



# USER MANUAL

# Contents

| 1        |      | About This Manual                                 | 3   |
|----------|------|---------------------------------------------------|-----|
|          | 1.1  | User Manual Version                               | 3   |
|          |      |                                                   |     |
| 2        |      | Caution Statements                                | 4   |
| 3        |      | General Description                               | 6   |
| 5        | 31   |                                                   | 6   |
|          | 3.1  | Eastura List                                      |     |
|          | 3.2  | Key Features                                      | 7   |
|          | 3.5  | Nodel Code                                        | 8   |
| <u> </u> | 5.1  |                                                   |     |
| 4        |      | Specifications                                    | 9   |
| •        | 4    | Kay Components                                    | 9   |
|          | 40   | Dimensions and Weights                            | 10  |
|          | 43   | Conoral Technical Data                            | 11  |
|          | 4.4  | Panel Specifications                              | 13  |
|          | 1.1  |                                                   | .15 |
| 5        |      | Receiving and Storage                             | 16  |
| 5        | 5 1  | Possiving                                         |     |
|          | 5.1  | Cetomgo                                           | .16 |
|          | J.Z  | Storage                                           | .16 |
| 6        |      | Installation                                      | 17  |
| 0        |      |                                                   |     |
|          | 6.1  | Clearance Requirements                            | .17 |
|          | 6.2  | Foundation Requirements                           | .18 |
|          | 6.3  | Fastening Panels to the Foundation                | .19 |
|          | 6.4  | Earth Termination                                 | .20 |
|          | 6.5  | Assembling the Switchgear Line-up                 | .21 |
|          | 6.6  | Mounting Instructions - Power Assembly            | .23 |
|          | 6./  | Mounting Instructions - Controller                | .25 |
|          | 6.8  | Power Terminations                                | .26 |
|          | 6.9  | Earth Terminations                                | .28 |
|          | 6.10 |                                                   | .28 |
|          | 6.11 | VViring Terminations on the Controller            | .28 |
|          | 6.1Z | Vviring Terminations on the Power Interface Board | .27 |
|          | 6.13 | Ground Current                                    | .30 |
|          | 6,14 | Power Circuits                                    | .51 |
| 7        |      | Internal Wiring XIO                               | 34  |
| ~        |      |                                                   | 22  |
| 8        |      | Keypad and Feedback                               | 37  |
|          | 8.1  | The Controller                                    | .37 |
|          | 8.2  | Menu Shortcuts                                    | .37 |
|          | 8.3  | Displays                                          | .37 |
| ~        |      |                                                   |     |
| 9        |      | Configuration                                     | 38  |
|          | 9.1  | Programming Menu                                  | .38 |
|          | 9.2  | Standard Menu                                     | .39 |
|          | 9.3  | Extended Menu                                     | .40 |
|          | 9.4  | Load/Save Settings                                | .43 |
|          | 9.5  | Parameter Descriptions                            | .43 |
|          |      |                                                   |     |
| 10       |      | Commissioning                                     | 5/  |
|          | 10.1 | Commissioning Menu (Tools)                        | .57 |
|          | 10.2 | Set Date and Time                                 | .57 |
|          | 10.3 | Simulation Tools                                  | .57 |
|          | 10.4 | Input/Ouput Status                                | .59 |
|          | 10.5 | Reset Thermal Models                              | .60 |

# CONTENTS

|    | 10.6 | Low Voltage Test Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |
|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|    |      | Monitoring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 67  |
|    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (2) |
|    | 11.1 | Logs Menu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 02  |
| 12 |      | Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 64  |
|    | 12.1 | Start, Stop and Reset Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |
|    | 12.2 | Using the Soft Starter to Control a Motor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |
|    | 12.3 | Using the MVS to Control a Slip-Ring Motor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
|    | 12.4 | Operating States                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |
|    | 12.5 | Notor Protection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |
|    | 12.6 | Operating Feedback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |
| 13 |      | Troubleshooting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 72  |
|    | 13.1 | Protection Responses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |
|    | 13.2 | Trip Messages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |
|    | 13.3 | General Faults                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |
| 14 |      | Maintonanco                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 78  |
| 17 | 141  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 70  |
|    | 14.1 | Salety                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |
|    | 14.2 | Maintenance Schedule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |
|    | 14.3 | The second large and the second secon |     |
|    | 14.4 | i nermai image                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |
|    | 14.5 | Contactor Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 70  |
|    | 14.0 | Isolation Switch Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |
|    | 14.7 | Blasse Arms Assembly Alizament (meddel) (12)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |
|    | 14.8 | Phase Arm Assembly Alignment (model VI3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |
|    | 14.7 | Removing Flidse Arms (model vis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 01  |
| 15 |      | Appendix                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 83  |
|    | 15.1 | Parameter Defaults                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|    | 15.2 | Accessories                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |

# I About This Manual

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.



WARNING Indicates a hazard that may cause personal injury or death.



CAUTION

Indicates a hazard that may damage the equipment or installation.



Provides helpful information.

# I.I User Manual Version

NOTE

This user manual (710-13937-00C) is compatible with MVS soft starters using version 1.29 control software and version 2.30 interface software. For other software versions, please contact AuCom for the correct user manual.

The control software version is displayed on the Controller screen at power up.

Ready

Welcome 1.05 / 1.29 / 2.30

Software versions: Controller, control software, interface software

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# 2 Caution Statements

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is the installer's responsibility to read and understand all instructions in this manual prior to installing, operating or maintaining the equipment, to follow good electrical practice including applying appropriate personal protective equipment and to seek advice before operating this equipment in a manner other than as described in this manual.

- Read and understand the entire manual before installing operating, or maintaining the MVS. Follow all applicable local and national codes.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- Use only electrically insulated tools and clothing and insulated protective gear when working around electrical equipment.
- Disconnect all power and ensure that the MVS is de-energised before servicing the equipment.
- Do not rely on visual indications such as switch position or fuse removal for determining a de-energised condition. Always assume that a terminal is energised until it is checked with a properly rated meter to ensure that a terminal is de-energised and grounded.
- Isolate the MVS completely from the power supply before attempting any work on the MVS or motor.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before servicing the MVS, ensure that all static charge has been discharged by grounding it with an appropriate grounding device.
- Metal swarf in the cabinet can cause equipment failure.
- Do not apply voltage to the control input terminals. These are active 24 VDC inputs and must be controlled with potential free contacts.
- Contacts or switches operating the control inputs must be suitable for low voltage, low current switching (ie gold flash or similar).
- Cables to the control inputs must be segregated from mains voltage and motor cabling.
- Some electronic contactor coils are not suitable for direct switching with PCB mount relays. Consult the contactor manufacturer/supplier to confirm suitability.



### WARNING - ELECTRICAL SHOCK HAZARD

The MVS contains dangerous voltages when connected to mains voltage. Only a qualified electrician should carry out the electrical installation. Improper installation of the motor or the MVS may cause equipment failure, serious injury or death. Follow this manual and local electrical safety codes.



### SHORT CIRCUIT

The MVS is not short circuit proof. After severe overload or short circuit, the operation of the MVS should be fully tested by an authorised service agent.



# GROUNDING AND BRANCH CIRCUIT PROTECTION

It is the responsibility of the user or person installing the MVS to provide proper grounding and branch circuit protection according to local electrical safety codes.



### ARC FLASH HAZARD

Medium voltage equipment has a potential risk of arc flash. When insulation or isolation between electrified conductors is breached or can no longer withstand the applied voltage, a short circuit occurs through the air. This may cause a phase-to-ground and/or a phase-to-phase fault.

Although unlikely, arc fault can be caused by:

- Contamination in the insulation caused by deterioration over time
- Inadequate insulation system on cable terminals
- Overvoltage
- Incorrect protection coordination settings
- Overheating of the contact area, due to incorrect tightening of connections
- Introduction of foreign matter, including swarf, vermin, tools or maintenance equipment left in the starter

AuCom medium voltage equipment has been designed to mitigate an arc fault, however it is the responsibility of the site engineer to ensure that personnel are protected from serious injury that may result from an arc fault.



# STORAGE

The MVS must be stored in its original packaging in a clean and dry environment. The MVS should be unpacked only after the equipment room is ready for installation. Particular care should be taken to avoid exposure of the electronics to cement and/or concrete dust.

# **3** General Description

# 3.1 Overview

The MVS provides compact and robust soft start solutions for control of medium voltage motors. MVS soft starters provide a complete range of motor and system protection features and have been designed for reliable performance in the most demanding installation situations.

The two primary components of a MVS soft starter are:

- a power assembly
- a controller module

The power assembly and controller module are supplied as a pair and share the same serial number. Care should be taken during installation to ensure that the correct controller and power assembly are used together.

# 3.2 Feature List

### Starting

- Constant Current
- Current Ramp

### Stopping

- Coast To Stop
- Soft stop

### Protection

- Undervoltage / Overvoltage
- Mains frequency
- Phase sequence
- Shorted SCR
- Motor Overload (thermal model)
- Instantaneous Overcurrent (two stages)
- Time-overcurrent
- Ground Fault
- Undercurrent
- Current Imbalance
- Motor thermistor
- Excess Start Time
- Power circuit
- Auxiliary trip

### Extensive input and output options

- Remote control inputs
  (3 × fixed, 2 × programmable)
- Relay outputs (3 × fixed, 3 × programmable)
- Analog output (1 × programmable)
- Serial port (with module)

# Comprehensive feedback

- Starter status LEDs
- Date and time stamped event logging
- Operational counters (number of starts, hours-run, kWh)
- Performance monitoring (current, voltage, power factor, kWh)
- User-programmable monitoring screen
- Multi-level password protection
- Emergency stop pushbutton

### Power connection

- 50 A to 500 A, nominal
- 2300 VAC to 13800 VAC

# Accessories (optional)

- Communication modules: Ethemet (Profinet, Modbus TCP, Ethemet/IP), Profibus, DeviceNet, Modbus RTU, and USB
- Synchronous motor control
- PC software
- Overvoltage protection
- Control supply transformer
- MV/LV Control transformer

# 3.3 Key Features

MVS soft starters offer several special functions to ensure ease of use and to provide optimal motor control in all environments and applications.

### Customisable Protection

The MVS offers comprehensive protection to ensure safe operation of the motor and soft starter. The protection characteristics can be customised extensively to match the exact requirements of the installation.

Use 4 Protection Settings on page 45 to set the conditions in which each protection mechanism will activate.

**Example:** use parameter 4C *Undercurrent* to set the level for an undercurrent trip and parameter 4D *Undercurrent Delay* to set a delay on the trip.

Use *16 Protection Action* on page 56 to select the soft starter's response when a protection mechanism activates. Each protection can be set to trip the starter, activate a warning flag, or be ignored. All protection activations are recorded in the event log, regardless of the protection class setting.

**Example:** Use parameter 16C *Undercurrent* to select the response for an undercurrent trip (trip, warn or write to log). The default response is trip.

| r |   |
|---|---|
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| I | _ |
| I | _ |
|   | _ |

### NOTE

MVS soft starters have built-in trip points to ensure operation remains within the soft starter's capability. These internal trips cannot be overridden. Certain faults within the MVS will also prevent the soft starter from operating. Refer to *Troubleshooting* on page 72 for details.

### Advanced Thermal Modelling

Intelligent thermal modelling allows the soft starter to predict whether the motor can successfully complete a start. The MVS uses information from previous starts to calculate the motor's available thermal capacity, and will only permit a start which is predicted to succeed.

This feature can be enabled or disabled using parameter 4N Motor Temperature Check.

### Comprehensive Event and Trip Logging

The MVS has a 99-place event log to record information on soft starter operation. A separate trip log stores detailed information about the last eight trips.

#### Informative Feedback Screens

A digital display screen allows the MVS to display important information clearly. Comprehensive metering information, details of starter status and last start performance allow easy monitoring of the starter's performance at all times.

### Dual Parameter Set

The MVS can be programmed with two separate sets of operating parameters. This allows the soft starter to control the motor in two different starting and stopping configurations.

The secondary motor settings (parameter groups 9 and 10) are ideal for conventional (squirrel-cage) motors which may start in two different conditions (such as loaded and unloaded conveyors).

| Г |   |   | ヽ   |
|---|---|---|-----|
|   | _ | _ | • • |
|   | _ | _ |     |
|   | _ | _ |     |
|   | _ |   |     |
|   |   |   |     |
|   | _ |   |     |

#### NOTE

MVS soft starters are not suitable for controlling two separate motors. The secondary parameter set should only be used for a secondary configuration of the primary motor.

The MVS will use the secondary motor settings to control a start when instructed via a programmable input (refer to parameters 6A and 6F, *Input A or B Function*).

### Fibre Optics

The MVS uses two-line fibre optic connections between the low voltage control module and the high voltage power assembly for electrical isolation. This fibre optic link simplifies installation of chassis mount MVS starters into custom panels.

# 3.4 Model Code



# 4 Specifications

# 4.1 Key Components

Key Components (models V02 ~ V07)



Key Components (model VI3)



|   | Control transformer            |
|---|--------------------------------|
| 2 | Control voltage terminal block |
| 3 | Power interface board          |
| 4 | Phase arm (x3)                 |
| 5 | Power assembly                 |

| 1 | Phase arm                      |  |  |  |  |
|---|--------------------------------|--|--|--|--|
| 2 | Control voltage terminal block |  |  |  |  |
| 3 | Power interface board          |  |  |  |  |
| 4 | Phase arm                      |  |  |  |  |
| 5 | Controller                     |  |  |  |  |
| 6 | Phase arm                      |  |  |  |  |

#### 4.2 **Dimensions and Weights**

Models V02 ~ V07 (Power Assembly)

C' 1



| Front view  |              | Side view    |              |              | Phase arm extended |               |              |              |                          |                               |
|-------------|--------------|--------------|--------------|--------------|--------------------|---------------|--------------|--------------|--------------------------|-------------------------------|
|             | A            | В            | С            | a            | b                  | с             | d            | e            | Weight<br>(phase<br>arm) | Weight<br>(power<br>assembly) |
|             | mm<br>(inch) | mm<br>(inch) | mm<br>(inch) | mm<br>(inch) | mm<br>(inch)       | mm<br>(inch)  | mm<br>(inch) | mm<br>(inch) | kg<br>(lb)               | kg<br>(lb)                    |
| MVSxxxx-V02 | 770          | ((0          | //7          | 750          | (50                | (50           | 1202         | E 2 I        | 20                       |                               |
| MVSxxx-V03  | (30.4)       | 669<br>(263) | 667<br>(263) | (29.5)       | 658<br>(25.9)      | 650<br>(25.6) | (513)        | (20.9)       | (63.9)                   | (363.8)                       |
| MVSxxx-V04  | (30.1)       | (20.5)       | (20.5)       | (27.5)       | (23.7)             | (23.0)        | (31.3)       | (20.7)       | (05.7)                   | (505.0)                       |
| MVSxxxx-V06 | 832          | 875          | 817          | 810          | 864                | 800           | 1559         | 551          | 44                       | 217                           |
| MVSxxx-V07  | (32.8)       | (34.5)       | (32.2)       | (31.9)       | (34.0)             | (31.5)        | (61.4)       | (21.7)       | (97)                     | (478.4)                       |



# NOTE

For models MVSxxxxV02 to MVSxxxxV04, these dimensions apply up to 321 A. For the same models with current ratings of 500 A, the MVSxxxxV06 dimensions apply.

# Model VI3 (Power Assembly)







Front view

Phase arm extended

|            | A      | В      | С      | a      | b      | С      | d      | e      | Weight<br>(phase<br>arm) | Weight<br>(power<br>assembly) |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------------------|-------------------------------|
|            | mm     | kg                       | kg                            |
|            | (inch) | (lb)                     | (lb)                          |
| MVSxxx-VI3 | 2225   | 1300   | 1175   | 2200   | 1150   | 1150   | 1785   | 510    | 127                      | 720                           |
|            | (87.6) | (51.2) | (46.3) | (86.6) | (45.3) | (45.3) | (70.3) | (20.1) | (279.9)                  | (1587)                        |

# Controller

The controller is suitable for use with all MVS soft starters.



Weight: 2.1 kg (4.63 lb)

| Ι | Control input LEDs |
|---|--------------------|
| 2 | Keypad             |

# 4.3 General Technical Data

### Supply

| Mains Voltage                                                |                               |
|--------------------------------------------------------------|-------------------------------|
| MVSxxxxV02                                                   | 2.3 kV Phase-phase            |
| MVSxxxxV03                                                   | . 3.3 kV Phase-phase          |
| MVSxxxxV04                                                   | 4.2 kV Phase-phase            |
| MVSxxxxV06                                                   | 6.6 kV Phase-phase            |
| MVSxxxxV07                                                   | 7.2 kV Phase-phase            |
| MVSxxxxVI3                                                   | 13.8 kV Phase-phase           |
| Rated Frequency (fr)                                         |                               |
| Rated lightning impulse withstand voltage $(U_{\bullet})$    |                               |
| MVSxxxxV02 ~ V04                                             |                               |
| MVSxxxxV06 ~ V07                                             |                               |
| MVSxxxxV13                                                   |                               |
| Rated power frequency withstand voltage ( $U_d$ )            |                               |
| MVSxxxxV02 ~ V04                                             | II.5 kV                       |
| MVSxxxxV06 ~ V07                                             |                               |
| MVSxxxxV13                                                   |                               |
| Rated normal current (I <sub>r</sub> )                       |                               |
| MVS0080-Vxx                                                  |                               |
| MVS0159-Vxx                                                  |                               |
| MVS0200-Vxx                                                  |                               |
| MVS0230-Vxx                                                  |                               |
| MVS0321-Vxx                                                  |                               |
| MVS0500-Vxx                                                  |                               |
| Rated short-time withstand current (symmetrical RMS) $(I_k)$ |                               |
| MVSxxxxV02 ~ V07                                             |                               |
| MVSxxxxVI3                                                   |                               |
| Form designation                                             | motor starter form 1          |
| Control voltage                                              |                               |
| MVSxxxxV02 ~ V07                                             | 30 or 220 ~ 240 VAC           |
| MVSxxxxVI3                                                   |                               |
| Rated Frequency                                              |                               |
| Typical power consumption                                    |                               |
| MVSxxxxV02 ~ V07                                             | 70 W continuous <sup>3</sup>  |
| MVSxxxxVI3                                                   | 100 W continuous <sup>3</sup> |
| Control Inputs                                               |                               |
| Start (C23, C24)                                             | 4 VDC, 8 mA approx            |
| Stop (C31, C32)                                              | 4 VDC, 8 mA approx            |
| Reset (C41, C42)                                             | 4 VDC, 8 mA approx            |
| Input A (C53, C54)                                           | 4 VDC, 8 mA approx            |
| Input B (C63, C64)                                           | 4 VDC, 8 mA approx            |
| Motor thermistor (B4, B5)                                    | Trip point > 2.4 k $\Omega$   |



NOTE

All control inputs are potential free. Do not apply external voltage to these inputs.

# SPECIFICATIONS

| Outputs                                                          |                                                                         |
|------------------------------------------------------------------|-------------------------------------------------------------------------|
| Outputs on power interface board                                 |                                                                         |
| Main contactor (13, 14)                                          | Normally Open                                                           |
| Bypass contactor (23, 24)                                        | Normally Open                                                           |
| Run Output/ PFC (33, 34)                                         | Normally Open                                                           |
| Fan control output (43, 44)                                      | Normally Open                                                           |
| Outputs on Controller                                            |                                                                         |
| Output Relay A (43, 44)                                          | Normally Open                                                           |
| Output Relay B (51, 52, 54)                                      | Changeover                                                              |
| Output Relay C (61, 62, 64)                                      |                                                                         |
| Analog output (BIO, BII)                                         |                                                                         |
| Characteristics                                                  |                                                                         |
|                                                                  |                                                                         |
|                                                                  |                                                                         |
|                                                                  | IOA@30 VDC resistive                                                    |
| Environmental                                                    |                                                                         |
| Degree of Protection                                             |                                                                         |
| Power Assembly                                                   |                                                                         |
| Controller                                                       | IP54/ NEMA 12                                                           |
| Operating temperature                                            | $\sim$ - 10 °C to + 40 °C, with derating to + 55 °C                     |
| Humidity                                                         |                                                                         |
| Storage temperature                                              | - 25 °C to + 55 °C                                                      |
| Humidity                                                         |                                                                         |
| Operating Altitude                                               |                                                                         |
| Pollution degree                                                 |                                                                         |
| Vibration                                                        | Designed to IEC 60068                                                   |
| EMC Emission                                                     | 0                                                                       |
| Equipment class (EMC)                                            | Class A                                                                 |
| Conducted radio frequency emission                               | $10 \text{ kHz to } 150 \text{ kHz} < 120 - 69 \text{ dB } \text{\muV}$ |
| · · ·                                                            | $0.15$ MHz to 0.5 MHz: < 79 dB $\mu$ V                                  |
|                                                                  | $\sim$ 0.5 MHz to 30 MHz: < 73 dB $\mu$ V                               |
| Radiated radio frequency emission                                |                                                                         |
| · · · ·                                                          |                                                                         |
|                                                                  |                                                                         |
| This product has been designed as Class A equipment. Use of thi  | s product in domestic environments may cause                            |
| radio interference, in which case the user may be required to em | ploy additional mitigation methods.                                     |
| EMC Immunity                                                     |                                                                         |
| Electrostatic Discharge                                          |                                                                         |
| Radio Frequency Electromagnetic Field                            | 80 MHz to 1000 MHz; 10 V/m                                              |
| Fast Transients 5/50 ns (main and control circuits)              |                                                                         |

#### 

CE

EMC requirements EMC EU Directive

<sup>1</sup> Short circuit current, with appropriate R rated fuses fitted.

 $^{2}$  It is critical that the circuit breaker and associated protection relay are set to trip <150 ms. Failure to do so could result in SCR rupture and subsequent arc fault.

<sup>3</sup> Excludes contactors and/or circuit breakers.

# 4.4 Panel Specifications

AuCom switchgear panels are categorised as follows:

- Soft starter panel (SSP)
- Standard panels

|   |   | - |
|---|---|---|
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| I | _ | - |
| I |   | _ |
| I |   | - |
| I |   | _ |

NOTE

Panel layout views depict only typical panel configuration options.

### Soft Starter Panel (SSP)

The soft starter panel is designed to house the primary soft starter components and associated switchgear.



Typical Soft Starter Panel

<sup>1</sup> Cables (top or bottom entry) or horizontal busbar system. Cables and busbars are not supplied with the standard product, but AuCom can supply a horizontal busbar system on request.

<sup>2</sup> Contactor (a circuit breaker may be fitted instead, on request). Installations with a circuit breaker do not require R-rated protection fuses.

<sup>3</sup> Outgoing motor cables (top or bottom exit).

### Standard Panels

AuCom standard panels are designed to be installed individually or connected to an AuCom soft starter panel (SSP) in a panel line-up. Standard panels may be equipped with customisable switchgear options and are available as follows:

- Transition panel (TRP)
- Power factor correction panel (PFP)

### • Transition Panel (TRP)

Transition panels are used to connect cables or busbars between two different panels in a line-up. A transition panel may also be used to connect cables from one panel to busbars in another.





| - I | Horizontal busbar system         |  |
|-----|----------------------------------|--|
| 2   | Isolator/Earth switch (optional) |  |
| 3   | Current transformer (optional)   |  |
| 4   | Voltage transformer (optional)   |  |
| 5   | Incoming supply cables or busbar |  |
|     | system (customer)                |  |

### • Power Factor Correction Panel (PFP)

A power factor correction panel consists of capacitor banks which are switched by means of a contactor. This contactor is controlled by the soft starter or power factor controller, which measures power factor in an electrical network.



<sup>1</sup> Cables (top or bottom entry) or horizontal busbar system. Cables and busbars are not supplied with the standard product, but AuCom can supply a horizontal busbar system on request.

<sup>2</sup> Not required when incoming supply is fed from the soft starter panel (SSP).

# 5 Receiving and Storage

All AuCom panels are individually packed and securely braced for shipment. Depending on the size and weight, it may be necessary to ship the equipment in several sections to facilitate handling.

Panels may include relatively delicate equipment. Handle all sections with care when unloading. Some electrical components may be shipped separately and then installed on-site. The shipping inventory should account for all individual components.

# 5.1 Receiving

Inspect equipment as soon as possible for any damage that may have occurred during transit. Before accepting delivery, examine packaging for any signs of damage. A damaged package may indicate that the panel and internal components may also be damaged.

Check that the shipping manifest accounts for all equipment delivered. Any missing or damaged equipment should be noted on the freight bill and the carrier notified immediately. A record of the missing or damaged equipment should also be sent to AuCom.

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NOTE

NOTE

Avoid using heavy or sharp-edged tools while unpacking, as these may damage the equipment. Use nail pliers to separate all four sides of the wooden packaging box.

# 5.2 Storage

If immediate installation is not possible, the equipment should be stored in its original packaging in a clean and dry area indoors. Always store panels upright on their wooden pallets to keep them off the floor and allow air to pass under it freely.

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Equipment can be stored for a maximum of 12 months from the date of packaging as the quality of the packaging material degrades over time.

The following storage conditions should be met (IEC 60721-3-1, classification 1K3):

| Temperature                   | -5 °C ~ 40 °C |
|-------------------------------|---------------|
| Relative humidity             | 50 ~ 95%      |
| Rate of change of temperature | 0.5 °C/min    |

The following general precautions should be followed when storing equipment indoors:

- Do not unpack the panel or other components until they are ready for installation.
- If electrical components such as circuit breakers are to be stored for more than three months in humid conditions, space heaters should be used in the storage area to limit condensation. Switchgear panels with in-built anti-condensation heaters may be powered from an external supply during storage.
- Rats and other vermin may cause considerable damage and periodic inspection is necessary to minimise the danger they pose.
- Ensure the floor of the storage area is smooth and level to prevent mechanical strain to the structure and components.

# **6** Installation

Site installation of panels should only be carried out by specially trained and skilled personnel. The location must be adequately prepared with wall openings, ventilation ducts and cabling connections to the power supply.

# 6.1 Clearance Requirements

While installing AuCom switchgear panels, ensure that minimum clearance requirements are met.





# NOTE

Standard panels may be mounted closer to the wall from the rear if required. Consult AuCom if closer wall mounting is required.

# 6.2 Foundation Requirements

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### NOTE

The maximum tolerance for switchroom floor is  $\pm 2$  mm per metre (with a maximum of  $\pm 5$  mm over the entire panel line-up). Failure to comply with these recommendations may impair the electro-mechanical functionality of some components and the structural integrity of the entire panel system.

The base of the panels is suitable for mounting directly to the switchroom floor. It is recommended that buried steel channels are installed in a level concrete floor to support the equipment. The surfaces of the buried steel channels should be level with the finished floor and aligned with each other prior to final anchoring. The panel's base should be evenly supported by the concrete floor. If the panel is raised above the floor level by the mounting channels, the entire base frame must be supported at the same level. If the panel is part of a line-up, all channels must be level and aligned with each other.



The figure below illustrates typical methods for anchoring panels to buried steel channels.





Anchor bolts, channels, and other materials are not supplied as part of the switchgear arrangement.

# 6.3 Fastening Panels to the Foundation

Switchgear panels must be fastened securely to a level floor which has been adequately prepared.

# Soft Starter Panel (SSP)

It is recommended that all four bolt holes are used to securely bolt the panel to the floor using 10mm (0.39in) bolts.



|             | Width<br>mm (inch) | Depth<br>mm (inch) |
|-------------|--------------------|--------------------|
| MVSxxxx-V02 |                    |                    |
| MVSxxxx-V03 | 800 (31.5)         | 1200 (47.2)        |
| MVSxxxx-V04 |                    |                    |
| MVSxxxx-V06 |                    |                    |
| MVSxxxx-V07 | 1000 (39.3)        | 1200 (47.2)        |
| MVSxxx-VI3  |                    |                    |

# INSTALLATION

### Standard Panels

It is recommended that all four bolt holes are used to securely bolt the panel to the floor using 10mm (0.39in) bolts.



|                          | Width                | Depth       |
|--------------------------|----------------------|-------------|
|                          | mm (inch)            | mm (inch)   |
| Transition Panel (TRP)   | 600 (23.6)           | 1200 (47.2) |
| Power Factor Panel (PFP) | 800/1000 (31.5/39.2) | 1200 (47.2) |

# 6.4 Earth Termination

An earth bar is located at the rear of the panel.



An earthing wire may be terminated anywhere along this bar using M10 high tensile grade 8.8 threaded fasteners for all terminations.

# INSTALLATION

#### 6.5 Assembling the Switchgear Line-up

Switchgear panels may be connected together to form a panel line-up. Assembling the panel line-up includes the following operations:

- Aligning the panels
- Fastening the panels together
- Connecting the earth bus

### Lifting and Moving

Panels can be moved in a number of ways. However, care should be taken to protect the panel sections or enclosed electrical components from damage during moving. Provision has been made along the base of the panel to fit lifting rods. Lifting cables can then be fitted for lifting with a crane.



Spreader bar 2 Lifting rods fitted through lifting holes in base frame

Locate the four lifting holes in the base frame of the panel. Ι.

14085.A

≤/60°

- 2. Pass lifting rods through the lifting holes from one side of the panel to the other. Use lifting rods which are approximately 30mm in diameter to ensure that rods are of sufficient tensile strength to bear the weight of the panel.
- 3. Loop lifting cables around the ends of the lifting rods on both sides of the panel.
- Fit spreader bars to the lifting cables at the top of the panel. The lifting cables must have spreaders from 4 front-to-rear and side-to-side to prevent twisting the lifting cables during transportation.

Before moving the panel:

- Ensure that the crane is tall enough that the angle formed between the arms of the sling is no more than 60° when viewed from the front or rear of the panel.
- Always use lifting equipment that is rated for the prescribed load. Only use a crane of sufficient lifting capacity to bear the weight of the equipment to be lifted.
- Identify the centre of gravity, physical dimensions, weight etc.
- Plan the path along which the switchgear will be moved, ensuring that it is free from obstructions.
- If moving more than one unit at a time, disconnect bus connections between panels to prevent damage to the busbars.
- Ensure that adequate precautions have been taken to protect personnel before moving the panel.
- Only use AuCom recommended bolts and metal connectors. Never replace or modify a manufactured lifting component.



NOTF

Spreader bar, lifting rods, and other materials are not supplied as part of the switchgear arrangement.

# Aligning the panels

Switchgear sections may be shipped individually to facilitate loading and transportation. At the installation site, the shipping sections must be securely bolted together to form the switchgear line-up. Align the shipping sections side by side on the foundation as follows:

- Remove all packaging material from the first switchgear section to be installed, except the wooden pallet on which each panel is mounted. The wooden pallet protects the switchgear and reduces risk of damage during moving.
- Move the panel to the desired location (refer to *Lifting and Moving* on page 21 for details). Remove the bolts and discard the wooden pallet.
- Line up the bolt holes in the base frame of the switchgear with the holes in the foundation steel channels (refer to *Fastening Panels to the Foundation* for details).
- Once the individual panels have been placed in position, use a level or plumb line to make sure the panel line-up is level both across its depth and along its length. Draw an installation baseline the entire length of the complete switchgear.

Install the other switchgear sections following the above steps, with reference to the installation base line.

### Fastening the panels together

Once the sections of the switchgear line-up have been aligned exactly, fasten adjacent panels together securely.

Use M6x10 screws to fasten panels together using the joining brackets supplied.



# Connecting the earth bus

The standard earth bus runs the entire length of the switchgear line-up. The earth bus in the switchgear line-up is assembled in sections, with a bus joint in each panel. Terminals are provided on each joint for connecting the earth bus to the earthing system of the switchgear building. Each panel is equipped with the facility to connect to the building earth (refer to *Earth Termination* on page 20 for more information).



To connect the earth bus between panels in a line-up:

- I. Slip the fish plate through the aperture in the panel.
- 2. Align the bolt holes of the fish plate with those in the bus joint of each panel and fasten together securely.

NOTE

NOTE

The MVS soft starter should only be installed in a restricted access location suitable for electrical equipment.

| <u> </u> |
|----------|
|          |
|          |
|          |

Ensure that the equipment room is clean and relatively dust-free before unpacking and installing the MVS soft starter. In particular, beware of concrete dust as it may cause corrosion.

# 6.6 Mounting Instructions - Power Assembly

### Clearances

The MVS power assembly is rated IP00 and must be installed inside an enclosure.

No clearance is required below or at the sides. For models  $V02 \sim V07$ , the power assembly should be installed with 100 mm clearance above for isolation. Model V13 requires no additional clearance beyond the external frame.



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|---|-----|--|
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# NOTE

Models with current ratings 500 A and above require forced air ventilation when installed in an enclosure.

# **Mounting Points**

The power assembly is mounted in place using four M12 bolts. One bolt is required through each corner at the base of the unit, tightened to a torque of 40 Nm. Individual phase arms are secured within the frame using one M10 nut and two M10 high tensile grade 8.8 bolts complete with Belleville washers, all tightened to a torque of  $28 \sim 30$  Nm.



### Mounting Points (model VI3)

For VI3 models, the power assembly is mounted in place using eight MI2 bolts (two bolts per side at 944 mm centres). Individual phase arms are secured within the frame using two locking rods and two lock nuts, tightened to a torque of I0 Nm.

MVS model V13 comes with a travel plinth. For installation the frame should be bolted into a panel with eight M12 bolts, tightened to a torque of  $28 \sim 30$  Nm.



Front of unit

### Measurements

|            | A<br>mm (inch) | B<br>mm (inch) | C<br>mm (inch) |
|------------|----------------|----------------|----------------|
| MVSxxxxV02 | 636            | 513            | 68.5           |
| MVSxxxxV03 | (25.04)        | (20.20)        | (2.70)         |
| MVSxxxxV04 |                |                |                |
| MVSxxxxV06 | 842            | 663            | 68.5           |
| MVSxxxxV07 | (33.15)        | (26.10)        | (2.70)         |
| MVSxxxxV13 | 50<br>(45.28)  | 944<br>(37.17) | 103<br>(4.06)  |



# NOTE

For models MVSxxxxV02 to MVSxxxxV04, these dimensions apply up to 321 A. For the same models with current ratings of 500 A, the MVSxxxxV06 dimensions apply.

# 6.7 Mounting Instructions - Controller

The controller is secured into place using ten M4 nuts, affixed to the studs on the back of the controller.



To mount the controller, make a 186 mm × 300 mm cutout at the desired mounting location. Ensure adequate clearance (>85 mm) is available behind the mounting location. If you intend to use a communication module, allow for a minimum clearance of 120 mm behind the mounting panel.

Drill 5 mm holes to accommodate the studs on the controller. Fit the MVS Controller through the cutout and tighten the nuts onto the studs.

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|   |  |

# NOTE

Before installation, always ensure that you are using the correct controller for the soft starter. This can be checked by comparing the serial number on the back of the controller with the serial number on the front of the power assembly.

| Serial number |                                                                            |                                                                                                                                                  |                                                                                                |                                                                |
|---------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
|               | MVS 0159-<br>3-phase, 4.16kV AC<br>SC withstand:                           | <b>410</b> S<br>, 5060 Hz 159A : AC53b 4:<br>Type 1 coordination, HRC fuse<br>freen VLA Oct                                                      | /N: 8228054074<br>20:1780,1.16M VA<br>s at prospective 48k A RMS                               | 1                                                              |
|               | Enclosure rating:<br>Aux. terminals:<br>Aux. contacts:<br>Power terminals: | IP00, U L Open Type<br>#24-#14 AWG, 0.2-2.5 mm2 (f<br>10 A @ 250 V AC DF 10%, A<br>150mm2 at torque 28-30 Nm, 2<br>Copper or stranded 75 - C con | Pollution Degree 3<br>0.5 Nm, 4.5 lb-in)<br>300, AC-15 6 A @ 250 V AC<br>0-22 ft-lb<br>dictors | MAIN CONTROL MODULE<br>MVS-0150-410-V04-C12<br>S/N: 822805-074 |
|               | <b>C C C C C C C C C C</b>                                                 |                                                                                                                                                  | Made in New Zealand                                                                            | CE Cry IND. CON T. EQ.                                         |

# 6.8 **Power Terminations**



Use only M10 high tensile grade 8.8 threaded fasteners for all terminations. Use a pre-load torque setting between  $28 \sim 30$  Nm. Use only Belleville washers.





|                          | А             | В            | С              | D              | E             | F             | G             | Н              | I              | J              |
|--------------------------|---------------|--------------|----------------|----------------|---------------|---------------|---------------|----------------|----------------|----------------|
|                          | mm (inch)     | mm (inch)    | mm (inch)      | mm (inch)      | mm (inch)     | mm (inch)     | mm (inch)     | mm (inch)      | mm (inch)      | mm (inch)      |
| MVSxxxxV02*              | 220           | 70           | 744            | 7/0            | 70            | 120           | 170           | 200            | 200            | 200            |
| MVSxxxxV03*              | 228<br>(8.98) | (3   1)      | (29 29)        | 760<br>(29.92) | (3   1)       | 129           | 1/9<br>(7.05) | 200<br>(7.87)  | 200<br>(7.87)  | 200<br>(7.87)  |
| MVSxxxxV04*              | (0.70)        | (3.11)       | (27.27)        | (27.72)        | (3.11)        | (3.00)        | (7.05)        | (7.07)         | (7.07)         | (7.07)         |
| MVSxxxxV06<br>MVSxxxxV07 | 228<br>(8.98) | 79<br>(3.11) | 792<br>(31.18) | 806<br>(31.73) | 107<br>(4.19) | 164<br>(6.46) | 222<br>(8.72) | 268<br>(10.55) | 268<br>(10.55) | 268<br>(10.55) |



# NOTE

For models MVSxxxxV02 to MVSxxxxV04, these dimensions apply up to 321 A. For the same models with current ratings of 500 A, the MVSxxxxV06 dimensions apply.

# INSTALLATION

# Model VI3



Use only M10 high tensile grade 8.8 threaded fasteners for all terminations. Use a pre-load torque setting between 28 ~ 30 Nm. Use only Belleville

| -0          |                | -                |                |                  | <b>.</b> 0.0     |                   |                   |                 |                 |
|-------------|----------------|------------------|----------------|------------------|------------------|-------------------|-------------------|-----------------|-----------------|
|             | a              | b                | С              | d                | е                | f                 | g                 | h               | i               |
|             | mm (inch)      | mm (inch)        | mm (inch)      | mm (inch)        | mm (inch)        | mm (inch)         | mm (inch)         | mm (inch)       | mm (inch)       |
| MVSxxxx-VI3 | 19.8<br>(0.78) | 355.0<br>(13.98) | 2200<br>(86.6) | 1965.5<br>(77.4) | 1936.5<br>(76.2) | l 274.8<br>(50.2) | l 245.8<br>(49.0) | 584.1<br>(23.0) | 555.1<br>(21.9) |

# 6.9 Earth Terminations

A 10 mm earth stud is located on each side of the power assembly, at the rear of the unit. Use only M10 high tensile grade 8.8 threaded fasteners for all terminations. Use a pre-load torque setting between  $28 \sim 30$  Nm. Use only Belleville washers.



# 6.10 Control Terminations

On the control voltage terminal block, control wiring is secured in place by 3 mm spring terminals. Use a screwdriver to open the terminal clamp, then insert the wire into the terminal cage. Release the clamp by removing the screwdriver.



# 6.11 Wiring Terminations on the Controller

# **Control Wiring**

The MVS has three fixed inputs for remote control. These inputs should be controlled by contacts rated for low voltage, low current operation (gold flash or similar).



|   | Two-wire control   |
|---|--------------------|
| 2 | Three-wire control |
| 3 | Four-wire control  |
| А | Start              |
| В | Stop               |
| С | Reset              |
|   |                    |

# CAUTION

Do not apply voltage to the control input terminals. These are active 24 VDC inputs and must be controlled with potential free contacts.

Cables to the control inputs must be segregated from mains voltage and motor cabling.

The reset input can be normally open or normally closed. Use parameter 6M to select the configuration.



NOTE

Reset input is normally closed by default.

### Terminal Block (controller)

Terminations on the controller use plug-in terminals. Unplug the terminal blocks, complete the wiring, then re-plug the terminal blocks into the controller.



# 6.12 Wiring Terminations on the Power Interface Board



### Model VI3



| Ι  | Control terminals (refer to <i>Power</i><br><i>Circuit Configuration (model V13)</i> |
|----|--------------------------------------------------------------------------------------|
|    | on page 33 for details)                                                              |
| 2  | LV terminal block X1 and X10                                                         |
| 3  | Gate firing fibre optic connectors                                                   |
|    | and firing LEDs (red)                                                                |
| 4  | Voltage sensing input connector                                                      |
| 5  | Ground fault CT connector                                                            |
| 6  | Line CT connectors                                                                   |
| 7  | Access hole for CT wiring                                                            |
| 8  | Control voltage terminal block                                                       |
| 9  | CT ratio selector DIP switch SI                                                      |
| 10 | Fibre optic connections to                                                           |
|    | controller, and LEDs                                                                 |
|    | Access for LV wiring                                                                 |
| 12 | Non-conduction LEDs (green)                                                          |
| 13 | Alarm inputs                                                                         |
| 14 | Non-conduction readback fibre                                                        |
|    | optic connectors                                                                     |
| 15 | Switch mode power supply SMPS I                                                      |

# 6.13 Ground Current

The ground current selector switches on the power interface board must be set to match the method for calculating ground current and the ratio of the line current CTs.



### NOTE

The soft starter will check the ground fault settings when control power is applied. If the switch settings are changed, control power must be cycled for the new setting to take effect.

### Switch settings for ground current summation method

| 5 5           |                |
|---------------|----------------|
| Line CT ratio | Switch setting |
| 1000:1        | 1100           |

### Switch settings for ground current zero sequence method



Zero sequence ground fault measurement requires a customer-supplied ground fault CT. The CT must be 1000:1, 1 VA, minimum protection class rating 5P10.

| Line CT ratio | Switch setting |
|---------------|----------------|
| 1000:1        | 1100           |

### Example settings for SI

NOTE



# 6.14 **Power Circuits**

### Overview

MVS soft starters are designed to operate as part of a system including other components. A main contactor and bypass contactor are required in all installations. MVS models V02 ~ V07 must be installed with fuses. MVS model V13 must be installed with either contactor and fuses or a circuit breaker.

The following additional components may also be required:

- main isolator/ earth switch
- power factor correction
- line inductors
- transient/ overvoltage protection
- MV/LV control supply transformer

### Main Contactor

The MVS must always be installed with a main contactor. Select a contactor with an AC3 rating greater than or equal to the full load current rating of the connected motor or there is an option for a circuit breaker above 7.2 kV.

The main contactor is associated with terminals L1, L2, L3 on the supply side of the soft starter. The coil is associated with output terminals 13, 14 of the MVS (refer to *Power Circuit Configuration (models V02 ~ V07)* on page 32).

To ensure that the potentially dangerous medium voltage area is isolated from the low voltage control area, power is supplied to the main contactor coil from the control voltage terminal block (refer to *Internal Wiring* -X10 on page 36).

### Bypass Contactor

The MVS must always be installed with a bypass contactor. Select a contactor with an ACI rating greater than or equal to the full load current rating of the connected motor or there is an option for a circuit breaker above 7.2 kV.

The bypass contactor is associated with terminals L1, L2, L3 on the supply side of the soft starter, and bypass terminals T1B, T2B, T3B on the motor side. The coil is associated with output terminals 23, 24, and the auxiliary Normally Open contact is associated with input terminals C73, C74 of the soft starter (refer to *Power Circuit Configuration (models V02 ~ V07)* on page 32).

To ensure that the potentially dangerous medium voltage area is isolated from the low voltage control area, power is supplied to the bypass relay coil from the control voltage terminal block (refer to *Internal Wiring* -X10 on page 36).

# Power Circuit Configuration (models V02 ~ V07)

MVS power circuit with main contactor, bypass contactor, main isolator/ earth switch, R Rated fuses and control supply. Configured for four-wire start/ stop control. Models V02 to V07 must be installed with backup/R-rated fuses (refer to R-Rated Protection Fuses)



| AI      | Power assembly                                     |
|---------|----------------------------------------------------|
| I       | 3 Phase 50/60 Hz Supply                            |
| QI      | Main isolator/Earth switch                         |
| FI-3    | R-Rated protection fuses                           |
| KI      | Main contactor                                     |
| К2      | Bypass contactor                                   |
| 2       | To motor                                           |
| A2      | Control voltage terminals                          |
| 3       | Control supply                                     |
| A3      | Power interface board                              |
| 4       | Relay outputs                                      |
| C73~C74 | Bypass readback signal                             |
| 3~ 4    | Main contactor (KT)                                |
| 23~24   | Bypass contactor (K2)                              |
| 33~34   | Run output (PFC)                                   |
|         | (refer to <i>Internal Wiring –X10</i> on page 36). |
| 43~44   | Fan control output                                 |

| A4                                                | Controller                                                                                                                                                   |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5                                                 | Remote control inputs                                                                                                                                        |
| C23~C24                                           | Start                                                                                                                                                        |
| C31~C32                                           | Stop                                                                                                                                                         |
| C41~C42                                           | Reset                                                                                                                                                        |
| C53~C54                                           | Programmable input A                                                                                                                                         |
| C63~C64                                           | Programmable input B                                                                                                                                         |
|                                                   |                                                                                                                                                              |
| 6                                                 | Programmable outputs                                                                                                                                         |
| <b>6</b><br>43, 44                                | Programmable outputs<br>Programmable Relay output A                                                                                                          |
| <b>6</b><br>43, 44<br>51, 52, 54                  | Programmable outputs<br>Programmable Relay output A<br>Programmable Relay output B                                                                           |
| <b>6</b><br>43, 44<br>51, 52, 54<br>61, 62, 64    | Programmable outputs<br>Programmable Relay output A<br>Programmable Relay output B<br>Programmable Relay output C                                            |
| 6<br>43, 44<br>51, 52, 54<br>61, 62, 64<br>7      | Programmable outputs<br>Programmable Relay output A<br>Programmable Relay output B<br>Programmable Relay output C<br>Motor thermistor input                  |
| 6<br>43, 44<br>51, 52, 54<br>61, 62, 64<br>7<br>8 | Programmable outputs<br>Programmable Relay output A<br>Programmable Relay output B<br>Programmable Relay output C<br>Motor thermistor input<br>Analog output |

### Power Circuit Configuration (model VI3)

MVS power circuit with main contactor/circuit breaker and bypass contactor/circuit breaker. Configured for four-wire start/ stop control with optional MV/LV potential transformer.



# INSTALLATION

### **Emergency Stop Button**

In the event of an emergency, press the emergency stop button located on the front of the panel.



### Main Isolator/ Earth Switch (models V02 ~ V07)

A main isolator/ earth switch can be connected on the supply side of the main contactor (refer to *Power Circuit Configuration (models V02 ~ V07)* on page 32)



### CAUTION

The main isolator/ earth switch must only be operated when the motor is not running and the incoming mains supply has been disconnected.

To open the isolator, pull out the pin and switch off. If the starter is operating, removing the pin will open the main contactor.



### **R** Rated Protection Fuses

If specified, R Rated protection fuses can be installed on the supply side of the soft starter to provide Type 2 coordination and short circuit protection for the motor branch circuit. The appropriate fuse should be selected from the table below, based on the motor's rated full load current. MVS models V02  $\sim$  V07 must be installed with fuses.

### Fuse ratings:

| Starter Rated FLC | Fuse                             |
|-------------------|----------------------------------|
| 80 A              | I 2R                             |
| 159 A             | I 2R                             |
| 200 A             | I 2R                             |
| 230 A             | 24R                              |
| 321 A             | 24R                              |
| 500 A             | Selection based on motor current |

### Fuse type code formats:

|          | System Voltage<br>2.3 kV | System Voltage<br>3.3 ~ 4.2 kV | System Voltage<br>6 ~ 7.2 kV |
|----------|--------------------------|--------------------------------|------------------------------|
| Ferraz   | A240Rm                   | A480Rrr-I                      | A072xxDxRO-rr                |
| Bussmann | JCK-x-rr                 | JCL-x-rr                       | JCR-x-rr                     |
| Siba     | -                        | 400RC315*                      | 400RC315*                    |

\* two fuses in parallel

rr = R rating of the fuse

x = physical format of the fuse (select according to installation requirements)

#### Examples:

12R fuse for 3.3 kV: A480R12R-1 or JCL-B-12R 24R fuse for 6.6 kV: A072B1DARO-24R or JCR-B-24R

| I | <u> </u> |  |
|---|----------|--|
| I |          |  |
| I |          |  |
| I |          |  |
| I |          |  |
|   |          |  |

NOTE

Protection fuses are only required when the switching device used is a contactor.

### **Power Factor Correction**

| r |    |
|---|----|
| I | =1 |
| I |    |
| I | =1 |
| L |    |

### NOTE

Do not connect power factor correction capacitors to the output of MVS soft starters. If static power factor correction is employed, it must be connected to the supply side of the soft starter.

Power factor correction capacitors should be selected based on the motor data and the required final power factor.

If power factor correction capacitors are being used, select a contactor according to the required kVAr. The contactor must be connected on the supply side of the soft starter. The power factor correction capacitor contactor coil is associated with output terminals 33, 34 of the soft starter's Interface PCB.

### Line Inductors

Output line inductors may be required if the cable run between the soft starter and the motor is greater than 200 metres. Line inductors are typically installed in a shielded caged enclosure at the soft starter end of the motor cable. Factors which determine the requirement of line inductors are; the soft starter model, system operating voltage, output cable length and cable type.

Contact your local supplier for advice when using motor output cables exceeding 200 metres. Cable data will be required, including the capacitance per km of the cable to be used.

### Transient/ Overvoltage Protection

Overvoltage protection should be installed if there is a risk of high voltage transients at the installation. Contact your local supplier for details.

### Control Supply Transformer (PT/VT)

The MVS requires a low voltage control supply. If low voltage is not available, a transformer is required. Use a transformer with primary voltage matching the MV mains voltage, and secondary voltage to suit the MVS starter. Use a single phase 550 VA transformer with protection fuses on both the primary and secondary sides.
# 7 Internal Wiring –X10



| А                        | External wiring                    |  |
|--------------------------|------------------------------------|--|
| 1                        | Control supply                     |  |
| A I , A 2                | 110-130 VAC                        |  |
| A2, A3                   | 220-240 VAC                        |  |
| 2                        | 0 VAC for contactor coils          |  |
| A2-1                     | 110/220 VAC coils                  |  |
| A2-2                     | 120/230 VAC coils                  |  |
| A2-3   130/240 VAC coils |                                    |  |
| 3                        | Phase supply for contactor coils   |  |
| 14                       | Main contactor coil (K1)           |  |
| 24                       | Bypass contactor coil (K2)         |  |
| 34                       | PFC contactor coil (K3)            |  |
| 4                        | Fan control output                 |  |
| 5                        | Bypass readback signal             |  |
| 6                        | 24 VAC supply for Controller       |  |
| В                        | Power assembly terminal rail (X10) |  |

| C            | Internal wiring                 |  |  |
|--------------|---------------------------------|--|--|
| 7            | Power transformer (PT1)         |  |  |
| AI           | 110 V                           |  |  |
| A3           | 220 ∨                           |  |  |
| A2-1         | 0 V                             |  |  |
| A2-2         | -10 V                           |  |  |
| A2-3         | -20 V                           |  |  |
| 8            | Power interface board (A3)      |  |  |
| A3-13, A3-14 | Main contactor output           |  |  |
| A3-23, A3-24 | Bypass contactor output         |  |  |
| A3-33, A3-34 | Run relay output / PFC          |  |  |
| A3-43, A3-44 | Fan control output              |  |  |
| A3-C73,      | Bypass readback signal          |  |  |
| A3-C74       |                                 |  |  |
| 9            | 24 VAC supply for Controller    |  |  |
| AI0          | 24 VAC                          |  |  |
| AI2          | 0 VAC                           |  |  |
| 10           | 24 VAC supply for interface PCB |  |  |

# ≣

NOTE

The control voltage terminal section (A2) has links fitted for 110 VAC external control and contactor coil voltages. For other voltages, remove these links and refit as indicated.

| External control supply |              |                  | Contactor coil supply (K1 - K3) |                |  |
|-------------------------|--------------|------------------|---------------------------------|----------------|--|
| Voltage                 | Connect into | Link from        | Voltage                         | Link from      |  |
| 110 VAC                 |              | A2(2) to A2-I(2) | 110 VAC                         |                |  |
| 120 VAC                 | AI, A2       | A2(2) to A2-2(2) | 120 VAC                         | AI(2) to I3(2) |  |
| 130 VAC                 |              | A2(2) to A2-3(2) | 130 VAC                         |                |  |
| 220 VAC                 |              | A2(2) to A2-I(2) | 220 VAC                         |                |  |
| 230 VAC                 | A3, A2       | A2(2) to A2-2(2) | 230 VAC                         | A3(2) to 13(2) |  |
| 240 VAC                 |              | A2(2) to A2-3(2) | 240 VAC                         |                |  |

# 8 Keypad and Feedback

# 8.1 The Controller



| _  | _ |     |  |
|----|---|-----|--|
| -  | _ | - ` |  |
| 12 |   |     |  |
|    |   | -   |  |
|    |   | _   |  |

## NOTE

When the Controller is powered up, the Ready LED flashes for 5 seconds as part of the initialisation routine.

## 8.2 Menu Shortcuts

The F1 and F2 buttons offer keyboard shortcuts to the Auto-Stop menu. Use parameters 8B and 8C (BB, BC - F1 and F2 Button Action on page 52) to select the shortcut target.

## 8.3 Displays

The controller displays a wide range of performance information about the soft starter. The top half of the screen shows real-time information on current or motor power (as selected in parameter 8D). Use the  $\blacktriangle$  and  $\nabla$  buttons to select the information shown on the bottom half of the screen.

- Starter status
- User programmable screen
- Motor temperature
- Current
- Motor power
- Voltage
- Last start information
- Date and time
- Performance graphs
- SCR conduction

Refer to Operating Feedback on page 70, for further details.

# 9 Configuration

## 9.1 Programming Menu

The Programming Menu lets you view and change programmable parameters that control how the MVS operates. You can access the Programming Menu at any time, including while the soft starter is running. Any changes to the start profile take effect immediately.

To open the Programming Menu, press the **MENU** button while viewing the monitoring screens.

To navigate through the Programming Menu:

- to scroll through parameter groups, press the  $\blacktriangle$  or igvee button.
- to open a submenu, press the button.
- to view the parameters in a group, press the button.

#### Adjustment Lock

You can lock the Programming Menu to prevent users from altering parameter settings. The adjustment lock can be turned on and off using parameter 15B.

To lock the programming menu:

- I. Open the Programming Menu.
- 2. Open the Extended Menu.
- 3. Select 'Advanced'.
- 4. Enter the Access Code.
- 5. Select parameter I 5B Adjustment Lock
- 6. Select and store 'Read Only'.

If a user attempts to change a parameter value when the adjustment lock is active, an error message is displayed:

## Access Denied Adj Lock is On

#### **Altering Parameter Values**

To change a parameter value:

- scroll to the appropriate parameter in the Programming Menu and press ▶ to enter edit mode.
- to alter the parameter setting, use the ▲ and ▼ buttons. Pressing ▲ or ▼ once will increase or decrease the value by one unit. If the button is held for longer than five seconds, the value will increase or decrease at a faster rate.
- to save changes, press **STORE**. The setting shown on the display will be saved and the controller will return to the parameter list.
- to cancel changes, press **EXIT**. The controller will ask for confirmation, then return to the parameter list without saving changes.

#### Access Code

Critical parameters (parameter group 15 and higher) are protected by a four-digit security access code, preventing unauthorised users from viewing or modifying parameter settings.

When a user attempts to enter a restricted parameter group, the controller prompts for an access code. The access code is requested once for the programming session, and authorisation continues until the user closes the menu.

To enter the access code, use the  $\blacktriangleleft$  and  $\triangleright$  buttons to select a digit, and the  $\blacktriangle$  and  $\checkmark$  buttons to change the value. When all four digits match your access code, press **STORE**. The controller will display an acknowledgement message before continuing.



To change the access code, use parameter 15A.

## 9.2 Standard Menu

The standard menu provides access to commonly used parameters, allowing the user to configure the MVS as required for the application. For details of individual parameters, refer to *Parameter Descriptions* on page 43.

| 1 |    | Motor Data-I                    |
|---|----|---------------------------------|
|   | IA | Motor Full Load Current         |
| 2 |    | Start/Stop Modes-I              |
|   | 2A | Start Mode                      |
|   | 2B | Start Ramp Time                 |
|   | 2C | Initial Current                 |
|   | 2D | Current Limit                   |
|   | 2H | Stop Mode                       |
|   | 21 | Stop Time                       |
| 3 |    | Auto-Start/Stop                 |
|   | 3C | Auto-Stop Type                  |
| - | 3D | Auto-Stop Time                  |
| 4 |    | Protection                      |
|   | 4A | Excess Start Time               |
|   | 4C | Undercurrent                    |
|   | 4D | Undercurrent Delay              |
|   | 4E | Instantaneous Overcurrent       |
|   | 4F | Instantaneous Overcurrent Delay |
|   | 4G | Phase Sequence                  |
| 6 |    | Inputs                          |
|   | 6A | Input A Function                |
|   | 6B | Input A Name                    |
|   | 6C | Input A Trip                    |
|   | 6D | Input A Trip Delay              |
|   | 6E | Input A Initial Delay           |
|   | 6F | Input B Function                |
|   | 6G | Input B Name                    |
|   | 6H | Input B Trip                    |
|   | 61 | Input B Trip Delay              |
| - | 6J | Input B Initial Delay           |
| 7 |    | Outputs                         |
|   | 7A | Relay A Function                |
|   | 7B | Relay A On Delay                |
|   | 7C | Relay A Off Delay               |
|   | 7D | Relay B Function                |
|   | 7E | Relay B On Delay                |
|   | 7F | Relay B Off Delay               |
|   | 7G | Relay C Function                |
|   | 7H | Relay C On Delay                |
|   | 71 | Relay C Off Delay               |
|   | 7M | Low Current Flag                |
|   | 7N | High Current Flag               |
|   | 70 | Motor Temperature Flag          |
| 8 |    | Display                         |
| - | 8A | Language                        |
|   | 8B | FI Button Action                |
|   | 8C | F2 Button Action                |
|   | 8D | Display A or kW                 |
|   | 8E | User Screen - Top Left          |
|   | 8F | User Screen - Top Right         |
|   | 8G | User Screen - Bottom Left       |
|   | 8H | User Screen - Bottom Right      |
|   |    |                                 |

## 9.3 Extended Menu

The extended menu gives access to all of the MVS's programmable parameters.

| 1 |          | Motor Data-I                       |
|---|----------|------------------------------------|
|   | IA       | Motor Full Load Current            |
|   | ΙB       | Locked Rotor Time                  |
|   | IC       | Locked Rotor Current               |
|   | ID       | Motor Service Factor               |
| 2 |          | Start/Stop Modes-I                 |
| _ | 2A       | Start Mode                         |
|   | 2B       | Start Ramp Time                    |
|   | 2C       | Initial Current                    |
|   | 2D       | Current Limit                      |
|   | 25<br>2F | Reserved                           |
|   | 2E<br>2E | Kickstart Time                     |
|   | 20       | Kickstart Laval                    |
|   | 20<br>2H | Stop Mode                          |
|   | 211      | Stop Time                          |
| 3 | 21       | Auto-Start/Stop                    |
| 5 | 30       | Received                           |
|   | 38       | Received                           |
|   | 30       | Auto Stop Type                     |
|   | 30       | Auto-stop Type                     |
|   | 3D       | Auto-Stop Time                     |
| 4 | T        | Protection                         |
|   | 4A       | Excess Start Time                  |
|   | 4B       | Excess Start Time-2                |
|   | 4C       | Undercurrent                       |
|   | 4D       | Undercurrent Delay                 |
|   | 4E       | Instantaneous Overcurrent          |
|   | 4F       | Instantaneous Overcurrent Delay    |
|   | 4G       | Phase Sequence                     |
|   | 4H       | Current Imbalance                  |
|   | 41       | Current Imbalance Delay            |
|   | 4J       | Frequency Check                    |
|   | 4K       | Frequency Variation                |
|   | 4L       | Frequency Delay                    |
|   | 4M       | Restart Delay                      |
|   | 4N       | Motor Temperature Check            |
|   | 40       | Ground Fault Level                 |
|   | 4P       | Ground Fault Delay                 |
|   | 4Q       | Undervoltage                       |
|   | 4R       | Undervoltage Delay                 |
|   | 4S       | Overvoltage                        |
|   | 4T       | Overvoltage Delay                  |
|   | 4U       | Instantaneous Overcurrent S2       |
|   | 4V       | Instantaneous Overcurrent Delay S2 |
| 5 | •        | Auto-Reset Trips (Reserved)        |
|   | 5A       | Reserved                           |
| 6 |          | Inputs                             |
|   | 6A       | Input A Function                   |
|   | 6B       | Input A Name                       |
|   | 6C       | Input A Trip                       |
|   | 6D       | Input A Trip Delay                 |
|   | 6E       | Input A Initial Delay              |
|   | 6F       | Input B Function                   |
|   | 6G       | Input B Name                       |
|   | 6H       | Input B Trip                       |

|    | 61                | Input B Trip Delay                                                      |
|----|-------------------|-------------------------------------------------------------------------|
|    | 6                 | Input B Initial Delay                                                   |
|    | 6K                | Reserved                                                                |
|    | 6L                | Reserved                                                                |
|    | 6M                | Remote Reset Logic                                                      |
|    | 6N                | Reserved                                                                |
|    | 60                | Reserved                                                                |
|    | 6P                | Reserved                                                                |
|    | 6Q                | Local/Remote                                                            |
|    | 6R                | Comms in Remote                                                         |
| 7  |                   | Outputs                                                                 |
|    | 7A                | Relay A Function                                                        |
|    | 7B                | Relay A On Delay                                                        |
|    | 7C                | Relay A Off Delay                                                       |
|    | 7D                | Relay B Function                                                        |
|    | 7E                | Relay B On Delay                                                        |
|    | 7F                | Relay B Off Delay                                                       |
|    | 7G                | Relay C Function                                                        |
|    | 7H                | Relay C On Delay                                                        |
|    | 71                | Relay C Off Delay                                                       |
|    | 7]                | Reserved                                                                |
|    | 7K                | Reserved                                                                |
|    | 7L                | Reserved                                                                |
|    | 7M                | Low Current Flag                                                        |
|    | 7N                | High Current Flag                                                       |
|    | 70                | Motor Temperature Flag                                                  |
|    | 7P                | Analog Output A                                                         |
|    | 7Q                | Analog A Scale                                                          |
|    | 7R                | Analog A Maximum Adjustment                                             |
|    | 7S                | Analog A Minimum Adjustment                                             |
|    | 7T                | Reserved                                                                |
|    | 7U                | Reserved                                                                |
|    | 7V                | Reserved                                                                |
|    | 7W                | Reserved                                                                |
| 8  |                   | Display                                                                 |
|    | 8A                | Language                                                                |
|    | 8B                | EL Button Action                                                        |
|    | 80                | F2 Button Action                                                        |
|    | 80                | Display A or kW                                                         |
|    | 8E                | User Screen - Top Left                                                  |
|    | 8E                | User Screen - Top Right                                                 |
|    | 8G                | User Screen - Bottom Left                                               |
|    | 8H                | User Screen - Bottom Right                                              |
|    | 81                | Graph Data                                                              |
|    | 81                | Graph Timebase                                                          |
|    | 8K                | Graph Maximum Adjustment                                                |
|    | 81                | Graph Minimum Adjustment                                                |
|    | 8M                | Mains Reference Voltage                                                 |
| 9  |                   | Motor Data-2                                                            |
|    | 9A                | Reserved                                                                |
|    | 9B                | Motor FLC-2                                                             |
|    | 9C                | Reserved                                                                |
|    | 9D                | Reserved                                                                |
|    | 9E                | Reserved                                                                |
| 10 |                   |                                                                         |
|    |                   | Start/Stop Modes-2                                                      |
| -  | 10A               | Start/Stop Modes-2<br>Start Mode-2                                      |
|    | 10A<br>10B        | Start/Stop Modes-2<br>Start Mode-2<br>Start Ramp-2                      |
|    | 10A<br>10B<br>10C | Start/Stop Modes-2<br>Start Mode-2<br>Start Ramp-2<br>Initial Current-2 |

|    | 10D | Current Limit-2           |
|----|-----|---------------------------|
|    | IOE | Reserved                  |
|    | IOF | Kickstart Time-2          |
|    | 10G | Kickstart Level-2         |
|    | IOH | Stop Mode-2               |
|    | 101 | Stop Time-2               |
| 11 | •   | RTD/PT100 (Reserved)      |
|    | IIA | Reserved                  |
| 12 |     | Slip-Ring Motors          |
|    | 12A | Motor Data-1 Ramp         |
|    | 12B | Motor Data-2 Ramp         |
|    | 12C | Changeover Time           |
|    | 12D | Slip Ring Retard          |
| 15 |     | Advanced                  |
|    | 15A | Access Code               |
|    | 15B | Adjustment Lock           |
|    | 15C | Emergency Run             |
| 16 | r   | Protection Action         |
|    | 16A | Motor Overload            |
|    | 16B | Excess Start Time         |
|    | 16C | Undercurrent              |
|    | 16D | Instantaneous Overcurrent |
|    | 16E | Current Imbalance         |
|    | 16F | Frequency                 |
|    | 16G | Input A Trip              |
|    | 16H | Input B Trip              |
|    | 161 | Motor Thermistor          |
|    | 16] | Starter Communication     |
|    | 16K | Network Communication     |
|    | 16L | Reserved                  |
|    | 16M | Battery/Clock             |
|    | 16N | Ground Fault              |
|    | 160 | Reserved                  |
|    | 16P | Reserved                  |
|    | 16Q | Reserved                  |
|    | I6R | Reserved                  |
|    | 165 | Reserved                  |
|    | 16T | Reserved                  |
|    | 16U | Reserved                  |
|    | 16V | Undervoltage              |
|    | 16W | Overvoltage               |

## 9.4 Load/Save Settings

The Load/Save Settings menu requires an access code and allows users to:

- Load the MVS's parameters with default values
- Reload previously saved parameter settings from an internal file
- Save the current parameter settings to an internal file

In addition to the factory default values file, the MVS can store two user-defined parameter files. These files contain default values until a user file is saved.

To load or save settings:

- 2. Open the Programming Menu
- 3. Scroll to Load/Save Settings and press the button.
- 4. Scroll to the required function and press the ▶ button. Enter the access code when prompted.
- 5. At the confirmation prompt, select YES to confirm or NO to cancel and then **STORE** to load/save the selection.

When the action has been completed, the screen will briefly display a confirmation message, then return to the Load/Save Settings screen

Load Defaults Load Backup Load User Set 1

Load Defaults No Yes

## 9.5 **Parameter Descriptions**

## I Motor Data-I

The parameters in Motor Data-I configure the soft starter to match the connected motor. These parameters describe the motor's operating characteristics and allow the soft starter to model the motor's temperature.

| I A – Motor FLC           |                                                                                                                                         |                                                                                       |  |  |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|--|
| Range:                    | 5 - 1200 A                                                                                                                              | Default: 100 A                                                                        |  |  |
| Description:              | Matches the starter to the connected motor's full load current. Set to the full load current (FLC) rating shown on the motor nameplate. |                                                                                       |  |  |
| IB – Locked Rotor Time    |                                                                                                                                         |                                                                                       |  |  |
| Range:                    | 0:01 - 2:00 (minutes:seconds)                                                                                                           | Default: 10 seconds                                                                   |  |  |
| Description:              | Sets the maximum length of time the moto before reaching its maximum temperature.                                                       | r can sustain locked rotor current from cold<br>Set according to the motor datasheet. |  |  |
| IC – Locked Rotor Currer  | nt                                                                                                                                      |                                                                                       |  |  |
| Range:                    | 400% - 1200% FLC                                                                                                                        | Default: 600%                                                                         |  |  |
| Description:              | Sets the locked rotor current of the connected motor, as a percentage of full load current. Set according to the motor datasheet.       |                                                                                       |  |  |
| ID – Motor Service Factor | •                                                                                                                                       |                                                                                       |  |  |
| Range:                    | 100% - 130%                                                                                                                             | Default: 105%                                                                         |  |  |
| Description:              | Sets the motor service factor used by the th<br>current, it will reach 100%. Set according t                                            | hermal model. If the motor runs at full load<br>to the motor datasheet.               |  |  |
| 2 Start/Stop Modes-I      |                                                                                                                                         |                                                                                       |  |  |
| 2A – Start Mode           |                                                                                                                                         |                                                                                       |  |  |
| Options:                  | Constant Current (default)                                                                                                              |                                                                                       |  |  |
| Description:              | Selects the soft start mode.                                                                                                            |                                                                                       |  |  |
| 2B – Start Ramp Time      |                                                                                                                                         |                                                                                       |  |  |
| Range:                    | 0:01 - 3.00 (minutes:seconds)                                                                                                           | Default: I second                                                                     |  |  |
| Description:              | Sets the ramp time for current ramp startin limit).                                                                                     | g (from the initial current to the current                                            |  |  |

2C - Initial Current 100% - 600% FLC Range: Default: 400% Description: Sets the initial start current level for current ramp starting, as a percentage of motor full load current. Set so that the motor begins to accelerate immediately after a start is initiated. If current ramp starting is not required, set the initial current equal to the current limit. 2D - Current Limit 100% - 600% FLC Default: 400% Range: Sets the current limit for constant current and current ramp soft starting, as a Description: percentage of motor full load current. 2E - Reserved Description: This parameter is reserved for future use. 2F – Kickstart Time 0 – 2000 milliseconds 0000 milliseconds Range: Default: Description: Sets the kickstart duration. A setting of 0 disables kickstart. 2G – Kickstart Level 100% - 700% FLC 500% Range: Default: Sets the level of the kickstart current. Description: CAUTION Kickstart subjects the mechanical equipment to increased torque levels. Ensure the motor, load and couplings can handle the additional torque before using this feature. 2H - Stop Mode Coast To Stop (default) Options: TVR Soft Stop Description: Selects the stop mode. 2I – Stop Time Range: 0:00 - 4:00 (minutes:seconds) Default: 0 second Description: Sets the time for soft stopping the motor using timed voltage ramp. If a main contactor is installed, the contactor must remain closed until the end of the stop time.

### 3 Auto-Stop

The MVS can be programmed to stop automatically, after a specified delay or at a specified time of day.



WARNING This function should not be used in conjunction with remote two-wire control. The soft starter will still accept start and stop commands from the remote inputs or serial communication network. To disable local or remote control, use parameter 6Q.

| 3A, 3B – Reserved   |                                                                                               |                                                                                                  |  |
|---------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--|
| Description:        | These parameters are reserved for future use.                                                 |                                                                                                  |  |
| 3C – Auto-Stop Type |                                                                                               |                                                                                                  |  |
| Options:            | Off (default)                                                                                 | The soft starter will not auto-stop.                                                             |  |
|                     | Timer                                                                                         | The soft starter will auto-stop after a delay from the next start, as specified in parameter 3D. |  |
|                     | Clock                                                                                         | The soft starter will auto-stop at the time programmed in parameter 3D.                          |  |
| Description:        | Selects whether the soft starter will auto-stop after a specified delay, or at a time of day. |                                                                                                  |  |
| 3D – Auto-Stop Time |                                                                                               |                                                                                                  |  |
| Range:              | 00:01 - 24:00 (hours:minu                                                                     | utes) <b>Default:</b> I minute                                                                   |  |
| Description:        | Sets the time for the soft                                                                    | starter to auto-stop, in 24 hour clock format.                                                   |  |

## **4** Protection Settings

These parameters determine when the soft starter's protection mechanisms will activate. The activation point for each protection mechanism can be set to suit the installation.

The soft starter responds to protection events by tripping, warning, or writing the event to the event log. The response is determined by the Protection Action settings. The default response is a trip.



### CAUTION

The protection settings are vital for safe operation of the soft starter and motor. Defeating the protection may compromise the installation and should only be done in the case of emergency.

#### 4A – Excess Start Time

Excess start time is the maximum time the MVS will attempt to start the motor. If the motor does not transition to Run mode within the programmed limit, the starter will trip. Set for a period slightly longer than required for a normal healthy start. A setting of 0 disables excess start time protection.

|          | Range:                                                | 0:00 - 4:00 (minutes:seconds)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Default:                                        | 20 seconds                                                                                     |
|----------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------|
|          | Description:                                          | Set as required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                 |                                                                                                |
| 4B – Exo | cess Start Time-2                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                                                                                                |
|          | Range:                                                | 0:00 - 4:00 (minutes:seconds)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Default:                                        | 20 seconds                                                                                     |
|          | Description:                                          | Set as required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                 |                                                                                                |
| 4C – Ur  | ndercurrent                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                                                                                                |
|          | Range:                                                | 0% - 100%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default:                                        | 20%                                                                                            |
|          | Description:                                          | Sets the trip point for undercurrent protect<br>current. Set to a level between the motor<br>magnetising (no load) current (typically 25%<br>0% disables undercurrent protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | tion, as a pen<br>'s normal wo<br>% to 35% of f | centage of motor full load<br>orking range and the motor's<br>full load current). A setting of |
| 4D – Ur  | ndercurrent Delay                                     | y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                                                                                |
|          | Range:<br>Description:                                | 0:00 - 4:00 (minutes:seconds)<br>Slows the MVS's response to undercurrent<br>fluctuations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Default:</b><br>, avoiding trip              | 5 seconds<br>os due to momentary                                                               |
| 4E, 4F – | Instantaneous Ov                                      | ercurrent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                 |                                                                                                |
|          | The MVS can be<br>the motor is run<br>information and | configured to trip if the average current of a ning. Refer to <i>4U, 4V – Instantaneous Over</i> examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | II three phase<br>current Stage                 | es exceeds a specified level while<br>e 2 on page 47 for more                                  |
|          | Parameter 4E Ins                                      | stantaneous Overcurrent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                 |                                                                                                |
|          | Range:                                                | 80% - 600% FL-C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Default:                                        | 400%                                                                                           |
|          | Description:                                          | Sets the trip point for instantaneous overcu<br>full load current.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | urrent protec                                   | tion, as a percentage of motor                                                                 |
|          | Parameter 4F Ins                                      | tantaneous Overcurrent Delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 |                                                                                                |
|          | Range:                                                | 0:00 - 1:00 (minutes:seconds)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Default:                                        | 0 second                                                                                       |
|          | Description:                                          | Slows the MVS's response to overcurrent, a events.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | avoiding trips                                  | due to momentary overcurrent                                                                   |
|          | NOTE<br>This protection<br><i>Stage 2</i> (parame     | is only active during run and must be coordinates at the coordinates at the second states at | nated with <i>Ir</i>                            | nstantaneous Overcurrent                                                                       |
| 4G – Ph  | ase Sequence                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                                                                                                |
|          | Options:                                              | Any Sequence<br>Positive Only (default)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                 |                                                                                                |

|              | Negative Only                                                                                                                                                                          |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description: | Selects which phase sequences the soft starter will allow at a start. During its pre-start checks, the starter examines the sequence of the phases at its input terminals and trins if |
|              | the actual sequence does not match the selected option.                                                                                                                                |

| 4H – Current Imbalance                                |                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Range:                                                | 10% - 50% Default: 30%                                                                                                                                                                                                                                                                      |
| Description:                                          | Sets the trip point for current imbalance protection.                                                                                                                                                                                                                                       |
| 41 – Current Imbalance De                             | elay                                                                                                                                                                                                                                                                                        |
| Range:                                                | 0:00 - 4:00 (minutes:seconds) Default: 5 seconds                                                                                                                                                                                                                                            |
| Description:                                          | Slows the MVS's response to current imbalance, avoiding trips due to momentary fluctuations.                                                                                                                                                                                                |
| NOTE<br>The MVS will d<br>Run mode. Wh<br>Connection. | lisplay a Current Imbalance trip only when phase loss at the supply terminals occurs during<br>ien a phase loss occurs during other modes of operation, the MVS will trip on Motor                                                                                                          |
| 4J – Frequency Check                                  |                                                                                                                                                                                                                                                                                             |
| Options:                                              | Do Not Check<br>Start Only<br>Start/Run<br>Run Only (default)                                                                                                                                                                                                                               |
| Description:                                          | Determines when and if the starter will monitor for a frequency trip.                                                                                                                                                                                                                       |
| 4K – Frequency Variation                              |                                                                                                                                                                                                                                                                                             |
| Options:                                              | ± 2 Hz<br>± 5 Hz (default)<br>± 10 Hz<br>± 15 Hz                                                                                                                                                                                                                                            |
| Description:                                          | Selects the soft starter's tolerance for frequency variation.                                                                                                                                                                                                                               |
| 4L – Frequency Delay                                  |                                                                                                                                                                                                                                                                                             |
| Range:                                                | 0:01 - 4:00 (minutes:seconds) Default: 5 seconds                                                                                                                                                                                                                                            |
| Description:                                          | Slows the MVS's response to frequency disturbances, avoiding trips due to momentary fluctuations.                                                                                                                                                                                           |
| NOTE<br>If the mains free<br>irrespective of t        | quency drops below 35 Hz or rises above 75 Hz, the starter will trip immediately, the settings for Frequency Trip parameters.                                                                                                                                                               |
| 4M – Restart Delay                                    |                                                                                                                                                                                                                                                                                             |
| Range:<br>Description:                                | 00:01 - 60:00 (minutes:seconds) <b>Default:</b> 30 minutes<br>The MVS can be configured to force a delay between the end of a stop and the<br>beginning of the next start. During the restart delay period, the display shows the time<br>remaining before another start can be attempted.  |
| 4N – Motor Temperature                                | 9 Check                                                                                                                                                                                                                                                                                     |
| Options:                                              | Do Not Check (default)<br>Check                                                                                                                                                                                                                                                             |
| Description:                                          | Selects whether the MVS will verify the motor has sufficient thermal capacity for a successful start. The soft starter compares the motor's calculated temperature with the temperature rise from the last motor start and only operates if the motor is cool enough to start successfully. |
| 40 – Ground Fault Level                               |                                                                                                                                                                                                                                                                                             |
| Range:                                                | I A - 40 A Default: I A                                                                                                                                                                                                                                                                     |
| Description:                                          | Sets the trip point for ground fault protection. Ground fault is a dynamic trip based on phase current measurements every half-cycle.                                                                                                                                                       |
| 4P – Ground Fault Dela                                | зу                                                                                                                                                                                                                                                                                          |
| Range:                                                | 0:01 - 4:00 (minutes:seconds) Default: 3 seconds                                                                                                                                                                                                                                            |
| Description:                                          | Slows the MVS's response to ground fault variation, avoiding trips due to momentary fluctuations.                                                                                                                                                                                           |
| NOTE<br>Ground fault ac                               | ccuracy is within $\pm 1$ A of the set value.                                                                                                                                                                                                                                               |

| Range:         100 − 18000 ∨         Default:         100 ∨                                                                                                                      |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Description:</b> Sets the trip point for undervoltage protection. Set as required.                                                                                            |                  |
| 4R Undervoltage Trip Delay                                                                                                                                                       |                  |
| Range:0:00 - 4:00 (minutes:seconds)Default:5 seconds                                                                                                                             |                  |
| <b>Description:</b> Slows the MVS's response to undervoltage, avoiding trips due to moment fluctuations.                                                                         | ary              |
| 4S Overvoltage Level                                                                                                                                                             |                  |
| Range:         100 − 18000 ∨         Default:         7200 ∨                                                                                                                     |                  |
| <b>Description:</b> Sets the trip point for overvoltage protection. Set as required.                                                                                             |                  |
| 4T Overvoltage Trip Delay                                                                                                                                                        |                  |
| Range:0:00 - 4:00 (minutes:seconds)Default:5 seconds                                                                                                                             |                  |
| <b>Description:</b> Slows the MVS's response to overvoltage, avoiding trips due to momentar                                                                                      | ry fluctuations. |
| 4U, 4V – Instantaneous Overcurrent Stage 2                                                                                                                                       |                  |
| The MVS has two instantaneous trip functions, stage 1 and 2. These protection functions are configure complementary.                                                             | ed to be         |
| Stage I must be configured to protect the motor against a locked rotor (shearpin) situation during rur Stage I should trigger at lower current/higher time values than Stage 2.  | n mode.          |
| Stage 2 must be configured to protect the main switching device. When Stage 2 triggers, the starter main switching device.                                                       | opens the        |
| If the main switching element is a contactor (protected by a fuse), then this function must be coordina fuse to ensure that the contactor does NOT open until the fuse ruptures. | ated with the    |
| If the main switching element is a breaker, then the delay must be minimised to provide the best poss<br>to the SCR.                                                             | ible protection  |
| Parameter 4U Instantaneous Overcurrent S2                                                                                                                                        |                  |
| Bange: 30 A – 4400 A Default: 4400 A                                                                                                                                             |                  |
| Description: Sets the trip point for instantaneous overcurrent stage 2 protection in amprequired.                                                                                | peres. Set as    |
| Parameter 4V Instantaneous Overcurrent Delay S2                                                                                                                                  |                  |
| Range: 10 – 1000 ms Default: 10 milliseconds                                                                                                                                     |                  |
| <b>Description:</b> Sets the duration required for current to exceed the level set in paramete trip occurs. Set as required.                                                     | er 4U before a   |
| NOTE<br>This protection is active during starting, running and stopping. It must be coordinated with <i>Novercurrent</i> (parameters 4E, 4F).                                    | Instantaneous    |
|                                                                                                                                                                                  |                  |
| I Instantaneous Over<br>Stage I (4F)                                                                                                                                             | rcurrent Delay - |
| 2 Motor start time                                                                                                                                                               |                  |
| 3 Instantaneous Over                                                                                                                                                             | rcurrent Delay - |
| 4 FLC                                                                                                                                                                            |                  |
| 5 Motor start current                                                                                                                                                            | 4                |

Instantaneous Overcurrent- Stage I 6 (4E) Instantaneous Overcurrent - Stage 2 (4U) to trip external upstream breaker 7 8 8 Fuse 9 9 SCR Thermal model curve 10 7 07248.E

Shaded area indicates motor operation

Time 1

2

3

4

56

Current

# CONFIGURATION



## 5 Auto-Reset Trips (Reserved)

This parameter group is reserved for future use.

## 6 Inputs

The MVS has two programmable inputs, which allow remote control of the soft starter.

## 6A - Input A Function

| Options: | Motor Set Select           | The MVS can be configured with two separate sets of<br>motor data.<br>To use the secondary motor data, parameter 6A must be<br>set to 'Motor Set Select' and C53, C54 must be closed<br>when a start command is given. The MVS checks which<br>motor data to use at a start, and will use that motor data<br>for the entire start/stop cycle.                                                                                                                                                                                                                       |
|----------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Input Trip (N/O) (default) | Input A can be used to trip the soft starter. When<br>parameter 6A is set to Input Trip ( $N/O$ ), a closed circuit<br>across C53, C54 trips the soft starter.<br>(Refer to parameters 6C, 6D, 6E)                                                                                                                                                                                                                                                                                                                                                                  |
|          | Input Trip (N/C)           | When parameter 6A is set to Input Trip (N/C), an open circuit across C53, C54 trips the soft starter. (Refer to parameters 6C, 6D, 6E)                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          | Local/Remote Select        | Input A can be used to select between local and remote control, instead of using the LCL/RMT button on the controller. When the input is open, the starter is in local mode and can be controlled via the controller. When the input is closed, the starter is in remote mode. The START and LCL/RMT buttons are disabled, and the soft starter will ignore any Local/Remote select command from the serial communications network. To use Input A to select between local and remote control, parameter 6Q must be set to 'LCL/RMT Anytime' or 'LCL/RMT When Off'. |
|          | Emergency Run              | In emergency run the soft starter continues to run until<br>stopped, ignoring all trips and warnings (refer to parameter<br>15C for details).<br>Closing the circuit across C53, C54 activates emergency<br>run.<br>Opening the circuit ends emergency run and the MVS<br>stops the motor.                                                                                                                                                                                                                                                                          |

|                                                                                                                       | Starter Disable                                                                                                               | The MVS can be disabled via the control inputs. An open circuit across C53, C54 will disable the starter. The MVS will not respond to start commands. If running, the soft starter will allow the motor to coast to stop, ignoring the soft stop mode set in parameter 2H. |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description:                                                                                                          | Selects the function of Input A                                                                                               | Α.                                                                                                                                                                                                                                                                         |
| 6B – Input A Name                                                                                                     |                                                                                                                               |                                                                                                                                                                                                                                                                            |
| Options:                                                                                                              | Input Trip (default)<br>Low Pressure<br>High Pressure<br>Pump Fault<br>Low Level<br>High Level<br>No Flow<br>Starter Disable  | Controller<br>PLC<br>Vibration<br>Field Trip<br>Interlock Trip<br>Motor Temp<br>Motor Prot<br>Feeder Prot                                                                                                                                                                  |
| Description:                                                                                                          | Selects a message for the con                                                                                                 | troller to display when Input A is active.                                                                                                                                                                                                                                 |
| 6C – Input A Trip                                                                                                     |                                                                                                                               |                                                                                                                                                                                                                                                                            |
| Options:                                                                                                              | Always Active (default)<br>Operating Only                                                                                     | A trip can occur at any time when the soft starter is<br>receiving power.<br>A trip can occur while the soft starter is running, stopping                                                                                                                                  |
|                                                                                                                       |                                                                                                                               | or starting.                                                                                                                                                                                                                                                               |
| Description                                                                                                           | Selects when an input trip car                                                                                                | A trip can only occur while the soft starter is running.                                                                                                                                                                                                                   |
| (Delenant & Trip Delena                                                                                               | Selects when an input trip car                                                                                                |                                                                                                                                                                                                                                                                            |
| Bangai                                                                                                                | 0,00 (minutossocondo)                                                                                                         | Defaulte Occord                                                                                                                                                                                                                                                            |
| Description                                                                                                           | Sets a delay between the inpu                                                                                                 | It activating and the soft starter tripping                                                                                                                                                                                                                                |
| 4E Input A Initial Delay                                                                                              |                                                                                                                               | a deuvading and the sole starter dipping.                                                                                                                                                                                                                                  |
| Banger                                                                                                                | 00.00 $30.00$ (minutes:second                                                                                                 | tc) Default: 0 second                                                                                                                                                                                                                                                      |
| Description:                                                                                                          | Sets a delay before an input to<br>start signal is received. The s<br>elapsed.                                                | rip can occur. The initial delay is counted from the time a tate of the input is ignored until the initial delay has                                                                                                                                                       |
| 6F, 6G, 6H, 6l, 6J – Input B                                                                                          | Trip                                                                                                                          |                                                                                                                                                                                                                                                                            |
| Parameters 6F~6<br>Input A. Refer t                                                                                   | ) configure the operation of Inp<br>o Input A for details.                                                                    | but B, in the same way as parameters 6A~6E configure                                                                                                                                                                                                                       |
| <ul> <li>6F Input B F</li> <li>6G Input B</li> <li>6H Input B</li> <li>6I Input B T</li> <li>6J Input B In</li> </ul> | Function(Default: Input TripName(Default: Input TripTrip(Default: Always ATrip Delay(Default: 0:00)itial Delay(Default: 0:00) | o (N/O))<br>o)<br>active)                                                                                                                                                                                                                                                  |
| These parameters are rese                                                                                             | inved for future use                                                                                                          |                                                                                                                                                                                                                                                                            |
| M Parante Parat                                                                                                       | n veu tor tuture USE.                                                                                                         |                                                                                                                                                                                                                                                                            |
| ori – Remote Reset Logic                                                                                              |                                                                                                                               |                                                                                                                                                                                                                                                                            |

| Options:     | Normally Closed (default)<br>Normally Open                                                             |
|--------------|--------------------------------------------------------------------------------------------------------|
| Description: | Selects whether the MVS's remote reset input (terminals C41, C42) is normally open or normally closed. |

# 6N, 6O, 6P – Reserved

These parameters are reserved for future use.

| 6Q – Local/Remote                            |                                                                                             |                                                                                                                                                                                                                           |
|----------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Options:                                     | LCL/RMT Anytime (default)<br>LCL/RMT When Off<br>Local Control Only<br>Remote Control Only  | LCL/RMT selection is always enabled.<br>LCL/RMT selection is enabled when the starter is off.<br>The LCL/RMT button and all remote inputs are disabled.<br>Local control buttons (START, RESET, LCL/RMT) are<br>disabled. |
| Description:                                 | Selects when the LCL/RMT b<br>control, and enables or disable<br>The STOP button on the con | utton can be used to switch between local and remote<br>es the local control buttons and remote control inputs.<br>troller is always enabled.                                                                             |
| WARNING<br>The STOP but<br>starter will rest | ton on the controller is always e<br>art if the remote start/stop and                       | enabled. When using two-wire remote control, the soft reset inputs are still active.                                                                                                                                      |

## 6R – Comms in Remote

| Options:     | Disable Control in RMT<br>Enable Control in RMT (default)                                                                                                                                            |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description: | Selects whether the starter will accept Start, Stop and Reset commands from the serial communication network when in Remote mode. The Force Comms Trip and Local/Remote commands are always enabled. |

## 7 Outputs

The MVS has three programmable outputs, which can be used to signal different operating conditions to associated equipment.

## 7A – Relay A Function

| /        |                           |                                                                                                                                     |
|----------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Options: | Off                       | Relay A is not used.                                                                                                                |
|          | Main Contactor (default)  | The relay closes when the MVS receives a start command,<br>and remains closed as long as the motor is receiving<br>voltage.         |
|          | Run                       | The relay closes when the starter changes to run state.                                                                             |
|          | Trip                      | The relay closes when the starter trips (refer to parameter 16A to 16X).                                                            |
|          | Warning                   | The relay closes when the starter issues a warning (refer to parameter 16A to 16X).                                                 |
|          | Low Current Flag          | The relay closes when the low current flag activates while the motor is running (refer to parameter 7M <i>Low Current Flag</i> ).   |
|          | High Current Flag         | The relay closes when the high current flag activates while the motor is running (refer to parameter 7N <i>High Current Flag</i> ). |
|          | Motor Temperature Flag    | The relay closes when the motor temperature flag activates (refer to parameter 70 <i>Motor Temperature Flag</i> ).                  |
|          | Input A Trip              | The relay closes when Input A activates to trip the soft starter.                                                                   |
|          | Input B Trip              | The relay closes when Input B activates to trip the soft starter.                                                                   |
|          | Motor Overload            | The relay closes when the starter trips on Motor<br>Overload.                                                                       |
|          | Current Imbalance         | The relay closes when the starter trips on Current Imbalance.                                                                       |
|          | Undercurrent              | The relay closes when the starter trips on Undercurrent.                                                                            |
|          | Instantaneous overcurrent | The relay closes when the starter trips on Instantaneous<br>Overcurrent.                                                            |
|          | Frequency                 | The relay closes when the starter trips on Frequency.                                                                               |
|          | Ground Fault              | The relay closes when the starter trips on Ground Fault.                                                                            |
|          | Heatsink Overtemperature  | Not applicable to this product.                                                                                                     |
|          | Phase Loss                | The relay closes when the starter trips on Phase Loss.                                                                              |
|          | Motor Thermistor          | The relay closes when the starter trips on Motor<br>Thermistor.                                                                     |

## CONFIGURATION

|          |                                                                                                   | Changeo                                                 | ver Conta                                         | actor                        | The relay clos<br>ramp has read<br>motor. | ses when th<br>ched full vol | e high rotor resistance current<br>tage, allowing use with a slip-ring |
|----------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------|------------------------------|-------------------------------------------|------------------------------|------------------------------------------------------------------------|
|          |                                                                                                   | Undervol                                                | tage                                              |                              | The relay clos<br>level set in pa         | ses when th<br>1rameter 4Q   | e mains voltage drops below the <u>)</u> .                             |
|          |                                                                                                   | Ready                                                   |                                                   |                              | The relay clos<br>mode.                   | ses when th                  | e starter transitions into Ready                                       |
|          | Description:                                                                                      | Selects th                                              | e functior                                        | n of Relay A                 | A (normally op                            | en).                         |                                                                        |
| 7B – Rel | lay A On Delay                                                                                    |                                                         |                                                   |                              |                                           |                              |                                                                        |
|          | Range:<br>Description:                                                                            | 0:00 - 5:0<br>Sets the c                                | ) (minute<br>lelay for c                          | s:seconds)<br>Iosing Rela    | y A.                                      | Default:                     | 0 second                                                               |
| 7C – Re  | lay A Off Delay                                                                                   |                                                         |                                                   |                              |                                           |                              |                                                                        |
|          | Range:<br>Description:                                                                            | 0:00 - 5:0<br>Sets the c                                | 0 (minute<br>lelay for n                          | es:seconds)<br>e-opening     | Relay A.                                  | Default:                     | 0 second                                                               |
| 7D~7l -  | - Output Relays B                                                                                 | and C                                                   |                                                   |                              |                                           |                              |                                                                        |
|          | Parameters 7D~<br>configure Relay A                                                               | 71 configure<br>A. Refer to                             | e the oper<br>Relay A                             | ration of Re<br>for details. | elays B and C i                           | n the same                   | way as parameters 7A~7C                                                |
|          | Relay B is a chang                                                                                | geover rela                                             | у.                                                |                              |                                           |                              |                                                                        |
|          | <ul> <li>7D Relay B</li> <li>7E Relay B</li> <li>7F Relay B</li> <li>Relay C is a chan</li> </ul> | <i>Function</i><br>On Delay<br>Off Delay<br>geover rela | Default:<br>Default:<br>Default:<br><sup>y.</sup> | Run<br>0 second<br>0 second  |                                           |                              |                                                                        |
|          | <ul> <li>7G <i>Relay C</i></li> <li>7H <i>Relay C</i></li> <li>71 <i>Relay C</i></li> </ul>       | Function<br>On Delay<br>Off Delay                       | Default:<br>Default:<br>Default:                  | Trip<br>0 second<br>0 second |                                           |                              |                                                                        |

#### 7J, 7L - Reserved

These parameters are reserved for future use.

## 7M – Low Current Flag

The MVS has low and high current flags to give early warning of abnormal operation. The current flags can be configured to indicate an abnormal current level during operation, between the normal operating level and the undercurrent or instantaneous overcurrent trip levels. The flags can signal the situation to external equipment via one of the programmable outputs.

The flags clear when the current returns within the normal operating range by 10% of the programmed flag value.

| Range:       | 1% - 100% FLC                         | Default:               | 50%                             |
|--------------|---------------------------------------|------------------------|---------------------------------|
| Description: | Sets the level at which the low curre | nt flag operates, as a | a percentage of motor full load |
|              | current,                              |                        |                                 |

7N – High Current Flag

| Range:       | 50% - 600% FLC                        | Default: 100%                                         |
|--------------|---------------------------------------|-------------------------------------------------------|
| Description: | Sets the level at which the high curr | ent flag operates, as a percentage of motor full load |
|              | current.                              |                                                       |

#### 70 – Motor Temperature Flag

The MVS has a motor temperature flag to give early warning of abnormal operation. The flag can indicate that the motor is operating above its normal operating temperature but lower than the overload limit. The flag can signal the situation to external equipment via one of the programmable outputs.

| Range:       | 0% - 160%                         | Default: 80%                              |           |
|--------------|-----------------------------------|-------------------------------------------|-----------|
| Description: | Sets the level at which the motor | temperature flag operates, as a percentag | je of the |
|              | motor's thermal capacity.         |                                           |           |

## 7P, 7Q, 7R, 7S – Analog Output A

The MVS has an analog output, which can be connected to associated equipment to monitor motor performance.

Parameter 7P Analog Output A

| Options:       | Current (% FLC) (default)<br>Motor Temp (%)<br>Motor kW (%) | Current as a percentage of motor full load current.<br>Motor temperature as a percentage of the motor rated<br>current (calculated by the soft starter's thermal model).<br>Motor kilowatts. 100% is motor FLC (parameter 1A)<br>multiplied by mains voltage. Power factor is assumed to<br>be 1.0.<br>$\frac{\sqrt{3} \cdot V \cdot I_{\rm FLC} \cdot pf}{1000}$ |
|----------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Motor kVA (%)                                               | Motor kilovolt amperes. 100% is motor FLC (parameter IA) multiplied by mains voltage.<br><u>√3 . V . I<sub>FLC</sub></u><br>1000                                                                                                                                                                                                                                  |
|                | Motor of                                                    | Motor power factor, measured by the soft starter.                                                                                                                                                                                                                                                                                                                 |
|                | Voltage (%Mains)                                            | The average voltage measured on three phases as a percentage of the mains voltage.                                                                                                                                                                                                                                                                                |
| Description:   | Selects which information wi                                | Il be reported via Analog Output A.                                                                                                                                                                                                                                                                                                                               |
| Parameter 70 A | Analog A Scale                                              |                                                                                                                                                                                                                                                                                                                                                                   |
| Range:         | 0-20 mA<br>4-20 mA (default)                                |                                                                                                                                                                                                                                                                                                                                                                   |
| Description:   | Selects the range of the analog                             | og output.                                                                                                                                                                                                                                                                                                                                                        |
| Parameter 7R A | nalog A Maximum Adjustment                                  |                                                                                                                                                                                                                                                                                                                                                                   |
| Range:         | 0% - 600%                                                   | Default: 100%                                                                                                                                                                                                                                                                                                                                                     |
| Description:   | Calibrates the upper limit of                               | the analog output to match the signal measured on an                                                                                                                                                                                                                                                                                                              |
|                | external current measuring d                                | evice.                                                                                                                                                                                                                                                                                                                                                            |
| Parameter 75 A | nalog A Minimum Adjustment                                  |                                                                                                                                                                                                                                                                                                                                                                   |
| Range:         | 0% - 600%                                                   | Default: 0%                                                                                                                                                                                                                                                                                                                                                       |
| Description:   | Calibrates the lower limit of external current measuring d  | the analog output to match the signal measured on an evice.                                                                                                                                                                                                                                                                                                       |

## 7T~7W - Reserved

These parameters are reserved for future use.

## 8 Display

These parameters allow the controller to be tailored to individual users' requirements.

#### 8A – Language

|          | Options              | English (default)                                                    | Português                                |  |  |
|----------|----------------------|----------------------------------------------------------------------|------------------------------------------|--|--|
|          | Options.             | Chinasa                                                              | Emplois                                  |  |  |
|          |                      | Chinese                                                              | Français                                 |  |  |
|          |                      | Español                                                              | Italiano                                 |  |  |
|          |                      | Deutsch                                                              | Russian                                  |  |  |
|          | Description:         | Selects which language the controller will use                       | to display messages and feedback.        |  |  |
| 8B, 8C - | - FI and F2 Button   | Action                                                               |                                          |  |  |
|          | Options:             | None                                                                 |                                          |  |  |
|          | ·                    | Setup Auto-Start/Stop                                                |                                          |  |  |
|          | Description:         | Selects the function of the $FI$ and $F2$ buttons on the controller. |                                          |  |  |
|          | • 8B FI Butto        | n Action Default: Setup Auto-Start/Stop                              |                                          |  |  |
|          | • 8C <i>F2 Butto</i> | on Action Default: None                                              |                                          |  |  |
| 8D – Di  | splay A or kW        |                                                                      |                                          |  |  |
|          | Options:             | Current (default)<br>Motor kW                                        |                                          |  |  |
|          | Description:         | Selects whether the MVS will display current                         | (amperes) or motor kilowatts on the main |  |  |

#### 8E, 8F, 8G 8H – User-Pr bla S

| Op             | tions:                                            | Blank                                      |                            | Displays no data in the se                                                        | elected area, allowing long                                  |
|----------------|---------------------------------------------------|--------------------------------------------|----------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------|
|                |                                                   | Starter State                              |                            | The starter's operating st                                                        | ate (starting, running, stopping or                          |
|                |                                                   |                                            |                            | tripped). Only available for<br>positions on the screen                           | or top left and bottom left                                  |
|                |                                                   | Motor Current                              |                            | The average current mea                                                           | sured on three phases.                                       |
|                |                                                   | Motor pf                                   |                            | The motor's power facto                                                           | r, measured by the soft starter.                             |
|                |                                                   | Mains Frequency                            |                            | The average frequency m                                                           | neasured on three phases.                                    |
|                |                                                   | Motor HP                                   |                            | The motor's running pow                                                           | ver in horsepower                                            |
|                |                                                   | Motor Temp                                 |                            | The motor's temperature model.                                                    | e, calculated by the thermal                                 |
|                |                                                   | kWh                                        |                            | The number of kilowatt h<br>soft starter.                                         | nours the motor has run via the                              |
|                |                                                   | Hours Run                                  |                            | The number of hours the starter.                                                  | e motor has run via the soft                                 |
|                |                                                   | Analog Input<br>Mains Voltage              |                            | n/a<br>The average voltage mea                                                    | sured on three phases                                        |
| De             | scription.                                        | Selects which inform                       | nation will                | The average voltage thea<br>I be displayed on the progr                           | ammable monitoring screen                                    |
| De:            | 8F / Iser Sch                                     | een - Too Left                             |                            | Starter State                                                                     | ammable monitoring screen,                                   |
| •              | 8F User Scr                                       | een - Top Right                            | Default:                   | Blank                                                                             |                                                              |
| •              | 8G User Sci                                       | reen - Bottom Left                         | Default:                   | kWh                                                                               |                                                              |
| •              | 8H <i>User Sci</i>                                | reen - Bottom Right                        | Default:                   | Hours Run                                                                         |                                                              |
| 8I, 8J, 8K, 8L | – Performance                                     | e Graphs                                   |                            |                                                                                   |                                                              |
| The            | e MVS has a re                                    | eal-time performance                       | e graph to                 | report the behaviour of cr                                                        | itical operating parameters.                                 |
| Par            | ameter 81 <i>Gra</i>                              | ph Data                                    |                            |                                                                                   |                                                              |
| Opt            | tions:                                            | Current (% FLC) (o<br>Motor Temp (%)       | default)                   | Current as a percentage<br>Motor temperature as a p<br>current (calculated by the | of motor full load current.<br>percentage of the motor rated |
|                |                                                   | Motor kW (%)                               |                            | Motor kilowatts. 100% is<br>multiplied by mains voltag<br>be 1.0.                 | motor FLC (parameter IA)<br>ge. Power factor is assumed to   |
|                |                                                   |                                            |                            | √3 . V . I <sub>FLC</sub> . pf                                                    |                                                              |
|                |                                                   | Motor kVA (%)                              |                            | 1000<br>Motor kilovolt amperes.                                                   | 100% is motor FLC (parameter                                 |
|                |                                                   |                                            |                            | $\sqrt{3 \cdot V \cdot I_{FLC}}$                                                  |                                                              |
|                |                                                   | Motor of                                   |                            | Motor power factor, mea                                                           | asured by the soft starter                                   |
|                |                                                   | Voltage (%Mains)                           |                            | The average voltage mea<br>percentage of the mains                                | sured on three phases as a<br>voltage.                       |
| De:<br>Par     | s <mark>cription:</mark><br>ameter 8 <u>1</u> Gra | Selects which inform<br>Timebase           | nation the                 | e graph will display.                                                             |                                                              |
| Op             | tions:                                            | 10 seconds (default                        | :)                         | 10 minute                                                                         | 25                                                           |
|                |                                                   | 30 seconds<br>1 minute<br>5 minutes        |                            | 30 minute<br>I hour                                                               | 25                                                           |
| De             | scription:                                        | Sets the graph time data.                  | scale. Th                  | ne graph will progressively                                                       | replace the old data with new                                |
| Par            | <u>ameter 8K</u> <i>Gr</i>                        | raph Maximum Adjus                         | tment                      |                                                                                   |                                                              |
| Rar            | ige:                                              | 0% – 600%                                  |                            | Default:                                                                          | 400%                                                         |
| De:<br>Par     | scription:<br>ameter 8L Gr                        | Adjusts the upper li<br>aph Minimum Adjust | mit of the<br><i>tment</i> | performance graph.                                                                |                                                              |
| Rar            | ige:                                              | 0% – 600%                                  |                            | Default:                                                                          | 0%                                                           |

# 8M – Mains Reference Voltage

Range:

100 - 14000 V

**Description:** Provides the reference voltage for the analog output and performance graphs.

Default:

400 V

#### 9 Motor Data-2

The MVS can support two different starting and stopping motor data sets.

To select the secondary motor data set, a programmable input must be configured to parameter set selection (parameters 6A and 6F) and the input must be active when the soft starter receives a start signal.

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|   |          |  |
|   |          |  |

# NOTE

You can only choose which motor data set to use while the soft starter is stopped.

#### $9A \sim 9E - Secondary Motor Settings$

| Para                  | <u>meter 9A</u> <i>Re</i>                 | eserved                                                                       |          |       |
|-----------------------|-------------------------------------------|-------------------------------------------------------------------------------|----------|-------|
| This                  | parameter is                              | s reserved for future use.                                                    |          |       |
| Para                  | <u>meter 9B</u> <i>Ma</i>                 | otor FLC-2                                                                    |          |       |
| Rang<br>Desc<br>Parar | ge:<br>cription:<br>meter 9 <u>C</u> Re   | 5 - 1000 A<br>Sets the secondary motor's full load current.<br><i>eserved</i> | Default: | 100 A |
| This<br><u>Parar</u>  | parameter is<br><u>meter 9D</u> <i>Re</i> | s reserved for future use.<br><i>eserved</i>                                  |          |       |
| This<br><u>Parar</u>  | parameter is<br><u>meter 9E</u> <i>Re</i> | ; reserved for future use.<br><i>served</i>                                   |          |       |
| This                  | parameter is                              | reserved for future use.                                                      |          |       |

# 10 Start/Stop-2

# 10A ~ 10I - Start/Stop-2

| Refer to Start/St                         | top-1 (parameters 2A~2I) for details.                                                                                                                                                          |                                              |                                          |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------|
| <u>Parameter 10A</u>                      | Start Mode-2                                                                                                                                                                                   |                                              |                                          |
| Options:<br>Description:<br>Parameter 10B | Constant Current (default)<br>Selects the soft start mode.<br><i>Start Ramp-2</i>                                                                                                              |                                              |                                          |
| Range:<br>Description:                    | 0:01 - 3.00 (minutes:seconds)<br>Sets the ramp time for current ram<br>limit).                                                                                                                 | <b>Default:</b><br>np starting (from the ini | I second<br>itial current to the current |
| Parameter 10C                             | Initial Current-2                                                                                                                                                                              |                                              |                                          |
| Range:                                    | 100% - 600%                                                                                                                                                                                    | Default:                                     | 400%                                     |
| Description:                              | Sets the initial start current level for current ramp starting, as a percentage of motor full load current. Set so that the motor begins to accelerate immediately after a start is initiated. |                                              |                                          |
| Parameter 10D                             | Current Limit-2                                                                                                                                                                                |                                              |                                          |
| Range:<br>Description:                    | 100% - 600% FLC<br>Sets the current limit for constant of<br>percentage of motor full load curre                                                                                               | Default:<br>current and current ran<br>ent.  | 400%<br>np soft starting, as a           |
| Parameter 10E                             | Reserved                                                                                                                                                                                       |                                              |                                          |
| Description:<br>Parameter 10F             | This parameter is reserved for futu<br><i>Kickstart Time-2</i>                                                                                                                                 | re use.                                      |                                          |
| Range:<br>Description:                    | 0 - 2000 (milliseconds)<br>Sets the kickstart duration. A sett                                                                                                                                 | <b>Default:</b><br>ng of 0 disables kicksta  | 0000 milliseconds<br>rt.                 |

Parameter 10G Kickstart Level-2

| Range:                 | 100% - 700% FLC                                      | Default: | 500%     |
|------------------------|------------------------------------------------------|----------|----------|
| Description:           | Sets the level of the kickstart current.             |          |          |
| Parameter 10H S        | top Mode-2                                           |          |          |
| Options:               | Coast To Stop (default)<br>TVR Soft Stop             |          |          |
| Description:           | Selects the stop mode.                               |          |          |
| Parameter 101 Sta      | op Time-2                                            |          |          |
| Range:<br>Description: | 0:00 - 4:00 (minutes:seconds)<br>Sets the stop time. | Default: | 0 second |

# II RTD/PT100 (Reserved)

This parameter group is reserved for future use.

## 12 Slip-Ring Motors

These parameters allow the soft starter to be configured for use with a slip-ring motor.

| <u>12A –</u> № | 1otor I Ramp                                 |                                                                                                                                                                                                                                                                                                                                           |
|----------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Options:                                     | Single Ramp (default)<br>Dual Ramp                                                                                                                                                                                                                                                                                                        |
|                | Description:                                 | Selects whether to use a single or dual current ramp profile for soft starting. Set to single ramp for non-slip ring induction motors, or dual ramp for slip-ring induction motors.                                                                                                                                                       |
| 12B – M        | 1otor 2 Ramp                                 |                                                                                                                                                                                                                                                                                                                                           |
|                | Options:                                     | Single Ramp (default)<br>Dual Ramp                                                                                                                                                                                                                                                                                                        |
|                | Description:                                 | Selects whether to use a single or dual current ramp profile for soft starting. Set to single ramp for non-slip ring induction motors, or dual ramp for slip-ring induction motors.<br>Parameter 12B selects the ramp configuration for the secondary motor.                                                                              |
| 12C –          | Changeover Time                              | e                                                                                                                                                                                                                                                                                                                                         |
|                | Range:                                       | 100 - 500 (milliseconds) Default: 150 milliseconds                                                                                                                                                                                                                                                                                        |
|                | Description:                                 | Sets the delay between the rotor resistance relay closing and the low resistance current<br>ramp starting. Set so that the contactor has enough time to close, but the motor does<br>not slow down.<br>Parameter 12C only applies if parameter 12A or 12B is set to 'Dual Ramp', and an<br>output relay is set to 'Changeover Contactor'. |
| 12D –          | Slip-Ring Retard                             |                                                                                                                                                                                                                                                                                                                                           |
|                | Range:                                       | 10% - 90% Default: 50%                                                                                                                                                                                                                                                                                                                    |
|                | Description:                                 | Sets the level of conduction after the rotor resistance contactor closes, as a percentage of full conduction.<br>Set so that no current pulse occurs, but the motor retains enough speed to start correctly.                                                                                                                              |
| 15 Adv         | anced                                        |                                                                                                                                                                                                                                                                                                                                           |
| 15A –          | Access Code                                  |                                                                                                                                                                                                                                                                                                                                           |
|                | Range:                                       | 0000 - 9999 Default: 0000                                                                                                                                                                                                                                                                                                                 |
|                | Description:                                 | Sets the access code to control access to restricted sections of the menus.                                                                                                                                                                                                                                                               |
|                |                                              | Use the $\blacktriangleleft$ and $\blacktriangleright$ buttons to select which digit to alter and use the $\blacktriangle$ and $\blacktriangledown$ buttons to change the value. After the last digit is set press <b>STORE</b> .                                                                                                         |
|                | NOTE<br>In the event of a<br>to re-program a | a lost access code, contact your supplier for master access code that allows you<br>1 new access code.                                                                                                                                                                                                                                    |

15B – Adjustment Lock

| -                   |                                                                                              |                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Options:            | Read & Write (default)                                                                       | Allows users to alter parameter values in the Programming Menu.                                            |
|                     | Read Only                                                                                    | Prevents users altering parameter values in the<br>Programming Menu. Parameter values can still be viewed. |
| Description:        | Selects whether the controller will allow parameters to be changed via the Programming Menu. |                                                                                                            |
| 15C – Emergency Run |                                                                                              |                                                                                                            |
| Options:            | Disable (default)<br>Enable                                                                  |                                                                                                            |
| Description:        | Selects whether the soft starte                                                              | er will permit emergency run operation. In emergency                                                       |

: Selects whether the soft starter will permit emergency run operation. In emergency run, the soft starter will start (if not already running) and continue to operate until emergency run ends, ignoring stop commands and trips. Emergency run is controlled using a programmable input.



Continued use of Emergency Run is not recommended. Emergency Run may compromise the starter life as all protections and trips are disabled.

Using the starter in 'Emergency Run' mode will void the product warranty.

#### **16** Protection Action

These parameters define how the soft starter will respond to different protection events. The soft starter can trip, issue a warning, or ignore different protection events as required. All protection events are written to the event log. The default action for all protections is to trip the soft starter.



## CAUTION

Defeating the protection may compromise the starter and motor, and should only be done in the case of emergency.

#### 16A~16W - Protection Actions

| Options:     | Inp Starter (default)                                   |
|--------------|---------------------------------------------------------|
|              | Warn and Log                                            |
|              | Log Only                                                |
| Description: | Selects the soft starter's response to each protection. |
|              | I6A Motor Overload                                      |
|              | • 16B Excess Start Time                                 |
|              | I6C Undercurrent                                        |
|              | I6D Instantaneous Overcurrent                           |
|              | I 6E Current Imbalance                                  |
|              | • 16F Frequency                                         |
|              | • I6G Input A Trip                                      |
|              | • I6H Input B Trip                                      |
|              | I 6I Motor Thermistor                                   |
|              | • [6] Starter Communication                             |
|              | 16K Network Communication                               |
|              | • I6L Reserved                                          |
|              | I6M Battery/Clock                                       |
|              | I6N Ground Fault                                        |
|              | • 160~16U <i>Reserved</i>                               |
|              | • 16V Undervoltage                                      |
|              | • 16W Overvoltage                                       |
|              |                                                         |

## 20 Restricted

These parameters are restricted for Factory use and are not available to the user.

# 10 Commissioning

# **10.1** Commissioning Menu (Tools)

The Commissioning Menu provides access to commissioning and testing tools.

Press ALT then TOOLS to open the Tools.

The Commissioning Menu is protected by the access code.

The default access code is 0000.

To navigate through the Commissioning Menu:

- to scroll to the next or previous item, press the  $\blacktriangle$  or  $\blacktriangledown$  button.
- to open an item for viewing, press the button.
- to return to the previous level, press the  $\blacktriangleleft$  button.
- to close the Commissioning Menu, press <- repeatedly.

## 10.2 Set Date and Time

To set the date and time:

- I. Open the Commissioning Menu.
- 2. Scroll to the date/time screen.
- 3. Press the button to enter edit mode.
- 4. Press the  $\blacktriangleright$  and  $\blacktriangleleft$  buttons to select which part of the date or time to edit.
- 5. Use the  $\blacktriangle$  and  $\blacktriangledown$  buttons to change the value.
- 6. To save changes, press the ▶ button. The MVS will confirm the changes. To cancel changes, press the ◀ button.

## **10.3 Simulation Tools**

Software simulation functions let you test the soft starter's operation and control circuits without connecting the soft starter to mains voltage.

The simulation tools are accessed via the Commissioning Menu. The simulations are only available when the soft starter is in Ready state, control voltage is available and the controller is active.

NOTE

Access to the simulation tools is protected by the security access code. The default access code is 0000.

#### **Run Simulation**

To use the run simulation:

- I. Open the Commissioning Menu.
- 2. Scroll to Run Simulation and press P.
- 3. Press **START** or activate the start input. The MVS simulates its pre-start checks and closes the main contactor relay. The Run LED flashes.

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## NOTE

If mains voltage is connected, an error message is shown. Remove mains voltage and proceed to the next step.

- 4. Press ▶. The MVS simulates starting. The Run LED flashes.
- 5. Press ▶. The MVS simulates running. The Run LED stays on without flashing and the bypass contactor relay closes.
- 6. Press **STOP** or activate the stop input. The MVS simulates stopping. The Run LED flashes and the bypass contactor relay opens.
- 7. Press ▶. The Ready LED flashes and the main contactor relay opens.
- 8. Press to return to the commissioning menu.

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# NOTE

Run simulation can be exited at any stage by pressing the  $\blacktriangleleft$ .

#### **Protection Simulation**

The **protection simulation** simulates activation of each protection mechanism to confirm that the soft starter and associated control circuits are responding correctly.

To use the protection simulation:

- I. Open the Commissioning Menu.
- 2. Scroll to Protection Simulation and press **P**.
- 3. Use the  $\blacktriangle$  and  $\blacktriangledown$  buttons to select the protection you want to simulate.
- 4. Press and hold  $\blacktriangleright$  to simulate the selected protection.
- 5. The screen is displayed momentarily. The soft starter's response depends on the Protection Action setting (parameter group 16).
- 6. Use  $\blacktriangle$  or  $\triangledown$  to select another simulation, or press  $\blacktriangleleft$  to exit.

Apply Start Signal
Run Simulation
Pre-Start Checks
STORE to Continue
Run Simulation
ATTENTION!
Remove Mains Volts
STORE to Continue
Run Simulation
Starting X:XXs
STORE to Continue

**Run Simulation** 

Ready

Run Simulation Running Apply Stop Signal

Run Simulation Stopping X:XXs **STORE** to Continue

Run Simulation Stopped **STORE** to Continue

0.0A Tripped Selected Protection



58

#### NOTE

If the protection trips the soft starter, reset before simulating another protection. If the protection action is set to 'Warn and Log', no reset is required.

If the protection is set to 'Warn and Log', the warning message can be viewed only while the **STORE** button is pressed.

If the protection is set to 'Log only', nothing appears on the screen but an entry will appear in the log.

#### Output Signal Simulation

The **output signal simulation** simulates output signalling to confirm that outputs and associated control circuits are operating correctly.

## NOTE

To test operation of the flags (motor temperature and low/high current), set an output relay to the appropriate function and monitor the relay's behaviour.

To use the output signal simulation:

- 1. Open the Commissioning Menu.
- 2. Scroll to Output Signalling Simulation and press 🕨
- 3. Use the  $\blacktriangle$  and  $\blacktriangledown$  buttons to select a function to simulate, then press  $\blacktriangleright$ .
- Use the ▲ and ▼ buttons to turn the signal on and off. To confirm correct operation, monitor the state of the output.

Prog Relay A Off On

5. Press  $\blacktriangleleft$  to return to the simulation list.

#### Analog Output Simulation

The analog output simulation uses the  $\blacktriangle$  and  $\checkmark$  buttons to change the analog output current at terminals B10, B11 of the controller.

Analog Output 0% 4 mA

Attach an external current measuring device to terminals BIO, BII of the controller. Use the  $\blacktriangle$  or  $\checkmark$  button to adjust the percentage value in the lower left hand corner of the display. The current measuring device should indicate the same level of current as shown at the lower right corner of the display.

## 10.4 Input/Ouput Status

#### **Temperature Sensors State**

This screen shows the state of the motor thermistors and RTD/PT100s.

Temp Sensors State Thermistor: 0 RTDs A <G:0000000 S = Shrt H=Hot C=Cld 0=0pn

| 1 |    |  |
|---|----|--|
|   | =1 |  |
|   | =  |  |
|   | =  |  |
|   |    |  |

**NOTE** The use of RTDs is not supported by this product and this screen will always indicate 0 (ie Open) for RTDs A->G.

#### Digital I/O State

This screen shows the current status of the digital inputs and outputs.

Digital I/O State Inputs: 1000000 Outputs: 0000000

The top line of the screen shows the start, stop, reset and programmable inputs A and B, then '00'. The screen shows input C23~C24 closed with all other inputs open.

The bottom line of the screen shows programmable output A, the fixed Run output, programmable outputs B and C, then '000'. The screen shows all outputs open.

## Analog I/O State

This screen shows the current status of the Analog I/O

Analog I/O State Input: - - - - % Output A: 04.0mA

| F |    |  |
|---|----|--|
| L | =1 |  |
| L | =  |  |
| L |    |  |
|   |    |  |

Input is not supported by this product and this screen will always indicate Input: ----%

## 10.5 Reset Thermal Models

NOTE

The MVS's advanced thermal modelling software constantly monitors the motor's performance. This allows the MVS to calculate the motor's temperature and ability to start successfully at any time.

The thermal model for the active motor can be reset if required.

- I. Open the Commissioning Menu.
- 2. Scroll to Reset Thermal Models and press **P**.
- 3. At the confirmation prompt press **STORE** to confirm or **4** to cancel the action. You may have to enter your access code.
- 4. Select Reset and press

Selecting Do Not Reset returns to previous screen.

When the thermal model has been reset, the screen will display a confirmation message then return to the previous screen.

Reset Thermal Models M1 X% M2 X% Store to Reset

Reset Thermal Models Do Not Reset Reset



#### CAUTION

Resetting the motor thermal model may compromise motor life and should only be done in the case of emergency.

# 10.6 Low Voltage Test Mode

The MVS can be connected to a low voltage motor ( $\leq$  500 VAC) for testing. This allows the user to thoroughly test the soft starter and its associated power and control circuits. The low voltage test mode provides a means of testing the soft starter's configuration without requiring a full medium voltage test facility.

For models V06 and higher, one non-conduction resistor assembly must be connected to each phase arm (three assemblies are supplied with the soft starter). The non-conduction resistor assembly is not required for models  $V02 \sim V04$ .

During the low voltage test, the soft starter's control input, relay output and protection settings can be tested. Low voltage mode is not suitable for testing soft starting or soft stopping performance.

## MVSxxxx-V06, V07

- Clip one end of the resistor assembly to the bolt on the non-conduction PCB. The non-conduction PCB is located on the side of the phase arm, at the top of the long round grading resistor (on the left hand side of the phase arm when viewed from the back). There is a small steel bracket just in front of the PCB.
- 2. Pass the other end of the assembly through the phase arm, in front of the three grading resistors, and clip it to the steel bracket in front of the grading resistor on the other side of the phase arm (this bracket looks the same as the bracket in front of the non-conduction PCB).



## MVSxxxx-VI3

- Clip one end of the resistor assembly to the bolt on the non-conduction PCB (do not connect to earth bolt, ie green/yellow wire). The non-conduction PCB is located on the side of the phase arm, at the top of the long round grading resistor (on the left hand side of the phase arm when viewed from the back).
- 2. Pass the other end of the assembly over the phase arms and clip it to the busbar at the other side of the phase arm.



07488.B



## WARNING

After low voltage mode testing, ensure that the non-conduction resistor assembly is removed from each phase arm before connecting the soft starter to a medium voltage motor. If the non-conduction resistor assemblies remain on the phase arms, the soft starter may suffer severe damage.

To operate the MVS in low voltage test mode:

- 2. Isolate the soft starter from the motor and the mains supply.
- 3. Connect one non-conduction resistor assembly to each phase arm.
- Connect T1, T2, T3 of the soft starter to a three phase motor with full load current of 5 ~ 20 A. Connect L1, L2, L3 of the soft starter to three phase mains supply with voltage less than 500 VAC (frequency 50 Hz or 60 Hz).
- 5. Set parameter *IA Motor Full Load Current* to the value shown on the motor name plate.
- 6. Switch on control and mains supply, and use the MVS to start the motor. The start command can be sent from the controller or via the remote input. Monitor the soft starter's display and verify the line current and voltage readings.
- 7. Stop and restart the motor several times to confirm correct and consistent operation.
- 8. When testing is complete, isolate the soft starter from the mains supply. Disconnect the soft starter from the motor and then remove control voltage. Remove the non-conduction resistor assembly from each phase arm.

# II Monitoring

## II.I Logs Menu

The Logs Menu provides information on events, trips and starter performance.

To open the Logs Menu, press ALT then LOGS while viewing the metering screens.



To navigate through the Logs Menu:

- to open a log, press the ▶ button.
- to scroll through the entries in each log, press the  $\blacktriangle$  and igvee buttons.
- to view details of a log entry, press the ▶ button.
- to return to the previous level, press the  $\blacktriangleleft$  button.
- to close the Logs Menu, press <- repeatedly.

## Trip Log

The Trip Log stores details of the eight most recent trips, including the date and time the trip happened. Trip I is the most recent and trip 8 is the oldest stored trip.

To open the Trip Log:

- I. Press ALT then LOGS to open the Logs.
- 2. Scroll to Trip Log and press ▶.
- 3. Use the  $\blacktriangle$  and  $\blacktriangledown$  buttons to select a trip to view, and press  $\blacktriangleright$  to display details.
- 4. Use the  $\blacktriangle$  and  $\blacktriangledown$  buttons to scroll through available details.

To close the log and return to the main display, press

## Event Log

The Event Log stores time-stamped details of the starter's 99 most recent events (actions, warnings and trips), including the date and time of the event. Event 1 is the most recent and event 99 is the oldest stored event.

To open the Event Log:

- I. Press ALT then LOGS to open the Logs.
- 2. Scroll to Event Log and press **P**.
- 3. Use the  $\blacktriangle$  and  $\blacktriangledown$  buttons to select an event to view, and press  $\blacktriangleright$  to display details.

To close the log and return to the main display, press

#### Starter Trip and Event Logger Software

The Starter Trip and Event Logger Software allows you to download the trip and event logs from the soft starter, for separate analysis.

The software is compatible with all AuCom medium voltage soft starters using control software version 1.29 or later.

For further information, or to download the software, visit <u>www.aucom.com</u>.

#### Performance Counters

The performance counters store statistics on the starter's operation:

- Hours run (lifetime and since counter last reset)
- Number of starts (lifetime and since counter last reset)
- Motor kWh (lifetime and since counter last reset)
- Number of times the thermal model has been reset

The resettable counters (hours run, starts and motor kWh) can only be reset if the *Adjustment Lock* (parameter 15B) is set to Read & Write.

To view the counters:

- I. Open the Logs Menu.
- 2. Scroll to Counters and press .
- Use the ▲ and ▼ buttons to scroll through the counters. Press ► to view details.
   To reset a counter, press STORE (enter access code if required) then use the ▼ button to select Reset. Press STORE to confirm the action.

To close the counters and return to the main display, press the  $\blacktriangleleft$  repeatedly.

# **12** Operation



#### CAUTION

We recommend testing the soft starter's setup on a low voltage motor before beginning operation on a medium voltage motor. This allows the operator to test that the soft starter is correctly connected to the auxiliary equipment.

# 12.1 Start, Stop and Reset Commands

The soft starter can be controlled in three ways:

- using the buttons on the controller
- via remote inputs
- via a serial communication link

The LCL/RMT button controls whether the MVS will respond to local control (via the controller) or remote control (via the remote inputs).

The Local LED on the controller is on when the soft starter is in local control mode and off when the soft starter is in remote control mode.

Control via the fieldbus communication network is always enabled in local control mode, and can be enabled or disabled in remote control mode (parameter 6R *Comms in Remote*). Control via the serial communication network requires an optional communication module.

The **STOP** button on the controller is always enabled.

## 12.2 Using the Soft Starter to Control a Motor

To soft start the motor, press the **START** button on the controller or activate the Start remote input. The motor will start using the start mode selected in parameter 2A.

To stop the motor, press the **STOP** button on the controller or activate the Stop remote input. The motor will stop using the stop mode selected in parameter 2H.

To reset a trip on the soft starter, press the **RESET** button on the controller or activate the Reset remote input.

To stop the motor with a coast to stop, regardless of the setting of parameter 2H *Stop Mode*, press the local **STOP** and **RESET** buttons at the same time. The soft starter will remove power from the motor and open the main contactor, and the motor will coast to stop.

# 12.3 Using the MVS to Control a Slip-Ring Motor

The MVS can be used to control a slip-ring motor, using rotor resistance.



| 1  | Sub-states                            |
|----|---------------------------------------|
| tl | Main contactor close time             |
| t2 | Rotor resistance contactor close time |
| t3 | Bypass contactor close time           |
| 2  | Output voltage                        |
| VI | 100% voltage                          |
| V2 | Slip-ring retard voltage              |

| 3  | States                        |
|----|-------------------------------|
| SI | Ready                         |
| S2 | Pre-start tests               |
| S3 | Starting                      |
| S4 | Running                       |
| 4  | Phases of operation           |
| ΡI | Start command                 |
| P2 | Rotor resistance current ramp |
| P3 | Shorted rotor current ramp    |

#### Commissioning

- I. Configure the MVS as follows: Parameter settings:
  - Parameter 7A Relay A Function
    - Select 'Changeover Contactor'
    - Parameter 7B *Relay A On Delay*
    - Set this to the maximum time (5m:00s).
  - Parameter I2A Motor Data-I Ramp
    - Select 'Dual Ramp' (for slip-ring induction motor control)
  - Parameter 12C Changeover Time
    - Default setting is 150 milliseconds. Set this to a value just greater than the changeover contactor (K3) pole closing time.
  - Parameter I2D *Slip Ring Retard* 
    - Default setting is 50%. Set this parameter to a value which is high enough to cause the motor to instantly accelerate once the rotor resistance (R1) has been bridged out and low enough to avoid a motor current pulse.
- 2. Start the motor under normal load conditions and record the time it takes to reach a constant speed with external rotor resistance (R1) in the circuit. Stop the motor soon after a constant speed has been reached. Change parameter 7B to the recorded time value.
- 3. Start the motor under normal load conditions and monitor the motor speed behaviour and motor current when the changeover contactor (K3) switches in to short-out the rotor resistance (R1) If the motor does not start to accelerate immediately after changeover, increase the setting of parameter 12D. If there is a pulse in motor current immediately after changeover, reduce the setting of parameter 12D.





#### NOTE

For this installation to function correctly, only use the constant current start method (parameter 2A *Start Mode*). To use the secondary motor settings, parameter 12B *Motor Data-2 Ramp* must be set to 'Dual Ramp'.

# Slip-Ring Motor Connection



| AI      | Power assembly                   |
|---------|----------------------------------|
|         | 3 Phase 50/60 Hz Supply          |
| KI      | Main contactor                   |
| K2      | Bypass contactor                 |
| 2       | Motor                            |
| RI      | Slip-ring rotor resistance       |
| K3      | Changeover contactor             |
| A2      | Control voltage terminals        |
| 3       | Control supply                   |
| A3      | Power interface board            |
| 4       | Relay outputs                    |
| C73~C74 | Bypass contactor feedback signal |
| 3~ 4    | Main contactor KI                |
| 23~24   | Bypass contactor K2              |
| 33~34   | Run relay output                 |
| 43~44   | Fan control output               |

| A4                                           | Controller                                                                                                                                   |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 5                                            | Remote control inputs                                                                                                                        |
| C23~C24                                      | Control Input - Start                                                                                                                        |
| C31~C32                                      | Control Input - Stop                                                                                                                         |
| C41~C42                                      | Control Input - Reset                                                                                                                        |
| C53~C54                                      | Control Input - Programmable input A                                                                                                         |
| C63~C64                                      | Control Input - Programmable input B                                                                                                         |
|                                              |                                                                                                                                              |
| 6                                            | Programmable outputs                                                                                                                         |
| <b>6</b><br>43, 44                           | Programmable outputs<br>Relay output A                                                                                                       |
| 6<br>43, 44                                  | Programmable outputs<br>Relay output A<br>Functionality = Changeover contactor                                                               |
| 6<br>43, 44<br>51, 52, 54                    | Programmable outputs<br>Relay output A<br>Functionality = Changeover contactor<br>Relay output B                                             |
| 6<br>43, 44<br>51, 52, 54<br>61, 62, 64      | Programmable outputs<br>Relay output A<br>Functionality = Changeover contactor<br>Relay output B<br>Relay output C                           |
| 6<br>43, 44<br>51, 52, 54<br>61, 62, 64<br>7 | Programmable outputs<br>Relay output A<br>Functionality = Changeover contactor<br>Relay output B<br>Relay output C<br>Motor thermistor input |

# 12.4 Operating States

## Start and Run States

The MVS soft starter has six operating states, and performs the following actions in each state:



| State |                  | Starter actions                                                                       |  |
|-------|------------------|---------------------------------------------------------------------------------------|--|
| I     | Not ready        | Control power is on and the starter performs system checks. The starter may be        |  |
|       |                  | waiting for the motor to cool before allowing a start.                                |  |
| 2     | Ready            | The starter is initialised and waiting for a start command.                           |  |
| 3     | Pre-start checks | A start command has been received (a). The main contactor closes (b) and the starter  |  |
|       |                  | performs connection checks.                                                           |  |
| 4     | Starting         | The starter ramps the SCRs up to full conduction and closes the bypass contactor (c). |  |
| 5     | Running          | The motor is running normally.                                                        |  |
| 6     | Stopping         | A stop command has been received (d). The starter opens the bypass contactor (e),     |  |
|       |                  | ramps the SCRs down to no conduction, then opens the main contactor (f).              |  |

## **Trip States**

The starter's response to a trip depends on the starter's state when the trip occurs.

## • Trip while starting (bypass contactor not yet closed)

| State                  | Function                                                            |
|------------------------|---------------------------------------------------------------------|
| Not ready              | Perform system checks.                                              |
| Ready                  | Wait for start command.                                             |
| Start command received | Main contactor closes.                                              |
| Pre-Start Checks       | Perform connection checks.                                          |
| Starting               | Ramp up SCR firing angles.                                          |
| Trip command           | Turn SCRs off then open main contactor.                             |
| Tripped                | Wait for reset command.                                             |
| Reset command received | Trip cleared and starter returns to Not Ready state or Ready state. |

## • Trip while running (bypass contactor closed)

| State                  | Starter action                                                                        |
|------------------------|---------------------------------------------------------------------------------------|
| Not ready              | Perform system checks.                                                                |
| Ready                  | Wait for start command.                                                               |
| Start command received | Main contactor closes.                                                                |
| Pre-Start Checks       | Perform connection checks.                                                            |
| Starting               | Ramp up SCR firing angles.                                                            |
| Full conduction        | SCRs at 100% conduction. Verify current is $< 120\%$ FLC then close bypass contactor. |
| Running                | Normal motor run state (bypassed mode).                                               |
| Trip command           | Open bypass contactor. Tum SCRs off then open main contactor.                         |
| Tripped                | Wait for reset command.                                                               |
| Reset command received | Trip cleared and starter returns to Not Ready or Ready state.                         |

#### • Instantaneous Overcurrent Stage 2 trip

The main contactor opens immediately, regardless of the starter's state.

## **12.5** Motor Protection

#### Motor, System and Soft Starter Protection Mechanisms

The MVS incorporates extensive protection features to ensure safe operation of the motor, system and soft starter. Most protection features can be customised to suit the installation. Use parameter group 4 Protection Settings to control the situation where the protections will activate and parameter group 16 Protection Action to select the soft starter's response. The default response is to trip the soft starter.

#### Protection Coordination

Check protection settings on the supply side of the starter to ensure correct coordination with the parameters of the soft starter. .

When using fuse and main contactors, set the upstream circuit breaker protection parameters according to the ratings for fuse and contactor. The contactor must not open if the current is above its maximum breaking current value. The fuse must act first or the upstream breakers instantaneous trip level must be less than the contactor's maximum breaking current level.

If using circuit breakers only, set the soft starter's maximum instantaneous trip time < 150 ms. Always use a suitable external protection relay with a circuit breaker to ensure instantaneous overcurrent trip functionality.

Voltage must not be continuously maintained on the phase arms while the motor is off. Short circuit protective equipment must be installed in all cases.

#### Motor Overload Protection

The MVS offers thermal model motor overload protection which monitors the performance of the motor and calculates its temperature in all states. This protection is based on the motor information programmed in parameter groups 1 and 9, and the thermal model adjusts itself according to the motor's recent operating history (including temperature rise from previous operation).



| I | Motor service factor                 |
|---|--------------------------------------|
| 2 | Locked rotor current                 |
| 3 | Motor failure curve                  |
| 4 | Motor thermal model protection curve |
| 5 | Typical motor operating current      |

#### Motor Thermal Model Protection Set-up

To enable motor and starter protection using the motor thermal model, the soft starter must be programmed with accurate information on the motor's characteristics.

- 1. Set parameters IB *Locked Rotor Time*, IC *Locked Rotor Current* and ID *Motor Service Factor* according to the motor datasheet.
- 2. Use instantaneous overcurrent protection (parameters 4E, 4F) to provide protection for locked rotor situations. Refer to individual parameters for details.
- 3. Use instantaneous overcurrent protection stage 2 (parameters 4U, 4V) to trip circuit breaker or main contactor in the event of extreme overcurrent situations.

## 12.6 Operating Feedback

## Displays

The controller displays a wide range of performance information about the soft starter. The top half of the screen shows real-time information on current or motor power (as selected in parameter 8D). Use the  $\blacktriangle$  and  $\nabla$  buttons to select the information shown on the bottom half of the screen.

- Starter status
- User programmable screen
- Motor temperature
- Current
- Motor power
- Voltage
- Last start information
- Date and time
- Performance graphs
- SCR conduction



NOTE Screens shown here are with the default settings.

#### Starter Status

The starter status screen shows details of the starter's operating status, including motor current, power and temperature.

|         | 0A |         |  |
|---------|----|---------|--|
| Ready   |    |         |  |
| M1 000% |    | 000.0kW |  |

#### Programmable screen

The MVS's user-programmable screen can be configured to show the most important information for the particular application. Use parameters 8E to 8H to select which information to display.



#### Motor Temperature

The temperature screen shows which motor data set is in use, and the temperature of the motor as a percentage of total thermal capacity.





NOTE

M2 xxx% temperature is not applicable to this product.

#### • Current monitoring screen

The current screen shows real-time line current on each phase.

| 0A                              |        |        |  |  |
|---------------------------------|--------|--------|--|--|
| Phase Currents (Gnd Crnt XX.XA) |        |        |  |  |
| 000.0A                          | 000.0A | 000.0A |  |  |

## Motor Power

The motor power screen shows motor power (kW, HP and kVA) and power factor.

| 0A      |        |
|---------|--------|
| 000.0kW | 0000HP |
| 0000kVA | pf     |

#### Voltage

The voltage screen shows real-time line voltage across each phase.

|               | 0A    |       |
|---------------|-------|-------|
| Line Voltages |       |       |
| 00000         | 00000 | 00000 |

#### Last Start Information

The last start information screen shows details of the most recent successful start:

- start duration (seconds)
- maximum start current drawn (as a percentage of motor full load current)
- calculated rise in motor temperature

| 0A             |                  |  |
|----------------|------------------|--|
| Last start 000 | S                |  |
| 000 % FLC      | $\Delta$ Temp 0% |  |

#### Date and Time

The date/time screen shows the current system date and time (24 hour format). For details on setting the date and time, refer to *Set Date and Time* on page 57.



#### Performance Graph

The performance graph provides a real-time display of operating performance. Use parameters 81~8L to select which information to display.



#### • SCR Conduction Bargraph

The SCR conduction bargraph shows the level of conduction on each phase.


# 13 Troubleshooting

The MVS provides extensive information to help the operator diagnose and remedy any operating difficulties.

In addition to the motor and load protection features already described, the MVS reports in detail on the starter's own state. Any internal failure will cause the soft starter to trip, and full details will be recorded in the Trip Log and Event Log.

# **13.1** Protection Responses

When a protection condition is detected, the MVS will write this to the event log and may also trip or issue a warning. The soft starter's response depends on the Protection Action setting (parameter group 16).

Some protection responses cannot be adjusted by the user. These trips are usually caused by external events (such as phase loss) or by a fault within the soft starter. These trips do not have associated parameters and cannot be set to Warn or Log.

If the MVS trips you will need to identify and clear the condition that triggered the trip, then reset the soft starter before restarting. To reset the starter, press the **RESET** button on the controller or activate the Reset remote input.

If the MVS has issued a warning, the soft starter will reset itself once the cause of the warning has been resolved.

# 13.2 Trip Messages

This table lists soft starter's protection mechanisms and the probable cause of the trip. Some of these can be adjusted using parameter group 4 Protection Settings and parameter group 16 Protection Action, other settings are built-in system protections and cannot be set or adjusted.

| Display           | Possible cause/Suggested solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| Battery/clock     | A verification error has occurred on the real time clock, or the backup battery voltage is low. If<br>the battery is low and the power is off, date/time settings will be lost. The MVS will continue<br>to soft start and soft stop correctly. Reprogram the date and time.<br>The battery is not removable. In order to replace the battery, the main control PCB must be<br>replaced.<br>Related parameters: I 6M                                                                                                                    |  |  |  |
| contactor)        | problem with the control circuit or the contactor coil.<br>Check the condition of the bypass contactor's main poles. Check the operation of the<br>contactor control circuitry and contactor coil.<br>This trip is not adjustable.                                                                                                                                                                                                                                                                                                      |  |  |  |
|                   | NOTE<br>You can use the Run Simulation to check the bypass contactor's operation<br>without mains voltage connected.                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |
| Controller        | This is a name selected for a programmable input. Refer to Input A trip.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |
| Current imbalance | <ul> <li>Current imbalance can be caused by problems with the motor, the environment or the installation, such as:</li> <li>An imbalance in the incoming mains voltage</li> <li>A problem with the motor windings</li> <li>A light load on the motor</li> <li>A phase loss on input terminals L1, L2 or L3 during Run mode</li> <li>An SCR that has failed open circuit. A failed SCR can only be definitely diagnosed by replacing the SCR and checking the starter's performance.</li> <li>Related parameters: 4H, 4I, 16E</li> </ul> |  |  |  |
| EEPROM fail       | <ul> <li>An error occurred loading data from the EEPROM to RAM when the controller powered up.</li> <li>"Load User Set" has been selected but no saved file is available.</li> <li>Reset the fault and then reload the default settings. If the problem persists, contact your local distributor.</li> <li>Related parameters: None</li> </ul>                                                                                                                                                                                          |  |  |  |

| Display             | Possible cause/Suggested solution                                                                                                                    |  |  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Excess start time   | The motor was unable to accelerate to full speed in the time allowed.                                                                                |  |  |
|                     | Excess start time trip can occur in the following conditions:                                                                                        |  |  |
|                     | • parameter I A <i>Motor Full Load Current</i> is not appropriate for the motor                                                                      |  |  |
|                     | parameter 2D <i>Current Limit</i> has been set too low                                                                                               |  |  |
|                     | • parameter 2B <i>Start Ramp Time</i> has been set greater than the setting for 4A <i>Excess Start</i>                                               |  |  |
|                     | Time setung<br>The meter may have experienced an abnormal increase in leading or might be immed                                                      |  |  |
|                     | <ul> <li>The motor may have experienced an abnormal increase in loading or might be jamined.</li> <li>Related parameters: LA_2A-2D_4A_16B</li> </ul> |  |  |
| Feeder Prot         | This is a name selected for a programmable input. Refer to Input A trip.                                                                             |  |  |
| Field Trin          | This is a name selected for a programmable input. Refer to input A trip.                                                                             |  |  |
| Frequencu           | The mains frequency has gone beyond the specified range                                                                                              |  |  |
| Inclusion           | Check for other equipment in the area that could be affecting the mains supply, particularly                                                         |  |  |
|                     | variable speed drives and switch mode power supplies (SMPS).                                                                                         |  |  |
|                     | If the MVS is connected to a generator set supply, the generator may be too small or could                                                           |  |  |
|                     | have a speed regulation problem.                                                                                                                     |  |  |
| Ground fault        | Related parameters: 4J, 4K, 4L, 16F                                                                                                                  |  |  |
| Ground fault        | selected level. Test the insulation of the output cables and the motor. Identify and resolve the                                                     |  |  |
|                     | cause of any ground fault.                                                                                                                           |  |  |
|                     | Related parameters: 40, 4P, 16N                                                                                                                      |  |  |
| Heatsink            | The soft starter is operating at a dangerously high temperature.                                                                                     |  |  |
| overtemperature     | Check if ventilation and cooling are adequate.                                                                                                       |  |  |
|                     | Reduce the number of consecutive starts by increasing the value set in parameter 4M                                                                  |  |  |
|                     | Restart Delay.                                                                                                                                       |  |  |
| High Level          | This is a name selected for a programmable input. Refer to Input A trip                                                                              |  |  |
| Tilgh Level         |                                                                                                                                                      |  |  |
| High Pressure       | This is a name selected for a programmable input. Refer to Input A trip.                                                                             |  |  |
| Input A trip        | The soft starter's programmable input is set to a trip function and has activated. Resolve the                                                       |  |  |
|                     | trigger condition.<br>Related commentary (A) (P) (C) (D) (E) (E) (C) (H) (L) (C) (C) (C)                                                             |  |  |
| Instantaneous       | There has been a sharp rise in motor current, probably caused by a locked rotor condition                                                            |  |  |
| overcurrent         | (shearpin) while running. This may indicate a jammed load.                                                                                           |  |  |
|                     | A trip may also occur when a medium level fault current has been detected. This may indicate                                                         |  |  |
|                     | a system short circuit.                                                                                                                              |  |  |
| I                   | Related parameters: 4E, 4F, 16D                                                                                                                      |  |  |
| Instantaneous       | I here has been a sharp rise in output current, possibly caused by a short circuit condition.                                                        |  |  |
| overcurrent az      | Related parameters: 4U, 4V, 16D                                                                                                                      |  |  |
| Int Comms Fail      | Communication has failed between the controller and the power interface board.                                                                       |  |  |
|                     | • Check that the controller is receiving control voltage within the specified range (terminals                                                       |  |  |
|                     | AII, AI2).                                                                                                                                           |  |  |
|                     | • Check that the fibre-optic cables between the controller and the interface board are firmly                                                        |  |  |
|                     | connected.<br>Charle that each fibre partic cable is emitting light at the By and                                                                    |  |  |
|                     | • Check that each libre-optic cable is emitting light at the rix end.<br>This trip is not adjustable                                                 |  |  |
| Interlock Trip      | This is a name selected for a programmable input. Refer to Input A trip.                                                                             |  |  |
| Internal fault 94 ~ | There has been an internal communication error within the soft starter. Remove then restore                                                          |  |  |
| Internal fault 98   | control power.                                                                                                                                       |  |  |
|                     | This trip is not adjustable.                                                                                                                         |  |  |
| Internal fault 99 - | There is a problem with the non-conduction fibre-optic connections. Internal Fault 99                                                                |  |  |
| Internal fault 101  | corresponds to phase 1, Internal Fault 100 corresponds to phase 2, Internal Fault 101                                                                |  |  |
|                     | Check that the fibre-optic cable is properly connected between the non-conduction $PCP$                                                              |  |  |
|                     | on the phase arm and the non-conduction readback connector on the power interface                                                                    |  |  |
|                     | board.                                                                                                                                               |  |  |
|                     | • If the problem persists, replace the fibre-optic cable.                                                                                            |  |  |
|                     | This trip is not adjustable.                                                                                                                         |  |  |

| Display            | Possible cause/Suggested solution                                                                                             |  |  |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|--|--|
| Internal fault 104 | The power fail input is open circuit.                                                                                         |  |  |
|                    | Check that control voltage is available.                                                                                      |  |  |
|                    | • There may be a wiring fault.                                                                                                |  |  |
|                    | This trip is not adjustable.                                                                                                  |  |  |
| Internal fault 105 | The power interface board is faulty or damaged. Replace the board.<br>This trip is not adjustable                             |  |  |
| Internal fault 106 | The selected configuration for the CT ratio selection switches on the power interface board is                                |  |  |
|                    | not valid.                                                                                                                    |  |  |
|                    | Check the DIP switch settings on the interface PCB. Refer to <i>Ground Current</i> .  This trip is part adjustable.           |  |  |
| Internal fault V   | This trip is not adjustable.<br>The MVS has tripped on an internal fault. Contact your local supplier with the fault code (X) |  |  |
|                    | Related parameters: None                                                                                                      |  |  |
| L1 phase loss      | During pre-start checks the starter has detected a phase loss as indicated.                                                   |  |  |
| L2 phase loss      | In run state, the starter has detected that the current on the affected phase has dropped below                               |  |  |
| L3 phase loss      | phase or connection to the motor has been lost                                                                                |  |  |
|                    | Check the supply and the input and output connections at the starter and at the motor end.                                    |  |  |
|                    | Phase loss can also be caused by a failed SCR, particularly an SCR that has failed open circuit.                              |  |  |
|                    | A failed SCR can only be definitely diagnosed by replacing the SCR and checking the starter's                                 |  |  |
|                    | performance.                                                                                                                  |  |  |
| 11 Ti shouted      | Related parameters: None                                                                                                      |  |  |
| LI-TI SHOPLED      | bypass contactor as indicated                                                                                                 |  |  |
| L2-12 Shorted      | This trip is not adjustable.                                                                                                  |  |  |
| Lo-15 Shorted      |                                                                                                                               |  |  |
| Low Control Volts  | Control voltage to the controller has dropped below the required level.                                                       |  |  |
| Low Level          | This is a name selected for a programmable input. Refer to Input A trip.                                                      |  |  |
| Low Pressure       | This is a name selected for a programmable input. Refer to Input A trip.                                                      |  |  |
| Motor connection   | There is a problem with the soft starter's connection to the motor. If only one phase is                                      |  |  |
|                    | affected, the error message will indicate which phase (TI, T2, T3).                                                           |  |  |
|                    | • Ensure the motor is connected to terminals TI, T2, T3 using in-line (three wire)                                            |  |  |
|                    | connection. The MVS does not support inside delta (six wire) connection.                                                      |  |  |
|                    | <ul> <li>Check that the fibre-optic cables between the power interface board and the MVS are<br/>firmly connected.</li> </ul> |  |  |
|                    | Check each output phase of the soft starter for power circuit continuity.                                                     |  |  |
|                    | This trip will also occur when there is a phase imbalance across the soft starter's input terminals                           |  |  |
|                    | L1, L2, L3, during starting and stopping.                                                                                     |  |  |
| kdates Connection  | Kelated parameters: None                                                                                                      |  |  |
|                    | The motor is not connected correctly to the soft starter $\frac{1}{2}$                                                        |  |  |
| 10                 | <ul> <li>Check individual motor connections to the soft starter for power circuit continuity.</li> </ul>                      |  |  |
|                    | <ul> <li>Check connections at the motor terminal box.</li> </ul>                                                              |  |  |
|                    | This trip is not adjustable.                                                                                                  |  |  |
|                    | Related parameters: None                                                                                                      |  |  |
| Motor overload     | The motor has reached its maximum thermal capacity. Overload can be caused by:                                                |  |  |
|                    | The soft starter protection settings not matching the motor thermal capacity                                                  |  |  |
|                    | Excessive starts per hour                                                                                                     |  |  |
|                    | Excessive throughput                                                                                                          |  |  |
|                    | Damage to the motor windings                                                                                                  |  |  |
|                    | Resolve the cause of the overload and allow the motor to cool.<br>Related parameters: $ A   B   C   D   9B   6A$              |  |  |
| Motor Prot         | Prot This is a name selected for a programmable input Refer to Input A trip                                                   |  |  |
| motorriot          |                                                                                                                               |  |  |
| Motor Terro        | I his is a name selected for a programmable input – Refer to Input A trip                                                     |  |  |

| Display                       | Possible cause/Suggested solution                                                              |  |  |
|-------------------------------|------------------------------------------------------------------------------------------------|--|--|
| Motor thermistor              | The external resistance across the motor thermistor input (terminals B4, B5) has exceeded      |  |  |
|                               | 2.4 k <b>Ω</b> .                                                                               |  |  |
|                               | • If the starter tripped at power-up, no thermistor is present at terminals B4, B5. If you are |  |  |
|                               | not using a thermistor, you must attach a link across terminals B4-B5.                         |  |  |
|                               | • If the starter tripped during operation, the temperature of the motor winding has            |  |  |
|                               | increased. Resolve the cause of the overheating.                                               |  |  |
|                               | Related parameters: 16                                                                         |  |  |
| Network                       | The network master has sent a trip command to the starter, or there may be a network           |  |  |
| communication                 | Communication problem.                                                                         |  |  |
| (between module               | Related parameters: 16K                                                                        |  |  |
| and network)                  |                                                                                                |  |  |
| No Flow                       | This is a name selected for a programmable input. Refer to Input A trip.                       |  |  |
| Overvoltage                   | There has been a voltage surge on the mains. Causes can include problems with a transformer    |  |  |
|                               | tap regulator or off-loading of a large transformer load.                                      |  |  |
|                               | Check that the starter is configured appropriately for local conditions.                       |  |  |
|                               | • Monitor the mains voltage to determine the cause of the voltage fluctuation, and resolve     |  |  |
|                               | the cause.                                                                                     |  |  |
| Dhalas as success             | The alter parameters: 45, 41, 16VV                                                             |  |  |
| Phase sequence                | The phase sequence on the soft starter's input terminals (L1, L2, L3) is not valid.            |  |  |
|                               | The installation                                                                               |  |  |
|                               | Related parameters: 4G                                                                         |  |  |
| PLC                           | This is a name selected for a programmable input Refer to Input A trip                         |  |  |
| Power loss                    | The starter is not receiving mains supply on one or more phases when a start command is        |  |  |
|                               | given.                                                                                         |  |  |
|                               | • Check that the main contactor closes when a start command is given, and remains closed       |  |  |
| until the end of a soft stop. |                                                                                                |  |  |
|                               | • Check MVS fuses and confirm that all three mains supply phases are present.                  |  |  |
| This trip is not adjustable.  |                                                                                                |  |  |
| Pump Fault                    | This is a name selected for a programmable input. Refer to Input A trip.                       |  |  |
| Starter                       | There could be a problem with the connection between the soft starter and the optional         |  |  |
| communication                 | communications module. Remove and reinstall the module. If the problem persists, contact       |  |  |
| (between module               | your local distributor.                                                                        |  |  |
| and soft starter)             | The communications module has been powered down while the soft starter remains powered         |  |  |
|                               | up.<br>Related parameters: 161                                                                 |  |  |
| Starter Disable               | This is a name selected for a programmable input. Refer to Input A trip.                       |  |  |
| Undercurrent                  | The motor has experienced a sharp drop in current, caused by loss of load. Causes can          |  |  |
|                               | include broken components (shafts, belts or couplings) or a pump running dry                   |  |  |
|                               | Related parameters: 4C. 4D. 16C                                                                |  |  |
| Undervoltage                  | Mains voltage has fallen below the level selected in parameter 40. Causes can include an       |  |  |
|                               | undersized supply or adding a large load to the system.                                        |  |  |
|                               | Check that the starter is configured appropriately for local conditions.                       |  |  |
|                               | • Monitor the mains voltage to determine the cause of voltage fluctuation.                     |  |  |
|                               | Related parameters: 4Q, 4R, 16V                                                                |  |  |
| Vibration                     | This is a name selected for a programmable input. Refer to Input A trip.                       |  |  |
| VZC Fail Px                   | Where 'X' is I, 2 or 3.                                                                        |  |  |
|                               | The voltage detection system has failed.                                                       |  |  |
|                               | The voltage dividing resistors have failed or the power interface board may be faulty.         |  |  |
|                               | Contact AuCom for advice.                                                                      |  |  |

## LED locations

The non-conduction and firing LEDs are located on the power interface PCB. The non-conduction LEDs should dim during starting, and should be off when the bypass contactor closes. The firing LEDs should be on during starting, and off just before the bypass contactor closes and the soft starter enters run mode.

The gate drive adaptor, gate drive and gate drive firing PCBs are located on individual phase arm power assemblies.



# **I3.3 General Faults**

This table describes situations where the soft starter does not operate as expected but does not trip or give a warning.

| Symptom                                                                                              | Probable Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| The soft starter does not respond to the <b>START</b> or <b>RESET</b> button on the controller.      | • The soft starter may be in Remote control mode. When the soft starter is in Remote control mode, the Local LED on the starter is off. Press the LCL/RMT button once to change to Local control.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| The soft starter does not respond to commands from the control inputs.                               | <ul> <li>The soft starter may be in Local control mode. When the soft starter is in Local control mode, the Local LED on the starter is on. Press the LCL/RMT button once to change to Remote control.</li> <li>The control wiring may be incorrect. Check that the remote start, stop and reset inputs are configured correctly (refer to <i>Control Wiring</i> on page 28 for details).</li> <li>The signals to the remote inputs may be incorrect. Test the signalling by activating each input signal in turn. The appropriate remote control input LED should activate on the starter.</li> </ul>                                                                                                                                                                                                                                                                                                            |  |
| The soft starter does not respond to<br>a start command from either the<br>local or remote controls. | <ul> <li>LED should activate on the starter.</li> <li>The soft starter may be waiting for the restart delay to elapse. The length of the restart delay is controlled by parameter 4M <i>Restart Delay</i>.</li> <li>The motor may be too hot to permit a start. If parameter 4N <i>Motor Temperature Check</i> is set to Check, the soft starter will only permit a start when it calculates that the motor has sufficient thermal capacity to complete the start successfully. Wait for the motor to cool before attempting another start.</li> <li>The starter may be disabled via a programmable input. If parameter 6A is set to Starter Disable and there is an open circuit on C53, C54, the MVS will not start. If there is no further need to disable the starter, close the circuit on the input.</li> <li>NOTE Parameter 6Q <i>Local/Remote</i> controls when the LCL/RMT button is enabled.</li> </ul> |  |
| Motor does not reach full speed.                                                                     | <ul> <li>If the start current is too low, the motor will not produce enough torque to accelerate to full speed. The soft starter may trip on excess start time.</li> <li>NOTE         Make sure the motor starting parameters are appropriate for the application and that you are using the intended motor starting profile. If parameter 6A or 6F is set to Motor Set Select, check that the corresponding input is in the expected state.     </li> <li>The load may be jammed. Check the load for severe overloading or a locked rotor situation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                  |  |

| Symptom                                                                                              | Probable Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Erratic motor operation.                                                                             | • The SCRs in the MVS require at least 5 A of current to latch. If you are testing the soft starter on a motor with full load current less than 5 A, the SCRs may not latch correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Soft stop ends too quickly.                                                                          | <ul> <li>The soft stop settings may not be appropriate for the motor and load.<br/>Review the settings of parameters 2H, 2I, 10H and 10I.</li> <li>If the motor is very lightly loaded, soft stop will have limited effect.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Remote start/stop command is<br>overriding Auto-Stop settings when<br>using remote two-wire control. | <ul> <li>Auto-Stop should only be used in remote mode with three-wire or<br/>four-wire control.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Parameter settings cannot be stored.                                                                 | <ul> <li>Make sure you are saving the new value by pressing the STORE button after adjusting a parameter setting. If you press EXIT, the change will not be saved.</li> <li>Check that the adjustment lock (parameter 15B) is set to <i>Read &amp; Write</i>. If the adjustment lock is set to <i>Read Only</i>, settings can be viewed but not changed. You need to know the security access code to change the adjustment lock setting.</li> <li>The EEPROM may be faulty on the controller. A faulty EEPROM will also trip the soft starter, and the controller will display the message Parameter Out Of Range. Contact your local supplier for advice.</li> </ul> |
| ATTENTION! Remove Mains Volts                                                                        | • The soft starter will not activate Run Simulation with three-phase power connected. This prevents unintentional direct on-line (DOL) start.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Current values shown on the display are incorrect.                                                   | • Check that the setting of the CT ratio selector DIP switch on the power interface board matches the ratio of the CT used. Refer to <i>Ground Current</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

# 14 Maintenance

# I4.I Safety

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The MVS soft starter is not user serviceable. The unit should only be serviced by authorised service personnel. Unauthorised tampering with the unit will void the product warranty.

#### **Electrical Shock Risk**

NOTE

The voltages present in the following locations can cause severe electric shock and may be lethal:

- AC supply cables and connections
- Output cables and connections
- Many internal parts of the starter, and external option units

The AC supply must be disconnected from the starter using an approved isolation device before any cover is removed from the starter or before any servicing work is performed.



## WARNING

Always ensure that all tools have been removed from the soft starter panel after conducting maintenance operations. There is a significant risk of arc fault due to bridging between panel conductors and conductive foreign bodies such as tools.

# 14.2 Maintenance Schedule

The table below lists the minimum maintenance requirements. Your maintenance program may include more frequent maintenance. In certain environmental conditions (such as dusty or humid environments), increase the frequency of maintenance to every year.

| Part               | Instructions                 | Timing        |  |
|--------------------|------------------------------|---------------|--|
| Switch             | Check contact condition      | Every 2 years |  |
| Contactor – main   | Check for wear, torque bolts | Every 2 years |  |
| Contactor – bypass | Check for wear, torque bolts | Every 2 years |  |
| Contactor for PFCC | Check for wear, torque bolts | Every 2 years |  |
| Control terminals  | Check tightness              | Every 2 years |  |
| Earthing terminals | Check tightness              | Every 2 years |  |
| Cable lugs         | Check tightness              | Every 2 years |  |
| General MVS        | Cleanliness                  | Every 2 years |  |

# 14.3 Tools required

MVS starters can be serviced with the following tools:

- Allen keys (standard metric)
- 16 mm spanners
- 16 mm socket
- Torque wrench <20 Nm
- Torx drive screwdriver #20
- Small flat bladed screwdriver 3 mm
- Multimeter
- MV Insulation tester

# 14.4 Thermal Image

After completing commissioning of the MVS and after the motor has been running fully loaded, take a thermal image of the busbars and other critical parts.

As part of the maintenance program, compare a recent thermal image with the post-commissioning image.

Perform the usual inspection for dust and debris.

# 14.5 Contactor Maintenance

Refer to your contactor manual for operation and maintenance instructions.

- I. As part of normal operation, run the withstand voltage test at not less than half the rated test value.
- 2. Follow the manufacturer's maintenance instructions and check the torque values on all connections.

# 14.6 Isolation Switch Maintenance



#### WARNING

Do not operate the switch while current is flowing (motor or capacitor).

The isolation switch is designed for use in any MVS panel and it is not designed for outdoor use. The isolation switch must be installed with a breaker or similar device on the supply side to limit the prospective fault energy. Fuses must be used on the motor side of the switch.

- I. Isolate the power supply before beginning any work on the isolation switch.
- 2. Inspect the switch contacts for signs of wear. If there is evidence of wear, contact your local supplier for replacement parts.
- 3. Check that the microswitch activates when removing the isolator locking pin.
- 4. With the switch in the closed position check the contact resistance for each pole of the switch.
- 5. Use a lint-free cloth to clean the isolation switch. Warm soapy water may be necessary in cleaning.
- 6. Wipe the main contacts and main arms with Electrolube (Electrolube part # CG35A) at points of contact.



Adjust to less than 60  $\mu\Omega$  (micro ohms)

# 14.7 Isolator Microswitch Adjustment

If the microswitch does not activate correctly, adjust the position of the plunger.

- I. Remove the isolation switch handle and the MVS panel front cover.
- 2. Adjust the position of the microswitch bracket by turning the adjusting screws.
  - The plunger must be horizontally aligned with the centre of the locking pin tube.
  - The end of the plunger must be approximately 8 mm from the edge of the locking pin tube.



| А | Front cover and handle in place |
|---|---------------------------------|
| В | Front cover and handle removed  |
| С | Microswitch location            |
| D | Microswitch detail              |
| I | Bracket                         |
| 2 | Adjustment screws               |
| 3 | Plunger                         |

# 14.8 Phase Arm Assembly Alignment (model VI3)

The phase arm locates itself at the fully withdrawn state when sliding in and out of the frame.

During the commissioning process, during maintenance and when installing a phase arm check the phase arm alignment.



#### WARNING

Do not extend more than one phase arm at any one time.



# NOTE

Torque all bolts after alignment.

 Loosen both rear busbar captive bolts and four (4) domed socket head cap screws on the rear of the phase arm. The busbar captive bolts are loose at the point of resistance.

- 2. Loosen the phase block mounting bolts on both sides of the phase assembly that hold it to the tray.
- 3. Remove the phase arm locking nuts on both sides.

- 4. Slide out the phase arm assembly.
- 5. Slide in the phase arm assembly to check alignment.
- 6. Align the phase block on left or right as required.
- 7. Align and secure the main phase connection captive bolts.
- Tighten locking rod on both sides to 10 Nm.
   Tighten nut and washer on both sides of the
- phase arm to 10 Nm. 10. Secure dome head bolts (nip and secure) on the
- bus work to 30 Nm. 11. Secure the cap head dome bolts on the phase
- blocks. Torque to 12 Nm. 12. Re-adjust if required by repeating steps 3-10

above.



# 14.9 Removing Phase Arms (model VI3)



WARNING

Do not extend more than one phase arm at any one time.

I. Undo the two phase connection bolts at the rear of the phase arm.

- 2. Remove the nut and washer and undo the rod bolt on both sides.
- 3. Unplug the controls on the right hand side.

4. On both sides, remove the nut and washer and undo the rod bolt.

5. Withdraw the phase arm.



# Removing Phase Arms with a Lifting Frame



To remove a phase arm with a forklift:

- I. Slide the phase arm out from the panel.
- 2. Place the lifting frame on the phase arm and tighten bolts.
- 3. Position the forks at 210 mm from fork to fork.
- 4. Taking care not to touch any other components, slowly slide the forks into the fork guide slot under the lifting frame.
- 5. Raise forks slightly to allow frame to clear location holes.
- 6. Remove the phase arm.

To remove a phase arm using a hoist:

- I. Slide the phase arm out from the panel.
- 2. Secure a cable from the hoist to the lifting eye
- 3. Lift the phase arm slowly, stabilising the phase arm to prevent it spinning.

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# NOTE

Lifting Frame Assembly (part no: 995-06391-00) is required for this.

# **I5** Appendix

# **15.1** Parameter Defaults

If you require assistance from your supplier or a service technician, please note all parameter settings in the table below.

| 1  | Primary Motor Settings               | User Set 1 | User Set 2 | Default Value    |
|----|--------------------------------------|------------|------------|------------------|
| IA | Motor Full Load Current              |            |            | 100 A            |
| ΙB | Locked Rotor Time                    |            |            | 00m:10s          |
| IC | Locked Rotor Current                 |            |            | 600% FLC         |
| ID | Motor Service Factor                 |            |            | 105%             |
| 2  | Start/Stop Modes-I                   |            |            |                  |
| 2A | Start Mode                           |            |            | Constant Current |
| 2B | Start Ramp Time                      |            |            | 00m:01s          |
| 2C | Initial Current                      |            |            | 400% FLC         |
| 2D | Current Limit                        |            |            | 400% FLC         |
| 2E | Reserved                             |            |            |                  |
| 2F | Kickstart Time                       |            |            | 0 ms             |
| 2G | Kickstart Level                      |            |            | 500% FLC         |
| 2H | Stop Mode                            |            |            | Coast To Stop    |
| 21 | Stop Time                            |            |            | 00m:00s          |
| 3  | Auto-Start/Stop                      |            |            |                  |
| 3A | Reserved                             |            |            |                  |
| 3B | Reserved                             |            |            |                  |
| 3C | Auto-Stop Type                       |            |            | Off              |
| 3D | Auto-Stop Time                       |            |            | 00h:01m          |
| 4  | Protection Settings                  |            |            |                  |
| 4A | Excess Start Time                    |            |            | 00m:20s          |
| 4B | Excess Start Time-2                  |            |            | 00m:20s          |
| 4C | Undercurrent                         |            |            | 20% FLC          |
| 4D | Undercurrent Delay                   |            |            | 00m:05s          |
| 4E | Instantaneous Overcurrent            |            |            | 400% FLC         |
| 4F | Instantaneous Overcurrent Delay      |            |            | 00m:00s          |
| 4G | Phase Sequence                       |            |            | Positive Only    |
| 4H | Current Imbalance                    |            |            | 30%              |
| 41 | Current Imbalance Delay              |            |            | 00m:05s          |
| 4  | Frequency Check                      |            |            | Run              |
| 4K | Frequency Variation                  |            |            | ±5 Hz            |
| 4L | Frequency Delay                      |            |            | 00m:05s          |
| 4M | Restart Delay                        |            |            | 30m:00s          |
| 4N | Motor Temperature Check              |            |            | Do Not Check     |
| 40 | Ground Fault Level                   |            |            | ΙA               |
| 4P | Ground Fault Delay                   |            |            | 00m:03s          |
| 4Q | Undervoltage                         |            |            | 100 V            |
| 4R | Undervoltage Delay                   |            |            | 00m:05s          |
| 4S | Overvoltage                          |            |            | 7200 ∨           |
| 4T | Overvoltage Delay                    |            |            | 00m:05s          |
| 4U | Instantaneous Overcurrent S2         |            |            | 4400 A           |
| 4V | Instantaneous Overcurrent Delay S2   |            |            | 10 ms            |
| 5  | Auto-Reset Trips ( <i>Reserved</i> ) |            | · ·        |                  |
| 5A | Reserved                             |            |            |                  |
| 6  | Inputs                               |            | ·          |                  |
| 6A | Input A Function                     |            |            | Input Trip (N/O) |
| 6B | Input A Name                         |            |            | Input Trip       |
| 6C | Input A Trip                         |            |            | Always Active    |
| 6D | Input A Trip Delay                   |            |            | 00m:00s          |
| 6E | Input A Initial Delay                |            |            | 00m:00s          |
| 6F | Input B Function                     |            |            | Input Trip (N/O) |

| 6G       | Input B Name                | Input Trip             |
|----------|-----------------------------|------------------------|
| 6H       | Input B Trip                | Always Active          |
| 61       | Input B Trip Delay          | 00m:00s                |
| 6        | Input B Initial Delay       | 00m:00s                |
| 61       | Reserved                    | 0011.003               |
| 61       | Reserved                    |                        |
|          | Reserved                    | Name (N/C)             |
|          | Rennole Reset Logic         | Thormally Closed (N/C) |
| 611      | Reserved                    |                        |
| 60       | Reserved                    |                        |
| 6P       | Reserved                    |                        |
| 6Q       | Local/Remote                | LCL/RMT Anytime        |
| 6R       | Comms in Remote             | Enable Control in RM I |
| 7        | Outputs                     |                        |
| 7A       | Relay A Function            | Main Contactor         |
| 7B       | Relay A On Delay            | 00m:00s                |
| 7C       | Relay A Off Delay           | 00m:00s                |
| 7D       | Relay B Function            | Run                    |
| 7E       | Relay B On Delay            | 00m:00s                |
| 7F       | Relay B Off Delay           | 00m:00s                |
| 7G       | Relay C Function            | Trip                   |
| 7H       | Relay C On Delay            | 00m:00s                |
| 71       | Relay C. Off Delay          | 00m:00s                |
| 71       | Reserved                    |                        |
| 7K       | Reserved                    |                        |
| 71       | Reserved                    |                        |
| 7L<br>7M | Low Current Flag            |                        |
| 711      | Low Current Flag            |                        |
| 710      | Matan Tanan antuna Flag     | 100% FLC               |
| 70       | Motor Temperature Flag      | 80%                    |
| 7P       | Analog Output A             | Current (% FLC)        |
| 70       | Analog A Scale              | 4-20 mA                |
| /K       | Analog A Maximum Adjustment | 100%                   |
| /5       | Analog A Minimum Adjustment | 0%                     |
| /        | Reserved                    |                        |
| /U       | Reserved                    |                        |
| 7V       | Reserved                    |                        |
| 7W       | Reserved                    |                        |
| 8        | Display                     |                        |
| 8A       | Language                    | English                |
| 8B       | FI Button Action            | Setup Auto-Start/Stop  |
| 8C       | F2 Button Action            | None                   |
| 8D       | Display A or kW             | Current                |
| 8E       | User Screen - Top Left      | Starter State          |
| 8F       | User Screen - Top Right     | Blank                  |
| 8G       | User Screen - Bottom Left   | kWh                    |
| 8H       | User Screen - Bottom Right  | Hours Run              |
| 81       | Graph Data                  | Current (% FLC)        |
| 81       | Graph Timebase              | 10 seconds             |
| 8K       | Graph Maximum Adjustment    | 400%                   |
| 81       | Graph Minimum Adjustment    | 0%                     |
| 8M       | Mains Reference Voltage     |                        |
| 011      | Motor Data 2                |                        |
| 7        |                             |                        |
| УA       | Reserved                    |                        |
| AR<br>AR | INDEOR FLC-2                | 100 A                  |
| 9C       | Keserved                    |                        |
| 9D       | Keserved                    |                        |
| 9E       | Reserved                    |                        |
| 10       | Start/Stop Modes-2          |                        |
| 10A      | Start Mode-2                | Constant Current       |
| IOB      | Start Ramp-2                | 00m:01s                |

| 10C  | Initial Current-2         | 400% FLC      |
|------|---------------------------|---------------|
| 10D  | Current Limit-2           | 400% FLC      |
| IOE  | Reserved                  |               |
| IOF  | Kickstart Time-2          | 0 ms          |
| 10G  | Kickstart Level-2         | 500% FLC      |
| IOH  | Stop Mode-2               | Coast To Stop |
| 101  | Stop Time-2               | 00m:00s       |
| 11   | RTD/PT100 (Reserved)      |               |
| IIA  | Reserved                  |               |
| 12   | Slip-Ring Motors          |               |
| 12A  | Motor Data-1 Ramp         | Single Ramp   |
| I2B  | Motor Data-2 Ramp         | Single Ramp   |
| 12C  | Changeover Time           | 150 ms        |
| I2D  | Slip Ring Retard          | 50%           |
| 15   | Advanced                  |               |
| 15A  | Access Code               | 0000          |
| 15B  | Adjustment Lock           | Read & Write  |
| 15C  | Emergency Run             | Disable       |
| 16   | Protection Action         |               |
| 16A  | Motor Overload            | Trip Starter  |
| 16B  | Excess Start Time         | Trip Starter  |
| I6C  | Undercurrent              | Trip Starter  |
| 16D  | Instantaneous Overcurrent | Trip Starter  |
| I6E  | Current Imbalance         | Trip Starter  |
| I 6F | Frequency                 | Trip Starter  |
| 16G  | Input A Trip              | Trip Starter  |
| 16H  | Input B Trip              | Trip Starter  |
| 161  | Motor Thermistor          | Trip Starter  |
| l 6J | Starter Communication     | Trip Starter  |
| 16K  | Network Communication     | Warn and Log  |
| 16L  | Reserved                  |               |
| I6M  | Battery/Clock             | Warn and Log  |
| 16N  | Ground Fault              | Trip Starter  |
| 160  | Reserved                  |               |
| I6P  | Reserved                  |               |
| 16Q  | Reserved                  |               |
| I6R  | Reserved                  |               |
| 16S  | Reserved                  |               |
| 16T  | Reserved                  |               |
| 16U  | Reserved                  |               |
| 16V  | Undervoltage              | Trip Starter  |
| 16W  | Overvoltage               | Trip Starter  |
| 20   | Restricted                |               |

# 15.2 Accessories

#### **Communication Interfaces**

MVS soft starters support network communication via easy-to-install communications interfaces. Each soft starter can support one communications interface at a time.

Available protocols:

Ethernet (Profinet, Modbus TCP, Ethernet/IP), Profibus, DeviceNet, Modbus RTU, and USB.

#### Installing Communication Modules

Communication modules attach to the back of the controller:



## • Trip Codes (Serial Communication Network)

| Description                                             | Profibus DP / | Modbus RTU / | DeviceNet / |
|---------------------------------------------------------|---------------|--------------|-------------|
|                                                         | Profinet      | Modbus ICP   | Ethernet/IP |
| Excess start time                                       |               |              | 101         |
| Motor overload                                          | 2             | 2            | 20          |
| Motor thermistor                                        | 3             | 3            | 75          |
| Current imbalance                                       | 4             | 4            | 26          |
| Frequency                                               | 5             | 5            | 55          |
| Phase sequence                                          | 6             | 6            | 54          |
| Instantaneous overcurrent                               | 7             | 7            | 28          |
| Power loss                                              | 8             | 8            | 50          |
| Undercurrent                                            | 9             | 9            | 29          |
| Motor connection                                        |               |              | 102         |
| Input A trip                                            | 12            | 12           |             |
| Starter communication (between module and soft starter) | 15            | 15           | 113         |
| Network communication (between module and network)      | 16            | 16           | 4           |
| Internal fault/error                                    | 17            | 17           | 104         |
| Overvoltage                                             | 18            | 18           | 52          |
| Undervoltage                                            | 19            | 19           | 51          |
| Ground fault                                            | 20            | 20           | 27          |
| EEPROM fail                                             | 23            | 23           | 62          |
| Input B trip                                            | 24            | 24           | 110         |
| Bypass fail (bypass contactor)                          | 25            | 25           | 105         |
| L1 phase loss                                           | 26            | 26           | 23          |
| L2 phase loss                                           | 27            | 27           | 24          |
| L3 phase loss                                           | 28            | 28           | 25          |
| LI-TI shorted                                           | 29            | 29           | 115         |
| L2-T2 shorted                                           | 30            | 30           | 116         |
| L3-T3 shorted                                           | 31            | 31           | 117         |
| Battery/clock                                           | 35            | 35           | 121         |
| Miscellaneous                                           | n/a           | n/a          | 70          |
| No trip                                                 | 255           | 255          | 0           |

## PC Software

WinMaster is a purpose-designed software suite for control and monitoring a soft starter. WinMaster is compatible with all AuCom soft starter ranges and is ideal for parameter management during commissioning. WinMaster has the following features:

- Operational control (Start, Stop, Reset, Quick Stop)
- Starter status monitoring (Ready, Starting, Running, Stopping, Tripped)
- Performance monitoring (motor current, motor temperature)
- Upload parameter settings
- Download parameter settings

To use WinMaster with the MVS, the soft starter must be fitted with a USB Module (PIM-USB-01) or a Modbus Module (PIM-MB-01).

Refer to the WinMaster Help for further details.

#### Starter Trip and Event Logger Software

The Starter Trip and Event Logger Software allows you to download the trip and event logs from the soft starter, for separate analysis.

The software is compatible with all AuCom medium voltage soft starters using control software version 1.29 or later.

For further information, or to download the software, visit <u>www.aucom.com</u>.

#### Other MVS Accessories

Other accessories available to enhance your MVS starter include:

- RTD protection relay
- Motor protection relay (external to MVS)
- Power meter
- Indication lamps
- Start, stop and reset pushbuttons
- Local/remote selector switch
- Internal panel light for low voltage section
- Panel heater
- Power supply and contactor for motor heater
- Control transformers
- Metering VT

NOTE

• MV/LV control supply transformer



Other accessories may be available on request.

# APPENDIX





AuCom Electronics Ltd 123 Wrights Road PO Box 80208 Christchurch 8440 New Zealand T +64 3 338 8280 F +64 3 338 8104 E enquiry@aucom.com W www.aucom.com