

静液行走装置



Apply to 0.1-10 tons moving machines
适用于中小型行走机械

HST 液压无级变速装置

产品结构特点 Product Features

HST液压无级变速装置由双向变量柱塞泵、手动定量马达、补油泵、阀组件、滤清器等组成。
WHPVMF HST consist of variable piston pump,bi-direction piston motor,Cycloid boost pump, valve assy,oil filters and other components.

工作原理 Work Principle

动力装置带动HST内的柱塞泵，实现机械能到液压能的转化；液压能通过柱塞马达，实现液压能到机械能的转化，从而为执行元件提供扭矩。柱塞泵和柱塞马达相互构成闭路循环，其泄漏油由补油泵供给。柱塞马达输出轴驱动行走装置，实现机器的前进、停止、后退功能。

Power device drive the piston pump to convert mechanical energy into hydraulic energy,then hydraulic energy converts into mechanical energy through piston motor to provide torque for executive component.Piston pump and motor constitute closed loop,leaked oil be supplied by cycloid boost pump.Piston motor output shaft drive the running device to realize the machine's forward,stop,back functions.

在行走机械上的应用特点 Features

- 操作简便：**采用HST的行走机械，一杆操作即可完成进退、换向及平稳的无级变速。
Operate easily:WHPVMF can fulfill retreat,commutation and stable any speed change only by operating a lever.
- 应用性强：**HST集液压泵、马达、阀于一体，重量轻，不仅容易实现四轮四驱驱动、动力输出和脉宽调制，还可以增加电子控制等多种装置，实现机、电、液一体化控制，提高产品性能。
Usefully: WHPVMF products are doing all-in-one right with a very small weight.It not only can easily to realize all-wheel drive,power output and pulse width modulation,but also can add variety of electronic control device to achieve electrification,improving machines performance.
- 灵活性强：**采用HST的行走机械，可以极低的速度在很小的回转半径内行走，实现灵活转弯或进出作业场地的目的。
Flexibility:Machine with the WHPVMF can move in a very small turning radius with a very slowly speed,it can turn or go in and out a site flexibility.
- 作业高效率：**HST独特的结构设计在减轻重量的同时，缩短了管路，降低功率损耗，有效地提高工作效率，HST总效率高达80%；HST可根据不同工况，负载以及装卸的数量改变斜盘角度，调整流量和输出扭矩，使机器作业效率更高。
High efficiency:WHPVMF's unique design reduce the weight,shorten pipeline,lower power consumption,improve the efficiency,its overall efficiency is up to 80%.According to different conditions,load and unload,WHPVMF can Change oblique the plate angle,adjusts the flow and the output torque to make machine operate more efficiently.

技术参数的计算 Calculate Technical Data

流量 Flow	$Q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	L/min	$V_g =$ 每转排量, 单位: cm^3 Displacment per revolution in cm^3
驱动转矩 Driving torque	$T = \frac{V_g \cdot \Delta P}{20 \cdot \pi \cdot \eta_{mh}} = \frac{1.59 \cdot V_g \cdot \Delta P}{100}$	Nm	$\Delta P =$ 压差, 单位: bar Differential pressure in bar
功率 Power	$P = \frac{2\pi \cdot T \cdot n}{6000} = \frac{q_v \cdot \Delta P}{600 \cdot \eta_t} = \frac{T \cdot n}{9549}$	Kw	$n =$ 转速, 单位: rpm Speed in rpm
			$\eta_v =$ 容积效率 Volumetric efficiency
			$\eta_{mh} =$ 机械液压效率 Mechanical hydraulic efficiency
			$\eta_t =$ 总效率 Total efficiency

工作要求 Technical Data

液压油 Hydraulic Fluid

有关液压油的选择和应用条件的详细资料，在项目设计之前请参考标准GB11118.1-2011。（WHPVMF适用HM68抗磨液压油）

Before starting project planning, pls refer to standard GB11118.1-2011. For detailed information regarding the choice of hydraulic fluid and application conditions..

HM68 hydraulic fluid is suitable for WHPVMF

工作粘度范围 Viscosity range of operating oil

为了得到最有效率的使用寿命，我们推荐工作粘度（在工作温度时）在下列范围内选择：

Vopt=最佳工作粘度 16...36mm²/s 取决于油箱温度（闭合回路）。

For get Optimal service life, we recommend that the working viscosity (at operating temperature) be selected in the following rang:

Vopt=Optimum working viscosity 16.....36mm²/s Depends on the tank's temperature (closed circuit).

粘度极限范围

粘度极限值如下：

V_{min}= 5mm²/s

短时 (t<3 min)

允许最高温度 t max=+115℃

V_{max}= 1600mm²/s

短时 (t<3 min)

冷启动时 (p≤30bar, n≤1000rpm
t_{in}≤-40℃)

以上仅适用于无负载启动，在大约15分钟内到达最佳工作粘度。

请注意：最高允许油液温度115℃即使在局部（如轴承区）也不可超过该温度。轴承区的温度与压力和转速有关，它最高比平均壳体泄油温度高5K。温度在-25℃和-40℃之间时（冷启动阶段）应采用特殊措施，请于我司联系。

工作温度范围（参见选图）。

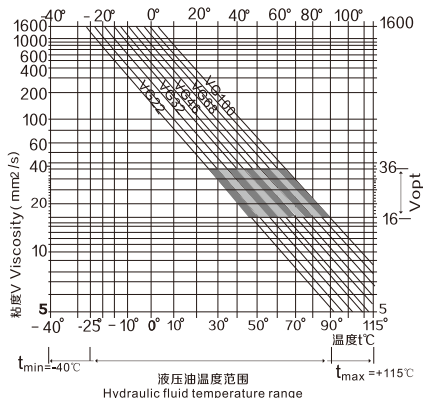
The above is only applicable to no load start and can reaching the best working viscosity in about 15 minutes.

Please note, The maximum allowable hydraulic oil's temperature of 115° should not be exceeded even locally (such as the bearing area). Bearing's temperature base on pressure and speed, it is up to 5K higher than the average shell drain temperature. When the temperature is between -25 °C to -40 °C (choke lever), Please contact us with it for get the special measures .

Operating temperature range (see selection in below).

数据表（理论值，不包括系数和公差；近似值）

选择图 Selection diagram



Viscosity and temperature of hydraulic fluid

Viscosity[mm ² /s]	Temperature	Comment
Transport and storage at ambient temperature	T _{min} ≥-50℃ T _{op} =+5℃ to +20℃	Factory preservation: up to 12months with standard, up to 24 months with long-term
(Cold) start-up ¹⁾ V _{max} =1600	T _{st} ≥-40℃	t≤3 min, without load (p≤50 bar), n≤1000 rpm
Permissible temperature difference	ΔT≤25K	between axial piston unit and hydraulic fluid
Warm-up phase v<1600 to 400	T=-40℃ to -25℃	at p≤0.7•P _{nom} , n≤0.5•n _{nom} and t≤15min
Operating phase		
Temperature difference	ΔT=approx.5K	
Maximum temperature	115℃ 110℃	between hydraulic fluid in the bearing and at port T in the bearing measured at port T
Continuous operation V=400 to 10 V _{opt} =36 to 16	T=-25℃ to +90℃	measured at port T, no restriction within the permissible data
Short-term operation V _{min} ≥7	T _{max} =+110℃	measured at port T, t<3min, p<0.3•p _{nom}
Shaft seal ¹⁾	T≤+115℃	see below "Shaft seal"

At temperatures below -25℃, an NBR shaft seal is required (permissible temperature range: -40℃ to +90℃).

液压油选择说明

Details regarding the choice of hydraulic fluid

为了正确选择液压油，必须知道与环境温度相关的工作温度：闭式回路中指回路温度。

液压油应这样选择：在工作温度范围内粘度处于最优范围（Vopt）见选择图的阴影区域，我们推荐在同种条件下选择较高的粘度等级。

示例：X°C的环境温度下，回路中的工作温度为60°C。在最佳的工作粘度范围（Vopt阴影区域），对应粘度等级VG46或VG68，应选择VG68。

请注意：壳体泄油温度受压力和转速的影响，总是高于回路温度，系统内任何一点的温度都不能超过115°C。

The correct choice of hydraulic fluid requires knowledge of the operating temperature in relation to the ambient temperature: in a closed circuit, the circuit temperature.

The hydraulic fluid should be chosen so that the operating viscosity in the operating temperature range is within the optimum range (Vopt see shaded area of the selection diagram). We recommended that the higher viscosity class be selected in each case.

Example: At an ambient temperature of X°C, an operating temperature of 60°C is set in the circuit. In the optimum operating viscosity range (Vopt, shaded area), this corresponds to the viscosity classes VG 46 and VG 68; to be selected: VG 68.

Note: The case drain temperature, which is affected by pressure and speed, can be higher than the circuit temperature. At no point of the component may the temperature be higher than 115°C.

液压油的过滤

Filtration of the hydraulic fluid

油液过滤得越精细，油液的清洁度越高，轴向柱塞元件的使用寿命就越长。为了确保轴向柱塞元件的正常工作，油液的清洁度等级应至少按ISO4406的20/18/15级。

根据系统和应用情况，对WHPVMF我们推荐过滤器滤芯精度应在10µm之内；过滤器滤芯的压差升高时，过滤精度不得降低。

在较高油液温度（90°C至最高115°C），清洁度等级应至少按ISO4406的19/17/14级。

壳体内部的压力必须等于或大于外部对轴密封圈的压力。

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

To ensure the functional reliability of the axial piston unit, a gravimetric analysis of the hydraulic fluid is necessary to determine the amount of solid contaminant and to determine the cleanliness level according to ISO 4406.

A cleanliness level of at least 20/18/15 is to be maintained.

Depending on the system and the application, for the WHPVMF, we recommend filter's filtering precision should within 10µm. With an increasing differential pressure at the filter cartridges, the filtering precision of filter must not deteriorate.

At very high hydraulic fluid temperatures (90°C to maximum 115°C), a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary.

The case pressure must be equal to or higher than the ambient pressure.

轴密封圈

Shaft Seal

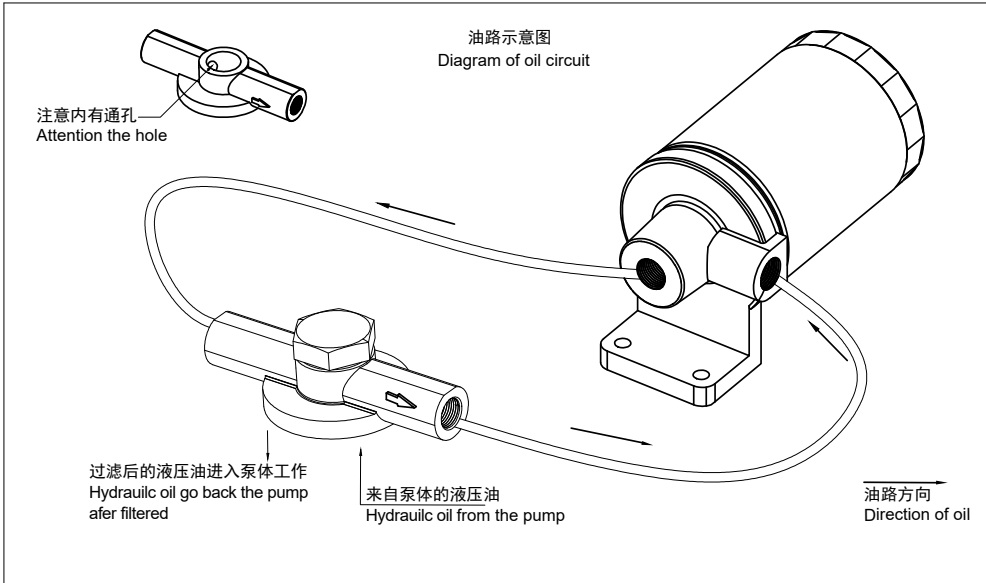
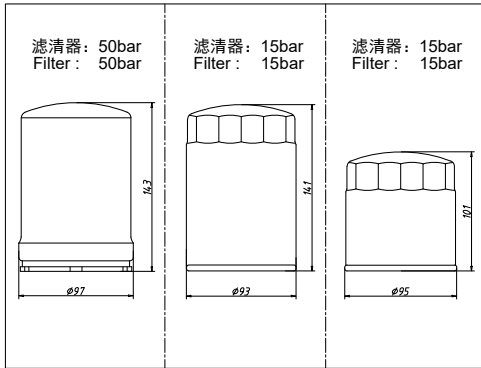
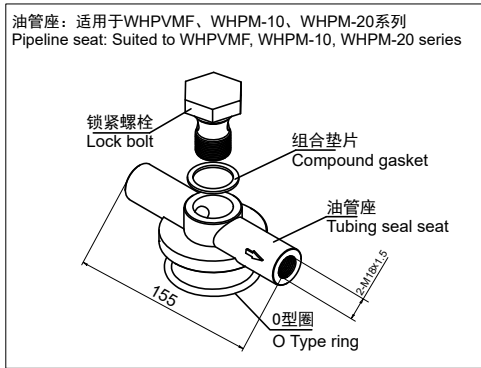
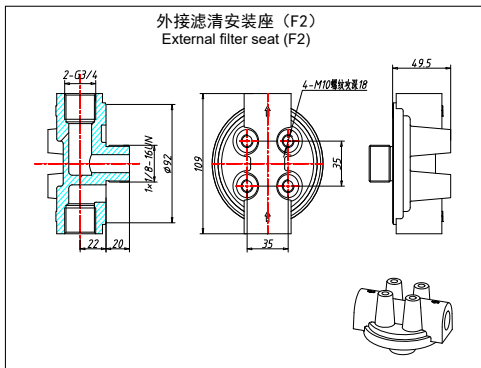
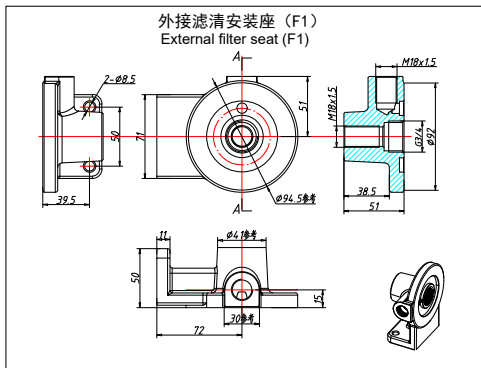
允许压力负载

轴密封圈的使用寿命受泵的转速和壳体泄油压力的影响。建议工作温度下的平均持久壳体泄油压力不可超过0.28Mpa绝对压力。转速减小时，最高允许壳体泄油压力为0.6Mpa。短时（t<0.1s）允许绝对压力峰值最高为1Mpa，压力峰值出现的频率越高，轴密封圈的使用寿命越短。

Permissible pressure loading

The service life of the shaft seal is influenced by the speed of the axial piston unit and the case drain pressure. We suggest the average of the persistent case drain pressure must not exceed 0.28 Mpa absolute pressure. When the speed decreases, the maximum permissible case drain pressure is 0.6Mpa under operating temperature. Momentary pressure spikes (t<0.1s) of up to 1Mpa are permitted. The service life the shaft seal decreases with an increase in the frequency of pressure spikes.

滤清 Filter



WHPV 系列

型号说明 Specifications

WHPV	-	37	-	S	-	L	-	02	-	Z	-	M	+
01	-	02	-	03	-	04	-	05	-	06	-	07	08

轴向柱塞元件 Axial Piston Unit

01	斜盘结构变量柱塞泵 Swashplate design, Variable pump
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规格 Size

02	排量 DSPL(ml/r)	37	42
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结构 Struction

03	泵 Pump	单泵 Single Pump	S
		串泵 Double Pump	D

旋转方向 Rotation

04	泵 Pump	顺时针 Clockwise	R
		逆时针 Anti-clockwise	L

滤清器 Filter

05	无滤清器 None	01
	有滤清器 With	02

零位定位器 Positioner

06	无定位器则不标注 None	
	加装定位器 Choice zero controller (能精准的控制驻车系统, 帮助简化安装和调试。)	Z

手柄位置 Control Hand Location

07	手柄安装左侧 Control hand in the left	详见图表P26 / Detail Check P26	M
	手柄安装右侧 Control hand in the right		N

“+” 的定义 The defintion of the Plus sign

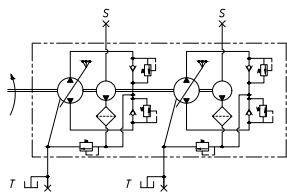
08	订购串联泵请使用“+”来区别泵型号 If order double pumps, please use a plus sign to distinguish the two pump modles	+
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技术参数 Technical Data

规格 Size		37S	37D	42S	42D
排量 Displacement	泵 Pump Vg max ml/r	37	2*37	42	2*42
	补油泵 Boost Pump Vg max ml/r	10	2*10	10	2*10
转速 Rotation	输入 Input n max r/min	3000			
	输出 Output n max r/min	0---3000			
最大流量 Flow (Max)	在 When n max 时 L/min	111	2*111	126	2*126
	在 When n=1500 时 L/min	55.5	2*55.5	63	2*63
压力 Presssure (Max)	额定压力 Nominal pressure	21	21	21	21
	最高压力 Max pressure	33	33	35	35
最大功率 Power (Max)	在 n max 时 Pmax 功率 KW When n in max	61	2*61	73.5	2*73.5
	在 n=1500r/min 时 Pmax 功率 KW When n=1500r/min	30.5	2*30.5	36.75	2*36.75
重量 Weight	KG	21	43	25	51

外形及安装尺寸图 Mounting Dimension

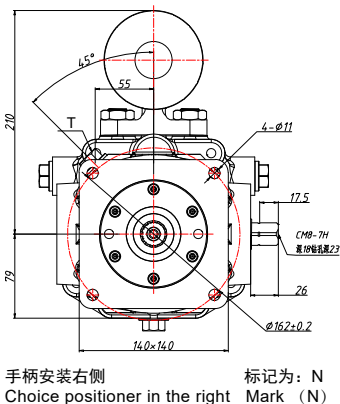
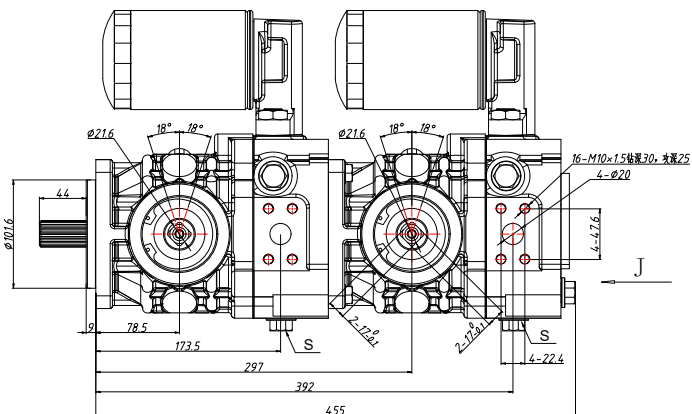
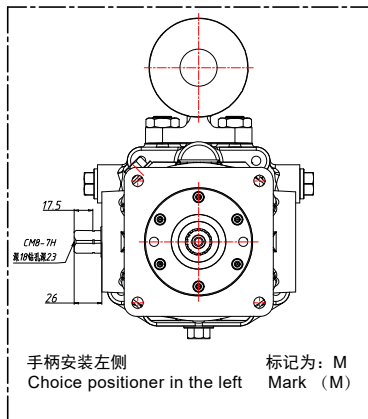
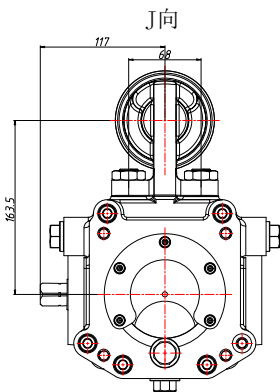
WHPV-37/42-D-R/L-02-N+WHPV-37/42-D-R/L-02-N串泵



液压原理图

油口代号 Port		规格 Size
回油口 Return port	T	G1/2
进油口 Inlet opening	S	G1/2

传动轴渐开线花键参数 Drive shaft involute spline parameters		
齿数 Number of teeth	Z	15
模数 Modulus	m	1.5875
压力角 Pressure angle	α	20°
分度圆直径 Standard pitch diameter	D	Φ23.7
大径 Major diameter	Di1	Φ24.68
小径 Minor diameter	Di	Φ21.8
跨测齿数 Cross-test teeth	n	3
公法线 Common normal	We	11.85±0.02



型号说明
Specifications

WHM	47	/	10	W	—	F	T1	—	B	01	F
01	02		03	04		05	06		07	08	09

轴向柱塞元件
Axial Piston Unit

01	固定式柱塞马达 Bent axis design, Fixed
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规格
Size

02	排量DSPL(ml/r)	47	52
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系列
Series

03	版本号 Model	10
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旋转方向
Rotation

04	从轴端上看, 双向	W
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密封件
Seals

05	氟橡胶(FKM)	F
	丁腈胶(NBR)	N

轴端
Shaft End

06	花键尺寸 Splined Shaft, DIN 5480	47	52	T1
	平键尺寸 Parallel Keyed Shaft, DIN 6885	○	○	T2

安装法兰
Mouting Flange

07	符合ISO3019-2 4孔 4-Hole-ISO3019-2	详细见图表P28 / Detail Check P28	B
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法兰油口
Flange Port

08	对侧侧面螺纹油口	M27*2	01
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选配功能
Optional Features

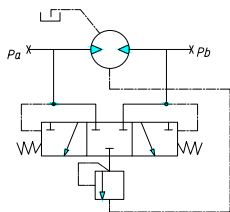
09	不配冲洗阀 None	N
	配冲洗阀 Flush Valve	F

技术参数 Technical Data

数据值 (理论值, 不考虑系数和公差; 近似值)

规格	NG		47	52
排量	vg	cm ³	47.4	52.1
转速	n _{nom}	rpm	2800	2800
	n _{max}	rpm	3000	3000
输入流量 n _{nom} 且vg	qv	l/min	131.6	145.6
vg且扭矩	ΔP=300	Bar	224.2	248.0
	ΔP=350	Bar	261.6	289.4
质量 (近似值)	m	KG	12	12.5

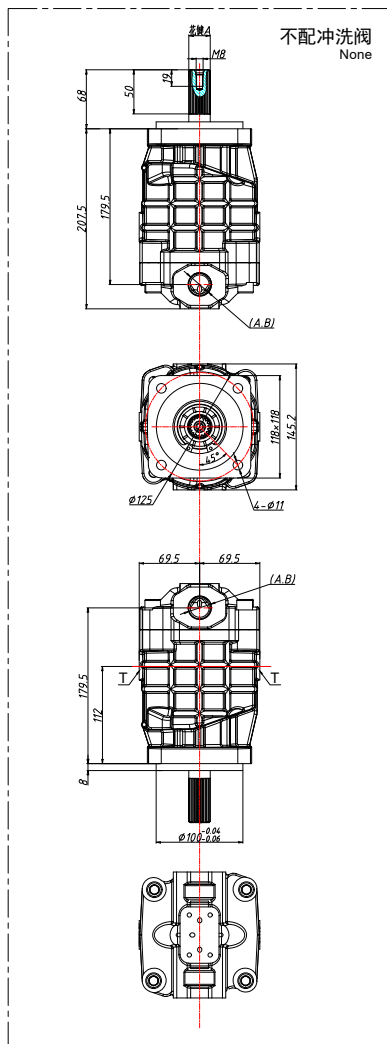
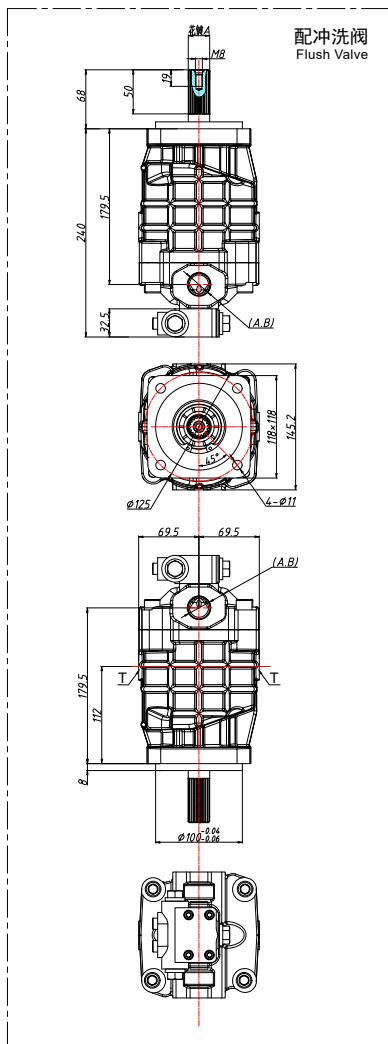
外形及安装尺寸图 Mounting Dimension



液压原理图

油口代号 Port	规格 Size	
回油口 Return port	T	G1/2
注：回油口选其中任何一个即可。 Ps: Only choice one of "T" ports.		
进/出油口 Inlet/outlet port	A	M27
	B	

传动轴A渐开线花键参数 Drive shaft A involute spline parameters			
齿数 Number of teeth	Z	18	
模数 Modulus	m	1.25	
压力角 Pressure angle	α	30°	
分度圆直径 Standard pitch diameter	D	$\Phi 22.5$	
大径 Major diameter	Dri	$\Phi 24.75 - \text{0.1}$	
小径 Minor diameter	Di	$\Phi 22.25 - \text{0.21}$	
变位系数 Modification coefficient	X	0.45	
跨测齿数 Cross-test teeth	n	4	
公法线 Common normal	We	13.513 ± 0.008	



WHPV系列

型号说明 Type Code

WHPV	37	S	L	02	Z	M	
01	02	03	04	05	06	07	

轴向柱塞元件 Axial Piston Unit

01	斜盘结构变量柱塞泵 Swashplate design ,Variable pump	WHPV
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规格 Size

02	排量 DSPL (ml/r)	37	42
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结构 Struction

03	泵 Pump	单泵 Single pump	S
		串泵 Double pump	D

旋转方向 Rotation

04	泵 Pump	顺时针 Clockwise	R
		逆时针 Anti-clockwise	L

滤清器 Filter

05	无滤清器 None	01
	有滤清器 Yes	02

零位定位器 Zero Controller

06	无定位器则不标注 None	
	加装定位器 Choice zero controller (能精准的控制驻车系统, 帮助简化安装和调适。)	Z

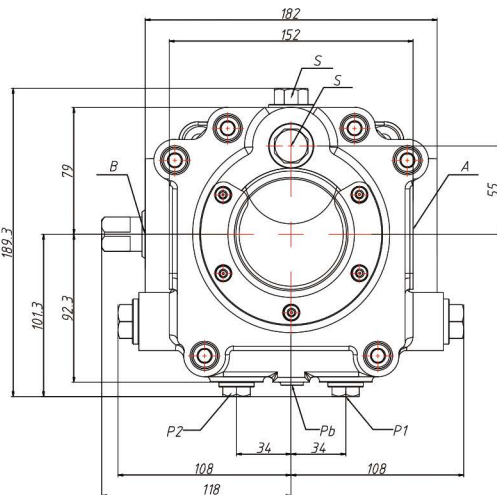
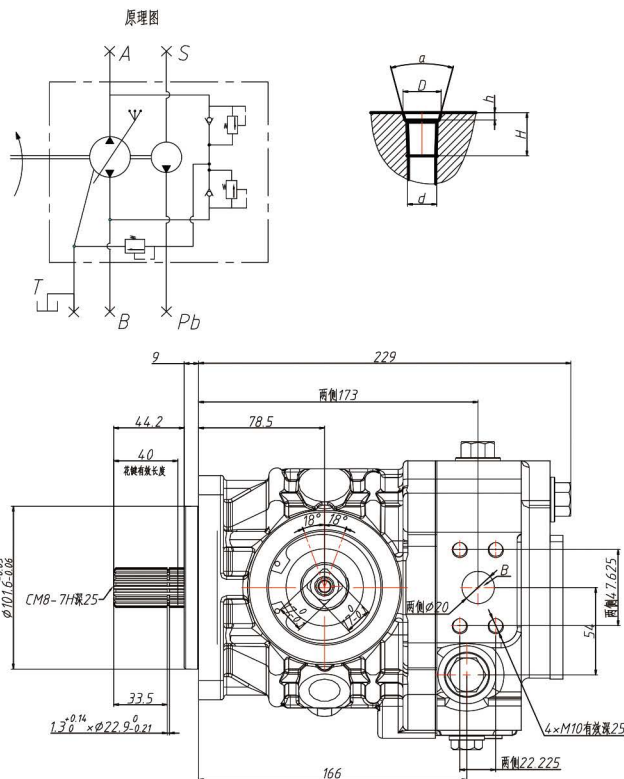
手柄位置 Control Hand Location

07	手柄安装左侧 Control hand in the left	M	详情见图文
	手柄安装右侧 Control hand in the right	N	

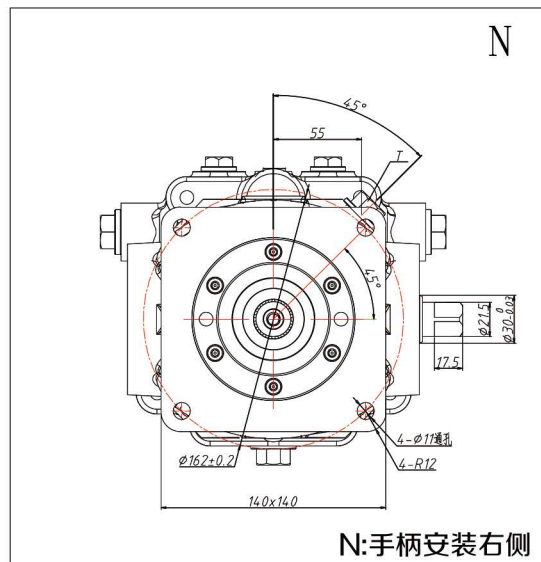
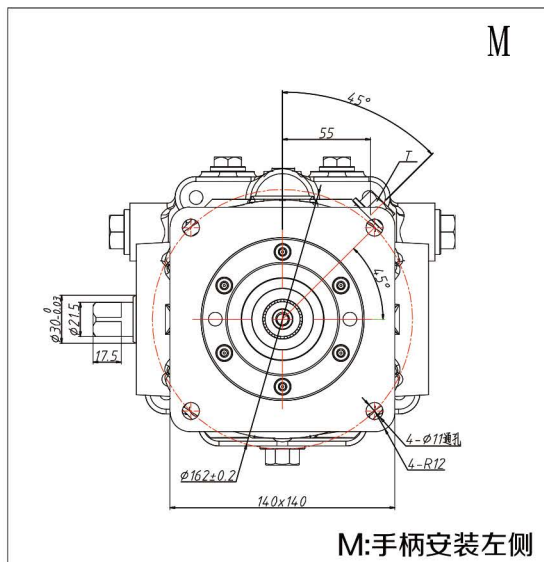
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转速 Rotation	输入 Input n max r/min	3000			
	输出 Output n max r/min	0---3000			
最大流量 Flow(Max)	在 When n max时 L/min	111	2*111	126	2*126
	在 When n=1500时 L/min	55.5	2*55.5	63	2*63
压力 Pressure(Mpa)	额定压力 Nominal pressure	21	21	21	21
	最高压力 Max pressure	33	33	35	35
最大功率 Power(Max)	在n max时Pmax功率KW When n in max	61	2*61	73.5	2*73.5
	在n=1500r/min时Pmax功率KW When n=1500r/min	30.5	2*30.5	36.75	2*36.75
重量 Weight	KG	21	43	25	51

外形及安装尺寸图 Mounting Dimension



尺寸代号		d	D	h	H	a	螺纹标准
补油泵测压口	Pb	M10			13		GB/T196-2003
主泵测压口	P1,P2	G1/4	$\phi 15.8$	3	18	30°	GB/T7307-2001
回油口	T	G1/2	$\phi 22.5$	3	20	24°	
补油泵进口	S	G1/2	$\phi 22.5$	3	20	24°	
渐开线花键参数 Parameter of involute spline A、B							
齿数	Number of Teech						18
模数	Modulus						1.25
压力角	Pressure angle						20°
变位量	Displacement coefficient						1
分度圆直径	Reference circle diameter						$\phi 22.5$
大径	Big diameter						$\phi 24.5_{-0.050}^0$
小径	Small diameter						$\phi 22_{-0.021}^0$
精度等级	Precision grade						GB/T3478.1-1995 6级 Grade



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