Your Advantages

• Simple and time-saving commissioning as well as user-friendly operation through setting via potentiometers
• Hybrid relay combines benefits of relay technology with non-wearing semiconductor technology
• High availability by
  - Temperature monitoring of semiconductors
  - High withstand voltage up to 1500 V

Features

• According to IEC/EN 60 947-4-2
• 2-phase softstart and softstop of 3-phase motors up to 4 KW
• 4 potentiometer für setting of starting torque, deceleration torque, softstart /-stop
• 3 LEDs for status indication
• Reset button on front
• Connection facility for external reset button
• Relay indicator output for operation
• Galvanic separation between control circuit and power circuit
• Width 22.5 mm

Product Description

The softstart-softstop unit provides smooth starting and stopping of 3-phase asynchronous motors. 2 phases are controlled by power semiconductors in a way that the current can rise continuously. This provides also a continuous rising motor torque. This eliminates mechanical shock while starting. After successful starting the power semiconductors are bridged with internal relay contacts. This reduces internal power dissipation. The softstop function prolongs the stop time of the motor in order to avoid a sudden stop.

Applications

• Motors with gear, belt or chain drive
• Fans, pumps, conveyor systems, compressors
• Woodworking machines, centrifuges
• Packaging machines, door drives
• Start current limiting on 3 phase motors

Circuit Diagram

All technical data in this list relate to the state at the moment of edition. We reserve the right for technical improvements and changes at any time.
### Connection Terminals

<table>
<thead>
<tr>
<th>Terminal designation</th>
<th>Signal description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 (+)</td>
<td>Auxiliary voltage + DC 24 V</td>
</tr>
<tr>
<td>A2</td>
<td>Auxiliary voltage 0 V</td>
</tr>
<tr>
<td>X1+</td>
<td>Control input Start/Stopp</td>
</tr>
<tr>
<td>X2</td>
<td>Earth connection control input</td>
</tr>
<tr>
<td>MAN</td>
<td>Input for remote reset</td>
</tr>
<tr>
<td>RES</td>
<td>Output for remote reset</td>
</tr>
<tr>
<td>11, 12, 14</td>
<td>Indicator relay for operation</td>
</tr>
<tr>
<td>L1</td>
<td>Phase voltage L1</td>
</tr>
<tr>
<td>L2</td>
<td>Phase voltage L2</td>
</tr>
<tr>
<td>L3</td>
<td>Phase voltage L3</td>
</tr>
<tr>
<td>T1</td>
<td>Motor connection T1</td>
</tr>
<tr>
<td>T2</td>
<td>Motor connection T2</td>
</tr>
<tr>
<td>T3</td>
<td>Motor connection T3</td>
</tr>
</tbody>
</table>

### Function

#### Soft start
Two motor phases are impacted through thyristor phase-fired control to allow a steady increase of the currents. The motor torque behaves in the same manner when ramping up. This ensures that the drive can start without jerking and the drive elements are not damaged. Starting time and starting torque can be adjusted via rotary switch $t_{on}$ and $M_{st}$.  

#### Softstop
The softstop function shall extend the natural running down time of the drive to also prevent jerky stopping. The deceleration time is set with rotary switch $t_{off}$, the running-down torque with rotary switch $M_{str}$.  

#### Phase failure
To make sure the motor is not loaded with asymmetric currents, a check takes place during motor start whether phases L1, L2 and L3 are present. If one or several phases are absent, the device switches to fault 4. The fault can be acknowledged via the reset button or reset input.

#### Control inputs
If a voltage of more than 10 V DC is connected to terminals X1/X2, the device begins with softstart. If the voltage falls lower than DC 8 V the device will softstop.

#### Signalling output “Ready”
Contact 11/14 is closed if no device fault is present.

### Indication

- **green LED "ON":** permanent on - auxiliary supply connected
- **yellow LED "RUN":** permanent on - power semiconductors bridged 
  - flashing - ramp operation
- **red LED "ERROR":**
  - 1st - Error
  - 2nd - Overtemperature on semiconductors
  - 3rd - Wrong mains frequency
  - 4th - Phase reversal detected
  - 7th - Incorrect temperature measurement circuit

$1^{st}-7^{th}$ = Number of flashing pulses in sequence

### Reset Function
2 options are available to acknowledge the fault

- **Manual (reset button):**
  Acknowledgement is performed by operating the reset button at the front of the device. If the button is still actuated after 2 seconds, the device resumes the fault state.

- **Manual (remote acknowledgement):**
  Remote acknowledgement can be realised by connecting a button (N/O contact) between the terminals MAN and RES. Acknowledgement is triggered as soon as the contact of the button closes. If the button is still actuated after 2 seconds, the device resumes the fault state since a defect in the acknowledgement circuit cannot be ruled out.
### Technical Data

**Nominal voltage L1/L2/L3:**
3 AC 200 ... 480 V ± 10 %

**Nominal frequency:**
50 / 60 Hz, automatic detection

**Auxiliary voltage:**
DC 24 V ± 10 %

**Motor power:**
max. 4 kW at AC 400 V

**Operating mode:**
6.9 A (3 kW / 400 V):
AC 53a: 3-5: 100-30 IEC/EN 60947-4-2
9 A (4 kW / 400 V):
AC 53a: 6-2: 100-30 IEC/EN 60947-4-2

**Surge current:**
200 A (tp = 20 ms)

**Load limit integral:**
200 A²s (tp = 10 ms)

**Peak reverse voltage:**
1500 V

**Overvoltage limiting:**
AC 550 V

**Leakage current in off state:**
< 3 x 0.5 mA

**Starting voltage:**
30 ... 80 %

**Start / deceleration ramp:**
1 ... 10 s

**Consumption:**
2 W

**Start up delay for master tick:**
max. 100 ms

**Release delay for master tick:**
max. 50 ms

**Short circuit strength:**
max. fuse rating: 25 A gG / gL IEC/EN 60 947-5-1

**Electrical life:**
> 10 x 10⁶ switching cycles

**Inputs**

- Control input X1+/X2:
  DC 24 V
- Rated current:
  4 mA
- Response value ON:
  DC 15 V ... 30 V
- Response value OFF:
  DC 0 V ... 5 V
- Connection:
  polarity protected diode
- Manual:
  DC 24 V (connect button on terminals "MAN" and "RES")

**Indicator Outputs**

- RES:
  DC 24 V, semiconductor, short circuit proof, rated continuous current 0.2 A
- Ready:
  Changeover contact 250 V / 5 A
- Contact:
  1 changeover contact

**Switching capacity**

- to AC 15:
  3 A / AC 230 V IEC/EN 60 947-5-1
- NC contact:
  1 A / AC 230 V IEC/EN 60 947-5-1
- Thermal current Iₜ:
  5 A

**Electrical life**

- to AC 15 at 3 A, AC 230 V: 2 x 10⁶ switch. cycles IEC/EN 60 947-5-1
- Mechanical life:
  30 x 10⁶ switching cycles
- Permissible switching frequency:
  1800 switching cycles/h

**Test voltage**

- Coil - Contact:
  4000 V AC
- Open Contact:
  1000 V AC

**Short circuit strength**

- max. fuse rating:
  4 A gG / gL IEC/EN 60 947-5-1

### General Data

**Device type:** Hybrid Motor Controller H1B

**Operating mode:** Continuous operation

**Temperature range:**
0 ... + 60 °C (see derating curve)

**Storage:**
-25 ... + 75 °C

**Relative air humidity:** 93 % at 40 °C

**Altitude:**
< 1.000 m

**Clearance and creepage distances**

- Rated insulation voltage:
  overvoltage category / contamination level between control input, auxiliary voltage and motor voltage respectively
  indicator contact: 4 kV / 2 IEC/EN 60 947-4-2

**Intermediate resistance**

<table>
<thead>
<tr>
<th>Device</th>
<th>Value</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic discharge (ESD)</td>
<td>8 kV (air)</td>
<td>IEC/EN 61 000-4-2</td>
</tr>
<tr>
<td>HF-irradiation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interference emission**

- Wire guided: Limit value class B IEC/EN 60 947-4-2
- Radio irradiation: Limit value class B IEC/EN 60 947-4-2

**Degree of protection**

- Housing: IP 40 IEC/EN 60 529
- Terminals: IP 20 IEC/EN 60 529

**Vibration resistance**

- Amplitude 0.35 mm
- Frequency 10 ... 55 Hz, IEC/EN 60 068-2-6

**Climate resistance**

- 0 / 060 / 04 IEC/EN 60 068-1

**Dimensions**

- Width x height x depth: 22.5 x 105 x 120.3 mm

**Safety Notes**

- Never clear a fault when the device is switched on.
- The user must ensure that the device and the necessary component are mounted and connected according to the locally applicable regulations and technical standards (VDE, TÜV,BG).
- Adjustments may only be carried out by qualified specialists and the applicable safety rules must be observed.
- If several softstart-softstop units are protected together, the sum of the motor currents must not exceed 25 A.
Characteristics

- Nominal voltage: 3 AC 200 ... 480 V
- Nominal current: 9.0 A
- Ramp time: 1 ... 10 s
- Width: 22.5 mm

Motor data:
UL 508, CSA C22.2 No. 14-13
3 AC 200 ... 480 V, 3-phase, 50 / 60 Hz:
- up to 7.6 FLA, 45.6 LRA at 40 °C
- up to 4.8 FLA, 28.8 LRA at 50 °C
- up to 2.1 FLA, 12.6 LRA at 60 °C

UL 60947-4-2, CSA 60947-4-2
3 AC 200 ... 300 V, 3-phase, 50 / 60 Hz:
- up to 7.6 FLA, 45.6 LRA at 40 °C
- up to 4.8 FLA, 28.8 LRA at 50 °C
- up to 2.1 FLA, 12.6 LRA at 60 °C

3 AC 301 ... 480 V, 3-phase, 50 / 60 Hz:
- up to 2.1 FLA, 12.6 LRA at 60 °C

Indicator output relay:
5 A 240Vac Resistive

Wire connection:
60°C / 75°C copper conductors only

Connections
A1+, A2, X1+, X2, MAN,
RES, NE, 11, 12, 14:
AWG 22 - 14 Sol/Str Torque
3.46 Lb-in (0.39 Nm)
L1, L2, L3, T1, T2, T3:
AWG 30 - 12 Str Torque 5-7 Lb-in
(0.564-0.79 Nm)

Additional Notes:
- This device is intended for use on supply systems with a maximum voltage from phase to ground of 300V (e.g. for a three phase-four wire system 277/480 V or on a three phase-three wire systems of 240V), rated impulse withstand voltage of max. 4 kV
- Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical Amperes, 480 Volts maximum when protected by class CC, J or RK5 fuse rated maximum 20 A
- For use in pollution degree 2 Environment or equivalent
- The control circuits of this device shall be supplied by an isolated 24 Vdc power supply which output is protected with a fuse rated max. 4 A dc
- For installations according to Canadian National Standard C22.2 No. 14-13 (cUL Mark only) and supply voltages above 400V:
  -Transient surge suppression devices shall be installed on the line side of this equipment and shall be rated 240 V (phase to ground), 415 V (phase to phase), suitable for overvoltage category III, and shall provide protection for a rated impulse withstand voltage peak of 4 kV
  -Transient surge suppression devices shall be installed on the line side of this equipment and shall be rated 277 V (phase to ground), 480 V (phase to phase), suitable for overvoltage category III, and shall provide protection for a rated impulse withstand voltage peak of 4 kV

Motor control with UG 9019 and PLC