



AC30V series Hydraulic Control Applications

HA502134U003 Issue 1
Technical Manual

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



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Hydraulic Control Applications

HA502134U003 Issue 1

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Hydraulic Control Applications

Description

The hydraulic application provides 4 pump control configurations:

- Accumulator Control
- Variable Flow Pressure Compensated (VFPC) Control
- “Q” Control
- “P” Control

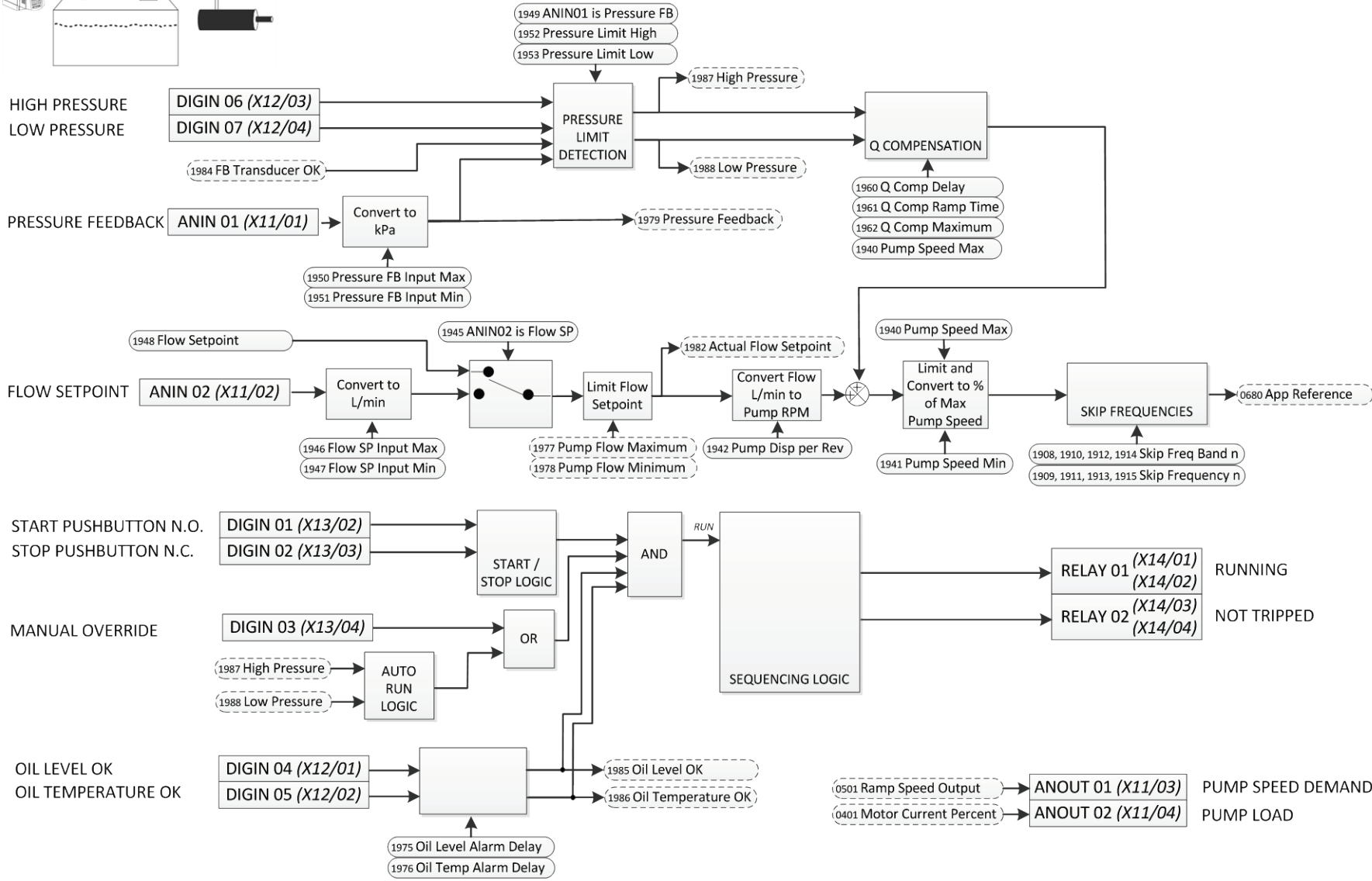
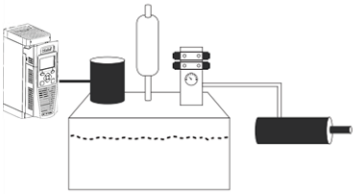
Features

- Pressure Units kilopascal (kPa)
- Flow Units Litres per Minute (L/min)
- Pump Displacement per Revolution specified in Litres (L)

Requirements

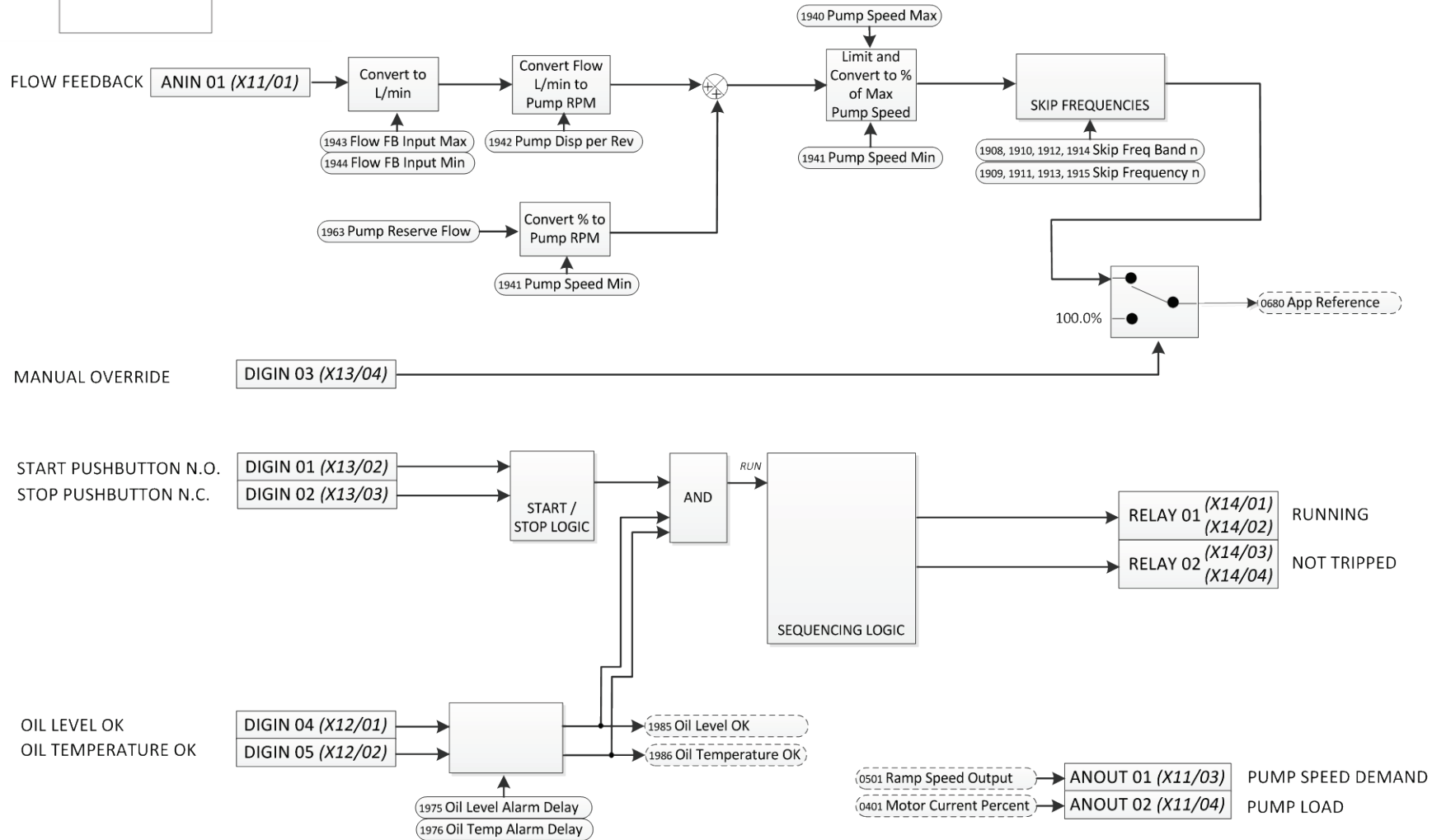
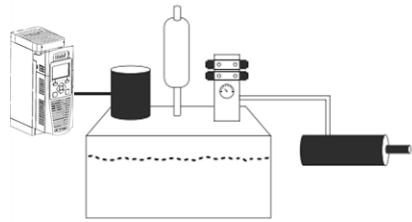
To use the AC30V for hydraulic control as described in this manual, the application RA502134U003 must be loaded into an AC30V series drive with firmware 1.4.1 or newer.

Hydraulic Application 0:
Accumulator Control

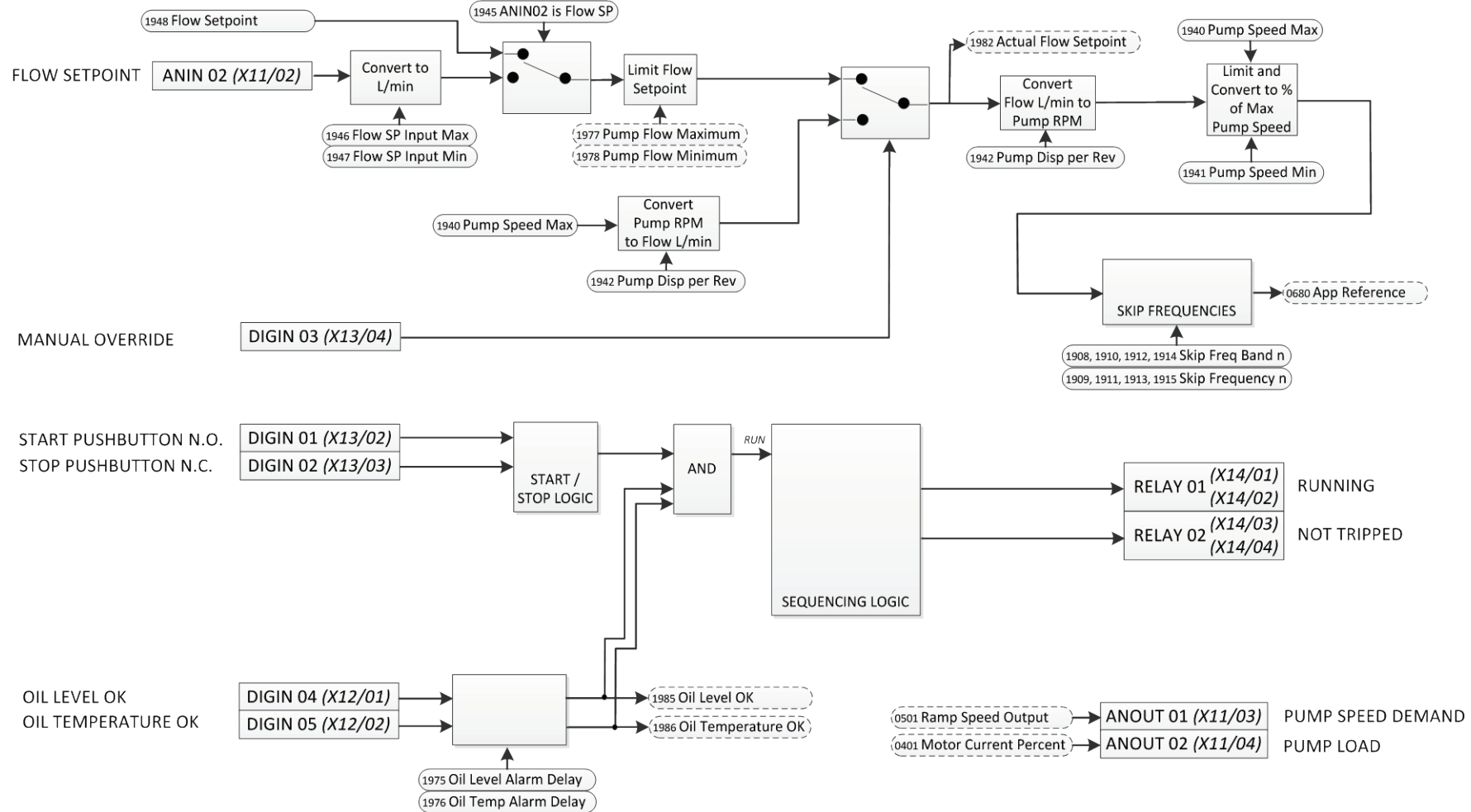
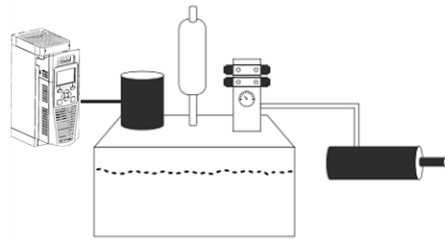


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Hydraulic Application 1: VFPC Control

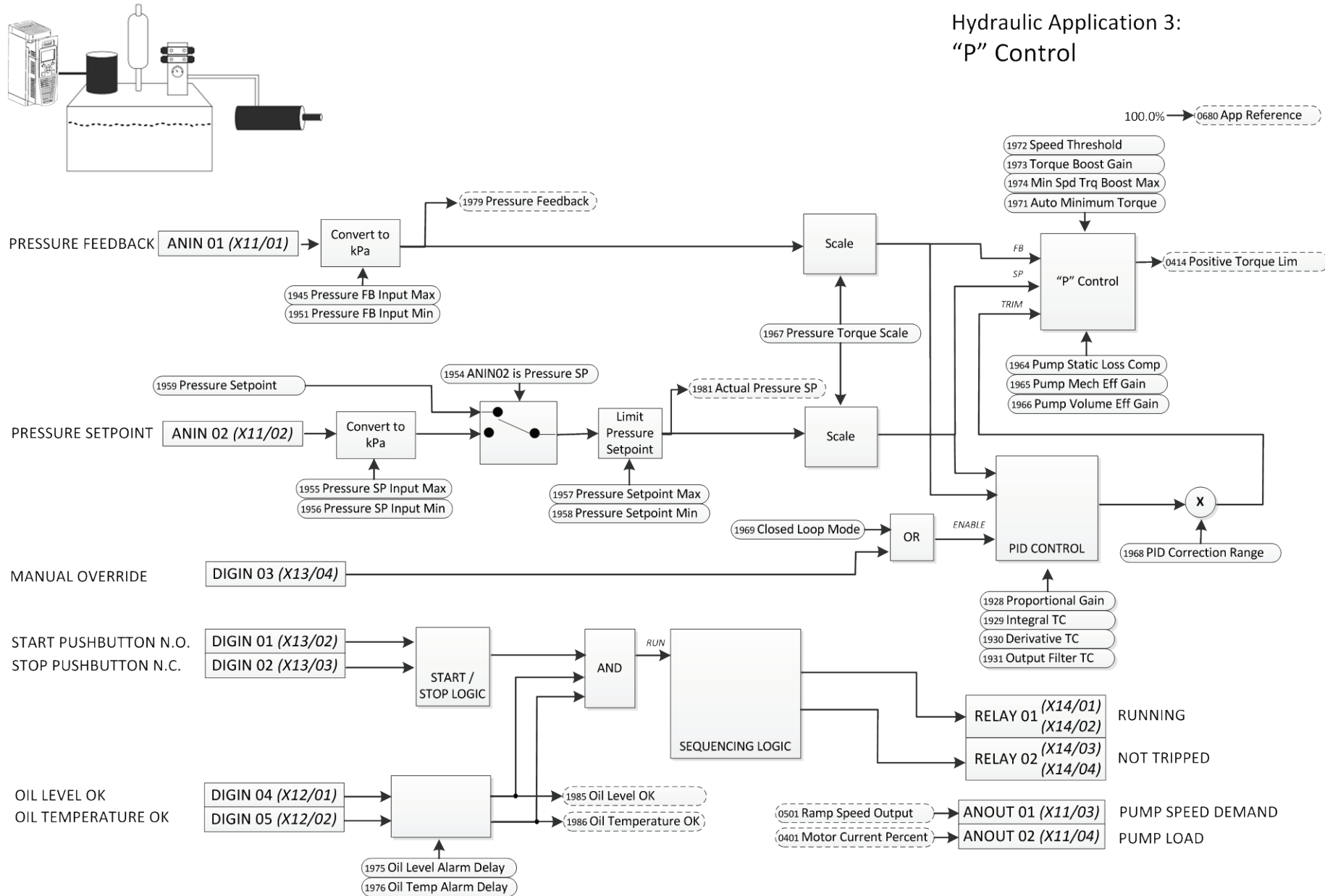


Hydraulic Application 2: "Q" Control



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Hydraulic Application 3: "P" Control



Inputs

Terminal	Selected Application (Control Type)			
	Accumulator	VFPC	“Q”	“P”
ANIN01 (X11/01)	PRESSURE FEEDBACK*	FLOW FEEDBACK	Not used	PRESSURE FEEDBACK
ANIN02 (X11/02)	FLOW SETPOINT**	Not Used	FLOW SETPOINT**	PRESSURE SETPOINT***
DIGIN01 (X13/02)	START PUSH BUTTON (N.C.)			
DIGIN02 (X13/03)	STOP PUSH BUTTON (N.O.)			
DIGIN03 (X13/04)	MANUAL OVERRIDE			
DIGIN04 (X12/01)	OIL LEVEL OK			
DIGIN05 (X12/02)	OIL TEMPERATURE OK			
DIGIN06 (X12/03)	HIGH PRESSURE (N.C.)*	Not used		
DIGIN07 (X12/04)	LOW PRESSURE (N.O.)*	Not used		

* by default Pressure Feedback is from DIGIN06 and DIGIN07, but if **1949: ANIN01 is Pressure FB** is set to TRUE then ANIN01 is used with the limits set by **1952: Pressure Limit High** and **1953: Pressure Limit Low**.

** by default Flow Setpoint is set by ANIN02, but if **1945: ANIN02 is Flow SP** is set to FALSE then **1948: Flow Setpoint** is used instead.

*** by default Pressure Setpoint is set by ANIN02, but if **1954: is Pressure SP** is set to FALSE then **1959: Pressure Setpoint** is used instead.

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Outputs

Terminal	Function	Comment
ANOUT 01 (X11/03)	PUMP SPEED DEMAND	Speed demand as % of maximum Pump speed
ANOUT 02 (X11/04)	PUMP LOAD	Load as % of maximum load
RELAY 01 (X14/01 & X14/02)	RUNNING	When closed the Pump is being driven
RELAY 02 (X14/03 & X14/04)	NOT TRIPPED	When closed the Drive is not tripped
DIGOUT 01 (X12/01)		Terminal used as DIGIN 04
DIGOUT 02 (X12/02)		Terminal used as DIGIN 05
DIGOUT 03 (X12/03)		Terminal used as DIGIN 06
DIGOUT 04 (X12/04)		Terminal used as DIGIN 07

Graphical Keypad (GKP) Application Customization

The hydraulic applications add parameters and menus to the GKP.

Control Screen			
Accumulator Control	VFPC Control	“Q” Control	“P” Control
1982: Actual Flow Setpoint (L/min)* 1948: Flow Setpoint (L/min)** 1997: Hydraulic Status 1983: Flow Demand (L/min) 1979: Pressure Feedback (kPa)*** 0395: Actual Speed (%) 0399: Actual Torque (%)	1980: Flow Feedback (L/min) 1997: Hydraulic Status 1983: Flow Demand (L/min) 0395: Actual Speed (%) 0399: Actual Torque (%)	1982: Actual Flow Setpoint (L/min)* 1948: Flow Setpoint (L/min)** 1997: Hydraulic Status 1983: Flow Demand (L/min) 0395: Actual Speed (%) 0399: Actual Torque (%)	1981: Actual Pressure SP (kPa)* 1959: Pressure Setpoint (kPa)** 1997: Hydraulic Status 1979: Pressure Feedback (kPa) 0395: Actual Speed (%) 0399: Actual Torque (%)
* ANIN02 used for Flow Setpoint ** ANIN02 not used for Flow Setpoint *** ANIN01 used for Pressure Feedback		* ANIN02 used for Flow Setpoint ** ANIN02 not used for Flow Setpoint	* ANIN02 used for Pressure Setpoint ** ANIN02 not used for Pressure Setpoint

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Setup Wizard::Application menu			
Accumulator Control	VFPC Control	“Q” Control	“P” Control
1901: Selected Application			
1940: Pump Speed Max (RPM) 1941: Pump Speed Min (RPM) 1942: Pump Disp per Rev (L) 1945: ANIN02 is Flow SP 1946: Flow SP Input Max (L/min) 1947: Flow SP Input Min (L/min) 1948: Flow Setpoint (L/min) 1949: ANIN01 is Pressure FB 1950: Pressure FB Input Max (kPa) 1951: Pressure FB Input Min (kPa) 1952: Pressure Limit High (kPa) 1953: Pressure Limit Low (kPa) 1960: Q Comp Delay (s) 1961: Q Comp Ramp Time (s) 1962: Q Comp Maximum (%) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s)	1940: Pump Speed Max (RPM) 1941: Pump Speed Min (RPM) 1942: Pump Disp per Rev (L) 1943: Flow FB Input Max (L/min) 1944: Flow FB Input Min (L/min) 1963: Pump Reserve Flow (%) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s)	1940: Pump Speed Max (RPM) 1941: Pump Speed Min (RPM) 1942: Pump Disp per Rev (L) 1945: ANIN02 is Flow SP 1946: Flow SP Input Max (L/min) 1947: Flow SP Input Min (L/min) 1948: Flow Setpoint (L/min) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s)	1940: Pump Speed Max (RPM) 1941: Pump Speed Min (RPM) 1950: Pressure FB Input Max (kPa) 1951: Pressure FB Input Min (kPa) 1954: ANIN02 is Pressure SP 1955: Pressure SP Input Max (kPa) 1956: Pressure SP Input Min (kPa) 1957: Pressure Setpoint Max (kPa) 1958: Pressure Setpoint Min (kPa) 1959: Pressure Setpoint (kPa) 1964: Pump Static Loss Comp (%) 1965: Pump Mech Eff Gain 1966: Pump Volume Eff Gain 1967: Pressure Torque Scale 1968: PID Correction Range 1969: Closed Loop Mode 1971: Auto Minimum Torque (%) 1972: Speed Threshold (%) 1973: Torque Boost Gain 1974: Min Spd Trq Boost Max (%) 1928: PID Proportional Gain 1929: PID Integral TC (s) 1930: PID Derivative TC (s) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s)

Quick Setup menu			
Accumulator Control	VFPC Control	“Q” Control	“P” Control
1945: ANIN02 is Flow SP 0486: Acceleration Time (s) 0487: Deceleration Time (s) 1952: Pressure Limit High (kPa) 1953: Pressure Limit Low (kPa) 1960: Q Comp Delay (s) 1961: Q Comp Ramp Time (s) 1962: Q Comp Maximum (%) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s) 1006: Run Wizard? 1934: View Level	0486: Acceleration Time (s) 0487: Deceleration Time (s) 1948: Pump Reserve Flow (%) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s) 1006: Run Wizard? 1934: View Level	1945: ANIN02 is Flow SP 0486: Acceleration Time (s) 0487: Deceleration Time (s) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s) 1006: Run Wizard? 1934: View Level	1954: ANIN02 is Pressure SP 0486: Acceleration Time (s) 0487: Deceleration Time (s) 1964: Pump Static Loss Comp (%) 1965: Pump Mech Eff Gain 1966: Pump Volume Eff Gain 1967: Pressure Torque Scale 1968: PID Correction Range 1969: Closed Loop Mode 1971: Auto Minimum Torque (%) 1972: Speed Threshold (%) 1973: Torque Boost Gain 1974: Min Spd Trq Boost Max (%) 1928: PID Proportional Gain 1929: PID Integral TC (s) 1930: PID Derivative TC (s) 1975: Oil Level Alarm Delay (s) 1976: Oil Temp Alarm Delay (s) 1006: Run Wizard? 1934: View Level

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Quick Monitor menu			
Accumulator Control	VFPC Control	“Q” Control	“P” Control
0383: Energy (kWh)	0383: Energy (kWh)	0383: Energy (kWh)	0383: Energy (kWh)
0393: Actual Speed (RPM)	0393: Actual Speed (RPM)	0393: Actual Speed (RPM)	0393: Actual Speed (RPM)
0394: Actual Speed (rev/s)	0394: Actual Speed (rev/s)	0394: Actual Speed (rev/s)	0394: Actual Speed (rev/s)
0395: Actual Speed (%)	0395: Actual Speed (%)	0395: Actual Speed (%)	0395: Actual Speed (%)
0399: Actual Torque (%)	0399: Actual Torque (%)	0399: Actual Torque (%)	0399: Actual Torque (%)
1984: FB Transducer OK	1984: FB Transducer OK		1984: FB Transducer OK
1985: Oil Level OK	1985: Oil Level OK	1985: Oil Level OK	1985: Oil Level OK
1986: Oil Temperature OK	1986: Oil Temperature OK	1986: Oil Temperature OK	1986: Oil Temperature OK
1987: High Pressure			
1988: Low Pressure			
1990: Start PB Input NO	1990: Start PB Input NO	1990: Start PB Input NO	1990: Start PB Input NO
1991: Stop PB Input NC	1991: Stop PB Input NC	1991: Stop PB Input NC	1991: Stop PB Input NC
1992: Manual Override Input	1992: Manual Override Input	1992: Manual Override Input	1992: Manual Override Input
1993: Oil Level OK Input	1993: Oil Level OK Input	1993: Oil Level OK Input	1993: Oil Level OK Input
1994: Oil Temp OK Input	1994: Oil Temp OK Input	1994: Oil Temp OK Input	1994: Oil Temp OK Input
1995: High Pressure Input			
1996: Low Pressure Input			
0696: First Trip	0696: First Trip	0696: First Trip	0696: First Trip
1995: Recent Trips[]	1995: Recent Trips[]	1995: Recent Trips[]	1995: Recent Trips[]

Setup::Application and Monitor::Application

The contents of the Setup and Monitor menus are customized for the selected Application. They Include all parameters listed in the table at the end of this manual.

Setup::Application			
Accumulator Control	VFPC Control	“Q” Control	“P” Control
<ul style="list-style-type: none"> Application App Selection Pump Flow Setpoint Pressure Feedback Q Compensation Skip Frequencies Alarms 	<ul style="list-style-type: none"> Application App Selection Pump Flow Feedback VFPC Control Skip Frequencies Alarms 	<ul style="list-style-type: none"> Application App Selection Pump Flow Setpoint Skip Frequencies Alarms 	<ul style="list-style-type: none"> Application App Selection Pump Pressure Feedback Pressure Setpoint P Control PID Alarms

Monitor::Application			
Accumulator Control	VFPC Control	“Q” Control	“P” Control
<ul style="list-style-type: none"> Application Pump Pressure Feedback Flow Setpoint Alarms Digital Inputs 	<ul style="list-style-type: none"> Application Pump Flow Feedback Alarms Digital Inputs 	<ul style="list-style-type: none"> Application Pump Flow Setpoint Alarms Digital Inputs 	<ul style="list-style-type: none"> Application Pressure Feedback Pressure Setpoint PID Alarms Digital Inputs

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ALARMS

Setup::Application::Alarms

Monitor::Application::Alarms*

Application specific parameters to setup and monitor alarms.

PNO	Parameter Descriptions
1975	Oil Level Alarm Delay This is the duration that the Oil Level OK input must be FALSE before the Oil Level Alarm becomes active.
1976	Oil Temp Alarm Delay Oil Temperature Alarm Delay. This is the duration that the Oil Temperature OK input must be FALSE before the Oil Temperature Alarm becomes active.
1985	Oil Level OK* Diagnostic when TRUE indicates that Oil Level Alarm is not active
1986	Oil Temperature OK* Diagnostic when TRUE indicates that Oil Temperature Alarm is not active

Functional Description

If either the Oil Level Alarm or Oil Temperature Alarm become active, the Drive is disabled.

The delay parameters are used to filter the alarm digital inputs. For an alarm to become active, the corresponding digital input must remain low (FALSE) for the duration of the delay.

APP SELECTION**Setup::Application::App Selection**

Application specific parameter to setup the control strategy and terminal usage.

PNO	Parameter Descriptions
1900	<p>Selected Application</p> <p>This is an enumerated parameter which allows the required hydraulic control application to be selected.</p> <p>0: ACCUMULATOR CONTROL Flow Setpoint with Pressure Limit Feedback 1: VFPC CONTROL Flow Feedback 2: Q CONTROL Flow Setpoint 3: P CONTROL Pressure Setpoint with Pressure Feedback</p>

Functional Description

The Selected Application can only be changed when the drive is in the configuration mode. The menus and parameters viewed on the GKP depend on the application. Unused parameters are hidden.

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DIGITAL INPUTS

Monitor::Application::Digital Inputs*

Application specific monitor for digital inputs.

PNO	Parameter Descriptions
1990	Start PB Input NO* Start Pushbutton Input (Normally Open). Diagnostic showing the state of DIGIN01. This is the same as 0006: Digin_01 . Also the same as bit 0 of 0005: Digin_Value .
1991	Stop PB Input NO* Stop Pushbutton Input (Normally Closed). Diagnostic showing the state of DIGIN02. This is the same as 0007: Digin_02 . Also the same as bit 1 of 0005: Digin_Value .
1992	Manual Override Input * Diagnostic showing the state of DIGIN03. This is the same as 0008: Digin_03 . Also the same as bit 2 of 0005: Digin_Value .
1993	Oil Level OK Input * Diagnostic showing the state of DIGIN04. This is the same as 0009: Digin_04 . Also the same as bit 3 of 0005: Digin_Value .
1994	Oil Temp OK Input * Oil Temperature OK Input. Diagnostic showing the state of DIGIN05. This is the same as 0010: Digin_05 . Also the same as bit 4 of 0005: Digin_Value .
1995	High Pressure Input * Accumulator Control only Diagnostic showing the state of DIGIN06. This is the same as 0011: Digin_06 . Also the same as bit 5 of 0005: Digin_Value .
1996	Low Pressure Input * Accumulator Control only Diagnostic showing the state of DIGIN07. This is the same as 0012: Digin_07 . Also the same as bit 6 of 0005: Digin_Value .

Functional Description

These diagnostic parameters present the state of the digital inputs used by the application with a name reflecting their use in the selected application.

FLOW FEEDBACK*VFPC Control only***Setup::Application::Flow Feedback****Monitor::Application::Flow Feedback***

Application specific parameters to setup and monitor the flow feedback.

PNO	Parameter Descriptions
1943	Flow FB Input Max Flow Feedback Input Maximum. This is the full range value in L/min for the flow feedback analog input (ANIN01). It corresponds to the maximum input value of either 10V or 20mA depending on the setting of 0001: Anin 01 Type .
1944	Flow FB Input Min Flow Feedback Input Minimum. This is the minimum value in L/min for the flow feedback analog input (ANIN01). It corresponds to the minimum input value of either 0V, 0mA or 4mA depending on the setting of 0001: Anin 01 Type .
1980	Flow Feedback* This diagnostic shows the Flow Feedback in L/min from the Flow Feedback analog input (ANIN01).
1984	FB Transducer OK* This diagnostic is FALSE when 0001: Anin 01 Type is set to 4..20mA and the measured input is below 4mA.

Functional Description

The analog input used for the flow feedback is scaled using the **1943: Flow FB Input Max** and **1944: Flow FB Input Min** parameters. These define the range and offset in L/min.

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FLOW SETPOINT

Accumulator Control and “Q” Control only

Setup::Application::Flow Setpoint

Monitor::Application::Flow Setpoint*

Application specific parameters to setup flow setpoint.

PNO	Parameter Descriptions
1945	ANIN02 is Flow SP Analog Input 02 is Flow Setpoint. When set TRUE the analog input to be used as the flow setpoint instead of 1948: Flow Setpoint .
1946	Flow SP Input Max Flow Setpoint Input Maximum. This is the full range value in L/min for the flow setpoint analog input (ANIN02). It corresponds to the maximum input value of 10V.
1947	Flow SP Input Min Flow Setpoint Input Minimum. This is the minimum value in L/min for the flow setpoint analog input (ANIN02). It corresponds to the minimum input value of 0V.
1948	Flow Setpoint This parameter sets the flow setpoint when 1945: ANIN02 is Flow SP is FALSE. The entered value is clamped to be between 1977: Pump Flow Maximum and 1958: Pump Flow Minimum . These limits are calculated from 1940: Pump Speed Max , 1941: Pump Speed Min and 0142: Pump Disp per Rev .
1979	Actual Flow Setpoint* This diagnostic shows the flow setpoint value being used in L/min. This with either be the same as 1948: Flow Setpoint or the value from ANIN02 clamped by 1977: Pump Flow Maximum and 1978: Pump Flow Minimum .

Functional Description

The analog input used for the flow setpoint is scaled using the **1946: Flow SP Input Max** and **1947: Flow SP Input Min** parameters. These define the range and offset in L/min.

1947: Flow SP Input Max and **1948: Flow SP Input Min** are not required to be set if **1945: ANIN02 is Flow SP** is set FALSE.

PID**Setup::Application::PID****Monitor::Application::PID***

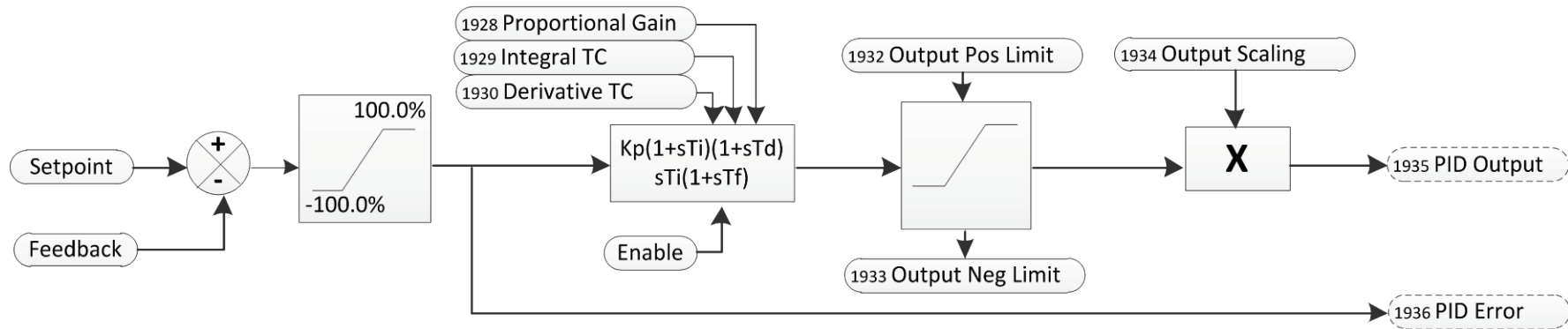
This function allows the AC30V to be used in applications requiring a trim to the reference, depending on feedback from an external measurement device. Typically this will be used for process control, i.e. pressure or flow.

PNO	Parameter Descriptions
	<p>Setpoint</p> <p>This is connected to an Analog Input through the application.</p>
	<p>Feedback</p> <p>This is connected to an Analog Input through the application.</p>
	<p>Enable</p> <p>This is set TRUE by the application when flow control is required (AUTO mode). It globally resets the PID output and integral term when FALSE. Enable must be TRUE for the PID to operate.</p>
1928	<p>PID Proportional Gain</p> <p>This is the true proportional gain of the PID controller. When set to zero the PID Output is zero.</p>
1929	<p>PID Integral TC</p> <p>The integral time constant of the PID controller.</p>
1930	<p>PID Derivative TC</p> <p>The derivative time constant of the PID controller.</p>

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PNO	Parameter Descriptions
1931	PID Output Filter TC In order to help attenuate high frequency noise on the PID output, a first order output filter has been provided. This parameter determines the output filter time constant.
1935	PID Output* PID output monitor
1936	PID Error* PID error monitor. This is Setpoint – Feedback.

Functional Description



PRESSURE FEEDBACK*Accumulator Control and "P" Control only***Setup::Application::Pressure Feedback****Monitor::Application::Pressure Feedback***

Application specific parameters to setup and monitor the pressure feedback.

PNO	Parameter Descriptions
1949	ANIN01 is Pressure FB <i>Accumulator Control only</i> Analog Input 01 is Pressure Feedback. When set TRUE the analog input to be used to detect high and low pressure instead of using the digital inputs.
1950	Pressure FB Input Max Pressure Feedback Input Maximum. This is the full range value in kPa for the pressure feedback analog input (ANIN01). It corresponds to the maximum input value of either 10V or 20mA depending on the setting of 0001: Anin 01 Type .
1951	Pressure FB Input Min Pressure Feedback Input Minimum. This is the minimum value in kPa for the pressure feedback analog input (ANIN01). It corresponds to the minimum input value of either 0V, 0mA or 4mA depending on the setting of 0001: Anin 01 Type .
1952	Pressure Limit High <i>Accumulator Control only</i> This parameter sets the high pressure limit when the analog input is being used for Accumulator Control pressure feedback.
1953	Pressure Limit Low <i>Accumulator Control only</i> This parameter sets the low pressure limit when the analog input is being used for Accumulator Control pressure feedback.
1979	Pressure Feedback* This diagnostic shows the Pressure Feedback in kPa from the Pressure Feedback analog input (ANIN01).
1984	FB Transducer OK* This diagnostic is FALSE when 0001: Anin 01 Type is set to 4..20mA and the measured input is below 4mA.
1985	High Pressure* <i>Accumulator Control only</i> This diagnostic is TRUE when the pressure feedback value is greater than 1952: Pressure Limit High or DIGIN07 is TRUE.
1986	Low Pressure* <i>Accumulator Control only</i> This diagnostic is TRUE when the pressure feedback value is less than 1953: Pressure Limit Low or DIGIN06 is TRUE.

Functional Description

The analog input used for the pressure feedback is scaled using the **1950: Pressure FB Input Max** and **1951: Pressure FB Input Min** parameters. These define the range and offset in kPa.

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In Accumulator Control mode **1950: Pressure FB Input Max** and **1951: Pressure FB Input Min** are not required to be set if **1949: ANIN01 is Pressure FB** is set FALSE.

In Accumulator Control mode **1952: Pressure Limit High** and **1953: Pressure Limit Low** must be set if **1949: ANIN01 is Pressure FB** is set TRUE.

PRESSURE SETPOINT*"P" Control only***Setup::Application::Pressure Setpoint****Monitor::Application::Pressure Setpoint***

Application specific parameters to setup and monitor the pressure setpoint.

PNO	Parameter Descriptions
1954	ANIN02 is Pressure SP Analog Input 02 is Pressure Setpoint. When set TRUE the analog input to be used as the pressure setpoint instead of 1959: Pressure Setpoint .
1955	Pressure SP Input Max Pressure Setpoint Input Maximum. This is the full range value in kPa for the pressure setpoint analog input (ANIN02). It corresponds to the maximum input value of 10V.
1956	Pressure SP Input Min Pressure Setpoint Input Minimum. This is the minimum value in kPa for the pressure setpoint analog input (ANIN02). It corresponds to the minimum input value of 0V.
1957	Pressure Setpoint Max Pressure Setpoint Maximum. This value is the high clamp value for the Pressure Setpoint in kPa.
1958	Pressure Setpoint Min Pressure Setpoint Minimum. This value is the low clamp value for the Pressure Setpoint in kPa.
1959	Pressure Setpoint This parameter sets the pressure setpoint when 1954: ANIN02 is Pressure SP is FALSE. The entered value is clamped to be between 1957: Pressure Setpoint Max and 1958: Pressure Setpoint Min .
1981	Actual Pressure SP* Actual Pressure Setpoint. This diagnostic shows the pressure setpoint value being used in kPa. This with either be the same as 1959: Pressure Setpoint of the value from ANIN02 clamped by 1957: Pressure Setpoint Max and 1958: Pressure Setpoint Min .

Functional Description

The analog input used for the pressure setpoint is scaled using the **1955: Pressure SP Input Max** and **1956: Pressure SP Input Min** parameters. These define the range and offset in kPa.

1955: Pressure SP Input Max and **1956: Pressure SP Input Min** are not required to be set if **1954: ANIN02 is Pressure SP** is set FALSE.

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PUMP

Setup::Application::Pump

Monitor::Application::Pump*

Application specific parameters to setup and monitor the pump.

PNO	Parameter Descriptions
1940	Pump Speed Max This is the maximum speed in RPM that the pump can operate. It is the same as the 0464: 100% Speed in RPM parameter.
1941	Pump Speed Min This is the minimum speed in RPM that the pump is allowed to operate. It sets the low limit for the speed demand when running.
1942	Pump Disp per Rev <i>Accumulator Control, VFPC Control and "Q" Control only</i> Pump Displacement per Revolution. This sets the number of Cubic Inches (in ³) displaced by one revolution of the pump.
1977	Pump Flow Maximum* <i>Accumulator Control, VFPC Control and "Q" Control only</i> Diagnostic showing the maximum flow through the pump with the given maximum RPM and displacement.
1978	Pump Flow Minimum* <i>Accumulator Control, VFPC Control and "Q" Control only</i> Diagnostic showing the minimum flow through the pump with the given maximum RPM and displacement.

Functional Description

The maximum pump speed is set in RPM using **1940: Pump Speed Max**. This corresponds to 100% speed demand. A minimum speed may be set using **1941: Pump Speed Min**, also in RPM.

The calculation from flow to pump speed is set by **0142: Pump Disp per Rev**.

Q COMPENSATION*Accumulator Control only***Setup::Application::Q Compensation**

Application specific parameters to setup Minimum Pressure Q Compensation.

PNO	Parameter Descriptions
1960	Q Comp Delay Q Compensation Delay. This specifies the duration from low pressure being detected until the compensation is applied.
1961	Q Comp Ramp Time Q Compensation Ramp Time. This limits the rate at which the compensation is applied. It is the duration over which the compensation is increased from 0% to the maximum specified by 1962: Q Comp Maximum .
1962	Q Comp Maximum Q Compensation Maximum. The maximum amount of compensation that can be applied specified as a % of 1940: Pump Speed Max .

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SKIP FREQUENCIES

Setup::Application::Skip Frequencies

When used in the Hydraulics **Accumulator**, **VFPC** or “**Q**” control modes a maximum of 4 skip frequencies are available for use.

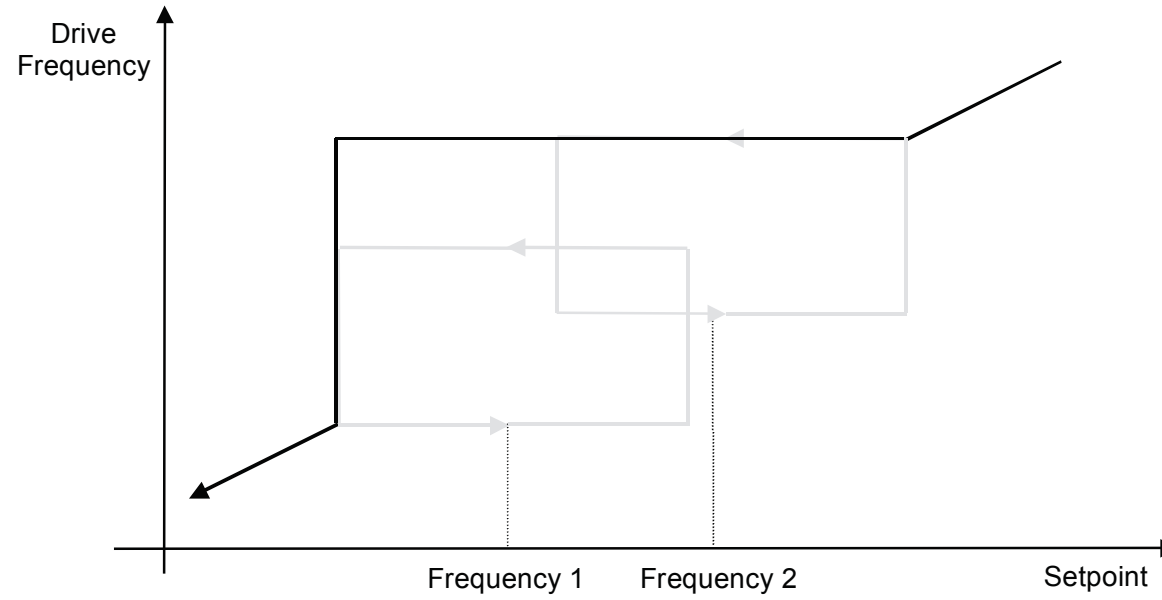
This function is used to prevent the Drive operating at frequencies that cause mechanical resonance in the pump.

PNO	Parameter Descriptions
1908	Skip Freq Band 1
1910	Skip Freq Band 2
1912	Skip Freq Band 3
1914	Skip Freq Band 4
	The width of skip band n in Hz.
1909	Skip Frequency 1
1911	Skip Frequency 2
1913	Skip Frequency 3
1915	Skip Frequency 4
	The centre frequency of skip band 1 in Hz.

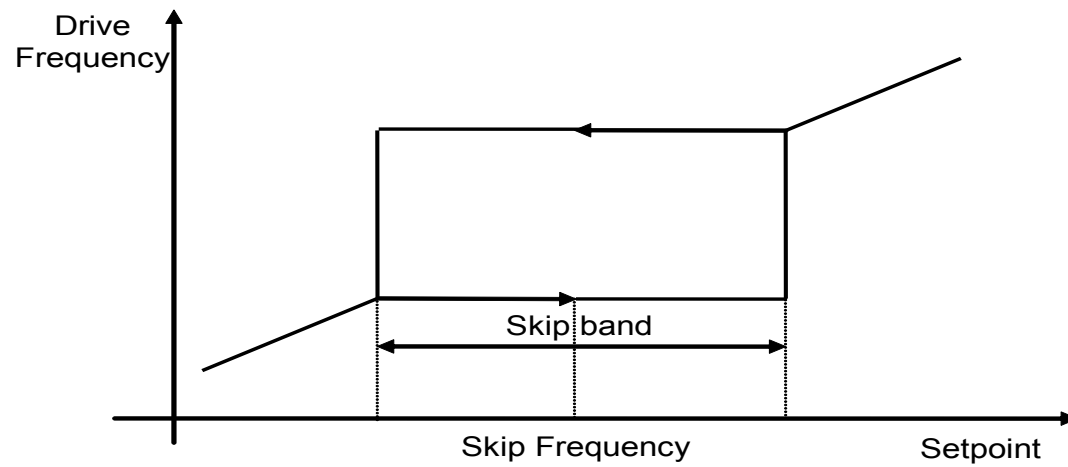
Functional Description

Skip frequencies are used to avoid resonances within the mechanical system. Enter the value of frequency that causes the resonance using a **Frequency** parameter and then program the width of the skip band using its **Band** parameter. The Drive will then avoid sustained operation within the forbidden band as shown in the diagram. The skip frequencies are symmetrical and thus work in forward and reverse.

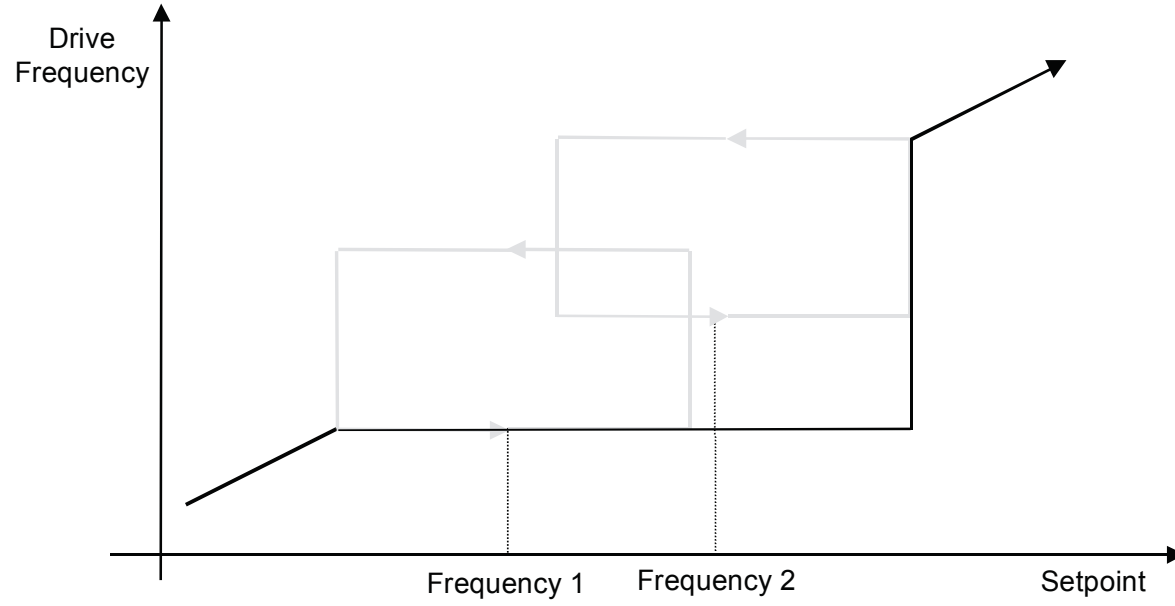
Setting a **Frequency** to 0.0 disables the corresponding band. Setting a **Band** to 0.0 causes the value of **Band 1** to be used for this band.



The behaviour of this function is illustrated below.



28 Hydraulic Control Applications



VFPC CONTROL*VFPC Control only***Setup::Application::VFPC Control**

Application specific parameter to setup VFPC Control.

PNO	Parameter Descriptions
1963	Pump Reserve Flow Instantaneous flow reserve needed. I.e. 20% reserve allows the pump to generate 20% more through the mechanical flow compensator.

30 Hydraulic Control Applications

PARAMETER TABLE

PNO	Name	Path(s)	Type	Default	Range	Units	WQ	Selected App	MBus
1900	Selected Application	Setup::Application::App Selection	USINT (enum)	0	0: ACCUMULATOR CONTROL 1: VFPC CONTROL 2: Q CONTROL 3: P CONTROL		CONFIG	ALL	04327
1908	Skip Band 1	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04343
1909	Skip Frequency 1	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04345
1910	Skip Band 2	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04347
1911	Skip Frequency 2	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04349
1912	Skip Band 3	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04351
1913	Skip Frequency 3	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04353
1914	Skip Band 4	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04355
1915	Skip Frequency 4	Setup::Application::Skip Frequencies	REAL	0.0	0.0 to 1000.0	Hz	ALWAYS	ACC, VFPC, Q	04357
1928	PID Proportional Gain	Setup::Application::PID	REAL	1.0	0.0 to 100.0		ALWAYS	P	04383
1929	PID Integral TC	Setup::Application::PID	TIME	1.00	0.01 to 100.00	S	ALWAYS	P	04385
1930	PID Derivative TC	Setup::Application::PID	TIME	0.000	0.000 to 10.000	S	ALWAYS	P	04387
1931	PID Output Filter TC	Setup::Application::PID	TIME	0.100	0.000 to 10.000	S	ALWAYS	P	04389
1935	PID Output	Setup::Application::PID	REAL			%	NEVER	P	04397
1936	PID Error	Setup::Application::PID	REAL			%	NEVER	P	04399
1940	Pump Speed Max	Setup::Application::Pump	REAL	1500.	1. to 100000.	RPM	STOPPED	ALL	04407
1941	Pump Speed Min	Setup::Application::Pump	REAL	400.	0. to 100000.	RPM	STOPPED	ALL	04409
1942	Pump Disp per Rev	Setup::Application::Pump	REAL	1.00	0.00 to 200.00	L	STOPPED	ACC, VFPC, Q	04411

PNO	Name	Path(s)	Type	Default	Range	Units	WQ	Selected App	Mbus
1943	Flow FB Input Max	Setup::Application::Flow Feedback	REAL	0.0	0.0 to 1000.0	L/min	STOPPED	VFPC	04413
1944	Flow FB Input Min	Setup::Application::Flow Feedback	REAL	0.0	0.0 to 1000.0	L/min	STOPPED	VFPC	04415
1945	ANIN02 is Flow SP	Setup::Application::Flow Setpoint	BOOL	TRUE			STOPPED	ACC, Q	04417
1946	Flow SP Input Max	Setup::Application::Flow Setpoint	REAL	0.0	0.0 to 1000.0	L/min	STOPPED	ACC, Q	04419
1947	Flow SP Input Min	Setup::Application::Flow Setpoint	REAL	0.0	0.0 to 1000.0	L/min	STOPPED	ACC, Q	04421
1948	Flow Setpoint	Setup::Application::Flow Setpoint	REAL	0.0	0.0 to 1000.0	L/min	STOPPED	ACC, Q	04423
1949	ANIN01 is Pressure FB	Setup::Application::Pressure Feedback	BOOL	FALSE			STOPPED	ACC	04425
1950	Pressure FB Input Max	Setup::Application::Pressure Feedback	REAL	0.	0. to 10000.	kPa	STOPPED	ACC, P	04427
1951	Pressure FB Input Min	Setup::Application::Pressure Feedback	REAL	0.	0. to 10000.	kPa	STOPPED	ACC, P	04429
1952	Pressure Limit High	Setup::Application::Pressure Feedback	REAL	0.	0. to 10000.	kPa	ALWAYS	ACC	04431
1953	Pressure Limit Low	Setup::Application::Pressure Feedback	REAL	0.	0. to 10000.	kPa	ALWAYS	ACC	04433
1954	ANIN02 is Pressure SP	Setup::Application::Pressure Setpoint	BOOL	FALSE			STOPPED	P	04435
1955	Pressure SP Input Max	Setup::Application::Pressure Setpoint	REAL	0.	0. to 10000.	kPa	STOPPED	P	04437
1956	Pressure SP Input Min	Setup::Application::Pressure Setpoint	REAL	0.	0. to 10000.	kPa	STOPPED	P	04439
1957	Pressure Setpoint Max	Setup::Application::Pressure Setpoint	REAL	0.	0. to 10000.	kPa	ALWAYS	P	04441
1958	Pressure Setpoint Min	Setup::Application::Pressure Setpoint	REAL	0.	0. to 10000.	kPa	ALWAYS	P	04443
1959	Pressure Setpoint	Setup::Application::Pressure Setpoint	REAL	0.	0. to 10000.	kPa	ALWAYS	P	04445
1960	Q Comp Delay	Setup::Application::Q Compensation	TIME	0.5	0.0 to 100.0	s	ALWAYS	ACC	04447
1961	Q Comp Ramp Time	Setup::Application::Q Compensation	TIME	5.0	0.0 to 100.0	s	ALWAYS	ACC	04449
1962	Q Comp Maximum	Setup::Application::Q Compensation	REAL	20.0	0.0 to 100.0	%	ALWAYS	ACC	04451
1963	Pump Reserve Flow	Setup::Application::VFPC Control	REAL	20.0	0.0 to 100.0	%	ALWAYS	VFPC	04453

32 Hydraulic Control Applications

PNO	Name	Path(s)	Type	Default	Range	Units	WQ	Selected App	Mbus
1964	Pump Static Loss Comp	Setup::Application::P Control	REAL	0.0	0.0 to 100.0	%	ALWAYS	P	04455
1965	Pump Mech Eff Gain	Setup::Application::P Control	REAL	0.000	0.000 to 10.000		ALWAYS	P	04457
1966	Pump Volume Eff Gain	Setup::Application::P Control	REAL	0.000	0.000 to 10.000		ALWAYS	P	04459
1967	Pressure Torque Scale	Setup::Application::P Control	REAL	1.000	0.000 to 10.000		ALWAYS	P	04461
1968	PID Correction Range	Setup::Application::P Control	REAL	0.150	0.000 to 1.000		ALWAYS	P	04463
1969	Closed Loop Mode	Setup::Application::P Control	BOOL	TRUE			ALWAYS	P	04465
1971	Auto Minimum Torque	Setup::Application::P Control	REAL	10.0	0.0 to 100.0	%	ALWAYS	P	04469
1972	Speed Threshold	Setup::Application::P Control	REAL	4.0	0.0 to 100.0	%	ALWAYS	P	04471
1973	Torque Boost Gain	Setup::Application::P Control	REAL	3.000	0.000 to 10.000		ALWAYS	P	04473
1974	Min Spd Trq Boost Max	Setup::Application::P Control	REAL	0.0	0.0 to 100.0	%	ALWAYS	P	04475
1975	Oil Level Alarm Delay	Setup::Application::Alarms	TIME	15.0	0.0 to 100.0	s	ALWAYS	ALL	04477
1976	Oil Temp Alarm Delay	Setup::Application::Alarms	TIME	15.0	0.0 to 100.0	s	ALWAYS	ALL	04479
1977	Pump Flow Maximum	Monitor::Application::Pump	REAL			L/min	NEVER	ACC, VFPC, Q	04481
1978	Pump Flow Minimum	Monitor::Application::Pump	REAL			L/min	NEVER	ACC, VFPC, Q	04483
1979	Pressure Feedback	Monitor::Application::Pressure Feedback	REAL			kPa	NEVER	ACC, P	04485
1980	Flow Feedback	Monitor::Application::Flow Feedback	REAL			L/min	NEVER	VFPC	04487
1981	Actual Pressure SP	Monitor::Application::Pressure Setpoint	REAL			kPa	NEVER	P	04489
1982	Actual Flow Setpoint	Monitor::Application::Flow Setpoint	REAL			L/min	NEVER	ACC, Q	04491
1983	Flow Demand	Control Screen	REAL			L/min	NEVER	ACC, VFPC, Q	04493
1984	FB Transducer OK	Monitor::Application::Pressure Feedback Monitor::Application::Flow Feedback	BOOL				NEVER	ACC, VFPC, P	04495

PNO	Name	Path(s)	Type	Default	Range	Units	WQ	Selected App	Mbus
1985	Oil Level OK	Monitor::Application::Alarms	BOOL				NEVER	ALL	04497
1986	Oil Temperature OK	Monitor::Application::Alarms	BOOL				NEVER	ALL	04499
1987	High Pressure	Monitor::Application::Pressure Feedback	BOOL				NEVER	VFPC	04501
1988	Low Pressure	Monitor::Application::Pressure Feedback	BOOL				NEVER	VFPC	04503
1990	Start PB Input NO	Monitor::Application::Digital Inputs	BOOL				NEVER	ALL	04507
1991	Stop PB Input NC	Monitor::Application::Digital Inputs	BOOL				NEVER	ALL	04509
1992	Manual Override Input	Monitor::Application::Digital Inputs	BOOL				NEVER	ALL	04511
1993	Oil Level OK Input	Monitor::Application::Digital Inputs	BOOL				NEVER	ALL	04513
1994	Oil Temp OK Input	Monitor::Application::Digital Inputs	BOOL				NEVER	ALL	04515
1995	High Pressure Input	Monitor::Application::Digital Inputs	BOOL				NEVER	ACC	04517
1996	Low Pressure Input	Monitor::Application::Digital Inputs	BOOL				NEVER	ACC	04519
1997	Hydraulic Status	Control Screen	USINT (enum)				NEVER	ALL	04521

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