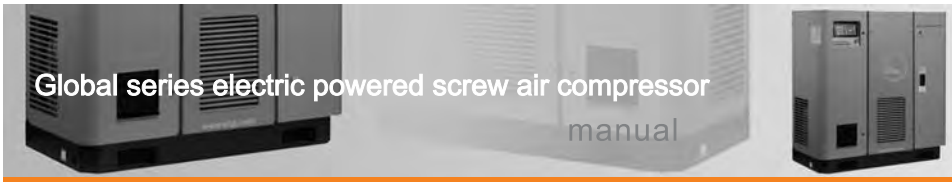


ELGI
Think Long Run

Operation and Maintenance Manual

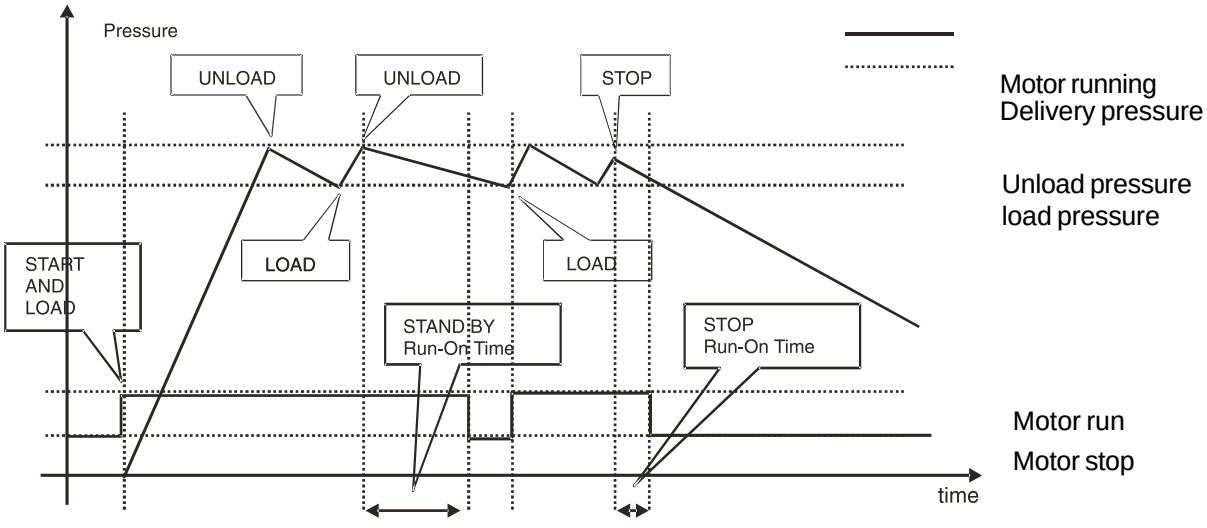
S1 Controller Users Manual

General Description

General Operation

In normal operation, the detected delivery pressure controls regulation of the compressor once the compressor has been started by pushing the start button, or by a remote start command if enabled. The controller will perform safety checks and start the compressor if no inhibiting conditions are detected.

If a start inhibiting condition exists the compressor will not enter the started condition and a start inhibit message is displayed. If a run inhibiting condition exists the compressor will enter the started condition but a main motor start is inhibited; the compressor will remain in the standby condition and a run inhibit message is displayed. If a load request is present, in accordance with internal pressure settings or by remote command, the main motor is started in a star/delta sequence. When running in delta configuration, after the star/delta time (adjustable) has expired, the load delay time (adjustable) prevents loading for a period to allow motor speed to stabilise. The load delay time can be set to one second if required. When the load delay time has expired the load valve output is energized and the compressor will load. If the unload pressure setting is reached, or a remote unload command is received, the load valve output is de-energized and the compressor will run offload for the standby run on time (adjustable) before the main motor stops and the compressor enters Standby mode.



The compressor will load again if pressure falls below the load setting before the standby run on time expires. If in Standby mode, a motor start sequence followed by the load delay time is executed before loading.

In the event of a motor stop, initiated by a stop command or when entering standby mode, a blow down timer (adjustable) is started. If a start request is made during the blow down time the compressor will enter standby mode until the blow down time expires. If already in standby mode, and a load request is present, the compressor will remain in standby mode until the blow down time has expired. For units with internal pressure detection enabled, a minimum internal re-start pressure can also be set to prevent a motor start sequence before internal pressure is vented. In the event internal pressure fails to fall below the set minimum re-start pressure within two minutes after the set blow down time has expired, a blow down fault is generated and the compressor will shutdown. After an unload event a re-load timer (adjustable) is initiated that will prevent re-loading, this time can be adjusted to a minimum of one second if required. Normal automated operation is ended by pushing the stop button, a remote stop command or in the event of a shutdown fault.

When stopped manually, or by a remote command, the load valve is de-energized and the main motor allowed to run-on for the stop run on time (adjustable). This time can be adjusted to a minimum of one second if required. Safety checks are made continuously, if there is a condition detected that presents a hazardous or damaging situation an immediate stop is performed and the reason displayed as a shutdown error message. If a warning condition is detected an Alarm message is displayed and normal operation continues.

I/O Description

Digital Inputs

Connector X04:

Connector type: 9 pole mini Combicon with 0.15" (3.81mm) Pitch

Pin	Name	Function	id	active state
1	C+	Digital inputs common		
2	C1	Emergency stop	digital input 1	fault if open
3	C2	Oil filter high DP	digital input 2	fault if open
4	C3	Reverse rotation (RDS)	digital input 3	fault if closed
5	C4	Air/Oil separator DP	digital input 4	fault if open
6	C5	Remote start/stop	digital input 5	fault if open/ start on closure
7	C6	High sump pressure	digital input 6	fault if open
8	C7	Fan motor Overload	digital input 7	fault if open
9	C8	Main motor overload	digital input 8	fault if open

Excess Pressure fault code : E0060
Reverse Direction Switch fault code : E0030
Fan motor Overload falut code : E0070

Remote Stop:

When the remote start/ stop function is enabled (P07), the compressor will execute a controlled stop, as if the control panel stop button had been pressed, when the remote start/stop input is open circuit.

Remote Start:

When the remote start/stop function is enabled (P07), the compressor will execute a normal start sequence when the remote start/stop input changes state from open to closed circuit. If closed, the remote start/stop input must be opened and closed again to initiate a remote start sequence. Local controller start is inhibited.

Digital Outputs

Connector X03: relays

Connector type: 6 pole Combicon with 0.20" (5mm) Pitch

Pin	name	function	id	active state
1	C-R123	Common for **star, delta and Main contactor**		
2	NO-R1	**Main contactor**	digital output 1	energized
3	NO-R2	**Star contactor**	digital output 2	energized
4	NO-R3	**Delta contactor**	digital output 3	energized
5	C-R4	Common for **load solenoid**		
6	R4	**Load solenoid**	digital output 4	load when energized

Connector X02: additional relays ***(S1-20 variant only)***

Connector type: 4pole Combicon with 0.20" 5mm pitch

Pin	name	function	id	active state
1	C-R5	Common **ADV**		
2	NO-R5	Normal open contact **ADV**	digital output 5	
3	C-R6	Common **Dryer**		
4	NO-R6	Normal open contact **Dryer**	digital output 6	

The function of auxiliary relays 5 and 6 can be set in the configuration menu.

Analog Inputs and Outputs

Note: All analogue device inputs have open circuit, short circuit and out-of-range fault detection functions

Connector X05: analogue inputs

Connector type: 6 pole mini Combicon with 3.81mm (0.15") pitch

Pin	name	function	id	type	range
1	C-ANA 1	**Delivery pressure**+ V common			
2	ANA 1	**Delivery pressure** input	Analog input 1	4-20mA	Adjustable
3	C-ANA2	**Temperature** OV common			
4	ANA2	**Temperature** input (menu setting + ACM type)	Analog input 2	KTY	-14^{0}F-269.6^{0}F
5	C-ANA 3	**Dryer Dewpoint** +V common	**(Optional)**		
6	ANA3	**Dryer Dewpoint input** (option)	Analog input 3	PT 1000	-58^{0}F+122^{0}F

Analog Input 1: fixed 4-20mA type

Analogue inputs 2 and 3: the S1 uses plug-in analogue conditioning modules (ACM's) that allow different sensor and signal types to be accommodated; for a particular sensor type the correct ACM hardware must be fitted.

Connector X06: analog output ***(S1-20 variant only)***

Connector type: 2 pole mini Combicon with 0.2" (5.08mm) Pitch

Pin	name	function	id	type	range
1	AGND	OV analog ground			
2	ANA-OUT1	4-20mA analog output	analog output1	4-20mA	Adjustable

Analog Output 1:

Standard

4-20mA signal, function selectable

Variable speed Control Active

4-20mA signal for percentage motor speed; 0%= stopped,

100%= maximum set motor speed

Machine State Diagram

Controller operational logic is shown in the machine state diagram as state blocks with an associating status block number. The state block determines the functionality of the controller at any given time. The controller can only be in one state at any given time. The controller will move from state to state in accordance with the defined exit and entry conditions of each state block and the defined connections between state blocks.

Definitions:

Fault:

A detected abnormal condition that must be indicated to operator personnel and that may require controller automated safety action, dependant on fault type and definition.

Start Inhibit Fault (S):

A start inhibit fault is a condition that may present a danger or cause damage to the compressor if started whilst the condition is present. Start inhibit faults are only triggered if a compressor start from the ready to start condition is attempted. Start inhibit faults are not triggered during an automated motor start sequence from the stand by condition. Start inhibit faults are self-resetting. A start inhibit fault code is displayed when triggered but is not recorded in the fault log.

Run inhibit Fault (R):

A run inhibit fault is a condition that may present a danger or cause damage to the compressor if the main motor is started whilst the condition is present. Run inhibit faults are only triggered if a motor start sequence is initiated. Run inhibit faults are self-resetting and do not prevent the compressor from entering a started condition. A Run inhibit will hold the compressor in a standby state and will allow a motor start sequence when the condition is no longer present. A Run inhibit fault code is displayed when triggered but is not recorded in the fault log.

Alarm Fault (A):

An alarm fault is a warning condition that does not present an immediate danger or potential damage to the compressor. An alarm state will not shutdown the compressor or affect normal operation. An alarm fault code is displayed that must be manually reset to clear once the condition has been resolved or no longer exists.

Shutdown Fault (E):

A shutdown fault is a condition that may present danger or potential damage to the compressor if the condition persists. A shutdown fault will cause the controller to stop the compressor. A shutdown fault code is displayed that must be manually reset to clear once the condition has been resolved or no longer exists. Two types of shutdown fault are definable a) non-emergency shutdown, an immediate controlled stop is executed, b) emergency shutdown, an instantaneous stop is executed.

Unload Pressure:

The unload pressure is the delivery pressure level (adjustable) at which the controller will de-energizes the load solenoid output and the compressor will offload.

Load Pressure:

The load pressure is the delivery pressure level (adjustable) at which the compressor will energizes the load solenoid output and the compressor will load. If in the standby state, an automated main motor start sequence is triggered prior to load.

Main Motor Start Sequence:

The controller will energizes the Star contactor or output followed by the Main contactor output 200ms later. After the Star/Delta timer (adjustable) expires the controller will execute an automated Star to Delta contactor output changeover with a 50ms star to delta transition time. If a Stop command is received during the start sequence the controller will continue to execute the start sequence before stopping. This action is intended to limit the break current of motor starter contactors.

Load Delay Timer:

The star to delta output transition is immediately followed by a load delay time (adjustable) that will inhibit the load solenoid output from energizing until the load delay time expires. Intended to allow the main motor speed to stabilize and other pre-load functions to occur.

Reload Delay Timer:

The reload delay time (adjustable) is a period of time immediately following a load to unload event during which the load solenoid output is inhibited from energizing.

Blow Down Timer:

The blow down time (adjustable) immediately follows a main motor stop event. During the blow down time a start request is recognized but is not initiated until the timer expires. If the optional internal pressure detection feature is enabled the restart inhibit is also dependant on internal pressure falling below the 'start inhibit pressure level' (adjustable). Failure of internal pressure to fall below the set pressure level for a period of two minutes after the set blow down timer expires will result in a blow down trip fault. The remaining time in seconds is show on the Information Item display.

Standby Run-on-Time:

When off load the standby run-on-timer will start. If the compressor remains in an off load condition and the timer expires the main motor will stop and the compressor will enter the Stand by state. The compressor will automatically re-start and load as required. This function is intended to improve efficiency during low demand periods and to limit the number, and interval between, motor start events. The remaining time in seconds is show on the Information Item display.

Stop Run-On-Time:

When stopped (stop button, remote stop input or remote stop command) the compressor will unload and the main motor continue to run for the stop run-on-time before stopping. This function is intended to allow for internal pressure venting and to limit lubrication oil aeration prior to the main motor stopping. The remaining time in seconds is show on the Information Item display.

Started State:

The unit has been started (start button, remote start input or remote start command) and is in an active condition ready to respond to changes in delivery pressure.

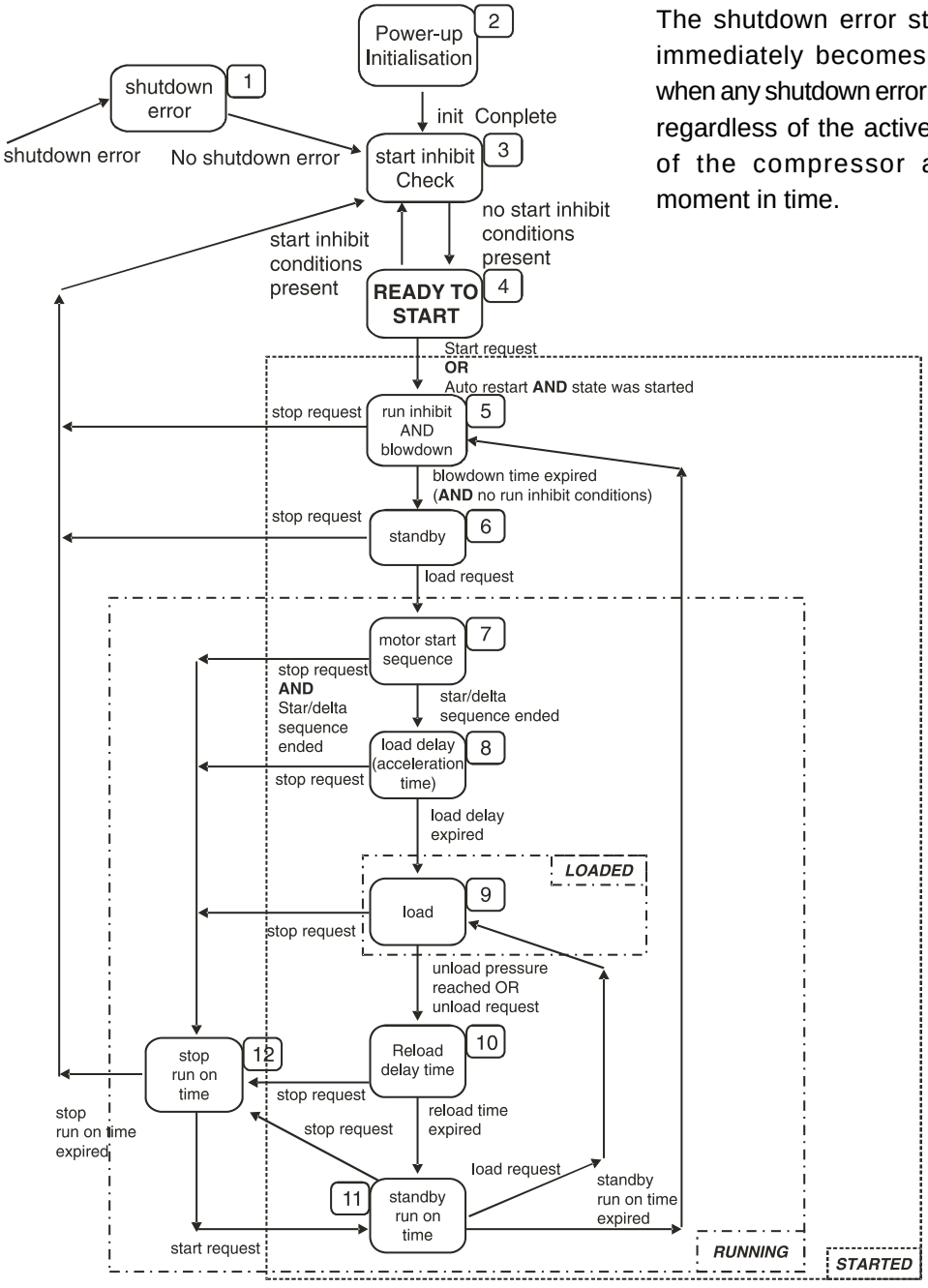
Running State:

The unit is in the Started state and the main motor is running

Loaded State:

The unit is in the Started state and Running state and the load solenoid output is energized.

Machine State Diagram



The shutdown error state (1) immediately becomes active when any shutdown error occurs, regardless of the active status of the compressor at that moment in time.

User Interface

Display	:	Custom backlit LCD
Indicators	:	2 x LED
Controls	:	7 x Tactile push buttons
START	:	Enter STARTED Condition
STOP	:	Exit STARTED Condition
RESET	:	Reset and clear fault conditions
ENTER	:	Confirm selection or value adjustments
MINUS/DOWN	:	Scroll down through menu, menu item options or decrement value
PLUS/UP	:	Scroll up through menu, menu item options or increment value
ESCAPE (C)	:	Step back one menu navigation level

Start and Stop have one defined function and are not used for any other purpose. Reset will initiate a display jump to the fault code item if a fault condition remains active or initiate a display jump to the information item if no active faults exist in normal display mode. If pressed and held for longer than two seconds in menu mode will exit menu mode to the normal operational display mode, page 00.

Enter will lock a selected value display preventing return, after a short delay, to the default To value display. When locked the 'key' symbol will flash. To unlock press Escape.

Escape will initiate a display jump to the information item in normal display mode, page 00.

Plus, Minus, Enter and Escape are used to navigate menu mode and adjust menu parameters.

LED Indicators

STATUS : Green, adjacent to Start and Stop buttons

FAULT : Red, adjacent to Stop and Reset buttons

Indicator States :

ON : Illuminated continuously.

FF : Fast Flash: on/off four times per second.

SF : Slow Flash: on/off once per second.

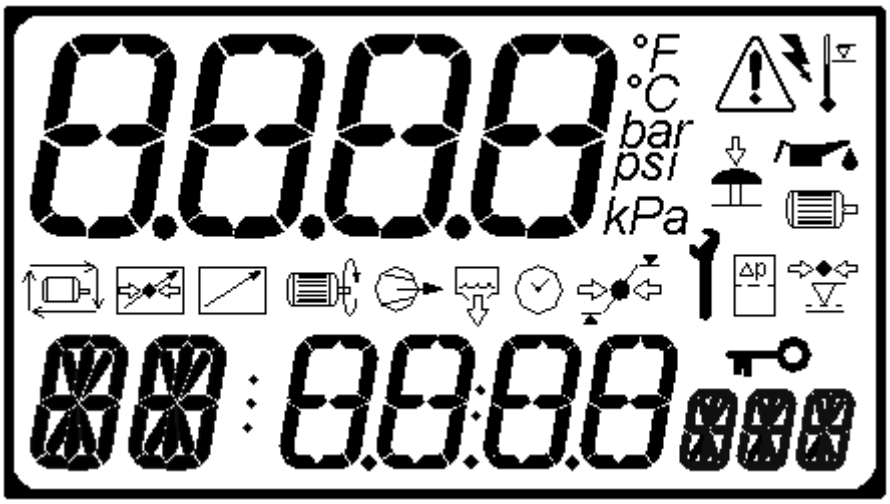
IF : Intermittent Flash: on/off every four seconds.

OFF : Extinguished continuously.

Machine State Number	Machine State	Status 🔴	Fault
1	Shutdown Error	OFF	FF
2	Startup Init	OFF	OFF**
3	Start inhibit Check	OFF	OFF**
	Start inhibit condition		SF
4	Ready to Start	OFF	OFF**
5	Blowdown	if (load_request) FF else IF	OFF**
6	Standby	IF	OFF**
7	Start Motor in Star/ Delta	if (load_request) FF else IF	OFF**
8	Load Delay	if(load_request) FF else IF	OFF**
9	Load	ON	OFF**
10	Reload Delay	if(load_request) FF else IF	OFF**
11	Standby Run on Time	IF	OFF**
12	Stop Run on Time	SF	OFF**

🔴** SF for Alarm condition

Display



The display is divided into 4 areas

Top, Left : The display Field:-

4 character numeric display, with unit symbols, used to continuously show delivery pressure in normal operating mode or menu page number in menu mode

Top, Right : Fault Symbol Field:-

Symbolic displays used to indicate common general fault conditions

Middle : Symbolic displays used to reinforce meaning of selected item, fault condition. Symbolic status information in normal operational mode ' Information Screen' item

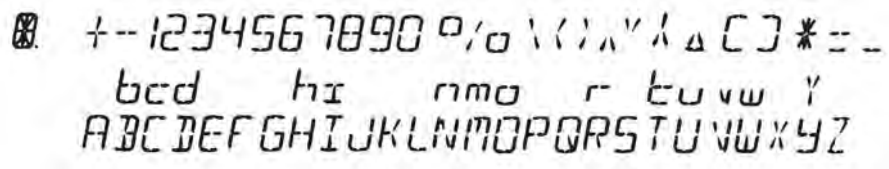
Bottom : Item and Value Field:-

Item identification : 2 character alphanumeric, 14segment

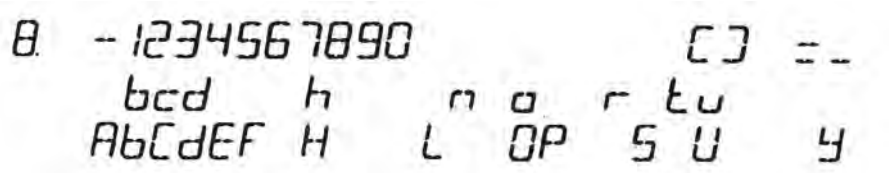
Item Value : 4 character numeric,7 segment

Item Unit : 3 character alphanumeric, 14 segment

14 Segment Display Character Set:



7 Segment Display Character Set:



Display Character Examples, Units :

BAR	bar	KPA	kPa	cFm	cfm	CFM	cfm
PSI	psi	Hh	hour	M3m	m^3/min	m3	m^3 cubic metres
kW	kW Kilowatt	Mm	minute	Ft3	ft^3 cubic feet	h:m	time hours/minutes
kV	kV KiloVolt	S	seconds	SPM	spm bearing monitoring	dmY	date day/month/year
RPM	rpm	mA	mA milliAmp	dBn	dBn spm unit	( )	greater than less than
°C	°C	mV	mV milliVolt	+	+ positive	^ v	up down
%	% percent	°F	°F	--	- negative	Δ	star delta

Operational Display Symbols :

Motor Running

Loaded

Amount of time, timer

Filter, differential pressure


Pressure set point indication (upper and lower set point indicators displayed independently)


Condensate drain active (optional function)


Power failure autorestart enabled (optional function)


Remote load or remote pressure regulation active


Remote start/stop


Normal Operational : Selected item locked as temporary default display page item locked (adjustment inhibited)
Menu Mode :

Fault Display Symbols:


General fault / Dryer


Lubrication, oil, oil, level


Emergency stop


Dewpoint


Excess pressure


Motor


Power failure

Service due, maintenance


Above Set temperature


Filter differential, filter service

Display Structure and Menu Navigation

Display Item Structure

All value, parameter or option selection displays are grouped into menu lists. Items are assigned to a list according to type and classfication. Items that can be used to select options or modify functions are assigned to ‘menu mode’ lists. Items that an operator may require to view during routine operation, detected pressure or temperature values for example, are assigned to the normal operational mode list. Lists are identified by page number, the normal operational display list is page 0. All parameters and options are assigned to menu mode pages 1 or higher. All Page 0 items are view only and cannot be adjusted.

Normal Operational Mode (Page 0).

At controller initialisation, all display elements and LED indicators are switched on for three seconds, the display will then show the software version code for a further 3 seconds before initialisation is complete and the normal operating display (Page 0) is shown. In page 0 ‘normal operational display mode’ the Display Field will show the final delivery pressure continuously and the Item and Value Fields will initially show the Information Item display for 35 seconds before reverting to the default temperature display item. All available Item and Value field option displays (temperatures, pressures, hours counters) can be selected using the Up or Down buttons at any time. The Item display will revert to the default item after 35 seconds if no further selection is made. Pressing the Enter button will lock any selected Item display and inhibit return to the default display. When an Item display is locked the lock key symbol will slow flash. To unlock an Item display press Up or Down to view an alternative Item display or press Reset or Escape. In page 0 Escape will select the Status Information Item display if no faults are active. Unless a selected Item display is locked, the display will automatically jump to display the fault code. More than one active fault code item can exist at any one time.

Access Code :

Access to page list displays higher than page 0 are restricted by access code. To access menu mode pages press UP and DOWN together, an access code entry display is shown and the first code character will flash. Use PLUs or MINUS to adjust the value of the first code character then press ENTER. The next code character will flash ; use UP or DOWN to adjust then press ENTER. Repeat for all four code characters. If the code number is less than 1000 then the first code character will be 0 (zero). To return to a previous code character press ESCAPE. When all four code characters have been set to an authorized code number press ENTER. Access to certain menu mode pages is dependent on authority level determined by the access code used. An invalid code will return the display to normal operational mode ; page 0.

The following pages and access levels are used :

ACCESS LEVEL = USER (CODE = 9)	ACCESS LEVEL = SERVICE 1 (CODE = 100)	ACCESS LEVEL = SERVICE 2
P00,P01,P02	P00,P01,P02,P03 P04,P05,P06,P07 P08,P09	P00,P01,P02,P03 P04,P05,P06,P07 P08,P09,P10

Access Code Timeouts :

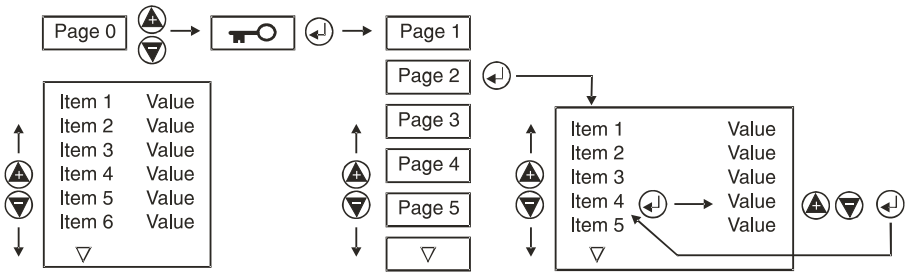
When in menu mode, if no key activity is detected for a period of time the display will automatically reset to the normal operational display ; Page 0. The timeout period is dependant on the access code used :

User : *1 minute* Service 1 : *10 minutes* Service 2 : *1 hour*

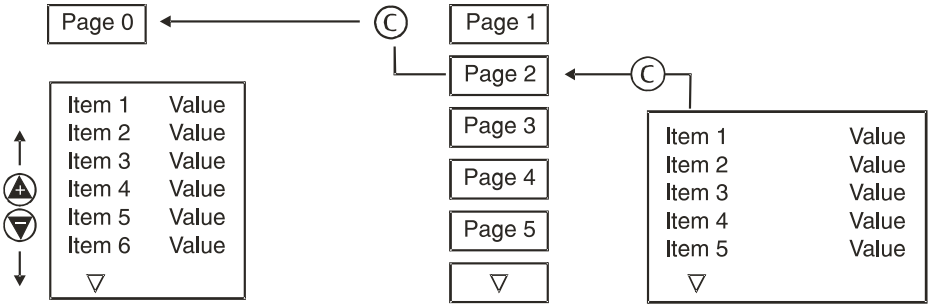
Menu Mode Navigation

In menu mode the Display Field will flash and show the Page number. To select a page press UP or DOWN. For each page the Item and Value field will display the first Item of the page list. To view a page list press ENTER, the Page number will stop flashing and the Item display will flash. Press UP or DOWN to view the selected page list items.

To select an Item value for modification press ENTER, the Item display will stop flashing and the Value display will flash. The value or option can now be modified by pressing UP (Plus) or DOWN (Minus). To enter a modified value or option in memory press ENTER ; alternatively the modification can be abandoned, and the original setting maintained, by pressing ESCAPE.



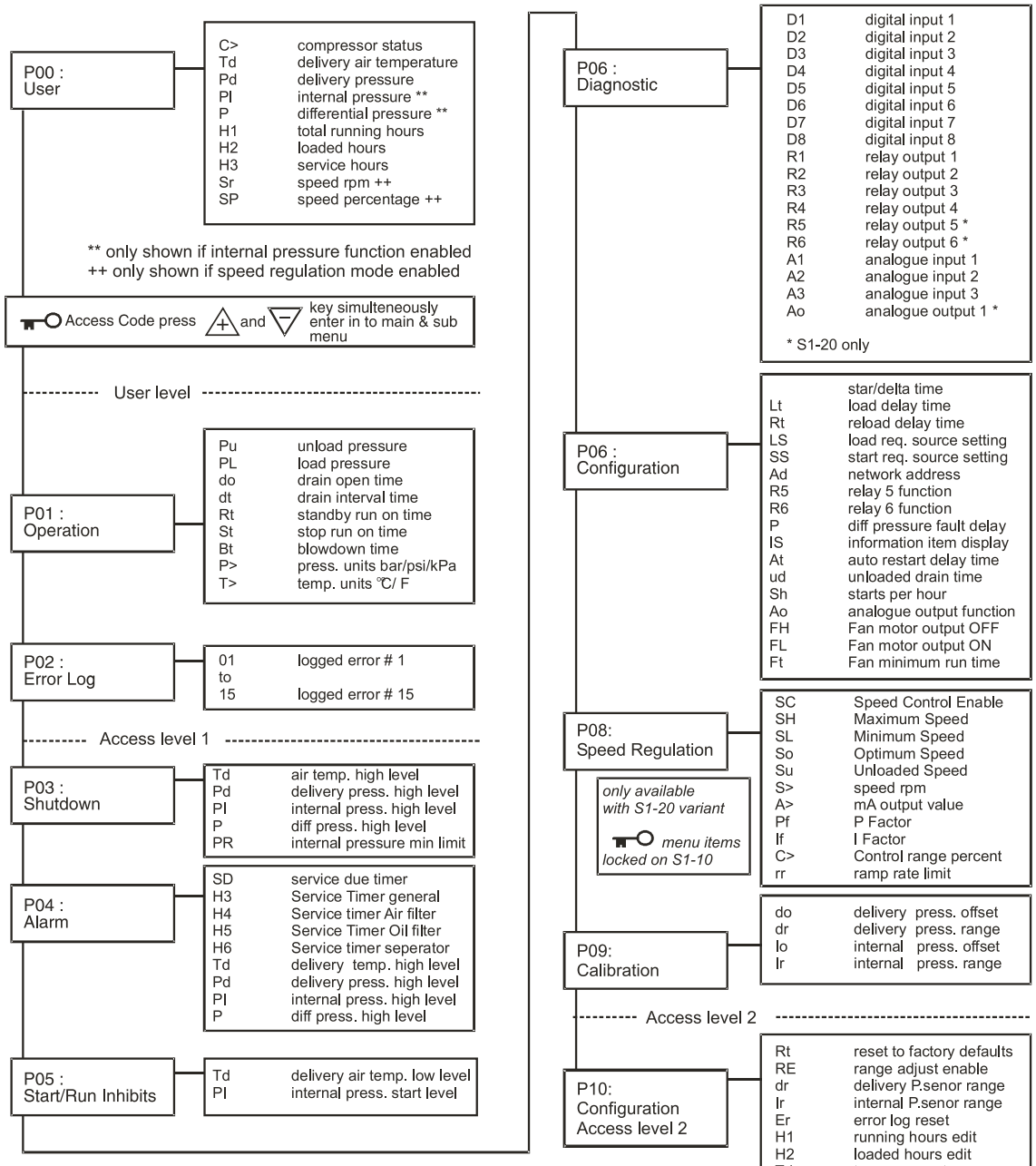
Press ESCAPE at any time in menu mode to step backwards one stage in the navigation process. Pressing ESCAPE when the page number is flashing will exit menu mode and return the display to normal operational mode; page 0.



Press and hole RESET for two seconds at any time to immediately exit menu mode and return to the normal operational mode display. Any value or option adjustment that has not been confirmed and entered into memory will be abandoned and the original setting maintained.

A flashing Key symbol displayed with any Item indicates the Item is locked and cannot be modified. This will occur if the Item is view only (non adjustable) or in instances where the item cannot be adjusted while the compressor is in the operation STARTED state.

Menu structure



P00 User Menu

The User menu shows normal operational values and information displays. This is the default display menu; no access code is required.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Information screen	-	no_edit	-	-	-	C>
2	Delivery air temperature	°C/°F	no_edit	-	-	-	**Td** 131°F
3	Delivery pressure	bar/psi	no_edit	-	-	-	**Pd** 65.26 PSI
4**	Internal pressure	bar/psi	no_edit	-	-	-	**PI** 18.85 PSI
5**	Differential pressure	bar/psi	no_edit	-	-	-	**PΔ** 5.80 PSI
6	Running hours	h	no_edit	0	99999	-	**H1** 1430
7	Loaded hours	h	no_edit	0	99999	-	**H2** 1275
8	Service hours	h	no_edit	0	10000	-	**H3** 0570
9	Service hours Air filter	h	no_edit	1000	10000	-	**H4** 2000
10	Service hours Oil filter	h	no_edit	1000	10000	-	**H5** 4000
11	Service hours Seperator	h	no_edit	1000	10000	-	**H6** 4000
12##	Motor speed	rpm	no_edit	0	7200	-	**Sr** 3000rpm
13##	Percent speed	%	no_edit	0.0	100.0	-	**SP** 100.%

** only shown if internal pressure sensor function activated

only shown if variable speed regulation mode is activated (S1 - 20 only)

Status Information Item

The page 0 'Status Information Item' provides a basic overview of status using symbols :


Main motor running


Compressor on load


Delivery pressure relative to pressure set points, not displayed when remote pressure control active.


Pressure equal to, or below, load pressure set point


Pressure equal to, or above, unload pressure set point


Pressure between load and unload pressure set points

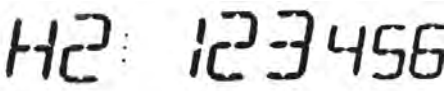

Condensate drain valve output is energized (if function enabled)


Countdown timer function is occurring (Run -On-Time, Stop Run-On-Time, Blowdown -Time). During a countdown time funciton the remaining time in seconds is displayed.

Unless a timer function is active and the timer count is being displayed, the 'units' display field will show the selected information item, see P07 'In' menu item.

Hours Display Items

Hours are displayed using the 'value and units' display fields together. This feature enables a maximum of 9999999 hours to be displayed.



(Loaded Hours 'H2' = 123456 h)

Note : hour values less than 1000 are shown with leading zeros (10 hours = 0010)

P01 Operation Menu

Contains general operation parameters that may be modified by the User from time to time.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Unload pressure	bar/psi	1.45	PL + 2.90	203.05	101.52	**Pu** 101.52 PSI
2	Load pressure	bar/psi	1.45	72.51	Pu- 2.90	94.27	**PL** 94.27 PSI
3	Drain open time	s	1	1	30	5	**do** 5 s
4	Drain interval time	s	1	30	3600	60	**dt** 60 s
5	Standby run or time	s	1	1	3600	300	**Rt** 300 s
6	Stop run on time	s	1	1	60	30	**St** 30 s
7	Blowdown time	s	1	1	600	10	**Bt** 10 s
8	Pressure units	-	1	0	29	0	**P>** 0 0=bar / 1=psi / 2=kPA
9	Temperature units	-	1	0	14.5	0	**T>** 0 0= ^{0}C 1=^{0}F

Minimum differential between load and unload set points is 2.90 PSI

Pressure Settings

Trip cannot be adjusted above maximum sensor range

Alarm can not be adjusted above (Shutdown -2.90 PSI) or below ('Pu' Unload + 2.90 PSI)

Unload can not be adjusted above (Alarm - 2.90 PSI) or below ('PL' Load + 2.90 PSI)

Load cannot be adjusted above ('Pu' Unload - 2.90 PSI) or below 72.51PSI

Pressure and Temperature Units:

Selects the units for displayed values. Internally the controller operates using mBar (0.014 PSI) and mCelsius (32°F). The values displayed are calculated from the internal operating values.

P02 Error Log Menu

Contains the last 15 fault states in chronological order. The most recent fault (alarm, start inhibit or shutdown) is stored as item 1. Each item consists of two values : the fault code number and the running hours when the fault occurred. The display will automatically alternate between these two values. All items are view only.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Logged error # 1	_	no_edit	_	_	_	**01** ... Er. 0010 E<> 12345*
2 to 15	Logged error # 2 to error # 15	_	no_edit	_	_	_	**02 to 15**

* example : last detected error = Emergency Stop shutdown (fault code 0010E) at 12345 running hours

P03 Shutdown Menu

Settings that determine the level or condition at which a shutdown fault is generated.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Delivery air temperature high level	°C/°F	33.8	176	266	248	**Td** 248°F
2	Delivery pressure high level	bar/psi	1.45	101.52	232	116	**Pd** 116 PSI
3*	Internal pressure high level	bar/psi	1.45	102	232	130	**PI** 130 PSI
4*	Differential pressure high level	bar/psi	1.45	Alarm +2.90	72.51	14.50	**Pr** 14.50 PSI
5*	Internal pressure minimum level	bar/psi	1.45	0.0	14.50	0.0	**PR** 0.0 PSI

** Delivery temperature maximum limit may be higher with alternative temperature sensor types.

* Optional - only shown if internal pressure sensor function activated.

Differential Pressure High Level

Will activate if the condition remains above the set level for longer than the differential pressure fault delay time (see menu 07) AND the delivery temperature is above 112°F.

Internal Pressure Minimum Level

Internal pressure is checked after the initial motor start sequence + set load delay time, and at each load request thereafter. If detected pressure is below the set limit a shutdown error is generated. This feature is intended to provide protection against incorrect motor rotation or catastrophic internal pipe / coupling failure.

P04 AlarmMenu

Settings that determine the level or condition at which an alarm fault is generated.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Service Timer	hours	100	1000	10000	2000	**H3** 2000
2	Service timer Air filter	hours	100	1000	10000	4000	**H4** 4000
3	Service time Oil filter	hours	100	1000	10000	4000	**H5** 4000
4	Service time Seperator	hours	100	1000	10000	4000	**H6** 4000
5	Delivery air temperature high level	°C/°F	33.8	158	248	230	**Td** 230°F
6	Delivery pressure high level	bar/psi	1.45	101.52	230	110	**Pd** 116 PSI
7*	Internal pressure high level	bar/psi	1.45	102	232	124	**PI** 130.53 PSI
8*	Differential pressure high level	bar/psi	1.45	2.9	Shut down - 2.9	11.60	**PΔ** 11.60 PSI

*- Optional

Service Countdown Timer :

The service countdown timer will count down from the set value in accordance with running hours. When the item is viewed the service hour's value will reflect the current hours remaining until a routine maintenance service is due (zero hours). When zero hours are reached a service due alarm will be displayed. The alarm can only be reset when the service hours is adjusted above zero. The service hours count will continue to count down in negative values until the timer is re-set. This function is intended to promote timely routine maintenance and indicate how many running hours have passed since a service due alarm was displayed. The value can be adjusted back to the required maintenance interval time each time a maintenance service is completed.

Differential Pressure High Level

Will activate if the condition remains above the set level for longer than the differential pressure fault delay time (see menu PO7) AND the delivery temperature is above 112°F

P05 Start and Run Inhibit Menu

Settings that determine the level or condition at which a start or Run inhibit condition exists.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Delivery air temperature low level (R)	°C/°F	33.8	-4	50	33.8	**Td** 33.8°F
2	Internal pressure start level (R)	bar/psi	1.45	1.45	29	7.25	**PI** 7.25 PSI

Delivery Air TemperatureLow Level : Run Inhibit active if temperature falls below set limit.

Internal Pressure Start Level : Run Inhibit active if pressure is above set limit.

Run inhibits (R) allow the compressor to be started but will prevent a main motor start until the condition clears.

When the condition is no longer present, the alarm will self reset and the main motor automatically allowed to start as required (see : internal pressure blowdown timeout shutdown function)

Note : There are not Start inhibits (S) as standard.

P06 Diagnostic Menu

This menu allows a technician to check all inputs and test all outputs individually without running the compressor.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Digital input 1	_	no_edit	_	_	_	**D1** 0 - - -
2	Digital input 2	_	no_edit	_	_	_	**D2** 0 - - -
3	Digital input 3	_	no_edit	_	_	_	**D3** 0 - / -
4	Digital input 4	_	no_edit	_	_	_	**D4** 0 - - -
5	Digital input 5	_	no_edit	_	_	_	**D5** 0 - - -
6	Digital input 6	_	no_edit	_	_	_	**D6** 0 - / -
7	Digital input 7	_	no_edit	_	_	_	**D7** 0 - / -
8	Digital input 8	_	no_edit	_	_	_	**D8** 0 - - -
9	Relay output 1	_	1	0	1	0	**R1** 0 - / -
10	Relay output 2	_	1	0	1	0	**R2** 0 - / -
11	Relay output 3	_	1	0	1	0	**R3** 0 - / -
12	Relay output 4	_	1	0	1	0	**R4** 0 - / -
13	Relay output 5	_	1	0	1	0	**R5** 0 - / -
14	Relay output 6	_	1	0	1	0	**R6** 0 - / -
15	Analogue input 1	_	no_edit	_	_	_	**A1** 4.00m A
16	Analogue input 2	_	no_edit	_	_	_	**A2** 0.467V
17	Analogue input 3	_	no_edit	_	_	_	**A3** 4.00mA
18	Analogue output 1	mA	0.10	4.0	20.0	_	**A0** 4.00mA

Digital Inputs : The display will indicate the actual state of the in put "_/_" (open circuit) or " _ _ _ " (closed circuit) and the status of the corresponding input function ; active (1) or de-active(0).

Note : Value display number indicates function not input state (example : Emergency Stop = 0 " _ _ _ " the input is closed circuit and the Emergency Stop function is not active).

Relay Outputs : Relays can be energized (1) and de-energized (0). The motor starter relay outputs, 1 to 3, can only be energized one at a time, the output will de-energize when the selected Item is changed.

Analogue Inputs : Analogue input values will toggle (2 second) between associated engineering units set for the input and the actual mV (temperature or voltage inputs) or mA (current loop inputs) detected on the controller connector of the corresponding analogue input. The mV or mA value can be independently checked with a meter.

Analogue output values can be adjusted (from 4.0mA to 20.0mA in 0.1 mA steps) to force the output to a desired mA level for diagnostic or calibration processes. The output will automatically revert to the defined function upon menu exit.

P07 Configuration Menu

Settings that determine the basic operating configuration.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Star / delta time	s	0.2	1	30	10	⅄Δ 10.0 sec
2	load delay time	s	0.2	1	30	1	**Lt** 1.0 sec
3	reload delay time	s	0.2	1	30	1	**Rt** 1.0 sec
4	Load request source setting	0 = press. sensor 1 = comm. req	1	0	1	0	**LS** 0
5	Start request source setting	0 = keyboard 1 = comm. req 2 = dig.inputs	1	0	2	0	**SS** 0
6	network address	_	1	1	99	1	**Ad** 1
7	relay 5 function setting	1 to 13 see Output Functions	1	1	14	7	**R5** 7
8	relay 6 function setting	1 to 13 see Output Functions	1	1	14	3	**R6** 3

Relay 5 and 6 Output Functions:

1 - Alarm — De-energized for any active larm fault(not including Start/Run Inhibit)

2 - Shutdown — De-energized for any active Shutdown fault (not including Start/Run Inhibit)

3	-	Group Fault	De-energized for any active Alarm, Star/ Run Inhibit or Shutdown fault
4	-	Alarm Service	De-energized for any Alarm fault or Service Due alarm (not including Start/Run Inhibit)
5	-	Service	Energized for Service Due alarm only
6	-	Heater	Energizes if detected temperature fails below set low temperature run inhibit + 35.6°F De-energizes if detected temperature increases above set low temp run inhibit + 37.4°F Can be used to energize anti-condensate heater contactor or as low temperature warning auxiliary output
7	-	Drain	When loaded : cycle in accordance with drain open and drain interval time settings. Elapsed interval time is stored in non-permanent memory when not loaded and the remaining interval time applied when loaded operation is resumed. - When not loaded AND in ' started' state (optional ; active only if offload drain time set above zero seconds, 0 sec = offload drain function disabled). drain interval time = drain interval time x 10. drain open time = offload drain time setting reset to start of interval time when status change to not loaded, then cycle
8	-	Fan	Energized in all RUNNING states except 'motor start' and 'load delay time' Can be used to energize internal and/or external cooling fan motor contactor
9	-	Standby	Energized in 'Standby' and 'Blowdown states
10	-	Running	Energized in all RUNNING state conditions
11	-	Loaded	Energized in all LOADED state conditions
12	-	Started	Energized in all STARTED state conditions

13 - Fan(temp ctl) Enabled to operate in all RUNNING states except 'motor start' and 'load delay time' If enabled to operate the output will only energize if delivery temperature exceeds the set 'Fan High' temperature setting. If delivery temperature falls below the set 'Fan Low' temperature setting the output will de-energize. Once energized the output will remain energized for a minimum of the set 'Fan Minimum Run Time' regardless of delivery temperature. Can be used to energize internal and/or external cooling fan motor contactor ; the minimum run time is intended as a means of limiting Fan motor starts -perhour.

14 - Dryer Enabled it will run on running states as per dryer logic as follows.

1. Dryer relay is selected on after 3 minutes from delta on during start sequence.
2. During stop sequence compressor and dryer stops together.
3. Dryer flow diagram enclosed in annexure

Item #	Description	Units	Step	Min	Max	Default	Display
9	differential pressure fault delay time	s	1	1	600	10	**P△** 10.0 sec
10	indication field function setting	0 = no indication 1 = network address 2 = machine state No. 3 = average cycle time 4 = max cycle time 5 = # starts registered	1	0	5	1	**IS** 1
11	auto restart delay time	s	1	0	120	10	**At** 10.0 sec
12	offload drain time	s	1	0	30	0	**ud** 0
13	starts per hour	_	1	0	20	0	**Sh**
14	Analog output select	_	1	0	17	2	**Ao** 2
15	Fan control OFF temp	°F					**FHt** 185°F
16	Fan control ON temp	°F					**FLt** 167°F
17	Fan minimum run time	s					**Frt** 180 sec

Indication Field Function Setting

The function of the number shown in the ‘units’ display field (bottom right of display) when the Status Information.

Item’ is selected from the normal operational menu P00 :

Network Address - the set RS485 network address for the compressor (default)

Machine State Number - the current active status block condition (see machine state diagram)

Average Cycle Time - the average controller software cycle time in mSecs

Maximum Cycle Time - the maximum controller software cycle time in mSec

Starts Registered - The number of motor start events that have occurred in the last one-hour period

Information field items are intended for general information or diagnostic purposes, to disable select (0).

Auto Restart Delay :

If an auto restart delay time is specified, the controller will execute an automated restart after a power disruption if the controller was in the Started state when the power disruption occurred. The delay time specifies the warning period after controller initialization before a re-start is executed. The time before restart is indicated on the controller display. No restart will occur if the controller was not in the started state prior to power disruption.

Starts per hour :

Every time a main motor start event occurs, an entry is made in an array (app _starts_per _hour_countdown_array(x)). The entry is made in the first available location in aFIFO registerlist. The entry is 3600 seconds, which is counted down from that point in time. For every motor start event to the maximum number of starts per hour allowed, an entry is made. when the first entry expires, the others, which were recorded at a later point in time, will be shifted forward one, and the number of registered motor starts is decremented.

If the number of motor starts registered (motor start events within the last one hour period) equals the number of starts allowed, an adjustment to the run-on-time is made. The new run-on-time is calculated so that the compressor will continue to run offload until the number of registered start events within the last one hour period reduces below the maximum number set, allowing another start event to occur. The 'starts per hour' function only influences the standby run on time, it will not prevent the motor from being starting. If a new start is performed after the maximum number of starts has already been registered, the oldest one is removed from the list, which causes the time to wait to increase.

To disable the function, and maintain the set run-on-time period regardless of motor start events, adjust the starts per hour setting to 0(zero).

Analog Output Select:

In standard fixed motor speed mode the analogue output can be selected to follow delivery pressure '14' delivery temperature '15' or internal pressure '16'. To disable output select '0'.

The analogue output can also be used to energize an auxiliary relay ; the contact of which can then be used to switch remote devices.

Settings : 1 to 13 = same functions as R5 and R6 options 1 to 13
Default = 3 ' Group Fault'

NOTE : Must use a 24Vdc relay that has a switch -on current of less than 20 mA Part number Y01 ENER 34.00 is suitable

Note : In speed regulation modes the analogue output will be the frequency inverter drive 4-20mA control signal. In this instance the analogue output will display setting '17' (variable speed regulation) and the setting will be locked and can not be adjsuted.

P08 Speed Regulation Menu

The speed regulation function provides P&I loop control of a variable speed drive (using 4-20m A output 1) in order to maintain a steady target pressure level (load pressure). Speed regulation is used to maintain delivery pressure at the load pressure set point. If pressure rises to the unload pressure set point the load solenoid output is de-energized and the compressor unloaded. While in the offload state the controller will maintain speed at the set offload speed setting. If pressure remains above the load pressure set point for longer than the set run-on-time the main motor will stop and the controller will enter the standby state. When pressure falls below the load pressure set point the motor is re-started, if in standby state, and the load solenoid output is energized. Full range speed regulation is then applied.

If connected to a CMC sequence controller system, and the system consists of more than one VSR (variable speed regulated) compressor, any VSR compressor assigned as base load will be based to operate at the set optimum speed setting. Any VSR compressor assigned as top-up will use full range speed regulation. In addition, the target pressure of each VSR compressor is automatically referenced to the sequencer to maintain exact pressure control regardless or pressure differentials between compressors. In this manner up to 12 VSR compressors can be controlled as a single coherent system with full efficiency capacity matched management, sequence rotation and single pressure set point control.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Speed regulation control mode	_	1	0	2	0	**SC** 0 = disabled 1 = fixed speed regulation 2 = variable speed regulation
2	maximum speed	rpm	100	100	10000	3000	**SH**
3	minimum speed	rpm	100	0	9900	1500	**SL**
4	optimum speed	rpm	100	100	10000	2700	**So**
5	unload speed	rpm	100	0	9900	1800	**Su**
6	rpm actual	_	_	_	_	_	**S>** View only, for information
7	output actual	mA	_	_	_	_	**A>** View only, for information
8	P factor	_	1	0	100	40	**Pf**
9	I factor	_	1	0	100	10	**If**
10	Control range percent	%	_	_	_	_	**C>** View only, for information
11	Maximum ramp rate	%	1	5	100	10	**rr**

Speed regulation control mode :

To disable speed regualtion control for a fixed speed motor, load/unload compressor; select mode ‘0’. To operate at fixed speeds select mode ‘1’. The motor will operate at the set optimum speed while loaded, and at the set offload speed when unloaded. The transition in speed is determined by the max ramp rate. To operate as a full range variable speed regulated compressor select mode ‘2’.

Maximum Speed	set for motor speed at 20 mA output
Minimum Speed	set for motor speed at 4mA output
Optimum Speed	optimum efficiency speed while loaded
Offload Speed	motor speed when off load
P Factor	P & I loop proportional factor
I Factor	P & I loop integration factor
Max Ramp Rate	maximum allowed rate of change expressed as % of full speed range per second (example : max 3000 rpm, min 1500 rpm, ramp rate 10% = 150 rpm/second maximum)

Control Range Percent : Shows the percentage of speed range where set minimum speed is represented as 0% and maximum speed is 100%. This value is different from the percent speed show in menu page 0.

Remote Load Digital Input Function :

If enabled for variable speed regulation , the remote load digital input will operate the compressor in speed control regulation mode ‘1’ regardless of mode setting. IF set for mode ‘2’ the compressor will revert to mode ‘2’ operation when the remote load enable input is deactivated.

P09 Calibration Menu

Pressure sensor calibration settings.

Calibration settings for analogue pressure sensors.

When an item is selected the page # display field will show the actual pressure for the item select using the existing calibration values. As calibration values are adjusted the pressure display will reflect the new calibration.

Offset : To calibrate an offset, expose the appropriate sensor to atmosphere and adjust the offset value until the pressure display shows 0.0PSI.

Range : To calibrate the range, apply an accurately known pressure to the sensor and adjust the range value until the pressure display matches the applied pressure. The range value can be calibrated with static or changing applied pressure.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Delivery pressure offset	bar/psi	1.45	-23.20 PSI	-23.20 PSI	0.0	**do** 0.0 PSI
2	Delivery pressure range	bar/psi	1.45	-10% range	-10% range	16.0	**dr** 232.06 PSI
3*	Internal pressure offset	bar/psi	1.45	-23.20 PSI	+23.20 PSI	0.0	**Io** 0.0 PSI
4*	Internal pressure range	bar/psi	1.45	-10% range	-10% range	16.0	**Ir** 232.06 PSI

* Optional

Caution : Incorrectly set pressure sensor calibration values will affect performace and pressure related safety functions.

Note : PT 1000 calibration enclosed in annexure

P10 Access Level 2 Configuration Menu

Special functions and settings that determine specific configuration; generally set once during commissioning.

Item #	Description	Units	Step	Min	Max	Default	Display
1	Reset to factory defaults	-	-	-	-	-	**Rt** dFLt 101.52 PSI
2	Enable P. sensors range adjust	-	1	0	1	0	**RE** 0
3	Delivery P. sensor range	bar/psi	1.45	72.51	1450	232.06	**dr** 232.06 PSI
4	Internal P. sensor range	bar/psi	1.45	72.51	1450	232.06	**Ir** 232.06 PSI
5	error log reset	-	-	rst=0	reset	-	**Er** 0
6	running hours edit	hours	100	0	99999	0	**H1** 0
7	loaded hours edit	hours	100	0	99999	0	**H2** 0
8	delivery air temperature sensor type	2 = PT 100/PT 1000 3 = KTY 4 = RTD	1	2	4	3**	**Td** 3
9*	internal press sensor enable	0 = not used 1 = used	1	0	1	0	**Pl** 0

* Optional

** set to 7 as default on software variant S1CMCPT1.E03+ ; may be set differently in other standard software variant derivatives.

Reset To Factory Defaults

Caution : This function will reset all adjustable settings and configuration pararameters to factory default (see Factory Default Configuration and Pressure tables).

Enable Pressure Sensor Range Adjustment :

If set to 1 = ON will allow the range values for the delivery and internal pressure sensors to be adjusted. Range adjustment provides a means of modifying the controller to accept 4-20mA pressure sensors that have range values different to the standard 0 to 232.06 PSI default. If set to 1 = ON and a 'Reset to Factory Default' is executed the pressure sensor ranges are not reset and will remain as adjusted.

Pressure Sensor Range Adjustments:

The pressure sensor range values must match the range of the pressure sensor used. If a 4-20mA sensor with a range of 0 to 290.07 PSI is connected to the delivery pressure analogue input adjust the delivery pressure sensor range value to 29 PSI.

Incorrect adjustment of pressure sensor range values will affect accuracy, performance and pressure related safety functions.

Error log reset :

Error log reset is used to clear all entires in the error log list (menu page 02.)

To clear the error log list select the error log reset item then press UP (plus); the value display will show "RST". Press ENTER, when the error log is clear the value display will change back to "0".

Running and Loaded Hours Edit :

Note : The recorded hours values can be adjusted using these items.

Delivery Air Temperature Sensor Type :

The appropriate hardware ACM module must be fitted to the S1 before a selection change is made.

Sensor Type	Setting	ACM
KTY	2	KTY
PT100	3	PT100
PT1000	3	PT1000
RTD	4	KTY

Internal Pressure Sensor Enable :

Set to 0(zero) if no internal compressor pressure sensor is to be fitted ; internal pressure and differential pressure related functions will be inhibited and associating values will not be displayed on user page 0.

Reset To Defaults -CONFIGURATION TABLE

Factory Defaults				
No.	Item	Description	Value	Unit
	P01			
1	do	Drain Open Time	4	sec
2	dt	Drain Interval Time	240	sec
3	Rt	Standby Run-On Time	300	sec
4	St	Stop Run-On Time	10	sec
5	Bt	Blowdown Time	60	sec
6	T>	Temperature Display Unit	0 = °F	
	P03			
7	Td	Delivery Temperature Shutdown	230	°F
	P04			
8	SD	Service Timer	4000	hours
9	Td	Delivery Temperature Alarm	221	°F
	P05			
10	Td	Delivery Temperature Run Inhibit	34	°F
	P07			
11	⅄△	Star/Delta Time	6	sec
12	Lt	Load Delay Time	5	sec
13	Rt	Reload Delay Time	1.0	sec
14	R5	Relay 5 Function	7 - Drain	
15	R6	Relay 6 Function	14- Dryer	
16	P△	Differential Pressure Fault Delay	10	sec
17	At	Power Failure Auto Restart Time	90	sec
18	ud	Offload Drain Interval Time	0 = off	sec
19	Sh	Starts Per Hour	5 = off	number
20	FH	Fan Temperature Control High - ON	185	°F
21	FL	Fan Temperature Control Low - OFF	167	°F
22	Ft	Fan Temperature Control		
		Minimum Run Time	180	sec
	P08			
23	SC	Speed Regulation Mode Enable	0 = off	
24	SH	Maximum Speed	3000	rpm
25	SL	Minimum Speed	1500	rpm
26	So	Optimum Speed	2700	rpm
27	Su	Offload Speed	1800	rpm
28	Pf	P-Factor, Speed Regulation	40	number
29	If	I-Factor, Speed Regulation	10	number
30	rr	Ramp Rate, Speed Regulation	10	%/sec
	P10			
31	Pr	Delivery Temperature Sensor Type	3 = KTY	
32	Ir	Internal Pressure Enable	0 = off	

Reset To Defaults - PRESSURE TABLE

Factory Default			
No.	Item	Description	PSI
	P01		
1	Pu	Unload Pressure	132
2	Pl	Load Pressure	103
	P03		
3	Pd	Delivery Pressure Shutdown	140
4	Pl	Internal Pressure Shutdown	15.3
5	P△	Differential Pressure Shutdown	14.5
	P04		
6	Pd	Delivery Pressure Alarm	140
7	Pl	Internal Pressure Alarm	155
8	P△	Differential Pressure Alarm	11.6
	P05		
9	Pl	Internal Pressure Run Inhibit	104.42
10	- -	Minimum Load Pressure Setting	72.5
11	- -	Delivery Pressure Shutdown Maximum	232
12	- -	Internal Pressure Alarm Minimum	78
13	- -	Internal Pressure Shutdown Maximum	232
14	- -	Differential Pressure Alarm Minimum	2.9
15	- -	Differential Pressure Shutdown Maximum	72.5
16	- -	Minimum Settings Differential	2.9
	P10		
17	dr	Delivery Pressure Sensor Range	232
18	Ir	Internal Pressure Sensor Range	232
	P03		
19	PR	Minimum Internal Pressure Shutdown	0.0 = disabled
	P01		
20	P>	Bar/psi/kPa DisplayUnit	0 = psi

Temperature Sensor Adjustment Limits and Default Values

KTY Temperature °C	min	max	default	step
Alarm	158	267.8	230	32.9
Shutdown	159.8	269.6	248	32.9
Range	14	269.6	-	-

PT100/1000 Temperature °C	min	max	default	step
Alarm	158	480.2	410	32.9
Shutdown Trip	159.8	482	428	32.9
Range	-58	482	-	-

RTD Temperature °C	min	max	default	step
Alarm	158	300.2	230	32.9
Shutdown	159.8	302	248	32.9
Range	-40.0	302	-	-

Pressure Control Source Priority Logic

Pressure regulation control can be derived from a number of sources, internal or remote. Each Potential Sources has a different priority over potential sources. The following sources priority logic diagrams show the pressure regulation mode and method the controller will use under all potential setup selections, remote connection of failure mode conditions. The remote digital load enable input (mode 16) has priority over all other pressure control sources. If, for example, RS485 network control is selected as the primary source (8), and communications are disrupted, the controller will automatically select load/unload (2). When network communications are restored, the controller will automatically return to communications pressure regulation control (8).

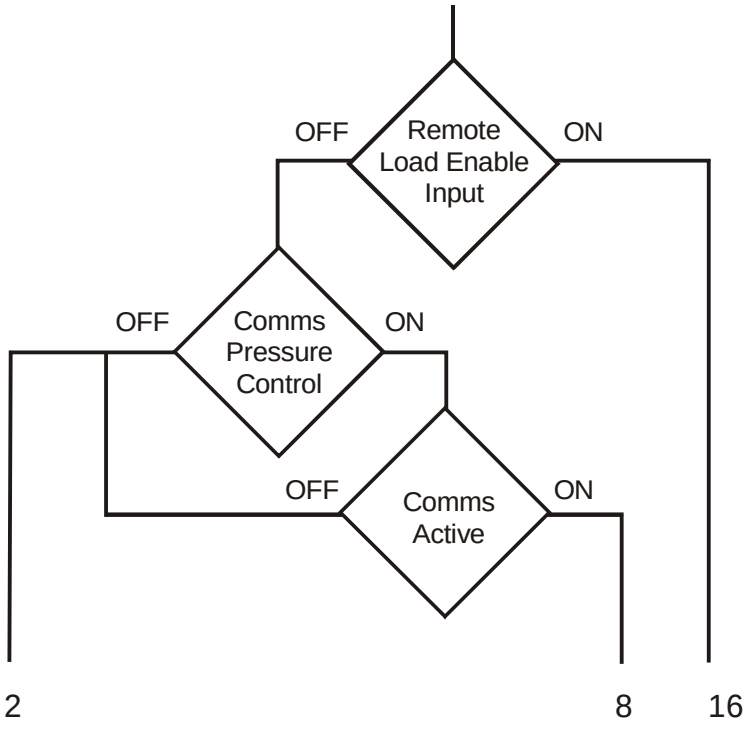
For Standard Fixed Speed Compressor Mode:

1 Alarm Limit Unload Override

2 Menu Page 01 Load and Unload Settings

8 Remote RS485 Communications Load and Unload Commands

16 Remote Digital Input Load and Unload Control



For Variable Speed Regulation Mode:

1 Alarm Limit Unload Override

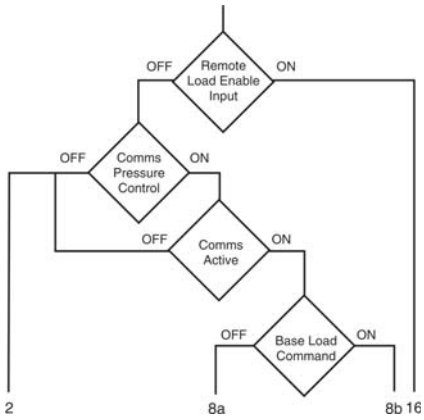
2 Menu Page 01 Load and Unload Settings

8a Remote RS485 Communications Load and Unload Commands

8b Remote RS485 Communications Base-Load (motor speed=biased to optimum speed)

16 Remote Digital Input Load and Unload Control

17 (Load=set optimum speed, Unload=set offload speed)



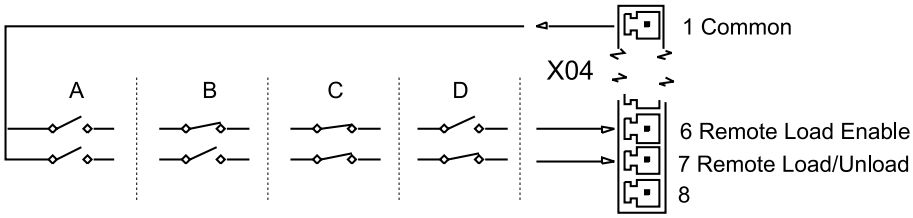
Safety:

Regardless of pressure regulation source, the set Alarm and Shutdown pressure safety limits remain active and are detected from the delivery pressure sensor and internal pressure sensor (if fitted). If internal pressure sensing is not in use, the delivery pressure sensor must never be detached from the air delivery point of the compressor package.

Alarm Limit Unload Override:

If delivery pressure exceeds the set Alarm pressure limit, regardless of pressure regulation source. The load solenoid will be immediately de-energized. The load solenoid will remain de-energized while pressure is above the set Alarm limit and for a period of 10 seconds after pressure falls below the Alarm limit. This is a safety feature designed to prevent incorrectly set remote pressure regulation sources causing the compressor to exceed design pressure limits. While in the alarm Unload Override condition the pressure source number will be incremented by '1' (for example: remote digital load enable and load active (16) AND Alarm unload override active(1) +17).

Remote Digital Load Input Functions



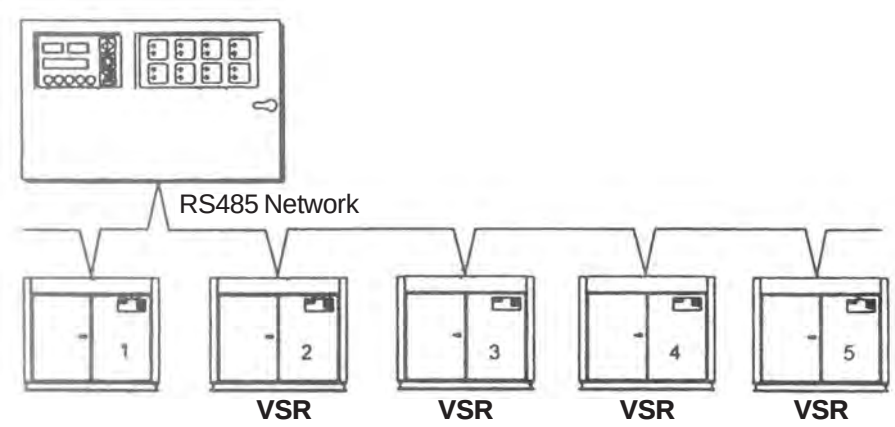
A Remote load enable not active

B Remote load enable active, compressor unload command, PL & Pu ignored

C Remote load enable active, compressor load command, PL & Pu ignored

D Remote load enable not active, remote load input ignored

RS485 Communications Mangement Control system (CMC)



Integration with a CMC air system mangement controller is inherent to all standard S1 controllers.

More than one VSR (variable speed regulated) compressor can be sequence managed by a CMC air system management controller. One VSR compressor, selected depending on control strategy, will be assigned as top-up and will operate with full range speed regulation. Other VSR compressor(s), assigned as base-load units, will operate at the optimum speed regulation. other VSR compressor(s), assigned as base-load units, will operate at the optimum speed set in each controller. If demand exceeds total system capacity at any time all base-load VSR compressors will increase speed above the optimum setting (up to the maximum speed setting) as appropriate to maintain pressure.

The CMC mangement control system is capable of demand matching any mixture of different output capacity VSR and fixed speed compressors in energy efficiency mode of operation.

Fault Messages

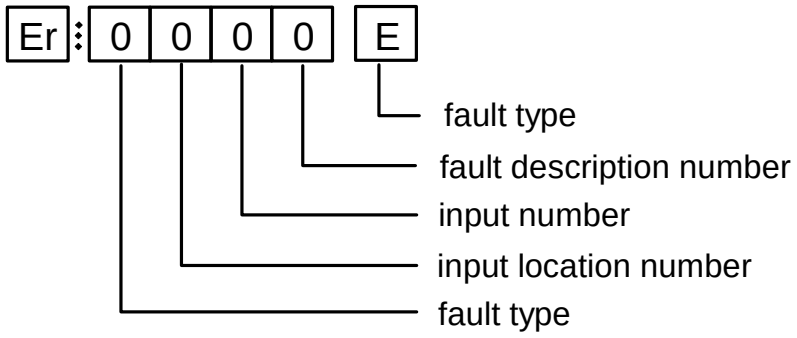
Faults are abnormal operating condition states. Alarms are fault states that indicate normal operating conditions have been exceeded but do not present an immediate hazard or potentially damaging condition. Alarms are intended as a warning only and will not stop the compressor or prevent the compressor from being started and run.

Start inhibits are fault states that prevent the compressor from initially being starting. Start inhibit faults are conditions that may present a hazard or damaging situation if the compressor was to be started. A start inhibit will self reset when the condition being monitored returns to normal operational levels. Start inhibit conditions are only checked during the initial start procedure and will not stop the compressor once started and in the ‘started’ state. Start inhibit conditions are not checked during an automated motor start from standby.

Run inhibits are fault states that prevent the compressor from starting and running the main motor. Run inhibit faults are conditions that may present a hazard or damaging situation if the main motor is run. A run inhibit will self reset when the condition being monitored returns to normal operational levels and the compressor will then be allowed to exit the standby condition and run without further manual intervention. Run inhibit conditions are checked prior to a main motor start sequence and will not stop the compressor motor once started. Run inhibit conditions do not prevent the compressor from entering the ‘started’ state condition.

Shutdown trip errors are fault states the present a hazardous or damaging condition, the compressor is stopped immediately. The Shutdown trip error condition must be resolved, and the fault reset, before the compressor can be re-started.

The different fault state conditions are indicated on the screen with specific codes; the last character indicating the fault type: E = Shutdown Trip Error, A= Alarm, S=Start inhibit, R= Run inhibit. Shutdown trip error are divided into two different categories: immediate shutdown errors and controlled stop errors. Immediate shutdown errors stop the compressor instantly (Emergency Stop button activated for example). Controlled stop errors stop the compressor in a controlled way using a normal Stop command; the motor will continue to run for the set stop run-on-time. Immediate shutdown errors have an errors have an error code where the first character is 0 (Zero). Controlled stop faults have a “1” as the first character. Alarm faults are also divided into two different categories: alarms and service alarm messages. Alarms start with a “2”, service alarm messages with a “4”. Start inhibit fault codes start with a”3”.



Fault Description Number	Fault Description
9	high level shutdown trip
8	high level alarm
7	high level start inhibit
6	special function
5	sensor error
4	timeout
3	low level start inihibit
2	low level alarm
1	low level shutdown trip
0	digital input

Input Number	Input
#	Input number for controller input terminal/location

Input location Number	Input location Description
0	digital input
1	analog input
2 to 7	not used
8	special functions
9	special functions slave unit

Fault Category Number	Fault Category Descripion
0	immediate shutdown trip error
1	controlled shutdown trip error
2	alarm
3	start or run inhibit
4	service

Fault Type	Fault Type Description
E	shutdown trip error
A	alarm (or service message alarm)
S	start inhibit
R	run inhibit

Immediate Stop Shutdown Errors

Digital input error

Er:0010 E	emergency stop
Er:0020 E	oil filter differential pressure switch
Er:0030 E	Reverse Direction switch fault
Er:0040 E	air/oil separator differential pressure switch
Er:0060 E	Excess Pressure Fault
Er:0070 E	Fan motor Overload Fault
Er:0080 E	motor fault (fault relay contact, overload device contact or PTC thermistor)

Analogue input errors

Er:0115 E	Delivery pressure sensor fault
Er:0119 E	Delivery pressure high
Er:0125 E	Delivery temperature sensor fault
Er:0129 E	Delivery temperature high
Er:0131 E	Internal pressure below the set minimum limit ‘PR’
Er:0135 E	Internal pressure sensor fault
Er:0139 E	Internal pressure high

Special function errors

Er:0809 E	Differential pressure high
Er:0814 E	Blowdown timeout (internal pressure failed to fall below minimum level after 120 seconds)
Er:0821 E	low resistance, short circuit to earth condition exists on an analogue input or digital input (incorrect connection, cable fault or sensor fault)
Er:0846 E	Delivery pressure sensor range is set too low for default pressure settings to be applied.
Er:0856 E	Internal pressure sensor range is set too low for default pressure settings to be applied.

Controlled Stop Shut down Errors

none

Alarms

Digital input alarms

Er:2040A Air filter differential pressure switch

Analogue input alarms

Er:2118 A Delivery pressure high
Er:2128 A Delivery temperature high
Er:2138 A Internal pressure high

Special function alarms

Er:2808 A Differential pressure high
Er:2816 A Power failure occured while compressor was in the Started state

Start Inhibits

none

Run Inhibits

Er:3123 R Delivery temperature Td below the set low temperature run inhibit level, controller will allow motor start when temperature increase above the set level
Er:3137 R Internal pressure Pl higher than the set run inhibit pressure level, controller will allow motor start when pressure decreases below the set level, see blowdown timeout E0814

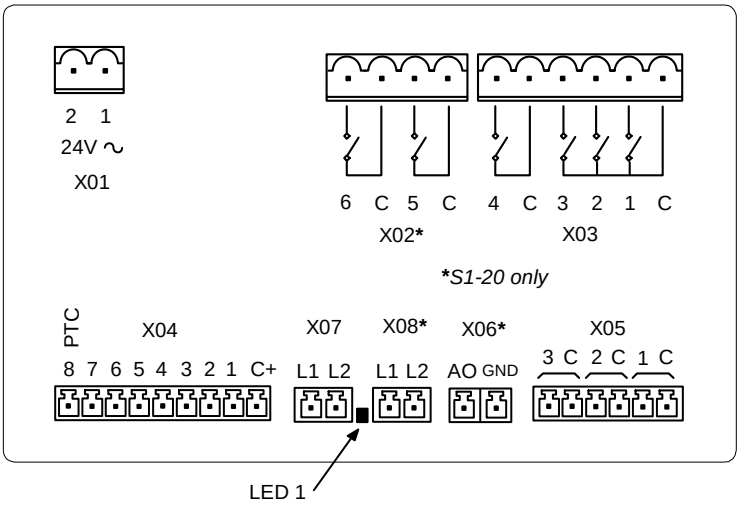
Service Alarms

Special function service alarms

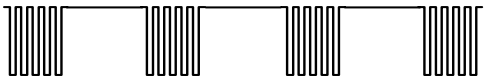
Er:4804 A Service hours time expired, service due (reset service hours countdown timer)
Er:4814 A Airfilter service time expired
Er:4824 A Oilfilter service time expired
Er:4834 A Seperator service time expired

S1 Controller - LED Indication

LED1 is located on the PCB between connectors X07 and X08 and can be seen from the rear of the controller without removing the rear enclosure housing. This LED gives diagnostic information about different functions of the S1 controller.

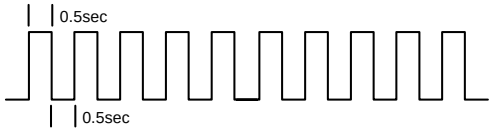


Production; Burn-in



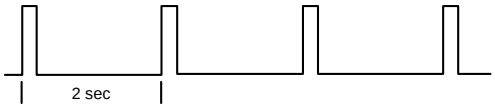
Production; Test Mode

Normal Operating Mode No Communications

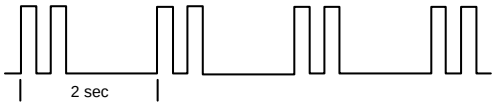


Note : a two second interrupation to this sequence will occur every 10 seconds as the S1broad casts output data on the RS485 communication port.

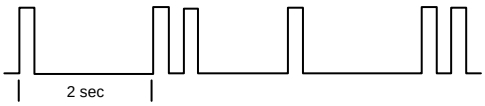
Normal Operating Mode
RS485#1 Communications



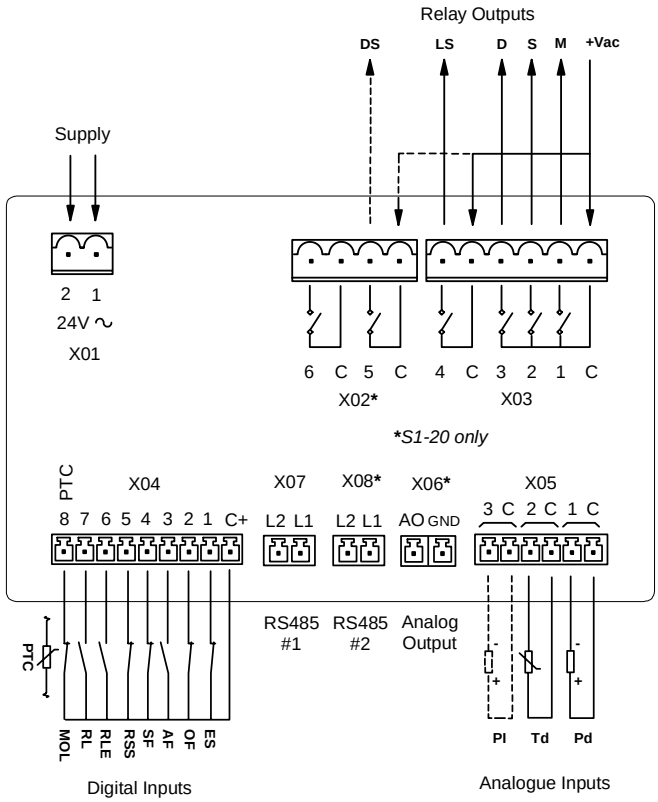
Normal Operating Mode
RS485#2 Communications



Normal Operating Mode
RS485#1 and RS485#2



Example Configuration



ES	Emergency Stop Button
OF	Oil Filter High DP
AF	Air Filter High DP
SF	Air/ Oil Separator Element High DP
RSS	Remote Start/Stop
RLE	Remote Load Enable
RL	Remote Load
MOL	Motor Over-Load (or PTC thermistor)
M	Main (Line) Motor Contactor
S	Star Motor Contactor
D	Delta Motor Contactor
LS	Load Solenoid
DS	Drain Solenoid (option)
Pd	Delivery Pressure Sensor (4-20mA)
Td	Delivery Temperature Sensor (KTY)
PI	Internal Pressure Sensor (4-20mA)

S1 Trouble Shooting

Error Codes

Er:0010 E	Emergency Stop
Er:0020 E	Oil Filter differential pressure switch
Er:0030 E	Reverse Direction switch fault
Er:0040 E	Air/ Oil Separator differential pressure switch
Er:0060 E	Excess pressure Fault
Er:0070 E	Fan Motor overload Fault
Er:0080 E	Motor fault (fault relay contact, overload device contact or PTC)
Er:0115 E	Delivery pressure sensor fault
Er:0119 E	Delivery pressure High
Er:0125 E	Delivery temperature sensor fault
Er:0129 E	Delivery temperature High
Er:0131 E	Internal pressure below the set minimum limit 'PR'
Er:0135 E	Internal pressure sensor fault
Er:0139 E	Internal pressure High
Er:0809 E	Differential Pressure High
Er:0814 E	Blow down Timeout (Internal Pressure failed to fall below minimum level after 120 seconds)
Er:0821 E	Low resistance, short circuit to earth condition exists on an analog input or digital input (incorrect connection, cable fault or sensor fault)
Er:0836 E	EMC Interference has occured, verify the cabling of contactors and the motor; Ensure to separate these from the analog and digital signals of the controllers
Er:0846 E	Delivery pressure sensor range is set too low for default pressure settings to be applied
Er:2040 A	Air Filter differential pressure switch
Er:2118 A	Delivery pressure High
Er:2128 A	Delivery temperature High
Er:2138 A	Internal Pressure High

Error Codes

Er:2808 A	Differential pressure High
Er:2816 A	Power failure occurred while compressor was in the started state
Er:3123 R	Delivery temperature Td below the set low temperature run inhibit level,controller will allow motor start when temperature increase above the set level
Er: 3137 R	Internal pressure Pl higher than the set run inhibit pressure level,controller will allow motor start when pressure decrease below the set level, see blow down timeout E0814
Er:4804 A	Service hours time expired, Service due (reset service hours countdown timer)
Er:4814	Air filter service time expired
Er:4824	Oil filter service time expired
Er:4834	Seperator service time expired
Er:2138 A	Internal Pressure High
Er:2808 A	Differential Pressure High
Er:2816 A	Power failure occurred while compressor was in the started state
Er:3123 R	Delivery temperature Td below the set low temperature run inhibit level, controller will allow motor start when temperature increase above the set level
Er:3137 R	Internal pressure Pl higher than the set run inhibit pressure level, controller will allow motor start when pressure decreases below the set level, see blow down timeout E0814
Er:4804 A	Service hours time expired, Service due (reset service hours countdown timer)
Er:4814	Air filter service time expired
Er:4824	Oil filter service time expired
Er:4834 E	Seperator service time expired

Checklist

Problem Description	Verification Action
Blowdown time erratic	Verify the "starts per hour" setting. If e.g.2 starts per hour maximum Only 5 starts will be allowed within 1 hour; If already 2 starts have passed within an hour, the controller will not stop the motor until the hour has passed....
Nothing on Display	-Ensure NOT to earth the 24V AC input voltage; -Ensure not to apply a voltage higher than 24V AC *If one of the above conditions did apply, the internal power supply of the controller will be damaged ->return the controller to the manufacturer
-All symbols light up Any button is working	Check if the relays are switching continuously -> If this in the case . - return the controller to the manufacturer
Parameters are not saved	-Ensure the controller is supplied with an AC voltage -Ensure that no big disturbances occur on the power supply network
Controller stuck in a particular state	Check the attached state diagram