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## YGM9518 型高压磨粉机使用说明书

### 高压磨的用途：

■该机主要适用于冶金、建材、化工、矿山等矿产品物料的磨粉加工，可粉磨石英、长石、方解石、滑石、重晶石、萤石、稀土、大理石、陶瓷、铝矾土、锰矿、铜矿、磷矿石、氧化铁红、皓英砂、矿渣、水渣、水泥熟料、活性炭、白云石、花岗岩、石榴子石、氧化铁黄、豆饼、化肥、复合肥、粉石、氟石、膨润土、麦饭石流纹岩、浑绿岩、叶腊石、页岩、紫砂石、绿浑岩、迭岩石、玄武石、石膏、石墨、炭化硅、保温材料等莫式硬度在 9.3 级以下，湿度在 6% 的各种非易燃易爆矿产物料的加工。

### 高压磨的六大特点：

■与其它磨机相比相同等动力条件下产量提高 10-20%，磨辊对物料的碾压力在高压弹簧作用下提高 800-1200kgf。

■莫式硬度小于 9.3 级的矿产物料均可加工粉碎。

■成品粒度范围广，粒径最粗可达 0.613 毫米(30 目)，粒径一般可达 0.033 毫米(425 目)，少部分物料最细可达到 0.013 毫米(1000 目)。

■除尘效果完全达到国家粉尘排放标准。

■分析机调整方便。

■研磨装置采用重叠式多级密封，密封性能好。

性能、规格

见表 1 和表 2

表 1

名称	单位	规格、技术性能数据
磨辊数量	个	4
磨辊直径×高度	毫米	Φ310×180
磨环直径×高度	毫米	Φ950×180
主机转速	转/分	130
最大进料粒度	毫米	≤25
成品粒度	毫米	0.14-0.010
产 量	吨/小时	5-0.5
外形尺寸长×宽×高	米	7.1×5.9×7.9
总重（电控除外）	吨	16

★ 注：粉碎石灰石、成品粒度为 0.075 毫米（200 目）、通筛率 85%条件下的标准产量。

基本数据		单位	规格、技术数据	
主机电动机	型号		Y225S-4	
	功率	千瓦	37	
	转速	转/分	1480	
分析机电动机	型号		YCT200-4A	
	功率	千瓦	18.5	
	转速	转/分	125~1250	
提升机电动机	型号		Y100L-4	
	功率	千瓦	3	
	转速	转/分	1480	
鼓风机电动机	型号		Y225S-4	
	功率	千瓦	30	
	转速	转/分	1470	
颚式破碎机电动机	型号	PE	200×350	250×400
			Y160M-6	Y180L-6
	功率	千瓦	15	15
	转速	转/分	970	
电磁振动给料机	型号		GZ <sub>2</sub> F	
	功率	瓦	100	

★注：破碎机根据物料硬度、供料量可按表 2 内型号选配。

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## 工作原理、整机结构特征

9518 型高压磨粉机整机结构是由主机、分析机、管道装置、鼓风机、颚式破碎机、斗式提升机、电磁振动给料机、电控电机等组成（详见安装基础图）。

### ■工作原理：

■磨粉机整机工作过程（粉磨物料过程）：大块状物料经颚式破碎机破碎到所需粒度后，由提升机将物料送至储料斗，再经振动给料机将料均匀、定量、连续地送入主机磨室内进行研磨，粉磨后的粉子被风机气流带走，经分析机进行分级，符合细度的粉子随气流经管道进入大旋风收集器内，进行分离收集，再经出粉管排出即为成品粉。气流再由大旋风收集器上端回风管吸入鼓风机。本机整个气流系统是密闭循环的，并且是在正负压状态下循环流动的。

■在磨室内因被磨物料有一定的含水量，研磨时产生热量导致磨室内气体蒸发改变了气流量。以及整机各管道结合处不密封，外界气体被吸入，是循环气流风量增加，为此通过调整风机和主机间的余风管来达到气流的平衡，并将多余的气体导入布袋除尘器内，把余气带入的细粉子收集下来，余气被净化后排出。

■主机工作过程是通过传动装置带动中心轴转动，轴的上端连接着梅花架，架上装有磨辊装置并形成摆动支点，其不仅围绕中心旋转，同时磨辊在磨环内公转的同时，磨辊本身因摩擦作用而自转。梅花架下端装有铲刀系统，其位置处于磨辊下端，铲刀与磨辊同转过程中把物料铲抛喂入磨辊与磨环之间，形成垫料层，该料层受磨辊旋转产生向外的离心力（即挤压力）将物料碾碎，即由此而达到制粉目的。

■分析机通过调速电机带动转盘上的叶片旋转，形成对粉子的分级作用。叶片转速的快慢是按成品粉子料度大小进行调节，当如要获得较细粒度粉子时，就必须提高叶片转速，使叶片与粉子接触增加，使不合要求的粉子被叶片抛向外壁与气流脱离，粗粉子因自重力的作用落入磨室进行重磨，合格的成品粉子通过叶片随气流吸入大旋风收集器内，气流与粉子通过叶片随气流吸入大旋风收集器内，气流与粉子被分离后，粉子被收集。

■大旋风收集器对磨粉机的性能起到很重要的作用，当带粉气流进入收集器时是高速旋转状态，待气流与粉子分离后，气流随圆锥体壁收缩向中心移动至锥底时（自气流自然长度）形成一个旋转向上的气流圆柱，这时粉子被分离掉落收集。由于向上旋转的气流核心呈负压状态，所以对收集器下端密封要求很高，必须对外界空气严格隔开，否则被收集下

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的粉子会重新被核心收集器负压气体隔离开，这是一个相当重要的部件，如不装锁粉器或锁粉器的舌板密封不严就会造成不出粉或少出粉，严重影响整机产量。

**■整机结构特征：**

- 1、磨粉机整机为立式结构，其特征是占地面积小，成套性强，从块料至粉碎到成品粉子、包装，能独立自成一個生产体系。
- 2、磨粉机所磨制的各种粉子成品细度均匀性，能达到所需细度的 99%通过，即为通筛可达 99%。这是其它磨粉设备所不能胜任的。
- 3、磨粉机主要传动装置采用密闭齿轮箱和带轮，传动平稳，运转可靠，磨粉机的重要件均采用优质钢材制造，因此整机耐用稳定可靠。
- 4、磨粉机电气系统采用集中控制，选型先进合理，在磨粉车箱内基本上可实现无人操作、振动给料机体积小重量轻，给料均匀，易于调节并省电，使用维修方便。



## 整机的安装、调试

### ■整机的安装:

#### (一) 安装前的准备事项

- 1、磨粉机运行现场还未安装时，应妥善保管，外露表面须涂上防锈油脂，并避免日晒雨淋，以防机体生绣进水，并要建立保养制度。
- 2、厂房和基础应根据基础图尺寸应有足够的高度和安装位置，磨机基础应采用高标水泥并须埋有钢筋方能浇基础，并预埋穿线管和电缆沟。水泥基础浇好后，必须有 15 天的保养期。
- 3、应配有 2-3 吨起吊工具，供安装维修用。
- 4、磨粉机从出厂到使用时间超过 6 个月者，对主机中心轴系统、传动装置、磨辊装置、分析机油池等应清洗检查，清洗检查完毕后应对各部件加入足够的润滑油脂。

#### (二) 磨粉机的安装（见图 1 安装示意图）

- 1、首先将传动装置底座吊入坑内校平，注意控制好一定高度，然后用水平仪校正上端平面“A”，同时将传动装置安装在“A”面上并用螺栓固定。
- 2、主机安装。安装前应在底座下端平面与水泥基础接触处和地脚螺栓连接间垫上橡胶防震垫（见图 2），然后用框形水平仪校正底座“B”平面，校正点为交叉十字线四点，同时调正两半联轴器“C”、“D”，其不同轴度应小于 0.20 毫米， $E_1-E_2$  不平行度大于 0.1 毫米，“ $E_1$ ”、“ $E_2$ ”之间隙应保持在 5-8 毫米内。
- 3、管道装置的位置和高度应按总图安装，不得任意改动和加高，各管道连接处应密封，紧固后不得有漏气现象。电气设备应准确可靠，待各部件安装完毕后应进行试机。

### ■ 调试（空运转试机）

- 1、压力弹簧的工作高度（被压缩后的有效高度）越低，磨辊对物料的压力也越大，其产量也越高，但应根据主电动机的负荷情况，随着磨辊被磨小逐渐压缩。压力弹簧的工作高度应控制在 145~160 毫米范围内。
- 2、空负荷运转试机在无负荷试机前，应将磨辊装置用钢丝绳包扎牢，避免磨辊装置与磨环接触冲击，然后主机空运转试机不少于 1 小时；主机运转时应平稳，箱体内油温不得超过 80℃，温升不超过 40℃。主机与分析机旋转方面见图 3。
- 3、鼓风机应空载开机，待运转正常后再加载。然后观察其运转状态，无异常噪音和振

动、滚动轴承最高温度不得超过 70℃，温升不得超过 35℃。

- 4、空负荷运转试机时间不少于 8 小时，磨机工作正常后整机无异常噪音，各管道连接处无漏风现象，经试机时间后再次把紧固体拧紧，即可投入正常使用。

## 磨粉机的操作规程

■ 开动磨粉前，应检查所有检修门关闭是否严密，检查破碎机的颚板间隙是否符合进料粒度尺寸，调整分析机转速应达到近似成品粒度要求。最后按以下顺序开机。

- 1、开动斗式提升机；
- 2、开动颚式破碎机；
- 3、待料仓存有物料后，启动分析机；
- 4、启动鼓风机（空负荷启动，待正常运转后再加载）；
- 5、启动主机，在启动主机瞬间随即启动电磁振动给料机。此时磨粉工作即为开始。

操作顺序简易表示如下。“启动”、提升机→破碎机→分析机→风机→主机→给料机。

■ 停机时应按下列顺序关闭各机：

- 1、先关闭给料机停止给料；
- 2、约一分钟后停止主机；
- 3、吹净残留的粉子后停止鼓风机；
- 4、最后关闭分析机。

停机顺序是：给料机→主机→鼓风机→分析机。

注：提升机输运物料至料仓一定量后，先停止破碎机而后再停止提升，此项应由储料量而变动。

- 5、磨粉机在正常工作时不准随意加油，要确保生产安全，磨粉机在任何部分发生不正常噪音，或负荷突然增大应立即检查，排除故障，以免发生重大事故。再继续开机时必须将磨机内余料取出，否则开机时电流过大，影响启动。

## 润滑系统

■ 为了保证整机的正常运转，应按下表要求和方法进行加油。润滑部位和油脂名称均在下表中述明：

润滑系统表

润滑部位	润滑形式		润滑油名称	润滑点数	每次加油时间	备注
	人工	油脂				
传动装置带轮轴		△	HJ-40 机械油	1	保持油位线	三个月换油一次
	△					
主机中心轴	△		3 号 MOS <sub>2</sub> 复合钙基润滑脂	3	1 月	从下油孔挤入从上油孔出油即可钙基润滑油脂代
磨辊装置	△		3 号 MOS <sub>2</sub> 复合钙基润滑脂	6-8	1-3 月	钙基润滑脂代
分析机油池		△	HJ-40 机械油	1	保持油位线	三个月换油一次
鼓风机轴承座	△		3 号 MOS <sub>2</sub> 复合钙基润滑脂	2	一个月	钙基润滑脂代
分析机轴承座	△		3 号 MOS <sub>2</sub> 复合钙基润滑脂	1	一个月	钙基润滑脂代
提升机下轴承座	△		3 号 MOS <sub>2</sub> 复合钙基润滑脂	1	一个月	钙基润滑脂代
提升机上轴承座	△		3 号 MOS <sub>2</sub> 复合钙基润滑脂	1	一个月	打开端盖注油
提升机蜗轮箱		△	HJ-40 机械油	1	保持油位线	三个月更换油一次

### ■ 电器控制部分

■ 磨粉机电机系统控制均集中装在控制柜内，各机均设有相互联锁装置，给料自动控制由主机电流变化来控制其给料量，各机启动的先后应按操作程序和规程进行。本控制柜中，除主机、分析机、给料机外，其余各机电机均为一般交流异步电动机。具体原理线路见原理系统图（图 5-6）。

### ■ 主机、风机的启动控制

本控制系统，对电机容量大于 30KW，采用降压启动，小于 30 KW 采用直接启动，系统中，风机采用三角启动，主机是采用延边三角形启动。延边三角形的启动与正常运转

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联接，有接触器与时间继电器组成控制线路，自动转接，时间继电器一般调整延长时间为 10 秒左右。采用延边三角形启动的电机，定子绕组为 9 个出头线头分别编号为  $U_1$ 、 $U_2$ 、 $U_3$ 、 $V_1$ 、 $V_2$ 、 $V_3$ 、 $W_1$ 、 $W_2$ 、 $W_3$ ，与控制柜联接时对号联接不得有误差，如 4R 主机，控制柜中端子 7  $U_1$  与电机端子  $U_1$  联接 7  $V_1$  与  $V_1$ ……7 $W_1$  与  $W_1$  联接，以此类推，联接线要细心严格检查避免错接。

主机电机因故（使出线头电机损坏，可用相同功率转速普通 6 个出线头电机代用，但只能起到星三角启动控制作用，见星三角接线原理图 5（以 5 为例）只要将控制柜中 U3V3W3 三个端子用导线短接即可。

### ■ 振动给料的控制及自动给料

电磁振动给料机的结构原理。电振机是一个双质点定向强迫振动系统，由料槽联接叉衔铁所组成，其悬挂再料仓下端并有一定的游动间隙呈自由状态，不得有卡住或与它物相碰现象，以免工作时有噪音产生。

- (1) 电振机安装后，将作用在定位连接叉上的螺钉松开（上三下一个），松开后用螺母拧紧，打开电振器后盖，检查铁芯与衔铁间隙应在 1.8~2.1 毫米内，并两者应平行清洁。各螺钉应坚固，最后将盖装上固定。
- (2) 通电空载试验，将电控箱调振幅电位器 R1，由小逐渐加大，其振幅应在 1.8~2.5 毫米之间，电流在 1.2 安，连续工作数小时以上振幅电流是否稳定；正常后打开料仓闸门送料，观察其给料量电流是否稳定，允许振幅下降 0.5 毫米，如振幅电流均达额定值仍未满足给料量要求，方将振动器吊装倾斜 20°，使之满足给料量要求。
- (3) 自动给料调整，自动给料是通过主电机风机电流变化来实现的。当风机正常运转时，主机电流超过额定电流时就会停止给料，当电流下降后就会自动给料。这主要是通过电流继电器动作断开与接上可控硅的控制电压，达到给料和停给。在风机出现故障时也会自动停止给料。DL-12/6 型过电流继电器内有 2 个线圈，当串联时其动作电流可从 1.5~3 安可调。当二线圈并联时其动作电流可从 3~6 安间可调，当磨机正常工作下，电流互感变化在电流继电器上所得电流不会大于 3 安。因此，将线圈接成串联。
- (4) 自动给料开始时，将控制柜门上主令开关拨到自动位置。逐渐加大控制箱上电位器 R1 旋钮，使其电流达到额定而且稳定，同时按主机额定电流调整电流继电器滑臂，改变继电器动作电流，升高时，使常闭触头断开，电流稍下降时就

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立即闭合，使磨粉机始终保持最佳工作状态，不会造成空磨或过载现象，保证了主机制粉效益。

- (5) 分析采用机 JZT 型调速电机传动，通过控制柜上电磁滑差控制器（ZLK-1 型）按钮来控制，启动按钮开关电机部分首先运转，然后合上润滑电源开关，调节转速旋钮使分析机达到所需转速和所需细度（粉子粒度）相吻合，依此可控制粉子的粒度。

### 磨粉机的维护、保养

- 磨粉机使用过程中，应有固定人员负责看管，操作人员必须具备一定的技术水平，磨粉机安装前对操作有关人员必须进行技术培训，使之了解磨机的原理性能，熟悉操作规程。
- 为使磨机正常工作，应制定设备“维修保养安全操作制度”方能保证磨机长期安全运行，同时要有必要的检修工具以及润滑脂和配件。
- 磨机使用一段时期后，应进行检修，同时对磨辊磨环铲刀等易损件进行修理更换，磨辊装置在使用前后对连接螺栓螺母塞均应进行仔细检查，是否有松动现象，润滑油脂是否加足。

## 常见故障、排除方法

■磨粉机在使用过程中所出现的故障，可按如下表进行处理。

常见故障	产生原因	排除方法
1、不出粉或出粉少产量低	(1) 锁粉器未调整好，密封不严，倒吸。 (2) 铲刀磨损大物料铲不起	(1) 检查和调整好锁粉器密封，发现漏气处应堵住。 (2) 更换新铲刀。
2、成品粉子过粗或过细	(1) 分析机叶片磨损严重，不起分级作用 (2) 风机风量不适当。	(1) 更换叶片并适当关小风机进风量能解决过粗。 (2) 过细应提高进口风量。
3、主机电流上升，机温上升，风机电流下降	(1) 给料过量，风道被粉料堵塞，管道排气不畅循环气流发热使之主机电流，机温升高，风机电流下降。	(1) 减少进料量，清除风道积粉。 (2) 开大余风管阀门，进机物料湿度控制在 6%以下。
4、主机噪音大并有较大振动。	(1) 进料量小或主机与传动装置不同轴，两联轴器间无间隙，地脚螺栓松动。 (2) 料硬冲击大，或无料层 (3) 磨辊磨环失圆变形严重	(1) 调整给料量，找正同轴度，调整两联轴器中间的间隙 (2) 减少进料粒度。 (3) 更换磨辊、磨环。
5、风机振动	(1) 风叶上积粉或磨损不平衡。 (2) 地脚螺栓松动。	(1) 清除叶片积粉或更换叶片。 (2) 拧紧地脚螺栓。
6、传动装置和分析机油箱发热	(1) 机油粘度大油厚，螺纹泵油打不上去使上部轴承缺油。	(1) 检查机油的牌号和粘度是否与要求相符。 (2) 检查分析机运转方向。
7、磨辊装置进粉轴承易损坏	(1) 断油、或密封圈损坏。 (2) 长期缺乏维修和清洗。	(1) 按规定时间及时加油。 (2) 定期清洗，更换油封。

## 各部轴承型号及易损件名称、数量

本磨粉机所用轴承和易损件见下四表。目的是方便用户，参考购置。

滚动轴承表 表一

序号	代号	名称规格	数量	所属部件
1	GB286-64	轴承 3053128 140×210×53	1	主机上
2	GB286-64	3522 轴承 110×200×53	1	主机下
3	GB301-84	8322 轴承 110×190×63	1	主机下
4	GB297-64	7622 轴承 110×240×85	2	传动装置
5	GB297-64	7618 轴承 90×190×68	2	传动装置
6	GB297-84	7612 轴承 60×130×48.5	4	磨辊装置下
7	GB297-8	3616 轴承 80×170×58	4	磨辊装置下
8	GB281-64	111311 轴承 55×120×29	1	分析机
9	GB294-64	7315 轴承 75×160×39.5	1	分析机
10	GB296-84	7312 轴承 60×130×33	1	分析机
11	GB296-84	310 轴承 50×110×27	1	分析机
12	GB286-64	3616 轴承 80×170×58	2	鼓风机
13	GB297-64	6308 轴承 40×90×25	2	畚式提升机

易损件表 表二

序号	名称	件数
1	磨环	1
2	磨辊装置	4
3	磨辊	4
4	衬板	1
5	铲刀座	4
6	铲刀	4
7	磨辊轴	4
8	耐磨套	8

油封 表三

标准	名称	型号规格	数量	用途
HD4-692-67	油封	PD150×180×16	2	轴架上部
HD4-692-67	油封	SG105×130×14	8	磨辊装置下端
HD4-692-72	油封	Pd110×140×14	1	主轴下端
HD4-692-67	油封	SG70×95×12		磨辊装置上端

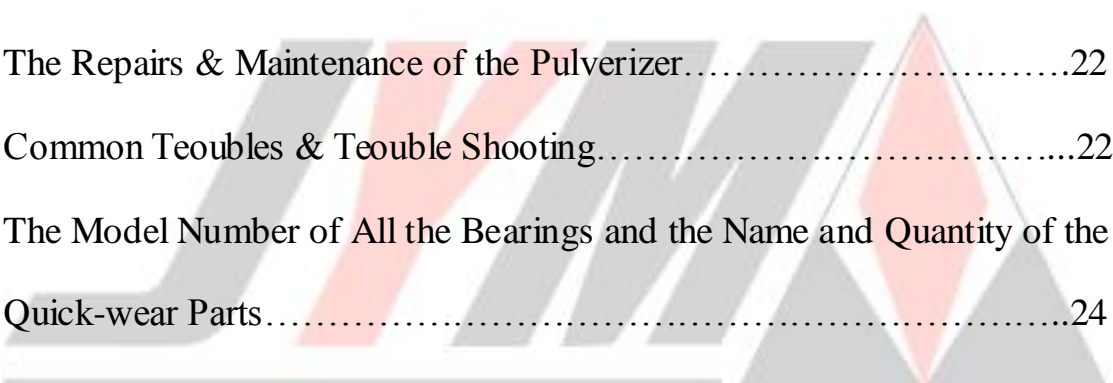
三角带 表四

标准	名称	规格	数量	用途
GB1171-74	三角带	B-2240	4	分析机
GB1171-74	三角带	C-1956	7	主机
GB1171-74	三角带	C-3150	6	风机

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## The Operating Instruction of YGM 9518 High Pressure Pulverizer

### The Application of High Pressure Pulverizer

This machine is mainly applied for the powder processing of mineral products in the industries of metallurgy, construction materials, chemical, and mining, etc. It can produce powder from various non-flammable and non-explosive mineral materials with Mohs hardness below 9.3 and humidity at 6%, such as quartz, feldspar, calcite, talcum, barite, fluorite, zircon, cinder, cement grappier, cement clinker, activated carbon, dolomite, granite, soft coal, coking coal, lignite, magnesia, chromium oxide green, gold ore, red clay, clay, bolus alba, coke, coal gangue, porcelain clay, kyanite, fluor-spar, bentonite, medicinal stone liparite, diabase, pyrophyllite, shale, red stone, emeraldite, basalt, gypsum, graphite, carborundum, heat insulating material, etc.

### The Six Key Features of High Pressure Pulverizer

Compared with other pulverizers under the same power conditions, the output of this machine is increased by 20-30%. Under the performance of high pressure springs, the rollers grinding pressure on raw materials is raised by 800-1200kg.

All the mineral materials with Mohs hardness below 9.3 can be crushed.

The finished powder has a wide range of particle size from the maximum particle diameter of 0.613 mm (30 mesh) to the finest diameter of 0.013 mm (1000 mesh)

While the normal particle diameter is around 0.033 mm (425 mesh).

Its dust-removing effect exactly meets the National Dust Discharge Standard.

The classifier is easy for adjustment.

The grinding unit adopts a superposition multi-grade sealing with good sealing performance.

### Specification & Performance

**See Diagram 1 & 2.**

Diagram 1

Name	Unit	Specification and Technical Performance Parameters
Quantity of grinding rollers	Piece	4
Grinding roller,diameter×height	Mm	Φ310×180
Grinding ring,diameter×height	Mm	Φ950×180
Rotation speed of the main unit	Rpm	130
Maximum particle size of the material to be fed	Mm	20-25
Particle size of the finished powder	Mm	0.613-0.033,the finest is 0.013
Output	Ton/Hour	1.5-5
Outer dimension:L×W×H	M	7.1×5.9×7.9
Total weight(excluding electrical contol)	ton	16

Note:For the crushing of limestone,this is the standard output with the finished particle size of 0.075mm(200 mesh)and the screen-passing rate of 85%.

Diagram 2

Bsic units		Unit	Specification and Technical Parameters	
Motor of Main Unit	Modle		Y225S-4	
	Power	Kw	37	
	Rotating speed	Rpm	1480	
Motor of Classifier	Modle		YCT3004A	
	Power	Kw	5.5	
	Rotating speed	Rpm	125-1250	
Motor of Elevator	Modle		Y100L-4	
	Power	Kw	3	
	Rotating speed	Rpm	1480	
Motor of Blower	Modle		Y2255-4	
	Power	Kw	37	
	Rotating speed	Rpm	1470	
Motor of Jaw Crusher	Modle	PE	200×350	250×400
			Y160M-6	Y180L-6
	Power	Kw	15	
	Rotating speed	Rpm	970	
Electromagnetic Vibration Feeder	Modle		GZ <sub>2</sub> F	
	Power	Watt	100	

Note:The crusher is optional relying on the hardness of material and feeding quantity with reference to the modles listed in Diagram 2.

### The Operating principle & characreristics of the Whole System

The whole system of 9518 high-pressure pulverrizer consists of main

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units, Classifier, piping device, blower, jaw crusher, dustpan elevator, electromagnetic vibration, feeder, and electric-control motor, etc. (For details, please refer to the Installation Foundation Diagram.)

#### Operating Principle:

The whole operating process of the pulverizer (the crushing process of raw material) is illustrated as follows: The lump material is firstly crushed by the jaw crusher into the required partial size. Then the crushed material is transferred to a hopper by the elevator and fed uniformly, quantitatively and continuously by the vibration feeder into the grinding chamber of the main unit for pulverizing. The pulverized particles are brought up by the air current of the blower into the classifier for classification. The particles with the required fineness go with the air current through the pipes into a cyclone collector for separation and collection and the finished particles are discharged from a pipe outlet. The air current is inhaled into the blower through the return pipe on the top of the cyclone collector. The air current of the whole system is in a sealed circulation under the condition of the positive and negative pressure.

Due to some moisture contained in the material to be pulverized in a grinding chamber, the heat resulting from grinding leads to the vaporized air which changes the airflow volume. Moreover, the outside air inhaled from the narrow gaps of the piping connections can increase the volume of air current. Therefore, it is necessary to adjust the redundant air pipe between the blower and the main unit for keeping the balance of the air current. The redundant air is then guided into a cloth bag of a dust cleaner to collect the fine powder in the air. And the redundant air is discharged after purification.

The main unit runs with a central shaft that is driven by a transmission device. The top of the shaft is connected with a quincunx stand, on which a grinding roller is installed to form a swing support. The grinding roller not only rotates around the center and the grinding ring, but also rotates around its own axis due to the friction. A relieving tool is installed under the quincunx stand, just located at the lower end of the grinding roller, when the relieving tool and the grinding roller rotate simultaneously, the mineral material is spaded up and fed into the room between the roller and ring to form a layer of feeding material. Such a layer of feeding material generates an outward centrifugal force (crushing force) through the grinding rollers rotation to crush the material into powder.

The classifier performs the function of classifying the particles by the rotation of blades on the disk driven by a speed-adjustable motor. The rotation speed of the blades is regulated according to the particle size of the finished powder. In order to realize a finer particle size, the rotation speed should be raised up to increase the contact between the blades and powder particles. The powder particles that do not meet the requirement are thrown by the blades to the outer wall and separated from the air current. The coarse particles drop because of self-gravity into the grinding chamber for regrinding. The qualified particles go through the blades and are inhaled by the air current into the cyclone collector. Then the particles are separated from the air current and collected.

The cyclone collector plays an important role in the performance of the

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pulverizer. When the air current with the powder enters the collector, it is at a high speed of rotation. After the air current is separated from particles, and when the air current concentrates towards the center along the cone wall and moves to the bottom of the cone (the natural length of the air current), an upward rotating air column is formed. Meanwhile, the particles are separated and fall down for collection. Because the core of the upward rotating air current is in state of negative pressure, the lower part of the collector must meet a very strict requirement of sealing and be isolated entirely from the outside air. Otherwise, the collected particles will be taken away by the central air current, which will directly influence the output of the complete system. Therefore, a powder-locking unit is installed under the collector. Its function is to isolate the outside positive pressure air from the negative pressure air inside the collector. This is a very important component. If the powder-locking unit is not installed, or the powder-locking unit has not strict sealing, the output of the complete system will be seriously influenced with no or less production of the finished powder.

#### Features of Whole System:

The whole pulverizer is of a standing structure and characteristic of a small occupying space and strong integration capability. It can form up an independent production system from lump material crushing to finished powder and packaging.

All the finished particles produced by the pulverizer have a good uniformity of fineness. 99% of the particles can meet the required fineness and go through the sieve, i.e. The passing rate is 99%. This is the advantage that other power grinding equipment cannot exceed.

The transmission device of the main unit is equipped with a closed gearbox and pulley that runs smoothly and reliably. The key components of the pulverizer are made of best quality steel, so the whole system is durable, stable, and reliable.

The electrical system of the pulverizer is centrally controlled and the advanced model is rationally selected. Basically, an unmanned operation can be realized in the pulverizing workshop. The lightweight and compact vibration feeder can feed the material uniformly. It is easily adjustable, energy saving and convenient for operation and maintenance.

### The Installation & Debugging of the Whole System

#### Installation of the Whole System

##### (1) Preparation before installation

1. The pulverizer shall be stored and protected well before it is transported to the site for installation. The surface open to the air shall be coated with the rustproof grease in order to resist the weather condition and prevent rusting of the machine from water penetration. A maintenance system shall be established.

2. According to the dimensions shown on the Installation Diagram, the workshop and foundation must have enough height and suitable installation position. The foundation of the pulverizer shall be constructed with the high-mark cement and reinforcing steel bars. The wiring pipes and cable ditches must be well prepared in advance. When the concrete foundation is completed, it is required to have 15 days of the maintenance period.

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3. A lifting facility with the capacity of 2-3 tonnage must be equipped for repairs and maintenance.

4. If the pulverizer has been operated for over six months since it left out of the manufacturer, the central shaft system of the main unit, transmission device, grinding rollers, and the oil tank of the classifier, etc. must be cleaned and examined. After completion of cleaning and checking, these components shall be lubricated sufficiently.

(2) Installation of the pulverizer (see Fig. 1-Installation).

1. Firstly, the bottom case of the transmission device is craned into the installation pit, and then the pit is filled and leveled. Pay attention to keeping a suitable height, and then adjust the upper plane A by a level gauge. Meanwhile, install the transmission device on the plane A and fix it by screws.

2. The installation of the main unit. Before installation, the shockproof rubber pads (see Fig. 2) shall be placed at the bottom plane of the bottom case contacting the concrete foundation and between the connections of stone bolts. Then adjust the B plane of the bottom case by a frame level gauge. The adjustment points are the four points on the cross lines. Meanwhile, regulate the two half-clutches of C and D with their axial difference less than 0.20mm; then non-parallel degree between E1-E2 shall not exceed 0.1mm; and the gap between "E1" and "E2" shall be kept within 5-8mm.

3. The piping system shall be installed with its location and height in conformity with the Master Drawing. Any random change of its location and height is prohibited. All the pipe connection must be sealed well and after fixing no air leakage is permitted. The electrical device must be correct and reliable. A trial operation must be carried out after installation of all the parts. Debugging (no-loading trial operation)

4. The lower the working height of the pressure springs (the effective height after the spring is compressed) is, the higher the pressure that the grinding roller exerts on the material is and the higher the output. However, according to the loading condition of the main motor and with the grinding roller worn smaller, the working height of the pressure spring shall be more compressed. The working height of the pressure springs shall be controlled within the range from 145-160mm.

5. No-loading trial operation. Before the trial operation, the grinding rollers shall be encircled and fixed by steel wires to avoid the contacting and bumping between the rollers and grinding ring. The no-loading trial operation of the main unit must last for not less than one hour. The main unit must run smoothly and stably. The temperature of the oil in the tank must not be over 80°C, and its temperature rise must not exceed 40°C. As for the rotation direction of the main unit and classifier, please refer to Fig. 3.

6. The blower shall be turned on without load. The load will not be exerted until the blower runs normally. Then observe whether it runs smoothly and steadily without abnormal noises and vibration. The highest temperature of its rolling bearing shall not be over 70°C, and its temperature rise shall not surpass 35°C.

7. The trial operation with load shall last for not less than 8 hours. After the normal operation, the whole machine shall be free of abnormal noises and air leakage

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in pipe connections. Then fix tightly all the fasteners again before the pulverizer is put into formal operation.

### The Operation Rules Of the Pulverizer

Before the powder grinding is started, check if all the maintenance doors are closed tightly and the gap between jaw plates of the crusher match the particle size of the feeding material, and the rotating speed of the classifier shall be adjusted in conformity of the required fineness of the finished powder. At last, turn on the machine according to the sequence below:

1. Turn on the dustpan elevator; 2. Turn on the jaw crusher; 3. Turn on the classifier after the hopper is fed with the material; 4. Turn on the blower (It starts with no load. The load will be exerted when the blower runs normally); 5. Turn on the main unit. And immediately after that, turn on the electromagnetic vibration feeder. The powder grinding is started now. The sequence of operation is outlined as follows: Start elevator → crusher → blower → main unit → feeder.

Turn off the machine in the following sequence:

1. Turn off the feeder and stop material feeding;
2. Turn off the main unit in one minute;
3. Turn off the blower after blowing off all the residual particles;
4. Turn off the classifier in the end;

The sequence of turning off the machine is outlined as follows: Feeder → Main unit → air blower → classifier.

Note: The material is transported to the hopper by an elevator. When the material in the hopper reaches a certain quantity, stop the crusher first and then the elevator. This operation depends on the quantity of the stored material.

5. In order to guarantee the production safety, the pulverizer must not be oiled under the normal condition of operation. If any part of the machine generates abnormal noises, or the load is suddenly raised up, turn off the machine immediately for checking and troubleshooting to prevent serious accidents. Before restarting the machine, take out the residual material first. Otherwise, the current will become so strong as to affect the start operation.

### The lubrication system

In order to guarantee the normal operation of the whole system, please oil the machine according to the instructions listed below. The lubricating location and the grease name are started in the following diagram:

The List of Lubrication System

Lubricating Location	Form of Lubrication		Name of Lubricant	Number of Lubricating Drops	Interval of lubrication	Remarks
	Manual	Oil Tank				
Transmission device with wheel axle		Δ	HJ-40 Machine oil	1	Keeping the oil level	Changing every three months
	Δ					
Central shaft of the main unit	Δ		No.3MOS2 Compound calcuim based grease	3		Inputting by upper hole and outer from lower hole replaced by calcium based grease
Grinding rollers	Δ		No.3MOS2 Compound calcuim based grease	6-8	1-3 days	
Oil tank of classifier		Δ	HJ-40 Machine oil	1	1 days	Changing every three months
Bearing base of blower	Δ		No.3MOS2 Compound calcuim based grease	2	Keeping the oil level	replaced by calcium based grease
Bearing base of classifier	Δ		No.3MOS2 Compound calcuim based grease	1	One months	replaced by calcium based grease
Turbo-box of elevator		Δ	HJ-40 Machine oil	1	Keeping the oil level	Changing every three months

### The Electrical Control vnit

The motor control system of the pulverizer is centralized in the controlling cabinet. Every unit of the system is set with mutual interlock. The feeder is automatic-controlled. The feeding volume is controlled by the current variant of the main unit. Every unit shall be started sequentially in accordance with the operation procedure and rules. In this control cabinet, most of the motors are generally asynchronous motors of the main unit classifier, and feeder. As for the detailed wiring connection, please refer to the Diagram of the System Principle (Fig.5-6).

The starting control of the main unit and blower.

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In this control system, the reduced voltage start is used for the motor with the capacity over 30KW while the direct start is for that below 30KW. And the Y start is adopted for the blower and the delta start is for the main unit. The delta start is connected with normal operation. The control circuit is composed of contactor and time relays. In an automatic switching, the time delay is usually set with an extension of about 10 seconds.

For the motor with the delta start, there are nine connectors on the stator winding. They are  $U_1, U_2, U_3, V_1, V_2, V_3, W_1, W_2, W_3$ . No mistakes are allowed in numbered terminal connections between motor and the control cabinet. Take the 4R main unit as an example. The terminal connector of  $7u_1$  in the control cabinet will be connected with the motor connectors of  $U_1, 7V_1$  with  $V_1, 7W_1$  with  $W_1$  and so on. Check these connections carefully to avoid any mistakes. In case the connector motor is damaged, it can be replaced by a common motor with six connectors at the same power and speed, but this can only perform as the Y start and control. Please refer to Fig. 5 The Principle of Y-delta Connection. (Take Fig. 5 as an example.) It will be done simply by a short connection of the three terminals of  $U_3, V_3, W_3$  in the control cabinet with the guiding wire.

The control and automatic feeding of the vibrating feeder

The structure of electric-magnetic vibration feeder is a two mass-point-fixed-directional forced vibration system. It consists of a feeding channel connected with a fork armature. It hangs under the material tank and with some free moving space. It cannot be blocked and bumped by other objects to avoid noises during the operation.

- (1) After installation of the electric-magnetic vibration feeder, loose the screws (upper three and lower one) on a positioning connection fork. After loosening the screws, fix the nuts, open the rear cover of the vibration feeder, and check if the gap between iron core and armature is within 1.8-2.1 mm. The two parts should be parallel and clean. All the screws should be fastened firmly. Finally, put on the cover and fix it.
- (2) No-load trial running with power on. Adjust the amplitude resistor  $R_1$  in the electrical control cabinet slowly from small to big with the amplitude ranging within 1.8-2.5 mm and the current of 1.2A. Keep running for several hours to see if the amplitude current is stable. If it is normal, open the door of material tank for material feeding and check if the current of feeding material is stable. The amplitude is allowed to fall down 0.5 mm. If the amplitude current is at the rated value but cannot meet the requirement of the feeding volume, hang the vibrator at a 20-degree position to meet the feeding requirement.
- (3) Regulation of the automatic feeding. The automatic feeding is realized by the current change of the main motor and blower. When the blower is running normally, and if the current of the main motor exceeds the rated value, the feeding will be stopped; if the motor current goes down, the feeding will be automatically started. This function is carried out by a current relay. The start and stop of the feeding can be performed by open and close of the connection between the current relay and the control voltage of a silicon-controlled device. If the blower is out of order, the feeding will also be automatically stopped.

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There are two coils in DL-12/6 over current relay. When these two coils are in series connection, the working current can be regulated from 1.5-3A. When they are parallel connected, the working current can be regulated from 3-6A. When the pulverizer is under normal working condition, the coils should be in series connection because the current on the relay caused by the current mutual inductor will not be over 3A.

(4) When the automatic feeding is started, turn the main switch on the control cabinet into an automatic position. Slowly turn the resistor  $R_1$  knob on the control cabinet and make the current to reach a rated value and remain stable. Meanwhile, move the sliding arm on the current regulating relay according to the rated current of the main motor and change the action current of the relay. When the current goes higher than the rated value, the constant close contact will be cut off; when the current goes lower, the contact will be closed immediately. In this way, the pulverizer will be always kept in an optimal working condition. The no-load and over load running is avoided and the efficiency of powder production is guaranteed.

JZT speed-adjustable motor transmission is used for the classifier. The control is carried out by the bottom of the electro-magnetic slide controller (ZLK-1) on the control cabinet. When the button is pressed, the squirrel-cage motor will be started first. Then close the slide power switch and turn the knob of rotating speed to make the classifier to reach the speed that matches the required fineness (powder particle size). The powder fineness can be controlled in this way.

### The Repairs & Maintenance of the Pulverizer

During the application of the pulverizer, some personnel shall be arranged to take responsibility of management. The operators must be qualified with the required technical knowledge. Before the installation of the pulverizer, the persons related to the operation should receive technical training and fully understand the operating principle, performance and regulations of the pulverizer.

In order to guarantee the pulverizer in a normal working state, a Safety Operation System for the Repairs and Maintenance of the Equipment must be established. Only in this way can the pulverizer be guaranteed to have a long-term and safe operation. Meanwhile, it is necessary to have the required maintenance and repairing tools, lubricant and grease, spare parts and accessories.

After some period of running, the pulverizer should receive an examination and repairing. The components vulnerable to be worn out, such as grinding rollers, grinding ring and relieving tool, etc. should be repaired or replaced. Before and after the operation, a careful examination should be carried out for the connecting screws, bolts and nuts on the grinding rollers to find whether they are loose or sufficiently lubricated.

### Common Troubles & Trouble Shooting

The troubles occurred in the process of operation can be dealt with as follows:

Common Troubles	Causes	Trouble Shooting
1、 No powder output or low powder output.	(1)Backward inhalation of the powder is caused by improper adjustment and bad sealing of the powder locking device. (2)The relieving tool is too worn out to handle the raw material.	Check and adjust the sealing of the powder locking device.Seal all the air leakage spots. Replace the relieving tool with a new one.
2 、 The finished particles are too coarse or too fine	(1)The blades of the classifier are severely worn out without the classifying function. (2)The airflow of the blower is not proper.	(1)If the particles are too coarse,replace the blades and adjust the blowe to reduce the airflow of inlet. (2)If the particles are too fine, enlarge the airflow of the inlet.
3、 The current of the main motor and the temperature of the machine go up while the current of the blower drops	(1)The material is fed too much that the air passage the airflow in the pipe is not blocked by the powder. The discharged smoothly so that the heating of the circulating airflow makes the current of the main unit and temperature of the machine rise up and the current of the blower drop.	(1)Reduce the quantity of feeding material and clean the accumulated powder in the air passage. (2)Open the valve of the residual air pipe and control the temperature of the feeding material below 6%
4、 The main motor has loud noises and strong vibration.	(1) The quantity of the feeding material is small, or the main motor is not coaxial with the transmission device. There is no gap between two clutches. The ground bolts are loose. (2) The raw material is very hard which results in strong impact, or there is no material layer. (3) The egrinding rollers and ring are not sor or seriously deformed.	(1)Regulate the quantity of feeding material, correct the coaxiality, adjust the gap between two clutches. (2)Reduce the particle size of the feeding material. (3)Replace the grinding rollers and ring.
5、 The blower vibrates.	(1)Powder accumulates on the blades, or the blades are worn out and not balanced. (2)The groud bolts are loose.	(1)Remove the accumulated powder on the blades or replace the blades.

		(2)Fix the ground bolts tightly.
6、 The transmission device and the oil tank of the caassifier become hot.	(1)The viscosity of the machine oil is too high to be pumped up to the bearing by the thread pump, so the upper part of the bearing is short of oil.	(1)Check whether the model number of the machine oil and its viscosity meet the requirement. (2)Check the rotating direction of the classifier.

**X.The Model Number of All the Bearings and Name and Quantity of the Quick-wear Parts**

All the bearings and quick-wear parts of the pulverizer are listed in the below four diagrams as reference for customers to select to buy with convenience.

List 1 the Rolling Bearings.

No.	Code	Name&Specifications	Quantity	Relevant Unit
1	GB286-64	Bearing3053128 140×210×53	1	Main Unit
2	GB301-64	Bearing3522 110×200×53	1	Main Unit
3	GB-301-84	Bearing8322 110×190×87	1	Transmission Device
4	GB297-64	Bearing7622 110×240×85	2	Roller Device
5	GB297-64	Bearing7618 90×190×68	2	Roller Device
6	GB297-84	Bearing7612 60×130×48.5	4	Classifier
7	GB297-8	Bearing3616 80×170×58	4	Classifier
8	GB281-64	Bearing111311 55×120×29	1	Classifier
9	GB297-64	Bearing7312 75×160×39.5	1	Classifier
10	GB297-64	Bearing7312 60×130×33	1	Classifier
11	GB276-82	Bearing310 50×110×27	1	Classifier
12	GB286-64	Bearing3616 80×170×58	2	Blower
13	GB297-64	Bearing6308 40×90×25	2	

## The Diagram of Quick -Wear Parts

NO	Name	Quantity
1	Grinding ring	1
2	Grinding device	4
3	Grinding roller	4
4	Follower	1
5	Bottom case of relieving tool	4
6	Relieving tool	4
7	Shaft of grinding roller	4
8	Wear resistant jacker	8

## The Diagram of oil Sealing

Standard	Name	Model Specification	Quantity	Application
HD4-692-67	Oil Seal	PD150×180×16	2	Upper part of bearing frame
HD4-692-67	Oil Seal	SG105×130×12	8	Lower part of Roller device

## The Diagram of Triangle Belt

Standard	Name	Specification	Quantity	Application
GB1171-74	Triangle Belt	B-2240	4	Classifier
GB1171-74	Triangle Belt	C-1956	7	Main unit
GB1171-74	Triangle Belt	C-3150	6	Blower

## Concrete foundation Description

1. The bearing base of the main unit and blower, and the foundation of the jaw crusher shall be made of the precast reinforced concrete. But the foundation of other units shall not be put with steel bars.
2. The surface of the foundation should be leveled. The depth of the concrete depends on the soil and weather condition of the local site.
3. The foundation size of the jaw crusher in the Diagram is PE200\*350. If the PE200\*350 jaw crusher is selected for application, the foundation size should be enlarged.
4. The holes for the stone bolts without making in the Diagram are all 120mm.
5. The pit borders shall be built with concrete side channels in 50×50mm for placing the cover.

## Technical Requirements

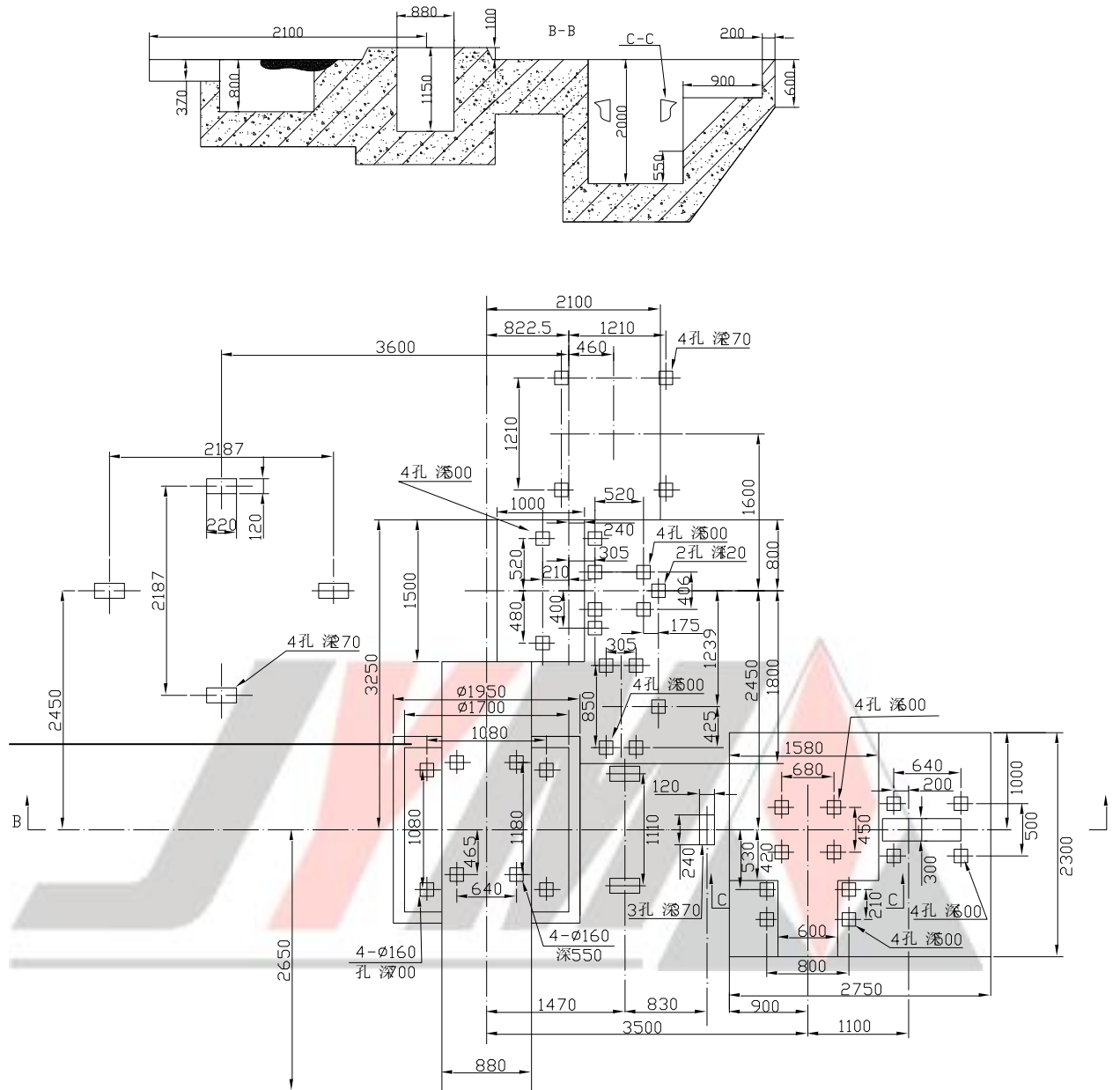
1. During installation, the central shaft of the main unit should be accurately coaxial with the decelerator shaft. After installed vertically, the gap between the upper and lower half clutches shall be 2-5mm.
2. During installation, the connections between all the units with primers without any air leakage.
3. When the errors resulting from the foundation and manufacture lead to the

disability of the right match, some parts should be repaired and adjusted, and then connected with bolts.

### The Diagram of the Rolling Bearings

No.	Code	Name&Specifications	Quantity	Relevant Unit
1	GB286-64	Bearing3053128 140×210×53	1	On the Main Unit
2	GB286-64	Bearing3522 110×200×53	1	Under the Main Unit
3	GB301-84	Bearing8322 110×190×63	1	Under the Main Unit
4	GB297-64	Bearing7622 110×240×85	2	Transmission Device
5	GB297-64	Bearing7618 90×190×68	2	Transmission Device
6	GB297-84	Bearing7612 60×130×48.5	4	On the Roller Device
7	GB297-84	Bearing3616 80×170×61.5	4	On the Roller Device
8	GB281-64	Bearing111311 55×120×29	1	Classifier
9	GB294-64	Bearing7315 75×160×39.5	1	Classifier
10	GB297-64	Bearing7312 60×130×33	1	Classifier
11	GB296-84	Bearing310 50×110×27	1	Classifier
12	GB286-64	Bearing3616 80×170×58	2	Blower
13	GB297-64	Bearing6308 40×90×25	2	Dustpan Elevator





注：颚式破碎机根据机器型号不同，地基图依实际情况而定。

#### 预制混凝土基础说明

- 1 主机、鼓风机轴承座以及颚式破碎机的预制钢筋混凝土基础，其余部件允许不筋；
- 2 基础表面应用水平尺校平，图中标注精度尺寸仅供参考，具体应根据当地的土壤情况而定；
- 3 图中括号内的尺寸为颚式破碎机PE20C，括号外的尺寸为PE250X400型颚式破碎机，对照相应的颚式破碎机型号选择预埋孔；
- 4 图中未标注尺寸的地脚螺栓孔均为150mm；
- 5 地坑边缘应预制50×50的边槽，以备埋设排水沟。

#### 技术要求

- 1 安装时必须保证主机中心轴与减速机输出轴有精确的同轴度并与水平面垂直，装配后，上下半联轴节间应有2-5毫米的间隙；
- 2 安装时，对气流通过的各部件之间连接处应加密封垫料，决不允许有漏气现象；
- 3 因基础误差和制造误差导致两部件不能正确吻合时应局部修整后再用螺栓连接。

