



Instruction

VLT® HVAC Basic Drive Cascade Controller

1.1 Cascade Controller

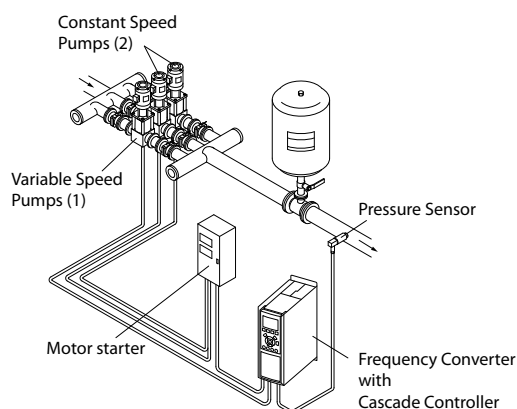


Illustration 1.1 Cascade Controller

The Cascade Controller is used for pump applications where a certain pressure ("head") or level needs to be maintained over a wide dynamic range. Running a large pump at variable speed over a wide for range is not an ideal solution because of low pump efficiency and because there is a practical limit of about 25% rated full load speed for running a pump.

In the Cascade Controller the frequency converter controls a variable speed motor as the variable speed pump (lead) and can stage up to two additional constant speed pumps on and off. By varying the speed of the initial pump, variable speed control of the entire system is provided. This maintains constant pressure while eliminating pressure surges, resulting in reduced system stress and quieter operation in pumping systems.

Fixed Lead Pump

The motors must be of equal size. The Cascade Controller allows the frequency converter to control up to 5 equal size pumps using the drives two built-in relays and terminal 27, 29 (digital input/digital output). When the variable pump (lead) is connected directly to the frequency converter, the other 4 pumps are controlled by the two built-in relays and terminal 27, 29 (digital input/digital output). Lead pump alternation can not be chosen when lead pump is fixed.

Lead Pump Alternation

The motors must be of equal size. This function makes it possible to cycle the frequency converter between the pumps in the system (when 25-57 Relays per Pump =1, maximum pump is 4. When 25-57 Relays per Pump =2, maximum pump is 3). In this operation the run time between pumps is equalized reducing the required pump maintenance and increasing reliability and lifetime of the system. The alternation of the lead pump can take place at a command signal or at staging (adding lag pump).

The command can be a manual alternation or an alternation event signal. If the alternation event is selected, the lead pump alternation takes place every time the event occurs. Selections include whenever an alternation timer expires, when the lead pump goes into sleep mode. Staging is determined by the actual system load.

25-55 Alternate if Load $\leq 50\% = 1$, if load $> 50\%$ Alternation will not happen. If load $\leq 50\%$ Alternation will happen. When 25-55 Alternate if Load $\leq 50\% = 0$, Alternation will happen no matter with Load. Total pump capacity is determined as lead pump plus lag speed pumps capacities.

Bandwidth Management

In cascade control systems, to avoid frequent switching of fixed speed pumps, the desired system pressure is kept within a bandwidth rather than at a constant level. The Staging Bandwidth provides the required bandwidth for operation. When a large and quick change in system pressure occurs, the Override Bandwidth overrides the Staging Bandwidth to prevent immediate response to a short duration pressure change. An Override Bandwidth Timer can be programmed to prevent staging until the system pressure has stabilized and normal control established.

When the Cascade Controller is enabled and running normally and the frequency converter issues a trip alarm, the system head is maintained by staging and destaging fixed speed pumps. To prevent frequent staging and destaging and minimize pressure fluxuations, a wider Fixed Speed Bandwidth is used instead of the Staging bandwidth.

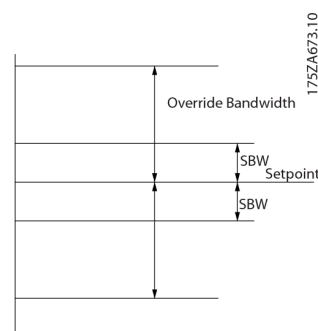


Illustration 1.2 Bandwidth

1.1.1 System Status and Operation

Only when lead pump is working, the frequency converter can go into sleep mode. When the Cascade Controller is enabled, the operation status for each pump and the Cascade Controller is displayed by 25-81, *Pump Status* and 25-80, *Cascade Status* on the LCP. Cascade Controller information displayed includes:

- Pumps Status, is a read out of the status for the relays assigned to each pump. The display shows pumps that are disabled, off, running on the frequency converter or running on the mains/ motor starter.
- Cascade Status, is a read out of the status for the Cascade Controller. The display shows the Cascade Controller is disabled, all pumps are running off, fixed speed pumps are being staged/de-staged and lead pump alternation is occurring.

1.1.2 Start/Stop Conditions

See 5-1* *Digital Inputs*.

Digital input commands	Variable speed pump (lead)	Fixed speed pumps (lag)
Start (SYSTEM START/STOP)	Ramps up (if stopped and there is a demand)	Staging (if stopped and there is a demand)
Lead Pump Start	Ramps up if SYSTEM START is active	Not affected
Coast (EMERGENCY STOP)	Coast to stop	Cut out (correspond relays, terminal 27/29 and 42/45)
External Interlock	Coast to stop	Cut out (built-in relays are de-energized)

Table 1.1 Commands Assigned to Digital Inputs

LCP keys	Variable speed pump (lead)	Fixed speed pumps (lag)
[Hand On]	Ramps up (if stopped by a normal stop command) or stays in operation if already running	Destaging (if running)
[Off]	Ramps down	Destaging
[Auto On]	Starts and stops according to commands via terminals or serial bus cascade controller only can work when drive in "Auto ON" mode	Staging/Destaging

Table 1.2 Function of Keys on LCP

1.1.3 Cascade Controller Parameter Detail

Parameter	Range	Default	Function
25-00 Cascade Controller	*[0] Disabled [1] Enabled	*[0] Disabled	Enable/disable the cascade controller which is used for staging multiple pumps.
25-04 Pump Cycling	*[0] Disabled [1] Enabled	*[0] Disabled	Select the method for determining the order of cutting in/out the fixed speed pumps.

Parameter	Range	Default	Function
25-05 Fixed Lead Pump	[0] No *[1] Yes	*[1] Yes	Select if the lead pump is fixed (Yes) or can be cycled (No).
25-06 Number of Pumps	2 - Expressionlimit (5)	*2	Set the total number of pumps including the variable speed pump.

Parameter	Range	Default	Function
25-20 Staging Bandwidth	1 - Expressionlimit (100) %	*10%	Set the SBW percentage to accommodate system pressure fluctuation.
	Expressionlimit (100) - 100%	*100%	Set the OBW for when to override the staging/destaging timers for immediate response.
25-22 Fixed Speed Bandwidth	Expressionlimit (1) - Expressionlimit (100) %	*Expressionlimit (10)%	Set the staging bandwidth to use when only fixed speed pumps are running.
25-23 SBW Staging Delay	0-3000 s	*15 s	Staging a pump on is delayed by the length of time programmed.
25-24 SBW Destaging Delay	0-3000 s	*15 s	Destaging a pump is delayed by the length of time programmed.
25-25 OBW Time	0-300 s	*10 s	OBW timer prevents staging a pump until the system pressure is stabilised.
25-27 Stage Function	[0] Disabled *[1] Enabled	*[1] Enabled	Enables the stage function timer.
25-28 Stage Function Time	0-300 s	*15 s	With the lead pump at maximum speed, a fixed speed pump is staged on when the programmed time expires.
25-29 Destage Function	[0] Disabled *[1] Enabled	*[1] Enabled	Enables the destage function timer.
25-30 Destage Function Time	0-300 s	*15 s	With the lead pump at minimum speed, a fixed speed pump is destaged when the programmed time expires.

Parameter	Range	Default	Function
25-42 Staging Threshold	Expressionlimit (0)-100%	*90%	The percentage [%] of maximum pump speed to stage on a fixed speed pump.
25-43 Destaging Threshold	Expressionlimit (0)-100%	*50%	The percentage [%] of maximum pump speed to destage a fixed speed pump.
25-45 Staging Speed [Hz]	0-400 Hz	*0.0 Hz	The actual staging speed based on the staging threshold.
25-47 Destaging Speed [Hz]	0-400 Hz	*0.0 Hz	The actual destaging speed based on the destaging threshold.
25-50 Lead Pump Alternation	*[0] Off [1] At staging [2] At command [3] At staging or command	*[0] Off	Changes the lead pump so all pumps run equal time.
25-51 Alternation Event	*[0] External [1] Alternation Time Interval [2] Sleep Mode	*[0] External	Choose the event that will change the lead pump.
25-52 Alternation Time Interval	1-999	*24	Set the time period between automatic alternation of the lead pump.
25-53 Alternation Timer Value			View the actual value of the Alternation Time Interval timer.
25-55 Alternate if Load <= 50%	[0] Disabled *[1] Enabled	*[1] Enabled	Choose enable to change the variable speed pump only if the pump load is less than 50%.
25-56 Staging Mode at Alternation	*[0] Slow [1] Quick	*[0] Slow	
25-57 Relays per Pump	1-2	*1	The number of relays used per pump.

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Parameter	Range	Default	Function
25-58 Run Next Pump Delay	0.1-5.0 s	*0.1 s	Time between stopping the old variable speed pump and starting the new appointed pump.
25-59 Run on Mains Delay	Expressionlimit (0.1)-5.0 s	*0.5 s	Time delay before a fixed speed pump is staged on according to normal staging sequence.
25-80 Cascade Status			View the control status for the Cascade Controller.
25-81 Pump Status	0-0	* 0	View the status for the pumps connected: X=Disabled, O=Off, D=Speed controlled, R=Mains.

Parameter	Range	Default	Function
25-84 Pump ON Time	0-2147483647	* 0	View the total operating hours of the connected pumps. Can be reset by writing 0..
25-90 Pump Interlock	*[0] Off [1] On	*[0] Off	Choose the pump to interlock for e.g. service. The pump will be taken out of any pump cycling etc.

Table 1.3

1.2 Installation

1.2.1 Control Terminals

Illustration 1.3 shows all control terminals of the frequency converter. Applying Start (terminal 18), connection between terminal 12-27 and an analog reference (terminal 53 or 54 and 55) make the frequency converter run.

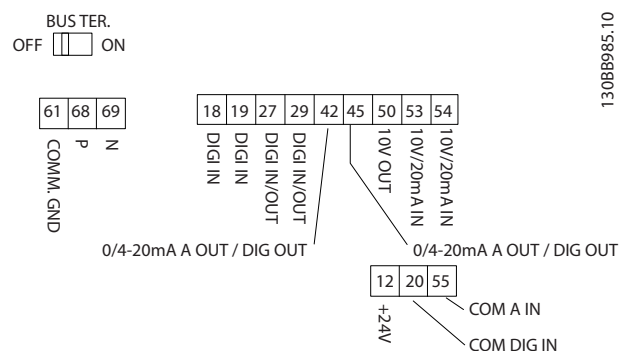
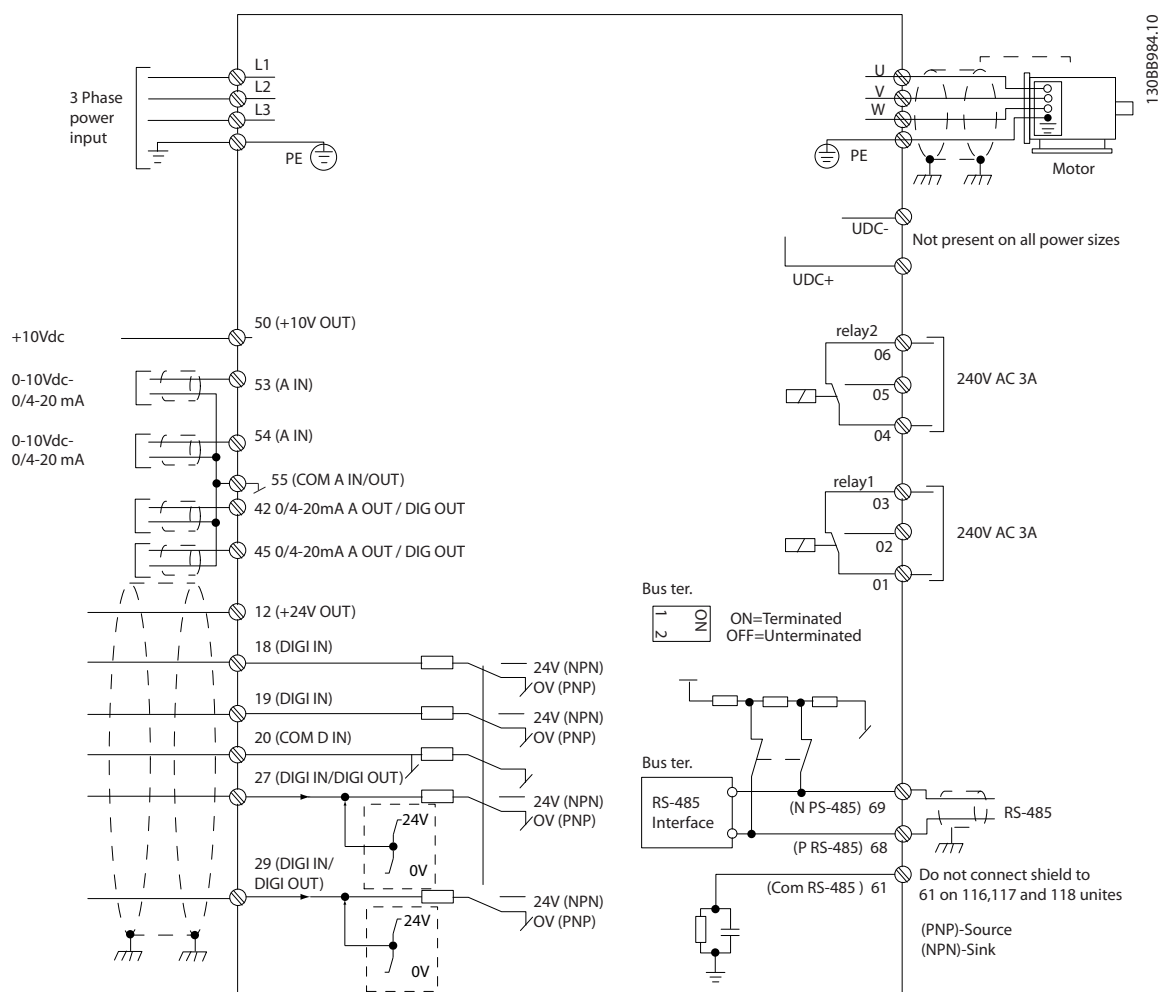


Illustration 1.3 Control Terminals



There is no access to UDC- and UDC+ on the following units:
IP20 380-480 V, 30-90 kW

1.3 Specifications

1.3.1 Product General Specifications

Frequency Converter	PK37	PK75	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5	P11K
Typical shaft output [kW]	0.37	0.75	1.5	2.2	3.0	4.0	5.5	7.5	11
IP20 Frame	H1	H1	H1	H2	H2	H2	H3	H3	H4
RFI Class	A1	A1	A1	A1	A1	A1	A1	A1	A1
PCB	Coated	Coated	Coated	Coated	Coated	Coated	Coated	Coated	Coated

Table 1.4

Frequency Converter	P15K	P18K	P22K	P30K	P37K	P45K	P55K	P75K	P90K
Typical shaft output [kW]	15	18	22	30	37	45	55	75	90
IP20 Frame	H4	H5	H5	H6	H6	H6	H7	H7	H8
RFI Class	A1	A1	A1	A1	A1	A1	A1	A1	A1
PCB	Coated	Coated	Coated	Coated	Coated	Coated	Coated	Coated	Coated

Table 1.5

1.4.1 Main Menu Structure

Operation / Display		Motor Limits		Terminal 53 Filter Time Constant		Bus Message Count	
0-0*	Basic Settings	4-1*	Motor Speed Direction	6-16	Terminal 53 mode	8-80	Bus Error Count
0-01	Language	4-12	Motor Speed Low Limit [Hz]	6-20	Analog Input 54	8-81	Slave Messages Rcvd
0-03	Regional Settings	4-14	Motor Magnetisation at Zero Speed	6-21	Terminal 54 Low Voltage	8-82	Slave Error Count
0-04	Operating State at Power-up	4-18	Current Limit	6-22	Terminal 54 High Voltage	8-83	Slave Messages Sent
0-06	GridType	4-19	Max Output Frequency	6-23	Terminal 54 Low Current	8-85	Slave Timeout Errors
0-07	Auto DC Braking	4-4*	Adj. Warnings 2	6-24	Terminal 54 High Current	8-88	Reset FC port Diagnostics
0-1*	Set-up Operations	4-40	Warning Freq. Low	6-25	Terminal 54 High Ref./Feedb. Value	8-9*	Bus Feedback
0-10	Active Set-up	4-41	Warning Freq. High	6-26	Terminal 54 Low Ref./Feedb. Value	8-94	Bus Feedback 1
0-11	Programming Set-up	4-5*	Adj. Warnings	6-29	Terminal 54 Filter Time Constant	13-2*	Smart Logic
0-12	Link Setups	4-50	Warning Current Low	6-30	Terminal 54 mode	13-0*	SLC Settings
0-3*	LCP Custom Readout	4-51	Warning Current High	6-7*	Analog/Digital Output 45	13-00	SL Controller Mode
0-30	Custom Readout Unit	4-54	Warning Reference Low	6-70	Terminal 45 Mode	13-01	Start Event
0-31	Custom Readout Min Value	4-55	Warning Reference High	6-71	Terminal 45 Analog Output	13-02	Stop Event
0-32	Custom Readout Max Value	4-56	Warning Feedback Low	6-72	Terminal 45 Digital Output	13-03	Reset SLC
0-37	Display Text 1	4-57	Warning Feedback High	6-73	Terminal 45 Output Min Scale	13-1*	Comparators
0-38	Display Text 2	4-58	Missing Motor Phase Function	6-74	Terminal 45 Output Max Scale	13-10	Comparator Operand
0-39	Display Text 3	4-6*	Speed Bypass	6-76	Terminal 45 Output Bus Control	13-11	Comparator Operator
0-40	[Hand on] Key on LCP	4-61	Bypass Speed From [Hz]	6-9*	Analog/Digital Output 42	13-12	Comparator Value
0-42	[Auto on] Key on LCP	4-63	Bypass Speed To [Hz]	6-90	Terminal 42 Mode	13-2*	Timers
0-44	[Off/Reset] Key on LCP	4-64	Semi-Auto Bypass Set-up	6-91	Terminal 42 Analog Output	13-20	SL Controller Timer
0-5*	Copy/Save	5-0*	Digital In/Out	6-92	Terminal 42 Digital Output	13-4*	Logic Rules
0-50	LCP Copy	5-00	Digital Input Mode	6-93	Terminal 42 Output Min Scale	13-40	Logic Rule Boolean 1
0-51	Set-up Copy	5-01	Digital Input Mode	6-94	Terminal 42 Output Max Scale	13-41	Logic Rule Operator 1
0-6*	Password	5-02	Terminal 29 Mode	6-96	Terminal 42 Output Bus Control	13-42	Logic Rule Boolean 2
0-60	Main Menu Password	5-03	Digital Input 29 Mode	6-98	Drive Type	13-43	Logic Rule Operator 2
1-*	Load and Motor	5-1*	Digital Inputs	8-*	Comm- and Options	13-44	Logic Rule Boolean 3
1-0*	General Settings	5-10	Terminal 18 Digital Input	8-0*	General Settings	13-5*	States
1-00	Configuration Mode	5-11	Terminal 19 Digital Input	8-01	Control Site	13-51	SL Controller Event
1-01	Motor Control Principle	5-12	Terminal 27 Digital Input	8-02	Control Source	13-52	SL Controller Action
1-03	Torque Characteristics	5-13	Terminal 29 Digital Input	8-03	Control Timeout Time	14-*	Special Functions
1-08	Clockwise Direction	5-3*	Digital Outputs	8-04	Control Timeout Function	14-0*	Inverter Switching
1-08	Motor Control Bandwidth	5-30	Terminal 27 Digital Output	8-3*	FC Port Settings	14-01	Switching Frequency
1-1*	Motor Selection	5-31	Terminal 29 Digital Output	8-30	Protocol	14-03	Overmodulation
1-10	Motor Construction	5-34	On Delay, Digital Output	8-31	Address	14-08	Damping Gain Factor
1-14	Damping Gain	5-35	Off Delay, Digital Output	8-32	Baud Rate	14-1*	Mains On/Off
1-15	Low Speed Filter Time Const	5-4*	Relays	8-33	Parity / Stop Bits	14-12	Function at Mains Imbalance
1-16	High Speed Filter Time Const	5-40	Function Relay	8-35	Minimum Response Delay	14-2*	Reset Functions
1-17	Voltage filter time const	5-41	On Delay, Relay	8-36	Maximum Response Delay	14-20	Reset Mode
1-2*	Motor Data	5-42	Off Delay, Relay	8-37	Maximum Inter-char delay	14-21	Automatic Restart Time
1-20	Motor Power	5-5*	Pulse Input	8-4*	FC MC protocol set	14-22	Operation Mode
1-22	Motor Voltage	5-50	Term. 29 Low Frequency	8-42	PCD Write Configuration	14-23	Typecode Setting
1-23	Motor Frequency	5-51	Term. 29 High Frequency	8-43	PCD Read Configuration	14-27	Action At Inverter Fault
1-24	Motor Current	5-52	Term. 29 Low Ref./Feedb. Value	8-5*	Digital/Bus	14-28	Production Settings
1-25	Motor Nominal Speed	5-53	Term. 29 High Ref./Feedb. Value	8-50	Coasting Select	14-29	Service Code
1-26	Motor Cont. Rated Torque	5-5*	Bus Controlled	8-51	Quick Stop Select	14-4*	Energy Optimising
1-29	Automatic Motor Adaptation (AMA)	5-90	Digital & Relay Bus Control	8-52	DC Brake Select	14-40	VT Level
1-30	Stator Resistance (Rs)	6-*	Analog In/Out	8-53	Start Select	14-41	AEO Minimum Magnetisation
1-33	Stator Leakage Reactance (Xl)	6-0*	Analog I/O Mode	8-54	Reversing Select	14-5*	Environment
1-35	Main Reactance (Xh)	6-00	Live Zero Timeout Time	8-55	Set-up Select	14-50	RFI Filter
1-37	d-axis Inductance (Ld)	6-01	Live Zero Timeout Function	8-56	Preset Reference Select	14-51	DC-Link Voltage Compensation
1-39	Motor Poles	6-1*	Analog Input 53	8-7*	BACnet	14-52	Fan Control
1-4*	Adv. Motor Data II	6-10	Ramp 2	8-70	BACnet Device Instance	14-53	Fan Monitor
		6-11	Ramp 2 Ramp Up Time	8-72	M5/TP Max Masters	14-55	Output Filter
		6-12	Ramp 2 Ramp Down Time	8-73	M5/TP Max Info Frames	14-6*	Auto Derate
		6-13	Other Ramps	8-74	"I am" Service	14-63	Min Switch Frequency
		6-14	Jog Ramp Time	8-75	Initialisation Password	15-*	Drive Information
		6-15	Quick Stop Ramp Time	8-79	Protocol Firmware version	15-0*	Operating Data
			Limits / Warnings	8-8*	FC Port Diagnostics	15-00	Operating hours

15-01	Running Hours	16-65	Analog Output AO42 [mA]	25-2*	Bandwidth Settings	38-41	Name Of Analog Value 3 For BACnet
15-02	kWh Counter	16-66	Digital Output	25-20	Staging Bandwidth	38-42	Name Of Analog Value 5 For BACnet
15-03	Power Up's	16-67	Pulse Input #29 [Hz]	25-21	Override Bandwidth	38-43	Name Of Analog Value 6 For BACnet
15-04	Over Temp's	16-71	Relay Output [bin]	25-22	Fixed Staging Bandwidth	38-44	Name Of Binary Value 1 For BACnet
15-05	Over Volt's	16-72	Counter A	25-23	SBW Staging Delay	38-45	Name Of Binary Value 2 For BACnet
15-06	Reset kWh Counter	16-73	Counter B	25-24	SBW Destaging Delay	38-46	Name Of Binary Value 3 For BACnet
15-07	Reset Running Hours Counter	16-79	Analog Output AO45	25-25	OBW Time	38-47	Name Of Binary Value 4 For BACnet
15-3*	Alarm Log	16-8*	Fieldbus & FC Port	25-27	Stage Function	38-48	Name Of Binary Value 5 For BACnet
15-30	Alarm Log: Error Code	16-86	FC Port REF 1	25-28	Stage Function Time	38-49	Name Of Binary Value 6 For BACnet
15-31	InternalFaultReason	16-9*	Diagnosis Readouts	25-29	Destage Function	38-50	Name Of Binary Value 22 For BACnet
15-4*	Drive Identification	16-90	Alarm Word	25-30	Destage Function Time	38-51	Name Of Binary Value 21 For BACnet
15-40	FC Type	16-91	Alarm Word 2	25-3*	Staging Settings	38-52	Name Of Binary Value 33 For BACnet
15-41	Power Section	16-92	Warning Word	25-42	Staging Threshold	38-53	Bus Feedback 1 Conversion
15-42	Voltage	16-93	Warning Word 2	25-43	Destaging Threshold	38-54	Run Stop Bus Control
15-43	Software Version	16-94	Ext. Status Word	25-45	Staging Speed [Hz]	38-58	Inverter ETR counter
15-44	Ordered TypeCode	16-95	Ext. Status Word 2	25-47	Destaging Speed [Hz]	38-59	Rectifier ETR counter
15-46	Drive Ordering No	18-*	Info. & Readouts	25-5*	Alternation Settings	38-60	DB ErrorWarnings
15-47	Power Card Ordering No	18-1*	Fire Mode Log	25-50	Lead Pump Alternation	38-61	Extended Alarm Word
15-48	LCP Id No	18-10	FireMode LogEvent	25-51	Alternation Event	38-69	AMA_DebugS32
15-49	SW ID Control Card	20-*	Drive Closed Loop	25-52	Alternation Time Interval	38-74	AOCDebug0
15-50	SW ID Power Card	20-0*	Feedback	25-53	Alternation Timer Value	38-75	AOCDebug1
15-51	Drive Serial Number	20-00	Feedback 1 Source	25-55	Alternate if Load <= 50%	38-76	AO42_FixedMode
15-53	Power Card Serial Number	20-01	Feedback 1 Conversion	25-56	Staging Mode at Alternation	38-77	AO42_FixedValue
15-9*	Parameter Info	20-8*	PI Basic Settings	25-57	Relays per Pump	38-78	DL_TestCounters
15-92	Defined Parameters	20-81	PI Normal/ Inverse Control	25-58	Run Next Pump Delay	38-79	Protect Func. Counter
15-97	Application Type	20-83	PI Start Speed [Hz]	25-59	Run on Mains Delay	38-80	Highest Lowest Couple
15-98	Drive Identification	20-84	On Reference Bandwidth	25-8*	Status	38-81	DB_SendDebugCmd
16-*	Data Readouts	20-9*	PI Controller	25-80	Cascade Status	38-82	MaxTaskRunningTime
16-0*	General Status	20-91	PI Anti Windup	25-81	Pump Status	38-83	DebugInformation
16-00	Control Word	20-93	PI Proportional Gain	25-84	Pump ON Time	38-85	DB_OptionSelector
16-01	Reference [Unit]	20-94	PI Integral Time	25-9*	Service	38-86	EEPROM_Address
16-02	Reference [%]	20-97	PI Feed Forward Factor	25-90	Pump Interlock	38-87	EEPROM_Value
16-03	Status Word	22-*	Appl. Functions	38-*	Debug only - see PNU 1429 (service-code) also	38-88	Logger Time Remain
16-05	Main Actual Value [%]	22-4*	Sleep Mode	38-0*	All debug parameters	38-90	LCP FC-Protocol select
16-09	Custom Readout	22-40	Minimum Run Time	38-00	TestMonitorMode	38-91	Motor Power Internal
16-1*	Motor Status	22-41	Minimum Sleep Time	38-01	Version And Stack	38-92	Motor Voltage Internal
16-10	Power [kW]	22-43	Wake-Up Speed [Hz]	38-06	LCPEdit Set-up	38-93	Motor Frequency Internal
16-11	Power [hp]	22-44	Wake-Up Ref./FB Diff	38-07	EPEPROMdataVers	38-94	Lsigma
16-12	Motor Voltage	22-45	Setpoint Boost	38-08	PowerData/VariantID	38-95	DB_SimulateAlarmWarningExStatus
16-13	Frequency	22-46	Maximum Boost Time	38-09	AMA Retry	38-96	Data Logger Password
16-14	Motor current	22-47	Sleep Speed [Hz]	38-10	DAC selection	38-97	Data Logging Period
16-15	Frequency [%]	22-6*	Broken Belt Detection	38-12	DAC scale	38-98	Signal to Debug
16-18	Motor Thermal	22-60	Broken Belt Function	38-20	MOC_TestUS16	38-99	Signed Debug Info
16-3*	Drive Status	22-61	Broken Belt Torque	38-21	MOC_TestS16		
16-30	DC Link Voltage	22-62	Broken Belt Delay	38-23	TestMocFunctions		
16-34	Heatsink Temp.	24-0*	Appl. Functions 2	38-24	DC Link Power Measurement		
16-35	Inverter Thermal	24-00	FM Function	38-25	CheckSum		
16-36	Inv. Nom. Current	24-05	FM Preset Reference	38-30	Analog Input 53 (%)		
16-37	Inv. Max. Current	24-09	FM Alarm Handling	38-31	Analog Input 54 (%)		
16-38	SL Controller State	24-1*	Drive Bypass	38-32	Input Reference 1		
16-5*	Ref. & Feeds.	24-10	Drive Bypass Function	38-33	Input Reference 2		
16-50	External Reference	24-11	Drive Bypass Delay Time	38-34	Input Reference Setting		
16-52	Feedback[Unit]	25-*	Cascade Controller	38-35	Feedback (%)		
16-6*	Inputs & Outputs	25-0*	System Settings	38-36	Fault Code		
16-60	Digital Input	25-00	Cascade Controller	38-37	Control Word		
16-61	Terminal 53 Setting	25-04	Pump Cycling	38-38	ResetCountersControl		
16-62	Analog Input AI53	25-05	Fixed Lead Pump	38-39	Active Setup For BACnet		
16-63	Terminal 54 Setting	25-06	Number of Pumps	38-40	Name Of Analog Value 1 For BACnet		
16-64	Analog Input AI54						



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