



PERMANENT MAGNET PUMPING SYSTEMS

SECTION 2 INTAKE & GAS HANDLING DEVICE CATALOGUE

INTRODUCTION

Magnetic Pumping Solutions offers a wide range of Intakes and Gas Separation / Handling devices that enable the successful application of the Electrical Submersible Pump technology in wells with high GOR, that require artificial lift.

The products offered by MPS include

1. Intakes - Standard and Integral.
2. Gas Separators - Rotary and Vortex types.
3. Gas Handlers - Low and High Flow types.

All Intakes and Gas Handling Devices manufactured by Magnetic Pumping Solutions are supplied with Tungsten Carbide radial bearings to minimize the effect of abrasives entering the intake module on the equipment during operation. The 513 series and the 538 series Intakes and Gas Handling equipment have the same bolt patterns and sizes at the flanges and may therefore be interchanged as required.

An Electrical Submersible Pumping System can operate with a maximum of 10% or 25% Free Gas at the Intake, depending on the type of stage that is used in the pump. Excess Gas entering the pump will need to be either separated or compressed back into solution without Gas Locking the Pump, which is caused by the accumulation of gas at the eye of the impeller.

Excessive Gas can have the following effects on the ESP system. 1. Create gas Lock, 2. Reduce bearing life, 3. Decrease flow, Head and Efficiency and 4. Reduce the cooling of the ESP system.

GAS HANDLING CAPABILITY											
Device	Gas Volume Fraction $[V/(V+L)]$ %										
Radial Flow Stage	0-10										
Mixed Flow Stage	0-25										
Single Vortex Gas Separator	0-40										
Single Rotary Gas Separator	0-45										
Advanced Gas Handler	0-45										
Tandem Vortex Gas Separator	0-60										
Tandem Rotary Gas Separator	0-65										
Tandem Vortex Gas Separator + Advanced Gas Handler	0-75										
	0	10	20	30	40	50	60	70	80	90	100

INTAKE

The Intake module in an ESP system facilitates the entry of well fluid into the pump. There are three main configurations for intake modules,

1. An integral intake module fitted at the bottom of the pump
2. A bolt on Intake module referred to as a Standard Intake and
3. An intake module which is a part of the gas handling device, be it a Gas Separator or an Advanced Gas Handler.

The selection of the type of intake module required for an ESP system used in a particular application is based on different factors like flow rate, amount of gas to be handled and the concentration of solids / abrasives in the well fluid.

STANDARD INTAKE

The Standard Intake is a basic intake module with no Gas Handling Capability. The body of the intake has cavities in them to allow the well fluid to flow into the pump. A screen is installed on the outside of the intake to prevent the ingress of large solid particles into the pump, which can potentially cause physical damage to the pump. A Standard Intake is selected for an application when the amount of free gas entering the pump is below the gas handling capacity of the stage selected. If in an application, the flowing bottom hole pressure is above the bubble point pressure, a Standard Intake can be used.

GAS SEPARATORS

Gas Separators are devices that separate the gas from the fluid that enters into the intake module, release the gas back into the annulus and allows the liquid to flow into the pump. These devices work on the principal of separation of particles of different densities when subjected to centrifugal force. There are two types of constructions for a Gas Separator, Single and Upper Tandem. Single Gas Separators have an Intake Module at the base and may be used as stand alone Gas Handling devices. The Upper Tandem Gas Separators do not have an Intake Module at the base and can be used above a Single gas Separator or a Standard Intake.



ROTARY GAS SEPARATORS

Rotary Gas Separators are built around an older technology where the rotating mass that imparts centrifugal force to the fluid is very large and heavy. Due to this reason, the Rotary Gas Separators are slightly more efficient than other types of Gas Separators but the heavy rotating mass decreases the reliability of the system, causing failure of the radial bearings in the Rotary Gas Separators. The reliability is significantly compromised when the well fluid produces solids / abrasives as this accelerates the wear of the radial bearings and the centrifugal separation chamber.

VORTEX GAS SEPARATORS

Magnetic Pumping Solutions offer the new technology Vortex Gas Separator that are extremely reliable compared to other types of Gas Separators. These are highly recommended for use in all applications, especially those in which the production of solids / abrasives through the pump is a possibility. The Gas Separation efficiencies are very close to that of the Rotary Type Gas Separators but the high reliability of the Vortex Gas Separators make it the preferred Gas Separation equipment.

OPTIONS

Options - INTAKE					
Metallurgy		Shaft		Shroud Arrangement	
Carbon Steel Body	CS	Standard Shaft (Monel® K-500)	MS	Standard	
Stainless Steel Body	SS	High Strength Shaft (Inconel®)	HS	With Shroud Adapter	SH

Options - GAS SEPARATORS					
Configuration		Metallurgy		Shaft	
Single Vortex	S-VGS	CS Head & Base, CS Housing, CS Fasteners	CS	Standard Shaft (Monel® K-500)	MS
Upper Tandem Vortex	UT-VGS	SS Head & Base, SS Housing, Monel Fasteners	SS	High Strength Shaft (Inconel®)	HSS
Single Rotary	S-RGS	SS Head & Base, Monel Coated CS Housing, Monel Fasteners	MT		
Upper Tandem Rotary	UT-RGS				

CS - Carbon Steel
SS - Stainless Steel



INTAKES & GAS SEPARATORS - TECHNICAL DATA

338 Series		50 Hz	60 Hz
Housing Diameter		3.38"	85.85 mm
Shaft Diameter		0.6875"	17.46 mm
Shaft BHP Limit -	Standard	125 HP	105 HP / 76 kW
	High Strength	200 HP	165 HP / 120 kW

387/400 Series		50 Hz	60 Hz
Housing Diameter		3.87/4.00"	98.30/101.60 mm
Shaft Diameter		0.875"	22.23 mm
Shaft BHP Limit -	Standard	255 HP	210 HP / 155 kW
	High Strength	410 HP	340 HP / 250 kW

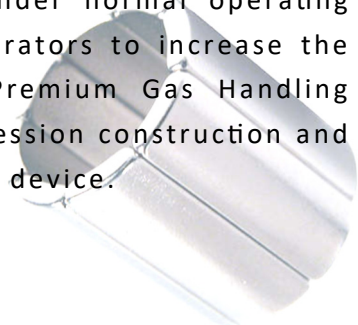
513 Series		50 Hz	60 Hz
Housing Diameter		5.13"	130.30 mm
Shaft Diameter		1.187"	30.15 mm
Shaft BHP Limit -	Standard	635 HP	530 HP / 395 kW
	High Strength	1015 HP	845 HP / 630 kW

538 Series		50 Hz	60 Hz
Housing Diameter		5.38"	136.65 mm
Shaft Diameter		1.187"	30.15 mm
Shaft BHP Limit -	Standard	635 HP	530 HP / 395 kW
	High Strength	1015 HP	845 HP / 630 kW

675 Series		50 Hz	60 Hz
Housing Diameter		6.75"	171.45 mm
Shaft Diameter		1.187"	30.15 mm
Shaft BHP Limit -	Standard	635 HP	530 HP / 395 kW
	High Strength	1015 HP	845 HP / 630 kW

MPS GAS HANDLERS

Gas Handlers are devices that will homogenize the gas and liquid before it enters the pump, thereby significantly reducing the tendency of the Pump to gas lock. These devices are available in the 387/400, 513 and 538 series, ranging in flow rates from 500 to 9000 BPD. The MPS Gas Handlers have the capability to handle 45% of Gas Volume Fraction under normal operating conditions and can be used in tandem with Gas Separators to increase the total gas handling capability of the system. The Premium Gas Handling Devices are designed to operate with pumps in Compression construction and have Abrasion Resistant radial bearings throughout the device.



MPS GAS HANDLERS - OPTIONS

Options - ADVANCED GAS HANDLERS			
Metallurgy		Shaft	
CS Head & Base, CS Housing, CS Fasteners	CS	Standard Shaft (Monel® K-500)	MS
SS Head & Base, SS Housing, Monel Fasteners	SS	High Strength Shaft (Inconel®)	HSS
SS Head & Base, Monel Coated CS Housing, Monel Fasteners	MT		

CS - Carbon Steel

SS - Stainless Steel

MPS GAS HANDLERS - TECHNICAL DATA

MGH 400, 5-20		50 Hz	60 Hz
Housing Diameter		4.00"	101.60 mm
Shaft Diameter		0.6875"	17.46 mm
Shaft BHP Limit -	Standard	125 HP	105 HP / 76 kW
	High Strength	200 HP	165 HP / 120 kW

MGH, 400, 15-50		50 Hz	60 Hz
Housing Diameter		4.00"	101.60 mm
Shaft Diameter		0.875"	22.23 mm
Shaft BHP Limit -	Standard	255 HP	210 HP / 155 kW
	High Strength	410 HP	340 HP / 250 kW

MGH, 513, 20-40		50 Hz	60 Hz
Housing Diameter		5.13"	130.30 mm
Shaft Diameter		1.00"	25.4 mm
Shaft BHP Limit -	Standard	375 HP	310 HP / 230 kW
	High Strength	600 HP	500 HP / 370 kW

MGH, 513, 35-75		50 Hz	60 Hz
Housing Diameter		5.13"	130.30 mm
Shaft Diameter		1.00"	25.4 mm
Shaft BHP Limit -	Standard	375 HP	310 HP / 230 kW
	High Strength	600 HP	500 HP / 370 kW

MGH, 538, 20-50		50 Hz	60 Hz
Housing Diameter		5.38"	136.65 mm
Shaft Diameter		1.00"	25.4 mm
Shaft BHP Limit -	Standard	375 HP	310 HP / 230 kW
Shaft BHP Limit -	High Strength	600 HP	500 HP / 370 kW

MGH, 538, 40-90		50 Hz	60 Hz
Housing Diameter		6.75"	171.45 mm
Shaft Diameter		1.00"	25.4 mm
Shaft BHP Limit -	Standard	375 HP	310 HP / 230 kW
	High Strength	600 HP	500 HP / 370 kW

INTAKES & GAS HANDLING DEVICES - DATA

338 Series

Description	Type	Length	Weight	Length	Weight
		[ft]	[lb]	[m]	[kg]
Intake	Standard Intake	0.8	28	0.24	13
Intake	Shroud Hanger Intake	1.4	36	0.44	16
Gas Separator	Single Rotary	2.1	42	0.64	19
Gas Separator	Upper Tandem Rotary	2.1	42	0.64	19

387/400 Series

Description	Type	Length	Weight	Length	Weight
		[ft]	[lb]	[m]	[kg]
Intake	Standard Intake	1.0	28	0.3	13
Intake	Shroud Hanger Intake	1.4	36	0.4	16
Gas Separator	Single Rotary	2.4	70	0.7	32
Gas Separator	Upper Tandem Rotary	2.4	70	0.7	32
MPS Gas Handler	500 - 2000 BPD (5-20)	6.4	135	2.0	61
MPS Gas Handler	1500 - 5000 BPD (15-50)	6.4	135	2.0	61

513 Series

Description	Type	Length	Weight	Length	Weight
		[ft]	[lb]	[m]	[kg]
Intake	Standard Intake	1.2	51	0.4	23
Intake	Shroud Hanger Intake	1.8	68	0.5	31
Gas Separator	Single Rotary	3.9	154	1.2	70
Gas Separator	Upper Tandem Rotary	3.9	154	1.2	70
MPS Gas Handler	2000 - 4000 BPD (20-40)	6.3	270	1.9	122
MPS Gas Handler	3500 - 7500 BPD (35-75)	6.3	270	1.9	122

538 Series

Description	Type	Length	Weight	Length	Weight
		[ft]	[lb]	[m]	[kg]
Intake	Standard Intake	1.4	57	0.4	26
Intake	Shroud Hanger Intake	2.0	74	0.6	34
Gas Separator	Single Vortex	3.5	116	1.1	53
Gas Separator	Upper Tandem Vortex	3.5	116	1.1	53
MPS Gas Handler	2000 - 5000 BPD (20-50)	6.3	625	1.9	284
MPS Gas Handler	4000 - 9000 BPD (40-90)	6.3	625	1.9	284

675 Series

Description	Type	Length	Weight	Length	Weight
		[ft]	[lb]	[m]	[kg]
Intake	Standard Intake	0.8	57	0.2	26
Intake	Shroud Hanger Intake	1.4	84	0.4	38

Magnetic Pumping

S O L U T I O N S

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