



EXTROLLER SOFTWARE
STANDARD SPECIFICATION

COAIRE
SOFTWARE SPECIFICATION
Standard
Scroll EXTROLLER



EXTROLLER SOFTWARE STANDARD SPECIFICATION

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1.0 General Description

1.1 Controller Model Variants

The general default settings and tables shown in this specification are applicable to the standard production EXTROLLER controller model **Extroller-361**, functions available for alternative models can be set in configuration menus.

- Temperature detection and setting limits may differ on models fitted with, and set for, alternative temperature sensor ACM types:



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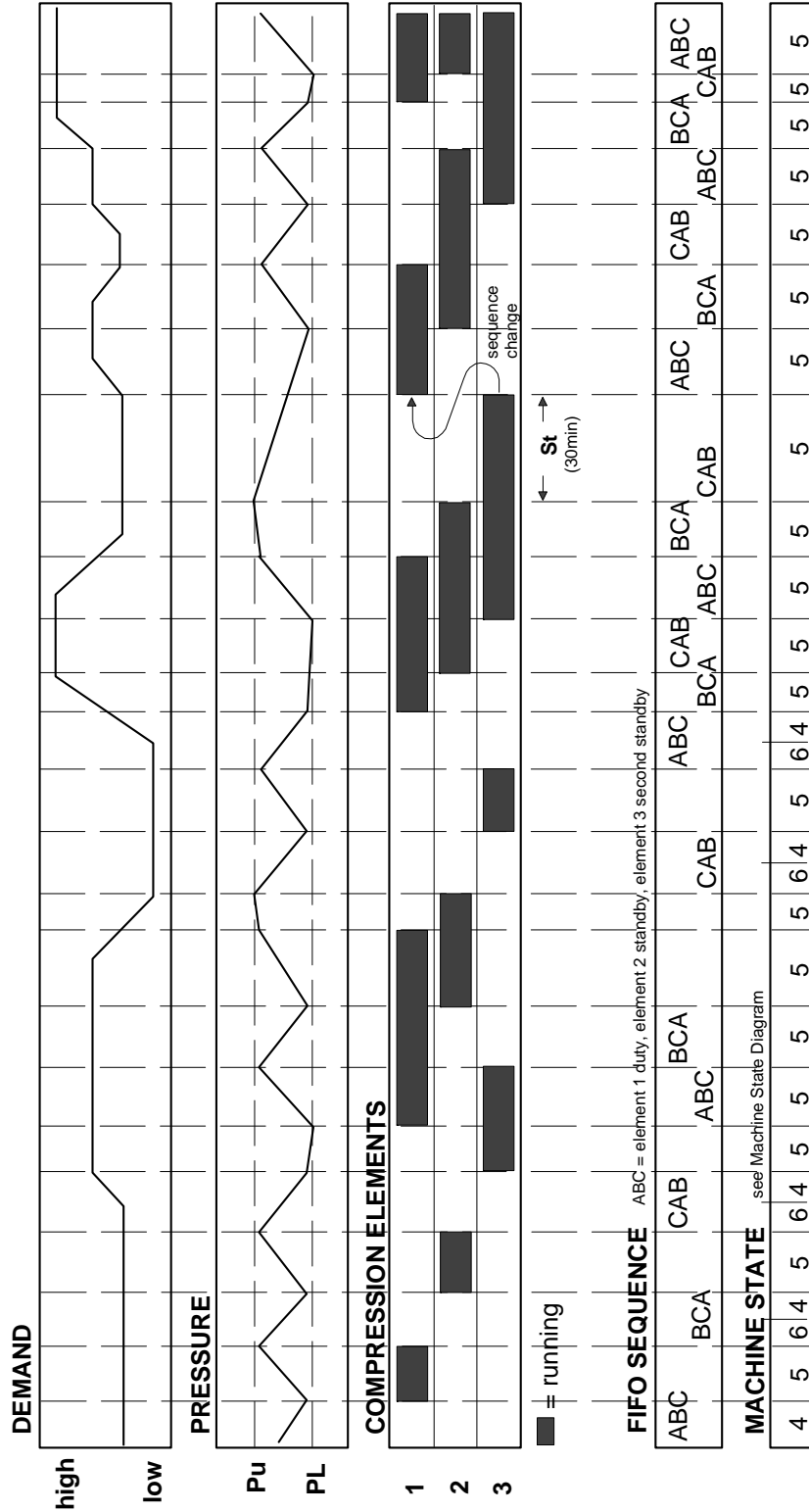
1.2 General Operation

In normal operation, the detected delivery pressure controls regulation of the compressor once the compressor has been started by pressing the start button, or by a remote start command (if enabled). The controller will perform safety checks and start one or more compression elements (dependant on machine type and pressure). If pressure is above the set lower pressure level the compressor will immediately enter standby mode until pressure falls. If a run inhibiting condition exists the compressor will enter the started condition but motor starts are inhibited; the compressor will remain in the standby condition until the inhibit condition no longer exists. During normal running operation the controller will utilise compression elements in a FIFO (First In, First Out) sequence pattern as required to maintain pressure within the set upper and lower pressure band limits. If demand is very low and all compressor element motors are stopped the compressor will enter Standby mode. The compressor will automatically re-start compression element motors (as required) when pressure falls to the set lower pressure level. Normal automated operation is ended by pushing the stop button, a remote stop command or in the event of a shutdown fault. 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. A fault condition detect on one compression element of a multi-element compressor will cause an Alarm indication but will not stop the remaining elements from operating normally. Only in the event of all compression elements experiencing a fault state will a Shutdown fault condition occur.



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1.3 Pressure Regulation And Compression Element Sequencing (example: 3 compressor element compressor)





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2.0 I/O Description

2.1 Digital Inputs

Connector X04:

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

Pin	name	function	id	active state
1	C+	Digital inputs common		
2	C1	Emergency stop	digital input 1	fault if open
3	C2	Motor Overload 1	digital input 2	fault if open
4	C3	Temperature Switch 1	digital input 3	fault if open
5	C4	Motor Overload 2	digital input 4	fault if open
6	C5	Temperature Switch 2	digital input 5	fault if open
7	C6	Motor Overload 3	digital input 6	fault if open
8	C7	Temperature Switch 3	digital input 7	fault if open
9	C8	Motor Overload 4	digital input 8	fault if open



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2.2 Digital Outputs

Connector X03: relays

Connector type: 6 pole Combicon with 5mm pitch

Pin	name	function	id	active state
1	C-R123	common for Motor Contactor 1 to 3		
2	NO-R1	Motor Contactor 1	digital output 1	energised
3	NO-R2	Motor Contactor 2	digital output 2	energised
4	NO-R3	Motor Contactor 3	digital output 3	energised
5	C-R4	common for Motor Contactor 4		
6	R4	Motor Contactor 4	digital output 4	energised

Connector X02: additional relays

Connector type: 4 pole Combicon with 5mm pitch

Pin	name	function	id	active state
1	C-R5	common relay 5		
2	NO-R5	normal open contact	digital output 5	
3	C-R6	common relay 6		
4	NO-R6	normal open contact	digital output 6	

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



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2.3 Analogue 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-ANA1	Delivery pressure +V common			
2	ANA1	Delivery pressure input	analogue input 1	4-20 mA	adjustable
3	C-ANA2	Temperature 0V common			
4	ANA2	Menu Selectable: 1) Temperature input (menu setting + ACM type) Default = KTY 2) Digital Remote Start/Stop	analogue input 2	KTY or PT100, PT1000 or RTD	-10°C 132°C or -50°C 250°C or -40°C 150°C open/closed
5	C-ANA3	Digital common			
6	ANA3	Temperature Switch 4	analogue input 3	Digital	fault if open

Analogue Input 1: fixed 4-20mA type

Analogue inputs 2 and 3: the EXTROLLER 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.

A software function to enable analogue input 2 to be used as a digital input for remote Start/Stop control is available in menu 9 (see menu P09).

Note: Analogue input 3 must be fitted with a Digital Input ACM for this software variant.

Connector X06: analogue output

Connector type: 2 pole mini Combicon with 5.08mm pitch

Pin	name	function	id	type	range
1	AGND	0V analogue ground			
2	ANA-OUT1	4-20mA analogue output	analogue output 1	4-20mA	adjustable



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3.0 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.

Run Inhibit (R):

A run inhibit 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 (except in the instance of a compression element alarm condition where output will be restricted). 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 respond by stopping compression element(s).

Load Pressure:

The load pressure is the delivery pressure level (adjustable) at which the controller will respond by starting/loading compression element(s).

Reload Delay Timer:

The reload delay time (adjustable) is a period of time immediately following a condition where all compression element motor(s) have stopped during which no motor(s) will be allowed to re-start.

Started State:

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

Run/Load State:

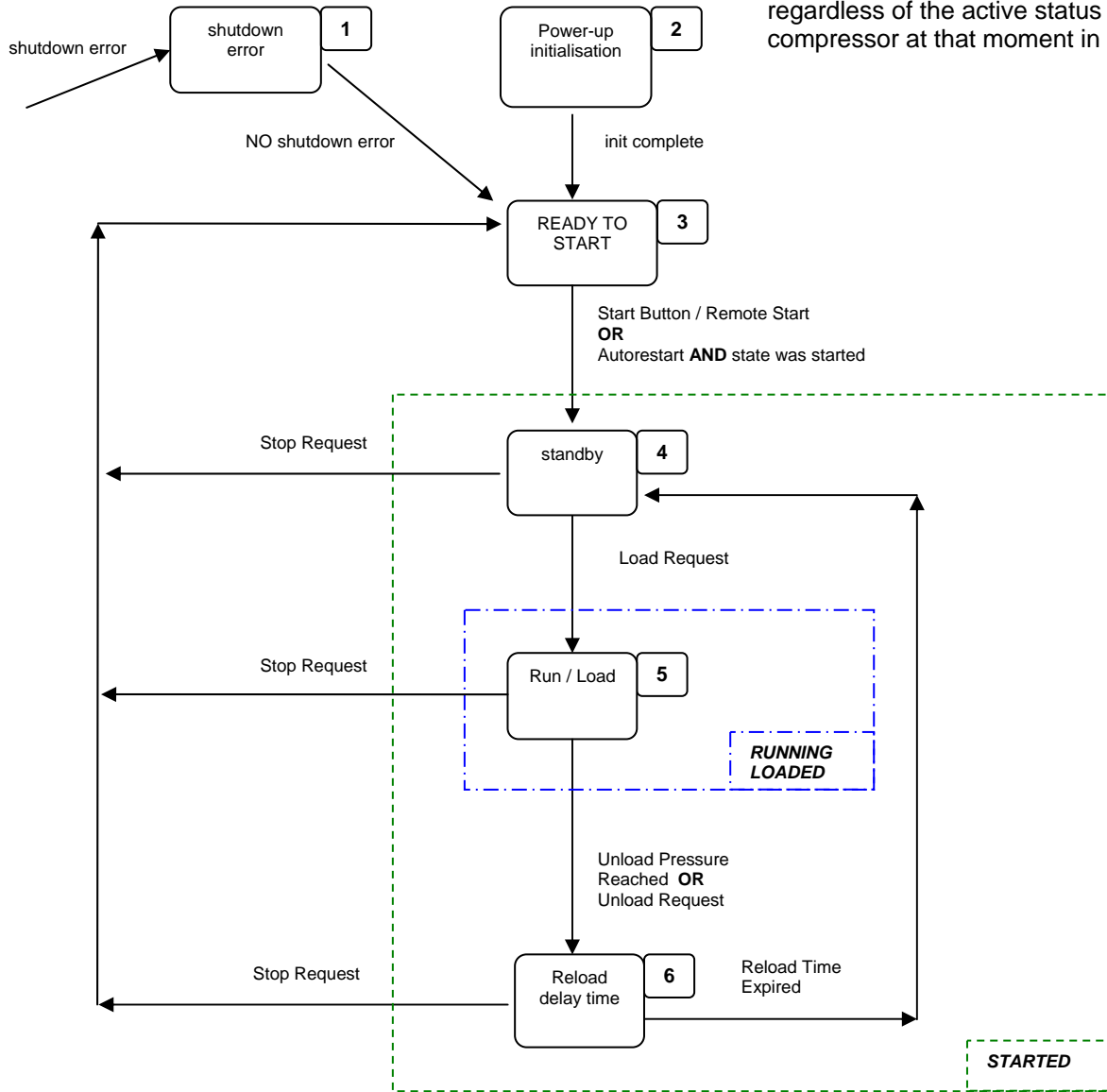
The unit is in the Started state AND one or more compression element motor(s) are running.



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Machine State Diagram:

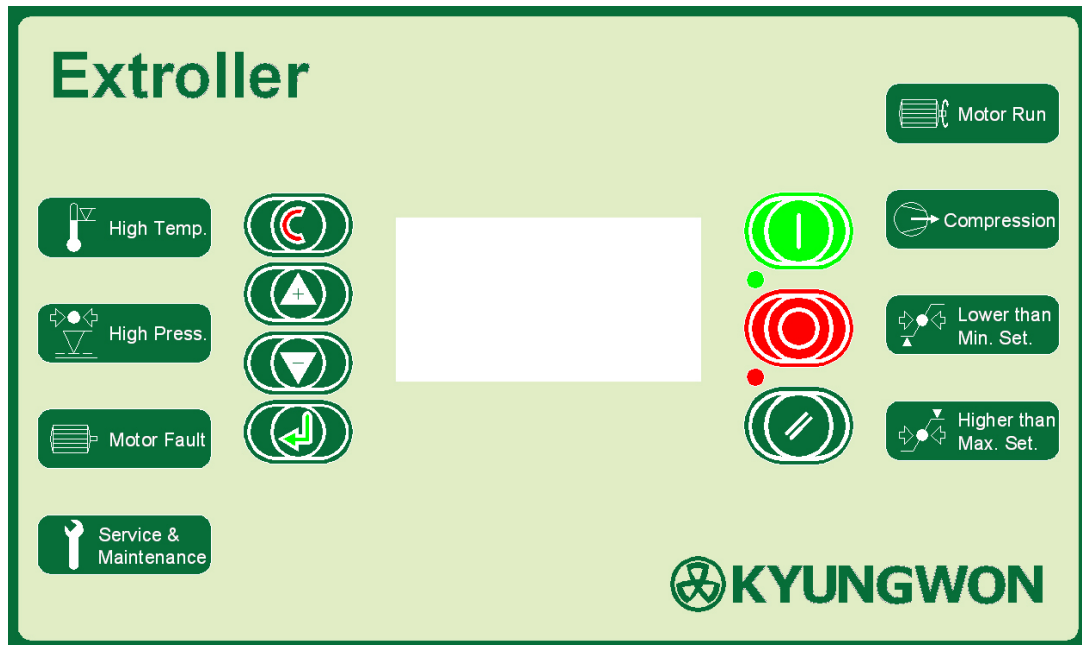
The shutdown error state (1) immediately becomes active when any shutdown error occurs, regardless of the active status of the compressor at that moment in time.





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4.0 User Interface



Display : Custom backlit LCD
Indicators : 2 x LED
Controls : 7 x Tactile push buttons

4.1 Keypad

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 Td 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.





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4.2 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.

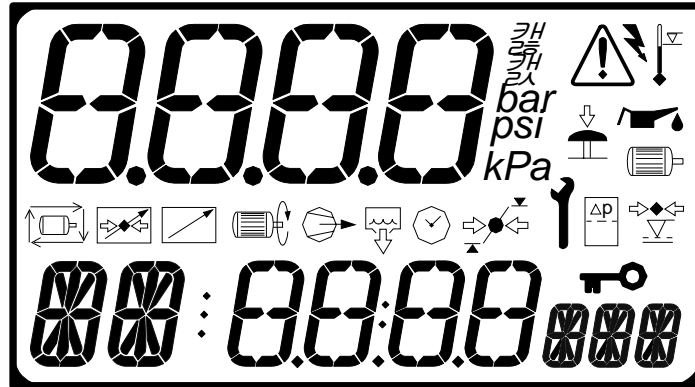
Machine State Number	Machine State	Status 	Fault 
1	Shutdown Error	OFF	FF
2	Startup Init	OFF	OFF
3	Ready to Start	OFF	OFF **
4	Standby	IF	OFF **
5	Running	ON	OFF **
6	Reload Delay	if (load_request) FF else IF	OFF **

 ** SF for Alarm condition



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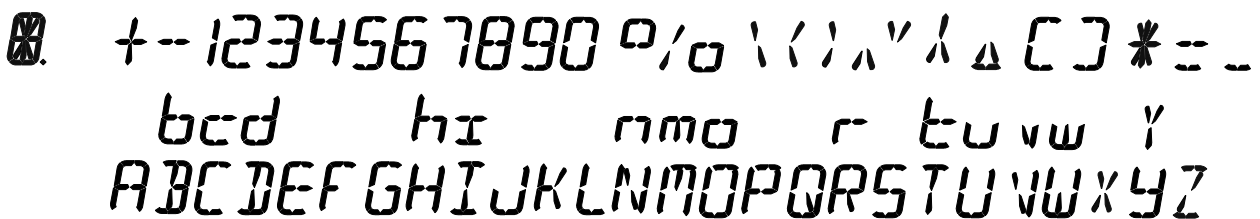
4.3 Display



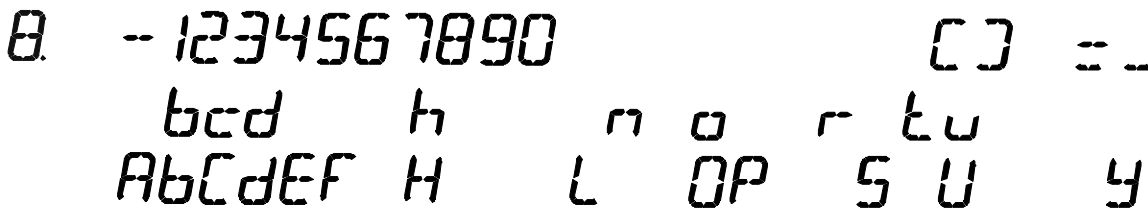
The display is divided in to 4 areas.

- Top, Left: 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, 14 segment
Item Value: 4 character numeric, 7 segment
Item Unit: 3 character alphanumeric, 14 segment

14 Segment Display Character Set:



7 Segment Display Character Set:














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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	dBm	dBn spm unit	< >	greater than less than
OC	☒	mV	mV milliVolt	+	+ positive	^ v	up down
0/0	% percent	OF	☒	--	- 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)
-  Power failure autorestart enabled (optional function)
-  Remote load or remote pressure regulation active
-  Remote start/stop active
-  Normal Operational: selected item locked as temporary default display
Menu Mode: page item locked (adjustment inhibited)

Fault Display Symbols:

- | | | | |
|---|-----------------------------|---|-------------------------------------|
|  | General fault |  | Lubrication, oil, oil level |
|  | Emergency stop |  | Motor |
|  | Excess pressure |  | Service due, maintenance |
|  | Power failure |  | Filter differential, filter service |
|  | Above set temperature limit | | |



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4.4 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 classification. 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 and Reset will select any active fault code display or the Status Information Item display if no faults are active. Unless a selected Item display is locked, the display will automatically jump to the Status Information Item display at key status change events. The timeout period before returning to the default Item display is modified in some instances to enable the full range of a set countdown timer to be shown. No Item values, options or parameters can be adjusted in page 0. If a fault condition occurs the fault code becomes the first list item and 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.

CD: 0000

The following pages and access levels are used:

ACCESS LEVEL = USER (code = 0302)	ACCESS LEVEL = SERVICE 1 (code = 2042)	ACCESS LEVEL = SERVICE 2 (code = 4570)
P00, P01, P02	P00, P01, P02, P03 P04, P05, P06, P07 P08	P00, P01, P02, P03 P04, P05, P06, P07 P08, P09



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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:

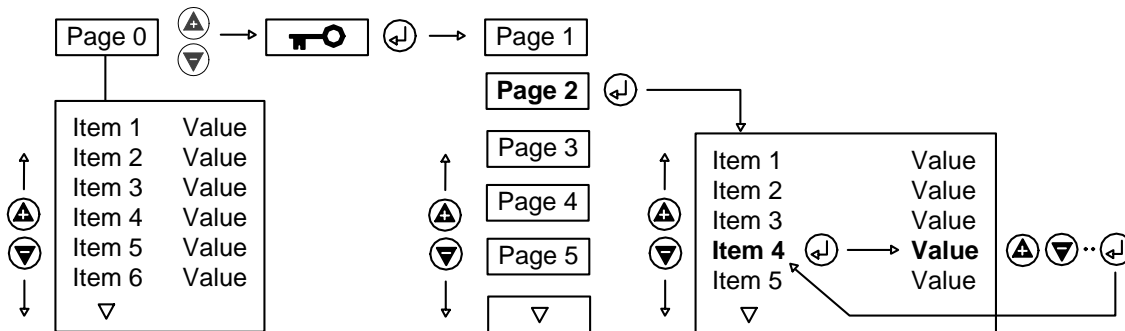
User: 1 minute

Service 1: 10 minutes

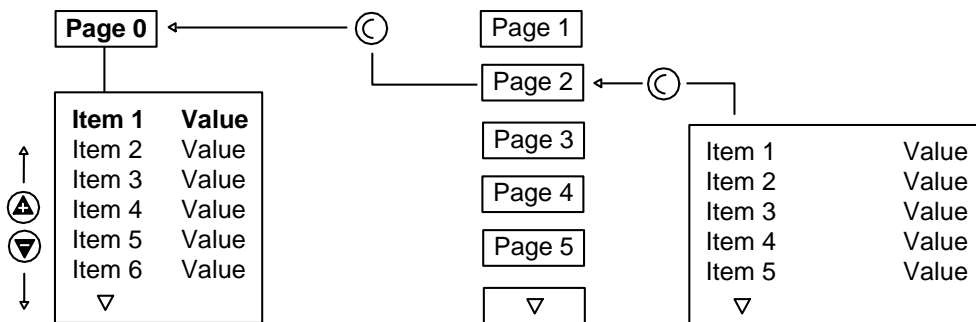
Service 2: 1 hour

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.



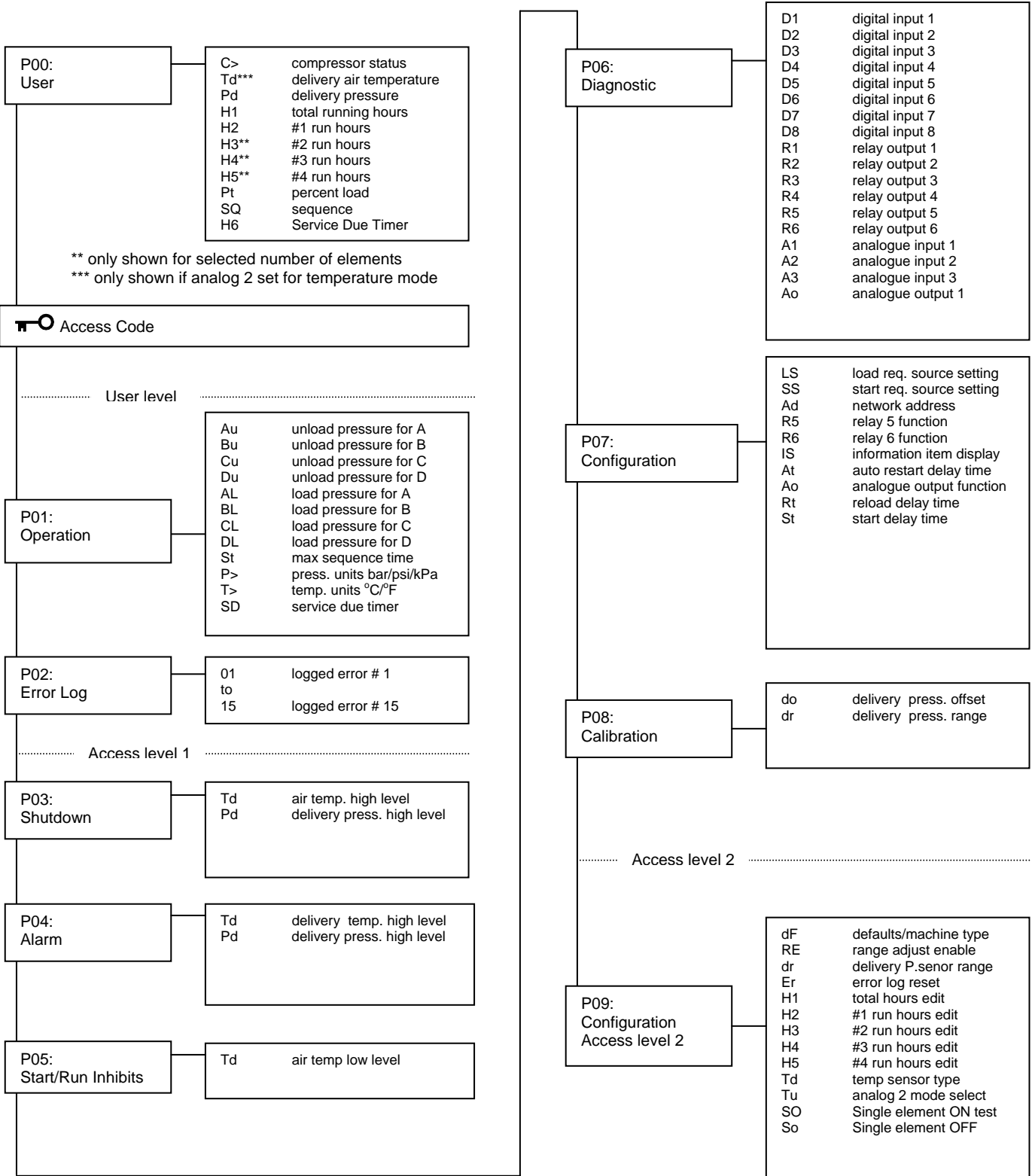
Press and hold RESET for two seconds at any time to immediately exit menu mode and return to the normal operational mode display. Any value or option adjustment that has not been confirmed and entered into memory will be abandoned and the original setting maintained.

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 operational STARTED state.



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4.4.1 Menu Structure





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⚠ At commissioning set the machine type (menu P09, item 'dF') before adjusting any other settings or operating the compressor.

4.4.2 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	Compressor status	---	no_edit	---	---	---	C>
2***	delivery air temperature	°C/°F	no_edit	---	---	---	Td 55 ⁰ C
3	delivery pressure	bar/psi	no_edit	---	---	---	Pd 6.5 bar
4	Total operational hours	h	no_edit	---	---	---	H1 1430
5	Element 1 running hours	h	no_edit	---	---	---	H2 358
6**	Element 2 running hours	h	no_edit	---	---	---	H3 358
7**	Element 3 running hours	h	no_edit	---	---	---	H3 357
8**	Element 4 running hours	h	no_edit	---	---	---	H3 357
9	Percent load	%	no_edit	0	100	---	Pt 50 %
10	sequence	---	no_edit	---	---	---	SP ABCD
11	service due timer	h	no edit	---	---	---	H6 - - - -

** only show if unit set for applicable number of elements.

*** only show if analog 2 set for temperature mode

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



Countdown timer function is occurring (Reload Delay Time).
During a countdown time function 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 'IS' menu item.



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Sequence:

The lower central display area of the status information item will show the current sequence of the compression elements, this information is a repeat of the 'SQ' sequence P00 menu item.

The sequence of each element is indicated by a letter A, B, C or D.

A = duty

B = first standby

C = second standby

D = third standby

The first element (element 1) is the first letter on the left and the last element (dependant on number of elements – machine type) is the last letter on the right.

For example: **B C A** 3 Element Machine (SCr3)
Element 1 = 'B' standby, 2 = 'C' second standby and 3 = 'A' duty.

The sequence will change in a FIFO (First In, First Out) pattern each time an element status change occurs
The sequence will also change if the compressor is running without a change in sequence status for longer than the set 'Maximum Sequence Time'.

Note: For a single element machine (SCr1) only the letter "A" will be displayed.

Element Status:

The sequence letter for each element will also indicate the status of the element:

ON running loaded

Flashing not running

Dash (" – ") fault condition

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.

H2: 123456 (Running Hours 'H2' = 123456 h)

Percentage Load:

The percentage load is dependant on the number of elements (Machine Type) and the running/loaded status of each element.

For a single element machine (SCr1) the percentage load will be 100% running/loaded or 0% not running.

For a 4 element machine (SCr4) the percentage load will be:-

100% 4 elements running/loaded

75% 3 elements running/loaded

50% 2 elements running/load

25% 1 element running/load

0% no elements running/load.



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4.4.3 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	'A' unload pressure	bar/psi	0.1	AL+0.2	16.0	8.0	Au 8.0 bar
2	'B' unload pressure	bar/psi	0.1	AL+0.2	16.0	7.8	Bu 7.8 bar
3	'C' unload pressure	bar/psi	0.1	AL+0.2	16.0	7.6	Cu 7.6 bar
4	'D' unload pressure	bar/psi	0.1	AL+0.2	16.0	7.4	Du 7.4 bar
5	'A' load pressure	bar/psi	0.1	5.0	#unload -0.2	6.6	AL 6.6 bar
6	'B' load pressure	bar/psi	0.1	5.0	#unload -0.2	6.4	BL 6.4 bar
7	'C' load pressure	bar/psi	0.1	5.0	#unload -0.2	6.2	CL 6.2 bar
8	'D' load pressure	bar/psi	0.1	5.0	#unload -0.2	6.0	DL 6.0 bar
9	maximum sequence time	m	1	0	60	20	St 20 m
10	pressure units	---	1	0	2	0	P> 0 0=bar / 1=psi / 2=kPA
11	temperature units	---	1	0	1	0	T> 0 0= ⁰ C 1= ⁰ F
12	service due timer	h	1	1	99999	disable	SD - - - -

Minimum differential between lowest load pressure set point and highest pressure set points is 0.2bar

All 'unload' pressure set points can be set to the same pressure if required.

All 'load' pressure set points can be set to the same pressure if required.

Note: Pressure set points applicability

Type	Unload	Load
1 element (P09-Df=SCr1)	Au	AL
2 element (P09-Df=SCr2)	Au,Bu	AL,BL
3 element (P09-Df=SCr3)	Au,Bu,Cu	AL,BL,CL
4 element (P09-Df=SCr4)	Au,Bu,Cu,Du	AL,BL,CL,DL

For units with less than 4 compression elements the unused pressure set points are ignored.

Pressure Settings:

Trip cannot be adjusted above maximum sensor range

Alarm can not be adjusted above (Shutdown – 0.2bar) or below ('Du' Unload + 0.2bar)

'Du'Unload can not be adjusted above (Alarm – 0.2bar) or below ('AL' Load + 0.2bar)

'AL'Load cannot be adjusted above (#Unload – 0.2bar) or below 5.0bar

(#unload is dependant on the number of elements – SCr1,2,3 or 4)

Pressure and Temperature Units:

Selects the units for displayed values. Internally the controller operates using mBar (0.001bar) and mCelsius (0.001°C). The values displayed are calculated from the internal operating values.



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4.4.4 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 operational hours

4.4.5 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	1	80	130	130	Td 130 °C
2	delivery pressure high level	bar/psi	0.1	7.0	16.0	8.8	Pd 8.8 bar

Note: If analogue input 2 is set for remote Start/Stop digital function 'Td' will show dashes (Td - - -) and the temperature Shutdown function is inhibited.

4.4.6 P04 Alarm Menu

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

item#	description	units	step	min	max	default	display
2	delivery air temperature high level	°C/°F	1	70	120	120	Td 120 °C
3	delivery pressure high level	bar/psi	0.1	7.0	15.9	8.5	Pd 8.5 bar

Note: If analogue input 2 is set for remote Start/Stop digital function 'Td' will show dashes (Td - - -) and the temperature Alarm function is inhibited.



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4.4.7 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	1	-20	10	1	Td 1 °C

Delivery Air Temperature Low 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.

Note: There are no Start inhibits (S) as standard.



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4.4.8 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 4.00mA
16	analogue input 2	---	no_edit	---	---	---	A2 0.467V
17	analogue input 3	---	no_edit	---	---	---	A3 0 _ / _ (digital Input)
18	analogue output1	mA	0.10	4.0	20.0	---	Ao 4.00 mA

Digital Inputs: The display will indicate the actual state of the input “_ / _” (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 energised (1) and de-energised (0). The motor starter relay outputs, 1 to 3, can only be energised one at a time, the output will de-energise 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 input 3 is set as a digital input and will show the status of the input and open or closed together with a voltage reading; the voltage reading is irrelevant in this instance.

Analogue output values can be adjusted (from 4.0mA to 20.0mA in 0.1mA 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.



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4.4.9 P07 Configuration Menu

Settings that determine the basic operating configuration.

item#	description	units	step	min	max	default	display
1	load request source setting	0=press.sensor 1=RS485 comms	1	0	1	0	LS 0
2	start request source setting	0=keyboard 1=RS485 comms. 2=analog 2 digital	1	0	2	0	SS 0
3	network address	---	1	1	99	1	Ad 1
4	relay 5 function setting	1 to 13 see Output Functions	1	1	9	3	R5 3
5	relay 6 function setting	1 to 13 see Output Functions	1	1	9	8	R6 8
6	Information item display	---	1	1	4	2	IS 2
7	Auto restart time	s	1	0	120	0	At 0 s (OFF)
8	Analogue output function	---	1	0	2	0	Ao 0
9	Reload delay time	s	1	1	10	5	Rt 5
10	Start delay time	s	1	1	10	3	Ao 3

Load Request Source:

0 = local, 1 = RS485 communication (sequencer)

Start Request Source:

0= local, 1= RS485 communication, 2= analog input 2 as digital remote Start/Stop

When 'SS' is set for analog input 2 as digital Start/Stop, and menu P09 'Tu' is set to 0(zero) a closed circuit contact across analog input 2 pins will start the compressor, open circuit condition will stop the compressor.

Note: when 'SS' is set for 1 or 2 local keypad START is inhibited (local STOP is always active).

Relay 5 and 6 Output Functions:

1 – Alarm	De-energised for any active Alarm fault (not including Start/Run Inhibit)
2 – Shutdown	De-energised for any active Shutdown fault (not including Start/Run Inhibit)
3 – Group Fault	De-energised for any active Alarm, Start/Run Inhibit or Shutdown fault
4 – Alarm Service	De-Energised for any Alarm fault or Service Due alarm (not including Start/Run Inhibit)
5 – Service	Energised for Service Due alarm only
6 – Heater	Energises if detected temperature falls below set low temperature run inhibit + 2°C De-energises if detected temperature increases above set low temp run inhibit + 3°C Can be used to energise anti-condensate heater contactor or as low temperature warning auxiliary output.
7 – Standby	Energised in 'Standby' state
8 – Running	Energised in all RUNNING state conditions
9 – Started	Energised in all STARTED state conditions

Information Item Display:

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:

1 = Network Address – the set RS485 network address for the compressor (default)

2 = Machine State Number – the current active status block condition (see machine state diagram)

3 = Average Cycle Time – the average controller software cycle time in mSecs

4 = Maximum Cycle Time – the maximum controller software cycle time in mSec



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Information 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.

Analogue Output Select:

The analogue output provides a 4-20mA signal, the function can be selected:-

0 = Disabled, no output

1 = Pressure

2 = Temperature

Reload Delay Time:

When a compressor element is unloaded(stopped) it will be inhibited from re-load(start) before the 'reload delay time expires. This function is intended to prevent rapid start/stop of an element in instances of extreme pressure fluctuation.

Start Delay Time:

When a compressor element is loaded(started) any further element load(start) is inhibited for the 'start delay time'. This function is intended to inhibit more than one element from loading(starting) at the same time.

4.4.10 P08 Pressure sensor calibration

Item#	description	units	step	min	max	default	display
1	delivery pressure offset	bar/psi	0.1	-0.5 bar	0.5 bar	0.0	do 0.0 bar
2	delivery pressure range	bar/psi	0.1	-10% range	+10% range	16.0	dr 16.0 bar

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 0.0bar.

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.



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



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4.4.11 P09 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	Machine type reset defaults	---	1	SCr1	SCr4	SCr4	Df SCr4 8.0 bar
2	Enable P.sensors range adjust.	---	1	0	1	0	RE 0
3	Delivery P.sensor range	bar/psi	0.1	5.0	100.0	16.0	dr 16.0 bar
5	error log reset	---	---	rst=0	reset	---	Er 0
6	Total running hours edit	hours	100	0	99999	0	H1 0
7	Element 1 run hours	hours	100	0	99999	0	H2 0
8	Element 2 run hours	hours	100	0	99999	0	H3 0
9	Element 3 run hours	hours	100	0	99999	0	H4 0
10	Element 4 run hours	hours	100	0	99999	0	H5 0
11	delivery air temperature sensor type	2=PT100/PT1000 3=KTY 4=RTD	1	2	4	2	Td 2
12	Analogue input 2 function	---	1	0	1	0	Tu 0
13	Single element ON test	---	1	0	4	0	SO 0
14	Single element OFF	---	1	0	4	0	So 0



Machine Type, Reset Defaults

Caution: This function will reset all adjustable settings and configuration parameters to default for the machine type selected.

To select machine type (1 element, 2 element, 3 element or 4 element type) adjust Df setting to SCr1, SCr2, SCr3 or SCr4 respectively and press ENTER. This function will set the controller to the required machine type and reset all settings and parameters in the default table to default.

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 16.0 bar default. If set to 1=ON and a 'Machine Type, Reset 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 20bar is connected to the delivery pressure analogue input adjust the delivery pressure sensor range value to 20.0bar.



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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 entries 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" and the cleared.

Operational and Running 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 EXTROLLER before a selection change is made.

Sensor Type	Setting	ACM
PT100	2	PT100
PT1000 (default)	2	PT1000
KTY	3	KTY
RTD	4	KTY

Analog Input 2 Function:

Analog input 2 can be set to detect a temperature sensor (1) or for use as a digital input for remote Start/Stop control (0). When set to '0' (digital input remote Start/Stop) and the 'SS' setting of menu P06 is set to '2' (remote Start/Stop from analog input 2) the compressor will start when a closed circuit condition is detected across the pins of analog input 2, and Stop when the pins are in an open circuit condition.

When analog input 2 is set for digital input remote Start/Stop all temperature safety functions are inhibited.

Important. The cable used for remote Start/Stop connection must be earth shielded, 100m maximum. The switching contacts used must be free of oxidization and suitable for very low voltage, low current, switching without resistance (gold flash contacts are recommended).

So - Single Element ON Test Function:

If item So is adjusted above 0(zero) then the controller will restrict element usage to the element number selected. For example: if So=3 with a 4 element unit then only element 3 will be used; elements 1, 2 and 4 will be inhibited. When set, this function will remain active until item 'So' is set back to 0(zero). Item 'So' can also be set back to 0(zero), without entering menu mode, by holding the RESET button for longer than 10 seconds.

When item 'So' is set to a value higher than 0(zero) the User page P00 information display will show the 'So' setting in the units display area (eg. So3).

Setting an element for single element operation will automatically cancel any "SO" single element OFF setting.

SO - Single Element OFF Function:

If item SO is adjusted above 0(zero) then the controller will inhibit the use of the selected element number. For example: if So=3 with a 4 element unit then only elements 1, 2 and 4 will be used; elements 3 will be inhibited.

When set, this function will remain active until item 'SO' is set back to 0(zero). Item 'SO' can also be set back to 0(zero), without entering menu mode, by holding the RESET button for longer than 10 seconds. When item 'SO' is set to a value higher than 0(zero) the User page P00 information display will show the 'SO' setting in the units display area (eg. SO3).

Setting an element to OFF will automatically cancel any "So" single element ON setting.



5.0 Fault Messages

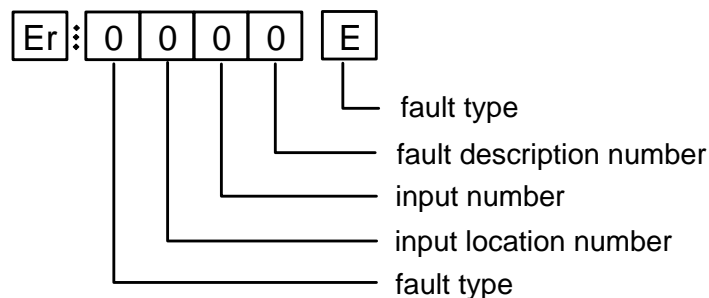
Faults are abnormal operating condition states. Alarms are fault states that indicate normal operating conditions have been exceeded but do not present an immediate hazard or potentially damaging condition. Alarms are intended as a warning only and will not stop the compressor or prevent the compressor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





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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 inhibit
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	analogue input
2 to 7	<i>not used</i>
8	special functions
9	special functions slave unit

fault category number	fault category description
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
L	load inhibit



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5.1 Immediate Stop Shutdown Errors

5.1.1 Digital input errors

Er:0010 E emergency stop

5.1.2 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

5.1.3 Special function errors

Er:0099 E all compression element(s) in fault condition
Er:0821 E low resistance, short circuit or short circuit to earth condition exists on an analogue input or digital input (incorrect connection, cable fault or sensor fault)
Er:0836 E Excessive electrical interference detected
Er:0846 E Delivery pressure sensor range is set too low for default pressure settings to be applied.
Er:5000 E Parameter table index corrupt

5.2 Controlled Stop Shutdown Errors

none



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5.3 Alarms

5.3.1 Digital input alarms

Er:2020 A Element Temperature High 1
Er:2030 A Motor Overload 1
Er:2040 A Element Temperature High 2
Er:2050 A Motor Overload 2
Er:2060 A Element Temperature High 3
Er:2070 A Motor Overload 3
Er:2080 A Element Temperature High 4
Er:2090 A Motor Overload 4
Er:2118 A Delivery Pressure High
Er:2128 A Delivery Temperature High
Er:2816 A Power Failure Detected

5.3.2 Analogue input alarms

Er:2118 A delivery pressure high
Er:2128 A delivery temperature high
Er:2138 A internal pressure high

5.3.3 Special function alarms

Er:2808 A differential pressure high
Er:2816 A power failure occurred while compressor was in the Started state

5.4 Start Inhibits

none

5.5 Run Inhibits

Er:3123 R delivery temperature Td below the set low temperature run inhibit level, controller will allow motor start when temperature increases above the set level

5.6 Load Inhibits

none

5.7 Service Alarms

5.7.1 Special function service alarms

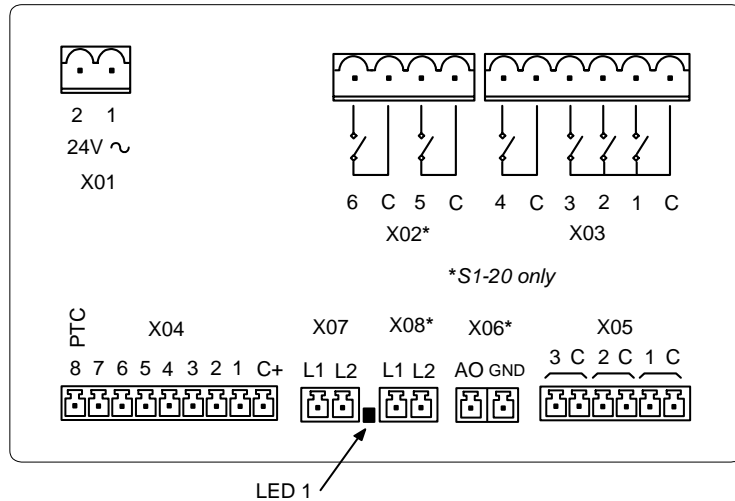
Er:4804 A service hours time expired, service due (reset service hours countdown timer)



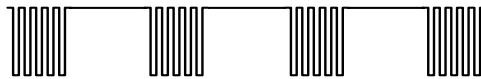
EXTROLLER SOFTWARE STANDARD SPECIFICATION

6.0 EXTROLLER 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 EXTROLLER controller.



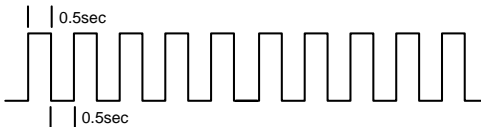
Production; Burn-in



Production; Test Mode

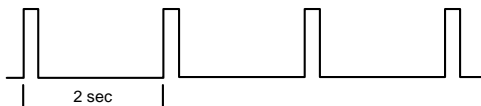


Normal Operating Mode
No Communications

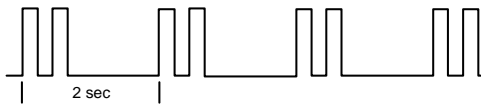


Note: a two second interruption to this sequence will occur every 10 second as the EXTROLLER broadcasts output data on the RS485 communications port.

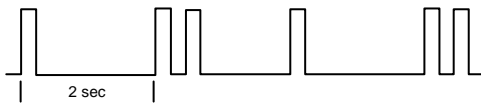
Normal Operating Mode
RS485#1 Communications



Normal Operating Mode
RS485#2 Communications



Normal Operating Mode
RS485#1 and RS485#2





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7.0 Example Configuration

