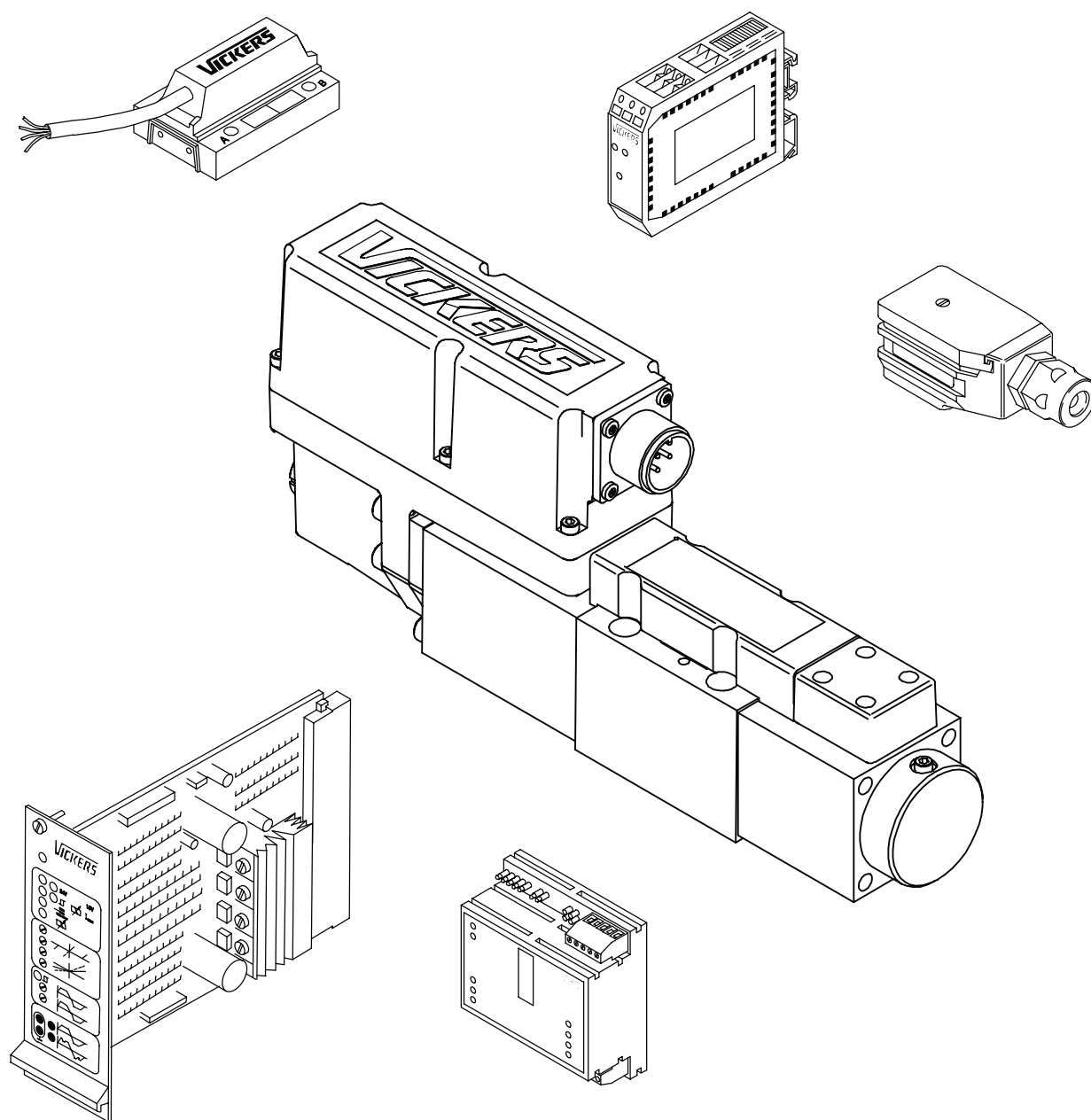


Vickers® by Danfoss

Installation wiring practices for electronic products



Installation Requirements

Introduction

Vickers Electronic Products are designed to be used in conjunction with the appropriate Vickers hydraulic valves.

A recent addition to the relevant global standards is the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, article 5.

All individual components which are identified by the CE logo in the relevant catalog leaflets have been developed to pass the tests required by the above directive and are qualified to bear the CE logo. However it is necessary, when they are installed in any application, that the total assembly

also passes the required tests. To ensure that this is achieved it is necessary to pay particular attention to the interconnecting wiring and shielding.

The purpose of this leaflet is to recommend basic information that has been found beneficial for general purpose installations. It is not intended to be a definitive statement which will completely satisfy all applications – such a document is not possible. The information contained in this document should ideally be used by qualified machine designers and control engineers when specifying and preparing the detailed circuit diagrams necessary for building machines.

The recommendations are suitable for use in a normal light industrial

environment. Where the installation is subject to high electromagnetic radiation from nearby electrical equipment or from fixed or mobile/portable radio transmitters, then extra precautions may need to be taken to ensure that valves are not affected by these external forces. If the offending power source(s) cannot be kept far enough away from the valves and cabling to prevent interference, then valve control cables may have to be routed in suitable metal conduit or trunking which is separately grounded.

Thorough testing of all new installations should always be undertaken to ensure that the system is not affected by interference from external electromagnetic radiation.

Scope

The Vickers products covered in this leaflet are as follows, but the information may also be found useful for others not listed here.

Product	Wiring Diagrams Figure	Page
EEA-PAM-5**-32 Eurocard amplifiers	1 and 2	5 and 6
EHH-AMP-702-*-20 Power plugs	3	7
EHH-AMP-712-*-20 Power plugs	3	7
EHH-AMP-724-*-10 Uniplug connector	–	–
KA Series valves with integral amplifiers	4 and 5	8
KB Series valves with integral amplifiers	4 and 5	8
EHA-CON-201-A-20 Converter module	6	9
EHA-RMP-201-A-20 Ramp generator module	7	9
EHA-PSU-201-A-10 Power supply module	8	10
EHA-PID-201-A-20 PID control module	9	10
EHD-DSG-201-A-10 Demand signal generator module	10	11

Products

Eurocards

The Eurocard amplifiers are used with a variety of valves. They have to be plugged into either an edge connector or a card holder, both of which can be supplied by Vickers. Connection details for the various types of valve are shown in figures 1 and 2. All cables connected to the valves need to be screened.

The solenoid cable screen should be connected to the machine protective ground point only at the electrical panel end remote from the valve.

The screen for the LVDT wires needs to be grounded at both ends to machine protective ground connections.

In difficult cases where the ground loops created by this method become a problem, then double screened cables can be used with one screen grounded at the valve end and the other screen grounded at the amplifier end of the cable.

Command signal cables should be screened as shown in figure 2.

Cables

Three core cable $\geq 0,5 \text{ mm}^2$ (20 AWG) with an overall screen should be used for the LVDT wiring.

Two core cable with an overall screen should be used for the solenoids.

Power Plugs

Power plugs can be used for all of the non-feedback valves in the Vickers proportional valve range. It is necessary for good reliable operation to screen the cables as shown in figure 3. A single overall screen is usually adequate and it should be connected to an efficient protective ground point at the electrical panel end. The D and J versions have differential voltage inputs giving the facility to work with positive or negative command signals. This feature also enables two plugs to be connected "back to back" so that two solenoids can be controlled alternately from one bi-polar (+/-) command signal. The various connection options are shown in figure 3 along with details of the necessary wire end preparation.

Cables

Cable sizes between $0,5 \text{ mm}^2$ and $1,0 \text{ mm}^2$ (20-17 AWG) are suitable.

Uniplugs

The UNIPLUGs are used with suitable Cetop 3 size directional and proportional valves and are supplied with a length of cable molded into the housing. The C and D versions are for use with proportional valves and the cables for these have an overall screen. The screen should always be connected at the electrical panel to an efficient ground point.



WARNING

Care should be taken when wiring the UNIPLUG to ensure that the correct solenoid "A" or "B" is energized when commanded. When fitting the UNIPLUG to the valve it is absolutely vital that it is fitted the correct way round with the "A" channel adjacent to the "A" solenoid. Failure to do this would cause the valve to operate in reverse and could result in serious injury.

Valves with Integral Amplifiers

Vickers valves with integral amplifiers are fitted with 7-pin connectors and all the connections to the valve are made through them. Figures 4 and 5 show the recommended electrical connection scheme for a KB type valve and the following information should be used when wiring the valves.

- 1) It is important to interconnect the 0V lines as shown in figures 4 and 5.
- 2) The multi-core cable should have at least two screens such that the power and signal lines are separated. Additional screens may be used around pairs of wires if desired, as shown in fig 4 & 5. Signal lines should ideally be twisted pairs.
- 3) If the demand signal generator has a differential output, the common mode voltage of this output should not exceed 18 volts with respect to the 0V power.
- 4) To obtain an accurate position signal, the user's position monitor circuit should ideally have a differential input with an impedance of between $20 \text{ k}\Omega$ and $100 \text{ k}\Omega$ (see figure 4). If the user's position monitor circuit has only one input, this should be connected to pin F and no connection made to pin C. The latter arrangement will add some noise to the monitor signal and connecting pin C to 0V will not reduce the noise level.
- 5) While this scheme shows the ideal arrangement for grounding the connections to the screen, there is a possibility of induced noise in the ground loop. If such problems occur it may be possible to minimize any interference by reducing the area of the ground loop, i.e. keep the screened cable close to the grounded metalwork of the machine.
- 6) Figure 5 is applicable if the amplifier has the valve enable feature (PR7 type). The wire connected to the enable pin C should not run inside the screen for the signal lines.

Products (continued)

Note 1:

To obtain operation in conformance with the European EMC Directive, a metal shell connector must be used with the screen of the cable connected to the shell of the connector. The metal shell and its threaded mating ring must have an electrically conducting finish. The cable must have at least two screens as described above and the user's electronics must be adequately screened or provided with a suitable enclosure.

Note 2:

If using a plastic connector, the system may not conform to the European EMC Directive. However, system immunity will be improved if the screen of the cable is connected to pin G as shown in figures 4 and 5.

Note 3:

For all new design (*) amplifiers the pin C may be connected to 0V without risk of excessive currents in the signal lines, but this is not recommended. For older design KA amplifiers or KB type PC7 and PE7 amplifiers, pin C may be used with pin F as shown in figure 4 but should not be connected to 0V.

(*) The new amplifier is shown on the front page of this leaflet and is fitted to the following models:

KBFD/TG4V-3/5-1*, KBSDG4V-3/5-1* and KBHDG5V-5/7/8-1*.

These models supersede the equivalent KA versions.

Snap-on Modules

The Vickers range of snap-on modules is used to provide various features for command signals. The connecting cables are vulnerable to outside interference from adjacent electro-magnetic devices and so need to be screened for protection. When used with KA valves with integral amplifiers, the wiring details should be as shown in figures 6, 7 and 8. If the modules are used with other devices then the command signal cables should be screened and the screens should be grounded at one end only to an efficient ground point.

Cables

Cable sizes from 0,5 to 2,5 mm² (20-12 AWG) are suitable.

Power Supplies

The recommended DC power supplies for all the preceding units are the Vickers EHA-PSU-704-A-20 Series 24 volt units. These units conform to the following specifications:

IEC 364-4-41, HD 384-4-41 and VDE 0100 Part 410

These specifications require a built-in screen between the primary and secondary windings which should be connected to a protective ground connection.

If a PWM stabilized power supply with current limiting is used, the limit should be set higher than the required start-up inrush current.

General Information

The wrapped foil type of screened cable is not recommended and the close braided type will be found to give better results.

Ground Connections

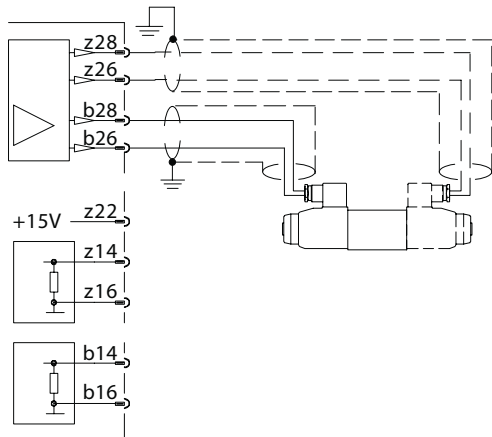
All screens should be connected to a "protective ground" which should be the ground point of the electrical panel and the framework of the machine.

Wiring Connections for Eurocard Amplifiers

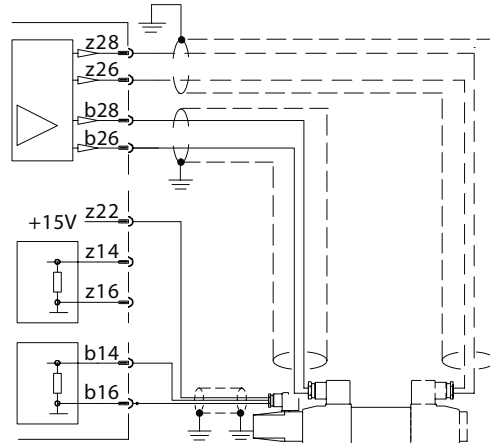
Amplifier Models (Typical Valve Types)

Amplifier Models: 513, 523, 525

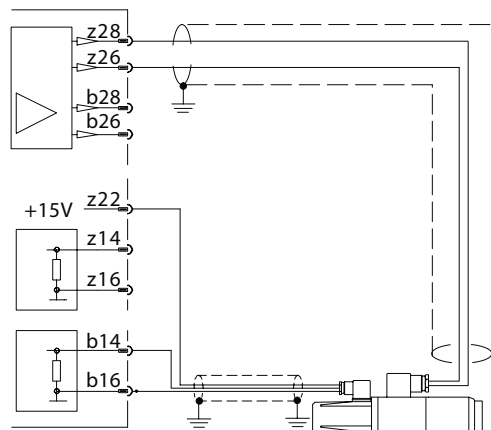
(KD/TG4V-3/5, KCG-3/6/8, KDG5V, KX(C)G-6/8)



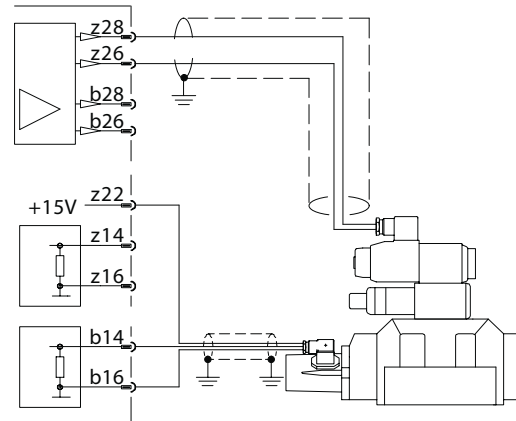
Amplifier Models: 533, 535 (KFD/TG4V-3/5)



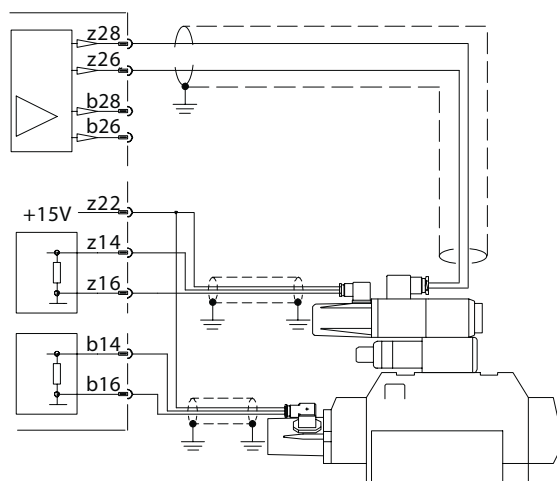
Amplifier Model: 553 (KSDG4V-3)



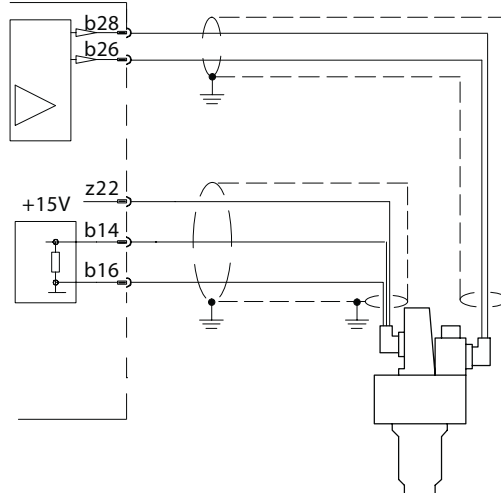
Amplifier Models: 561, 568 (KFDG5V)



Amplifier Models: 541, 581 (KHDG5V)



Amplifier Model: 571 (CVU-**-EFP1)



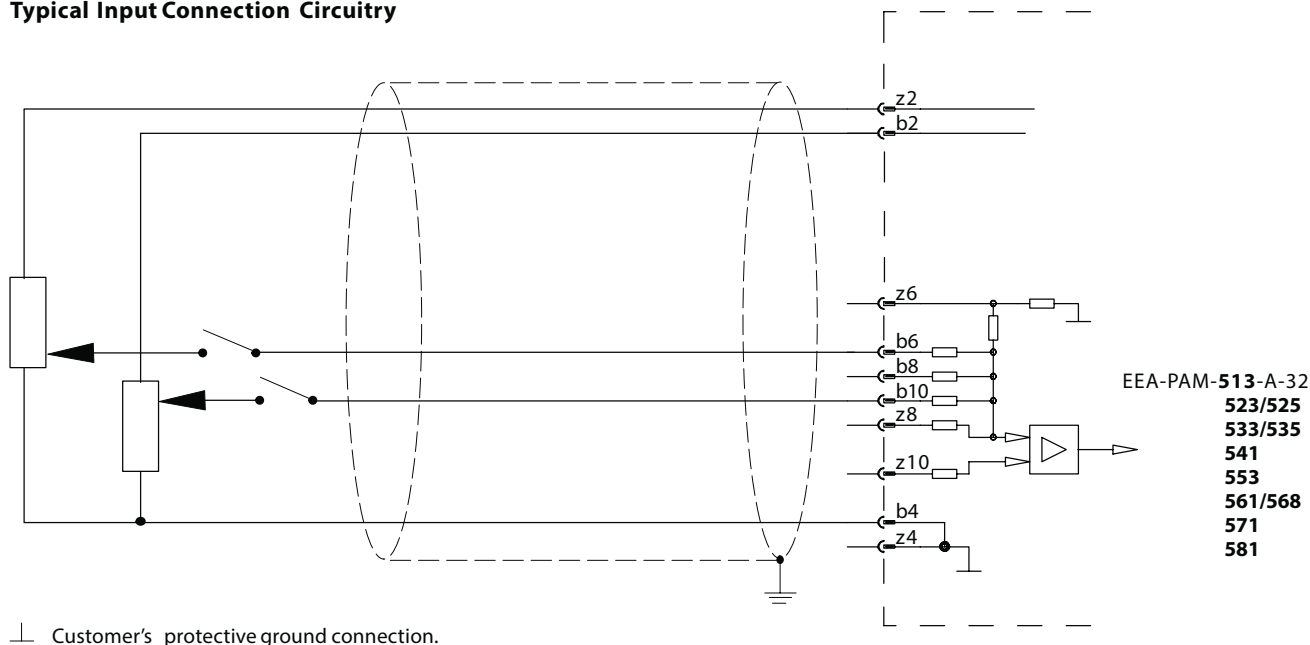
⏏ Customer's protective ground connection.

Figure 1

See product information on page 3.

Wiring Connections for Eurocard Amplifiers (continued)

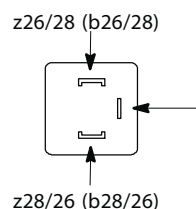
Typical Input Connection Circuitry



⏏ Customer's protective ground connection.

Valve Solenoid Connections

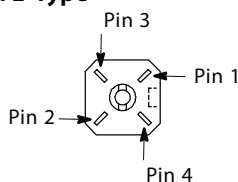
Note: Connection not polarity sensitive.



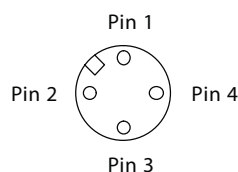
Protective ground: Connection not required if power supply conforms to VDE 0551/EN 60742/IEC 742

LVDT Connections

M and E Type



B Type



	LVDT plug pin	Amplifier pin
Pilot stage	1	z14
	2	z22
	3	z16
	4	Not connected
Main stage +CVU-EFP1	1	b14
	2	z22
	3	b16
	4	Not connected

Figure 2

See product information on page 3.



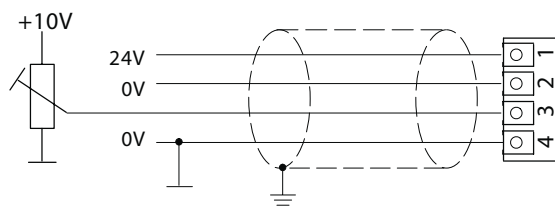
Electromagnetic Compatibility(EMC)

Notes for Wiring

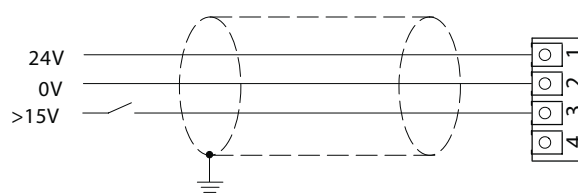
- 1) Screened cables should be used for the command signals, the solenoid connections and the LVDT connections.
- 2) Particular attention should be paid to the grounding of the screens as shown in the diagrams.
- 3) The screen on the LVDT cable needs to be grounded at both ends. An alternative method to prevent creating earth loops is to use double screened cable with each screen grounded at opposite ends.
- 4) The amplifiers should be mounted in a metal enclosure which is connected to an efficient ground point.

Wiring Connections for Power Plugs

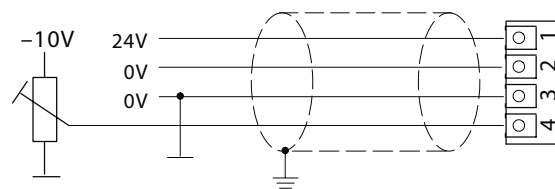
Positive Command Voltage EHH-AMP-702/712-D/J-20



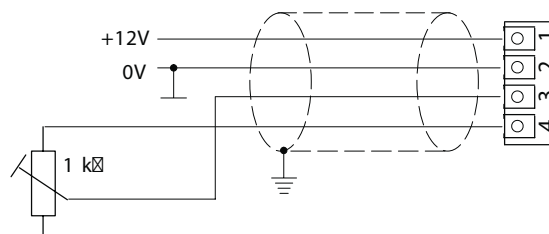
Soft Switching EHH-AMP-702-C-20



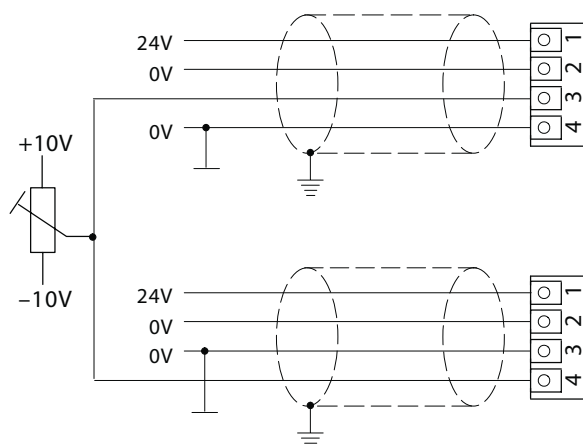
Negative Command Voltage EHH-AMP-702/712-D/J-20



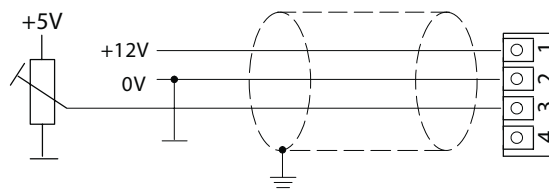
Internal Reference Voltage EHH-AMP-712-G-20



Bi-Polar Command Voltage for Operating 2 Solenoids from One Signal EHH-AMP-702/712-D/J-20

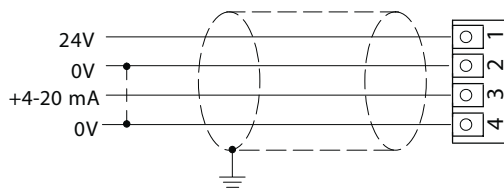


External Reference Voltage EHH-AMP-712-G-20



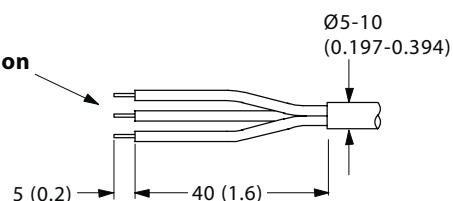
⏏ Customer's protective ground connection.

4 - 20 mA Command Signal EHH-AMP-702-K-20



Wiring Preparation

3 0,5-1,0 mm²
(20-18 AWG)



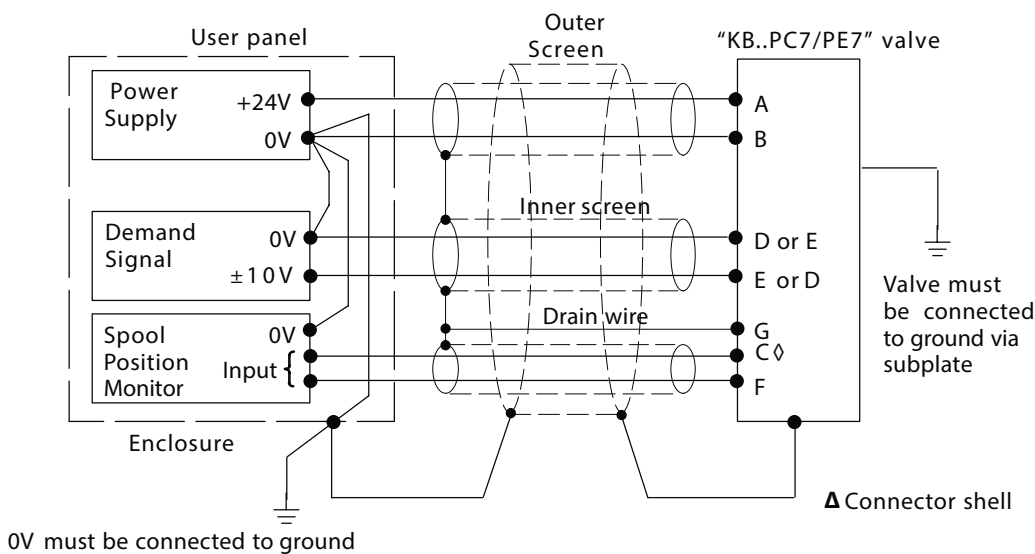
Warning: Electromagnetic Compatibility(EMC)
Screened cables should be used and particular attention paid to the grounding of the screens as shown in the above diagrams.

See product information on page 3.

Figure 3

Wiring Connections for Valves with Integral Amplifiers

Wiring Connections for Valves with integral Amplifier



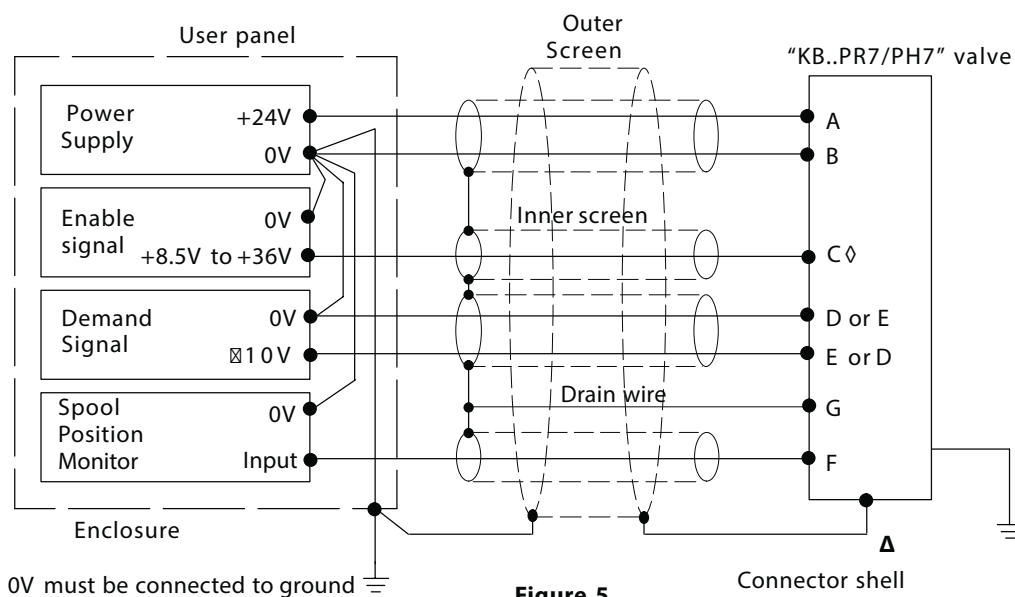
◇ Spool position monitor voltage (pin F) will be referenced to the KB valve local ground. A "local ground" (pin C) is provided on PC7/PE7 versions for optional use by differential input customer supplied electronics.



Warning

Do not ground pin C. If the local ground (pin C) is not used for differential monitor electronics, do not use. Read monitor pin F with respect to ground.

Wiring Connections for Valves with enable feature



△ Note: In applications where the valve must conform to European RFI/EMC regulations, the outer screen (shield) must be connected to the outer shell of the 7-pin connector and the valve body must be fastened to the earth ground. Proper earth grounding practices must be observed in this case, as any differences in command source and valve ground potentials will result in a screen (shield) ground loop.

Valve must be connected to ground via subplate



Warning

Electromagnetic Compatibility(EMC)

is necessary to ensure that the valve is wired-up as above. For effective protection, the user electrical cabinet, the valve subplate or manifold, and the cable screens should be connected to efficient ground points. The metal 7-pin connector, part no. 934939, should be used for the integral amplifier.

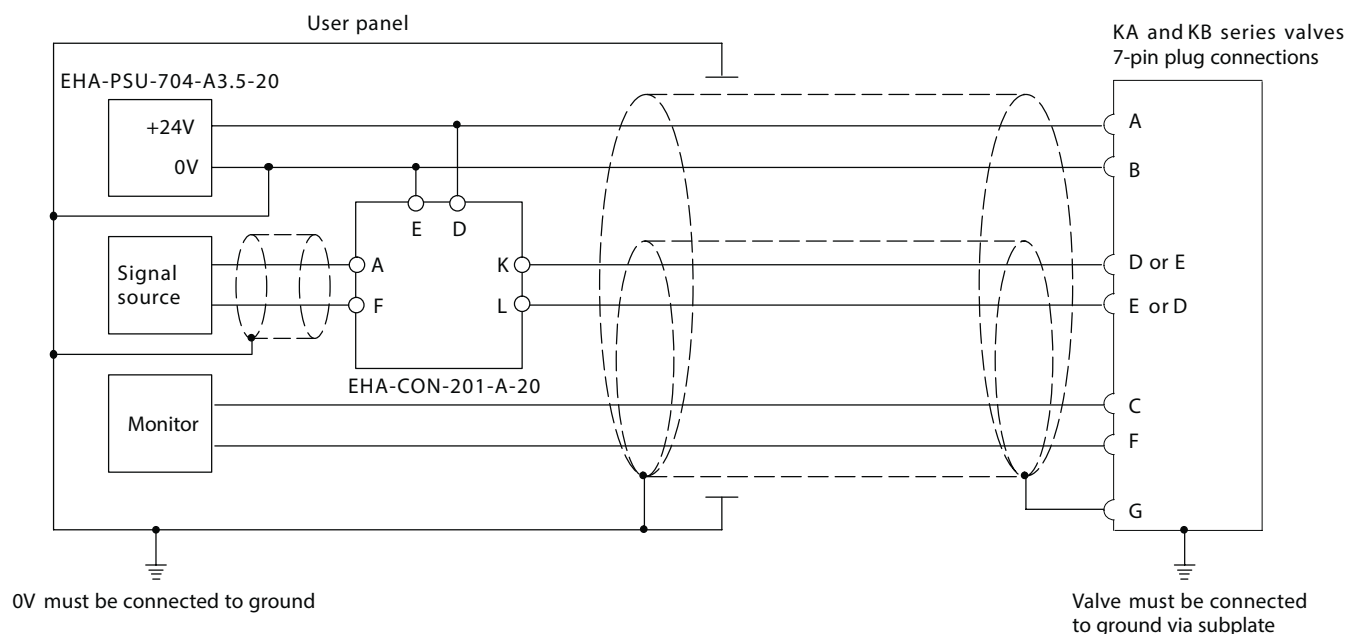
In all cases, both valve and cable should be kept as far as possible from any sources of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid the interference.

It is important to connect the 0V lines as shown above. The multi-core cable should have at least two screens to separate the demand signal and monitor output from the power lines.

The enable line to pin C should be outside the screen which contains the demand signal cables.

Wiring Connections for Snap-on Modules used with “KA” and “KB” Valves

Typical Connection Arrangement for EHA-CON-201-A-20

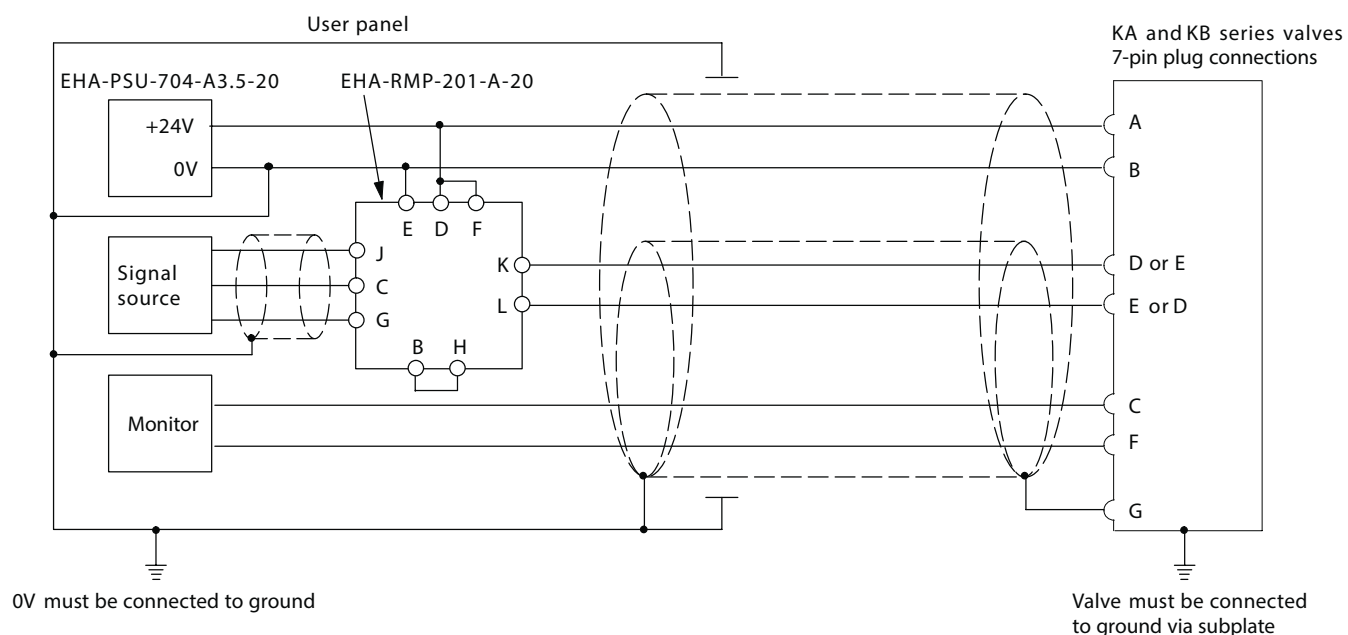


⏏ Customer's protective ground connection.

Figure 6

See product information on page 4.

Typical Connection Arrangement for EHA-RMP-201-A-20



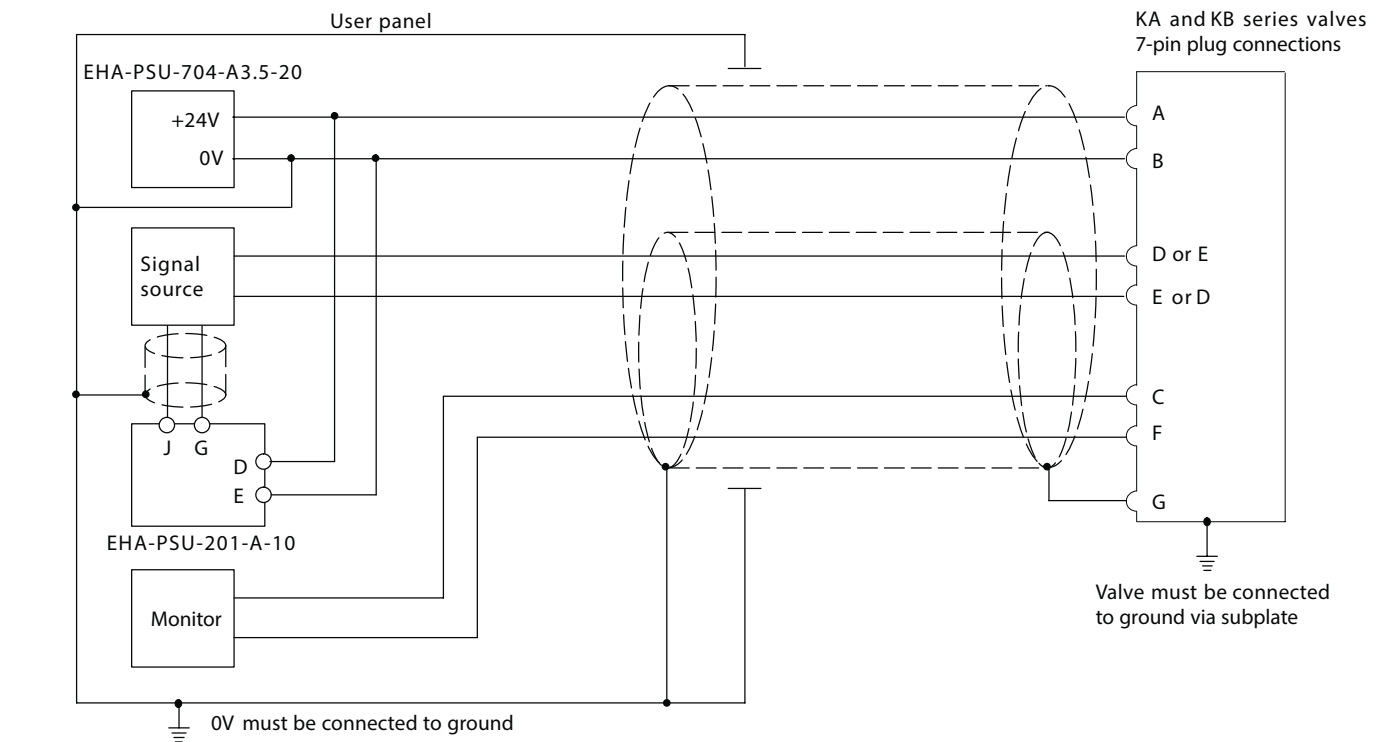
⏏ Customer's protective ground connection.

Figure 7

See product information on page 4.

Wiring Connections for Snap-on Modules used with “KA” and “KB” Valves (continued)

Typical Connection Arrangement for EHA-PSU-201-A-10

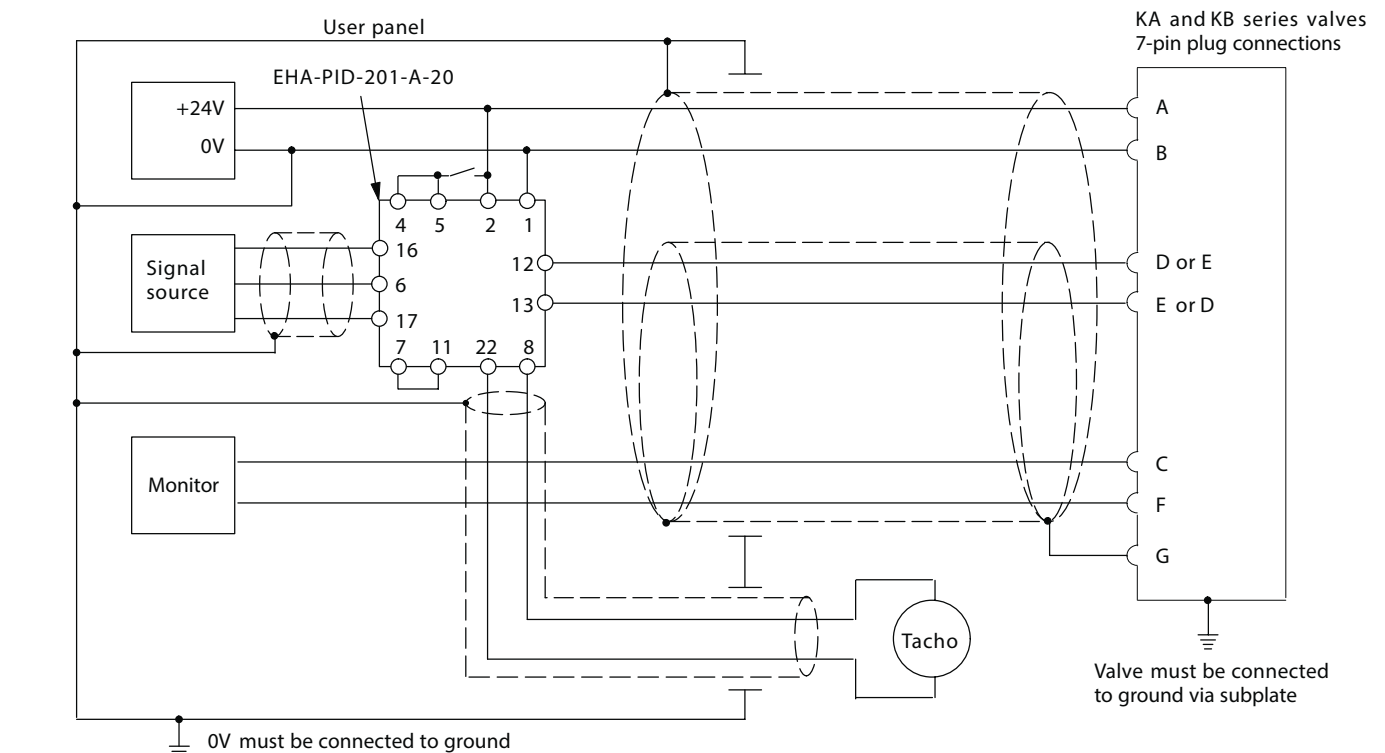


⏏ Customer's protective ground connection.

Figure 8

See product information on page 4.

Typical Connection Arrangement for EHA-PID-201-A-20



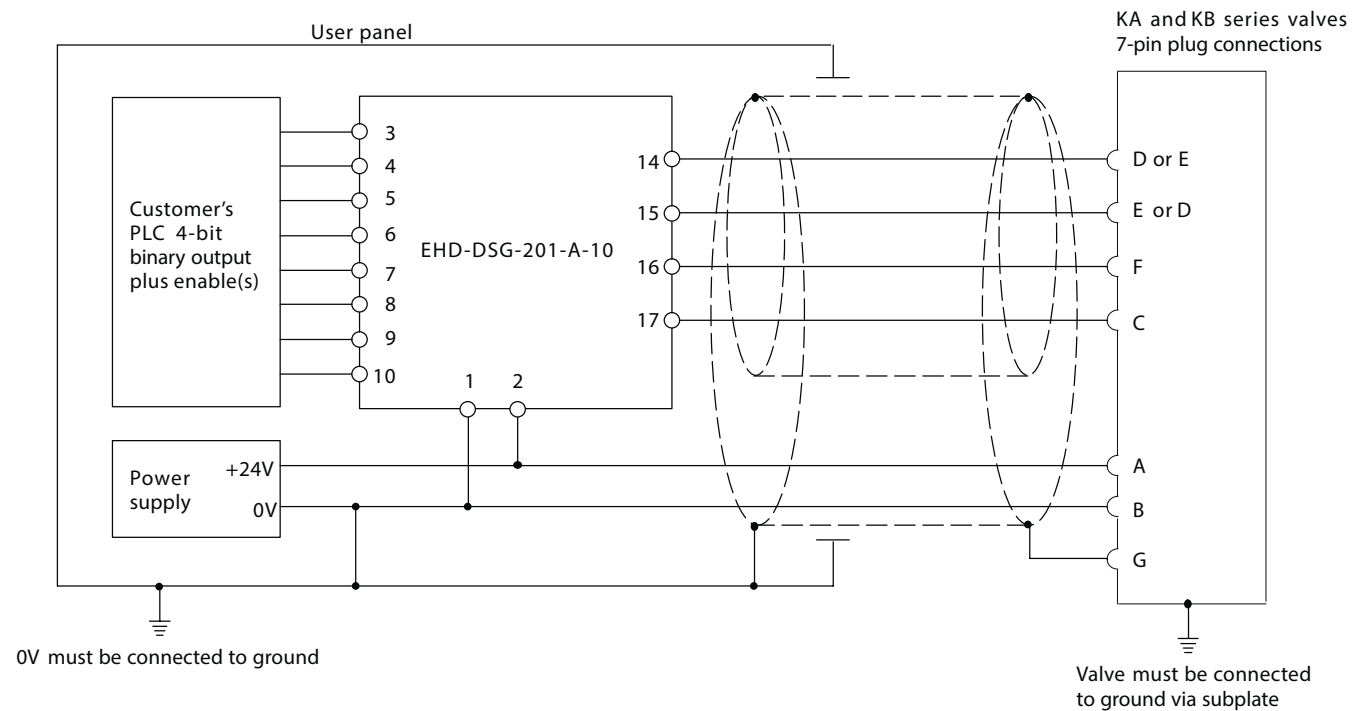
⏏ Customer's protective ground connection.

Figure 9

See product information on page 4.

Wiring Connections for Snap-on Modules used with “KA” and “KB” Valves (continued)

Typical Connection Arrangement for EHD-DSG-201-A-10



⏏ Customer's protective ground connection.

Figure 10

See product information on page 4.

Products we offer:

- Cartridge valves
- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Gear motors
- Gear pumps
- Hydraulic integrated circuits (HICs)
- Hydrostatic motors
- Hydrostatic pumps
- Orbital motors
- PLUS+1® controllers
- PLUS+1® displays
- PLUS+1® joysticks and pedals
- PLUS+1® operator interfaces
- PLUS+1® sensors
- PLUS+1® software
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

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Hydro-Gear

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Daikin-Sauer-Danfoss

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**Danfoss
Power Solutions (US) Company**
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

**Danfoss
Power Solutions GmbH & Co. OHG**
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

**Danfoss
Power Solutions ApS**
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

**Danfoss
Power Solutions Trading
(Shanghai) Co., Ltd.**
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 2080 6201