CMC
Software Specification

Intermediate valve controller

S1GDRVCS.E02

S1 CONTROLLER

CONTENT:

1.0 General Description

1.1 Controller Model type

There is only one type of controller for this application: S1-35-333. It is equipped as follows:

- S1 controller with three 4…20 mA analogue outputs
- Real Time clock

1.2 General Operation

The S1 based intermediate valve controller (IVC) manages and controls various hardware and software elements:

1) Variable position intermediate valve (though 4…20 mA output)
2) Bypass valve
3) Inlet drain valve
4) Outlet drain valve
5) Two service timers

It also monitors various pressure readings, reports if there is any problem with the values read and checks/reports the status of various digital inputs.

Apart from the various safety/security monitoring functions the IVC's main function is to control the intermediate valve (IV) position to achieve an outlet pressure which is as stable as technically possible in spite of varying outlet demand and/or fluctuating inlet pressure. In order to do so it sends a position signal to the IV. The actual position signal is calculated by observing the outlet pressure and using a PID control loop to obtain a final position result.

If necessary, when operating conditions or IVC controller status require it, the IVC will simply bypass the IV by means of the Bypass Valve. In that case the air supply causing the inlet pressure is simply passed to the outlet, thereby allowing and ensuring that the air demand side gets as much air as physically possible.

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	**IFC bypass**	digital input 2	Active if closed
4	C3	**Pressure schedule ON**	digital input 3	Active if closed
5	C4	**Local/remote set point**	digital input 4	Open = local, closed = remote
6	C5	**Remote start/stop**	digital input 5	stop if open/start on closure
7	C6	**Optional alarm 1**	digital input 6	Alarm if closed
8	C7	**Optional alarm 2**	digital input 7	Alarm if closed
9	C8	**Optional trip 1**	digital input 8	Trip if closed

Remark
All open/closed conditions indicated above and/or mentioned below (except the one for C1) are modifiable in menu P08.

Emergency stop
Unused in this application, a simple permanent wire bridge is applied, accidental opening of the wire bridge will cause the occurrence of error indication "E0010".

IFC Bypass
When this input is activated the bypass valve is permanently active regardless of the IVC's operating state or condition at the time.

Pressure schedule ON
When this input is activated AND the pressure schedule activated parameter is on the pressure schedule is effectively switched on. Provided the IVC is switched on and there are no other overriding conditions (see later) the desired target pressure value(s) defined in the pressure schedule will be used.

Local/remote set point:
Provided the corresponding remote/local control parameter in menu "P05" is activated the condition of this input will determine if the IVC's local pressure setting (standard setting or pressure schedule based) will be used or alternatively the remote target signal will be used (result of reading on defined analogue input for remote target reading).

Remote start/stop
Provided the corresponding remote start/stop parameter in menu "P05" is activated the condition of this input will make the IVC start and stop. Closing the contact will start the unit, opening it will stop it.

Optional alarm 1
Activating this input will cause alarm indication "A2060"

Optional alarm 2
Activating this input will cause alarm indication "A2070"

Optional alarm 3
Activating this input will cause alarm indication "E0080"

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 relays **R1,R2 and R3**		
2	NO-R1	**Bypass indicator**	digital output 1	Energised
3	NO-R2	**Bypass valve**	digital output 2	Not energised
4	NO-R3	**IVC Run status**	digital output 3	Energised
5	C-R4	**Common for alarm indication**		
6	R4	**low pressure alarm indication**	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 **Inlet drain**		
2	NO-R5	**Inlet drain**	digital output 5	Energised
3	C-R6	common **outlet drain**		
4	NO-R6	**Outlet drain**	digital output 6	Energised

Remark 1:
All energized/not energized conditions indicated above and/or mentioned below are modifiable in menu P09.

Remark 2:
All energized/not energized conditions indicated above and/or mentioned below are only valid while the unit is under power. In case the unit is not powered all relays automatically and absolutely revert back to “not energized” status.

Bypass indicator:
This relay signals that the Bypass valve (R2) is activated for some reason (unit not running, IFC bypass signal, …). It can be used to drive a corresponding indicator light.

Bypass valve
This relay gives the control signal to the bypass valve; usually, to open the valve, the contact remains open => normal open valve without power => IVC is bypassed. Closing the valve, thereby making actual IVC control possible, is normally done by energizing/closing the relay.

IVC Run status
This relay serves as an “IVC run status” or “IFC bypass status” indicator. When energised it indicates the IVC is modulating the IV valve and therefore controls the amount of air flowing/ passing by. However, in case there is an “IFC bypass” signal, this relay only indicates the IVC run status. Actual air flowing by goes through the bypass valve and/or the IV valve.

Alarm indication
This relay indicates an alarm condition, it stays energised for as long as the alarm is present.

Inlet drain
This relay will be energised/de-energised according to the corresponding timing parameters specified in menu P01. The resulting signal can be used to drive an inlet side (filter) drain valve.

Outlet drain

This relay will be energised/de-energised according to the corresponding timing parameters specified in menu P01. The resulting signal can be used to drive an outlet side (filter) drain valve.

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	**Analogue reading 2 common**			
4	ANA2	**Analogue reading 2**	analogue input 2	4-20 mA	adjustable
5	C-ANA3	**Analogue reading 3** common			
6	ANA3	**Analogue reading 3**	analogue input 3	4-20 mA	adjustable

Delivery pressure:

4…20 mA signal to read delivery (outlet) side pressure

Readings 2 and 3:

4…20 mA signal to read various types of analogue signals (reading selection setup in menu P07). The various possible signal readings are:

- Inlet pressure: to read inlet side pressure. Note that by default this reading is assigned to input nr 2 and therefore activated.
- Target pressure: to read desired delivery/outlet side target pressure. This reading/function is only valid when the corresponding parameter in menu P05 is activated. Equally, check + safety function for the presence of a valid 4…20 mA signal is only done when the function is activated.
- Temperature: to read an optional temperature
- Flow: to read an optional flow.

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

Analogue Output 1: Intermediate valve control signal

Hardware wise this analogue output can produce a 0….20 mA signal. Depending on the type of Intermediate valve (as defined in menu P06) the software limits the output to 4…20mA or 20…4mA, thus producing any valve position between fully closed and fully open.

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:

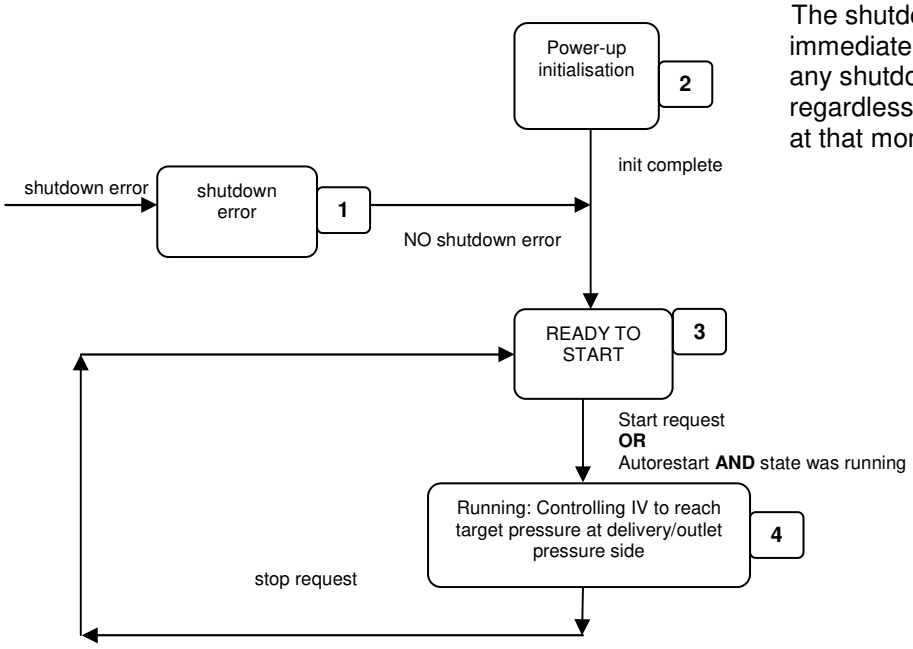
Alarm Fault (A):
An alarm fault is a warning condition that does not present an immediate danger or potential damage to the IVC. Alarm states will not shutdown the IVC or affect normal operation. An alarm fault code is displayed that must be manually reset to clear once the condition has been resolved 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.

Target Pressure:
The target pressure is the delivery/outlet pressure level (adjustable) which the IVC will try to achieve by manipulating the Intermediate valve position. If, due to circumstances it is incapable of doing so it will try to come as near to it as possible by, for example, opening the alternatively full bypass valve.

Ready to start State:
The unit is waiting to be started (start button, remote start input or remote start command)

Running State:
The unit is started and is controlling (opening/closing) the IV in order to bring the delivery pressure up to the desired target pressure.



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

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.

4.2 Led Indicators

STATUS: Green, adjacent to Start and Stop buttons
FAULT: Red, adjacent to Stop and Reset buttons

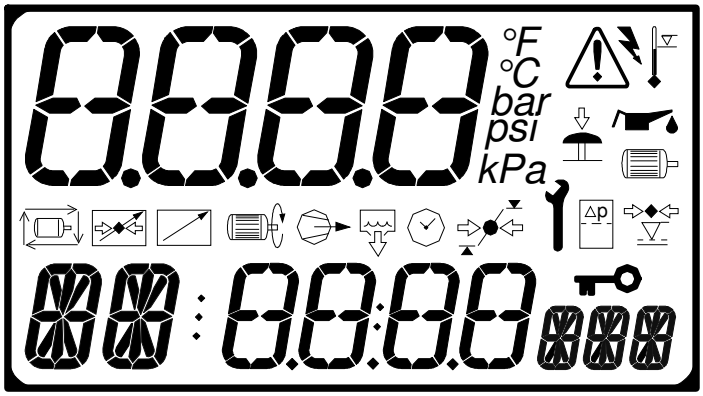
Indicator States:

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 **
			SF
4	Running	OFF	OFF **

🔴 ** SF for Alarm condition

4.3 Display



The display is divided in to 4 areas.

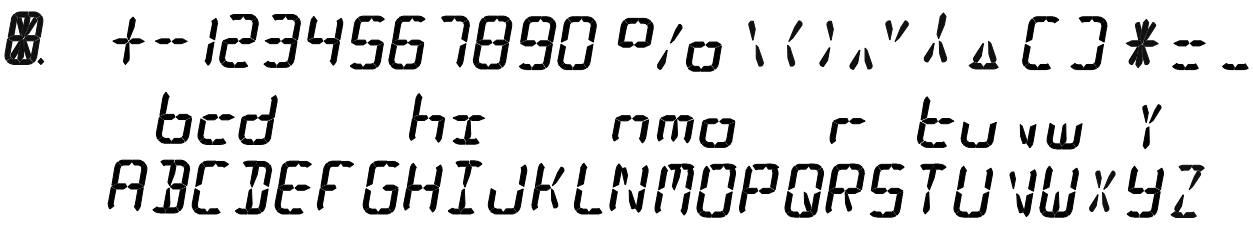
Top, Left: Display Field:-
4 character numeric display, with unit symbols, used to continuously show delivery pressure in normal operating mode or menu page number in menu mode

Top, Right: Fault Symbol Field:-
Symbolic displays used to indicate common general fault conditions

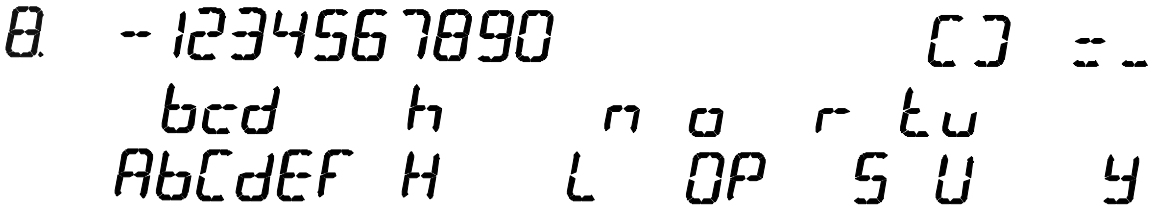
Middle: Symbolic displays used to reinforce meaning of selected item, fault condition.
Symbolic status information in normal operational mode 'Information Screen' item

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

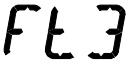
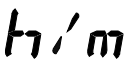
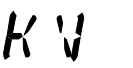
14 Segment Display Character Set:



7 Segment Display Character Set:



Display Character Examples, Units:

	bar		kPa		cfm		cfm
	psi		hour		m³/min		m³ cubic metres
	kW KiloWatt		minute		ft³ cubic feet		time hours/minutes
	kV KiloVolt		seconds		spm bearing monitoring		date day/month/year
	rpm		mA milliAmp		dBn spm unit		greater than less than
	ºC		mV milliVolt		+ positive		up down
	% percent		ºF		- negative		star delta

Operational Display Symbols:

 IVC power ON

 IVC controlling IV

 Pressure schedule ON

 Bypass valve on (low dp, IFC bypass, low pressure, …)

 Pressure set point indication (upper and lower set point indicators displayed depending on whether delivery pressure is lower than, within range or higher than desired target pressure)

 Condensate drain active (inlet and/or outlet)

 Power failure autorestart enabled (optional function)

 Remote target pressure regulation active

 Remote start/stop

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

Fault/status Display Symbols:

 General fault

 IVC off => manual control

 Power failure

 Service due, maintenance

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.

The following pages and access levels are used:

ACCESS LEVEL = USER (code = 12)	**ACCESS LEVEL = SERVICE 1** (code = 81)	**ACCESS LEVEL = SERVICE 2** (code =223)
P00, P01, P02,P03	P00, P01, P02, P03 P04	P00, P01, P02, P03 P04, P05, P06, P07 P08, P09, P10

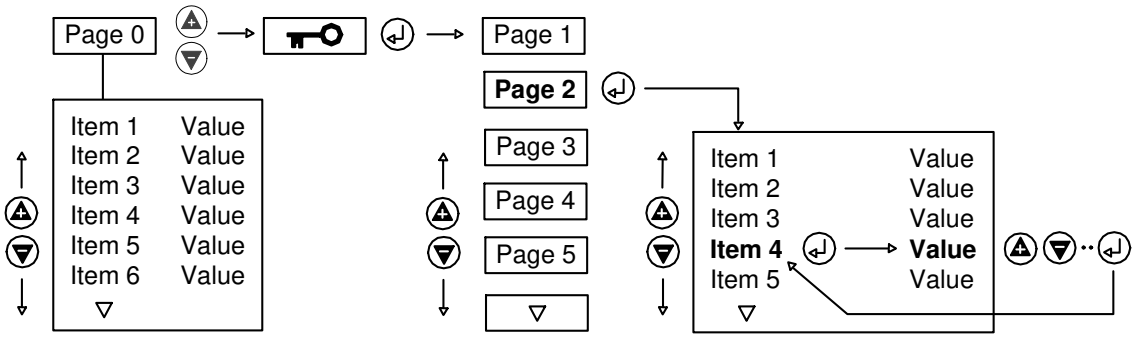
Access Code Timeouts:

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:

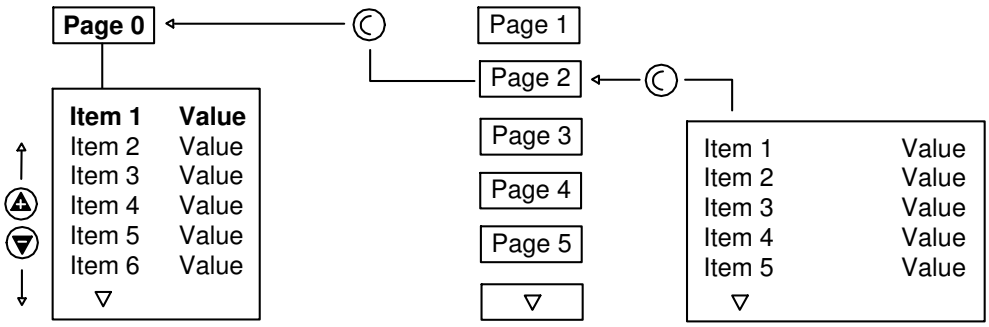
User: *1 minute* Service 1: *10 minutes* Service 2: *1 hour*

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.



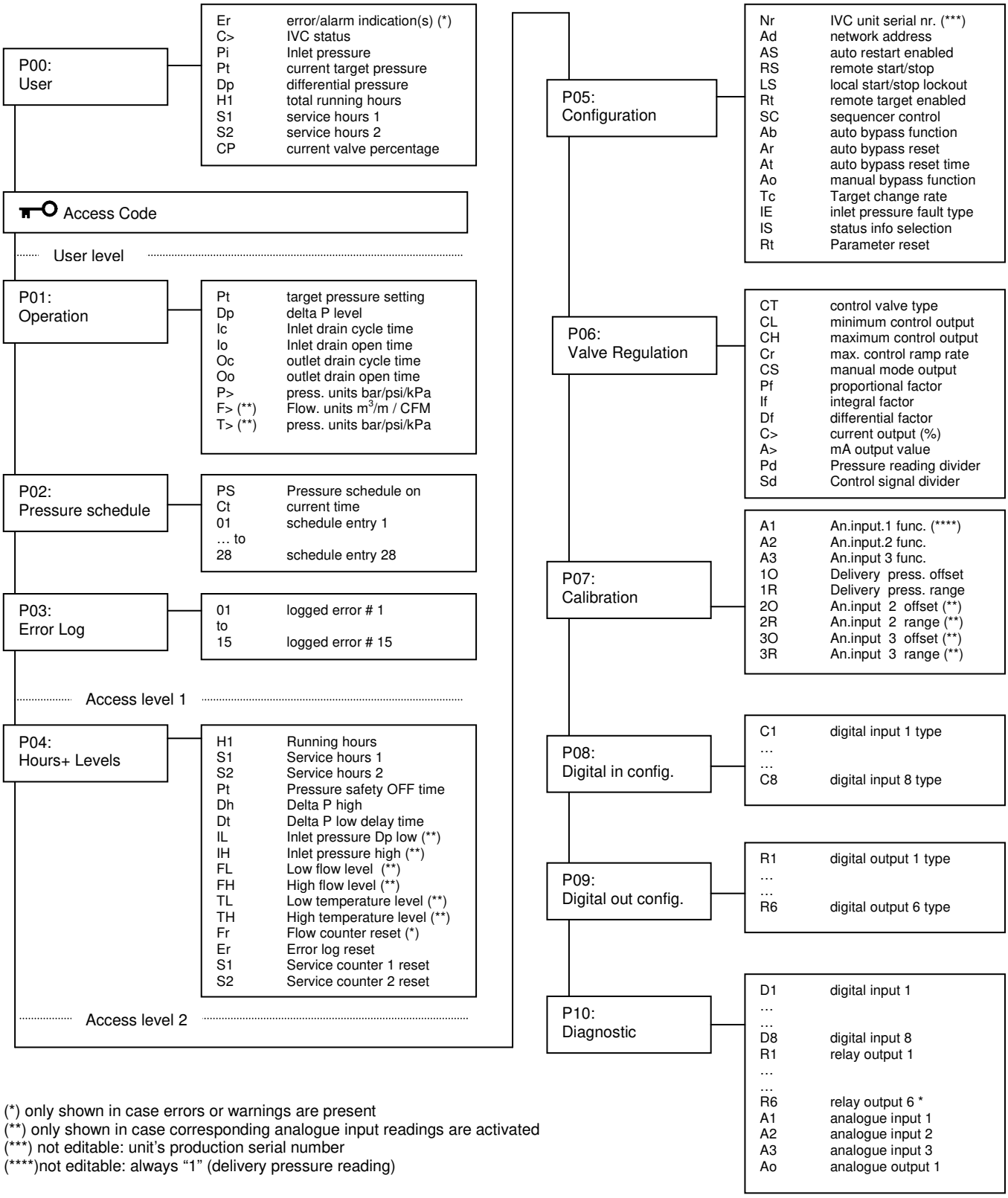
Press ESCAPE at any time in menu mode to step backwards one stage in the navigation process. Pressing ESCAPE when the page number is flashing will exit menu mode and return the display to normal operational mode; page 0.



Press and 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.

4.4.1 Menu Structure



(*) only shown in case errors or warnings are present
(**) only shown in case corresponding analogue input readings are activated
(***) not editable: unit's production serial number
(****)not editable: always "1" (delivery pressure reading)

4.4.2 P00 User Menu

The User menu shows normal current values, readings and information. This is the default display menu; no access code is required and values cannot be edited.

item	description	Units	step	min	max	default	Display
1	Error indication	---	no_edit	---	---	---	**Er:0080 E**
2	Status + info (time)	Hrs:min+inf	no_edit	---	---	---	**C>: 19:28 32**
3	Status + info (date)	Mo:day+year	no_edit	---	---	---	**C>: 12:25 08**
4	Inlet pressure	bar/psi	no_edit	---	---	---	**PI: 8.1 BAR**
5	Target pressure	bar/psi	no_edit	---	---	---	**Pt: 6,9 BAR**
6	Flow	m^3/m / CFM	no_edit	---	---	---	**FI: 250 M3M**
7	Volume	m^3 / CF	no_edit	---	---	---	**Ft: 1250 536**
8	Temperature	˚C/˚F	no_edit	---	---	---	**Tp: 89** ˚C
9	Running hours	H	no_edit	0	99999	---	**H1: 23 485**
10	Service hours 1	H	no_edit	-9999	9999	---	**S1: 1 536**
11	Service hours 2	H	no_edit	-9999	9999	---	**S2 : 7 536**
12	Current Valve percentage	%	no_edit	0	7200	---	**CP : 0 %**

Error indication
This item shows all currently active error(s). In case there is more than one active error each one is shown individually, scroll up down to go through the list.

Status+info (time or date)
This item shows the time of day + date as derived from the RTC + an information item in the lower right corner (fixed to year indication in case of date display) . Refer to menu “P05” item “IS” for a detailed list of all possible information selections.

Inlet pressure
This item shows the inlet pressure (in case the inlet pressure reading is activated).

Target pressure
This item shows the currently valid target for the IVC controller. The source of the target can be the local target pressure setting, a pressure schedule based setting, a remote target setting (via an analogue input) or a target of “0” forced by a connected sequencer unit.

Flow
This item shows the measured flow (in case the flow reading is activated).

Volume
This item shows the flow totaliser counter or “volume” (in case the flow reading is activated).

Temperature
This item shows the measured temperature (in case the temperature reading is activated).

Running hours
This item simply shows how long the IVC unit has been operating in RUN state.

Service hours 1
This item shows how much time remains on the first service timer. It shows “------“ in case the timer is not used.

Service hours 2
This item shows how much time remains on the second service timer. It shows “------“ in case the timer is not used.

Current Valve percentage

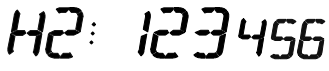
This item shows the actual signal currently being sent to the IV. It shows a value between 0% (valve closed) and 100 % (valve fully open). When in manual mode (system stopped) the value can be edited as if it were a normal parameter. As a result the valve position will change to the newly entered position. From the moment another menu item is observed or the controller is activated again the editing ability is cancelled/disabled and the valve position returns to the predefined manual value or the control value.

Delivery pressure reading and Status symbols

While displaying items in menu "P00" the text "P00" is not shown. Instead the upper section permanently shows the delivery pressure reading and various status symbols to indicate the IVC controller's status. Please refer to "page 11" for a detailed listing of all symbols and their meaning.

Remark: Hours and Volume Display Items

Hours and volume values are displayed using the 'value and units' display fields together. This feature enables a maximum of 9999999 hours or m^3/CF to be displayed.



(Loaded Hours 'H2' = 123456 h)

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

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	Target pressure	bar/psi	0.1	0.0	(*)	7.0	**Pt: 6,9 BAR**
2	Delta Pressure	bar/psi	0.1	0.0	(*)	7.0	**Dp: 0,3 BAR**
3	Inlet drain valve cycle time	Min	1	1	500	60	**Ic: 60 MIN**
4	Inlet drain valve open time	sec	1	1	300	5	**Io: 5 SEC**
5	outlet drain valve cycle time	Min	1	1	500	75	**Ic: 75 MIN**
6	outlet drain valve open time	sec	1	1	300	5	**Io: 5 SEC**
7	pressure units	---	1	0	2	1	**P>: 0 BAR**
8	Flow units (**)	---	1	0	1	1	**P>: 0 M3M**
9	Temperature units (**)	---	1	0	1	1	**P>: 0 °C**

(*) For this setting "min" is 1/10th of delivery pressure sensor measurement range, "max" is delivery pressure sensor measurement range.

(**) These parameters are only shown in case the relevant analogue readings are activated.

Target pressure setting

This is the normal target pressure. The IVC unit will try to match the delivery pressure to this target when operating. This target pressure setting may be overridden by the pressure schedule, the remote target etc…

Delta pressure setting

This setting defines how far the delivery pressure can go below the current target. Once it goes below that point an alarm is generated. Setting this value to 0 disables all related error checking.

Inlet drain cycle time

This defines the period between successive openings of the inlet drain valve.

Inlet drain open time
This defines how long the inlet drain valve remains open once the specified cycle time expires.

Outlet drain cycle time
This defines the period between successive openings of the outlet drain valve.

Outlet drain open time
This defines how long the outlet valve remains open once the specified cycle time expires.

Presssure units
This is where the pressure unit used for displaying pressure values can be selected: the available selections are: 0=>bar , 1=>psi , 2=>kPA

Flow units
This is where the flow unit used for displaying measured flow can be selected: the available selections are: 0=>m^3/m or 1 => CFM

Temperature units
This is where the temperature unit used for displaying temperature values can be selected: the available selections are: 0=>°C or 1 => °F

4.4.4 P02 Pressure Schedule Menu

item#	description	units	step	min	Max	default	Display
1	Pressure schedule enable	---	---	---	---	---	**PS 0**
2	Real time clock	---	---	---	---	---	**Ct.1 18:03 -1-**
3	Setting 1	---	---	---	---	---	**01.1 06:00 -1-**
To							
30	Setting 28	---	---	---	---	---	**28.1 00:00 -0-**

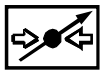
Pressure Schedule:
The pressure schedule can be used to change the operating target pressure set point, or force the IVC in to a standby state, at specified times on specified days of the week. The pressure schedule cycles through the settings on a weekly basis; beginning 00:00 hours on day of the week 1 (Monday) through to 23:59 hours on day of the week 7 (Sunday). Day of week setting '8' can be used to specify that the instruction should be executed at the same time on each day of the working week (days 1 to 5 inclusive; not including weekend days 6 and 7). Day of the week setting '9' can be used to specify that the instruction should be executed on every day of the week (days 1 to 7 inclusive).

The day of the week and the time of day can be specified for each setting together with the target pressure set point. The controller will use the specified pressure set point from the set time and day of the week until the next chronological setting modifies the pressure set point, or the pressure schedule is disabled or a remote override is activated.

If zero target pressure is specified the IVC will close the IV and enter the standby state. The IVC will remain in the standby state until the next setting specifies an operating pressure above zero. There are 28 available settings, some or all of which can be utilised. There are no limits to the number of settings that can be assigned to any particular day of the week. The controller will immediately operate in accordance with the schedule settings when the pressure schedule is activated and the compressor is started.

Note: The pressure schedule will not start and stop the IVC; the IVC must be started before pressure schedule functionality will operate.


When the pressure schedule is activated the timer symbol will appear in the operational display area.


The pressure schedule has a lower priority than communications pressure control or the remote pressure control digital inputs, both will override the pressure schedule settings. The timer symbol will disappear, and the 'Remote Pressure Control' symbol appear, during a remote override situation.

Pressure Schedule Menu Navigation
The pressure schedule menu page uses sub items. All page items, except PS pressure schedule enable, consist of a number of sub-items that are selected sequentially after entering the primary item for adjustment.

<u>REMARK:</u> The Pressure Schedule must be deactivated, or the IVC stopped, before any setting adjustments can be made.

To Adjust The Real Time Clock:
Select menu Page 02, and navigate to the Ct.1 Item. The page list item will flash and the display will show the current set day of the week and time in 24hr mode. Press ENTER to select the Item for adjustment; the Item display will stop flashing and the value display hours will flash. Press UP(plus) or DOWN(minus) to adjust the value then press ENTER, the minutes value will flash. Press UP or DOWN to adjust the value then press ENTER, the next sub item will automatically be displayed (and the Item display will increment from Ct.1 to Ct.2). Note: the day of the week will automatically be adjusted in accordance with the set date. If no adjustment of a sub item is necessary immediately press ENTER to increment to the next sub item. Continue to press ENTER to increment to the next sub item display, making adjustments as necessary, until the end of the sub item list is reached. When the last sub item is entered the value display will stop flashing and the Item display will show the first sub item number and will flash. Press UP or DOWN to navigate to another page list Item or press Escape to navigate to another menu page.

Ct.1 hour (0 to 23)
Ct.2 minutes (0 to 59)
Ct.3 year
Ct.4 month (1 to 12)
Ct.5 day of the month (1 to maximum number of days in the set month)

Pressure Schedule Settings:

##.1 day of the week and time of day (for example **06:30 –1–** = 6:30am every Monday)
##.2 target pressure set point

To Enter a New Pressure Schedule Setting:
Select menu Page 02, and navigate to an empty pressure schedule Item (01.1 to 28.1). A zero(0), followed by dashes, in the value display indicates an empty pressure schedule item. Press ENTER to select the Item for adjustment; the Item display will stop flashing and the zero(0) in the value display will flash. Press UP(plus) or DOWN(minus) to adjust the number to the required day of the week (1, Monday to 7, Sunday or 8 for every day of the working week 1 to 5). Press ENTER to set the day value into memory, the dashes will now show 00:00 (time of day, 24hr mode) and start to flash (the Item display will increment from ##.1 to ##.2). Press UP(plus) or DOWN(minus) to adjust the time and press ENTER.

Note: If there are other settings in the pressure schedule list the primary Item setting number will automatically change to position the setting in the correct chronological order. The pressure schedule menu will always store settings in chronological order from day of the week 1 (Monday) to day of the week 7 (Sunday), followed by any day of the week 8 or 9 settings.

The Item display will automatically increment to show the next sub item (##.2) and the value display will flash and show the target pressure set point for the pressure schedule setting. Press UP(plus) or DOWN(minus) to adjust the target pressure set point and then press ENTER. The Item display will flash and return to the first sub item (##.1). Press UP or DOWN to navigate to another Item setting or press Escape to navigate to another menu page.

Note: To force the compressor into a Standby state, adjust the target pressure set point to 0(zero).

To Adjust a Pressure Schedule Setting:
Navigate to the pressure schedule Item that requires adjustment and pressure enter. Follow the same procedure as for setting a new pressure schedule setting adjusting sub items as necessary. If a sub item does not require adjustment press ENTER to increment to the next sub item.

To Delete A Pressure Schedule Setting:
Navigate to the pressure schedule Item and Press ENTER. The day of the week number will flash and the Item display will show ##.1; the first sub item. Press DOWN(minus) to adjust the day of the week number to 0(zero) and press ENTER. All remaining sub item settings will be cleared and the setting will be deleted from the pressure schedule list.

Note: If there are other settings in the pressure schedule menu list the primary Item setting number will automatically change to position the empty setting in the correct chronological order. Press UP(plus) or DOWN(minus) to view other setting Items.

4.4.5 P03 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 time/date 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	---	---	---	**01:0080 E**
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 12:35 on the 17th of September 2007.

4.4.6 P04 Hours+levels menu

Settings that determine the level or condition at which a shutdown fault, alarm or maintenance warning is generated.

item#	Description	Units	Step	min	Max	default	Display
1	Running hours	Hrs	1…1000	0	999999	0	**H1: 000**
2	Service counter 1	Hrs	1…1000	0	10000	2000	**S1: 2 000**
3	Service counter 2	Hrs	1…1000	0	10000	8000	**S2: 8 000**
4	Delivery pressure Delta P high	bar/psi	0.1	0.0	(*)	0.5	**Dh: 0.5 BAR**
5	Delta P low detection delay	Sec	1	1	30	10	**Dt: 10 SEC**
6	Inlet pressure dp low level	Bar/psi	0.1	0	(**)	0.1	**IL: 0.1 BAR**
7	Inlet pressure high level	Bar/psi	0.1	0	(**)	10.0	**IH: 10.0 BAR**
8	Inlet pressure delay time	Sec	0.1	0	999	30.0	**It: 30.0 SEC**
9	Low flow level	m^3m/CFM	1(CFM)	0	9999 (CFM	0	**FL: 0 CFM**
10	High flow level	m^3m/CFM	1	0	9999(CFM)	9999	**FH: 9999 CFM**
11	Low temperature level	°C/°F	1	0	250	0	**TL: 0 °C**
12	High temperature level	°C/°F	1	0	250	100	**TH: 100 °C**
13	Volume reset	---	1	0	1	0	**Fr: 0**
14	Error log reset	---	1	0	1	0	**Er: 0**
15	Service counter 1 reset	---	1	0	1	0	**S1: 0**
16	Service counter 2 reset	---	1	0	1	0	**S2: 0**

(*) Max for this parameter is delivery pressure sensor range

(**) Min for inlet pressure low level is 0, max = inlet pressure sensor range – inlet pressure sensor range/10. Min for inlet pressure high is inlet pressure sensor range/10, max = inlet pressure sensor range. When setting up these parameters they are also linked. Setting low level higher than high level shifts up the high level and vice versa. The minimum distance between the levels is always at least 1/10th of the inlet pressure sensor range.

Running hours
Number of hours the unit has been under power and switched ON.

Service counter 1
Number of hours remaining until service alarm 1 is generated (counter at 0 or negative). The countdown runs synchronous with the running hours => the unit must be switched ON to start counting down. Note: setting the counter to a value higher than 10000 de-activates the counter (display = "------").

Service counter 2
Number of hours remaining until service alarm 2 is generated (counter at 0 or negative). The countdown runs synchronous with the running hours => the unit must be switched ON to start counting down. Note: setting the counter to a value higher than 10000 de-activates the counter (display = "------").

Delivery pressure Delta P high When the unit is running and the delivery pressure becomes higher than the current target pressure + this delta P value a delivery pressure high alarm is generated.

Delivery pressure delta P low detection delay When the unit is running and the delivery pressure becomes lower than the current target pressure – the delta P value specified in menu P01 and this condition lasts for a period longer than this specified time a delivery pressure low alarm is generated.

Inlet pressure delta P low level
When the unit is running and the inlet pressure becomes lower than the current target pressure minus this value for a period longer than the inlet pressure delay time (see below) a low inlet pressure error is generated.

Inlet pressure high level
When the unit is running and the inlet pressure becomes higher than this level for a period longer than the inlet pressure delay time (see below) a high inlet pressure error is generated.

Inlet pressure delay time
This timer defines how long the inlet pressure dp low and high conditions are allowed to exist before the associated erros are generated.

Low Flow level
When the unit is running and the measured flow is lower than this value a low flow alarm is generated. Note that this parameter is only shown when the associated flow measurement function is activated.

High Flow level
When the unit is running and the measured flow is higher than this value a high flow alarm is generated. Note that this parameter is only shown when the associated flow measurement function is activated.

Low temperature level
When the unit is running and the measured temperature is lower than this value a low temperature alarm is generated. Note that this parameter is only shown when the associated temperature measurement function is activated.

High temperature level
When the unit is running and the measured temperature is higher than this value a high temperature alarm is generated. Note that this parameter is only shown when the associated temperature measurement function is activated.

Volume reset
Setting this parameter to “1” clears the volume or “flow totaliser” counter. Note that this parameter is only shown when the associated flow measurement function is activated.

Error log reset
Setting this parameter to “1” simply clears the error log completely.

Service counter 1 reset
Setting this parameter to “1” resets the associated service counter to it’s default value.

Service counter 2 reset
Setting this parameter to “1” resets the associated service counter to it’s default value.

4.4.7 P05 Configuration Menu

Settings that determine the setup of the control unit

item#	description	units	step	Min	max	default	display
1	IVC serial number	---	--	--	---	---	**Nr 125**
2	Network address	---	1	1	99	20	**Ad 20**
3	Auto restart enabled	---	1	0	1	1	**AS 1**
4	Remote start/stop	---	1	0	1	0	**RS 0**
5	Local start/stop lockout	---	1	0	1	0	**LS 0**
6	Remote target enabled	---	1	0	1	0	**RT 0**
7	Sequencer control	---	1	0	1	0	**SC 0**
8	Auto bypass function	---	1	0	1	0	**AB 0**
9	Auto bypass reset	---	1	0	1	0	**AR 0**
10	Auto bypass reset time	---	1	0	1	0	**AT 0**
11	Manual bypass function	---	1	0	1	0	**Ao 0**
12	Target ramp time	Sec	1	0	43500	435	**Tc 435 SEC**
13	Inlet pressure fault type	---	1	0	1	0	**Ie 0**
14	Info selection	---	1	0	5	1	**IS: 0**
15	Reset parameters	---	1	0	1	0	**LS 0**

IVC Serial number
This parameter cannot be edited, it is simply an indication of the unit's production serial number.

Network address
This parameter indicates the unit's network address. In case multiple units are used on the same network each one should have its own unique network address. Note: make sure that no other element on the network has the same address (compressor. I/O box, sequencer etc….)

Auto restart enabled
Setting the parameter to "1" enables auto restart => in case of a power down the unit will always restart in the condition it was in before the power loss. In case the parameter is set to "0" the unit will always reboot in "stopped" state.

Remote start/stop
Setting the parameter to "1" enables the remote start/stop input. Setting it to "0" disables the input completely. Note: in that case the "local start/stop lockout" parameter is also switched off and no longer editable

Local start/stop lockout
Setting the parameter to "1" locks out the start/stop buttons on the unit's keyboard while setting it to "0" enables the start/stop buttons. Setting the parameter to "1" is only possible when "remote start/stop is activated.

Remote target enabled
Setting the parameter to "1" enables the remote target capability. Setting it to "0" disables it. As soon as the remote target capability is activated an analogue input 3 can receive a remote target signal. The input is checked for the presence of a valid 4…20 mA signal (and an alarm indicated if not). If the signal is OK it is read and the resulting reading then defines the unit's operating target. Note: (1) once there and activated this remote target overrides both the local target and any potentially present pressure schedule target (2) before activating this parameter it is essential that one of the analogue inputs is configured to actually read a remote target.

Sequencer control
This parameter has two possible settings (see below). It determines what the unit's behaviour will be in case it detects the presence and condition of a sequencer on the network. No sequencer communication to start with or disappearing for 1 minute after having been detected earlier makes the IVC revert back to local control.

- "0" => ignore sequencer completely; operation is determined by local parameters only.
- "1" => target pressure is set to "0" in case the sequencer signals "standby" operation or the sequencer is switched off AND is configured to retain control when stopped. The sequencer being switched off will not set the target pressure to "0" in case the stop condition is due to an error condition. In that case the control becomes local again.

Auto bypass function
This parameter determines the behaviour of the "bypass valve" in case a DP condition occurs while the unit is operating. If set to "0" the valve will remain deactivated. In case it is set to "1" the valve will be activated (extra airflow) as long as the Low DP condition exists.

Auto bypass reset & Auto bypass reset
This parameter determines how a low DP condition alarm is reset. If set to "0" the alarm indication must be manually reset. If set to "1" the indication is automatically reset once the alarm condition is gone and specified "Auto bypass reset time" has expired.

Manual bypass function
This parameter determines the behaviour of the "bypass valve" in case the unit is switched off. It has three possible values:
- "0" => Bypass valve is always deactivated
- "1" => Bypass valve is always activated
- "2" => Bypass valve is deactivated in case the delivery pressure is higher than the target pressure. The valve is activated if the delivery pressure becomes lower than Target pressure – Delta P low level.

Inlet pressure fault type
Setting the parameter to "0" makes the IVC produce inlet pressure alarms in case the pressure becomes too low or too high. If set to "1" those same error conditions become fault/trip conditions, stopping the unit from operating in case they occur.

Target ramp time
This parameter determines how fast the controller's target will change from one target point to another. Example: target is 0 (unit is standby) and has to change to 7.0 bar (normal operating point). It will not do so abruptly but will increase every 100 milliseconds by a particular amount. The amount is calculated as:

pressure sensor measurement range / target ramp time

Info selection
This defines which particular information is shown in the lower right corner of menu "P00" while displaying the "status +info" item. The available selections are: 0 => nothing/blank, 1 => network address, 2 => machine state number, 3 => average software cycle time, 4 => maximum software.cycle time, 5 = active pressure schedule entry.

4.4.8 P06 Valve Regulation Menu

The valve regulation function provides PID loop control for the variable position Intermediate Valve (using 4-20mA output 1) in order to maintain a steady target pressure level at the output (delivery pressure) .

item#	Description	units	step	min	max	default	display
1	Control (valve) type	---	1	0	1	0	**CT 0**
2	Minimum output	%	1	0	100	0	**CL 0 %**
3	Maximum output	%	1	0	100	100	**CL 100 %**
4	Maximum ramp rate	%	1	1	100	5	**Cr 5 %**
5	Manual mode output	%	1	0	100	0	**CL 0 %**
6	P factor	---	1	0	100	40	**Pf 40**
7	I factor	---	1	0	100	10	**If 10**
8	D factor	---	1	0	100	10	**Df 10**
9	Current output %	%	1	0	100	(*)	**C> 0 %**
10	Pressure reading divider	---	1	1	100	1	**Pd 1**
11	Output signal divider	---	1	1	100	1	**Sd 1**

Control valve type
This parameter sets the intermediate valve types. Setting it to “0” is used for a valve that goes from fully closed to fully open position using a 4…20 mA signal. It needs to be set to “1” in case the valve goes from closed to open position with a 20…4 mA signal.

Minimum output
Set to limit valve control output at low side. 0% = fully closed.

Maximum output
Set to limit valve control output at high side. 100% = fully open.

Maximum ramp rate
Determines max possible rate of change for IV control signal. Parameter unit is %/second.

Manual mode output
IV control signal when in manual mode (switched off)

P Factor P&I loop proportional factor

I Factor P&I loop integration factor

D Factor P&I loop differential factor

Current output % Shows current output signal to IV

Current mA output Shows current output signal to IV

Pressure signal divider
The pressure reading has a very high resolution (+/- 1 mBar). This means that the pressure reading may fluctuate a lot. The amount of fluctuation is very small but it is possible that the reading fed into the PID control produces a lot of, equally small, fluctuations. As a result some valves may be a bit “nervous”. To compensate it is possible to define a “pressure signal divider” value. Example: if the value is set to “69” the resolution of the pressure measurement is reduced to 1 PSI steps => it takes at least a 1 PSI change in pressure before that change is noted.

Output signal divider
The output signal for valve control has a very high resolution (+/- 0.01 mA). This means that the output signal may fluctuate a lot. The amount of fluctuation is very small but it is possible that the signal fed to the valve varies slightly but often. As a result some valves may be a bit "nervous". To compensate it is possible to define an "output signal divider" value. Example: if the value is set to "10" the resolution of the output signal is reduced to 0.1 mA steps => it takes a change of 0.1 mA in the calculated out signal value before the change will be present at the actual output.

4.4.9 P07 Sensor activation and Calibration Menu

Pressure sensor/target signal 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.

item#	Description	units	step	min	max	default	Display
1	Analogue input 1 function	---	1	1	1	1	**A1 1**
2	Analogue input 2 function	---	1	0	5	2	**A2 2**
3	Analogue input 3 function	---	1	0	5	0	**A3 0**
4	delivery pressure offset	bar/psi	0.1	-10% range	+10% range	0.0	**1O 0.0 BAR**
5	delivery pressure range	bar/psi	0.1	0.0	100.0	16.0	**1R 16.0 BAR**
6	inlet pressure offset (*)	bar/psi	0.1	-10% range	+10% range	0.0	**2O 0.0 BAR**
7	inlet pressure range (*)	bar/psi	0.1	0.0	100.0	16.0	**2R 16.0 BAR**
8	Remote target offset (*)	bar/psi	0.1	-10% range	+10% range	0.0	**3O 0.0 BAR**
9	Remote target range (*)	bar/psi	0.1	0.0	100.0	16.0	**3R 16.0 BAR**

(*) Parameters shown are only an example. Depending on whether or not the analogue measurements are activated/defined they will either not be shown or the displayed units will differ.

Analogue input 1 function
This value is only there for display purposes and cannot be changed. It simply shows that analogue input nr 1 is always the delivery pressure sensor.

Analogue input 2 function
Analogue input 3 function
By default the value for analogue input 2 is "2". Meaning that this analogue input is usually used to measure the inlet pressure. The default value for analogue input 3 is "0" However, each of them it can be given these values:

- 0 => unused
- 2 => inlet pressure measurement
- 3 => remote target signal
- 4 => flow measurement
- 5 => temperature measurement

Notes:

- each of these values can only be assigned to a single input. It is not possible to assign the same value to two inputs.
- Assigning a valid value to an analogue input activates the associated calibration parameters in menu P07 and all other associated readings in the various menus. Example: assigning function 5 to input nr 2 activates the temperature reading, the high and low alarm levels etc…

Offset:
To calibrate a pressure offset, expose the appropriate sensor to atmosphere and adjust the offset value until the pressure display shows 0.0bar. If, for example, the sensor is a –1.0(minus one) to 15.0bar type; set to –1.0bar.

Range:
To calibrate the 'maximum 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. If, for example, the sensor is a –1.0(minus one) to 15.0bar type; set initially to 15.0bar then adjust as necessary.

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

4.4.10 P08 Digital input configuration menu

item#	Description	Units	step	min	max	default	Display
1	Digital input 1	---	1	1 (NC)	1 (NC)	1 (NC)	**C1 1** ___
2	Digital input 2	---	1	0 (NO)	1 (NC)	0 (NO)	**C2 0** _/_
3	Digital input 3	---	1	0 (NO)	1 (NC)	0 (NO)	**C3 0** _/_
4	Digital input 4	---	1	0 (NO)	1 (NC)	0 (NO)	**C4 0** _/_
5	Digital input 5	---	1	0 (NO)	1 (NC)	0 (NO)	**C5 0** _/_
6	Digital input 6	---	1	0 (NO)	1 (NC)	0 (NO)	**C6 0** _/_
7	Digital input 7	---	1	0 (NO)	1 (NC)	0 (NO)	**C7 0** _/_
8	Digital input 8	---	1	0 (NO)	1 (NC)	0 (NO)	**C8 0** _/_

Digital input 1….8
Except for digital input nr 1 (which must always be normal closed) all digital inputs can be configured to be Normal open (0) or normal closed (1).

4.4.11 P09 Digital output configuration menu

item#	Description	Units	step	min	max	default	Display
1	Relay 1	---	1	1 (NO)	1 (NC)	0 (NO)	**R1 1** ___
2	Relay 2	---	1	0 (NO)	1 (NC)	1 (NC)	**R2 0** _/_
3	Relay 3	---	1	0 (NO)	1 (NC)	0 (NO)	**R3 0** _/_
4	Relay 4	---	1	0 (NO)	1 (NC)	0 (NO)	**R4 0** _/_
5	Relay 5	---	1	0 (NO)	1 (NC)	0 (NO)	**R5 0** _/_
6	Relay 6	---	1	0 (NO)	1 (NC)	0 (NO)	**R6 0** _/_

Relay 1…6
All relays can be configured to provide a normal open contact NO (0) or NC(1). Physically all relays are NO so upon power down they all automatically revert to "open" status. When operating the "normal" (inactive) status can be redefined.

4.4.12 P10 Diagnostic Menu

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

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** 4.00mA
17	analogue input 3	---	no_edit	---	---	---	**A3** 4.00mA
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 relays 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 mA(current loop inputs) detected on the controller connector of the corresponding analogue input. The or mA value can be independently checked with a meter.

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.

4.4.13 Target pressure source Logic

The target pressure for the delivery pressure regulation can be derived from a number of sources, internal or remote. Each potential source has a different priority over other potential sources. The following source priority logic diagrams show the target pressure source the controller will use. The target pressure selection follows these rules:

- To start with the target pressure equals the setting in P01
- Then the target pressure is replaced by the currently valid pressure schedule entry provided the unit's RTC is operational and the pressure schedule is activated.
- The target pressure is again replaced by the remote target (analogue remote target input signal) provided that function is activated and the analogue input is functioning properly (signal within 4….20mA range)
- Target pressure can then still be set to "0" (standby mode) in combination with a sequencer. See description of parameter "SC" in menu "P05" for an exact listing of the applicable rules.

The target pressure value replacements are checked one by one in the indicated order; if the conditions to make a replacement are positive the replacement is performed. For example: if the pressure schedule is not activated it is still possible for a replacement to occur due to the remote target signal being activated and applied.

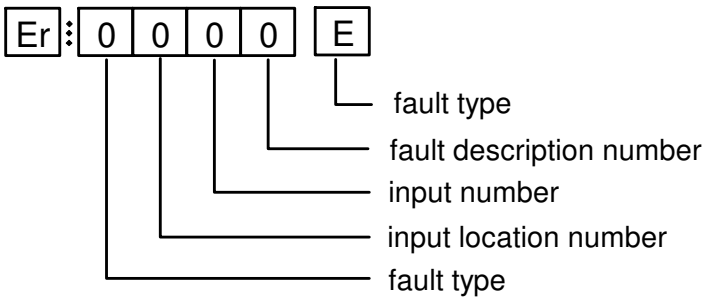
Safety:
Regardless of pressure regulation source, the set Alarm and Shutdown pressure safety limits remain active and are detected from the delivery pressure sensor and inlet pressure sensor.

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 IVC or prevent it being started and run.

Shutdown trip errors are fault states that present a hazardous or damaging condition, the IVC is stopped immediately. The Shutdown trip error condition must be resolved, and the fault reset, before the IVC 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.. 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”.



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	*not used*
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

5.1 Immediate Stop Shutdown Errors

5.1.1 Digital input errors

Er:0010 E Emergency stop (unused: wire strap)
Er:0080 E Optional trip input (NO or NC).

5.1.2 Analogue input errors

Er:0115 E Delivery pressure sensor fault
Er:0121 E Inlet pressure low trip (*)
Er:0125 E Analogue input nr 2 sensor fault
Er:0129 E Inlet pressure high trip (*)
Er:0135 E Analogue input nr 3 sensor fault

Note: for analogue input errors marked as (*) the third digit in the error code no longer refers to the physical analogue input. Instead the digit refers to the assigned function definition (inlet pressure, flow, temperature: see menu P07)

5.1.3 Special function errors

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 PLL unlocked: microprocessor has been subjected to extreme EMI => bad clock frequency
Er:0866 E Incorrect wire polarity of the 24VDC supply to the controller.

5.2 Controlled Stop Shutdown Errors

none

5.3 Alarms

5.3.1 Digital input alarms

Er:2060 A Optional alarm input 1 alarm
Er:2070 A Optional alarm input 2 alarm
Er:2080 A Optional alarm input

5.3.2 Analogue input alarms

Er:2112 A Delivery pressure Low
Er:2118 A Delivery pressure high
Er:2122 A Inlet pressure low (*)
Er:2125 A Inlet pressure sensor error (*)
Er:2128 A Inlet pressure high (*)
Er:2135 A Remote target signal error
Er:2142 A Flow low (*)
Er:2148 A Flow high (*)
Er:2152 A Temperature low (*)
Er:2158 A Temperature high (*)

Note: for analogue input alarms marked as (*) the third digit in the error code no longer refers to the physical analogue input. Instead the digit refers to the assigned function definition (inlet pressure, flow, temperature: see menu P07)

5.3.3 Special function alarms

Er:2801 A differential pressure high
Er:2816 A power failure occurred while compressor was in the started state.
Er:2836 A RTC failure
Er:5020 A IFC bypass input
Er:5030 A Pressure schedule input
Er:5040 A Remote target input
Er:5050 A Remote start input
Er:5060 A Target setpoint 1
Er:5070 A Target setpoint 2
Er:5090 A Target setpoint 3

5.4 Start Inhibits

none

5.5 Run Inhibits

none

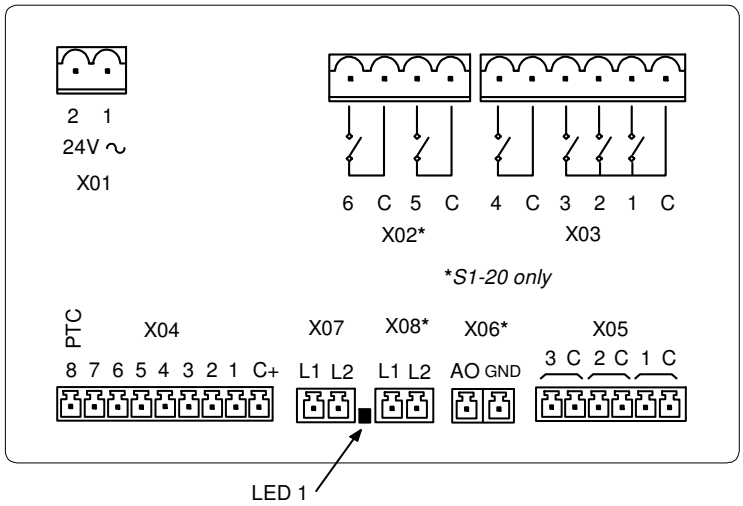
5.6 Service Alarms

5.6.1 Special function service alarms

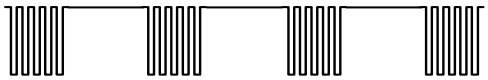
Er:4814 A Service hours time 1 expired, service due (reset service hours countdown timer)
Er:4824 A Service hours time 2 expired, service due (reset service hours countdown timer)

6.0 S1 Controller - LED indication

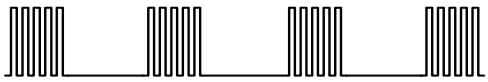
LED1 is located on the PCB between connectors X07 and X08 and can be seen from the rear of the controller without removing the rear enclosure housing. This LED gives diagnostic information about different functions of the S1 controller.



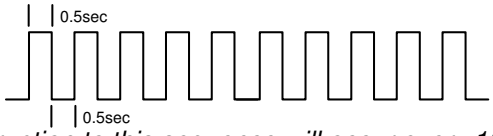
Production; Burn-in



Production; Test Mode

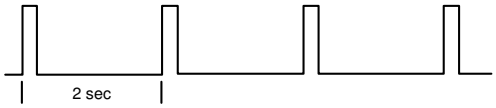


Normal Operating Mode
No Communications

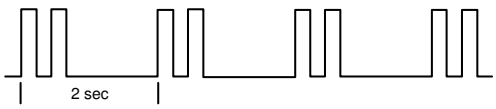


Note: a two second interruption to this sequence will occur every 10 second as the S1 broadcasts output data on the RS485 communications port.

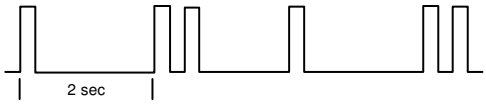
Normal Operating Mode
RS485#1 Communications



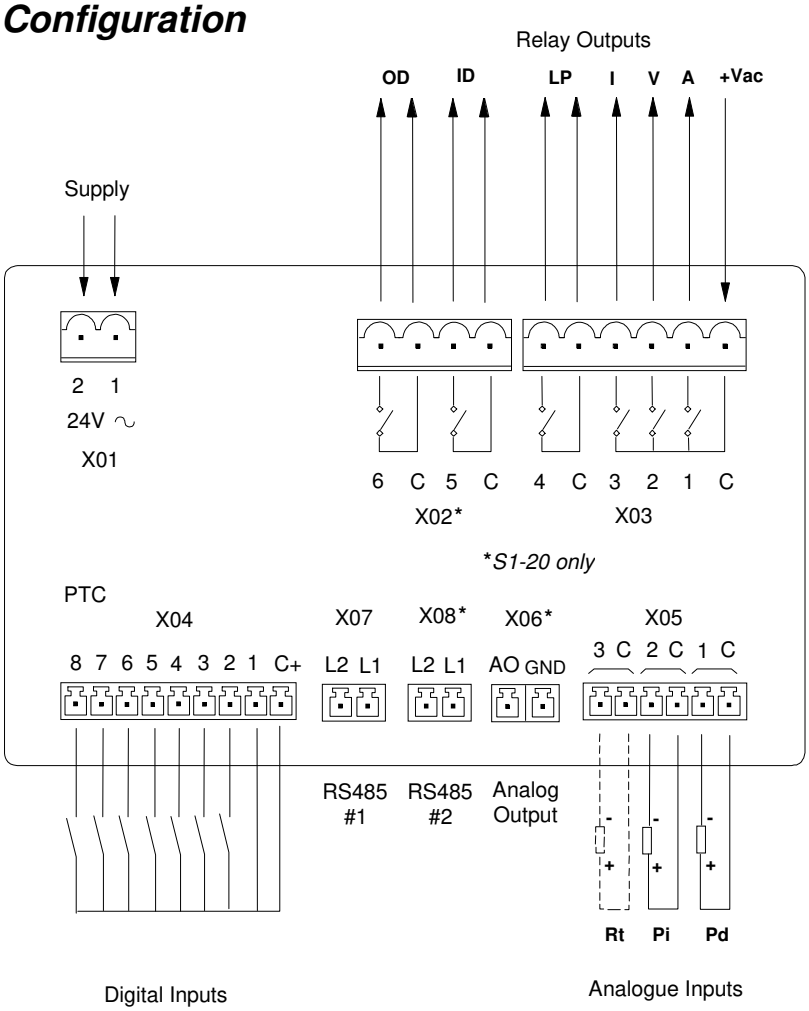
Normal Operating Mode
RS485#2 Communications



Normal Operating Mode
RS485#1 and RS485#2



7.0 Example Configuration



C+/1 Emergency Stop (not used => wire strap)
C+/2 IFC online/bypass switch
C+/3 Pressure schedule ON/OFF switch
C+/4 Local/remote pressure target switch
C+/5 Remote start/stop switch
C+/6 Optional alarm nr1
C+/7 Optional alarm nr2
C+/8 Optional trip

A Auto bypass indicator relay (standard = NO)
V Auto bypass valve relay (standard = NC)
I IFC bypass indicator (standard = NO)
LP Low pressure alarm relay (standard = NO)
ID Inlet drain valve relay (standard = NO)
OD outlet drain valve relay (standard = NO)

Pd Delivery Pressure Sensor (4-20mA)
PI Inlet Pressure Sensor (4-20mA)
Rt Remote target signal (4-20mA)