

# PRODUCT CATALOG



## 6" Rewindable High Efficiency System





Quality in the Well

# 6" High Efficiency System



## Quality in the Well

In consideration of environmental relief and energy saving Franklin Electric developed a High Efficiency 6" Submersible Borehole System, consisting of a synchronous submersible 304SS NEMA motor associated variable frequency drive and output filter.

## System Product advantages:

- One-stop shop – perfectly matching components guarantee first class performance
- Up to **20% energy saving\***
  - ⇒ *System payback < 2 years*
- Up to **13% improved motor efficiency** (system up to 11%) with excellent partial load behaviour\*
  - ⇒ *SKU Reduction*
- Significant lower motor heat rise
  - ⇒ *Increased lifetime*
- Higher power density\*
  - ⇒ *Lightweight*
- Easy set-up due to tailored pre-setting, user interface and own **Franklin Electric software**
- Speed control
  - ⇒ *Optimum aggregate operation - pump matches system any time*
- Incorporated Soft start and protection features
  - ⇒ *Increased lifetime*
  - ⇒ *No additional investment*
- Reduced amps
  - ⇒ *Smaller drop lead cross size*
- Top class protection with Electronics in IP66/54\*\*
  - ⇒ *Easy retrofit - no additional cabinet cost*
- Power factor corrected input
  - ⇒ *No power compensation needed*
- Communication Modbus (RS485 and Ethernet)

## System Technical Specification:

- Rating: 4 - 37kW
- Power Supply:    Voltage 400V +/- 10%  
                          Frequency 50Hz +/- 6%

\*In comparison to current asynchronous technology

\*\*Alternative Electronics in IP21/00 for cabinet assembly available



## Model Numbers

### 400V-50Hz / 460V/60Hz High Efficiency System (304SS Motor, VFD & Filter)

P <sub>N</sub> [kW]	For panel mount - VFD IP21 & Filter IP00		For wall mount - VFD IP66 & Filter IP54	
	du/dt Filter	Sinus Filter	du/dt Filter	Sinus Filter
4,0	308 010 016*	308 010 116*	308 010 216*	308 010 316*
5,5				
7,5				
9,3	308 014 023	308 014 123*	308 014 223	308 014 323*
11				
13	308 014 038	308 014 131*	308 014 238	308 014 338*
15		308 014 138*		
18,5		308 016 146*		
22	308 016 061	308 016 161*	308 016 261	308 016 361*
26		308 016 187*		
30				
37	308 016 087*	308 016 187*		

\*Non-stock items

For lead length > 120m please consult Franklin Electric

### System Options:

- Plug-in card 6x DI/DO - 308 170 201
- Plug-in card PT100 - 308 170 202
- Plug-in card Profibus - 308 170 203
- Plug-in card 1x AI & 2x AO 308 170 206
- Power Supply: 200V & 500V
- Sinus output filters in IP54 and IP00
- PT100 protection
- Motors in 316SS and 904L

To find the right System please use Selection & Payback link on: [www.franklinwater.eu](http://www.franklinwater.eu)

Control modes and necessary sensor technologies						
Process reference	Control reference	Flow meter	Pressure sensor	Level sensor	PT100 sensor & Drive slot card	Flow switch (digital)
<b>Q - Flow</b>	No (Optional)	mandatory				
	P	mandatory	mandatory			
	H	mandatory		mandatory		
<b>P - pressure</b>	No (Optional)	Yes*	mandatory			
	Q	mandatory	mandatory			
	H		mandatory	mandatory		
<b>H - level</b>	No (Optional)	Yes*		mandatory		
	Q	mandatory		mandatory		
	P		mandatory	mandatory		
<b>Direct Mode</b>	No	Yes**	No	No	Optional	No
<b>Manual Mode</b>	No				Yes*	
<b>Solar</b>	No				Yes*	mandatory

\*please consult Franklin Electric

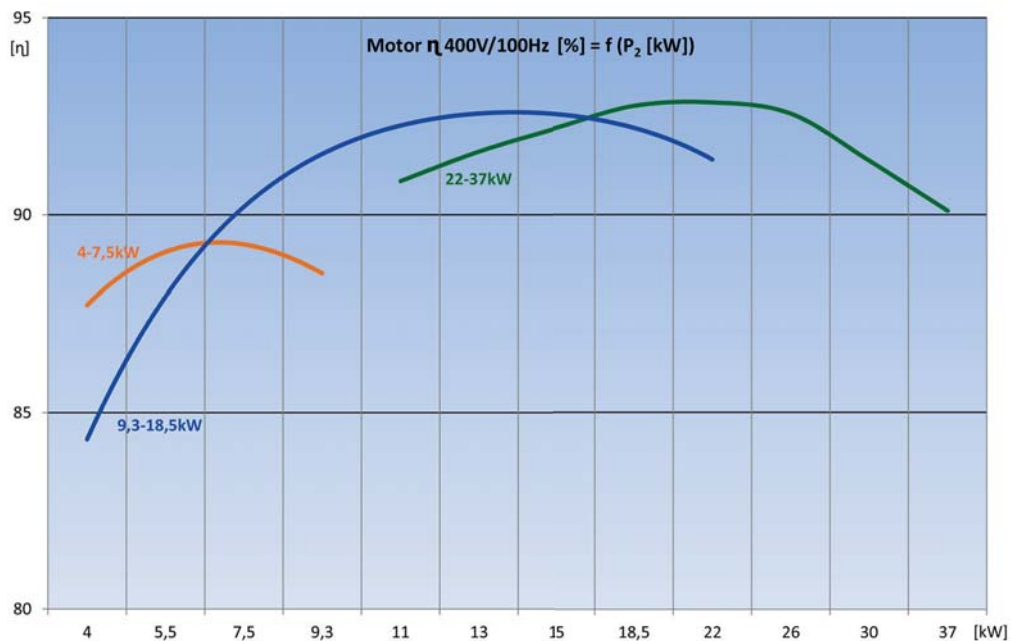
\*\* need to be evaluated to PLC

### Performance Data 400V-50Hz / 460V/60Hz

400V-50Hz / 460V-60Hz	$P_N$ [kW]	Thrust F [kN]	$\eta_N$ [ $\text{min}^{-1}$ ]	$I_N$ [A]	$I_A / I_N^*$ [A]	$\eta$ [%]	PF [ $\cos \varphi$ ]	$T_N$ [Nm]	$T_A / T_N^*$ [Nm]
<b>308 010 X16</b>	<b>4</b>	<b>15,5</b>	3000 / 3600	8	1	88	0,95	12,9	1
	<b>5,5</b>	<b>15,5</b>	3000 / 3600	10	1	89	0,95	17,5	1
	<b>7,5</b>	<b>15,5</b>	3000 / 3600	13	1	89,5	0,95	23,8	1
<b>308 014 X23</b>	<b>9,3</b>	<b>15,5</b>	3000 / 3600	18	1	91,5	0,95	29,6	1
	<b>11</b>	<b>15,5</b>	3000 / 3600	20	1	92	0,95	35	1
<b>308 014 X38</b>	<b>13</b>	<b>15,5</b>	3000 / 3600	23	1	92,5	0,95	41,5	1
	<b>15</b>	<b>15,5</b>	3000 / 3600	26	1	92,5	0,95	46,1	1
	<b>18,5</b>	<b>15,5</b>	3000 / 3600	32	1	92	0,95	59	1
<b>308 016 X61</b>	<b>22</b>	<b>27,5</b>	3000 / 3600	39	1	93	0,95	70	1
	<b>26</b>	<b>27,5</b>	3000 / 3600	46	1	92,5	0,95	82,6	1
	<b>30</b>	<b>27,5</b>	3000 / 3600	54	1	91,5	0,95	95,5	1
<b>308 016 X87</b>	<b>37</b>	<b>27,5</b>	3000 / 3600	72	1	90	0,95	117,8	1

Performance data are based on measurements with Franklin Electric original equipment!

\*Since this is an integrated system (motor plus electronics) these figures relate to VFD input





# 6" High Efficiency Motor



## Motor Features:

- Motor complete in 304SS
- PE2/PA winding as a standard
- SandFighter® SIC seal system
- Easy rewinding - winding housings removable
- Non-contaminating FES93 filling
- All motors pre-filled and 100% tested
- Max. storage temperature -15 ... +60°C
- Drinking water approved

## Motor Technical Specification:

- 4 – 37kW
- Power supply 400V/100Hz
- 6" NEMA flange with studs (M12)
- Protection IP68
- 20 Starts per hour
- Installation vertical ( for horizontal operation please consult FE)
- Motor lead in 4m length
- 30°C nominal ambient temperature with 0,2m/sec cooling flow

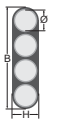
## Motor Options:

- Other voltages
- PT100 temperature sensor (retrofitable)  
⇒ VFD PT100 Plug-in Card (308 170 202) necessary
- Motors complete in 316SS and 904L



System model number	P <sub>N</sub> [kW]	Motor model number		
		304SS	316SS	904L
308 010 xxx	4 - 7,5	262 010 8711	262 010 6711	262 010 7711
308 014 xxx	9,3 - 18,5	262 014 8711	262 014 6711	262 014 7711
308 016 xxx	22 - 37	262 016 8711	262 016 6711	262 016 7711

### Motor Short Leads\*

DOL	P <sub>N</sub> [kW]	St.#	Ø [mm <sup>2</sup> ]	H / B [mm]	Length [m]	Lead Mod.- Nr.	Lead seal Kit
	<b>4 - 18,5</b>	1	4G4	8,2 x 23,0	4	308 710 101	308 660 812
	<b>22 - 37</b>	1	4G6	9,0 x 25,0	4	308 710 103	308 660 813

additionally the special Tape **700 541 688** is absolutely necessary

\*Cables are designed for submerged operation.

### Motor Drop Lead

Lead lengths in meters for 400V-50Hz / 460V-60Hz and max. 3% voltage drop at 50°C ambient

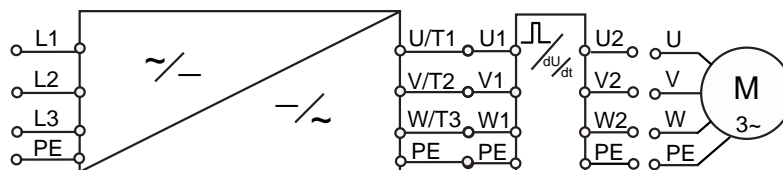
P <sub>N</sub> [kW]	cable size mm <sup>2</sup> , copper wire - 90°C rated insulation						
	4	6	10	16	25	35	50
<b>4</b>	160	250	410	-	-	-	-
<b>5,5</b>	140	200	340	530	-	-	-
<b>7,5</b>	100	150	250	390	-	-	-
<b>9,3</b>	75	110	190	300	460	-	-
<b>11</b>	65	100	160	260	400	-	-
<b>13</b>	55	85	140	220	340	460	-
<b>15</b>	-	70	120	190	300	400	-
<b>18,5</b>	-	60	100	160	240	320	440
<b>22</b>	-	-	80	130	200	270	370
<b>26</b>	-	-	65	110	170	230	320
<b>30</b>	-	-	55	90	140	190	270
<b>37</b>	-	-	-	65	100	140	200

For lead length > 120m please consult Franklin Electric.

Further potential energy saving due to more conservative lead sizing (< 3% voltage drop)

### Electrical Connection

#### DOL

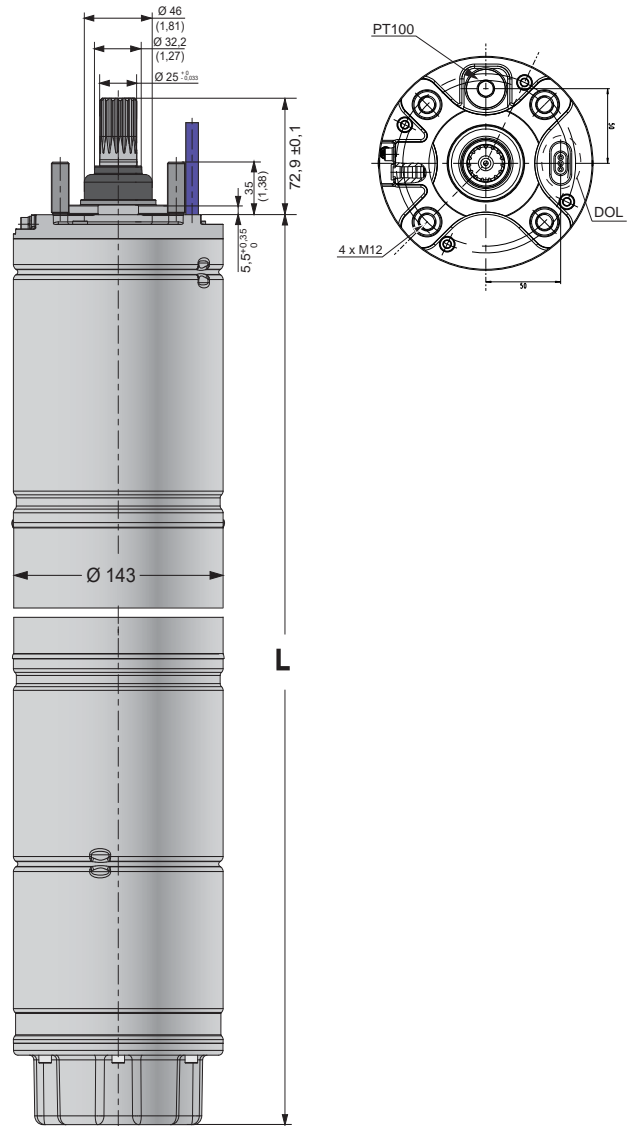


U	V	W	PE
brown	grey	black	yellow/green



## Motor Design

### 304SS / 316SS / 904L



#### Construction Materials

Component	304SS	316SS	904L
Shaft Extensions	1.4021	1.4462	1.4462
Slinger	NBR	NBR	NBR
Seal	SiC/SiC	SiC/SiC	SiC/SiC
End bell, NEMA	1.4308	1.4408	1.4539
Stator Shell	1.4301	1.4571	1.4539
Diaphragm	EPDM	EPDM	EPDM
Diaphragm Cover	1.4301	1.4404	1.4539

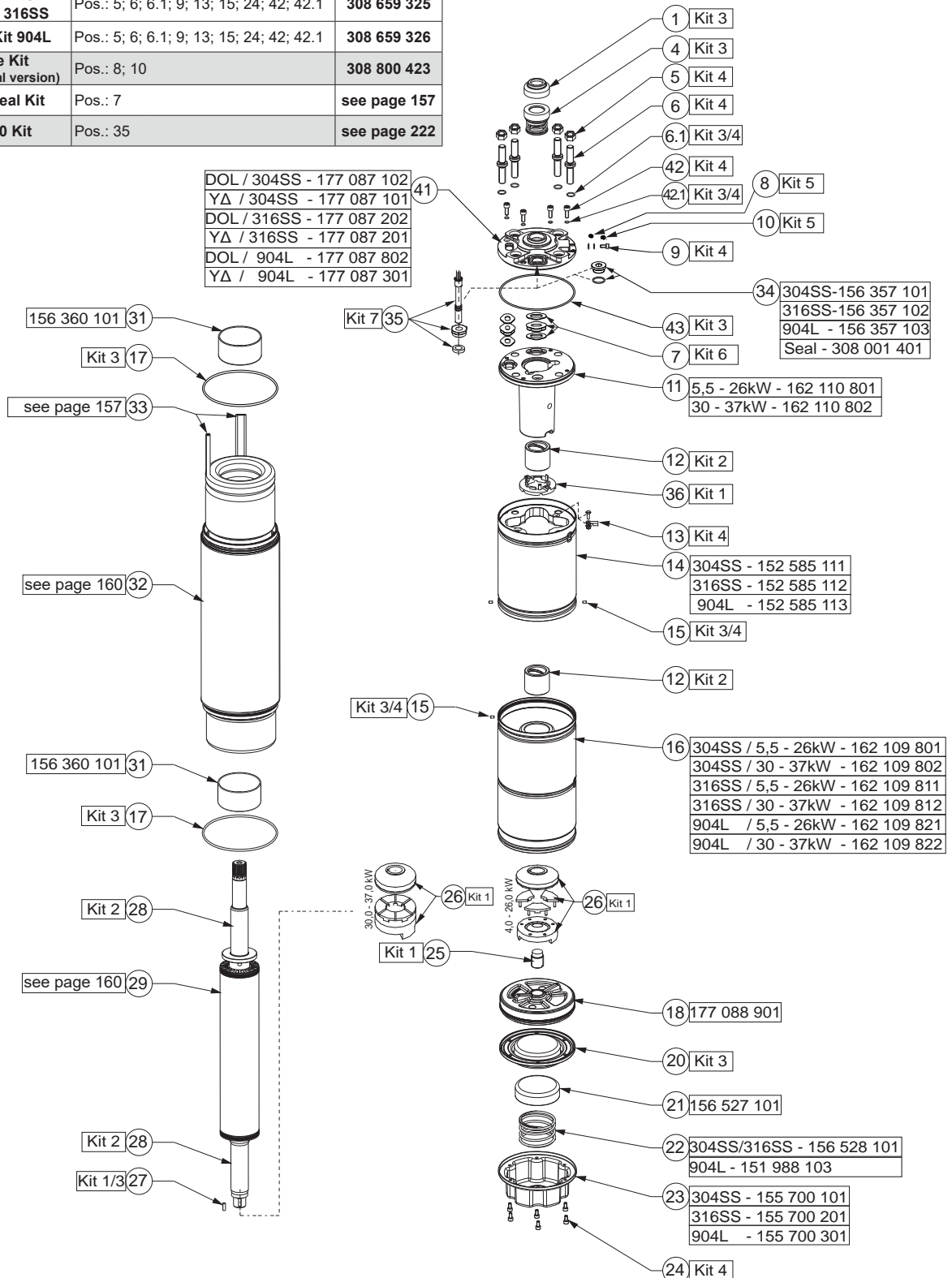
#### Motor Lengths and Weights

P [kW]	Motor Lengths L [mm]	Motor weights [kg]		Motor Shipping Size		
		Motor	incl. pack	B [mm]	H [mm]	L [mm]
4 - 7,5	655	41	46	155	270	905
9,3 - 18,5	809	56	61	155	270	1135
22 - 37	971	72	77			



## Motor Spare Parts 304SS / 316SS / 904L

<b>Kit 1</b>	<b>Thrust Bearing Kit</b>	4-18,5kW	Pos.: 17; 25; 26; 27; 36	<b>308 750 301</b>
		22-37kW		<b>308 750 302</b>
<b>Kit 2</b>	<b>Radial Bearing Kit</b>	4-18,5kW	Pos.: 12; 28	<b>308 750 401</b>
		22-37kW		<b>308 750 403</b>
<b>Kit 3</b>	<b>Seal Kit</b> 304SS / 316SS / 904L	Pos.: 1; 4; 6.1; 15; 17; 20; 34; 42.1, 43		<b>308 800 422</b>
<b>Kit 4</b>	<b>Screw Kit</b> 304SS / 316SS	Pos.: 5; 6; 6.1; 9; 13; 15; 24; 42; 42.1		<b>308 659 325</b>
	<b>Screw Kit</b> 904L	Pos.: 5; 6; 6.1; 9; 13; 15; 24; 42; 42.1		<b>308 659 326</b>
<b>Kit 5</b>	<b>Valve Kit</b> (all Material version)	Pos.: 8; 10		<b>308 800 423</b>
<b>Kit 6</b>	<b>Lead Seal Kit</b>	Pos.: 7		see page 157
<b>Kit 7</b>	<b>PT100 Kit</b>	Pos.: 35		see page 222





### 304SS Stator and Rotor Model Number (400V-50Hz / 460V/60Hz)

$P_N$ [kW]	Stator (incl. winding and 4m motor lead)	Rotor
4 - 7,5	327 086 701K	161 122 805K
9,3 - 18,5	327 075 701K	161 122 802K
22 - 37	327 076 701K	161 122 803K

### Windings 400V-50Hz / 460V/60Hz

$P_N$ [kW]	Mod.-No. Windingkit	Turns per coil	Wire diameter [mm]	Type of Isolation	Group connection	Total Wire length [m]	Resistance coil [Ω]	Resistance DOL (U1-V1) [Ω]
4 - 7,5	327 086 999	28+28+28+28	1,3 / 2,2	PE2/PA	Serie Y	212	0,2393	1,914
9,3 - 18,5	327 075 999	14+14+14+14	2 / 3,1	PE2/PA	Serie Y	161	0,0794	0,635
22 - 37	327 076 999	18+18+18+18	1,7 / 2,7	PE2/PA	Serie / Parallel Y	276	0,1797	0,359

### Insulation resistance (20°C / 500 VDC)

New motor without drop cable	400 >	MΩ
Used motor without drop cable	20 >	MΩ
New motor with drop cable	4 >	MΩ
Used motor with drop cable	1	MΩ

### Motor Repair Instructions

<b>Pictured Repair Instructions 304SS / 316SS / 904L</b>	308 018 624
<b>Motor Mounting Kit</b>	308 239 214

# Variable Speed Drive (VFD)



## VFD Features:

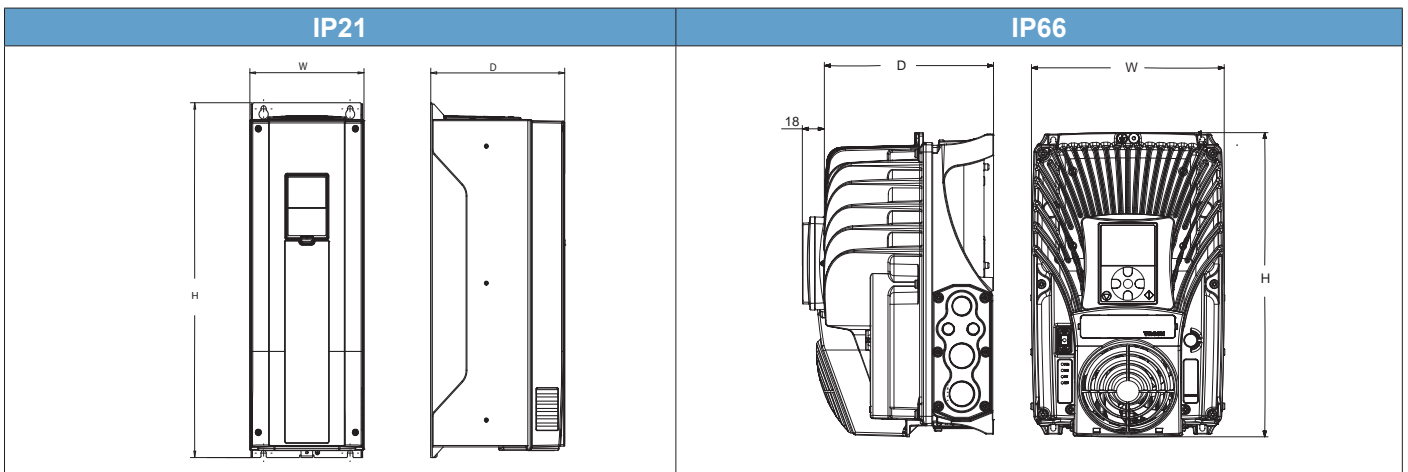
- Supports induction and permanent magnet motors
- Top class protection IP66 with Aluminium die casting powder coated enclosure . Alternative in IP21 with plastic enclosure
- Optimized for submersible permanent motor feeding – first class performance (Tailored pre-setting, user interface and software)

## VFD Technical Specification:

<b>Power supply</b>	Input voltage $U_{IN}$	380 - 500V ; -10%....+10% 400 - 840V DC - min starting voltage 440V
	Input frequency $f_{IN}$	47 - 65Hz
	Starts per hour	20 ; with min 3min rest period
<b>Motor connection</b>	Output voltage	0 - $U_N$
	Output current	$I_N$ at rated Ambient temperature (40°C) Overload: IP66: 1,5 x $I_N$ (1min/10min) IP21: 1,1 x $I_N$
	Output frequency	0- $f_N$ , resolution 0,01Hz
<b>Performance</b>	Efficiency	97,5%
<b>Control characteristics</b>	Switching frequency	3,6 ..... 6 kHz; default setting 4 kHz
<b>Ambient conditions</b>	Operation temperature	-10°C...+50°C (>40°C with derating) - 40°C optional for IP66
	Storage temperature	-40°C .... +70°C
	Altitude	3000m (>1000m with derating)
<b>EMC</b>	Immunity & Emissions	Complies with EN 61800-3, Category C2 - first and second environment
<b>Communication</b>	RS 485	Standard: Modbus
	Ethernet	Standard: Modbus
<b>I/O connections</b>	Digital Input (DI)	6x
	Analog Input (AI)	2x
	Analog Output (AO)	1x
	Relay Output (RO)	2x (change-over contact)
For further details please see separate Franklin Electric Quick Installation guide and VFD literature.		



## VFD Model Numbers and Dimensions 400V-50Hz / 460V/60Hz



### VFD High Efficiency System Model Numbers and Dimensions 400V-50Hz / 460V/60Hz IP21 up to 37kW

System Model Number	AC Drive Type	IP Type	$I_N$ [A]	Dimensions WxHxD [mm]	Weight [kg]
308 010 016/116	314 000 108	21	16	144 x 419 x 214	10,0
308 014 023/123	314 000 101	21	23	144 x 419 x 214	10,0
308 014 038/138	314 000 102	21	38	195 x 557 x 229	20,0
308 016 061/161	314 000 103	21	61	195 x 557 x 229	20,0
308 016 087/187	314 000 104	21	87	237 x 660 x 259	37,5

### VFD High Efficiency System 400V-50Hz / 460V/60Hz IP66 up to 30kW

System Model Number	AC Drive Type	IP Type	$I_N$ [A]	Dimensions WxHxD [mm]	Weight [kg]
308 010 216/316	314 000 109	66	16	233 x 368 x 214	14,9
308 014 223/323	314 000 105	66	23	233 x 368 x 214	14,9
308 014 238/338	314 000 106	66	38	350 x 500 x 236	31,5
308 016 261/361	314 000 107	66	61	350 x 500 x 236	31,5

### VFD Options:

- 200V - 230V
- Plug-in card 6x DI/DO 308 170 201
- Plug-in card PT100 308 170 202
- Plug-in card Profibus 308 170 203
- Plug-in card 1x AI & 2x AO 308 170 206
- Replacement Battery VFD IP21 - 308 170 205
- Replacement Battery VFD IP66 - 308 170 204

# Output Filter

## Output Filter Features:

- du/dt filter for lead lengths up to 120m, for lead lengths >120m please consult Franklin Electric.
- filter available in IP54 and IP00
- Optimized for submersible permanent magnet motor feeding



## Output Filter Technical Specification:

- Voltage → 380 - 500V
- Frequency → 0 - 120 Hz
- Switching Frequency → 4kHz
- Ambient Temperature → < 40°C

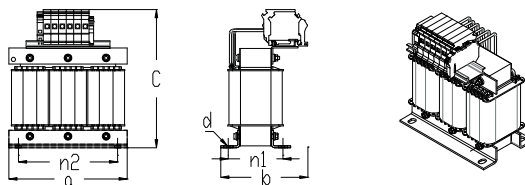
## Output Filter Options:

- Sinus filter in IP54 and IP00 for lead length >120m and/ or special applications
- Other voltages

### Output Filter du/dt High Efficiency System 400/500V Model Data - Protection Class IP00

System model number	Filter order code	I <sub>N</sub> [A]	Dimensions [mm]						weight [kg]	terminal [mm <sup>2</sup> ]	clamping torque [Nm]
			a	b	c	n1	n2	d			
308 010 016 308 014 023	314 005 101	23	125	100	165	55	100	5	3,4	2,5 - 16	2,5 - 5,0
308 014 038	314 005 102	38	155	110	190	57,5	130	8	4	2,5 - 35	2,5 - 5,0
308 016 061	314 005 103	61	155	130	215	72	130	8	6	2,5 - 35	2,5 - 5,0
308 016 087	314 005 104	87	190	130	260	60	170	8	10	16 - 50	3,0 - 6,0

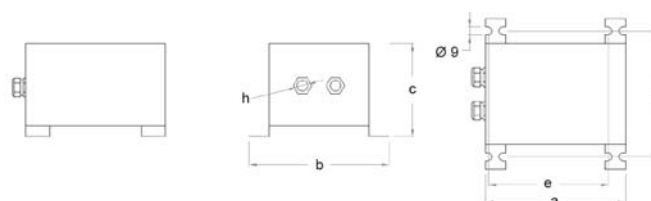
### Filter outlines



### Output Filter du/dt High Efficiency System 400/500V Model Data Protection Class IP54

System model number	Filter order code	I <sub>N</sub> [A]	Dimensions [mm]						cable Ø [mm]	weight [kg]	terminal [mm <sup>2</sup> ]	clamping torque [Nm]
			a	b	c	e	f					
308 010 216 308 014 223	314 005 110	23	300	260	135	250	230	2x24-35	8	2,5 - 16	2,5 - 5,0	
308 014 238	314 005 111	38	300	260	135	250	230	2x24-35	12	2,5 - 35	2,5 - 5,0	
308 016 261	314 005 112	61	450	360	215	400	330	2x32-42	22	2,5 - 35	2,5 - 5,0	

### Filter outlines

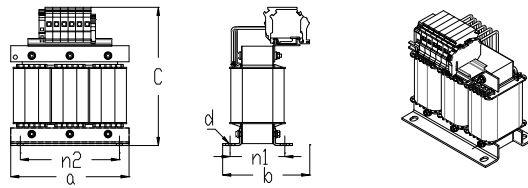




### Output Filter Sinus High Efficiency System 400/500V Model Data - Protection Class IP00

System model number	Filter order code	I <sub>N</sub> [A]	Dimensions [mm]						weight [kg]	terminal [mm <sup>2</sup> ]	clamping torque [Nm]
			a	b	c	n1	n2	d			
308 010 116	314 005 105	16	240	185	285	95	190	11	19	2,5 - 35	2,5 - 5
308 014 123/131	314 005 106	31	240	205	270	115	190	11	24	2,5 - 35	2,5 - 5
308 014 138/146	314 005 107	46	300	225	354	133	250	11	42	16 - 50	3 - 6
308 016 161	314 005 108	72	360	310	425	135	300	11	52	16 - 50	3 - 6
308 016 187	314 005 109	105	360	310	425	126	310	11	61	25 - 95	6 - 12

#### Filter outlines

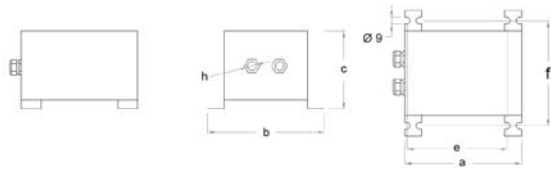


### Output Filter Sinus High Efficiency System 400/500V Model Data Protection Class IP54

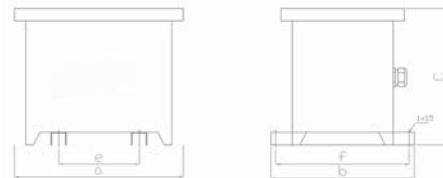
System model number	Filter order code	I <sub>N</sub> [A]	Dimensions [mm]					cable Ø [mm]	weight [kg]	terminal [mm <sup>2</sup> ]	clamping torque [Nm]
			a	b	c	e	f				
308 010 316	314 005 117	16	300	300	215	250	330	2x24-35	34	2,5 - 35	2,5 - 5
308 014 323*	314 005 113	23	520	480	480	240	440	2x24-35	75	2,5 - 35	2,5 - 5
308 014 338*	314 005 115	38	660	560	590	310	520	2x24-35	100	16 - 50	3 - 6
308 016 361*	314 005 116	72	660	560	590	310	520	2x38-48	110	16 - 50	3 - 6

\*Floor mount

#### Wall mount outlines



#### Floor mount outlines



# SS Pump

For any pump support please refer to:  
<http://www.etechpumps.com>






## Motor Filling Liquid

Filling liquid 5 L FES92					
4" Encapsulated	→	FES93	8" Encapsulated Standard	→	FES91
6" Encapsulated Standard	→	FES91	8" Encapsulated HighTemp75	→	FES92
6" Encapsulated HighTemp90	→	FES92	6" / 8" / 10" / 12" Rew Motors 6" / 8" Rew PM Motors		FES93



**Part number:  
308 353 941**

FES91	FES92	FES93
		

## Motor Filling Kit

This kit contains all necessary tools to check and replenish Franklin Electric submersible motors with FES 91, 92 or 93 filling liquid (fill solution/concentrate must be ordered separately).

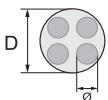
**Part number: 308 726 103**



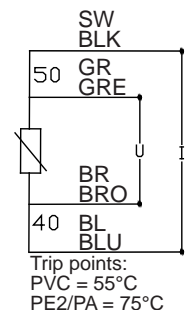
## PT100 Rewindable Motors

- Fitted into the upper end bell flange, all end bells 6", 8", 10" and 12" Rewindable are prepared for installation PT100
- Measures the temperature of the filling liquid
- Conductor with a resistance proportional to the temperature
- Allows monitoring the temperature continuously

The above-ground equipment is not available from Franklin Electric and is typically part of a custom panel or data acquisition system. PT100 sensor retrofit kits from Franklin Electric come with complete instructions and allow for easy field installation.



	Ø [mm <sup>2</sup> ]	D [mm]	Lead Lengths [m]	Mod.- No.:	6" Rew Redesign starting 08.2012		6" (Cast Iron/304SS) / 8" / 10" / 12"	
					304/316	904L	304/316	904L
<b>PT 100</b>	4X0,5	8	10	Mod.- No.:	308 016 501	308 016 522	308 016 401	308 016 422
<b>PT 100</b>	4X0,5	8	20	Mod.- No.:	308 016 502	-	308 016 402	-
<b>PT 100</b>	4X0,5	8	30	Mod.- No.:	308 016 503	-	308 016 403	-
<b>PT 100</b>	4X0,5	8	50	Mod.- No.:	308 016 505	308 016 526	308 016 405	308 016 426



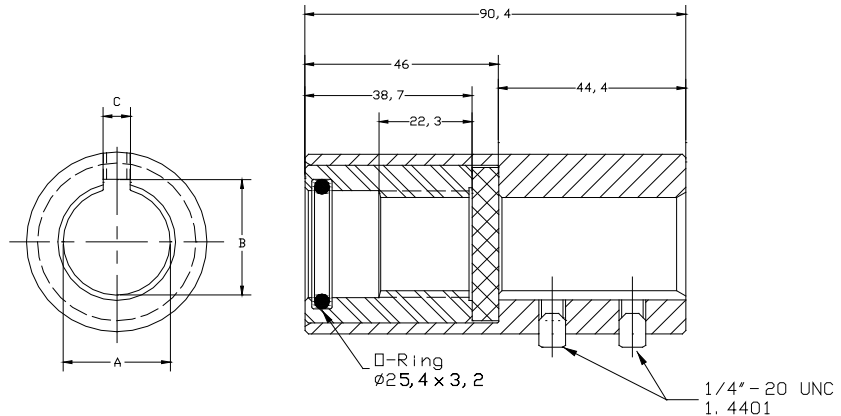


## 6" Motor – Pump Couplings

- Application:** Allow connection of pump to motors shaft.
- Specification:**
- Material: 304 / 316 SS
  - NEMA standard measuring on motor shaft
  - separation washer between motor & pump shafts

**Outline Drawing:**

### 6" Couplings



### Ordering information

No.	Coupling Material DIN / AISI	Dimension A (mm) Max. / Min.	Dimension B (mm) Max. / Min.	Dimension C (mm) Max. / Min.
<b>151 935 902</b>	1.4005 (304)	19,075 / 19,063	20,70 / 20,52	4,84 / 4,79
<b>151 935 922</b>	1.4401 (316SS)			
<b>151 935 910</b>	1.4005 (304)	20,025 / 20, 013	22,76 / 22,60	6,05 / 6,00
<b>151 935 927</b>	1.4401 (316SS)			
<b>151 935 908</b>	1.4005 (304)	22,025 / 22,013	25,53 / 25,32	8,03 / 7,98
<b>151 935 928</b>	1.4401 (316SS)			
<b>151 935 901</b>	1.4005 (304)	22,250 / 22,238	24,54 / 24,36	6,43 / 6,38
<b>151 935 921</b>	1.4401 (316SS)			
<b>151 935 906</b>	1.4005 (304)	25,025 / 25, 013	28,70 / 28,30	8,03 / 7,98
<b>151 935 926</b>	1.4401 (316SS)			
<b>151 935 909</b>	1.4005 (304)	25,425 / 25,413	27,74 / 27,56	6,43 / 6,38
<b>151 935 929</b>	1.4401 (316SS)			



## Flow Paddle Switch

The flow switch utilizes the force of liquid flow to propel its paddle and to detect the incoming flow or movement of the existing liquid in the pipe. For Flow rates above 4m<sup>3</sup>/h; Connection: G1 "



Mod.Nb.: 226 019 101

## Inline Flow Switch

The Inline Flow Switch operates magnetically. The piston within the switch body should be a free fit and spring back to its off position as soon as flow stops. For flow rates up to 4 m<sup>3</sup>/h; Connection: G1"



Mod.Nb.: 226 014 101

## Level Switch

A float switch is a device used to detect the level of liquid within a tank. A required Part of the 6" High Efficiency Solar System.

Mod.Nb.: 308 170 209



## DC Disconnect

To disconnect the drive even under load safely from the solar generator, Franklin Electric offers suitable DC disconnect switches for all different power ratings.

0 - 11A/800V DC - 308 170 313

12 - 22A/800V DC - 308 170 325







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DOC.NB. 308-018-626 REV. 16 02-17