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Latest up-date October 2013
1.0 SAFETY

1.1 In-built safety systems

The TORQ-MASTER 3000 soft starter is fitted as standard with the following safety and protection circuits:

- Motor overload protection.
- Motor underload protection.
- Load monitor.
- Over temperature.
- Instantaneous over current trip.
- Phase loss.
- Thyristor fault.
- Thermistor trip circuit.
- Limitation on starts per hour.
- Stall protection.
- Earth leakage protection (optional extra)

All chassis mounting soft starters are fitted with an earth connection which must be wired to the control panel rear earth point.

The chassis units are to IP2X protection, that is, a proof against direct contact. Although some live parts may be accessible by angled contact.

1.2 Safety considerations

This instruction manual is an essential part of the soft start device and must be:

- Available to competent personnel at all times.
- Read prior to installation or commissioning.
- Observed with regard to safety and risk management.

The safety instructions in this manual are described so they can be understood by persons trained in Electrical Engineering. Such personnel should have at their disposal the appropriate tools and testing equipment to enable a safe installation.

Such personnel must obtain any particular or general permits relating to local regulations and meet any requirements regarding:

- Safety of personnel.
- Product disposal.
- Environmental protection.
- Packaging disposal

NOTE: The safety measures outlined must remain in force at all times. Should questions or uncertainties arise, please contact your supplier.

1.3 User responsibilities

DANGEROUS VOLTAGES EXIST ON THE SOFT STARTER - ALWAYS REMOVE POWER BEFORE SERVICING

DO NOT MEGGER ANY PART OF THE UNIT

- It is a legal requirement that soft starters are protected by means of an isolating switch. It is recommended that a lockable isolator or MCCB is installed so that maintenance can be carried out safely.
- By definition a contactor is not an isolating switch since the coil of the contactor may be inadvertently energised. Do not depend on the circuit being safe if the only isolation is a mains contactor.
- Never place power factor correction capacitors on the output side of the soft starter, only on the input side and should be 'switched' using a programmable relay set for POWER FACTOR.

NOTE (see page 17 for details)

- Every soft starter carries a unique serial number which gives information on the power rating of the unit. It is the users responsibility to ensure that the rating is correct for the application.
- The user must ensure that whenever a STOP is called for that the soft starter assumes a SAFE operating condition at the end of the stop sequence.
- The user must ensure no unauthorised person works on the unit.
- The operator must avoid using any working practices that reduce the safety of the soft starter.

1.4 How to use this manual

This instruction manual will in most cases exceed the requirements of the user but it is advisable to read the notes on safety and installation before proceeding further. Each soft starter is set-up and tested at the factory prior to despatch and in the majority of applications the settings need never be altered. Where menu alterations need to be made the user must consult the manual or your supplier before attempting any changes.

1.5 Standards

The unit is manufactured in accordance with the following IEC standards:

- IEC/EN 60947-4-2
- Safety — IEC/EN 60204-1 (as is relevant)
- EMC — IEC/EN 61000-6-2 & 61000-6-4

Also see page 29 for declaration of conformity

2.0 INSTALLATION

2.1 Unit type

Firstly, after unpacking the soft starter the user should check the following:

- That there is no obvious damage to the unit.
- Check the serial number label, this will give you information about the kW size and type of soft starter you have purchased. For example, TQM3KB-250 would be a 250kW with a built-in bypass contactor. Whilst a TQM3K-250/R would be a 250kW unit designed for use with a bypass contactor supplied and fitted by the user.
- It is the users responsibility to make sure the correct unit has been supplied and that it is fit for the use it was intended.

2.2 Location (chassis units)

The standard chassis mounting soft starter is supplied as an IP2X unit designed for installation in industrial switchgear cabinets. The chassis will be supplied with either a built-in bypass contactor or for use with a bypass contactor. In both cases there is minimal heat loss from the starter. It is still good practise, however, to allow 50mm around the unit to allow for some air flow. There is no forced cooling of the heatsink and the only heat generated will be from cables, contactor coils etc.

Therefore when mounting the unit in a switchgear cabinet it may be considered the same as a D.O.L. starter. It should be noted that on large power units or in high ambient conditions due to the high running temperature of modern cables and contactor coils forced ventilation of the cubicle is recommended.

2.3 Location (complete starter)

The soft starter may also be supplied as a complete unit built into a floor or wall mounting IP54 sheet steel or polyester cabinet. The user will only need to wire in the mains and motor cables, all the rest of the controls will have been pre-wired.

The system wiring schematic will describe any special functions or conditions but in general the standard unit will be supplied as a stand alone motor starter.

2.4 Cabling

It is not necessary to use shielded control cables but it may be needed if the installation is electrically 'noisy'. Mains and motor cables need not be shielded. When wiring to the soft starter please follow these guidelines:

- Terminals 1 to 16 are control inputs. Keep the cables short and avoid, where possible, mixing power and control cables.
- Use tri-rated cable for mains and motor.
- Terminals 26 to 35 are volt free relay outputs so standard wiring is permissible.
- Other than the normal restrictions of volt drop on long motor leads there is no limit to the length of cable used between the soft starter and the motor.
- Due to the switching frequencies and distorted wave shape during ramp up (or down) the user must pay particular attention to the tightness of all connections.
- On large kilowatt units cable ducting is provided to enable segregation of power and control cables.

2.5 Bypass contactors

It is highly recommended that all soft starters are fitted with bypass contactors. Section 2.1 details the two chassis types available. In the case of the TQM3KB version the contactor has been fitted by the Factory, so the user need only connect mains, motor and control wiring to have a fully operational system. However, in the case of the type TQM3K____/B chassis the user will have to fit the bypass contactor. The connection details are covered in section 12.0 but the rating should follow this formula:

**FULL LOAD CURRENT OF THE MOTOR * 15%**

And then choose an AC1 rating closest to, but above that figure.

E.g. FLC = 100A * 15% = 115A

The reason for the AC1 rating is because of the unique software sequence within the Torq-master unit. When set up correctly the bypass contactor will not energise until the current has dropped to full load current or less. When a stop command is given and the chosen stop mode is freewheel the software de-energises the BPC and briefly turns the thyristors on so that the contactor does not "break" any current. Although the bypass contactor is energised and effectively "shorting out" the thyristors all the protective features such as overload, shearpin, etc. are still fully functional.

IMPORTANT

THE BYPASS CONTACTOR MUST HAVE A COIL SUPPRESSOR FITTED
2.0 INSTALLATION - continued

2.6 Power terminals

**R S T**

MAINS SUPPLY 3 PHASE 400V ± 10% 50/60HZ

(690v available as an option)

OUTPUT 3 PHASE TO THE LINE SIDE OF THE BYPASS CONTACTOR (THESE TERMINALS ARE NOT FITTED IF THE BYPASS CONTACTOR IS BUILT-IN)

**U V W**

OUTPUT 3 PHASE TO THE MOTOR

2.7 Control terminals

**Terminals L1 & L2**

colour code

110v – - yellow

240v – - blue

400v – - red

These terminals are the input for the electronics power supply input. This input can be 110v, 220v or 440v 50/60Hz. This is a factory set input based on customer requirements and is always marked and colour coded. On 'board' fusing and voltage selection are under the metal PCB cover. On units with a built-in bypass contactors L2 and L2 are provided as a separate connection or may be pre-wired for 415v.

**Terminals 1,1,1, (+ 24v)**

There are 3 number ‘1’ terminals in order to avoid doubling up cables. The No 1 terminal is a 24v+ source and is used for all control applications.

**Terminal 2 (Start)**

This is the input start command and should be used with a normally open momentary push button.

**Terminal 3 (Stop)**

Terminal 3 is the input stop command and should be used with a normally closed momentary push button.

**Terminal 5 (Bypass)**

Terminal 5 is not used on the TQM3K unit. However in a retrofit situation the user may still connect as per the TQM2K version or leave it disconnected.

**Terminal 7 (Program 1)**

[see page section 7.4, 7.5]

This terminal is the first of the programmable inputs. Depending on the program selected either a N/O or N/C contact will be needed to execute the program function.

**Terminals 11 & 12 (Thermistor I/P)**

These terminals are dedicated for the use of PTC motor thermistors. Circuit will accept 3 x PTC probes in series of approx 250Ω each. The circuit trips at 2.6KΩ. The circuit voltage is 5v+

**Terminals 13,14 & 15 (Prog’ I/Ps)**

[see page section 7.4, 7.5]

These terminals are the three remaining programmable inputs and are the same as program 1

**Terminal 16 (zero volts)**

This is the zero volt connection and can be used to provide a ‘common’ for relays or external voltage inputs. The user must limit the ‘drain’ to 250mA
2.0 INSTALLATION - continued

2.8 C.T. terminals

Terminals 17, 18, 19 & 20
Terminals CT3a, CT3b
Terminals CTRCa & CTRCb

On the edge of the CPU or display PCB are two connectors one RJ45 & one RJ10 and a USB port
No-1 is for a future-expansion board
No-2 is for the remote door mounted display.
No-3 is for connection to an external 12 position switch or potentiometer and is used to adjust the full load current setting without having to enter the menu structure.
The USB port is designed so that the event log can be downloaded to a memory stick and then analysed later.
This port is also used with the computer configuration software to enable the user to change settings and upload back into the soft starter. This facility also enables the user to easily change settings and email to site. Full details are on page 19 of this manual.

2.9 RJ45 & RJ10 connectors

Terminals 26 & 27 (Relay A)
Relay A on terminals 26 & 27 is a single pole single throw programmable relay. The contacts are rated at 10A @ 400v.

ONLY ONE FUNCTION CAN BE ASSIGNED AT ONE TIME

Terminals 28, 29 & 30 (Ready/Trip)
This is a dedicated relay and is not programmable. It’s function is to provide a ‘READY’ signal with power to L1 & L2 and a ‘TRIP’ signal if the soft starter detects a fault.

Terminals 31 & 32 (Top of Ramp)
The TOP OF RAMP relay is used to energise a bypass contactor and is rated at 10A 400v.

This is the second programmable relay and is a single pole changeover type again rated at 10A 400v.

These terminal blocks are situated at the top of the firing card and represent the gate and cathode connections of the six thyristors. Irrespective of the kW size of the thyristor stack these connections remain the same.
R = cathode red phase input  RG = gate, brown phase.
U = cathode red phase output  UG = gate, brown phase.
S = cathode yellow phase input  SG = gate, black phase.
V = cathode yellow phase output  VG = gate, black phase.
T = cathode blue phase input  TG = gate, grey phase.
W = cathode blue phase output  WG = gate, grey phase.

NOTE
ALL CATHODE LEADS ARE RED
ALL GATE LEADS ARE EITHER YELLOW OR WHITE
3.0 Keypad and Display

3.1 Layout

TORQ-MASTER 3K
READY TO START

2 line 16 character LCD display

Start & enter
next
previous

Stop & reset
Up count & yes
Down count & no

3.2 How to use the keypad

With the READY TO START screen as above the user has access to basic information. Press the next key and a "rolling" screen will start that will give the following details: TIME & DATE, RMS VOLTS, FULL LOAD AMPS SETTING & AMBIENT TEMPERATURE. Pressing the NEXT key will stop this process and allow the user to access more information screens every time the next key is pressed. These other screens will show phase to phase voltages, any service hours that have been set along with the accumulated running hours. The last information screen shows: TO OPEN EVENT LOG, PRESS ENTER. The event log is a unique system where the last 1000 events are recorded along with the time and date for each event. Also please note more information screens become available once the motor is started. (see opposite page for details)

3.3 How access the menu settings

To enter the menu settings hold down the RED 0* button for 4 seconds. The display will ask the user to enter a PIN No. This has been set at the Factory to 17, use the 'up count' button until 17 appears in the display. Press the NEXT key and the display will show the USER MENU as the first option. Use the down key to move the cursor to the next heading which is OPTIONS MENU, using the down key will show the user to the next screens which are PROG INPUTS & PROG RELAYS (programmable inputs and relays) again using the down key will show the next screen which is ENGINEERS MENU & USB MENU. The Engineers menu is separately Pin locked to 19.

4.0 Screens

4.1 Start-up screens

TORQ-MASTER 3K
READY TO START

No 3 Phase

TORQ-MASTER 3K
MOTOR/SCR FLT

TORQ-MASTER 3K
EMERGENCY STOP

With power to L1 and L2 the first screen will show that the soft starter is ready to start and is waiting for a start command.

When the ready to start screen is shown and a start command is given the unit will check to see if the three phase mains is available, if not, the screen shown opposite will appear and the screen will flash.

If a start command is given and the three phase is present but the motor has two or more connections missing the screen will show MOTOR/SCR FLT. A damaged thyristor will also give this message.

When emergency stop is chosen in the programmable inputs menu, and is actuated, even when a start is called for and mains and motor are connected the unit will not respond until the EM stop circuit is restored to normal.

4.2 Information screens

This screen shows the user the ambient temperature in the area around the soft starter unit. This should not be beyond 45-50°C. Temperatures above this figure can result in the soft starter malfunctioning.

The motor current bar graph gives the user a view of the motor amps and its percentage value in comparison with the full load setting. KW,KVA & COSØ is displayed when the motor is running.

The user can display the current time and date by accessing this screen. Any changes can be made in the Engineers menu.

The phase to phase voltages are displayed in this screen and are given as RMS values.

Service time for some machines is very important and this screen shows the user the time period between services and the elapsed time. A programmable relay can be configured to give an output signal when the service time is reached.

The unique software package within the soft starter has the ability to log the last 1000 events. This is a rolling log with battery back-up so that the unit can be interrogated at any time. The log will show the time and date of the event and also the event itself. The user can choose to view the event using the display or it can be downloaded to a memory stick and viewed on a PC or lap top. With the cursor under Y for view log pressing the NEXT key will change the screen to show the last recorded event. In this case no 3 phase supply was detected and the unit tripped at 10:45 and 21 seconds on the 14th of May. When a start command is given the display shows the type of ramp (voltage or current) and also shows the peak current during the ramp to full speed. The peak current is recorded in the log. Once the motor is at full speed the display shows MOTOR RUNNING on the top line and gives the running current at its bottom line. The peak starting value of current remains on the screen for several seconds along with the running current and then disappears. There is more detailed information about the data log on page 19 of this manual.
5.0 SCREENS - USER MENU

5.1 Motor protection

The user should enter the full load or nameplate current of the motor to be controlled. It is important to enter the correct figure or the overload and other protective devices will not operate correctly. The full load current can be set from three different sources, keypad, 12position switch or potentiometer. The last 2 are optional extras.

5.2 Motor start up

After setting the overload curve, pressing the next button will ask the user to choose either a voltage, or a current control ramp-up. The default screen is VOLTAGE RAMP, to change to CURRENT RAMP press the UP count key

5.0 Screens - User Menu

TO ENTER THE USER MENU; HOLD DOWN THE STOP/RESET BUTTON FOR 4 SECONDS AND ENTER THE PIN NO (17) & PRESS NEXT. WITH THE CURSOR UNDER 'Y' PRESS NEXT TO ENTER THE USER MENU

Explanation

The user should enter the full load or nameplate current of the motor to be controlled. It is important to enter the correct figure or the overload and other protective devices will not operate correctly. The full load current can be set from three different sources, keypad, 12position switch or potentiometer. The last 2 are optional extras.

There is a choice of five different overload curves. This enables the user to match the overload trip point to the load application. Please note these are cold start curves and every ‘start’ will reduce the tripping times.

SEE OVERLOAD CURVES OPPOSITE

5.1 Motor protection

SET MOTOR FLC 105 AMPS

There is a choice of five different overload curves. This enables the user to match the overload trip point to the load application. Please note these are cold start curves and every ‘start’ will reduce the tripping times.

SEE OVERLOAD CURVES OPPOSITE

5.2 Motor start up

After setting the overload curve, pressing the next button will ask the user to choose either a voltage, or a current control ramp-up. The default screen is VOLTAGE RAMP, to change to CURRENT RAMP press the UP count key.

SEE VOLTAGE RAMP CURVE OPPOSITE

If the voltage control ramp is chosen the user will be asked to set the ramp-up time. This is normally Factory set to 10 seconds (max = 240s). The second item in this screen is the kick start facility which gives the motor an instantaneous 70% voltage boost for up to 2 seconds in 100mS steps.

Note - at the end of the set ramp time the bypass contactor will energise even though the motor may not be at full speed.

The settings in this screen enable the user to adjust the starting torque and set the final ‘run out’ voltage. The pedestal is set on final test and depends on the application. Generally for pumps and fans it can be set lower than constant torque applications.

The target voltage setting is used to give linear acceleration for some applications, although it is normally set to 100%

SEE CURRENT CONTROL CURVE OPPOSITE

The first question in this screen is RAMP TO LIMIT and the user must input a value between 1 and 10 seconds which determines how long it will take for the current to rise to the limit. A typical value would be 5s and would suit most applications.

CURRENT LIMIT asks the user to set the multiple of full load current that will be the maximum during the ramp to full speed. For pumps and fans the value can be between 250-350%, for constant torque applications such as conveyors the value may need to be higher.

Note - the bypass contactor will not energise until the current has fallen to the full load current setting or less

TIME OUT FOR I LIMIT. In this screen the user must set the length of time allowed at the current limit setting before the unit trips. The user should try to set this value in order to co-ordinate with existing fuses or breakers.
5.0 SCREENS - USER MENU - continued

5.3 Control

Within the user menu the stop/start control can be configured to be either via the terminals or the keypad. Use the UP key to change from local to remote. In LOCAL the user can start, stop and reset from either the keypad on the base unit or from a door mounted keypad if one is fitted. In REMOTE the control for stop/start is via the terminals. A programmable input can be configured so that an external switch can change from one to the other.

The user has a choice of two independent stop modes:
- Freewheel stop (F)
- Soft stop (S)

If freewheel stop is chosen then every time a stop command is given the mains supply will be disconnected, the bypass contactor will be de-energised, and the motor will freewheel to a stop.

If soft stop is chosen the screen changes and the user sets a RAMP DOWN time. The soft stop is used mainly in pumping systems to avoid 'water hammer' and damage to piping. The INITIAL value is a percentage of full volts and should be set so that the speed of the motor is affected immediately. The FINAL value is also a percentage of full volts and is the natural 'stall' point of the motor/load. The above settings are not able to be pre-set at the Factory as the site conditions, type of pump, length of pipe work etc, affects the values.

Please note that the INITIAL value needs to be set carefully so that the motor does not stall through lack of volts and trips the soft starter.

5.4 Stop modes

STOP MODE F S

Use the UP key to change

STOP MODE F S RAMP DOWN 18S

next

INITIAL 90%
FINAL 10%

5.0 SCREENS - OPTIONS MENU

To enter the options menu move the cursor from USER to OPTIONS and press the NEXT key

Terminals 11 and 12 are the thermistor trip input but the user has to 'enable' the function in this menu heading. Please note that once the thermistors are set to Y there must be motor thermistors connected into terminals 11 & 12. The user can also use thermal trips instead of the thermistors but they must be of the normally closed contact type (see page 5 for details)

The underload trip option allows the user to set a lower than full load current value as an 'underload' trip point at which the soft starter will stop after the time set. Use the FLC % bar graph to determine underload values.

The underload reset is used mainly as a substitute for float switches or other forms of level control in the Water industry. For example if the underload is set to a level of current that equates to a pump running dry then the starter will switch off after the trip time setting. After the underload reset time has elapsed the unit will start up automatically and check the current, if it is above the trip value it will continue to run until the current value drops below the trip setting at which time the unit will be stopped and the whole cycle repeats.

The shearpin trip is again a percentage of full load current. When the software detects a rise in current to the level set, the starter trips immediately.

Automatic reset is an option choice for the user to enable up to 3 automatic resets after a fault. The reset time is for the user to allow a time scale between resets. After a fault and with the auto reset enabled the unit will only restart if the start command is left on. The data log will only register and the ready trip relay actuate after the final reset

The overload pre-alarm acts similar to a load monitor and allows the user to set a value of current (more or less than full load current) at which the unit will give an alarm output if a programmable relay is assigned to it. The pre-alarm circuit is not designed to trip the starter unless the programmable relay is used but the screen will flash when the pre-alarm condition is detected.

The earth leakage detection system is a standard option and if requested by the end user is switched on via enabling software at the Factory before dispatch otherwise the screens opposite do not appear. If earth leakage is used then the ex-works settings would be 30mA and 5s delay. These values can be altered to suit applications and types of motor. There are 4 levels of leakage 10, 30, 100 & 200mA. The delay can be set from 0.1 to 60s. The CT value is set at the Factory and depends on the KW size of the motor.

The automatic timed start/stop system is again an optional extra and as above needs to be switched on via software at the Factory. There are 3 separate start stop times that the user can set. The user must firstly set the current time and then set the start time and stop time, once this is set start/stop-2 will appear and then start/stop-3. Once these times have been set the soft starter will automatically start and stop according to these times. The user must take care that no damage or harm can result from the motor suddenly starting.
7.0 PROGRAMMABLE INPUTS MENU

When the user first enters this menu the programmable input and terminal numbers are shown.

There are four programmable inputs on terminals 7,13,14 and 15. The user can choose an input and then assign one program to that terminal. The program inputs are listed below and it enables the user to tailor the soft starter to a particular application.

For example, if the user needed a ‘soft’ inch facility for say, positioning purposes, an input would be chosen and inch would be assigned to that input. Therefore whenever the inch button was pressed the voltage would rise to the inch level setting.

ONLY ONE INPUT PER PROGRAM

7.1 Screen

<table>
<thead>
<tr>
<th>PROG INPUT 1</th>
<th>TERMINAL 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROG INPUT 2</td>
<td>TERMINAL 13</td>
</tr>
<tr>
<td>PROG INPUT 3</td>
<td>TERMINAL 14</td>
</tr>
<tr>
<td>PROG INPUT 4</td>
<td>TERMINAL 15</td>
</tr>
</tbody>
</table>

7.2 Program inputs

<table>
<thead>
<tr>
<th>INCH</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVEL (min=10%, max=85%)</td>
<td></td>
</tr>
<tr>
<td>EXT TRIP 1</td>
<td>Y/N</td>
</tr>
<tr>
<td>TRIP DELAY</td>
<td>00S</td>
</tr>
<tr>
<td>EXT TRIP 2</td>
<td>Y/N</td>
</tr>
<tr>
<td>TRIP DELAY</td>
<td>00S</td>
</tr>
<tr>
<td>START DELAY</td>
<td>Y/N</td>
</tr>
<tr>
<td>DELAY TIME</td>
<td>00S</td>
</tr>
<tr>
<td>LOCAL/REMOTE</td>
<td>Y/N</td>
</tr>
<tr>
<td>EM STOP</td>
<td>Y/N</td>
</tr>
<tr>
<td>RESET</td>
<td>Y/N</td>
</tr>
<tr>
<td>HS OVER TEMP</td>
<td>Y/N</td>
</tr>
<tr>
<td>OVERRIDE START</td>
<td>Y/N</td>
</tr>
<tr>
<td>RAMP TIME</td>
<td>10S</td>
</tr>
<tr>
<td>PEDESTAL</td>
<td>000mS</td>
</tr>
<tr>
<td>TARGET</td>
<td>00%</td>
</tr>
<tr>
<td>DIS AUTO RESET</td>
<td>Y/N</td>
</tr>
<tr>
<td>TIME CLOCK</td>
<td>Y/N</td>
</tr>
<tr>
<td>DIS START LIMS</td>
<td>Y/N</td>
</tr>
<tr>
<td>DOL START</td>
<td>Y/N</td>
</tr>
<tr>
<td>ENABLE FLC ADJ</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

INCH Soft inch can be used for positioning the user needs to set the voltage level.

EXT TRIP 1 This is a delay on de-energisation timer. The user will have to set the time required.

EXT TRIP 2 This is a delay on energisation timer the user will have to set the time required.

START DELAY This allows the user to set a delay, after receiving a start command the screen will show a countdown message and at zero the soft starter will begin to ramp.

LOCAL/REMOTE This program input switches the stop/start control from keypad to terminals.

EM STOP For use with an emergency stop button or relay. Requires a N/O contact to prevent tripping.

RESET Once set, this program input will reset any fault within the soft-starter. Needs a momentary N/O contact.

HS OVER TEMP If over temperature trips are fitted to the thyristor stack this input can be set to monitor the trips.

OVERRIDE START If this option is chosen the user can set other values for starting the motor so that when the programmable input is chosen the starting values alter to the override settings.

DISABLE AUTO RST This option allows the user to disable the auto reset for certain conditions.

TIME CLOCK if the user has set the optional 24 hour time clock menu it can be disabled by using this prog input.

DISABLE START LIMITATIONS this input allows the user disable the starts per hour limitations.

DOL START In an emergency and providing other switchgear and protection fuses/breakers will stand it the user can perform a direct on line start using the bypass contactor. The overload protection within the soft starter will still be active but the shearpin setting may have to be increased in value or disabled.

ENABLE FLC ADJ The user can adjust the full load current settings without entering the Menu Structure. This can be done via a 12 position switch or a potentiometer.
**8.0 PROGRAMMABLE RELAYS MENU**

From the initial menu choose **PROG RELAYS** and press **NEXT** this will take the user into the programmable relays menu.

**8.1 Programmable relay A**

RELAY A

T26 & T27

**8.2 Programmable relay B**

RELAY B

T33 T34 T35

**8.3 Programmable functions**

OVERLOAD
UNDERLOAD
THERMISTOR
SERVICE TIME
PHASE FAULT
FIRING FAULT
EXTERNAL TRIP 1
EXTERNAL TRIP 2
O/L PRE-ALARM
MOTOR RUNNING
SHEARPIN
TOO MANY STARTS
TOP OF RAMP
POWER FACTOR
READY TRIP (only on B)
PHASE ROTATION
UNDER VOLTS
OVER VOLTS
MOTOR/SCR FLT

**NOTES**

IN THIS CIRCUIT RELAY 'A' WILL BE SET IN THE MENU FOR TOP OF RAMP. WHEN THE BYPASS CONTACTOR ENERGISES RELAY 'A' WILL ALSO ENERGISE. THIS CIRCUIT IS USED TYPICALLY TO SEND A FULL SPEED SIGNAL TO OTHER CIRCUITS OR PLCs.

RELAY 'A'

RELAY 'A'

RELAY 'B'

RELAY 'B'

IN THIS CIRCUIT RELAY 'B' WILL BE SET IN THE MENU FOR POWER FACTOR. THE RELAY WILL THEN ENERGISE 500ms AFTER THE BYPASS CONTACTOR HAS ENERGISED AND WILL DE-ENERGISE 500ms BEFORE THE BYPASS DROPS OUT. THIS ALLOWS THE USER TO ADD POWER FACTOR CAPACITORS AND ENERGISE THEM FROM THE PFC CONTACTOR AS SHOWN.

IN THIS CIRCUIT RELAY 'B' WILL BE SET IN THE MENU FOR OVERLOAD PRE-ALARM. THIS ENABLES THE USER TO SEND A SIGNAL IF THE MOTOR DRAWS MORE CURRENT THAN IS NORMAL FOR THE APPLICATION. FOR EXAMPLE, DETECTING EXCESS CURRENT IN A MIXING MACHINE BECAUSE IT HAS BEEN OVERLOADED WITH MATERIAL OR PRODUCT.

The user has to choose the programmable relay to be used and assign a function to it. Once a relay has had a function assigned the menu structure does not allow any more functions to be accessed. The user must cancel the action assigned before the menu will show the other options available.

The relays are all rated at 10amps AC1 with a voltage withstand of 400v, 50/60hz. The relays can switch DC voltages but the switching current is reduced to 3amps. If large currents need to be switched it is recommended that a slave relay is used.

POWER FACTOR is a unique and special setting that enables the user to energise a contactor from a programmable relay so that the power factor capacitors are only charged or discharged whilst the bypass contactor is energised.

Relay 'B' can also be used as a second READY/TRIP relay.

REMEMBER

ONCE A FUNCTION HAS BEEN ASSIGNED TO A RELAY NO OTHER FUNCTIONS ARE AVAILABLE.
9.0 ENGINEERS MENU

9.1 Entering pin number

Although all the previous menus have been designed for full user access the ENGINEERS MENU can only be opened by entering a second PIN number.

THE OPTIONS LISTED IN THIS MENU SHOULD ONLY BE ALTERED BY AUTHORISED PERSONNEL.

PLEASE NOTE NOT ALL OF THE SETTINGS AVAILABLE IN THE ENGINEERS MENU ARE LISTED BELOW IF IN ANY DOUBT CONSULT RALSPEED

9.2 Menu settings

The PIN numbers are set at the factory and should only be altered with the permission of RALSPEED.

The current transformer ratio is set at the Factory. There are some applications where the overload, even with the slowest trip setting, will still trip during ramp up. Using this facility the overload can be disabled during the ramp up.

The maximum duty cycle is 20 starts per hour. This is for units up to 75kw. Above that 10 per hour is normal. If the menu is set to zero there will be no restrictions to the number of starts per hour.

There is an option with this setting to turn off the low current detect during starting. This is useful when testing a large soft starter on a small motor.

This screen shows how many hours the starter has been running. This counter can be reset by holding down the up/down keys.

The time and date can be altered in this screen.

The first part of this screen asks the user if there is to be a service interval, and if so how many hours between services.

The second part of this screen is to allow the user the to delay the bypass contactor from de-energising when soft stop is used.

The setting in this screen enables the user to energise the bypass contactor either earlier or later than is normal. The user should not alter the setting from zero unless the implications are fully understood.

If the user requires the soft starter to be phase rotation sensitive then both questions should be set to YES. After the next START the unit will have logged the phase sequence and the user will have to enter and exit the menu to set the change. Thereafter the phase sequence will be checked on every start up.

The Fault Menu is normally set on final test so the User should avoid entering this section unless the Factory has been consulted. For information purposes the following settings are contained within this menu; MOTOR VOLTAGE, LATCH DETECT, MISSING PULSE, (these two choices are concerning the latching and zero crossover detection circuits for the thyristors) HIGH & LOW VOLTAGE DETECT, & TRIP AND LOG (DATA) OR LOG ONLY. These last two settings refer to the 1000 event data log.

The options listed in this menu should only be altered by authorised personnel.

Screen

Explanation

9.0 ENGINEERS MENU

9.1 Entering pin number

ENGINEERS MENU Y
USB MENU N

ENTER PIN No 19 THEN PRESS NEXT

9.2 Menu settings

SET PIN MAIN 17
SET PIN ENGR 19

CT TRANS —— A
O/L IN RAMP Y/N

DUTY CYCLE STARTS PER HR 00

LOW 1 IN START CHECKING Y

HOURS RUN 000000 HRS

TIME HH/MM/SS
DATE DD/MM/YYYY

SERVICE 8750HRS
BPC CHECK DLY 05

ENERGISE BYPASS CONTACTOR 05

PHASE SETTING Y/N
PHASE CHECKING Y/N

ENTER FAULT MENU Y/N

10.0 USB MENU AND DATA LOG

10.1 Entering USB menu

Using the next key with the cursor under ‘Y’ for will take the user to the next menu settings.

The first setting is asking the user to save the configuration menu settings to a memory stick. These settings can then be viewed on a computer, altered, and then re-installed using the second part of this screen. Also if the user needs to alter any settings then this can be done via the computer and uploaded to the soft starter.

10.2 Entering and viewing the Data log

With the READY TO START screen showing use the NEXT key to scroll down until the OPEN EVENT LOG screen appears, press the ENTER key and choose with the cursor under ‘Y’ will take the user to the next menu settings.

The first choice is to view the event log through the LCD display and the user will have to use the NEXT and PREV keys to see the events. Typical screens are shown opposite.

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Date</th>
<th>Action</th>
<th>Current information</th>
</tr>
</thead>
<tbody>
<tr>
<td>009</td>
<td>16:11:03 T3</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>FLC = 77 AMPS</td>
</tr>
<tr>
<td>010</td>
<td>16:29:26</td>
<td>23/04/2013</td>
<td>BYPASSED</td>
<td>PEAK I=238.2A</td>
</tr>
<tr>
<td>011</td>
<td>16:51:19</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=231.1A</td>
</tr>
<tr>
<td>012</td>
<td>16:59:49</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>FLC = 77 AMPS</td>
</tr>
<tr>
<td>013</td>
<td>17:00:00</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>PEAK I=231.1A</td>
</tr>
<tr>
<td>014</td>
<td>17:32:31</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=229.3A</td>
</tr>
<tr>
<td>015</td>
<td>18:20:41</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>FLC = 77 AMPS</td>
</tr>
<tr>
<td>016</td>
<td>18:30:53</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>PEAK I=228.4A</td>
</tr>
<tr>
<td>017</td>
<td>19:18:05</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>FLC = 77 AMPS</td>
</tr>
<tr>
<td>018</td>
<td>19:19:16</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=229.3A</td>
</tr>
<tr>
<td>019</td>
<td>19:20:21</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=228.4A</td>
</tr>
<tr>
<td>020</td>
<td>19:31:03</td>
<td>23/04/2013</td>
<td>BYPASSED</td>
<td>PEAK I=228.4A</td>
</tr>
<tr>
<td>021</td>
<td>19:10:04</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=228.4A</td>
</tr>
<tr>
<td>022</td>
<td>19:19:05</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>FLC = 77 AMPS</td>
</tr>
<tr>
<td>023</td>
<td>19:18:16</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=229.3A</td>
</tr>
<tr>
<td>024</td>
<td>19:49:26</td>
<td>23/04/2013</td>
<td>STOPPED</td>
<td>PEAK I=228.4A</td>
</tr>
<tr>
<td>025</td>
<td>20:00:01</td>
<td>23/04/2013</td>
<td>STARTED</td>
<td>FLC = 77 AMPS</td>
</tr>
<tr>
<td>026</td>
<td>20:06:12</td>
<td>23/04/2013</td>
<td>BYPASSED</td>
<td>PEAK I=228.4</td>
</tr>
</tbody>
</table>
11.0 TROUBLE SHOOTING FLOW CHART

The TORQ-MASTER 3000 has been designed so that the two line sixteen character display gives the user information on the running and fault status of the unit. The following flow charts will allow the user to rectify problems when the display does not give any indication of the problem or is waiting for start command or other inputs from the external control system. This flow chart also helps the user to interpret some of the specialised messages.

11.1 The soft starter does not run

Start

Are terminals selected in the options menu see page 12-5.3

No

The user must select terminals in the options menu in order that stop/start signals generated external to the soft starter can operate the unit

Yes

Has the local/remote been set in the inputs menu see 7.2 page 15

Yes

As explained in section 7.2 there are various programmable inputs so that the user can configure his control system. If, for example, program 1 has been set for local/remote and the input is set high it will have moved the control function from the terminals (remote) to the keypad (local). Therefore, the user will have to remove this input before the terminals will be active.

No

Has the stop/start controls been connected correctly. See 2.7 Page 5

Yes

The stop/start control is either through push buttons, relay, or switch contact. If buttons are used the START button must be connected to terminals 1 & 2. The STOP button must be connected to terminals 1 & 3. If a relay or switch contact is used the user must link 1 & 2 and switch between 1 & 3 to give start and stop functions.

No

CONTACT YOUR SUPPLIER

11.2 The soft starter trips on firing fault.

Start

Are any of the thyristor gate or cathode leads broken or loose?

Yes

The gate/cathode leads are connected at the Factory so unless the user has disturbed them it is very unlikely that they will be incorrect. Therefore, a FIRING FAULT will only occur if one of these leads is loose or broken so a simple repair should suffice. SEE 2.12 page 7

No

Are the thyristor gate impedances as per the test certificates?

Yes

It is possible that there is a faulty thyristor. Replace the thyristor and try a restart.

No

Is the motor connected correctly?

Yes

Make sure that the motor links in the terminal box are correct. Check the voltage of the motor.

No

Is the motor undersized for the soft starter?

Yes

If the motor is not ‘matched’ to the soft starter it is possible that the motor impedance is too large and does not allow enough current to flow to enable the thyristor to latch.

No

CONTACT YOUR SUPPLIER
11.3 The soft starter trips on overload fault.

Start

Has the correct value of FLC been entered? See 5.1 page 11

No

Yes

Has the correct overload curve been chosen? See 5.1 page 10

No

Yes

Is the LCD display flashing

Yes

No

Is the duty cycle of stop-starts too high?

No

Yes

CONTACT YOUR SUPPLIER

The full load current of the motor must be entered under the SET FLC question in the USER MENU. The motor nameplate will give the current value of the motor to be controlled.

There are five overload curves A, B, C, D & E. The 'A' curve is a fast response setting whilst the 'E' curve is a slow or slugged response setting. On an high inertial load the user may get a trip if an 'A' or 'B' curve has been chosen.

The LCD display flashes when there is a pending fault. If the motor is overloaded but still running the display will flash and then the soft starter will trip. The time to trip will depend on the overload curve setting and how much the motor is overloaded.

Check the number of stop/start per hour, if this is too high it could result in the unit tripping with a motor overload fault

CONTACT YOUR SUPPLIER

11.4 The soft starter trips on Shearpin fault.

Start

Has the correct value of SHEARPIN been set? See 6.3 Page 13

No

Yes

Has the motor stalled?

Yes

No

Has the bypass contactor jammed in?

Yes

No

Is there a genuine over current condition?

Yes

No

CONTACT YOUR SUPPLIER

The SHEARPIN trip is an instantaneous over current trip. The user must set it high enough to avoid problems during ramp-up. The setting should be at least 100% above the current limit setting. Default is 550% of FLC

If the ramp-up is set to VOLTAGE then the current is not limited. Therefore if the motor is stalled the current will rise to the SHEARPIN level and trip. Check and ‘free’ the motor.

If the bypass contactor has jammed in, the start command will cause the starter to attempt a direct on line start which will generate 6/7 x FLC and the unit will trip on SHEARPIN fault.

If the motor is free it may be the load at fault causing the motor to stall. Check the load and ‘free’ if necessary.
11.5 The motor does not accelerate properly.

Start – current control

Has the correct value of Current limit been set? See 5.2

No

In order for a motor to accelerate successfully on soft start control it will need to draw at least 200 to 350% of FLC, depending on the load. Ensure that the current limit is not set too low.

Start – voltage control

Has the pedestal and ramp times been set correctly? See 5.2

No

If the ramp-up is set to VOLTAGE then the user must input the correct values in order to achieve a smooth acceleration to full speed. Pedestal should be 15-40% ramp-up 10 to 30 secs, target 90 to 100%. Other values are possible but may lead to problems.

Yes

If the motor is overloaded the soft starter will attempt to overcome the load problems but the motor may not allow the acceleration to proceed smoothly.

No

Yes

If the mains power supply is poor or if supplied from a wrongly sized generator the acceleration current may cause the voltage to ‘dip’ and consequently the soft starter will lose control of the ramp-up and probably trip.

CONTACT YOUR SUPPLIER

11.6 The motor does not soft stop properly.

Stop command

Has soft stop been chosen in the USER MENU?

No

In order for the motor to ‘Soft Stop’ correctly the soft stop option has to be set in the USER MENU. See page 12 section 5.4

Yes

Are the initial and final settings correct? See page 12 5.4

No

The initial and final settings must have values that enable the motor to soft stop correctly without undue stress to the load or motor.

Yes

Can the motor/load combination have soft stop applied to it?

No

If the motor/load combination is of very low inertia or the run down time is naturally short the soft stop option may not work properly.

Yes

If the mains power supply is poor the deceleration current may cause the voltage to ‘dip’ and consequently the soft starter will lose control of the ramp-down.

CONTACT YOUR SUPPLIER
**DESCRIPTION**

BASIC SYSTEM. ISOLATOR, EXTERNAL BYPASS CONTACTOR AND STOP/START PUSHBUTTONS 27

BASIC SYSTEM. ISOLATOR, EXTERNAL BYPASS CONTACTOR AND STOP/START RELAY 27

INTEGRATED BYPASS CONTACTOR AND STOP/START BUTTONS 28

EMERGENCY STOP SYSTEM. INTEGRATED BYPASS CONTACTOR AND STOP/START RELAY 28

Please note that the following drawings are typical and therefore only represent a small part of the overall number of schemes that are possible.

If the user is in any doubt regarding any of the control functions of the TORQ-MASTER soft starter please contact

**RALSPEED’S TECHNICAL SALES DESK @**

**TEL** 01254 582345 (4 LINES)

**FAX** 01254 668414/504799

**e.mail** technical@ralspeed.com

Help is also available at our website:

www.ralspeed.com
3 PHASE SUPPLY 380/415V 50/60HZ

REMOTE A/B/C

PROGRAMMABLE INPUTS

CONTROL VOLTAGE

COIL SUPPRESSOR

RELAY 'A' RELAY 'B' READY TRIP OF RAMP

EMERGENCY STOP

PROGRAMMABLE INPUTS

TOP PROG PROG

REMOT KEYPAD RJ45

PTC THERMISTOR (IF FITTED)

BPC

BPC

BPC

MC

MC

MC

MC

EMERGENCY STOP

T5 ONLY USED ON RETROFIT

DECLARATION OF CONFORMITY

Declaration Of Conformity

We:

Manufacturer: Ralspeed Ltd
A1 Hurstwood Court
Mercer Way
Shadsworth Business Park
Blackburn
Lancashire
BB1 2QU

Hereby declare that the products detailed below:

Product/Model: Torq-Master 3000 Soft Starter

TQM3K-11 .... 500 /B
TQM3KB-11 .... 500
TQM3KD-11 .... 90
TQM3KC-11 .... 500

Have been designed and manufactured to the standards outlined below were applicable:

Standards: IEC/EN 60947-4-2

Safety: IEC/EN 60204-1 (As is relevant)

EMC: IEC/EN 61000-6-2 Generic Immunity, Industrial
IEC/EN 61000-6-4 Generic Emissions, Industrial

And conforms to the relevant safety provisions of the Low Voltage Directive 2006/95/EC and EMC directive 2004/108/EC

Mr Simon Finlay
Technical Director