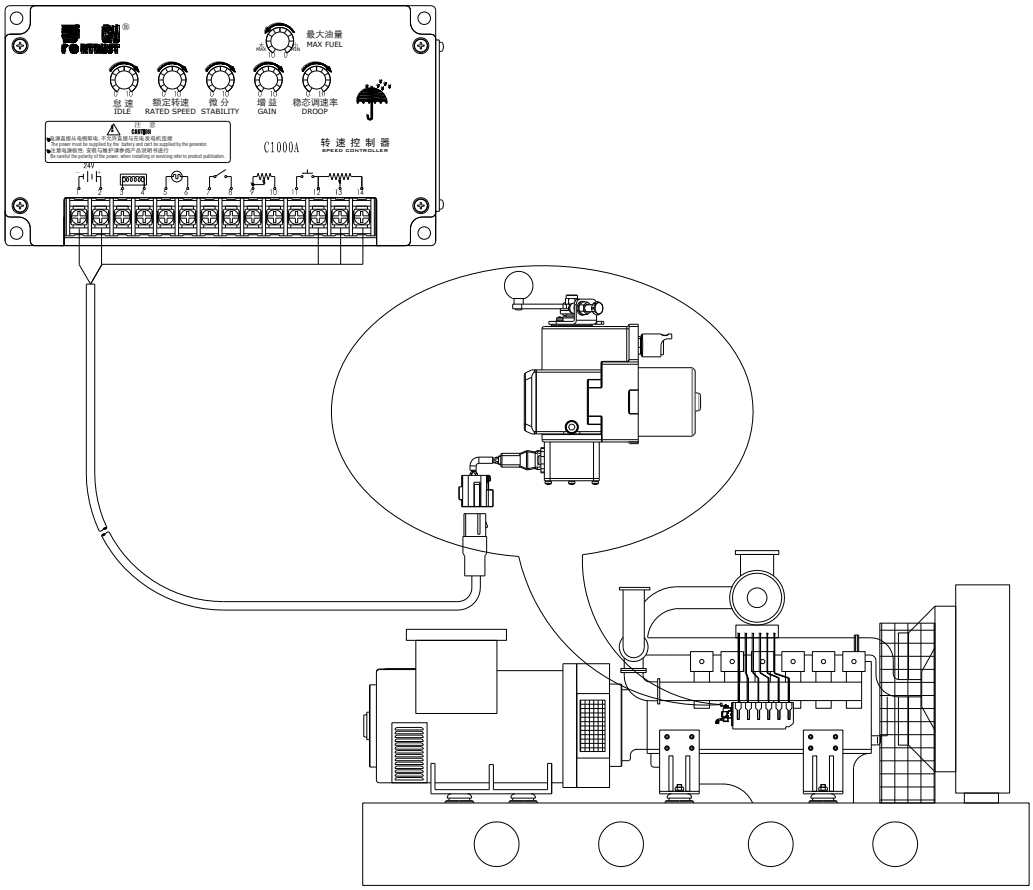
ESG1500 系列电子调速器使用维护说明书

ESG1500 Electronic Governor Instruction



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前言

ESG1500 系列电子调速器，其结构简单，可靠性高，操作方便. 简单的功能扩展和高性价比，使之适用于不同类型的柴油发电机组，包括车用和船用柴油发动机组等。ESG1500 系列电子调速器是全电子式单脉冲双闭环结构，并相应的控制转速并将柴油机控制在额定转速下运行,控制柴油机燃料的供应量.

注意事项

●发动机必须安装一个独立的超速保护装置.

●电子调速器系统需和其他系统隔离,减小干扰.

● 起动发动机组之前, 使用 “测试” 按钮来检查电子调速系统和高压油泵系统.

● 起动发动机组之前,“高低速开关”必须在怠速位置

1 调速系统的基本组成及原理

- 基本组成
- 基本原理
- 调整方法
- 保护功能

1.1. 基本组成

ESG1500 系列电子调速器是由转速控制器、电磁执行器、转速传感器和附件 (包括微调电位器、高低速开关、电源控制开关和连接线)组成. 系统的主要结构如图 1 所示。

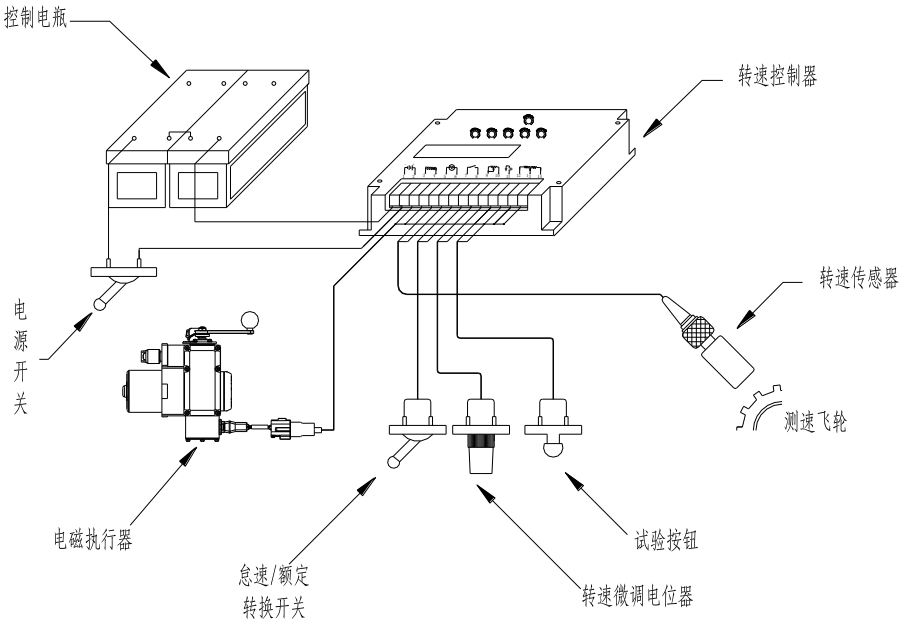


图 1 ESG1500 系统主要结构图

1.2. 基本原理

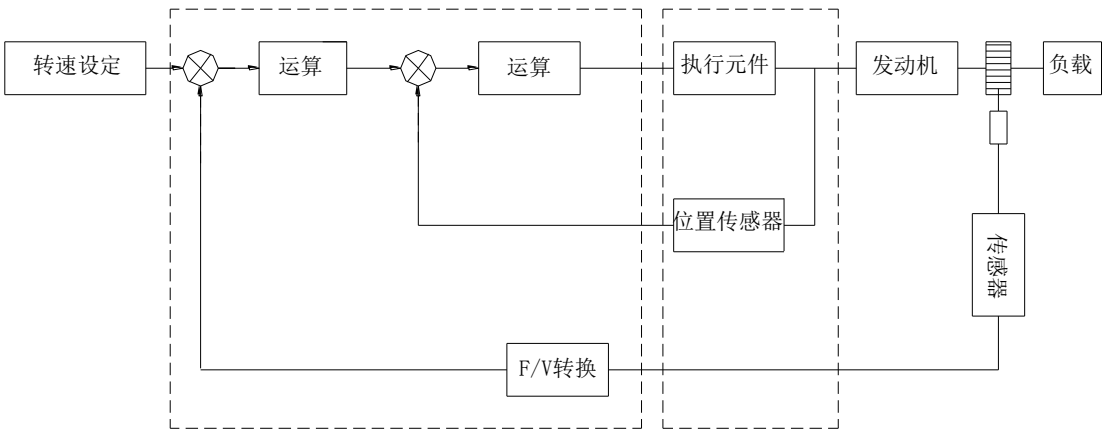


图 2 ESG1500 系统的原理示意图

发动机的理想转速由转速设定电位器和外接微调电位器设定，发动机的实际转速由安装于飞轮齿圈部位的磁电式转速传感器所感受，其输出信号为频率与发动机转速成比例的交流电压信号；该信号经 F/V 电路转换为直流电压，与转速设定值比较后得到转速偏差量；该偏差经 PID1 调节器运算放大后得出发动机燃料供给量位置值，即执行元件稳态输出指令位置，该指令位置与当前电磁执行器实际输出位置比较后，得到位置偏差量，该偏差再经过 PID2 调节器运算放大后，转化成 PWM 电流控制方式，向电磁执行器输出驱动电流，以改变电磁执行器的输出位置，驱动发动机喷油泵齿条、节气门或燃料控制阀向减小转速偏差的方向运动，从而控制发动机在所设定的转速下稳定运行。

1.3. 调整方法

图 3 是转速控制器面板上的调节参数

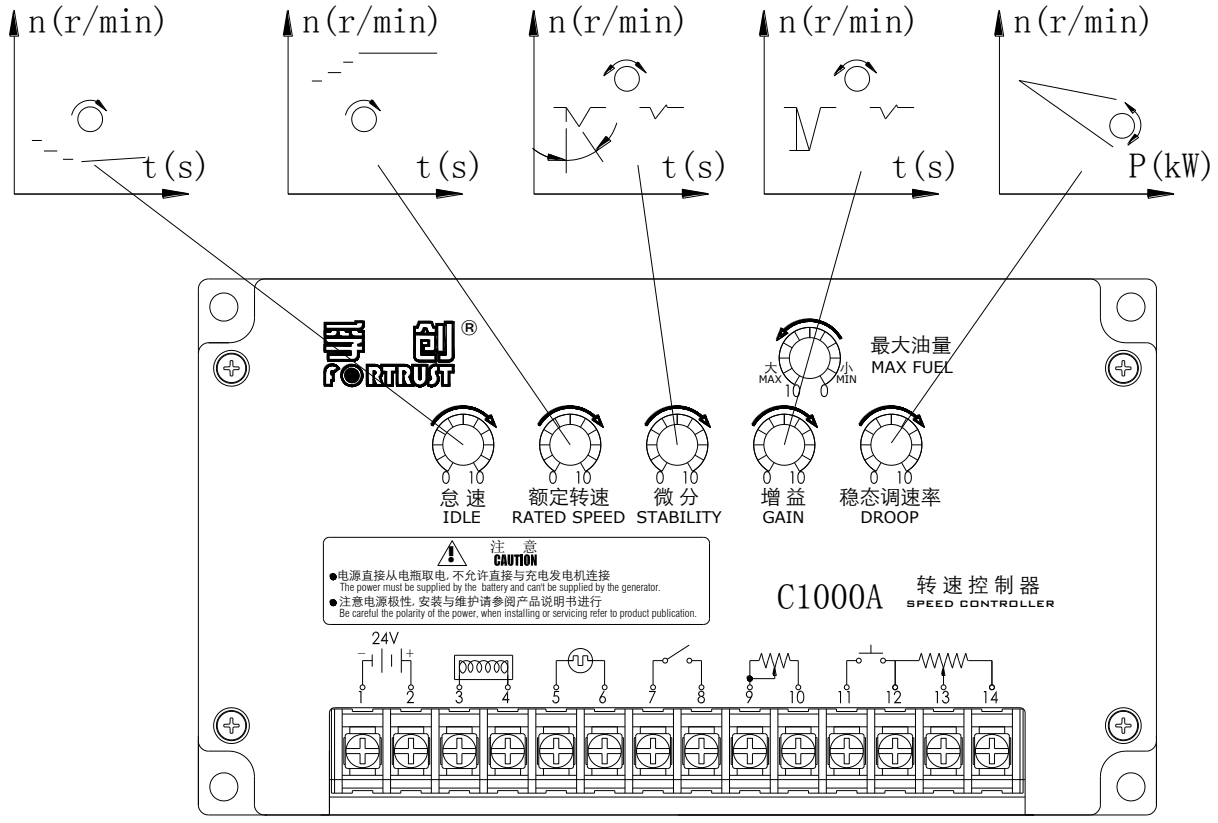


图 3: 转速控制器

注意:

- *电源要直接接到电瓶上,不能接到充电马达上.*
- *注意电源的极性.检查后按说明书短接端子 2、3.*

电子调速器系统的转速范围是通过转速控制器上的 “怠速”和 “额定”电位器以及外接转速微调电位器来调节. 发电机组的下垂及相应的功能,则通过控制器上的 “稳态调速率”、“ 微分”及“增益”电位器来调节. 确保电子调速系统的静态和动态都达到稳定的工作状态.

1.4. 保护功能

在 ESG1500 系列电子调速器，设计了安全保护电路，以确保在突发事件，如中断速度反馈信号或由于电缆损坏导致电源关闭的情况下，执行器执行机构将自动被拉回零位。

注意:

考虑到上述电路只能保证发动机的正常运转，电子调速器的调速功能并不能代替一般的发动机超速保护装置. 为了确保发动机系统的安全,必须单独提供一个紧急停车或超速保护装置.

2. 电子调速主要技术参数

- **转速控制器**
- **电磁执行器**
- **转速传感器**

2.1. 转速控制器

型　　号 : C1000
电源电压 : DC24V (范围:18-32V)
电源消耗 : <0.1A (不计执行器)
控制频率 : 1000~13,000Hz, 分为四级
N1:≤1, 700Hz
N2:≤3, 400Hz
N3:≤7, 800Hz
N4:≤13, 000Hz
转速波动率 : ±0. 25%
稳态调速率 : 0~5%
环境温度 : -10~+50°C
-30~+70°C(军品)
环境湿度 : <95%
重量 : 0.68 千克

2.2. 电磁执行器

型号　　：　A1000C/A2000C
可调行程　：　42㎜
工作能力　：　1Nm/2Nm
电源消耗　：　<10A(瞬态最大值)
　　<2.5A(平均值)
环境温度　：　-40~+100°C
环境湿度　：　<95%

2.3. 转速传感器

型号　　：　TM18×1.5
线圈电阻　：　大约 360Ω
输出电压　：　1~18V(有效值)
外形尺寸　：　图 **4.**
环境温度　：　-40~+100°C
环境湿度　：　<95%

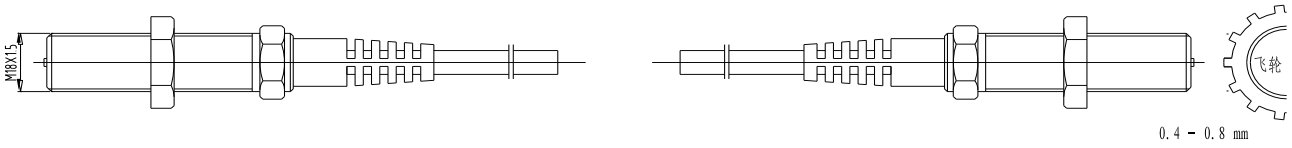


图 4: 转速传感器结构图

注意：本电子调速器系统中所使用到的转速传感器不得与其他测速系统共用，否则可能造成非常严重的后果！

3. 电子调速系统的安装

- 转速传感器
- 电磁执行器
- 转速控制器
- 供电电源

3.1. 转速传感器

转速传感器推荐安装于发动机齿圈部位，传感器与齿顶之间的间隙应为 0.4mm～0.8mm 之间，安装时可先将传感器旋至齿顶，然后退出约 1/3 圈（螺距 1.5mm）或 1/2 圈（螺距 1mm）,再锁紧螺母紧固即可。如无飞轮齿圈，也可利用其它传感齿轮，但材质必须为导磁材料，并要保证在发动机工作转速范围内，传感器输出频率不少于 1000Hz，发动机转速与传感器输出频率之间的对应关系为：

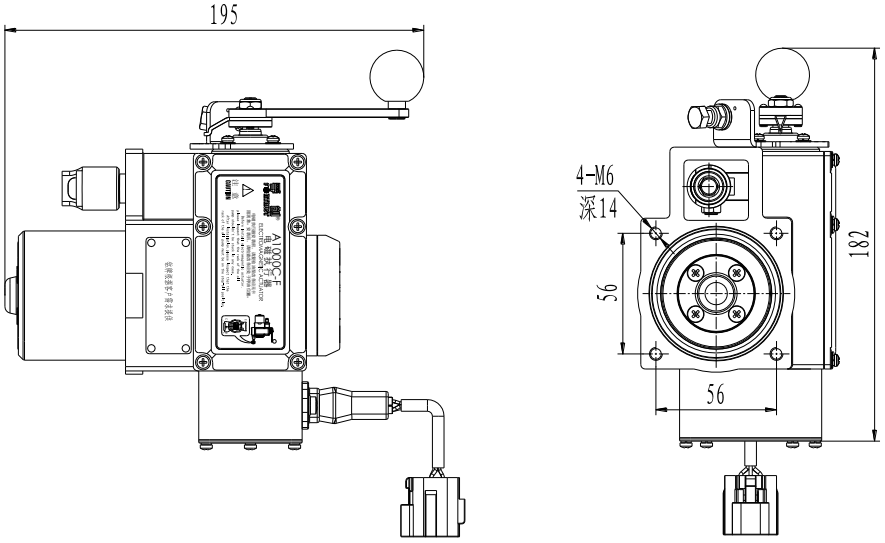
$$f=nz/60 \quad (Hz)$$

式中：f、n、z 分别表示传感器输出频率、发动机转速和测速飞轮齿数。

注意：

转速传感器仅供孚创电子调速器独用，避免与其它测速系统共用。

3.2 电磁执行器安装



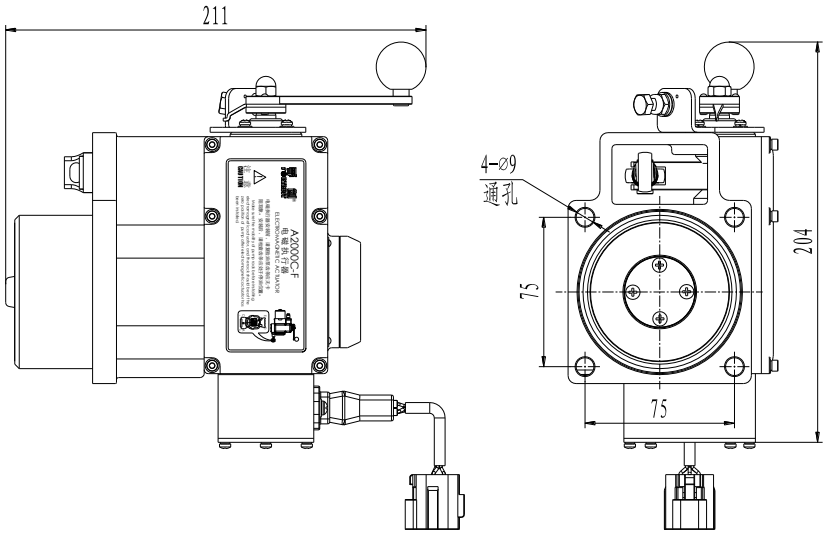


图 5.　　电磁执行器安装尺寸图

3.3 转速控制器

转速控制器应安装在无强烈冲击振动、无电磁干扰的保护箱内，并需留有足够的空间供安装维护和散热之用，其外壳需妥善接地。转速控制器的安装尺寸图参考图 6.

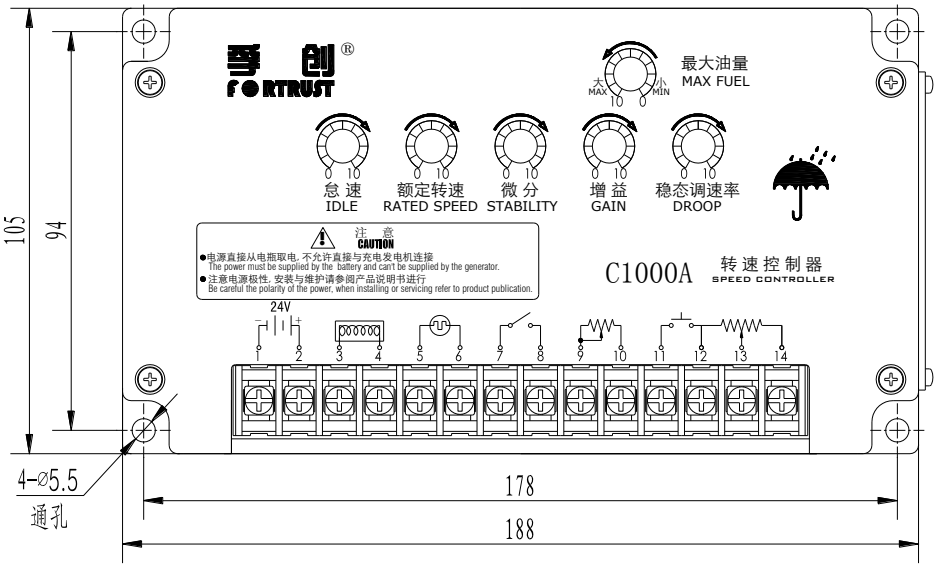
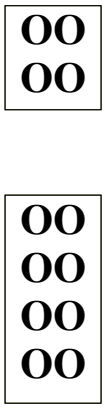


图 6. 转速控制器的安装尺寸图

考虑到各种发动机的额定转速及飞轮齿数的不同,有必要检查和选择与之对应的控制器,根据右侧发动机的工作频率范围判断转速控制器线路板上的频率选择跳线. 下表图 7 和发动机的频率之间的每个连接跳线的位置和控制器频率有着密切的关系. E、F 选择跳线为怠速升至高速延时时间分别为 3 秒和 10 秒. 通常情况下, 孚创工程师将根据客户的情况确定好 N1-N4 及 E、F 的位置选择.



端子	工作状态
N1	<1,700Hz
N2	<3,400Hz
N3	<7,800Hz
N4	<13,000Hz
E	延时 3 秒
F	延时 10 秒

图 7. 连接跳线的位置和功能

转速控制器的连接图参考图 8, 其中转速传感器、转速微调电位器与控制器间连线应采用屏蔽电缆，屏蔽层仅在控制器一点接地。请注意电磁执行器到转速控制器电缆的号码套管,以免接错.

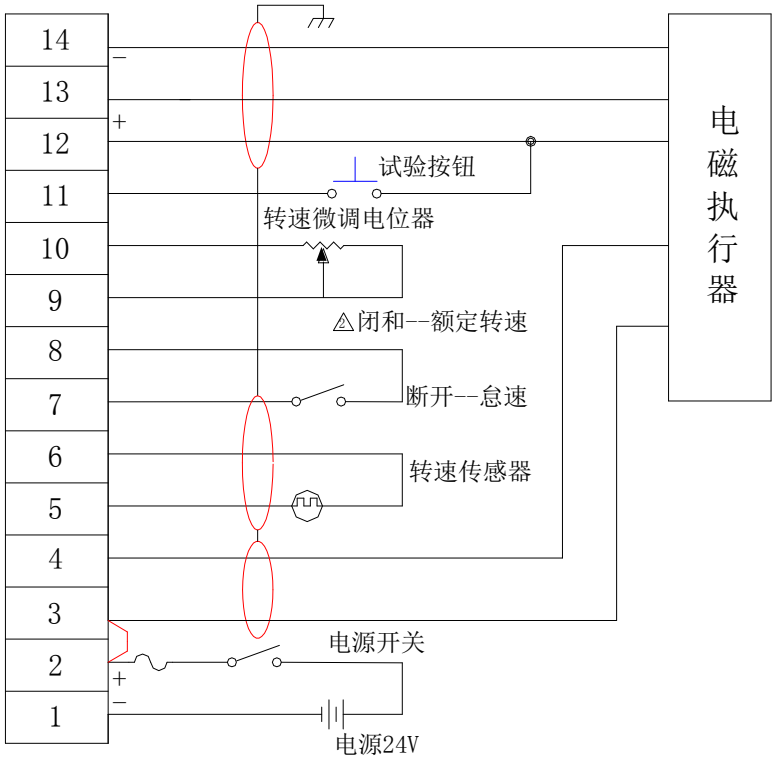


图 8. 转速控制器接线图

注意:

1) ***当控制器通电时,测量端子 12 和 14 之间必须有 9V 左右的电压. 在停油位置时,13 号脚的电压为 OV, 电压随执行器连杆的推进而逐渐增大. 请不要连接错误.***
2) ***屏蔽层可以通过连接线连接到 ESG1500 系统的控制器的连接螺钉上,确保正确的接地.***
3) ***只有当电源极性和电瓶电压都没有问题了, 然后再用短线将转速控制器上端子2(电源+)和电瓶连接起来.***

为防止用户不慎将电源极性接反而损坏控制器电路，控制器内部装有保护二极管，但该二极管长时间工作发热量较大，因此在系统安装调试完毕后，可以用短接线将控制器接线端子 2、3 端短接起来，这样对减小控制器发热量、提高系统的可靠性将更为有利。

3.4 供电电源

孚创电子调速器的工作电压为直流 24V（特殊订货 12V），可利用发动机的控制电瓶、起动电瓶或采用其它稳压及非稳压电源供电，但要保证系统的峰值功耗和电压波动范围的要求。当采用起动电瓶供电时，必须设置充电装置以保证电瓶电量充足。在发动机起动时，电瓶短时间的输出电压跌落不会影响调速器正常工作。

4 初次起动规程

- **安装、检查、初调**
- **初次起动注意事项**

4.1 安装、检查、初调

在发动机安装孚创电子调速器首次起动之前，应进行下列检查和初调工作：

1) 参照系统接线图，确认各部分电气连接正确无误，机械传动机构无任何卡阻现象，转速传感器已正确安装并紧固。断电时电磁执行器输出轴位置为发动机零供油位置，必要时可拆下中间体观察孔盖板以便于观察。

2) 将“怠速/额定”开关断开，即置于怠速位。

3) 打开调速器电源开关，观察执行器输出轴是否停留在零供油位置。检查控制器 12 和 14 之间的电压是 9（±0.5）V.

4) 按“测试”按钮或连接控制器 11 和 12 端子，即现在的输出轴将在燃料供应的最大位置, ，调整控制器上“最大油量”电位器，执行器的电源消耗大约在 2.5A-3A 之间 ，然后关掉“测试”按钮或断开控制器 11 和 12 端子，输出轴应回到燃料供应零位置。通过这个过程可以观察判断电调的运行情况。

注意:

在执行上述动作中，控制器上的第二和第三端子不应连接，直到 4.1.3 和 4.1.4 项目检查完成。

4.2 初次起动注意事项

在所有检查项目和预置完成并确认正确后，发动机可以启动。按下列步骤操作：

1) 合上电源开关, 按“测试”按钮或连接控制器 11 和 12 端子, 当前电流约 2.5A (or 3A), 当断开 11 和 12 端子时,电流消耗为 0.

2) 起动发动机，首先调节“微分”和“增益”电位器，使发动机在怠速工况稳定运转，暖机数分种后拨“怠速/额定”开关到额定档，使之逐渐升速至额定转速，调节“额定”电位器，达到所需的额定转速，必要时调节“微分”和“增益”电位器以保证发动机运转稳定。

3) 分段突加、突卸负载，观察调速系统的响应，微调“微分”和“增益”电位器，使系统的动态性能和稳态性能达到最佳状态。

4) 卸除负载，改变发动机转速，观察在全速范围内，系统均能保持稳定并具有满意的动态性能为止。

5) 将“怠速/额定”转换开关置于“怠速”位置，发动机转速降至怠速；关闭调速器电源开关（即停车开关），发动机应迅速停车。

5. 故障处理

- **发动机不能起动**
- **发动机超速**
- **发动机转速不稳**
- **发动机运行中自动停车**
- **发动机不能停车**
- **发动机加载后转速下跌**

在安装调试或使用过程中,出现任何故障现象,请按照下列图表进行排查.

现象(1)：发动机不能起动

故障原因:	*处理方法:*
1) 油路有空气	排出油路内空气
2)转速反馈信号中断	检查转速传感器及线缆
3)电源故障	检查电源和连接线
4) 转速反馈信号中断	重新安装并测试系统
5) 最大燃油量限制过高	适当增加电流（逆时针）

现象(2)：发动机超速

故障原因:	*处理方法:*
1)执行器和油泵之间的供油方向不一致	检查并重新安装
2)转速设置过高	减小设置
3) 控制器的参数设置不当	调节“增益”和“微分”电位器
4) 最大燃油量限制过低	适当减小电流（顺时针）

现象(3) :发动机转速不稳

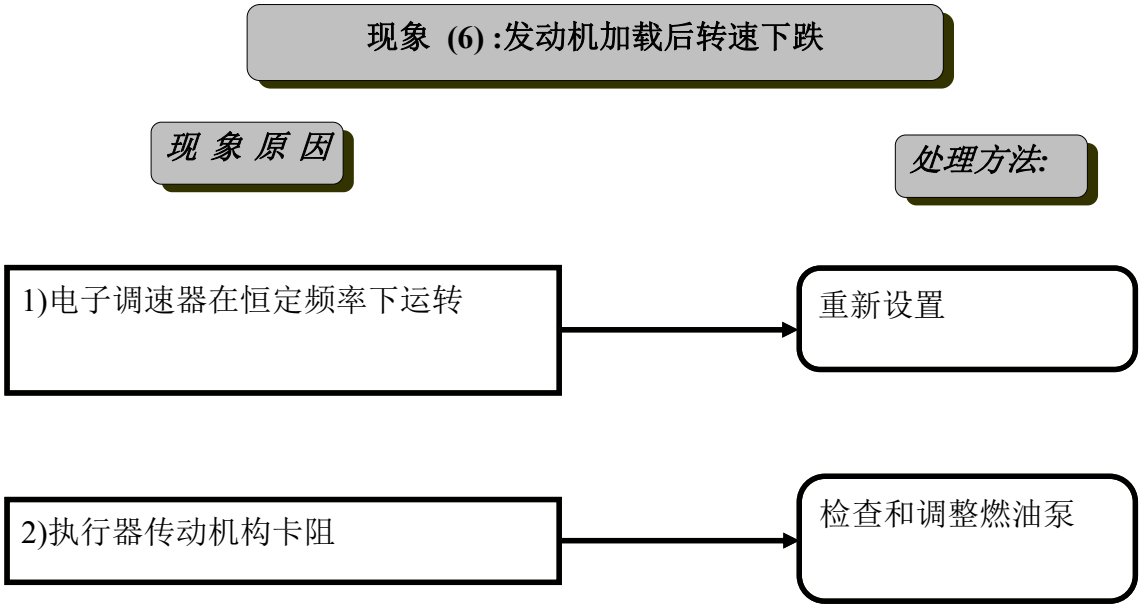
故障原因:	*处理方法:*
1)执行器和齿条之间有卡阻	检查并重新安装
2)发动机超载	降低发动机负荷
3)传感器松动或磨损	重新安装或更换
4)传感器安装空隙太大	检查并重新安装
5)控制器参数调节不当	1) 减小“增益”和“微分”电位器(转速波动>10Hz); 2) 增加“增益”和“微分”电位器(转速波动＜1Hz)

现象(4)：发动机运行中自动停车

现象原因:	*处理方法:*
1)电子调速器断电	检查电源及连线
2)转速反馈信号中断	检查传感器及连线
3) 速度设置信号中断	检查微调电位器和线缆
4) 执行器电缆开路或短路	检查执行器和电缆线

现象(5)：发动机不能停车

现象原因:	*处理方法:*
1)执行机构和燃油泵的零油位不一致	检查并重新安装
2)燃油泵卡阻	同上



注意:

若按上表检查处理后故障现象仍未排除，并确认发电机组系统无问题，则可能是调速器内部出现故障，可送交维修部门检修，请不具备维修条件的用户不要盲目拆修，以免扩大故障。

6. 电子调速器使用注意事项

- 每次起动发动机前,确保“高/低速开关”在怠速位置.
- 控制器各调节电位器已经出厂整定，非专业人员不得随意调整。
- 发动机封存较长时间后重新起用，在起动发动机之前短接控制器 11、12 脚，执行器输出至最大油量，断开 11、12 脚执行器输出应快速回复零位，如有异常，应及时处理，不能贸然起动发动机。
- 运行 2000 小时后,执行机构必须进行检查. 如果没有把握，应先用手推动执行器摇臂数次，感觉运行平滑，无卡滞现象，再起动发动机。

CATALOGUE

PREFACE

ESG1500 series electronic governor , with its simple structure ,high reliability, convenient operation, easy function extension and high cost performance, applied to varies kinds of diesel generating sets, vehicles and marine diesel engines. Its normal type is all-electronic single pulse speed and double close loop position structure and is provided with functions of non-corresponding or corresponding control, speed and rated speed during running. Maximum fuel supply control, emergency stop, etc.. It is also capable to add other control functions According to the custom's particular requirements.

CAUTION

- ●An independent over-speed protecting device must be fitted for the engine.
- ● The independent speed pickup fitted for this electronic governor must isolate from other systems.
- ● Before starting engine, check governor and high-pressure fuel pump by using "test" button.
- ●Before starting engine, "idle/run" switch must be

confirmed to be at “idle”.

1 MAIN STRUCTURE AND PRINCIPLE

- **Main Structure**
- **Principles**
- **Parameters Adjusting**
- **Protecting function**

1.1 Main Structure

ESG1500 series electronic governor consists of main parts (including a magnetic pickup, a governor controller, and electromagnetic actuator) and accessories (including a remote potential device, a control switch and some patching cords). System main structure is shown **Figure 1.**

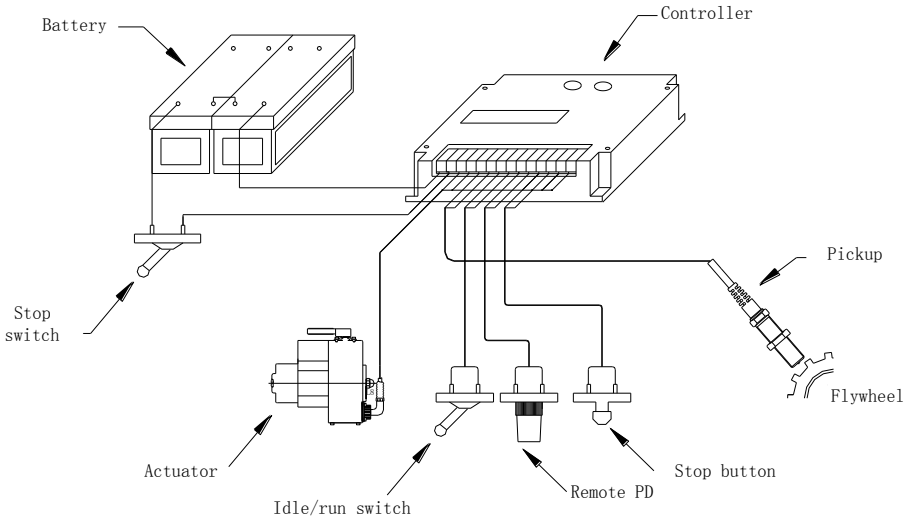


Figure 1. Basic structure of ESG1500 electronic governor

1.2 Principles

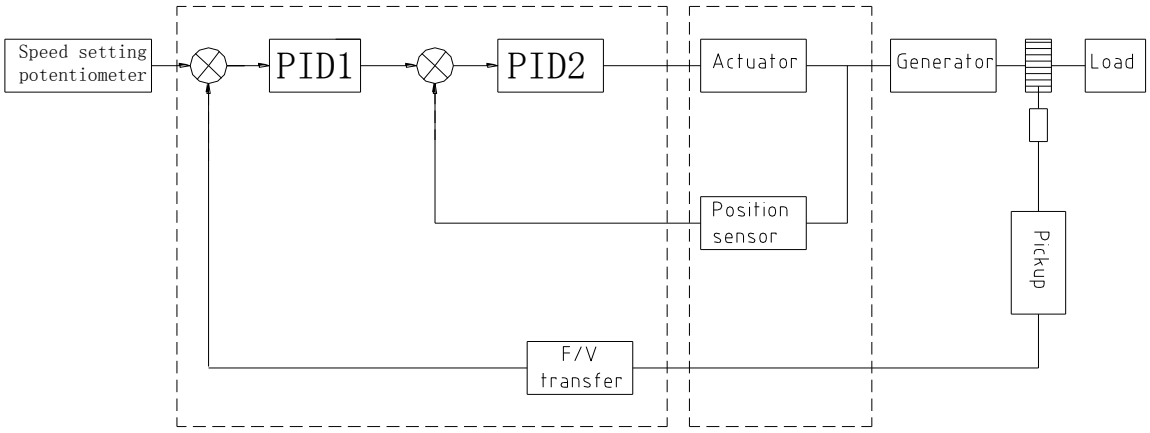


Figure 2. Principle of EGS1500 eletronic governor

In the governor system, the ideal speed is setted by adjust the speed potentiometer in the controller and the external remote control meter. The actual speed will be received by a pickup which transmit an AC signal with a frequency proportional to the speed of the engine to a special circuit where the AC signal will be converted into a DC voltage. A differential speed will be made out and then calibrated and magnified by PID1and transformed into the adjusting value of the position of the rack, a control current is sent out through PID2 and the power amplifier, then change the output position of the electromagnetic actuator and drive the rack in the fuel pump to move in the direction of decreasing the differential speed so that the engine can be running stable at the rated speed.

The electromagnetic actuator is an armored DC proportional electromagnetic iron. Its driving force to increase fuel is proportional to the control current in the coil, and its reset force to decrease fuel is given by the reset spring .When these two forces are equal. The output axis of the actuator will be in a respective balance position. In case of increasing control current, the output axis will move in the direction of increasing fuel ,on the contrary, the output axis will move in the direction of decreasing fuel. The actual position of the output axis will be fed back to the controller by the position sensor.

1.3 Parameter Adjusting

Figure 3 is the parameter adjusting panel of the governor controller.

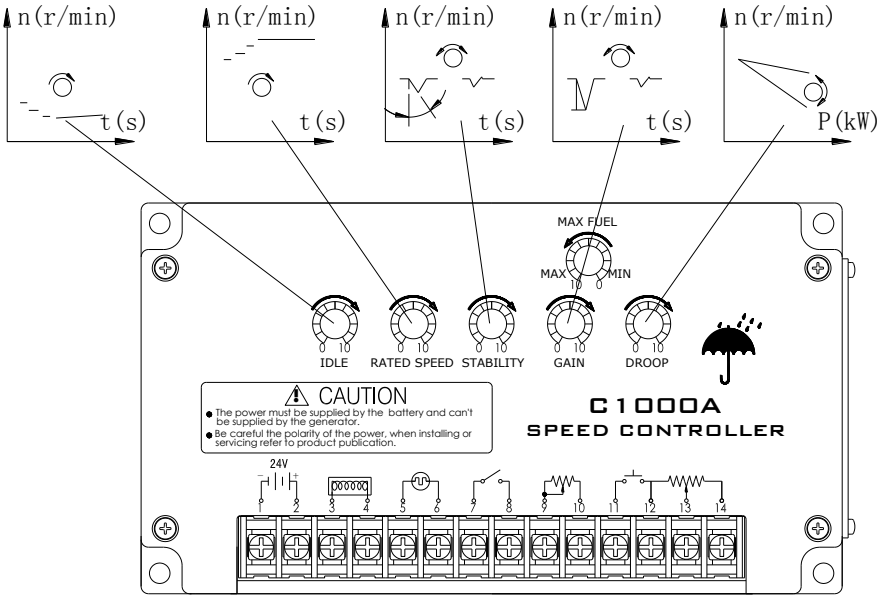


Figure 3 ESG1500 Governor controller

CAUTION:

- ***Don't connect the power terminal to the terminal of the battery charging motor directly.***
- ***Pay attention to the power polarity. After checking according to the instruction manual, short 2 and 3 terminal.***

The speed range in the governing system will be adjusted by the "idle" potentiometer and the "rated" potentiometer on the governor controller and the external remote control potentiometer. The droop and the dynamic corresponding feature can be adjusted by the "droop" , "gain" and "derivative " potentiometers on the governor controller to ensure the satisfactory static and dynamic state of the governing system.

1.4 Protecting Function

In ESG1500 series electronic governor, a security protecting circuit is designed to ensure that in case of unexpected events such as interruption of speed feedback and setting signal or power shut off of the governor due to programs like cable damage, the rack will be pulled to the zero-position automatically.

CAUTION:

considering that the above circuit can not act totally instead of the general engine over-speed protecting device, a separate emergency stoop or over-speed protecting device should be provided on the engine to ensure the safety of whole system.

2 MAIN TECHNICAL PARAMETER

- **Governor Controller**
- **Electromagnetic Actuator**
- **Magnetic Pickup**

2.1 Governor controller

TYPE	:C1000
SUPPLY VOLTAGE	:DC24V (Range:18-32V)
SUPPLLY CONSUMPTION	:<0.1A (Excluding Actuator)
CONTROL FREQUENCY	:1000~13,000Hz,Classified into Four Classes
	N1:≤1, 700Hz
	N2:≤3, 400Hz
	N3:≤7, 800Hz
	N4:≤13, 000Hz
SPEED FLUCTUATION RATIO	: ±0.25%
STATIC SPEED REGULATION	: 0~5%
AMBIENT TEMP.	:-10~+50°C
	-30~+70°C(For Military Product only)
RELATIVE HUMIDIT	: <95%
WEIGHT	: 0.68kg

2.2 Electromagnetic Actuator

TYPE	:A1000C/A2000C
ADJUSTABLE STROKE	: 42mm
WORKING ABILITY	: 1Nm/2Nm
CONTROL CURRENT	: <10A(Transient Maximum Value)
	<2.5A(Average Value at 24V DC)
AMBIENT TEMP.	:-40~+100°C
RELATIVE HUMIDIT	: <95%

2.3 Magnetic Pickup

TYPE	: TM18×1.5
COIL RESISTANCE	: About 360Ω
OUTPUT VOLTAGE	: 1~18V（Active Value）
OUTLINE DIMENSION	: See **Figure 4.**
AMBIENT TEMP.	:-40~+100°C

RELATIVE HUMIDIT : <95%

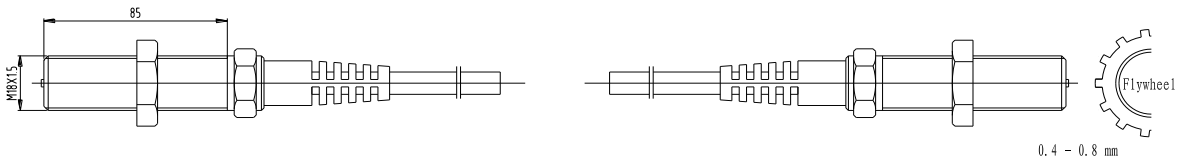


Figure 4 Outline dimension of pickup and its installation

Cautions: the use of speed sensor to the electronic control system shall not be shared with other system, otherwise it may cause very serious consequences!

3 SYSTEM INSTALLATION

- **Magnetic Pickup**
- **Electronic Actuator**
- **Governor Controller**
- **Power Supply**

3.1 Magnetic Pickup

For installation, it is permitted to screw in the pickup firstly until it touches the tip of the tooth, then screw it out for about half loop and secure with securing nut. If the flywheel has no teeth, other sensing gear can be also used provided that its material is magnetic conductive and it can be ensured that within engine working speed range, the output frequency of the pickup which means the teeth amount passing through the pickup per second is not less than 1000Hz . The commensurate formula of engine speed and pickup feedback frequency is:

$$f=nz/60 \quad (Hz)$$

In which , f (Hz) means output frequency of the pickup, n (RPM) means engine speed, and z means teeth amount of sensing gear. Installation method of the magnetic pickup is shown in Figure 4.

CAUTION: *This magnetic pickup is for fortrust electronic governor only, don' t*

be used by other speed checking system.

3.2 Electromagnetic Actuator installation

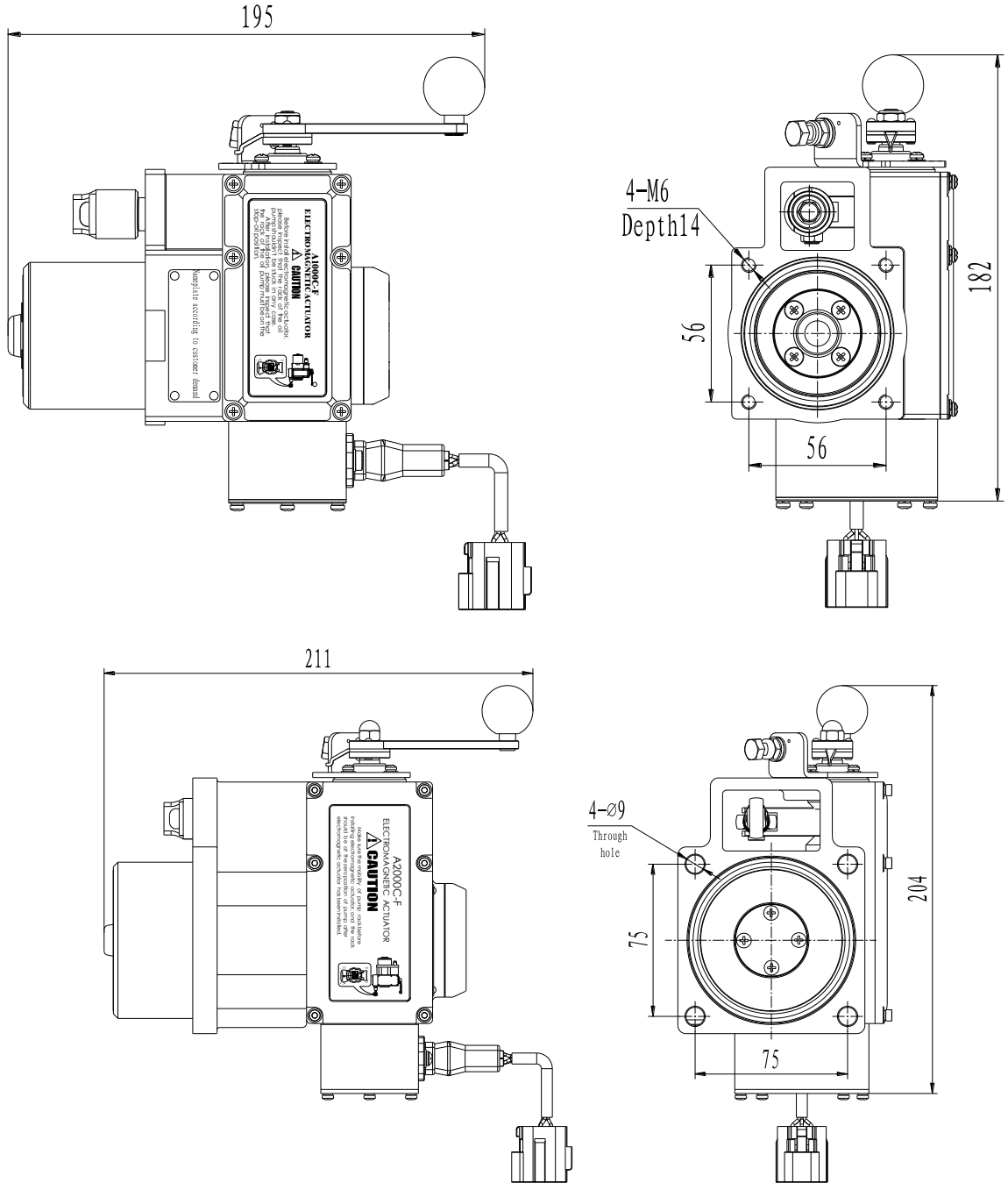


Figure 5. Electromagnetic actuator

3.3 Governor Controller

The governor controller should be in a safe cabinet that is free from strong impulsive vibration and electromagnetic interference. Efficient space must be left for access of maintenance and heat abstraction. The out shell of the cabinet must be grounded properly.

The installation dimension of the governor controller is shown in **Figure 6**

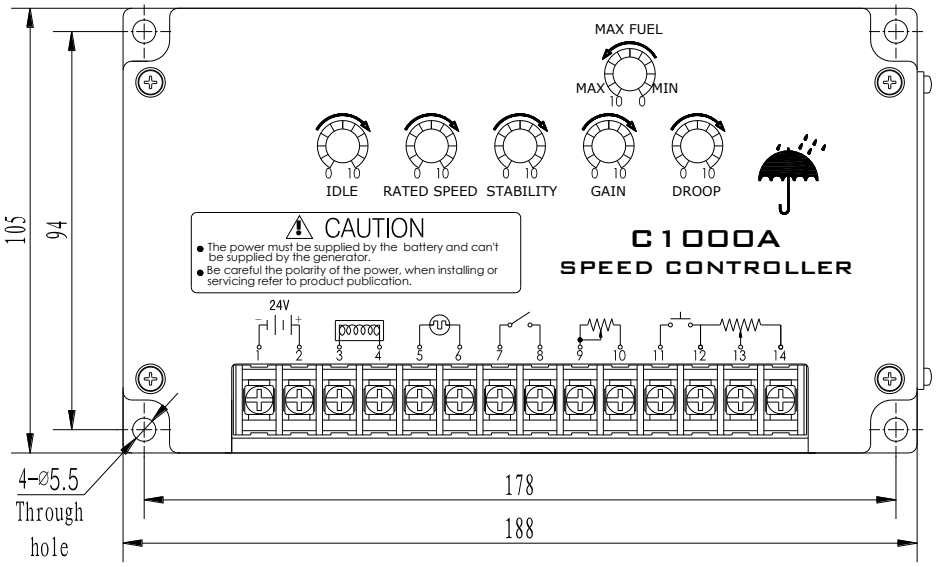
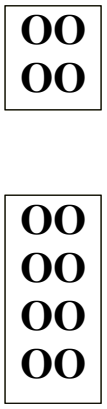


Figure 6. Outline dimension of controller

Considering the different operation speed range and teeth amount of the flywheel gear from various engines, it is necessary to check the correct correspond position of the running state choosing terminals on the right side of the controller circuit board in accordance with the operation frequency range of the engine and the requirement of governor's performance before installation. Following **Figure 7** and the right stable show the relationship between the connecting position of each terminal and the control frequency and the governor's performance. E, F select jumper for the idle speed up high-speed delay time was 3 seconds and 10 seconds.FORTRUST engineers will complete connecting for N1-N4、E、F before the governor leaves the factory according to the customer's situation.



TERMİNALS	WORKING STATE
N1	<1,700Hz
N2	<3,400Hz
N3	<7,800Hz
N4	<13,000Hz
E	Delay 3 seconds
F	Delay 10 seconds

Figure 7. Position of connecting terminals and their function

Controller connecting sees **Figure 8**, in which, the cables used to connect the magnetic pickup and speed remote control potentiometer to the controller should be shielded and the shielding layer should be grounded at the end of the controller. Please pay attention to the

wire number or the color of the cable from the electromagnetic actuator to the controller and do connection properly according to **Figure 8.**

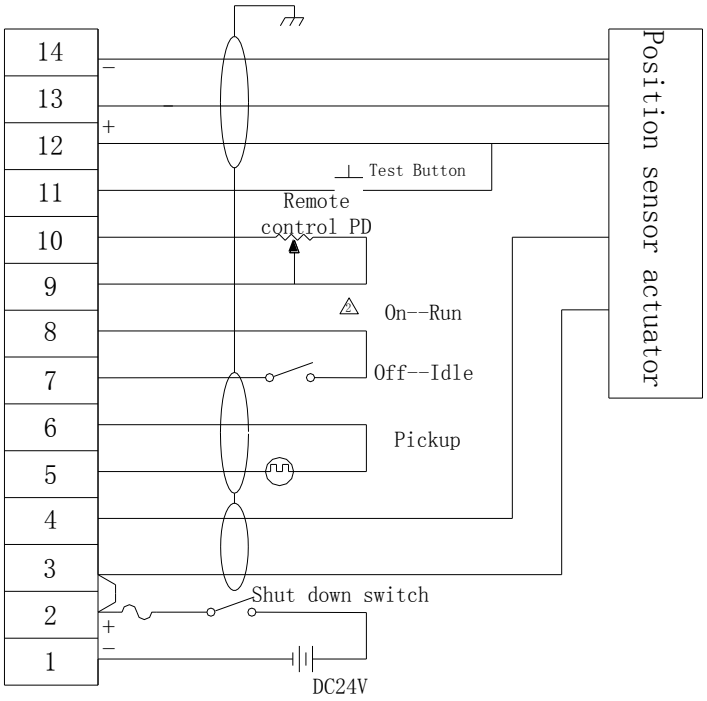


Figure 8. Connection diagram of controller

CAUTION:

4) ***When power on, voltage between 12 and 14 should be 9V. Voltage at 13 should be 0V when it is at the stop position, it will increase while the position of rack increases. Please do not connect wrong.***
5) ***The shielding cover can be connected with the fitting screw of the ESG15001 controller and then grounded properly by this connection point.***
6) ***Only when the correct connection of power polarities and normal value of power voltage are confirmed, then short 2 and terminals through a piece of wire.***

To avoid the damage on the controller circuit due to wrong electrode connecting, one Protecting diode is provided in the controller. But considering that the diode will produce lots of heat after long time working, it is recommended to connect No.2 and No.3 terminals of the controller by the short wire supplied together with the unit after completion of system installation and commissioning to reduce controller heat and thus increase the system stability.

3.4 Power Supply

The working voltage of this governor is DC24V that can be provided by the starting batteries of engine or other stable voltage or non-stable voltage power source that can ensure the system peak output and the voltage vibration range. In case of using the starting

batteries, some charging device should be provided to give efficient power to the batteries. When starting engine, the short-time droop on the voltage output of the batteries will not affect the normal working of the engine .

4 FIRST START PROTOCOL

- **Installing, checking , and Presetting**
- **First Start Operation**
- **Droop Adjusting**

4.1 Installing, Checking, and Presetting

After installing the governor on the engine , following checking and presetting items must be done before first start:

4.11 ccording to the relative mechanic and electric installation drawing, confirm that all electric connections are correct, there is no any seizing in mechanic driving, the magnetic pickup is installed and secured properly. Check and confirm that the output axis of the actuator is located at zero fuel supply position of the engine .

4.12 witch off the “idle/run” switch (i.e. at idle position) .

4.13 witch on the power and check if the output axis of actuator stays at the fuel supply zero position, then check if the voltage between 12(+) and 14(-) terminals is 9 (±0. 5) V.

4.14 press “test” button or connect terminal 11 with 12 ,now the output axis will be at the fuel supply maximum position, Adjust the “maximum fuel limit” potentiometer on the controller to make the current in the governor at about 2.5A~3A , then switch off the “test ” button and the output axis should return to the fuel supply zero position. This procedure can be judged by observing the current changing of the governor.

CAUTION: ***Before carrying out above operation , the 2nd and 3rd terminal on the controller should not be connected until 4.1.3 and 4.1.4 items are checked O.K..***

4.2 First Start Operation

After all checking items and presetting in 4.1 are completed and confirmed correctly, the engine can be started. Following operation procedure is recommended:

4.21 switch on the governor power, check by using "test" button. When the button is pressed , the current should be around 2.5A (or 3A), and when it is released, the current will be about 0A.

4.22 Start engine; adjust "gain" and "derivative" potentiometers to let the engine running stable under the idle speed state. After heating up the engine for some minutes. Switch on "idle/run" switch, increase the speed to the rated value gradually. Adjust "gain" potentiometer and "derivative " potentiometer to ensure stable running of engine when necessary.

4.23 Increase or decrease load step by step. Observe the correspondence of governing system, adjust "gain" and "derivative" potentiometer to achieve the best static and dynamic performance of the system.

4.24 Load down and change the engine speed, observe engine running within the full speed range . Do above operation repeatedly when necessary until the system can keep steadily with satisfactory dynamic performance within the full speed range.

4.25 settthe "idle/run" switch at "idle" position., engine running speed will decrease to the idle speed ; shut off the power switch of the governor (i.e. stop switch), the engine shall down very soon.

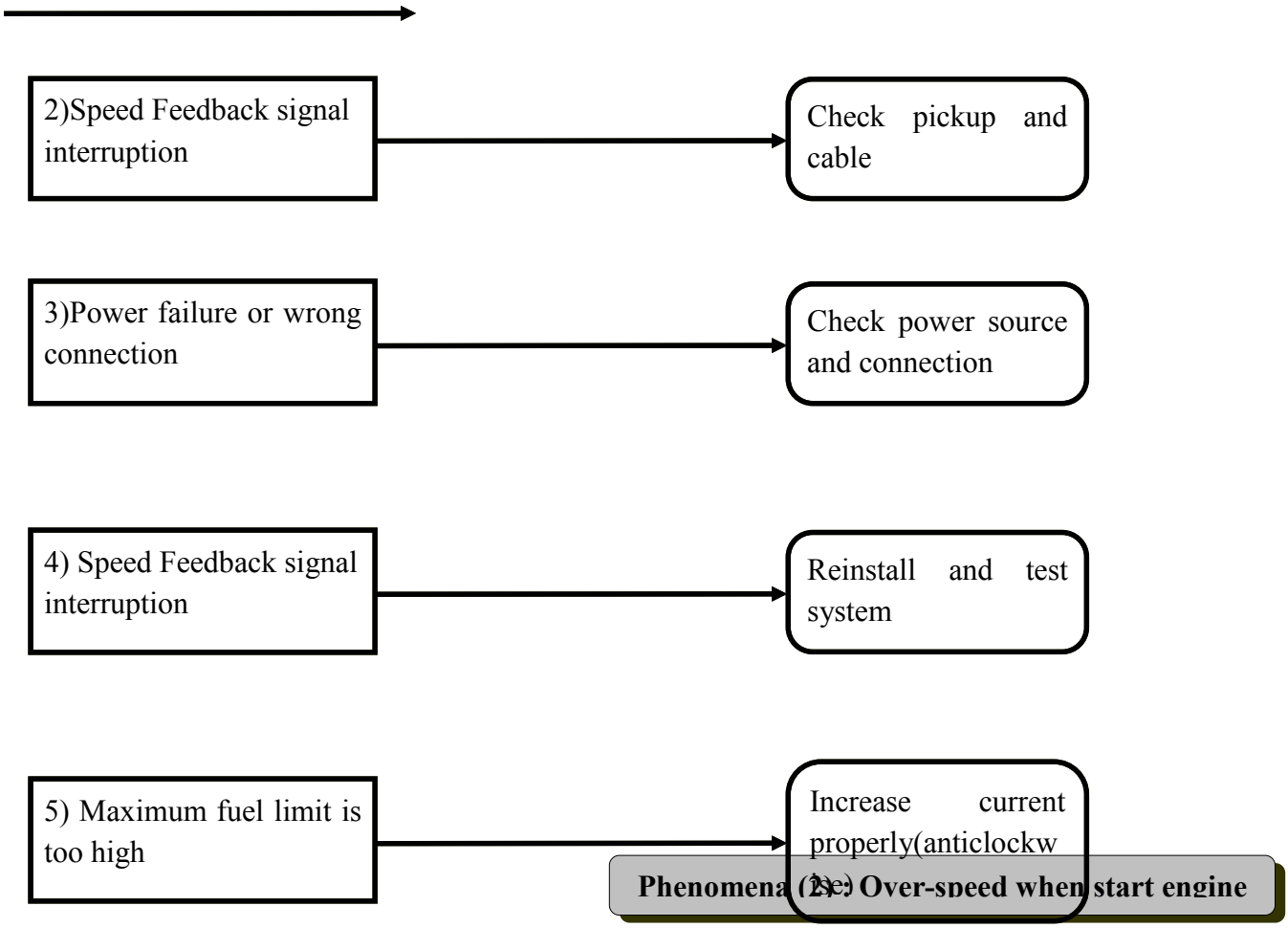
5. TROUBLE SHOOTING

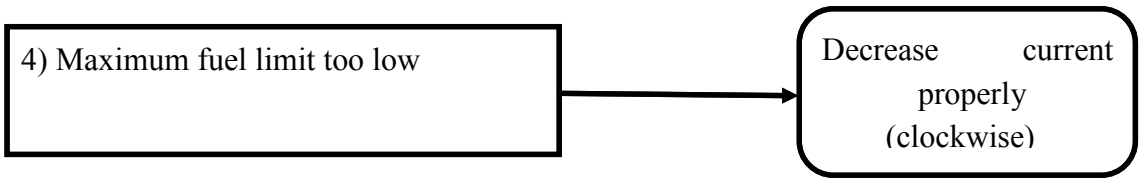
- **Engine can not start**
- **Over-speed when start engine**
- **Unsteady engine speed**
- **Halt unexpectedly**
- **Engine can not stop**
- **Drop can not be adjusted**

When any incorrect matter happens during installation testing or using , please clear the problem refer to following diagrams.

Phenomena (1) : Engine can not start

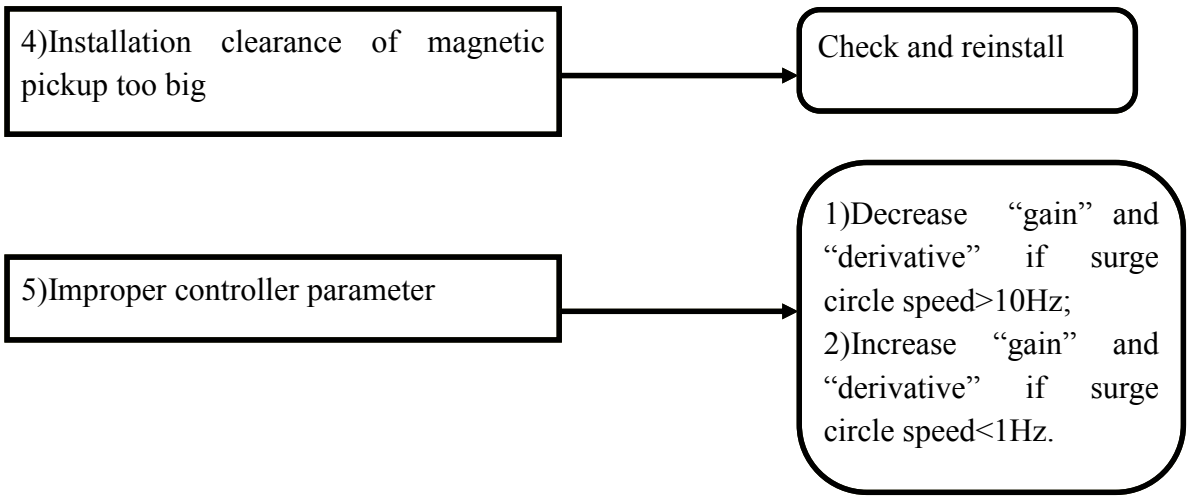
REASON:	***DEAL:***
1) Air in fuel line	Let air out of line


2)Speed Feedback signal interruption
Check pickup and cable
3)Power failure or wrong connection
Check power source and connection
4) Speed Feedback signal interruption
Reinstall and test system
5) Maximum fuel limit is too high
Increase current properly(anticlockw
2)
Phenomena (2): Over-speed when start engine
REASON:
DEAL:
1)Discord between fuel feeding direction of actuator and fuel pump
Check and reinstall
2)Speed setting too high
Decrease the setting
3) Improper parameter of the controller
Increase “gain” and “derivative” properly



Phenomena (3) :Unsteady engine speed

REASON:	***DEAL:***
1)Seizing or excessive clearance between actuator and drive rod	Check and reinstall
2)Overload of engine	Reduce engine load
3)Sensor loose or worn	Rescuer or change



Phenomena (4) : Halt unexpectedly

REASON:	***DEAL:***
1)Governor power failure	Check power and cable connection
2)Speed feedback signal interruption	Check sensor and cable
3) Speed setting signal interruption	Check remote control potentiometer and cable
4)Actuator cable break or short	Check actuator and cable

Phenomena (5) : Engine can not stop

REASON:	***DEAL:***
1)Discord between zero position of actuator and fuel pump	Check and reinstall
2)Fuel pump seized	Same as above

Phenomena (6) :Drop can not be adiusted

REASON:	***DEAL:***
1)Governor running at constant frequency	Reset
2)Drive device of governor seized	Check and readjust or clean fuel pump

CAUTION: The maximum fuel limit potentiometer should be adjusted when engine stops. If the defect still remains after checked and dealt according to above diagrams, and the engine system is confirmed correct, then it may be the defect of the governor itself. In this case, please send the governor to the maintenance department for repair.

Don't overhaul the governor if you is not capable to do so, otherwise, you may cause a bigger defect.

6.CAUTION

- Every time before starting engine, make sure the "idle/run" switch is at "idle"
- All potentiometers on the controller have been tested by the manufacture. Any non-professional staff are forbidden to do any adjustment or removing.
- When start engine after it has been stopped for a long time, make sure the governor be still under good condition by using "test" button.
- After 2000 running HRS, the actuator should be checked. If there is no any seizing, just leave it, otherwise drop some L.O. on the actuator bearing, then operate the actuator manually for a few times, if it is smooth without any seizing, then it can be used normally.

地址 1：上海市浦东新区兰嵩路 555 号森兰美伦大厦 A 座 802,803 室
Address 1: Room 802-803, No.2 Building, Block A, No.555, Lansong Road, Pudong District, Shanghai City, P.R. China
邮编：200127
Zip code : 200127
销售电话：021-68065446
Sales line : 021-68065446
地址 2：启东市近海镇滨海工业园区明珠路 49 号
Address 2: No.49 Mingzhu Road, Binhai Industiral Zone , Jinhai Town, Qidong City , Jiangsu Province, China
邮编： 226236
Zip code: 226236
传真：0513-83833619
Fax: 0513-83833619
销售电话：021-68065446
Sales line : 021-68065446
服务热线： 13917597386
Service line : 13917597386
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Website: www.fortrust.cn
邮箱: sales @fortrust.cn
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