FEDERAL PUMP CORP

1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Meets SDWA and NSF standards for potable water use.

- **Mechanical equipment**
- **Roof tank fill systems**
- **Booster systems**
- **Irrigation systems**
- **Chemical feed systems**
- **Marine vessels**
- **Apartment/Condo Use**
- **Cooling tower**
- **High Rise**
- **Hospital**
- **Universities**
- **Hotel/Casino Water-TI**
- **Water fountain display**

Federal Pump VSPV Duplex variable speed booster system combines over 87 years of Federal Pump product reliability with new designs that reduce energy costs, extend product life and provide innovative solutions where water pressure challenges exist.

Capacities to 600GPM
Pressure Boost to 300PSI*
Sizes 2 to 6”
HP to 50 each pump
Available in single and three phase power
***Higher pressure available-Consult local sales office**

- **Low Installed Costs**
- **Built-In-Reliability**
- **Energy Saver**
- **Quiet Operation**
- **Certified and Tested**
- **Backed by Federal Pump 87 year tradition**
- **Supported by USA Distribution Network**
- **Automatic Operation 24/7**
- **Three year extended warranty****

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Series VSPV-Duplex Booster System

Vertical multistage stainless steel pumps energy efficient design with working pressures to 475 PSI.

Energy efficient vertical motors coupled to stainless steel liquid end pump shaft.

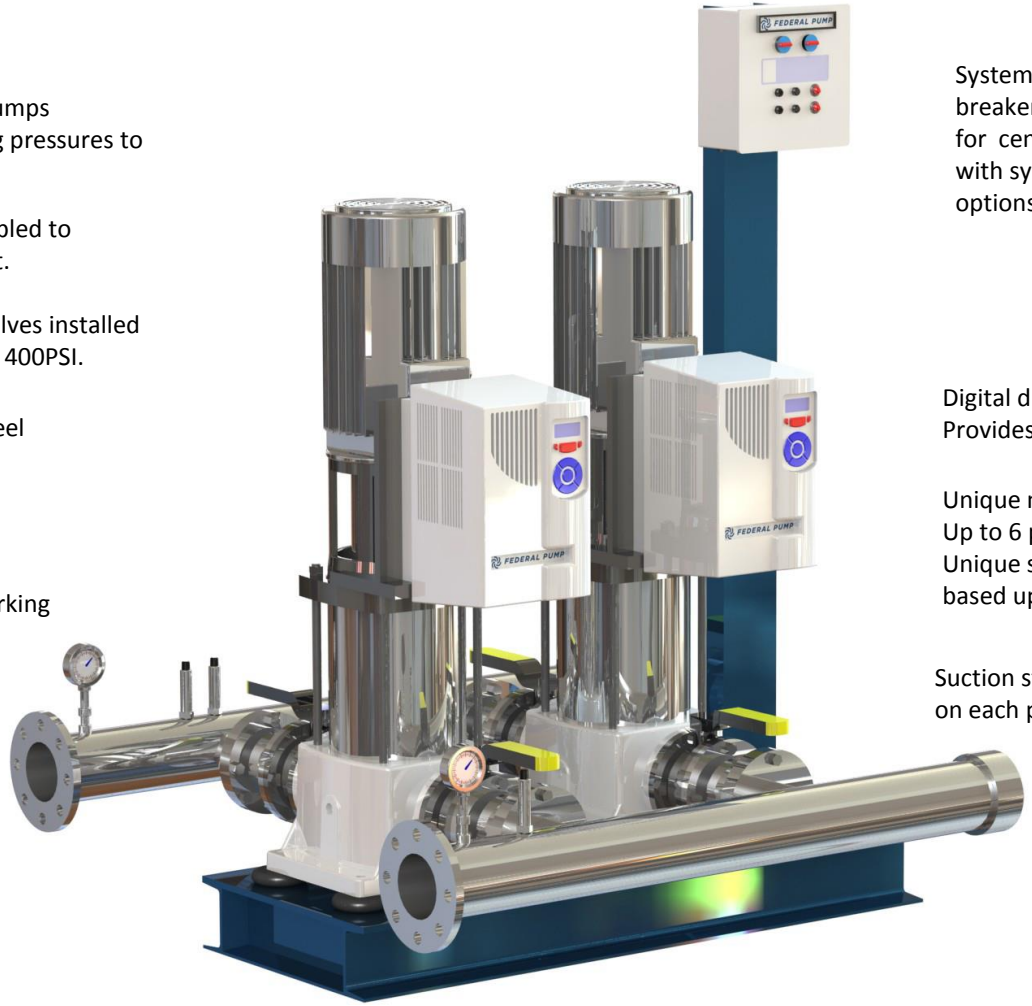
Discharge stainless steel isolating valves installed on each pump working pressures to 400PSI.

Individual pump control stainless steel pressure transducers with 4-20mA control wiring.

Spring loaded silent check valves in stainless steel construction with working pressures to 400PSI.

System mounted pressure gauges to 400PSI working pressure

Flanged stainless steel manifold connections from 2.5”-5” Diameter rated for 400PSI working pressure



System mounted circuit breaker central panel for central system controls with system monitoring options.

Digital display of pump system performance. Provides for field adjustable set points.

Unique multiplexing variable speed drives Up to 6 pumps controlled and alternated. Unique system drives interact and alternate based upon cycle times and system settings

Suction stainless steel isolating valves installed on each pump working pressures to 200PSI.

Fabricated steel welded base plate supporting engineered system.

Flow and pressure tested from 0-100% of system performance.

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Series VSPV-Duplex Booster System

Standard construction includes all stainless steel components ensuring quality construction with long lasting corrosion resistant life exceeding SDWA (Safe Drinking Water Act) and NSF/ANSI Standard 61 requirements of maximum 0.25% lead content. **System has 0% lead content**

Note: For applications including distilled water, sea water or other fluids where 316 Stainless Steel construction is preferred, consult with factory regarding specific gravity of fluid, temperature and applications as these may effect the selection of the mechanical seals and may alter the HP selection due to the specific gravity of the fluid pumped.

Item	Material-Standard
Pump Suction Case	Stainless Steel 316
Impeller	Stainless Steel 316
Shaft	Stainless Steel 316
Outer Casing	Stainless Steel 316
Suction Isolation Valve	Stainless Steel 316
Suction Piping	Stainless Steel 304
Discharge Isolation valve	Stainless Steel 316
Discharge Check Valve-Spring Loaded	Stainless Steel 304
Discharge piping	Stainless Steel 304
Transducers	Stainless Steel 316
Tank Isolation valve	Stainless Steel 316
Cushion Tank Liner	Polypropylene
Base Plate	Channel Steel

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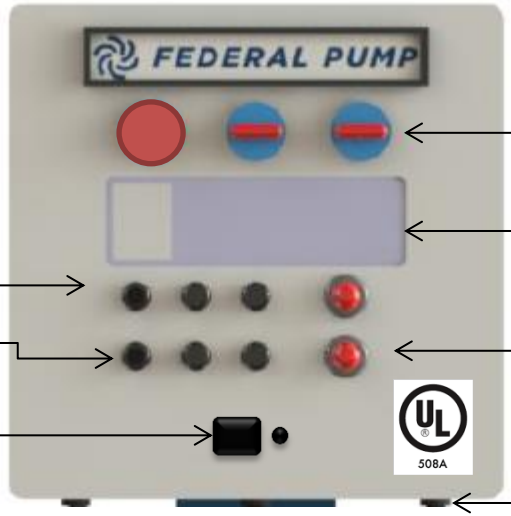
Series VSPV-Duplex Booster System



Individual Pump/Drive Circuit Breakers

H-O-A Selector Switch

Monitor Screen: Digital Read Out
- System Pressure
- System Flow
- Alarm Condition

Pump Run Lights

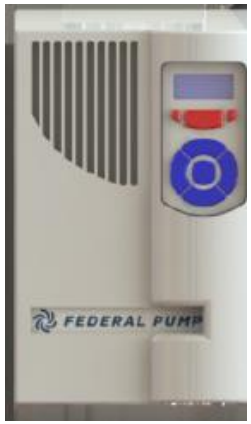
Alarm Lights
- Low Suction Pressure
- Pump/Drive failure
- Other

Common alarm horn with silence push button

Option for Building Management System connections

Individual back-up alarm conditions for each variable speed drive.

Drive function controlled at each pump with monitoring function at central controller.



System Control and Monitor :

Federal Pump VSPV system control monitors system performance and provides central power connection. Control monitors and displays critical system functions and provides visual and audible alarm conditions. Control system also includes back-up alarm status for each pump and variable speed drive at drive location.

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Series VSPV-Duplex Booster System

System Operation

- Pump Genius software monitors system pressure or flow and references low / high set point and run time requirements. The lead and lag pumps are cycled on and off based on motor run times.
  - – Starting motors are selected based on run time - motor with least amount of run time
  - – Stoping motors are selected based on run time - motor with highest amount of run time
  - – All pumps are dynamically alternated based on run times and system set point requirements
  - – System faults are monitored and alarmed
  - – Motor faults are monitored and alarmed
  - – Drive faults are monitored and alarmed
  - – Up to 6 pumps dynamically alternated and controlled

Performance Features

- 2-75 HP @ 230V / 2-600HP @ 480V
- Overload capacity: nominal 110% for 60sec. (150% peak)
- Starting torque: 100% at 3 Hz
- Motor preheat function
- Adjustable accel/decel: 0.1 to 6000 sec.
- Controlled speed range: 40:1
- Critical frequency rejection: 3 selectable, adjustable bands
- Torque-limiting: 30-180%
- Energy Saving control
- Torque boost: full range, auto
- Power loss ride-thru: 2 sec
- Auto restart after power loss or resettable fault, selectable, programmable
- Feedback signal loss detection
- Serial communications loss detection
- "Up / Down" floating point control capability (PI)
- Stationary motor auto-tuning
- Pump Sleep function
- Run-permissive input

Pump Control Features

- Operator Keypad with intuitive pump language
- Hand-Off-Auto
- Programmable Pump Process Set Point
- Pump Start Level & Start Time
- Sleep Protection
- Simplex, Duplex, Triplex, and Multiplex Control
- Automatic System Restart
- No Flow Detection

Pump Control Features (cont)

- Low and High Feedback set points
- Pre-Charge Low Level Control
- Thrust Bearing Control
- Automatic System Stabilization
- Motor Condensation Pre-Heat Function

Protective Features

- Current-limited stall prevention
- Heat sink over-temperature, speed fold-back
- Bi-directional start into rotating motor
- Current-limiting DC bus fuse
- Optically-isolated controls
- Short circuit protection: Phase-phase and phase-neutral
- Ground fault protection
- Short circuit withstand rating: 100K RMS
- Electronic motor overload: UL
- Current limit
- Fault display: last 10 faults
- Fault circuit: OC, OV, OT
- Over torque and under torque protection

Pump Protective Features

- Dry Well
- Air in System
- Blocked Impeller
- Pump over Cycling
- No Flow Protection
- Loss of Prime
- Transducer Loss
- Over Torque
- Anti-Cavitation

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FEDERAL PUMP BOOSTER SYSTEM PRODUCT OFFERING

Selection and Sizing Booster Systems: Flow Rate

Total system design conditions can be determined by using the fixture flow unit values and conversion Tables shown below

Determine System Flow Rate (1)

Fixture Type	Public	Semi-Public	Private
Water Closet			
Flush Valve	10	8	6
Flush tank	5	4	3
Urinal			
Flush Valve, pedestal	10	8	0
Flush Valve, stall or wall	5	4	3
Flush tank	3	2	0
Bath Tub	4	3	2
Shower	4	3	2
Lavatory (sink)	2	1	1
Bathroom Group (Water closet plus lavatory plus Tub/Shower)			
With flush valve	0	0	8
With flush tank	0	0	6
Sink:			
Kitchen	4	3	2
General	3	2	0
Service	3	2	2
Lavatory	0	2	0
Bar	3	2	0
Dishwasher			
General	6	4	2
Pot and Pans	3	3	0
Garbage Disposal, sink	3	3	2
Washing machine	0	6	4
Laundry Tub	0	3	3
Drinking fountain	2	1	1
Ice Cube machine	1	1	1
Steam tables	1	1	0
Hose Connections, 3/4"	0	4	4
Fire Sprinkler	10	10	0

(1) Select Building type

Building Type

PUBLIC
Hospitals, hotels, factories, retail schools, etc.

SEMI-PUBLIC
Office buildings, clubs, motels

PRIVATE:
Apartment buildings, homes etc.

Note:
Fixture Flow Tables do not include air-conditioning, swimming pool, boiler make-up or other mechanical equipment requirements.
Actual GPM requirements for these demand factors should be added.

Fixture Flow Unit Conversion

FFU	GPM	FFU	GPM
100	40	2000	210
200	70	2500	240
300	80	3000	270
400	90	3500	320
500	100	4000	350
750	115	5000	410
1000	120	6000	450
1250	150	7000	520
1500	170	8000	590
1750	190	9000	620

The above is a guideline to be used in estimating the flow requirements for a pressure booster system. Where possible, consult with local licensed plumbing engineer to ensure all parameters of the building have been taken into consideration!

Sizing the Booster System

The below is a guideline to be used in estimating the pressure and flow requirements for a pressure booster system. Where possible, consult with local licensed plumbing engineer to ensure all parameters of the building have been taken into consideration!

Discharge Pressure requirements

Total system pressure requirements can be determined once the system flow conditions have been calculated using the below estimates

- Building height in feet (from pump to top remote fixture)
- Pressure requirement of remote fixture
- Friction loss through piping at peak flow
- Friction loss through specialty valves or fittings

- Minimum Suction Pressure (dynamic while flowing)

- Total Dynamic head (TDH) = System conditions – suction pressure

Example

12 story office building located in downtown NYC with 40 PSI minimum suction pressure with remote plumbing fixture requirement of 21 PSI on the 12th floor. Piping has been designed at 6" diameter riser with peak flow rate of 300 GPM. Building has 12' per floor and booster system is located 2 floors below ground:

• Building height : (12 stories + 2 below ground" X 12' =	144'
• Pressure at remote fixture: 21 PSI X 2.31 =	49'
• Friction loss thru piping: 300 GPM/6"pipe/144' length=	12'
• Friction loss through special water filter device=	15'
Total System: at peak demand	220'
Subtract minimum suction pressure: (40 psi X 2.31)	(92')
TDH (Total Dynamic Head)=	128'
Pump Pressure rating: 128'TDH/2.31 =	**55 PSI**

The above is a guideline to be used in estimating the pressure requirements for a pressure booster system. Where possible, consult with local licensed plumbing engineer to ensure all parameters of the building have been taken into consideration!

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Series VSPV-Duplex Booster System

Selection Table

Select the model number based upon system flow and pressure requirements from the table below!

Refer to attached suggested specifications for system operation.

Model No: VSPV-10040-2-D

- Duplex
- 2=3600RPM
- Pressure: PSI
- Flow: GPM (each Pump)

Pump Flow Rate Required-Each Pump

PSI	TDH	Model No	20 GPM	40 GPM	60 GPM	80 GPM	100 GPM	125 GPM	150 GPM	175 GPM	200 GPM	225 GPM	250 GPM	300 GPM
40	92	VSPV-	2040-2 1.5 HP	4040-2 1.5 HP	6040-2 5 HP	8040-2 5 HP	10040-2 5 HP	12540-2 7.5 HP	15040-2 7.5 HP	17540-2 7.5 HP	20040-2 7.5 HP	22540-2 7.5 HP	25040-2 10 HP	30040-2 10 HP
60	139	VSPV-	2060-2 1.5 HP	4060-2 3 HP	6060-2 5 HP	8060-2 5 HP	10060-2 7.5 HP	12560-2 7.5 HP	15060-2 7.5 HP	17560-2 15 HP	20060-2 15 HP	22560-2 15 HP	25060-2 10 HP	30060-2 10 HP
80	185	VSPV-	2080-2 3 HP	4080-2 3 HP	6080-2 7.5 HP	8080-2 7.5 HP	10080-2 7.5 HP	12580-2 10 HP	15080-2 10 HP	17580-2 15 HP	20080-2 15 HP	22580-2 15 HP	25080-2 20 HP	30080-2 20 HP
100	231	VSPV-	20100-2 3 HP	40100-2 5 HP	60100-2 7.5 HP	80100-2 10 HP	100100-2 10 HP	125100-2 15 HP	150100-2 15 HP	175100-2 20 HP	200100-2 20 HP	225100-2 20 HP	250100-2 25 HP	300100-2 25 HP
120	277	VSPV-	20120-2 5 HP	40120-2 5 HP	60120-2 10 HP	80120-2 15 HP	100120-2 15 HP	125120-2 15 HP	150120-2 20 HP	175120-2 20 HP	200120-2 20 HP	225120-2 25 HP	250120-2 30 HP	300120-2 30 HP
140	323	VSPV-	20140-2 5 HP	40140-2 7.5 HP	60140-2 15 HP	80140-2 15 HP	100140-2 15 HP	125140-2 20 HP	150140-2 20 HP	175140-2 25 HP	200140-2 25 HP	225140-2 30 HP	250140-2 40 HP	300140-2 40 HP
160	370	VSPV-	20160-2 5 HP	40160-2 7.5 HP	60160-2 15 HP	80160-2 15 HP	100160-2 20 HP	125160-2 20 HP	150160-2 25 HP	175160-2 30 HP	200160-2 30 HP	225160-2 30 HP	250160-2 40 HP	300160-2 40 HP
180	416	VSPV-	20180-2 5 HP	40180-2 7.5 HP	60180-2 15 HP	80180-2 20 HP	100180-2 20 HP	125180-2 25 HP	150180-2 25 HP	175180-2 30 HP	200180-2 30 HP	225180-2 40 HP	250180-2 40 HP	300180-2 50 HP
200	462	VSPV-	20200-2 5 HP	40200-2 10 HP	60200-2 15 HP	80200-2 20 HP	100200-2 20 HP	125200-2 25 HP	150200-2 30 HP	175200-2 30 HP	200200-2 50 HP	225200-2 40 HP	250200-2 50 HP	300200-2 50 HP
225	**520**	**VSPV-**	**20225-2 7.5HP**	**40225-2 10 HP**	**60225-2 20 HP**	**80225-2 20 HP**	**100225-2 25 HP**	**125225-2 30 HP**	**150225-2 30 HP**	**175225-2 40 HP**	**200225-2 40 HP**	225225-2 50 HP	250225-2 50 HP	300225-2 60 HP
250	**578**	**VSPV-**	**20250-2 7.5 HP**	**40250-2 15 HP**	**60250-2 20 HP**	**80250-2 20 HP**	**100250-2 30 HP**	**125250-2 30 HP**	**150250-2 30 HP**	**175250-2 40 HP**	**200250-2 50 HP**	225250-2 50 HP	250250-2 50 HP	300250-2 100 HP
275	**635**	**VSPV-**	**20275-2 7.5 HP**	**40275-2 15 HP**	**60275-2 25 HP**	**80275-2 25 HP**	**100275-2 30 HP**	**125275-2 30 HP**	**150275-2 40 HP**	**175275-2 50 HP**	**200275-2 50 HP**	225275-2 50 HP	250275-2 50 HP	300275-2 RTF
300	**693**	**VSPV-**	**20300-2 7.5 HP**	**40300-2 15 HP**	**60300-2 25 HP**	**80300-2 25 HP**	**100300-2 40 HP**	**125300-2 40 HP**	**150300-2 40 HP**	**175300-2 50 HP**	**200300-2 50 HP**	**225300-2 60 HP**	**250300-2 60 HP**	**300300-2 RTF**

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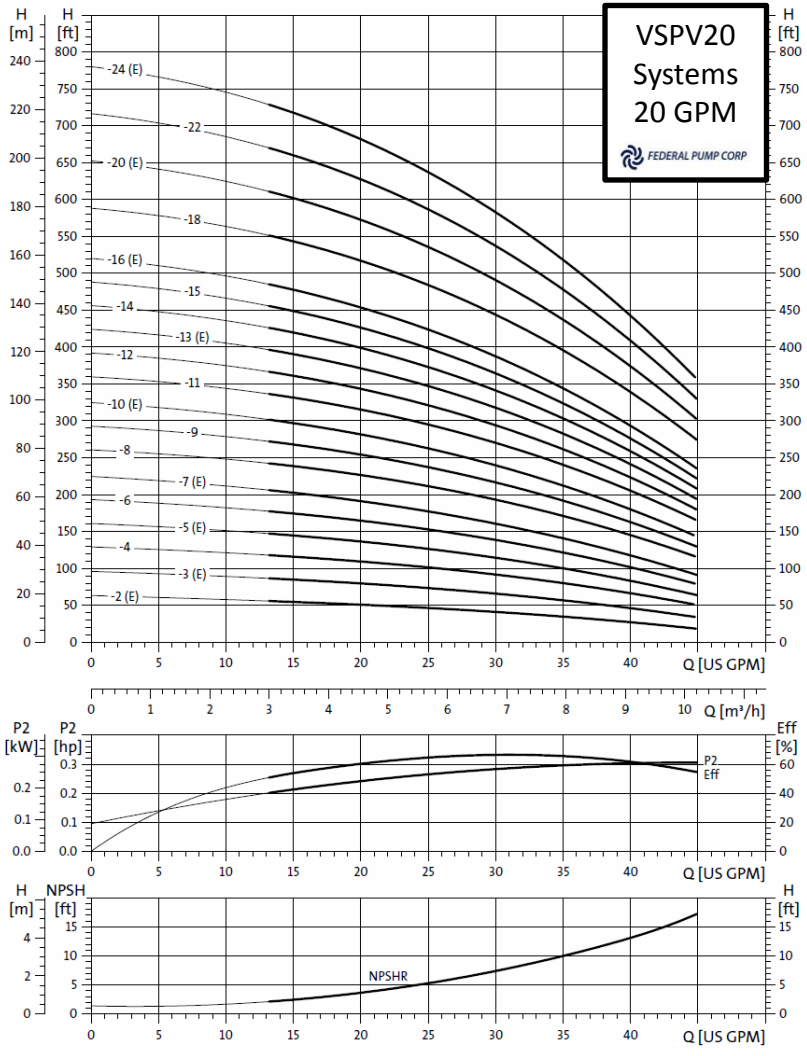
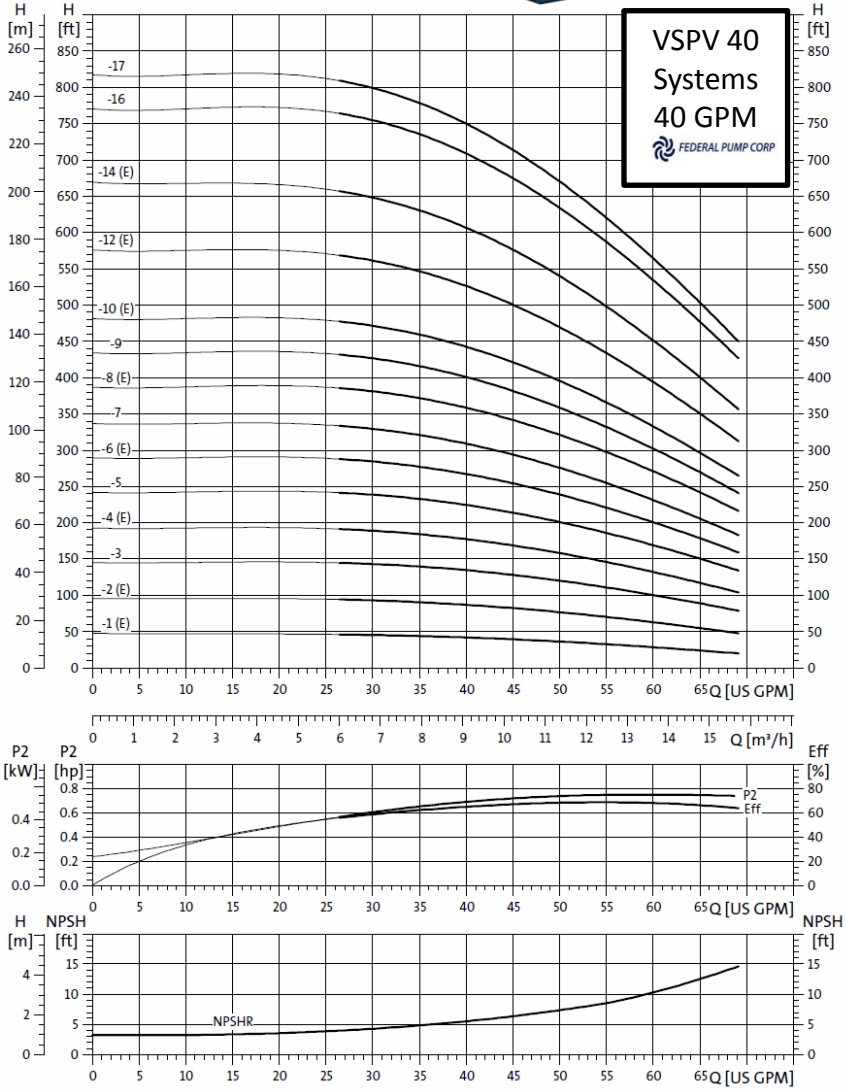
3600RPM Performance Curves





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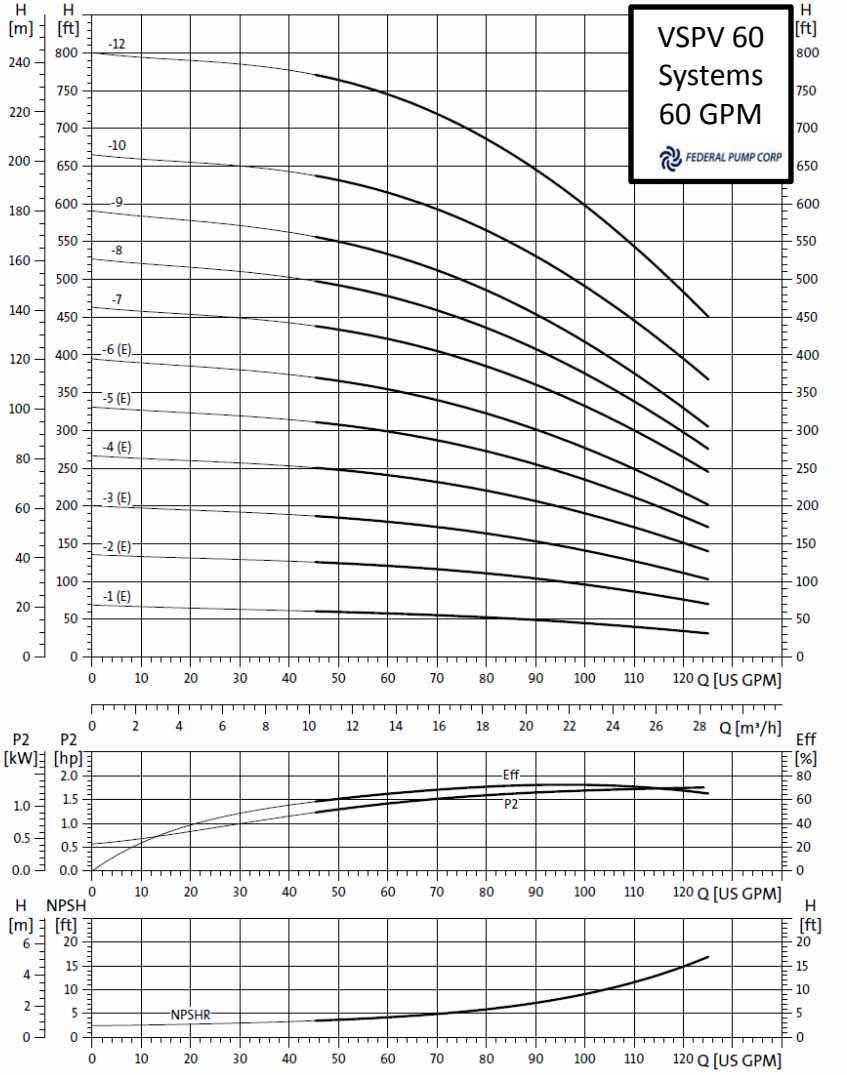

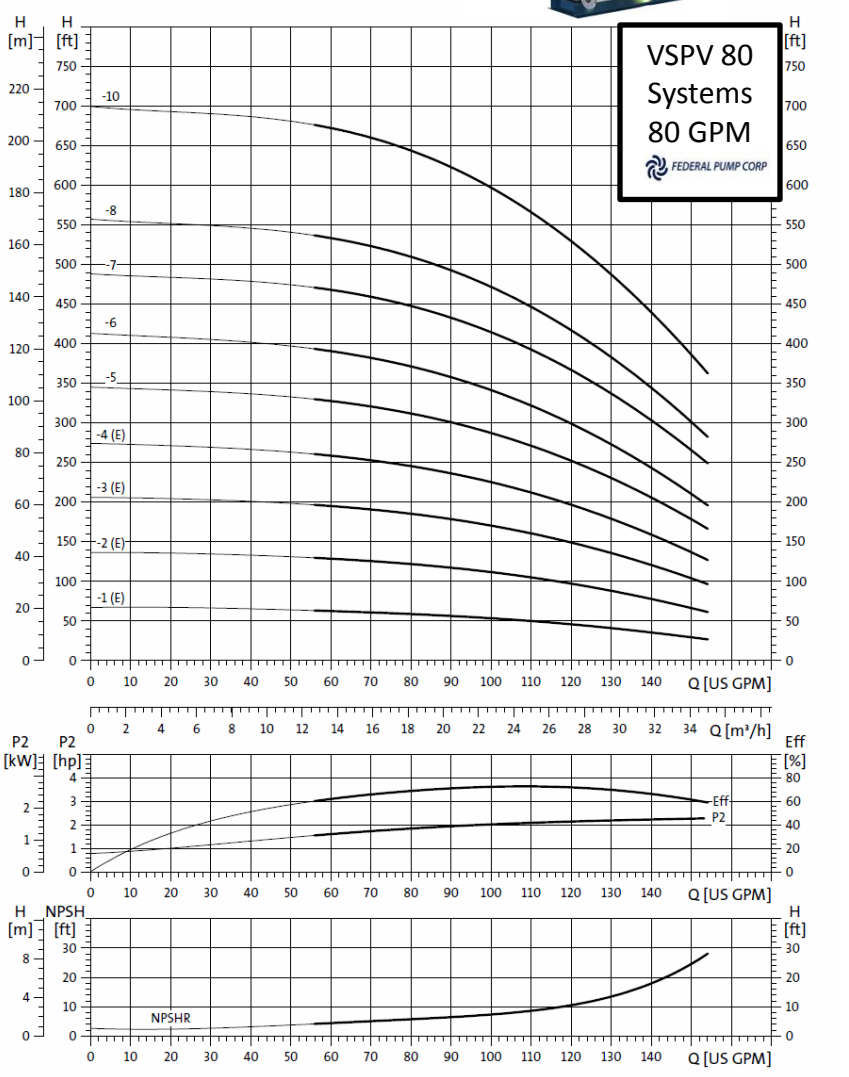

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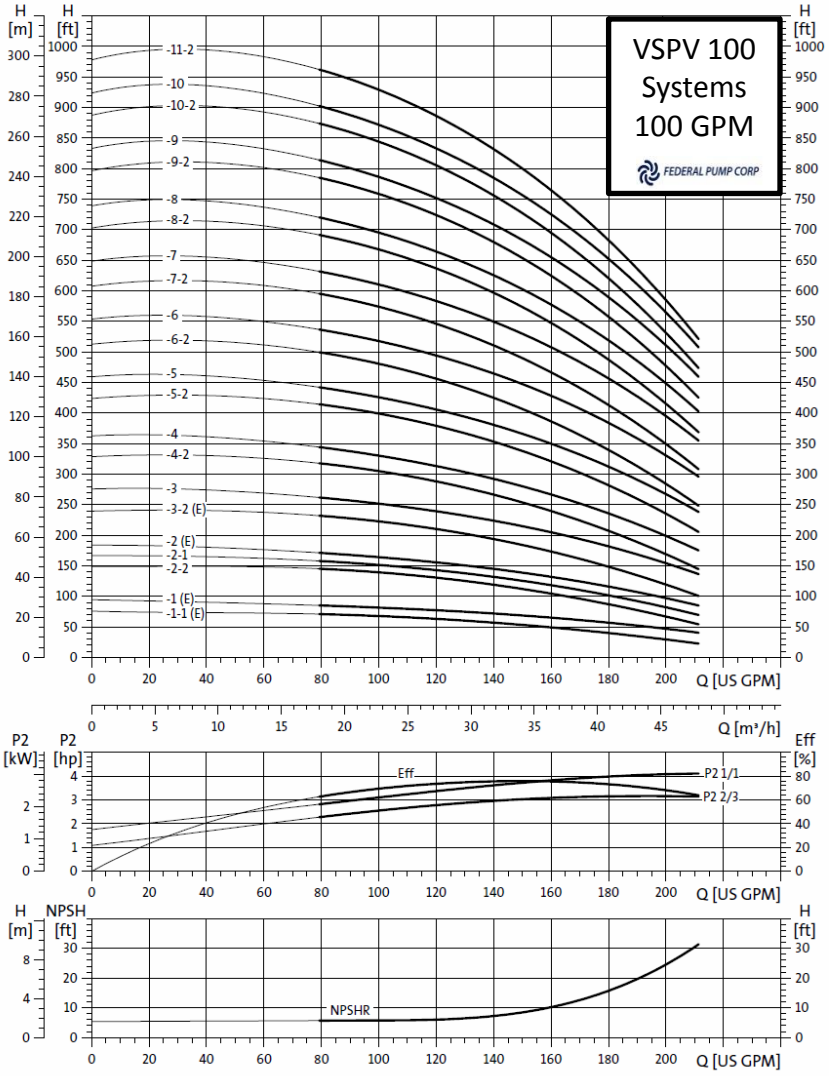

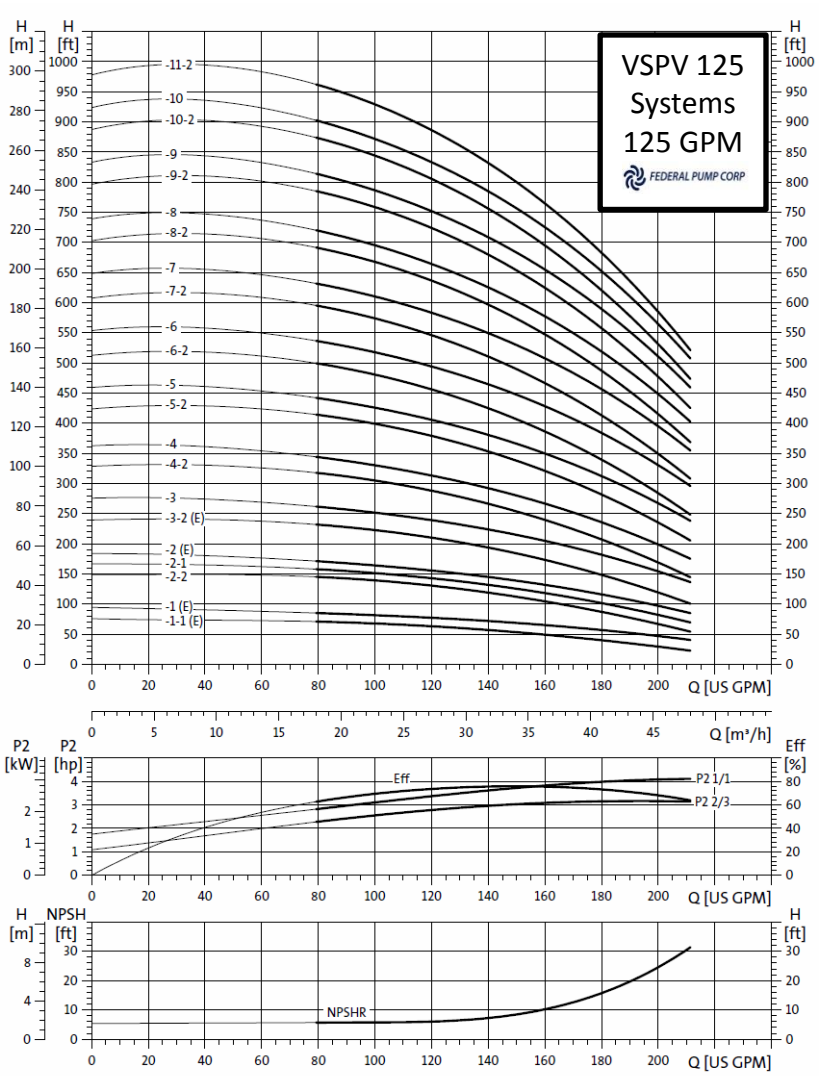

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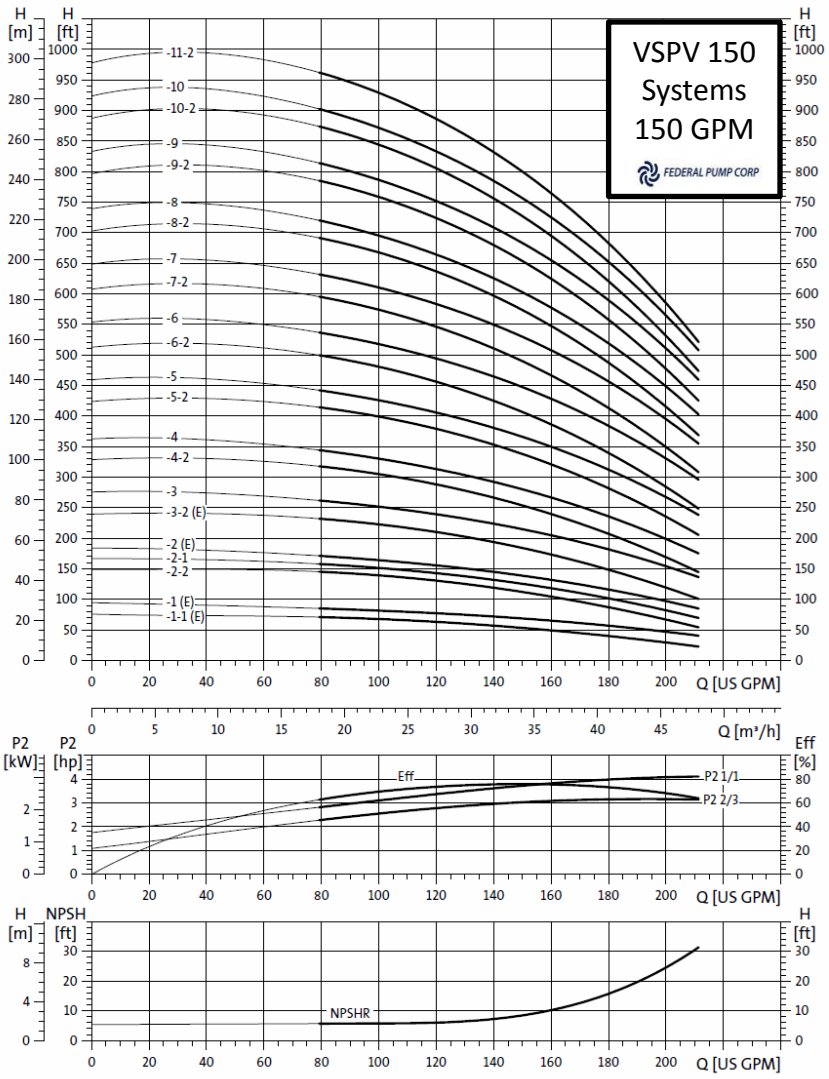

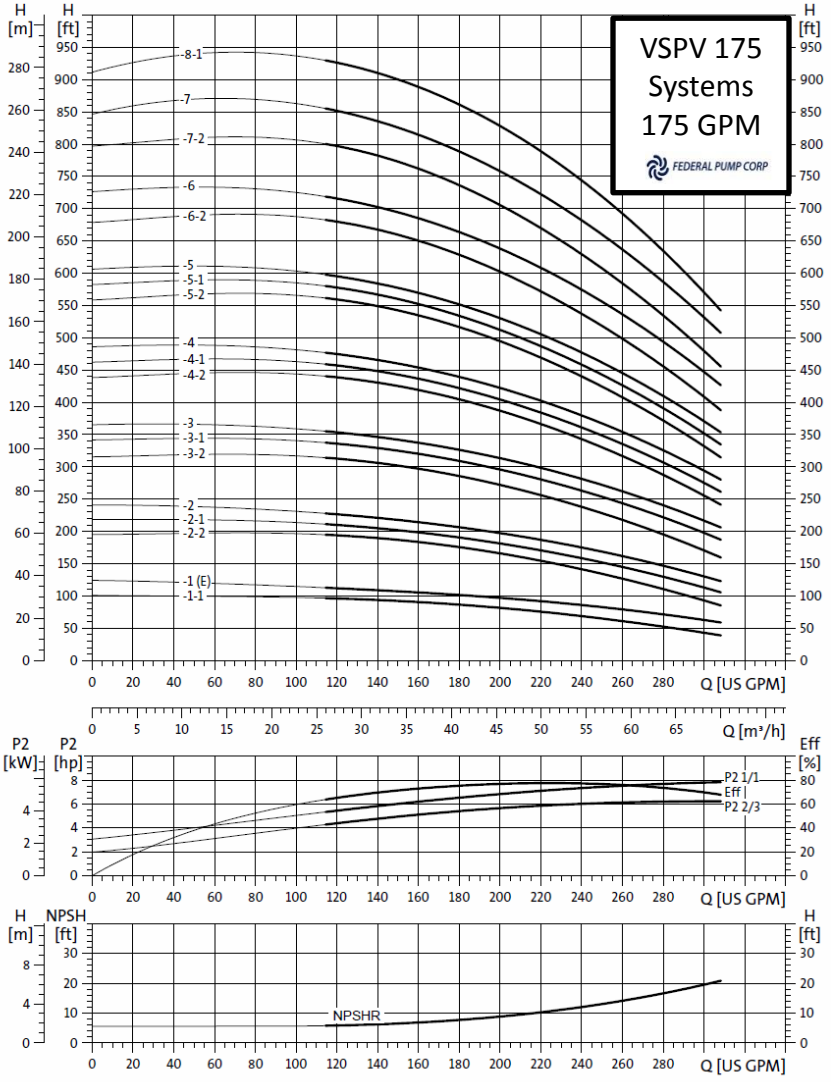

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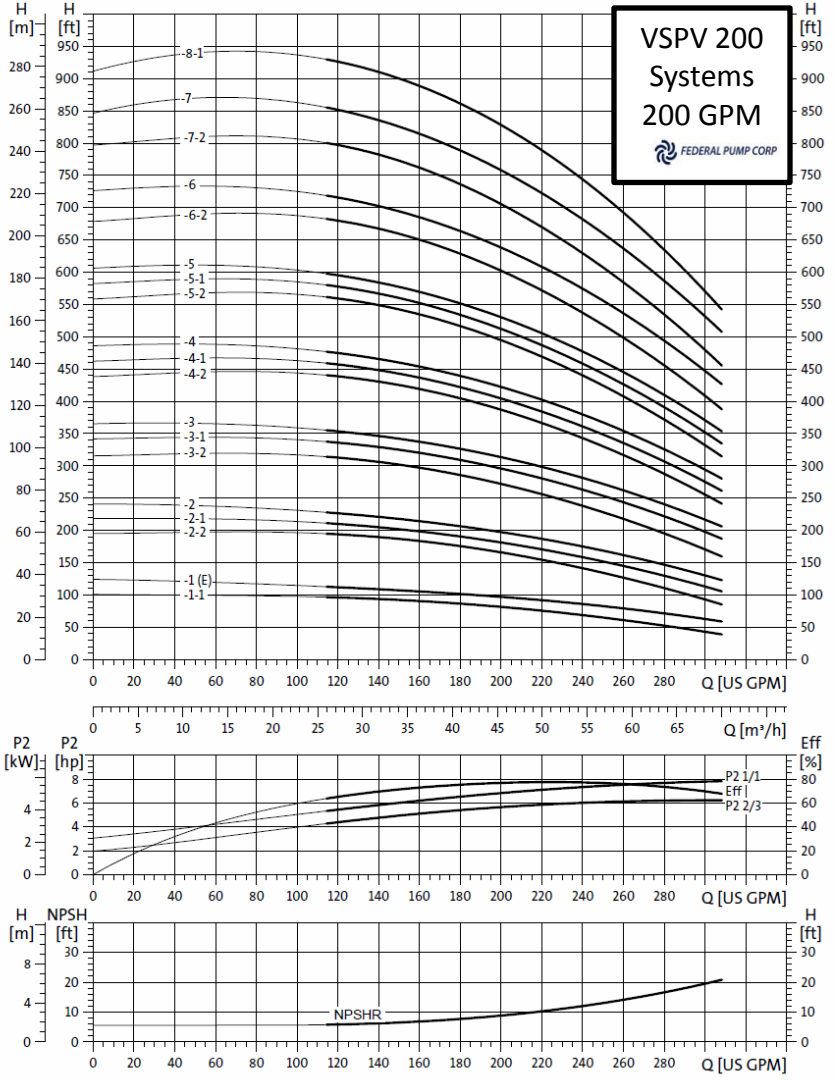

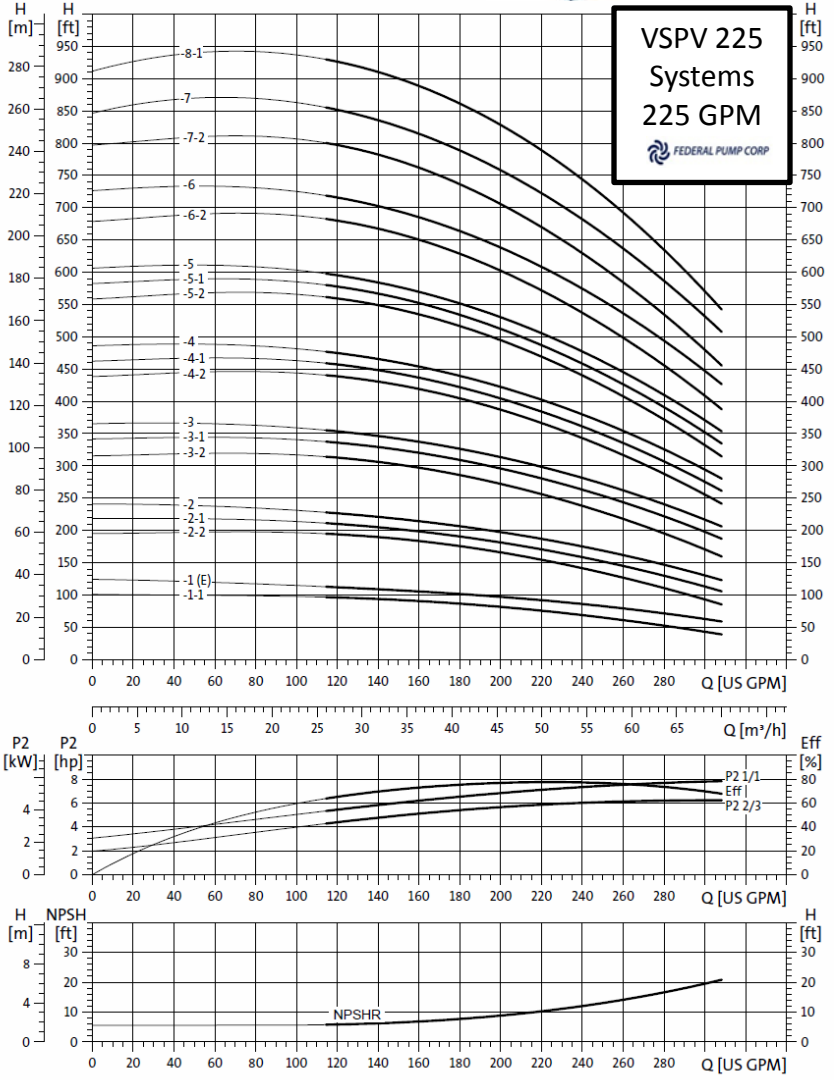

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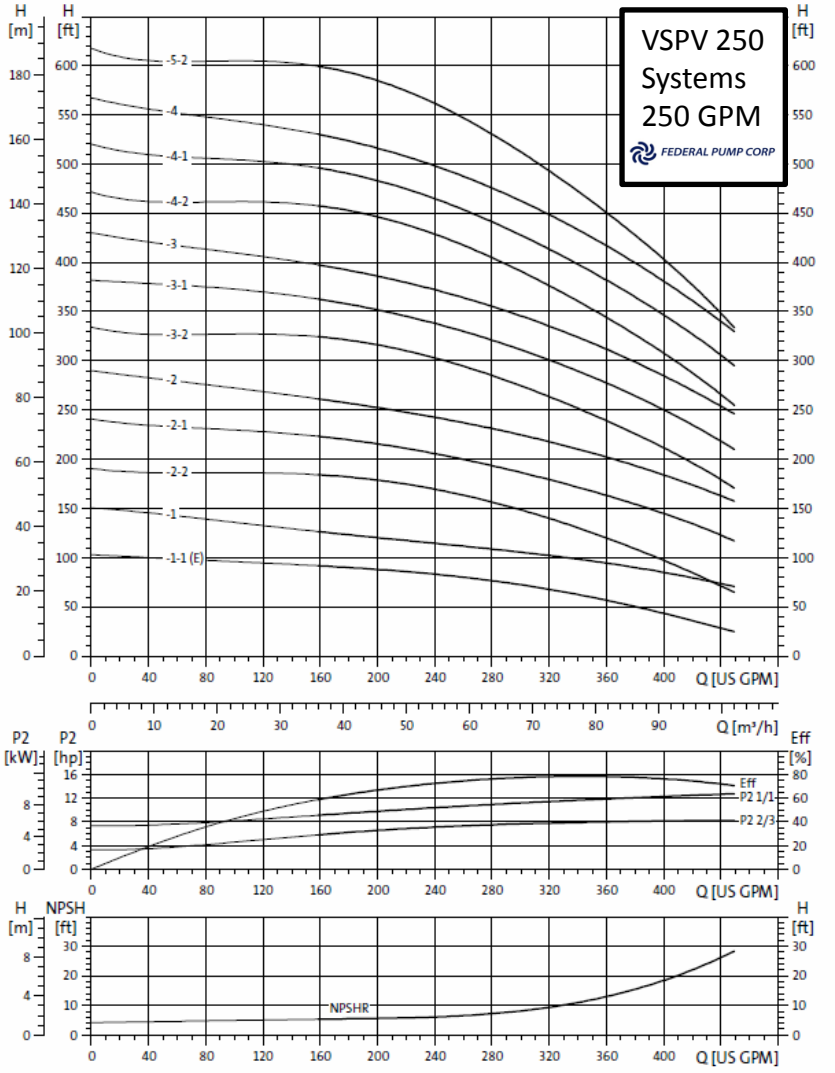

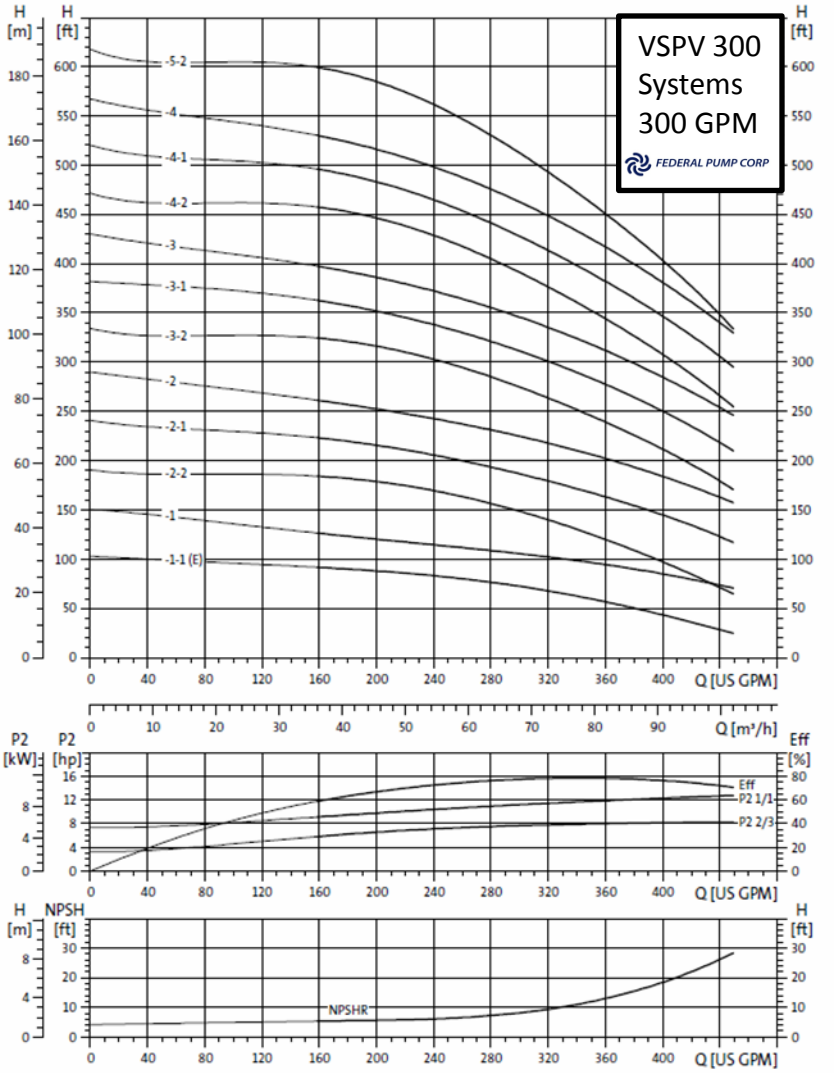

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Series VSPV-Duplex Booster System

Suggested Specifications

General Product Overview
Furnish and install where shown in the plans a Federal Pump Series VSPVD Duplex Variable Speed prefabricated system designed to deliver the scheduled flow and pressure differential as shown in the plans. System will require a single power connection to the System Monitor Panel and a single suction and single discharge piping connection. All other wiring and piping internal to the prefabricated system will be provided by the pump manufacturer. Complete system shall be a product manufacturered in the City of New York by a licensed and registered USA pump manufacturer. Pump system shall be warranted for a period of 3 years from the date of shipment

System Materials:
System shall include stainless steel fitted vertical multistage pumps each rated GPM and PSI as shown in the plans. Motor HP, RPM and voltage shall be supplied to meet system design conditions and rated as shown in the plans. Pumps shall be stainless steel fitted constriction and provided with mechanical seals. Pumps shall be rated 125% of system design pressure. Interconnecting piping shall be supplied in 304 stainless steel construction with all isolation valves and check valves provided in stainless steel construction. All potable water pump system materials will exceed SDWA requirement for 100% zero lead as amended 1.1.2014. Pumps, valves piping and controls shall be fabricated and tested for 100% performance range testing and hydrostatic tested to 125% of design pressure. System shall include suction and discharge mounted pressure gauges for visual indication o system conditions.

System Controls:
Booster system will be provided with individual pump variable frequency drives sequenced through multiplexing design and provided with individual pressure transducers. The pressure transducers will be installed in the system manifolds and monitor system pressure set point. Each variable frequency drive will be provided with a power disconnect switch that will control the power to the drive. The pressure transducer will provide a 4-20mA proportional signal to each drive to increase or decrease the speed of the pump and ensure system design conditions are maintained. Each variable frequency drive will include HOA selector switch, programmable pump process set point, operator keypad with intuitive pump language, multiplex controller where the three drives interact with one another in meeting system requirements, digital readout of RRM, Amps, Hertz, pressure, delay timers (sleep protection) for pump off operation, auto restart after power loss, triplex alternation based upon run times and system set point requirements, low suction pressure cutout and alarm signal.

Sequence of Operation:
The system discharge pressure transducers will monitor the discharge pressure of the system to ensure system pressure requirements are maintained. In the event of a drop in system pressure below the set point the pressure transducer will signal the variable speed drive to initiate lead pump operation and increase motor speed thereby increasing pressure output from the pump. The pump will continue increasing speed until such time that system pressure conditions are met. The pump will increase or decrease speed as required by system demand. When system demand is satisfied, the variable speed controller will, after a time delay, terminate pump operation. If system demand is not met and pressure falls below the set point, the lag pump will start and run in parallel with the lead pump to meet system conditions. The controller will include system set point adjustments that allow the pressure settings and time delay settings to be adjusted as may be required by the system. The controller will include digital display of those set points. Upon meeting system conditions the lag pump will terminate operation followed by the lead pump, after a timed delay. The system will select the lead pump for the next cycle based upon the least run time of each of the pumps.

Low Suction Cut-Off:
In the event of low suction condition, the suction pressure transducer will sense the decline in pressure below the acceptable low suction pressure point and terminate operation of the pump and display a red light alarm light condition. The digital display board will also communicate the alarm condition and failure reason.

Visual and Audible System Monitor Panel
Provide a visual indication control panel mounted and wired on the system package. The visual indication control panel will house the pump circuit breakers and include system alarm and operating conditions including: pump/drive failure alarm, low suction pressure cutoff and alarm, system flow in GPM, system pressure in PSI. All alarms will be provided with red alarm lights and connected to a common alarm horn for visual and audible alarm signal. System will be provided in NEMA 1 enclosure (or as required in the plans) with alarm and indicator panel mounted on the front cover.

Start-Up
Upon completion of installation by the contractor, the pump manufacturer's representative will review the Installation to ensure proper connections, witness the performance of the VSPV System from 0 to 100% system pressure and monitor and test low suction pressure cut-off and document completion of the commissioned system. The representative will train the onsite personnel in operating the system.

(Optional): If the system is provided with a charged cushion tank, the pump manufacturers representative will ensure the tank is charged to the appropriate pre-charge condition to ensure proper operation of the system.

Operation manuals
A complete set of system operation manuals will be provided at completion of system start-up.

Maintenance Agreement: The pump manufacturer's representative will provide an 18 month maintenance agreement where the representative will review the installation every 6 months to ensure proper operation of the system and suggest any necessary adjustments due to actual system performance over the period. A separate agreement will be submitted to the customer and included in the base price of the equipment purchase.

Warranty: The pump manufacturer will provide a three year limited warranty for material and workmanship and take unit responsibility of the system components.

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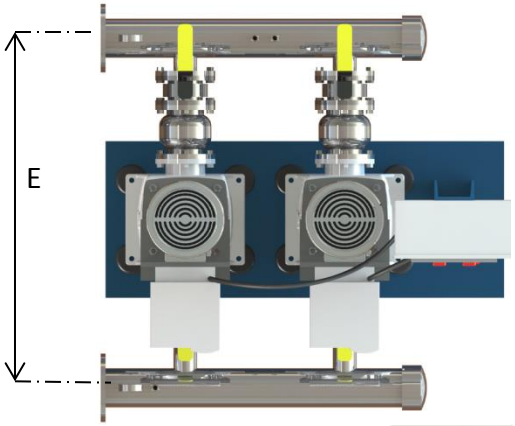
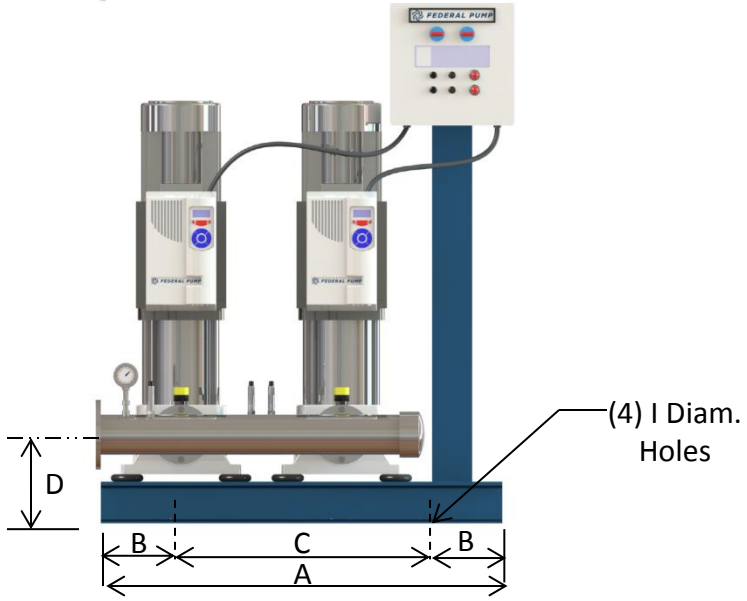
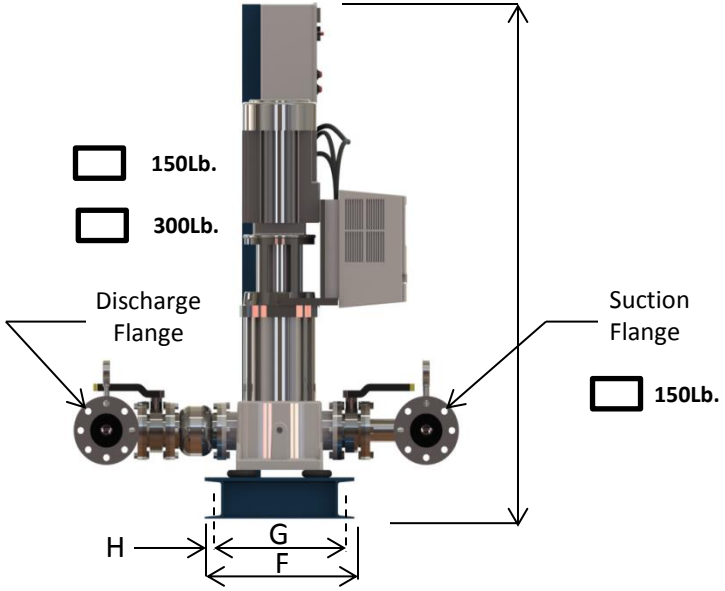
Series VSPV-Duplex Booster System

Dimensional Data
Release Date: 1.30.15

In the interest of continuous product development , dimensional data is subject to change without notice. Consult Factory for certified dimensional prints.







Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated flanges for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 20 GPM
System Max Rating: 40 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J (max)	Weight (lbs.)
2020	2	2	36	4	28	7	24	12	10	½	27	460
2040	2	2	36	4	28	7	24	12	10	½	30	470
2060	2	2	36	4	28	7	24	12	10	½	34	490
2080	2	2	36	4	28	7	24	12	10	½	38	510
20100	2	2	36	4	28	7	24	12	10	½	38	570
20120	2	2	40	4	32	7	24	12	10	½	44	630
20140	2	2	40	4	32	7	24	12	10	½	46	670
20160	2	2	40	4	32	7	24	12	10	½	48	700
20180	2	2	42	4	34	7	24	12	10	½	48	740
20200	2	2	42	4	34	7	24	12	10	½	50	800
20225	2	2	44	4	36	7	24	12	10	½	54	880
20250	2	2	44	4	36	7	24	12	10	½	56	1020
20275	2	2	46	4	38	7	24	12	10	½	58	1150
20300	2	2	46	4	38	7	24	12	10	½	60	1250

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 40 GPM
System Max Rating: 80 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J (max)	Weight (lbs.)
4020	2.5	2.5	42	4	34	7 ½	26	14	12	½	42	460
4040	2.5	2.5	42	4	34	7 ½	26	14	12	½	42	470
4060	2.5	2.5	42	4	34	7 ½	26	14	12	½	44	490
4080	2.5	2.5	42	4	34	7 ½	26	14	12	½	48	510
40100	2.5	2.5	42	4	34	7 ½	26	14	12	½	48	570
40120	2.5	2.5	46	4	38	7 ½	26	14	12	½	48	630
40140	2.5	2.5	46	4	38	7 ½	26	14	12	½	50	670
40160	2.5	2.5	46	4	38	7 ½	26	14	12	½	50	700
40180	2.5	2.5	48	4	40	7 ½	26	14	12	½	54	740
40200	2.5	2.5	48	4	40	7 ½	26	14	12	½	54	800
40225	2.5	2.5	50	4	42	7 ½	26	14	12	½	54	880
40250	2.5	2.5	50	4	42	7 ½	26	14	12	½	60	1020
40275	2.5	2.5	52	4	44	7 ½	26	14	12	½	60	1150
40300	2.5	2.5	52	4	44	7 ½	26	14	12	½	60	1250

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 60 GPM
System Max Rating: 120 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J (max)	Weight (lbs.)
6020	2.5	2.5	52	4	44	7 ½	26	14	12	½	42	930
6040	2.5	2.5	52	4	44	7 ½	26	14	12	½	42	940
6060	2.5	2.5	52	4	44	7 ½	26	14	12	½	44	940
6080	2.5	2.5	52	4	44	7 ½	26	14	12	½	48	1100
60100	2.5	2.5	52	4	44	7 ½	26	14	12	½	48	1100
60120	2.5	2.5	56	4	46	7 ½	26	14	12	½	48	1270
60140	2.5	2.5	56	4	46	7 ½	26	14	12	½	50	1340
60160	2.5	2.5	56	4	46	7 ½	26	14	12	½	50	1440
60180	2.5	2.5	58	4	50	7 ½	26	14	12	½	54	1440
60200	2.5	2.5	58	4	50	7 ½	26	14	12	½	54	1440
60225	2.5	2.5	60	4	52	7 ½	26	14	12	½	54	1680
60250	2.5	2.5	60	4	52	7 ½	26	14	12	½	60	1680
60275	2.5	2.5	62	4	54	7 ½	26	14	12	½	60	1825
60300	2.5	2.5	62	4	54	7 ½	26	14	12	½	60	1825

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 80 GPM
System Max Rating: 160 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J (max)	Weight (lbs.)
8020	2.5	2.5	52	4	44	7 ½	26	14	12	½	42	930
8040	2.5	2.5	52	4	44	7 ½	26	14	12	½	42	940
8060	2.5	2.5	52	4	44	7 ½	26	14	12	½	44	940
8080	2.5	2.5	52	4	44	7 ½	26	14	12	½	48	1100
80100	2.5	2.5	52	4	44	7 ½	26	14	12	½	48	1100
80120	2.5	2.5	56	4	46	7 ½	26	14	12	½	48	1270
80140	2.5	2.5	56	4	46	7 ½	26	14	12	½	50	1340
80160	2.5	2.5	56	4	46	7 ½	26	14	12	½	50	1440
80180	2.5	2.5	58	4	50	7 ½	26	14	12	½	54	1440
80200	2.5	2.5	58	4	50	7 ½	26	14	12	½	54	1440
80225	2.5	2.5	60	4	52	7 ½	26	14	12	½	54	1680
80250	2.5	2.5	60	4	52	7 ½	26	14	12	½	60	1680
80275	2.5	2.5	62	4	54	7 ½	26	14	12	½	60	1825
80300	2.5	2.5	62	4	54	7 ½	26	14	12	½	60	1825

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 100 GPM
System Max Rating: 200 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J (max)	Weight (lbs.)
10020	3	3	52	4	44	8 ½	26	14	12	½	48	1100
10040	3	3	52	4	44	8 ½	26	14	12	½	48	1200
10060	3	3	52	4	44	8 ½	26	14	12	½	48	1200
10080	3	3	52	4	44	8 ½	26	14	12	½	50	1450
100100	3	3	52	4	44	8 ½	26	14	12	½	50	1700
100120	3	3	56	4	46	8 ½	26	14	12	½	54	1700
100140	3	3	56	4	46	8 ½	26	14	12	½	54	1970
100160	3	3	56	4	46	8 ½	26	14	12	½	56	1970
100180	3	3	58	4	50	8 ½	26	14	12	½	56	1970
100200	3	3	58	4	50	8 ½	26	14	12	½	56	2200
100225	3	3	60	4	52	8 ½	26	14	12	½	64	2200
100250	3	3	60	4	52	8 ½	26	14	12	½	70	2600
100275	3	3	62	4	54	8 ½	26	14	12	½	70	2600
100300	3	3	62	4	54	8 ½	26	14	12	½	76	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 125 GPM
System Max Rating: 250 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
12520	3	3	52	4	44	8 ½	26	14	12	½	48	1100
12540	3	3	52	4	44	8 ½	26	14	12	½	48	1200
12560	3	3	52	4	44	8 ½	26	14	12	½	48	1200
12580	3	3	52	4	44	8 ½	26	14	12	½	50	1450
125100	3	3	52	4	44	8 ½	26	14	12	½	50	1700
125120	3	3	56	4	46	8 ½	26	14	12	½	54	1700
125140	3	3	56	4	46	8 ½	26	14	12	½	54	1970
125160	3	3	56	4	46	8 ½	26	14	12	½	56	1970
125180	3	3	58	4	50	8 ½	26	14	12	½	56	1970
125200	3	3	58	4	50	8 ½	26	14	12	½	56	2200
125225	3	3	60	4	52	8 ½	26	14	12	½	64	2200
125250	3	3	60	4	52	8 ½	26	14	12	½	70	2600
125275	3	3	62	4	54	8 ½	26	14	12	½	70	2600
125300	3	3	62	4	54	8 ½	26	14	12	½	76	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 150 GPM
System Max Rating: 300 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
15020	4	4	52	4	44	8 ½	26	14	12	½	48	1100
15040	4	4	52	4	44	8 ½	26	14	12	½	48	1200
15060	4	4	52	4	44	8 ½	26	14	12	½	48	1200
15080	4	4	52	4	44	8 ½	26	14	12	½	50	1450
150100	4	4	52	4	44	8 ½	26	14	12	½	50	1700
150120	4	4	56	4	46	8 ½	26	14	12	½	54	1700
150140	4	4	56	4	46	8 ½	26	14	12	½	54	1970
150160	4	4	56	4	46	8 ½	26	14	12	½	56	1970
150180	4	4	58	4	50	8 ½	26	14	12	½	56	1970
150200	4	4	58	4	50	8 ½	26	14	12	½	56	2200
150225	4	4	60	4	52	8 ½	26	14	12	½	64	2200
150250	4	4	60	4	52	8 ½	26	14	12	½	70	2600
150275	4	4	62	4	54	8 ½	26	14	12	½	70	2600
150300	4	4	62	4	54	8 ½	26	14	12	½	76	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 175 GPM
System Max Rating: 325 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
17520	4	4	52	4	44	9 ½	26	14	12	½	46	1100
17540	4	4	52	4	44	9 ½	26	14	12	½	46	1200
17560	4	4	52	4	44	9 ½	26	14	12	½	48	1200
17580	4	4	52	4	44	9 ½	26	14	12	½	52	1450
175100	4	4	52	4	44	9 ½	26	14	12	½	52	1700
175120	4	4	56	4	46	9 ½	26	14	12	½	58	1700
175140	4	4	56	4	46	9 ½	26	14	12	½	60	1970
175160	4	4	56	4	46	9 ½	26	14	12	½	64	1970
175180	4	4	58	4	50	9 ½	26	14	12	½	68	1970
175200	4	4	58	4	50	9 ½	26	14	12	½	68	2200
175225	4	4	60	4	52	9 ½	26	14	12	½	74	2200
175250	4	4	60	4	52	9 ½	26	14	12	½	74	2600
175275	4	4	62	4	54	9 ½	26	14	12	½	78	2600
175300	4	4	62	4	54	9 ½	26	14	12	½	78	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 200 GPM
System Max Rating: 400 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
20020	4	4	52	4	44	9 ½	26	14	12	½	46	1100
20040	4	4	52	4	44	9 ½	26	14	12	½	46	1200
20060	4	4	52	4	44	9 ½	26	14	12	½	48	1200
20080	4	4	52	4	44	9 ½	26	14	12	½	52	1450
200100	4	4	52	4	44	9 ½	26	14	12	½	52	1700
200120	4	4	56	4	46	9 ½	26	14	12	½	58	1700
200140	4	4	56	4	46	9 ½	26	14	12	½	60	1970
200160	4	4	56	4	46	9 ½	26	14	12	½	64	1970
200180	4	4	58	4	50	9 ½	26	14	12	½	68	1970
200200	4	4	58	4	50	9 ½	26	14	12	½	68	2200
200225	4	4	60	4	52	9 ½	26	14	12	½	74	2200
200250	4	4	60	4	52	9 ½	26	14	12	½	74	2600
200275	4	4	62	4	54	9 ½	26	14	12	½	78	2600
200300	4	4	62	4	54	9 ½	26	14	12	½	78	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 225 GPM
System Max Rating: 550 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
22520	4	4	52	4	44	9 ½	26	14	12	½	46	1100
22540	4	4	52	4	44	9 ½	26	14	12	½	46	1200
22560	4	4	52	4	44	9 ½	26	14	12	½	48	1200
22580	4	4	52	4	44	9 ½	26	14	12	½	52	1450
225100	4	4	52	4	44	9 ½	26	14	12	½	52	1700
225120	4	4	56	4	46	9 ½	26	14	12	½	58	1700
225140	4	4	56	4	46	9 ½	26	14	12	½	60	1970
225160	4	4	56	4	46	9 ½	26	14	12	½	64	1970
225180	4	4	58	4	50	9 ½	26	14	12	½	68	1970
225200	4	4	58	4	50	9 ½	26	14	12	½	68	2200
225225	4	4	60	4	52	9 ½	26	14	12	½	74	2200
225250	4	4	60	4	52	9 ½	26	14	12	½	74	2600
225275	4	4	62	4	54	9 ½	26	14	12	½	78	2600
225300	4	4	62	4	54	9 ½	26	14	12	½	78	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 250 GPM
System Max Rating: 500 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
25020	5	5	52	4	44	9 ½	30	14	12	½	44	1100
25040	5	5	52	4	44	9 ½	30	14	12	½	44	1200
25060	5	5	52	4	44	9 ½	30	14	12	½	46	1200
25080	5	5	52	4	44	9 ½	30	14	12	½	46	1450
250100	5	5	52	4	44	9 ½	30	14	12	½	52	1700
250120	5	5	56	4	46	9 ½	30	14	12	½	52	1700
250140	5	5	56	4	46	9 ½	30	14	12	½	56	1970
250160	5	5	56	4	46	9 ½	30	14	12	½	60	1970
250180	5	5	58	4	50	9 ½	30	14	12	½	64	1970
250200	5	5	58	4	50	9 ½	30	14	12	½	64	2200
250225	5	5	60	4	52	9 ½	30	14	12	½	68	2200
250250	5	5	60	4	52	9 ½	30	14	12	½	68	2600
250275	5	5	62	4	54	9 ½	30	14	12	½	74	2600
250300	5	5	62	4	54	9 ½	30	14	12	½	76	2800

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Series VSPV-Duplex Booster System

Each Pump Rated: 300 GPM
System Max Rating: 600 GPM

All dimensions are in inches

Model Numbers	Suction Flange	Discharge Flange	A	B	C	D	E	F	G	H	J	Weight (lbs.)
30020	5	5	52	4	44	9 ½	30	14	12	½	44	1900
30040	5	5	52	4	44	9 ½	30	14	12	½	44	2100
30060	5	5	52	4	44	9 ½	30	14	12	½	46	2200
30080	5	5	52	4	44	9 ½	30	14	12	½	46	2600
300100	5	5	52	4	44	9 ½	30	14	12	½	52	2900
300120	5	5	56	4	46	9 ½	30	14	12	½	52	2900
300140	5	5	56	4	46	9 ½	30	14	12	½	56	3200
300160	5	5	56	4	46	9 ½	30	14	12	½	60	3200
300180	5	5	58	4	50	9 ½	30	14	12	½	64	3600
300200	5	5	58	4	50	9 ½	30	14	12	½	64	4000
300225	5	5	60	4	52	9 ½	30	14	12	½	68	4200
300250	5	5	60	4	52	9 ½	30	14	12	½	68	4800
300275	5	5	RTF	RTF	RTF	RTF	RTF	RTF	RTF	RTF	RTF	RTF
300300	5	5	RTF	RTF	RTF	RTF	RTF	RTF	RTF	RTF	RTF	RTF

Note: 1. Dimensions may vary for custom systems where larger HP units require baseplate mounted controls. Consult factory for certified dimensions for pump motor/drives in excess of 40HP each.
Note: 2. Pumps provided with 150 LB rated manifolds for systems rated up to 150PSI.
Note: 3. Pumps provided with 300 LB rated manifolds for systems rated 150PSI to 300PSI.
Note: 4. Standard Triplex systems are not provide with cushion tank. If cushion tank required refer to “cushion tank selection” data in attached sections.
Note: 5. System dimensions are provided for ODP or TEFC motors with NEMA 12 controls. Dimensions may vary if Explosion Proof motors or NEMA 4 or 7 enclosures are required.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Installation and Operation Manual
Federal Pump
Vertical Pump Multiplex Booster Systems

1. Receiving the Equipment

All Federal Pump VSPV booster systems are assembled and tested at the factory and include certain set points and adjustments that have been programmed into the system settings. Do not tamper with any settings, electrical equipment, sensors elements or other components of the system until such time that the system is ready for installation and certain adjustments. Upon receipt of the equipment inspect the entire system and look for any broken or missing components that may have been damaged in shipment or handling. Depending on the system, some components may have shipped loose for field installation. If there is any damage note this immediately on your carries Bill of Lading.

CAUTION: Federal Pump systems should never be lifted from the system piping manifolds, control panel or any system component. To move the system, use a forklift under the system baseplate or hoist by system baseplate lifting eyes (if provided with the system)

Store the equipment in a dry area at least 4-6" above ground to prevent contact with any water. If stored for an extended period of time cover the equipment and ensure it is not exposed to dust, water vapor, extreme weather conditions or other harmful elements. If the equipment is to be stored for an extended period of time contact the pump manufacturer's representative regarding system product lubrication or rotation of the motor/pump rotating assembly or other special handling needs.

2. Locating the Equipment

The area in which the system is eventually to be installed must be large enough to have access 360 degrees around the system and should be close to a drainage area (floor drain) for system run off water, must have 36" clearance near the control panel extending down to the floor and should have lifting devices above the motors for future maintenance where these motors can be lifted off the system for maintenance. Do not install the equipment below piping that may have condensate forming on its exterior, Or other location that may be exposed to wet weather conditions.

3. Anchoring the Equipment

Prior to anchoring the equipment ensure a floor drain is located near the Pumping equipment with a 3" drainage connection from the equipment provided drainage fittings and ensure a pipe connection from the system to the floor drain is in place. The baseplate should be shimmed and leveled and filled with grout. Anchor bolts should be sized based upon the hole diameters provided with the system baseplate using all anchor bolt holes. Baseplate sizes vary based upon the equipment furnished with anchor bolts selected based upon weight, size and location of bolt down holes. Federal Pump bolt holes are typically 5/8" diameter (refer to dimensional information) and may be used as a guideline in selecting anchor bolt sizes. Refer to equipment dimension Figure No: 1 provides an example of anchor bot installation and base plate grout

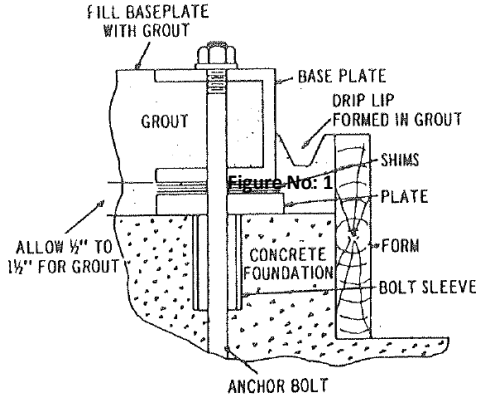


Figure No: 1

Grout should be of non-shrink non-ferrous type and installed per grout manufacturers Instructions. Apply oil based paint to the exposed surface of the grout 2 weeks after Installation to prevent air and moisture from coming in contact with the grout.

FEDERAL PUMP CORP
1144 Utica Ave, Brooklyn, NY 11203

Installation and Operation Manual
Federal Pump
Vertical Pump Multiplex Booster Systems

4. Connecting System Piping

Each Federal Pump packaged system is supplied with suction and discharge manifolds that are designed to be connected to the building water supply and building discharge riser. These supply and return connections should be supported with pipe hangers or other support structures to ensure the building piping is not supported by the booster system suction and discharge manifolds.
CAUTION:
Prior to connecting building piping to the booster system ensure all construction related debris, metal shavings, rocks and other solids are removed from the building piping. Any debris may severely damage the pump system components and cause for early system failure. Be sure these supply and return lines are flushed out prior to making the connection to the pump system manifolds.

Install any flex connectors (if provided) between the building piping and system manifolds and complete the connections and tighten accordingly. Once the connections have been secured, check the building piping to ensure it is secured with proper pipe hangers or ground supports.

5. System Preparation

Slowly open the suction and discharge valves and pump isolation valves and bleed the system of any air that may be trapped. Bleed all valves, pressure gauges, pressure switches, transducers, sensing elements, pump casing of air that may be trapped in the system. Check all sensing lines for leaks and ensure any drainage connections are installed and piped to the floor drain. Check for system leaks and make necessary corrections. Prior to starting the system the air should be removed, system tight of any leaks, drain lines piped to drain, building piping secured and no strain on system baseplate or connections.

CAUTION: Electrical connections should be made by a licensed electrician

Check to review electrical connections have been made and power supplied to the system control panel. Put HOA in off position and turn circuit breaker disconnect to the on position. Check system for lights and alarms to ensure electrical circuits are ready. Once reviewed and secure, check the Pump rotation for proper motor rotation. Turn the HOA to the hand position for an instant and “bump” the motor for proper rotation. The motor should turn as shown in the arrow position on the pump case. Make wiring corrections if necessary to ensure the motors rotate in the proper direction.

6. Start-Up Procedure

- ❑ Open all suction valves and close all discharge side pump valves. Ensure control panel door is completely closed. Energize the disconnect switches and start pump no 1 in the hand position.
- ❑ Silence any alarms that may be activated.
- ❑ Partially open the discharge valve and allow pressure in the system piping to reach design pressure. After the building piping reaches system pressure, open the valve all the way.
- ❑ Start the remaining pumps using the HOA in the hand position and slowly open all vales as well. Re-bleed all sensing lines, valves and other components again. If alarm condition are activated, silence the alarm.
- ❑ Switch pumps from the hand position to the automatic position and take readings of suction and discharge pressure at the system manifolds. System may shut down in the automatic position if system design point is maintained for a minimum run period.
- ❑ If the system is provided with a cushion tank, the tank should be charged to the proper system settings.
- ❑ Check system amp draw of each motor.
- ❑ Compare system settings to specification and make adjustments as required to meet specification.
- ❑ Allow system to shut down automatically as intended by design.
- ❑ Check for system vibration. If possible drain building system line and allow system to start automatically and respond to system demand.
- ❑ Simulate low suction pressure or other alarm condition to ensure alarms are working as specified.
- ❑ Once completed, fill out check sheet, date and provide data along with operation manual to the end user or contractor.

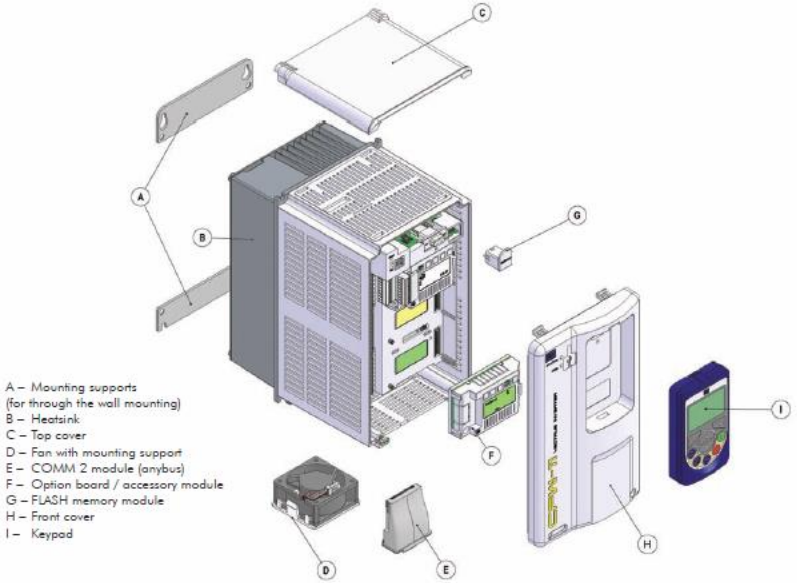


Figure 2.2 - Main components of the CFW-11

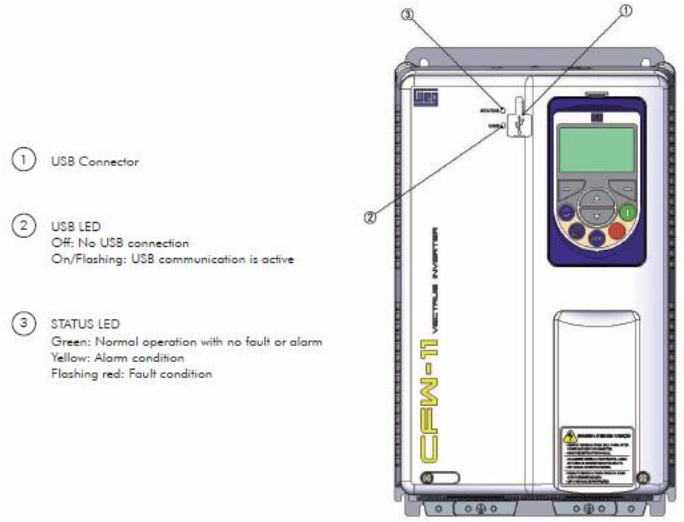
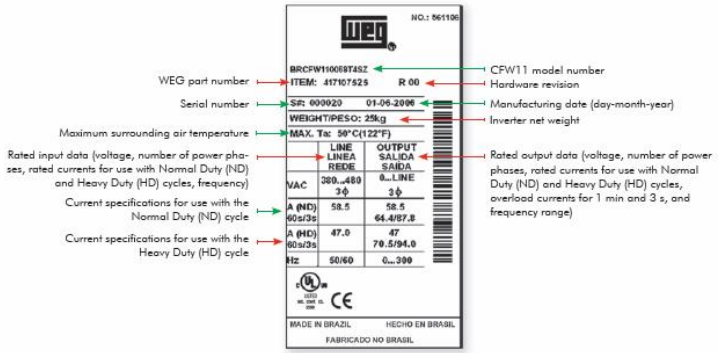


Figure 2.3 - LEDs and USB connector

2.4 IDENTIFICATION LABELS FOR THE CFW-11

There are two nameplates on the CFW-11: one complete nameplate is affixed to the side of the inverter and a simplified one is located under the keypad. The nameplate under the keypad allows the identification of the most important characteristics of the inverter even if they are mounted side-by-side.



a) Nameplate affixed to the side of the inverter

b) Nameplate located under the keypad

Figure 2.4 *- Nameplates*

Figure 2.5 *- Location of the nameplates*

KEYPAD AND DISPLAY

This chapter describes:
- The operator keys and their functions;
- The indications on the display;
- How parameters are organized.

4.1 INTEGRAL KEYPAD - HMI-CFW11

The integral keypad can be used to operate and program (view / edit all parameters) of the CFW-11 inverter. The inverter keypad navigation is similar to the one used in cell phones and the parameters can be accessed in numerical order or through groups (Menu).

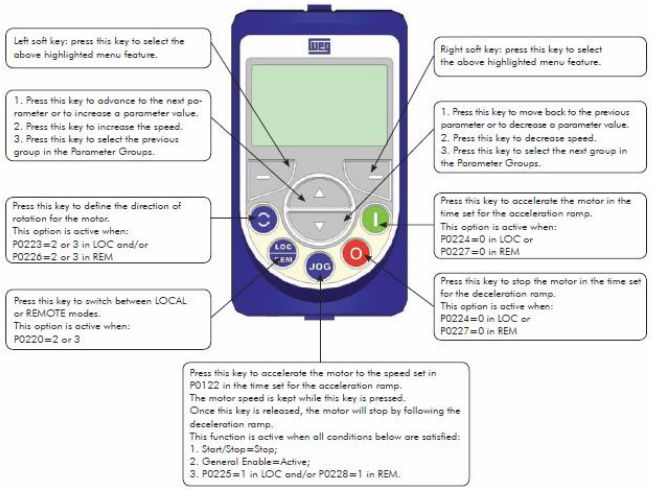
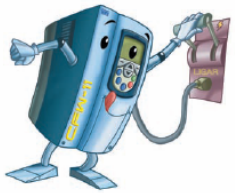


***Figure 4.1** - Operator keys*

FIRST TIME POWER-UP AND START-UP



This chapter describes how to:
- Check and prepare the inverter before power-up.
- Power-up the inverter and check the result.
- Set the inverter for the operation in the V/f mode based on the power supply and motor information by using the Oriented Start-Up routine and the Basic Application group.

NOTE!
For a detailed description of the VVW or Vector control modes and for other available functions, please refer to the CFW-11 Software Manual.

5.1 PREPARE FOR START-UP

The inverter shall have been already installed according to the recommendations listed in Chapter 3 – Installation and Connection. The following recommendations are applicable even if the application design is different from the suggested control connections.

DANGER!
Always disconnect the main power supply before performing any inverter connection.

1) Check if power, grounding, and control connections are correct and firmly secured.

2) Remove from the inside of the inverter all installation material left behind.

3) Verify the motor connections and if the motor voltage and current is within the rated value of the inverter.

4) Mechanically uncouple the motor from the load:
If the motor cannot be uncoupled, make sure that the chosen direction of rotation (forward or reverse) will not result in personnel injury and/or equipment damage.

5) Return the inverter covers.

6) Measure the power supply voltage and verify if it is within the range listed in chapter 8.

7) Apply power to the input:
Close the input disconnect switch.

8) Check the result of the first time power-up:
The keypad should display the standar monitoring mode (figure 4.3 **(a)**) and the status LED should be steady green.

5.2 START-UP

The start-up procedure for the V/f is described in three simple steps by using the **Oriented Start-up routine** and the **Basic Application group**.

Steps:
(1) Set the password for parameter modification.

(2) Execute the **Oriented Start-up routine**.

(3) Set the parameters of the **Basic Application group**.

5.2.1 Password Setting in P0000

Step	Action/Result	Display indication
1	- Monitoring Mode. - Press **"Menu"** (rigth soft key).	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu
2	- Group **"00 ALL PARAMETERS"** is already selected. - Press **"Select"**.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
3	- Parameter **"Access to Parameters P0000: 0"** is already selected. - Press **"Select"**.	Ready LOC 0rpm Access to Parameters P0000: 0 Speed Reference P0001: 90 rpm Return 15:45 Select
4	- To set the password, press the Up Arrow until number 5 is displayed in the keypad.	Ready LOC 0rpm P0000 Access to Parameters 0 Return 15:45 Save
5	- When number 5 is displayed in the keypad, press **"Save"**.	Ready LOC 0rpm P0000 Access to Parameters 5 Return 15:45 Save
6	- If the setting has been properly performed, the keypad should display **"Access to Parameters P0000: 5"**. - Press **"Return"** (left soft key).	Ready LOC 0rpm Access to Parameters P0000: 5 Speed Reference P0001: 90 rpm Return 15:45 Select
7	- Press **"Return"**.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
8	- The display returns to the Monitoring Mode.	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu

***Figure 5.1** - Steps for allowing parameters modification via P0000*

5.2.2 Oriented Start-Up

There is a group of parameters named "Oriented Start-up" that makes the inverter settings easier. Inside this group, there is a parameter – P0317 – that shall be set to enter into the Oriented Start-up routine.

The Oriented Start-up routine allows you to quickly set up the inverter for operation with the line and motor used. This routine prompts you for the most commonly used parameters in a logic sequence.

In order to enter into the Oriented Start-up routine, follow the steps presented in figure 5.2, first modifying parameter P0317 to 1 and then, setting all remaining parameters as they are prompted in the display.

The use of the Oriented Start-up routine for setting the inverter parameters may lead to the automatic modification of other internal parameters and/or variables of the inverter.

During the Oriented Start-up routine, the message "Config" will be displayed at the left top corner of the keypad.

Step	Action/Result	Display indication
1	- Monitoring Mode. - Press **"Menu"** (right soft key).	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 13:48 Menu
2	- Group **"00 ALL PARAMETERS"** has been already selected.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
3	- Group **"01 PARAMETER GROUPS"** is selected.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
4	- Group **"02 ORIENTED START-UP"** is then selected. - Press **"Select"**.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
5	- Parameter **"Oriented Start-Up P0317: No"** has been already selected. - Press **"Select"**.	Ready LOC 0rpm Oriented Start-Up P0317: No Return 13:48 Select
6	- The value of **"P0317 = [000] No"** is displayed.	Ready LOC 0rpm P0317 Oriented Start-up [000] No Return 13:48 Save
7	- The parameter value is modified to **"P0317 = [001] Yes"**. - Press **"Save"**.	Ready LOC 0rpm P0317 Oriented Start-up [001] Yes Return 13:48 Save
8	- At this point the Oriented Start-up routine starts and the "Config" status is displayed at the top left corner of the keypad. - The parameter **"Language P0201: English"** is already selected. - If needed, change the language by pressing **"Select"**. Then, press or to scroll through the available options and press **"Save"** to select a different language.	Config LOC 0rpm Language P0201: English Type of Control P0202: V/F 60 Hz Reset 13:48 Select
9	- If needed, change the value of P0202 according to the type of control. To do so, press **"Select"**. - The settings listed here are valid only for P0202=0 (V/f 60 Hz) or P0202=1 (V/f 50 Hz). For other options (Adjustable V/f, VVW, or Vector modes), please refer to the Software Manual.	Config LOC 0rpm Language P0201: English Type of Control P0202: V/F 60 Hz Reset 13:48 Select

***Figure 5.2** - Oriented Start-up*

Step	Action/Result	Display indication
10	- If needed, change the value of P0296 according to the line rated voltage. To do so, press **"Select"**. This modification will affect P0151, P0153, P0185, P0321, P0322, P0323, and P0400.	Config LOC 0rpm Type of Control P0202: V/F 60 HZ **Line Rated Voltage** **P0296: 440 – 460 V** Reset 13:48 Select
11	- If needed, change the value of P0298 according to the inverter application. To do so, press **"Select"**. This modification will affect P0156, P0157, P0158, P0401, P0404 and P0410 (this last one only if P0202 = 0, 1, or 2 – V/f control). The time and the activation level of the overload protection will be affected as well.	Config LOC 0rpm Line Rated Voltage P0296: 440 – 460 V **Application** **P0298: Heavy Duty** Reset 13:48 Select
12	- If needed, change the value of P0398 according to the motor service factor. To do so, press **"Select"**. This modification will affect the current value and the activation time of the motor overload function.	Config LOC 0rpm Application P0298: Heavy Duty **Motor Service Factor** **P0398: 1.15** Reset 13:48 Select
13	- If needed, change the value of P0400 according to the motor rated voltage. To do so, press **"Select"**. This modification adjusts the output voltage by a factor x = P0400/P0296.	Config LOC 0rpm Motor Service Factor P0398: 1.15 **Motor Rated Voltage** **P0400: 440 V** Reset 13:48 Select
14	- If needed, change the value of P0401 according to the motor rated current. To do so, press **"Select"**. This modification will affect P0156, P0157, P0158, and P0410.	Config LOC 0rpm Motor Rated Voltage P0400: 440V **Motor Rated Current** **P0401: 13.5 A** Reset 13:48 Select
15	- If needed, set P0402 according to the motor rated speed. To do so, press **"Select"**. This modification affects P0122 to P0131, P0133, P0134, P0135, P0182, P0208, P0288, and P0289.	Config LOC 0rpm Motor Rated Current P0401: 13.5 A **Motor Rated Speed** **P0402: 1750 rpm** Reset 13:48 Select
16	- If needed, set P0403 according to the motor rated frequency. To do so, press **"Select"**. This modification affects P0402.	Config LOC 0rpm Motor Rated Speed P0402: 1750 rpm **Motor Rated Frequency** **P0403: 60 Hz** Reset 13:48 Select
17	- If needed, change the value of P0404 according to the motor rated power. To do so, press **"Select"**. This modification affects P0410.	Config LOC 0rpm Motor Rated Frequency P0403: 60 Hz **Motor Rated Power** **P0404: 4hp 3kW** Reset 13:48 Select
18	- This parameter will only be visible if the encoder board ENC1 is installed in the inverter. - If there is an encoder connected to the motor, set P0405 according to the encoder pulses number. To do so, press **"Select"**.	Config LOC 0rpm Motor Rated Power P0404: 4hp 3kW **Encoder Pulses Number** **P0405: 1024 ppr** Reset 13:48 Select
19	- If needed, set P0406 according to the motor ventilation. To do so, press **"Select"**. - To complete the Oriented Start-Up routine, press **"Reset"** (left soft key) or 0.	Config LOC 0rpm Encoder Pulses Number P0405: 1024 ppr **Motor Ventilation** **P0406: Self-Vent.** Reset 13:48 Select
20	- After few seconds, the display returns to the Monitoring Mode.	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 13:48 Menu

Figure 5.2 (cont.) *- Oriented Start-up*

5.2.3 Setting Basic Application Parameters

After running the Oriented Start-up routine and properly setting the parameters, the inverter is ready to operate in the V/f mode.

The inverter has a number of other parameters that allow its adaptation to the most different applications. This manual presents some basic parameters that shall be set in most cases. There is a group named "Basic Application" to make this task easier. A summary of the parameters inside this group is listed in table 5.1. There is also a group of read only parameters that shows the value of the most important inverter variables such as voltage, current, etc. The main parameters comprised in this group are listed in table 5.2. For further details, please refer to the CFW-11 Software Manual.

Follow steps outlined in figure 5.3 to set the parameters of the Basic Application group.

The procedure for start-up in the V/f operation mode is finished after setting these parameters.

Step	Action/Result	Display indication
1	- Monitoring Mode. - Press **"Menu"** (right soft key).	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu
2	- Group **"00 ALL PARAMETERS"** has been already selected.	Ready LOC 0rpm **00 ALL PARAMETERS** 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
3	- Group **"01 PARAMETER GROUPS"** is then selected.	Ready LOC 0rpm 00 ALL PARAMETERS **01 PARAMETER GROUPS** 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
4	- Group **"02 ORIENTED START-UP"** is then selected.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS **02 ORIENTED START-UP** 03 CHANGED PARAMETERS Return 15:45 Select
5	- Group **"03 CHANGED PARAMETERS"** is selected.	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP **03 CHANGED PARAMETERS** Return 15:45 Select
6	- Group **"04 BASIC APPLICATION"** is selected. - Press **"Select"**.	Ready LOC 0rpm 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS **04 BASIC APPLICATION** Return 15:45 Select
7	- Parameter **"Acceleration Time P0100: 20.0 s"** has been already selected. - If needed, set P0100 according to the desired acceleration time. To do so, press **"Select"**. - Proceed similarly until all parameters of group **"04 BASIC APPLICATION"** have been set. When finished, press **"Return"** (left soft key).	Ready LOC 0rpm **Acceleration Time** **P0100: 20.0s** Deceleration Time P0101: 20.0s Return 15:45 Select
8	- Press **"Return"**.	Ready LOC 0rpm 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS **04 BASIC APPLICATION** Return 15:45 Select
9	- The display returns to the Monitoring Mode and the inverter is ready to run.	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu

Figure 5.3 *- Setting parameters of the Basic Application group*

Table 5.1 - Parameters comprised in the Basic Application group

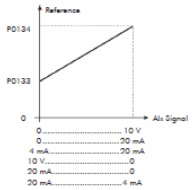
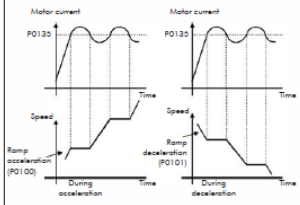
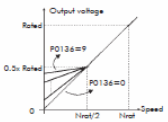
Parameter	Name	Description	Setting Range	Factory Setting	User Setting
P0100	Acceleration Time	- Defines the time to linearly accelerate from 0 up to the maximum speed (P0134). - If set to 0.0 s, it means no acceleration ramp.	0.0 to 999.0 s	20.0 s	
P0101	Deceleration Time	- Defines the time to linearly decelerate from the maximum speed (P0134) up to 0. - If set to 0.0 s, it means no deceleration ramp.	0.0 to 999.0 s	20.0 s	
P0133	Minimum Speed	- Defines the minimum and maximum values of the speed reference when the drive is enabled. - These values are valid for any reference source.	0 to 18000 rpm	90 rpm (60 Hz motor) 75 rpm (50 Hz motor)	
P0134	Maximum Speed			1800 rpm (60 Hz motor) 1500 rpm (50 Hz motor)	
P0135	Max. Output Current	- Avoids motor stall under torque overload condition during the acceleration or deceleration. - The factory default setting is for "Ramp Hold": if the motor current exceeds the value set at P0135 during the acceleration or deceleration, the motor speed will not be increased (acceleration) or decreased (deceleration) anymore. When the motor current reaches a value below the programmed in P0135, the motor speed is again increased or decreased. - Other options for the current limitation are available. Refer to the CFW-11 Software Manual. 	0.2 x I_{nom-D} to 2 x I_{nom-D}	1.5 x I_{nom-D}	
P0136	Manual Torque Boost	- Operates in low speeds, modifying the output voltage x frequency curve to keep the torque constant. - Compensates the voltage drop at the motor stator resistance. This function operates in low speeds increasing the inverter output voltage to keep the torque constant in the V/f mode. - The optimal setting is the smallest value of P0136 that allows the motor to start satisfactorily. An excessive value will considerably increase the motor current in low speeds, and may result in a fault (F048, F051, F071, F072, F078 or F183) or alarm (A046, A047, A050 or A110) condition. 	0 to 9	1	

Table 5.2 - Main read only parameters

Parameter	Description	Setting Range
P0001	Speed Reference	0 to 18000 rpm
P0002	Motor Speed	0 to 18000 rpm
P0003	Motor Current	0.0 to 4500.0 A
P0004	DC Link Voltage (Ud)	0 to 2000 V
P0005	Motor Frequency	0.0 to 300.0 Hz
P0006	VFD Status	0 = Ready 1 = Run 2 = Undervoltage 3 = Fault 4 = Self-tuning 5 = Configuration 6 = DC-Braking 7 = STO
P0007	Motor Voltage	0 to 2000 V
P0009	Motor Torque	-1000.0 to 1000.0 %
P0010	Output Power	0.0 to 6553.5 kW
P0012	DI8 to DI1 Status	0000h to 00FFh
P0013	DO5 to DO1 Status	0000h to 001Fh
P0018	AI1 Value	-100.00 to 100.00 %
P0019	AI2 Value	-100.00 to 100.00 %
P0020	AI3 Value	-100.00 to 100.00 %
P0021	AI4 Value	-100.00 to 100.00 %
P0023	Software Version	0.00 to 655.35
P0027	Accessories Config. 1	Hexadecimal code representing the identified accessories. Refer to chapter 7.
P0028	Accessories Config. 2	
P0029	Power Hardware Config.	Hexadecimal code according to the available models and option kits. Refer to the software manual for a complete code list.
P0030	IGBTs Temperature U	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0031	IGBTs Temperature V	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0032	IGBTs Temperature W	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0033	Rectifier Temperature	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0034	Internal Air Temp.	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0036	Fan Heatsink Speed	0 to 15000 rpm
P0037	Motor Overload Status	0 to 100 %
P0038	Encoder Speed	0 to 65535 rpm
P0040	PID Process Variable	0.0 to 100.0 %
P0041	PID Setpoint Value	0.0 to 100.0 %
P0042	Time Powered	0 to 65535h
P0043	Time Enabled	0.0 to 6553.5h
P0044	kWh Output Energy	0 to 65535 kWh
P0045	Fan Enabled Time	0 to 65535h
P0048	Present Alarm	0 to 999
P0049	Present Fault	0 to 999

Parameter	Description	Setting Range
P0050	Last Fault	0 to 999
P0051	Last Fault Day/Month	00/00 to 31/12
P0052	Last Fault Year	00 to 99
P0053	Last Fault Time	00:00 to 23:59
P0054	Second Fault	0 to 999
P0055	Second Flt. Day/Month	00/00 to 31/12
P0056	Second Fault Year	00 to 99
P0057	Second Fault Time	00:00 to 23:59
P0058	Third Fault	0 to 999
P0059	Third Fault Day/Month	00/00 to 31/12
P0060	Third Fault Year	00 to 99
P0061	Third Fault Time	00:00 to 23:59
P0062	Fourth Fault	0 to 999
P0063	Fourth Flt. Day/Month	00/00 to 31/12
P0064	Fourth Fault Year	00 to 99
P0065	Fourth Fault Time	00:00 to 23:59
P0066	Fifth Fault	0 to 999
P0067	Fifth Fault Day/Month	00/00 to 31/12
P0068	Fifth Fault Year	00 to 99
P0069	Fifth Fault Time	00:00 to 23:59
P0070	Sixth Fault	0 to 999
P0071	Sixth Fault Day/Month	00/00 to 31/12
P0072	Sixth Fault Year	00 to 99
P0073	Sixth Fault Time	00:00 to 23:59
P0074	Seventh Fault	0 to 999
P0075	Seventh Flt.Day/Month	00/00 to 31/12
P0076	Seventh Fault Year	00 to 99
P0077	Seventh Fault Time	00:00 to 23:59
P0078	Eighth Fault	0 to 999
P0079	Eighth Flt. Day/Month	00/00 to 31/12
P0080	Eighth Fault Year	00 to 99
P0081	Eighth Fault Time	00:00 to 23:59
P0082	Ninth Fault	0 to 999
P0083	Ninth Fault Day/Month	00/00 to 31/12
P0084	Ninth Fault Year	00 to 99
P0085	Ninth Fault Time	00:00 to 23:59
P0086	Tenth Fault	0 to 999
P0087	Tenth Fault Day/Month	00/00 to 31/12
P0088	Tenth Fault Year	00 to 99
P0089	Tenth Fault Time	00:00 to 23:59
P0090	Current At Last Fault	0.0 to 4000.0 A
P0091	DC Link At Last Fault	0 to 2000 V
P0092	Speed At Last Fault	0 to 18000 rpm
P0093	Reference Last Fault	0 to 18000 rpm
P0094	Frequency Last Fault	0.0 to 300.0 Hz
P0095	Motor Volt.Last Fault	0 to 2000 V
P0096	DIx Status Last Fault	0000h to 00FFh
P0097	DOx Status Last Fault	0000h to 001Fh

5.3 SETTING DATE AND TIME

Step	Action/Result	Display indication
1	Monitoring Mode. - Press **"Menu"** (right soft key).	Ready C LOC Brpn 0 rpm 0.0 A 0.0 Hz 16:10 Menu
2	- Group **"00 ALL PARAMETERS"** is already selected.	Ready C LOC Brpn 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 16:10 Select
3	- Group **"01 PARAMETER GROUPS"** is selected. - Press **"Select"**	Ready C LOC Brpn 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 16:10 Select
4	- A new list of groups is displayed and group **"20 Ramps"** is selected. - Press ▼ until you reach group **"30 HMI"**.	Ready C LOC Brpn 20 Ramps 21 Speed References 22 Speed Limits 23 V/F Control Return 16:10 Select
5	- Group **"30 HMI"** is selected. - Press **"Select"**.	Ready C LOC Brpn 27 V/F DC Volt. Limit. 29 Dynamic Braking 29 Vector Control 30 HMI Return 16:10 Select
6	- Parameter **"Day P0194"** is already selected. - If needed, set P0194 according to the actual day. To do so, press **"Select"** and then, ▲ or ▼ to change P0194 value. - Follow the same steps to set parameters **"Month P0195"** to **"Seconds P0199"**.	Ready C LOC Brpn Day P0194: 06 Month P0195: 10 Return 16:10 Select
7	- Once the setting of P0199 is over, the Real Time Clock is now updated. - Press **"Return"** (left soft key).	Ready C LOC Brpn Minutes P0198: 11 Seconds P0199: 34 Return 16:11 Select
8	- Press **"Return"**.	Ready C LOC Brpn 27 V/F DC Volt. Limit. 29 Dynamic Braking 29 Vector Control 30 HMI Return 16:11 Select
9	- Press **"Return"**.	Ready C LOC Brpn 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 16:11 Select
10	- The display is back to the Monitoring Mode.	Ready C LOC Brpn 0 rpm 0.0 A 0.0 Hz 16:11 Menu

***Figure 5.4** - Setting date and time*

5.4 BLOCKING PARAMETERS MODIFICATION

To prevent unauthorized or unintended parameters modification, parameter P0000 should be set to a value different from 5. Follow the same procedures described in item 5.2.1.

5.5 HOW TO CONNECT A PC

NOTES!

- Always use a standard host/device shielded USB cable. Unshielded cables may lead to communication errors.
- Recommended cables: Samtec:
USBC-AM-MB-B-B-S-1 (1 meter);
USBC-AM-MB-B-B-S-2 (2 meters);
USBC-AM-MB-B-B-S-3 (3 meters).
- The USB connection is galvanically isolated from the mains power supply and from other high voltages internal to the inverter. However, the USB connection is not isolated from the Protective Ground (PE). Use an isolated notebook for the USB connection or a desktop connected to the same Protective Ground (PE) of the inverter.

Install the SuperDrive G2 software to control motor speed, view, or edit inverter parameters through a personal computer (PC).

Basic procedures for transferring data from the PC to the inverter:

1. Install the SuperDrive G2 software in the PC;
2. Connect the PC to the inverter through a USB cable;
3. Start SuperDrive G2;
4. Choose "Open" and the files stored in the PC will be displayed;
5. Select the file;
6. Use the command "Write Parameters to the Drive".

All parameters are now transferred to the inverter.
For further information on SuperDrive G2 software, please refer SuperDrive Manual.

5.6 FLASH MEMORY MODULE

Location as presented in figure 2.2 item G.

<u>Features:</u>

- Store a copy of the inverter parameters;
- Transfer parameters stored in the FLASH memory to the inverter;
- Transfer firmware stored in the FLASH memory to the inverter;
- Store programs created by the SoftPLC.

Whenever the inverter is powered up, this program is transferred to the RAM memory located in the inverter control board and executed.

Refer to the CFW-11 Software Manual and to SoftPLC Manual for further details.

ATTENTION!

Before installing or removing the FLASH memory module, disconnect the inverter power supply and wait for the complete discharge of the capacitors.

TROUBLESHOOTING AND MAINTENANCE

This chapter:
- Lists all faults and alarms that may occur.
- Indicates the possible causes of each fault and alarm.
- Lists most frequent problems and corrective actions.
- Presents instructions for periodic inspections and preventive maintenance in the equipment.

6.1 OPERATION OF THE FAULTS AND ALARMS

When a fault is detected ("FAULT" (FXXX)):
☑ The PWM pulses are blocked;
☑ The keypad displays the "FAULT" code and description;
☑ The "STATUS" LED starts flashing red;
☑ The output relay set to "NO FAULT" opens;
☑ Some control circuitry data is saved in the EEPROM memory:
- Keypad and EP (Electronic Pot) speed references, in case the function "Reference backup" is enabled in P0120;
- The "FAULT" code that occurred (shifts the last nine previous faults and alarms);
- The state of the motor overload function integrator;
- The state of the operating hours counter (P0043) and the powered-up hours counter (P0042).

Reset the inverter to return the drive to a "READY" condition in the event of a "FAULT". The following reset options are available:
☑ Removing the power supply and reapplying it (power-on reset);
☑ Pressing the operator key (manual reset);
☑ Through the "Reset" soft key;
☑ Automatically by setting P0206 (auto-reset);
☑ Through a digital input: DIx=20 (P0263 to P0270).

When an alarm situation ("ALARM" (AXXX)) is detected:
☑ The keypad displays the "ALARM" code and description;
☑ The "STATUS" LED changes to yellow;
☑ The PWM pulses are not blocked (the inverter is still operating).

6.2 FAULTS, ALARMS, AND POSSIBLE CAUSES

Table 6.1 - "Faults", "Alarms", and Possible Causes

Fault/Alarm	Description	Possible Causes
F006: Imbalance or Input Phase Loss	Mains voltage imbalance too high or phase missing in the input power supply. **Note:** - If the motor is unloaded or operating with reduced load this fault may not occur. - Fault delay is set at parameter P0357. P0357=0 disables the fault.	☑ Phase missing at the inverter's input power supply. ☑ Input voltage imbalance >5 %.
A010: Rectifier High Temperature	A high temperature alarm was detected by the NTC temperature sensors located in the rectifier modules. **Note:** - This is valid only for the following models: CFW110086T2, CFW110105T2, CFW110045T4, CFW110058T4, CFW110070T4 and CFW110088T4. - It may be disabled by setting P0353=2 or 3.	☑ Surrounding air temperature is too high (>50 °C (122 °F)) and output current is too high. ☑ Blocked or defective fan. ☑ Inverter heatsink is completely covered with dust.
F011: Rectifier Overtemperature	An overtemperature fault was detected by the NTC temperature sensors located in the rectifier modules. **Note:** - This is valid only for the following models: CFW110086T2, CFW110105T2, CFW110045T4, CFW110058T4, CFW110070T4 and CFW110088T4.	
F021: DC Bus Undervoltage	DC bus undervoltage condition occurred.	☑ The input voltage is too low and the DC bus voltage dropped below the minimum permitted value (monitor the value at Parameter P0004): Ud < 223 V - For a 200-240 V three-phase input voltage Ud < 170 V - For a 200-240 V single-phase input voltage (models CFW11XXXXS2 or CFW11XXXB2) (P0296=0); Ud < 385 V - For a 380 V input voltage (P0296=1); Ud < 405 V - For a 400-415 V input voltage (P0296=2); Ud < 446 V - For a 440-460 V input voltage (P0296=3); Ud < 487 V - For a 480 V input voltage (P0296=4). ☑ Phase loss in the input power supply. ☑ Pre-charge circuit failure. ☑ Parameter P0296 was set to a value above of the power supply rated voltage.
F022: DC Bus Overvoltage	DC bus overvoltage condition occurred.	☑ The input voltage is too high and the DC bus voltage surpassed the maximum permitted value: Ud > 400 V - For 220-230 V input models (P0296=0); Ud > 800 V - For 380-480 V input models (P0296=1, 2, 3, or 4). ☑ Inertia of the driven-load is too high or deceleration time is too short. ☑ Wrong settings for parameters P0151, or P0153, or P0185.
F030: Power Module U Fault	Desaturation of IGBT occured in Power Module U. **Note:** This protection is available only for frame D models.	☑ Short-circuit between motor phases U and V or U and W.
F034: Power Module V Fault	Desaturation of IGBT occured in Power Module V. **Note:** This protection is available only for frame D models.	☑ Short-circuit between motor phases V and U or V and W.
F038: Power Module W Fault	Desaturation of IGBT occured in Power Module W. **Note:** This protection is available only for frame D models.	☑ Short-circuit between motor phases W and U or W and V.
F042: DB IGBT Fault	Desaturation of Dynamic Braking IGBT occured. **Note:** This protection is available only for frame D models.	☑ Short-circuit between the connection cables of the dynamic braking resistor.

Table 6.1 (cont.) - "Faults", "Alarms", and Possible Causes

Fault/Alarm	Description	Possible Causes
A046: High Load on Motor	Load is too high for the used motor. **Note:** It may be disabled by setting P0348=0 or 2.	☑ Settings of P0156, P0157, and P0158 are too low for the used motor. ☑ Motor shaft load is excessive.
A047: IGBT Overload Alarm	An IGBT overload alarm occurred. **Note:** It may be disabled by setting P0350=0 or 2.	☑ Inverter output current is too high.
F048: IGBT Overload Fault	An IGBT overload fault occurred. **Note:** It may be disabled by setting P0350=0 or 2.	☑ Inverter output current is too high.
A050: IGBT High Temperature	A high temperature alarm was detected by the NTC temperature sensors located on the IGBTs. **Note:** It may be disabled by setting P0353=2 or 3.	☑ Surrounding air temperature is too high (>50 °C (122 °F)) and output current is too high. ☑ Blocked or defective fan. ☑ Inverter heatsink is completely covered with dust.
F051: IGBT Overtemperature	A high temperature fault was detected by the NTC temperature sensors located on the IGBTs.	
F067: Incorrect Encoder/ Motor Wiring	Fault related to the phase relation of the encoder signals. **Note:** - This fault can only happen during the self-tuning routine. - It is not possible to reset this fault. - In this case, turn off the power supply, solve the problem, and then turn it on again.	☑ Output motor cables U, V, W are inverted. ☑ Encoder channels A and B are inverted. ☑ Encoder was not properly mounted.
F070: Overcurrent / Short-circuit	Overcurrent or short-circuit detected at the output, in the DC bus, or at the braking resistor. **Note:** It is available only for models of frames A, B, and C.	☑ Short-circuit between two motor phases. ☑ Short-circuit between the connection cables of the dynamic braking resistor. ☑ IGBT modules are shorted.
F071: Output Overcurrent	The inverter output current was too high for too long.	☑ Excessive load inertia or acceleration time too short. ☑ Settings of P0135, P0169, P0170, P0171, and P0172 are too high.
F072: Motor Overload	The motor overload protection operated. **Note:** It may be disabled by setting P0348=0 or 3.	☑ Settings of P0156, P0157, and P0158 are too low for the used motor. ☑ Motor shaft load is excessive.
F074: Ground Fault	A ground fault occured either in the cable between the inverter and the motor or in the motor itself. **Note:** It may be disabled by setting P0343=0.	☑ Shorted wiring in one or more of the output phases. ☑ Motor cable capacitance is too large, resulting in current peaks at the output. (1)
F076: Motor Current Imbalance	Fault of motor current imbalance. **Note:** It may be disabled by setting P0342=0.	☑ Loose connection or broken wiring between the motor and inverter connection. ☑ Vector control with wrong orientation. ☑ Vector control with encoder, encoder wiring or encoder motor connection inverted.
F077: DB Resistor Overload	The dynamic braking resistor overload protection operated.	☑ Excessive load inertia or desacceleration time too short. ☑ Motor shaft load is excessive. ☑ Wrong setttings for parameters P0154 and P0155.
F078: Motor Overtemperature	Fault related to the PTC temperature sensor installed in the motor. **Note:** - It may be disabled by setting P0351=0 or 3. - It is required to set the analog input / output to the PTC function.	☑ Excessive load at the motor shaft. ☑ Excessive duty cycle (too many starts / stops per minute). ☑ Surrounding air temperature too high. ☑ Loose connection or short-circuit (resistance < 100 Ω) in the wiring connected to the motor termistor. ☑ Motor termistor is not installed. ☑ Blocked motor shaft.
F079: Encoder Signal Fault	Lack of encoder signals.	☑ Broken wiring between motor encoder and option kit for encoder interface. ☑ Defective encoder.

Table 6.1 (cont.) - "Faults", "Alarms", and Possible Causes

Fault/Alarm	Description	Possible Causes
F080: CPU Watchdog	Microcontroller watchdog fault.	☑ Electrical noise.
F082: Copy Function Fault	Fault while copying parameters.	☑ An attempt to copy the keypad parameters to an inverter with a different firmware version.
F084: Auto-diagnosis Fault	Auto-diagnosis fault.	☑ Defect in the inverter internal circuitry.
A088: Keypad Comm. Fault	Indicates a problem between the keypad and control board communication.	☑ Loose keypad cable connection. ☑ Electrical noise in the installation.
A090: External Alarm	External alarm via digital input. **Note:** It is required to set a digital input to "No external alarm".	☑ Wiring was not connected to the digital input (DI1 to DI8) set to "No external alarm".
F091: External Fault	External fault via digital input. **Note:** It is required to set a digital input to "No external fault".	☑ Wiring was not connected to the digital input (DI1 to DI8) set to "No external fault".
F099: Invalid Current Offset	Current measurement circuit is measuring a wrong value for null current.	☑ Defect in the inverter internal circuitry.
A110: High Motor Temperature	Alarm related to the PTC temperature sensor installed in the motor. **Note:** - It may be disabled by setting P0351=0 or 2. - It is required to set the analog input / output to the PTC function.	☑ Excessive load at the motor shaft. ☑ Excessive duty cycle (too many starts / stops per minute). ☑ Surrounding air temperature too high. ☑ Loose connection or short-circuit (resistance < 100 Ω) in the wiring connected to the motor termistor. ☑ Motor termistor is not installed. ☑ Blocked motor shaft.
A128: Timeout for Serial Communication	Indicates that the inverter stopped receiving valid messages within a certain time interval. **Note:** It may be disabled by setting P0314=0.0 s.	☑ Check the wiring and grounding installation. ☑ Make sure the inverter has sent a new message within the time interval set at P0314.
A129: Anybus is Offline	Alarm that indicates interruption of the Anybus-CC communication.	☑ PLC entered into the idle state. ☑ Programming error. Master and slave set with a different number of I/O words. ☑ Communication with master has been lost (broken cable, unplugged connector, etc.).
A130: Anybus Access Error	Alarm that indicates an access error to the Anybus-CC communication module.	☑ Defective, unrecognized, or improperly installed Anybus-CC module. ☑ Conflict with a WEG option board.
A133: CAN Not Powered	Alarm indicating that the power supply was not connected to the CAN controller.	☑ Broken or loose cable. ☑ Power supply is off.
A134: Bus Off	Inverter CAN interface has entered into the bus-off state.	☑ Incorrect communication baud-rate. ☑ Two nodes configured with the same address in the network. ☑ Wrong cable connection (inverted signals).
A135: CANopen Communication Error	Alarm that indicates a communication error.	☑ Communication problems. ☑ Wrong master configuration/settings. ☑ Incorrect configuration of the communication objects.
A136: Idle Master	Network master has entered into the idle state.	☑ PLC in IDLE mode. ☑ Bit of the PLC command register set to zero (0).
A137: DNet Connection Timeout	I/O connection timeout - DeviceNet communication alarm.	☑ One or more allocated I/O connections have entered into the timeout state.
F150: Motor Overspeed	Overspeed fault. It is activated when the real speed exceeds the value of P0134+P0132 for more than 20 ms.	☑ Wrong settings of P0161 and/or P0162. ☑ Problem with the hoist-type load.
F151: FLASH Memory Module Fault	FLASH Memory Module fault (MMF-01).	☑ Defective FLASH memory module. ☑ Check the connection of the FLASH memory module.

Table 6.1 (cont.) - "Faults", "Alarms", and Possible Causes

Fault/Alarm	Description	Possible Causes
A152: Internal Air High Temperature	Alarm indicating that the internal air temperature is too high. **Note:** It may be disabled by setting P0353=1 or 3.	☑ Surrounding air temperature too high (>50 °C (122 °F)) and excessive output current. ☑ Defective internal fan (if installed).
F153: Internal Air Overtemperature	Internal air overtemperature fault.	
F156: Undertemperature	Undertemperature fault (below -30 °C (-22 °F)) in the IGBT or rectifier measured by the temperature sensors.	☑ Surrounding air temperature ≤ -30 °C (-22 °F).
A177: Fan Replacement	Fan replacement alarm (P0045 > 50000 hours). **Note:** This function may be disabled by setting P0354=0.	☑ Maximum number of operating hours for the heatsink fan has been reached.
F179: Heatsink Fan Speed Fault	This fault indicates a problem with the heatsink fan. **Note:** This function may be disabled by setting P0354=0.	☑ Dust on fan blades and bearings. ☑ Defective fan.
A181: Invalid Clock Value	Invalid clock value alarm.	☑ It is necessary to set date and time at parameters P0194 to P0199. ☑ Keypad battery is discharged, defective, or not installed.
F182: Pulse Feedback Fault	Indicates a fault on the output pulses feedback.	☑ Defect in the inverter internal circuitry.
F183: IGBT overload + Temperature	Overtemperature related to the IGBTs overload protection.	☑ Surrounding air temperature too high. ☑ Operation with frequencies < 10 Hz under overload.

Note:

(1) Long motor cables (with more than 100 meters) will have a high leakage capacitance to the ground. The circulation of leakage currents through these capacitances may activate the ground fault protection after the inverter is enabled, and consequently, the occurrence of fault F074.

POSSIBLE SOLUTIONS:

- Decrease the carrier frequency (P0297).
- Install an output reactor between the inverter and the motor.

6.3 SOLUTIONS FOR THE MOST FREQUENT PROBLEMS

Table 6.2 - Solutions for the most frequent problems

Problem	Point to be Verified	Corrective Action
Motor does not start	Incorrect wiring connection	1. Check all power and control connections. For instance, the digital inputs set to start/stop, general enable, or no external error shall be connected to the 24 Vdc or to DGND* terminals (refer to figure 3.16).
	Analog reference (if used)	1. Check if the external signal is properly connected. 2. Check the status of the control potentiometer (if used).
	Incorrect settings	1. Check if parameters are properly set for the application.
	Fault	1. Check if the inverter is not blocked due to a fault condition. 2. Check if terminals XC1:13 and XC1:11 are not shorted (short-circuit at the 24 Vdc power supply).
	Motor stall	1. Decrease motor overload. 2. Increase P0136, P0137 (V/f), or P0169/P0170 (vector control).
Motor speed fluctuates (oscillates)	Loose connection	1. Stop the inverter, turn off the power supply, and check and tighten all power connections. 2. Check all internal connections of the inverter.
	Defective reference potentiometer	1. Replace potentiometer.
	Oscillation of the external analog reference	1. Identify the cause of the oscillation. If it is caused by electrical noise, use shielded cables or separate from the power and control wiring.
	Incorrect settings (vector control)	1. Check parameters P0410, P0412, P0161, P0162, P0175, and P0176. 2. Refer to the Software Manual.
Motor speed too high or too low	Incorrect settings (reference limits)	1. Check if the values of P0133 (minimum speed) and P0134 (maximum speed) are properly set for the motor and application used.
	Control signal from the analog reference (if used)	1. Check the level of the reference control signal. 2. Check the settings (gain and offset) of parameters P0232 to P0249.
	Motor nameplate	1. Check if the motor has been properly sized for the application.
Motor does not reach the rated speed, or motor speed starts oscillating around the rated speed (Vector Control)	Settings	1. Decrease P0180. 2. Check P0410.
Off display	Keypad connections	1. Check the inverter keypad connection.
	Power supply voltage	1. Rated values shall be within the limits specified below: 200-230 V power supply: - Minimum: 187 V - Maximum: 253 V 380-480 V power supply: - Minimum: 323 V - Maximum: 528 V
	Blown fuses	1. Replace fuses.

Table 6.2 (cont.) - Solutions for the most frequent problems

Problem	Point to be Verified	Corrective Action
Motor does not operate in the field weakning region (Vector Control)	Settings	1. Decrease P0180.
Low motor speed and P0009 = P0169 or P0170 (motor operating with torque limitation), for P0202 = 4 - vector with encoder	Encoder signals are inverted or power connection is inverted	1. Check signals $\overline{A}$ – A, $\overline{B}$ – B, refer to the incremental encoder interface manual. If signals are properly installed, exchange two of the output phases. For instance U and V.

6.4 INFORMATION FOR CONTACTING TECHNICAL SUPPORT

NOTE!

For technical support and servicing, it is important to have the following information in hand:

- ☑ Inverter model;
- ☑ Serial number, manufacturing date, and hardware revision that are listed in the product nameplate (refer to item 2.4);
- ☑ Installed software version (check parameter P0023);
- ☑ Application data and inverter settings.

6.5 PREVENTIVE MAINTENANCE

DANGER!

- ☑ Always turn off the mains power supply before touching any electrical component associated to the inverter.
- ☑ High voltage may still be present even after disconnecting the power supply.
- ☑ To prevent electric shock, wait at least 10 minutes after turning off the input power for the complete discharge of the power capacitors.
- ☑ Always connect the equipment frame to the protective ground (PE). Use the adequate connection terminal in the inverter.

ATTENTION!

The electronic boards have electrostatic discharge sensitive components.
Do not touch the components or connectors directly. If needed, first touch the grounded mettalic frame or wear a ground strap.

Do not perform any withstand voltage test!
If needed, consult WEG.

The inverters require low maintenance when properly installed and operated . Table 6.3 presents main procedures and time intervals for preventive maintenance. Table 6.4 provides recommended periodic inspections to be performed every 6 months after inverter start-up.

Table 6.3 - Preventive maintenance

Maintenance		Interval	Instructions
Fan replacement		After 50.000 operating hours. (1)	Replacement procedure shown in figures 6.1 and 6.2.
Keypad battery replacement		Every 10 years.	Refer to chapter 4.
Electrolytic capacitors	If the inverter is stocked (not being used): "Reforming"	Every year from the manufacturing date printed in the inverter identification label (refer to item 2.4).	Apply power to the inverter (voltage between 200 and 230 Vac, single-phase or three-phase, 50 or 60 Hz) for at least one hour. Then, disconnect the power supply and wait at least 24 hours before using the inverter (reapply power).
	Inverter is being used: replace	Every 10 years.	Contact WEG technical support to obtain replacement procedures.

Note:

(1) The inverters are factory set for automatic fan control (P0352=2), which means that they will be turned on only when the heatsink temperature exceeds a reference value. Therefore, the operating hours of the fan will depend on the inverter usage conditions (motor current, output frequency, cooling air temperature, etc.).

The inverter stores the number of operating hours of the fan in parameter P0045. When this parameter reaches 50.000 operating hours, the keypad display will show alarm A177.

Table 6.4 - Recommended periodic inspections - Every 6 months

Component	Problem	Corrective Action
Terminals, connectors	Loose screws	Tighten
	Loose connectors	
Fans / Cooling system	Dirty fans	Cleaning
	Abnormal acoustic noise	Replace fan. Refer to figure 6.1.
	Blocked fan	Check the fan connection.
	Abnormal vibration	
	Dust in the cabinet air filter	Cleaning or replacement.
Printed circuit boards	Accumulation of dust, oil, humidity, etc.	Cleaning
	Odor	Replacement
Power module / Power connections	Accumulation of dust, oil, humidity, etc.	Cleaning
	Loose connection screws	Tighten
DC bus capacitors	Discoloration / odor / electrolyte leakage	Replacement
	Expanded or broken safety valve	
	Frame expansion	
Power resistors	Discoloration	Replacement
	Odor	
Heatsink	Dust accumulation	Cleaning
	Dirty	

6.5.1 Cleaning Instructions

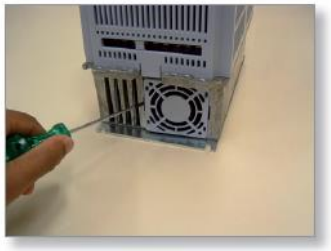
If needed to clean the inverter, follow the guidelines below:

Ventilation system:

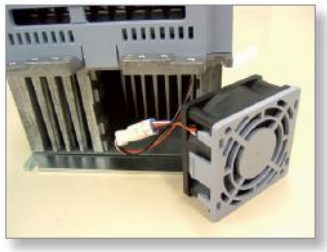
- ☑ Disconnect the inverter power supply and wait at least 10 minutes.
- ☑ Remove the dust from the cooling air inlet by using a soft brush or a flannel.
- ☑ Remove the dust from the heatsink fins and from the fan blades by using compressed air.

Electronic boards:

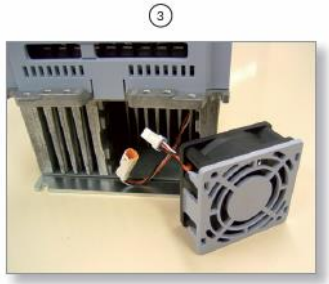
- ☑ Disconnect the inverter power supply and wait at least 10 minutes.
- ☑ Remove the dust from the electronic board by using an anti-static brush or an ion air gun (Charges Burtes Ion Gun - reference A6030-6DESCO).
- ☑ If needed, remove the boards from the inverter.
- ☑ Always wear a ground strap.



Releasing the latches of the fan cover

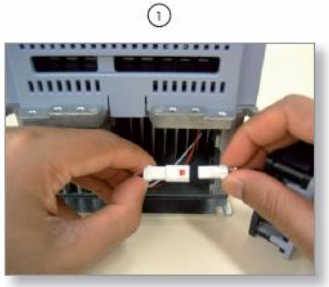


Fan removal

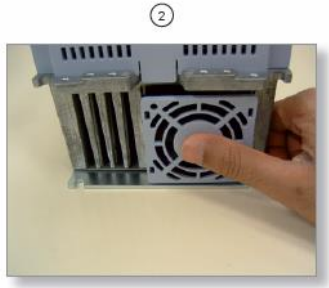


Cable disconnection

Figure 6.1 *- Removing the heatsink fan*



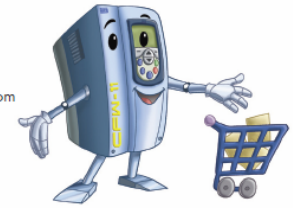
Cable connection



Fan fitting

Figure 6.2 *- Fan installation*

OPTION KITS AND ACCESSORIES



This chapter presents:
☑ The option kits that can be incorporated to the inverter from the factory:
- RFI filter;
- Safety Stop according to EN 954-1 category 3;
- External 24 Vdc power supply for control and keypad.

☑ Instructions for the proper use of the option kits.
☑ The accessories that can be incorporated to the inverters.

Details for the installation, operation, and programming of the accessories are described in their own manuals and were not included in this chapter.

7.1 OPTION KITS

Some models cannot incorporate all available option kits. Refer to table 8.1 for a detailed description of the option kits that are available for each inverter model.

The inverter codification is described in chapter 2.

7.1.1 RFI Filter

Inverters with the following codification: CFW11XXXXXXOFA. Refer to table 8.1 for information on availability of this option kit for each inverter model.

ATTENTION!
Do not use inverters with internal RFI filters in IT networks (ungrounded neutral or grounding provided by a high ohm value resistor) or in grounded delta networks ("delta corner earth"). These type of installations will damage the inverter filter capacitors.

The RFI filter reduces the conducted noise of the inverter to the electrical supply system in the high frequency range (>150 kHz).

The RFI filter is required for the compliance with conducted emissions limits established by the Electromagnetic Compatibility standards such as EN 61800-3 and EN 55011.

For the proper operation of the RFI filter, please follow the instructions listed in item 3.3 for the installation of the inverter, motor, cables, etc. This chapter also provides information on the compliance of these standards, such as the maximum motor cable length.

7.1.2 Safety Stop According to EN 954-1 Category 3 (Pending Certification)

Inverters with the following codification: CFW11XXXXXXOY.

The inverters with this option are equipped with an additional board (SRB) that contains 2 safety relays and an interconnection cable with the power circuit.

Figure 7.1 shows the location of the SRB board and the location of the connector XC25 (used for the connection of the SRB board signals) in the inverter.

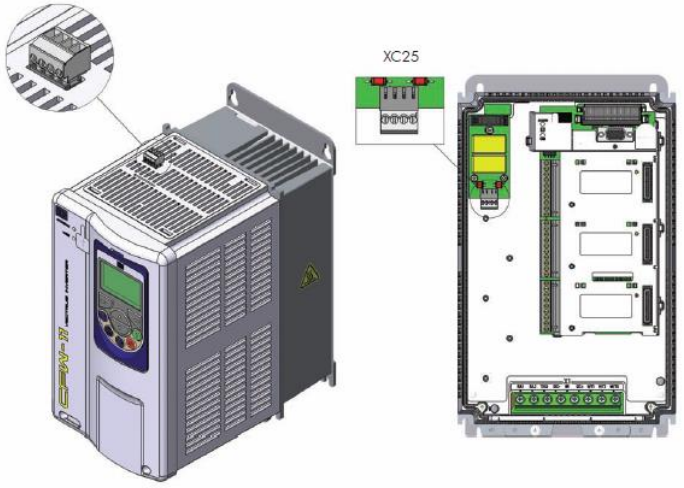
The relay coils are available through the connector XC25, as presented in figure 7.1.

DANGER!
The activation of the Safety Stop, i.e., disconnection of the 24 Vdc power supply from the safety relay coil (XC25: 1(+) and 2(-); XC25:3(+) and 4(-)) does not guarantee the electrical safety of the motor terminals (they are not isolated from the power supply in this condition).

Operation:
1. The Safety Stop function is activated by disconnecting the 24 Vdc voltage from the safety relay coil (XC25: 1(+) and 2(-); XC25:3(+) and 4(-)).

2. Upon activation of the Safety Stop, the PWM pulses at the inverter output will be blocked and the motor will coast to stop.
   The inverter will not start the motor or generate a rotating magnetic field even in the event of an internal failure (pending certification).
   The keypad will display a message informing that the Safety Stop is active.

3. Apply 24 Vdc voltage to the safety relay coil (XC25: 1(+) and 2(-); XC25:3(+) and 4(-)) to get back to normal operation after activation of the Safety Stop.



(a) Frame A *(b) Frames B, C, and D*

***Figure 7.1** - Location of the SRB boards*

***Table 7.1** - XC25 connections*

Connector XC25		Function	Specifications
1	R1+	Terminal 1 of relay 1 coil	Rated coil voltage: 24 V, range from 20 to 30 Vdc
2	R1-	Terminal 2 of relay 1 coil	Coil resistance: 960 Ω ±10 % @ 20 °C (68 °F).
3	R2+	Terminal 1 of relay 2 coil	Rated coil voltage: 24 V, range from 20 to 30 Vdc
4	R2-	Terminal 2 of relay 2 coil	Coil resistance: 960 Ω ±10 % @ 20 °C (68 °F).

7.1.3 24 Vdc External Control Power Supply

Inverters with the following codification: CFW11XXXXXXOW.

The use of this option kit is recommended with communication networks (Profibus, DeviceNet, etc.), since the control circuit and the network communication interface are kept active (with power supply and responding to the network communication commands) even in the event of main power supply interruption.

Inverters with this option have a built-in DC/DC converter with a 24 Vdc input that provides an adequate output for the control circuit. In such manner the power supply of the control circuit will be redundant, i.e., it can be provided by a 24 Vdc external power supply (connection as shown in figure 7.2) or by the standard internal switched-mode power supply of the inverter.

Observe that the inverters with the external 24 Vdc power supply option use terminals XC1:11 and 13 as the input for the external power supply and no longer as an output as in the standard inverter (figure 7.2).

In case of interruption of the external 24 Vdc power source, the digital inputs/outputs and analog outputs will have no power supply, even if the mains power is on. Therefore, it is recommended to keep the 24 Vdc power source always connected to terminals XC1:11 and 13.

The keypad displays warnings indicating the inverter status: if the 24 Vdc power source is connected, if the mains power source is connected, etc.