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This drive is an isolated 4 Quadrant speed controller for shunt wound or permanent magnet motors. It utilises speed feedback from the armature voltage (Avf), or from a shaft mounted tachogenerator. It incorporates an accurate current control loop to protect the drive and motor, and can be used in speed or current control modes. The drive can operate in forward or reverse, motoring or regenerative braking.

Please obtain expert help if you are not qualified to install this equipment. Make safety a priority. **This component is hazardous.** (All specifications in this document are nominal).

**POWER RATING**

340XRi 0.55KW (0.5 HP) at 180 Volts DC, 3.4 Amps  
 680XRi 0.75KW (1.0 HP) at 180 Volts DC, 6.8 Amps  
 1220XRi 1.80KW (2.0 HP) at 180 Volts DC, 12.2 Amps

Versions that work from 60V / 30V AC supply are also available.

340XRi / LV60, 680XRi / LV60, 1220XRi / LV60.

For motors rated up to 48V DC

**MAXIMUM OUTPUT**

**Armature:** +/-200 Volts DC, or +/-50V for LV60 models.  
 Models 340XRi / 680XRi /1220XRi - 3.4/ 6.8/ 12.2 Amps.  
**Field:** Volts DC = 0.9 x AC supply volts. 1 Amp  
 (0.45 x AC for field connected to F- and N). 1 Amp.

**AC SUPPLY INPUT**

110V AC or 240V AC +/-10%, 50-60 Hz.  
 30V AC or 60V AC +/-10%, 50-60Hz for LV60 models.

**SPEED RANGE**

Speed range 0-100%. (motor dependant)  
 Load Regulation typically 0.2% tach, 2% Arm Volts.

**USER ADJUSTMENTS**

Presets accessible under lift up cover.  
 Clockwise rotation for linear increase in parameter.

Relay driver threshold (**Level**)  
 Maximum Speed (**Max spd**)  
 Minimum Speed (**Min spd**)  
 Up Ramp (**Ramp▲**)  
 Down Ramp (**Ramp▼**)  
 Stability (**Stab**)  
 Maximum Current (**I max**)  
 IR compensation (**IR comp**)

+/- (0.5% to 105%). (+/-10.5V) Symmetrical about zero.  
 40V-200V span with Spd x 2 switch. (Avf/Tach fb volts)  
 LV60 models have an Avf range 10 - 50V.  
 0 to 30% of maximum speed. (With 10K external pot).  
 20 to 1 seconds up ramp rate. (For 0 to +10V)  
 20 to 1 seconds down ramp rate (For +10 to 0V)  
 Gain 1 to 10  
 0 to 100% current limit.  
 0 to 25%

**EXTERNAL CONTROLS**

Speed setpoint from **external 10K Ohms pot.**  
 External RUN contact for electronic STOP/START.

Built in functions are +/- channel with pushbutton control inputs, and relay driver with variable threshold. There is a pot kit available with graduated dial and knob. Sprint Electric part ref. POTKIT.

**CONTROL ACTION**

Speed loop: Full P+I armature voltage feedback.  
 Current loop: Full P+I isolated current feedback.

**INSTALLATION**

Use correctly rated cable minimum 600V AC, 1.5 times armature current.

**FUSING REQUIREMENT**

Sprint Electric semi-conductor fuse parts.  
 20A fuse 6 X 32 CH00620A  
 Fuseholder 6 X 32 CP102071  
 DIN rail clip for fuseholder FE101969

Suitable for use on a circuit capable of delivering not more than 5000A RMS symmetrical amperes when protected by an Ar class fuse.

**WARNING** The drive can only be protected by fitting an external AC supply semi-conductor fuse with an  $I^2t$  rating below 150 A<sup>2</sup>s.

**CONTROL SIGNALS**

Control signals are isolated from the supply, and the unit may be connected to other isolated instruments.

**MECHANICAL**

The unit is designed to clip onto a DIN rail. Avoid vibration and ambient temperatures outside -10 and +40C. Protect the unit from pollutants. Ensure there is an adequate supply of clean cool air to ventilate the unit and the enclosure it is mounted in. (Dissipation in Watts = 5 x Armature Amps).

**MOTOR**

Foot mounted motors must be level and secure. Protect motors from ingress of foreign matter during installation. Ensure accurate alignment of motor shaft with couplings. Do not hammer pulleys or couplings onto the motor shaft.

Before running motor, complete the following check list. (**Warning isolate the supply first**).

- 1) Correct insulation between all motor windings and earth. Disconnect all drive cables.
- 2) Check inside connection box for foreign objects, damaged terminals etc.
- 3) Check that brushes are in good condition, correctly seated and free to move in brush boxes. Check correct action of brush springs.
- 4) Motor vents must be freed of any obstruction or protective covers prior to running.

**AC SUPPLY**

**To avoid damage, ensure the supply selection jumper on the drive matches the incoming supply. 110V or 240V AC.**  
 For models with LV60 suffix. 30V or 60V AC.

**PRESET POT settings**

Set the **I max** (Max Current) preset to approximately match the motor armature rating. Fully clockwise is 100% drive rating. (340XRi 3.4A, 680XRi 6.8A, 1220XRi 12.2A). Fully anticlockwise is 0%. E. g. for a 340XRi unit a midway setting is 50% i.e. 1.7A. More accurate setting requires a suitable current meter in series with the armature. Set the **Stab** preset midway. (Clockwise rotation of the stab preset increases gain, excessive rotation may lead to instability). **Set all the other presets anticlockwise to start off with.** (Note LV60 models avf range is 25%).

The preferred strategy for initial commissioning is in armature voltage feedback mode described as follows. Set **Avf/Tach** switch ON (left) for armature voltage feedback (Avf) and **Spd x 2** switch OFF (right) for 40V max feedback. For systems utilising tach feedback, remove the terminal 11 tach connection and temporarily make wire end safe until later.

**POWER ON**

Check that the **Power** lamp lights. (Note, the **Power** lamp intensity is reduced when the negative armature bridge is demanded). Increase the external speed pot slowly to maximum. The motor should slowly ramp up to around 40V on the motor armature. Now set the 100% armature voltage and hence speed by using the **Spd x 2** switch (ON (left) for speed X 2) and the **Max spd** preset (Clockwise to increase speed). Note, if you change the **Spd x 2** switch position whilst running, the speed will undergo an immediate step change.

**RAMP and MIN SPEED**

The up / down ramps can now be set between 20 and 1 seconds, and the **Min spd** adjusted up to 30%.  
(Note, down ramp becomes up ramp for reverse rotation).

**IR COMP**

Speed droop on heavy loads may occur when armature voltage feedback is used. This is compensated for by clockwise rotation of **IR comp**. Excessive rotation may lead to instability.  
Note, **IR comp** is not used with tach feedback, leave preset anticlockwise.

**TACH FEEDBACK**

**The tach feedback signal on terminal 11 must be negative with respect to terminal 10 for a positive speed input.**

Whilst still in Avf mode measure the tach volts on the wire intended for T11 when running at 100% speed. (**Warning**, possible high voltage). This is the tach full speed voltage. Make a note of it to assist in selecting the speed range. **Stop the motor and turn off the supply.**

Set **Avf/Tach** switch OFF (right). Adjust the **Max spd** preset anti-clockwise. (With **Spd x 2** switch OFF (right) maximum speed range = 40 to 100V. With **Spd x 2** switch ON (left) the maximum speed range = 80 to 200V). Re-connect the tach wire to T11, re-start and adjust **Max spd** as required. Do not use an AC rectified tach for bi-directional systems.

**TERMINAL LISTING**

**WARNING. A+, A-, F-, F+, N, L, are at high potential. DO NOT TOUCH the terminals or any connected conductor**

- 1 + **10V** output. 10mA max. (Use a 10K Ohm pot for external speed reference).
- 2 **MIN** Speed. 5K Ohms preset to COM. (Connect to minimum end of speed pot).
- 3 **IP**. Speed input to ramp. 0 to +/-10V from speed pot wiper. 47K pull down.
- 4 **OP** +/- . (+/-10.5V range). 10mA max. T6 is the input for this function. Invert with pushbutton input T8 open. Non-invert with pushbutton input T7 open. (This function may be used to provide pushbutton controlled +/- 10V ref for fwd/rev).
- 5 **COM**. Common. (0 Volts)
- 6 **IP** +/- . Input to pushbutton controlled +/- signal channel. OP on T4. 50K Ohms.  
**Note**. This channel can invert input signals in the range +/-10.5V. It can also buffer (i.e. non-invert) signals in the range 0V to +10.5V. (**It cannot buffer negative signals**. If you try to buffer negative signals the output swings positive).
- 7 **PB+** Pushbutton input. 47K Ohm pull up to +12V. Connect to T5 **COM**. Latches T4 to buffer (**non-invert**) positive T6 signals when opened, provided T8 **PB-** is connected to T5 **COM**.
- 8 **PB-** Pushbutton input. 47K Ohm pull up to +12V. Connect to T5 **COM**. Latches T4 to **invert** T6 when opened. T7 **PB+** may be open or connected to T5 **COM**.
- 9 **RUN**. Internal 12K pull up to +12V. Open to stop, close to T5 **COM** to run. **WARNING. RUN is an electronic inhibit function. The field remains energised, and all power terminals 'live'. RUN must not be relied on to prevent rotation during hazardous operations. See section on STOPPING & JOGGING below.**
- 10 **COM**. Common. (0 Volts)
- 11 **TACH** input. The tach must be opposite polarity to speed input. 1.5 MOhms.
- 12 **RLOP**. Relay driver. +10V active high at 10mA. Flywheel diode to COM.
- 13 **RLIP**. Relay driver input. Accepts 0 to +/-10.5V signal inputs. The threshold to activate the relay driver is symmetrical around zero, and set by the **Level** preset between +/- 0.05V and +/-10.5V. When the T13 input **exceeds** the positive or negative threshold, then the T12 **RLOP** is turned **ON**. Typical uses include zero speed detector, zero current detector, stall detector etc. The input will accept any output from other control terminals. 50K Ohm pull down to COM.

- 14 **OVLD.** Overload. +10V active high at 10mA if the current demand exceeds 100%. Latches high if the stall timer eventually times out.
- 15 **TRIP.** Latched +10V active high at 10mA for either stall **OR** fan alarm tripped.
- 16 **ROP.** Ramp output. 0 to +/-10V output for 0 to +/-10V input. 1K Ohm output.
- 17 **DEM.** Demand output. 0 to +/-10V output for 0 to +/-100% speed demand. 1K Ohm output impedance. Represents the inverted total speed demand.
- 18 **SOP.** Speed output. 0 to +/-10V for 0 to +/-100%. 1K Ohm output impedance.
- 19 **IOP.** Current output. 0 to +/-5V output for 0 to +/-100% armature current. Maximum output +/-7.5V for +/-150% current. 1K Ohm output impedance.
- 20 **SPD.** Direct speed input fast response. Input impedance 100K. This signal is summed with the ramped reference. 0 to +/-10V input for 0 to +/-100%.
- 21 **TRQ.** Torque input. 100K Ohms pull up to +12V. 0 to +7.5V for 0 to +/-150% current (torque) demand. This input acts as an upper clamp on the current demand output produced by the speed loop. The current demand polarity determines the sign of the current. This input controls torque by clamping the demand amplitude. To operate, the total input speed demand must require current higher than this clamp level will allow. Conversely, if the speed loop current demand falls below this clamp level, the speed loop will regain control.

A +	Motor armature +	Form Factor typically 1.5
A-	Motor armature -	
F-	Motor Field - (No connection required for permanent magnet motors).	
F+	Motor Field + (For half wave field volts 0.45 X AC, connect field to F- and N).	
N	AC supply. 110V AC or 240V AC +/-10%, 50–60 Hz. (30/60VAC for type LV60)	
L	AC supply. 110V AC or 240V AC +/-10%, 50–60 Hz. (30/60VAC for type LV60)	

<b>Terminal tightening torques</b>	A + A- F- F+ N L	4.4in lb - 0.50Nm
	Terminals 1 to 21	2.2in lb - 0.25Nm

## ALARMS

Models 680XRi and 1220XRi use an internal fan for cooling. The **Alarm** lamp will come ON and the drive will electronically shut down if the internal fan fails. **The field**

**will remain energised**, hence if the machine is to be left unattended for long periods it may cause the field to overheat. (T15 **TRIP** alarm output available).

All models possess a STALL TIMER. This starts to integrate when the current demand exceeds 100%. A continuous demand of 150% will take 30 seconds to saturate the timer integrator, and latch the drive into shut down. Overload profiles at lower levels will take longer to trip. A STALL TRIP is indicated when the **Stall** lamp is latched on and the drive is shut down by the alarm. The LAMP gets progressively brighter as the stall integrator fills up prior to tripping. (T15 **TRIP** alarm output available and T14 **OVLD** also latches high).

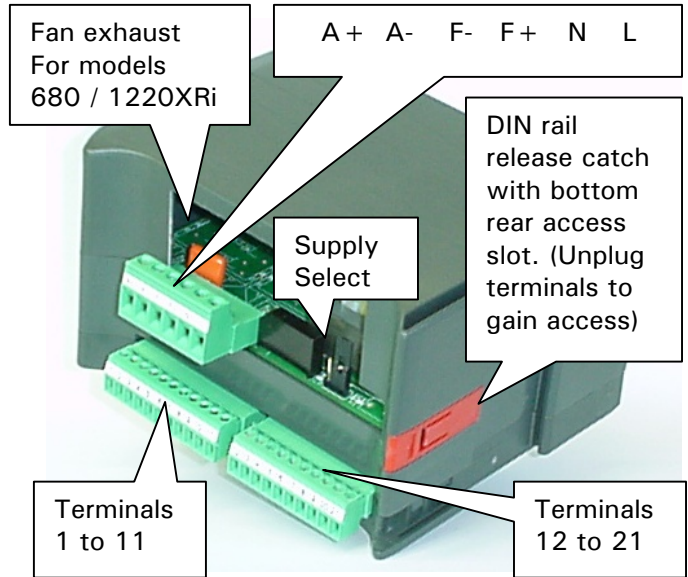
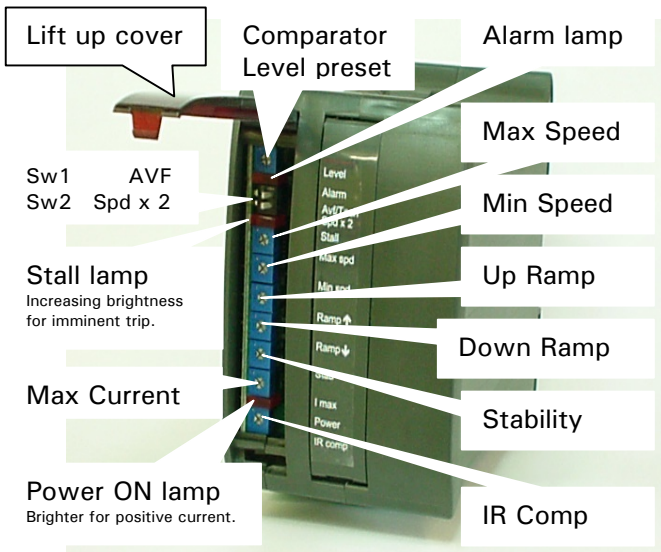
## STOPPING & JOGGING

For frequent stopping or jogging it is recommended to use the RUN input. When using a mains contactor, connect a spare

Normally Open contact from the contactor in series with the RUN input. Do not simply remove the supply to stop the motor, especially if the system is regenerating. This may cause fuse blowing, and possibly damage if the regenerative energy cannot be dissipated due to supply removal. If the drive is running, open the RUN (T9) input at least 250mS before removing the supply to allow time for the current to be quenched by the drive.

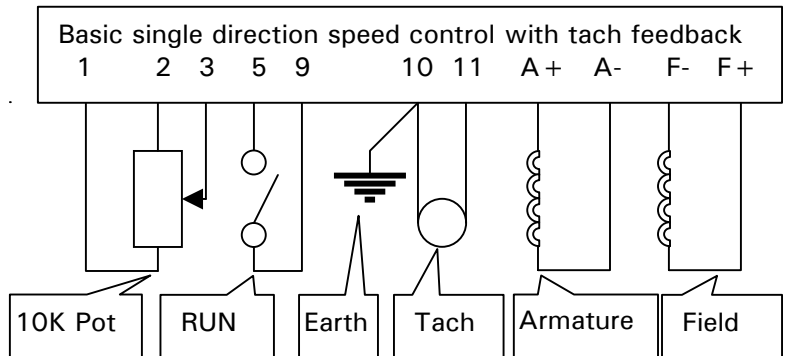
**MECHANICAL DETAILS**

The product is enclosed in a stylish DIN rail mounted enclosure with plug in screw terminal connections.



	Height	Width	Depth
340XRi	105	60	120
680XRi	105	70	120
1220XRi	105	70	120

**For Forward / Reverse operation**  
**Move the wire from T1 into T4.**  
**Connect T1 to T6. The pushbutton**  
**inputs T7/8 can then be used for**  
**direction control.**



**Earthing** A clean signal earth connection should be made to terminal 10 (Common). The motor earth should be connected to the earth in the system enclosure.

**APPLICATIONS GUIDE**

This is available at [www.sprint-electric.com](http://www.sprint-electric.com) 'Downloads', 'Technical Data'.

If the unit is to be used in the domestic environment, then for installations in the EU a supply filter is recommended in order to comply with EN6800-3. Sprint Electric part number FRLN16. For EU EMC compliance guidelines refer to the above website.

**WARNINGS**

**Health and safety at work. Electrical devices constitute a safety hazard. It is the responsibility of the user to ensure compliance with any acts or bylaws in force. Only skilled persons should install this equipment. Sprint Electric Ltd. does not accept any liability whatsoever for the installation, fitness for purpose or application of its products. It is the users responsibility to ensure the unit is correctly used and installed.**



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