn or the communication from the PLC is lost. Note that the occurrence of this fault depends on then “Watch Dog” function of the Profibus controller. *You must reconnect the wiring and/or the communication with the PLC and wait for a start command initiated by the PLC.*
FREQUENCY	Trips the soft starter when mains voltage frequency is not within the limits of 45-65Hz. *Check mains frequency*.

9.1 Blank RMA Form

Return Material Authorization Form-"RMA" - Fault Report – Non/ Warranty Claim

After Sales Service Department
E-mail: tech.support@solcon.com Tel. + 972 – 77-7711130, 972-77-7711123 Fax. + 972 – 77-7711140

Equipment Model:			
Equipment Serial no.:			
Report date			
Date of equipment sale		Date of installation	
Representing Firm			
Contact person			
Telephone number		Fax number	
Email address			
Application			
Starter Rating			
Motor current rating (motor Label)			
Number of starts per hour			
Special installation / ambient factors (°C)			
Type of Fault Reported & time of occurrence (during start, after start, during soft stop, end of soft stop, ON B.P. closing, when …			
Last Start Period		Total Number Of Trips	
Last Start Max. I		Starter FLC	
Total Run Time		Motor FLC	
Total Number Of Starts		Initial Voltage	
Last Trip		Acceleration Time	
Trip Current		Current Limit	
Remarks			
By Distributor: We declare that product has been correctly applied, installed and operated, in accordance with Solcon's written instructions, appropriate codes, regulations and good practice, within the limits of rated capacity and normal usage.		Warranted repair/replacement	

To be completed By Solcon Service Dept.:

Return Material Authorization Number	
Date	
Authorized by	

10. TECHNICAL SPECIFICATIONS

Supply Voltage	Line to Line 208-600V (to be specified) + 10%-15% for all models
Frequency	45 – 65 Hz (Fixed or variable frequency source)
Control Supply	115V or 230V (to be specified) +10% - 15%
Load	Three phases, three wires, squirrel cage induction motor.

Start-Stop Parameters:

Starter FLC	Starter's Full Load Current, according to Selector Guide
Motor FLA	Motor Full Load Ampere 50-100% of Starter FLC (Full Load Current).
Pump and Torque Control Curves	Field selectable curves preventing Over-pressure during start and Water Hammer during stop.
Pulse Start Duration	A pulse of 80% Un, adjustable range 0.1-1 Sec, for starting high friction loads.
Initial Voltage,	5-80% Un
Initial Current	100-400% of Motor FLA
Current Limit	100-500% of Motor FLA
Acceleration Time	1-90 Sec
Deceleration Time	1-90 Sec

Motor Protection:

Too Many Starts	Maximum number of starts, range: Off or 1-10, during a time period 1-60 min.
Starts inhibit	Period of 1-60 min, during which starting is prevented, after Too Many Start fault.
Long Start Time (Stall protection)	Maximum allowable starting time 1-30 sec. (1-250sec. in WIDER SETTINGS)
Over Current (Shear-pin)	Two operation functions: during starting trips the starter at 850% and during running at 100-850% In, both within 1 Cycle (after internal delay).
Electronic Overload (I^2t)	Adjustable IEC and MEMA curves.
Under Current	Trips when current drops below 20-90% In, time delay 1-40 sec.
Under Voltage*	Trips when main voltage drops below 50-90%, time delay 1-10 Sec
Over Voltage	Trips when main voltage increase above 110-125%, time delay 1-10 sec.
Phase Loss, Under/Over Frequency*	Trips when one or two phases are missing and frequency is 45Hz. or 65Hz.
Phase Sequence	Trips when phase sequence is wrong
Shorted SCR or Wrong connection	Prevents starting, trips if motor is not connected / incorrectly connected to the starter, or in case one or more SCRs have been shorted
Heat Sink Over temp	Trips when heat-sink temperature rises above 85˚C.
External fault	Trips when an External Contact closes for 2 sec.

* With optional Auto Reset.

Control:

Displays	LCD in 4 – Field selectable languages and 4 LEDs.
Keypad	6 keys for easy setting
Fault Contact	2 Contacts, 8A, 250VAC, 2000VA
Aux. Contact – Imm. or End Of Acc.	2 Contacts, 8A, 250VAC, 2000VA

Temperatures:	Operating -10˚ to 50˚C. For higher ratings consult factory.
	Storage -20˚ to 70˚C

Standards:

Dielectric Test		2500VAC	
Degree of Protection		IP 20 for frame size D1, IP 00 for frame sizes D2-D5	
EMC	Emissions	EN 55011	CISPR 11 Class A
	Immunity	EN 55082-2	ESD 8KV air, IEC 801-2
			Electric RF field 10 V/m, 20-1000MHz, IEC 801-3
			Fast transients 2KV, IEC 801-4
	Safety	EN 600947-1	Related to safety requirements.
		Designed and assembled to conform with UL508C	

Normal Service Conditions:

Altitude	Up to 1000m. For equipment to be used at higher altitudes consult Factory.
Humidity	95% at 50˚C or 98% at 45˚C.

Control Power Consumption

The approx. consumption of RVS-DXM soft starters is as follows:

Model	Electronic	Optional fan module consumption
210	35VA	50
240	35VA	50
310	35VA	50
360	35VA	50
414	35VA	50
477	35VA	50
515	50VA	50
590	50VA	50
720	50VA	50
840	50VA	50
960	62VA	110*
1100	62VA	110*

Note : In RVS-DXM 960A and 1100A models fans must be fitted.

Notes: