



ORIGINAL INSTRUCTIONS

Instruction Manual
5 Port Solenoid Valve
Series JSY1000/3000/5000



The intended use of this valve is to control the movement of an actuator.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) ¹⁾, and other safety regulations.
¹⁾ ISO 4414: Pneumatic fluid power - General rules relating to systems.
 ISO 4413: Hydraulic fluid power - General rules relating to systems.
 IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
 ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

Caution

- The product is provided for use in manufacturing industries only. Do not use in residential premises.

2 Specifications

2.1 Manifold specifications

2.1.1 Non plug-in metal base

Model	Piping direction	
	Side	Bottom
Enclosure (Based on IEC60529)	IP40	

Table 1

2.1.2 Plug-in connector connection base

Model	FC type	D-sub			Flat ribbon cable		Fterminal block box	Lead wire
		F type	FW type	PC, PGC, PHC type	P, PG, PH type	T, TC type	L type	
Enclosure (Based on IEC60529)	JSY1000	IP20	IP40	IP20	IP40	IP40		
	JSY3000	-	-	-	-	IP40		
	JSY5000	-	IP67	-	-	IP67		

Table 2

2 Specifications - continued

Model	Serial wiring		
	S6□ type (EX600)	S□ type (EX250/EX260)	S3□ type (EX120)
Enclosure (Based on IEC60529)	JSY1000	IP40	IP40
	JSY3000	IP67 (I/O unit; partially IP40)	IP67 (EX260 D-Sub communication connector; IP40)
	JSY5000	-	IP20

Table 3

2.2 Valve specifications

Valve type		Rubber seal	
Fluid		Air	
Internal pilot Operating pressure range (MPa) ^{Note 1)}	2 position single	0.15 to 0.7	
	2 position double	0.1 to 0.7	
	3 position	0.2 to 0.7	
	4 position dual 3 port	0.15 to 0.7	
Operating pressure range		-100 kPa to 0.7	
External pilot Operating pressure range (MPa) ^{Note 1)} (Made to Order)	Pilot pressure range	0.25 to 0.7	
	2 position single/double		
3 position			
Ambient and fluid temperature (°C)		-10 to 50 (No freezing)	
Minimum Operating frequency		1 cycle / 30 days	
Maximum Operating Frequency (Hz)	JSY1000	2 position single/double	5
	JSY3000	4 position dual 3 port	3
		3 position	5
	JSY5000	2 position single/double	3
3 position		3	
Duty cycle		Continuous (JSY1000: 0.2 W & JSY3000/5000: 0.1 W standard pressure power saving type). For other types contact SMC	
Flow rate		Refer to catalogue	
Response time		Refer to catalogue	
Manual override		Non-locking push type Push turn-locking slotted type Push turn locking lever type ^{Note 2)}	
Pilot exhaust type	Internal pilot	Individual exhaust	
	External pilot (Made to order)		
Lubrication		Not required	
Mounting orientation		Unrestricted	
Impact/vibration resistance ^{Note 3)} (m/s ²)		150/30	
Enclosure (based on IEC60529)	Plug-in type	JSY1000: IP40 JSY3000/5000: IP67	

	Non plug-in type	IP40
Weight	Refer to catalogue	

Table 4

Note 1) See section 3.18 Reverse flow.
 Note 2) Not available for the JSY1000 series plug-in type.
 Note 3) **Impact resistance:** No malfunction occurred when it was tested with a drop tester in the axial direction and at right angles to the main valve & armature; in both energized & de-energized states and for every time in each condition. (Values at the initial period.)
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Tests are performed at both energized and de-energized states in the axial direction and at right angles to the main valve & armature. (Values at the initial period.)

2.3 Solenoid specifications

Coil rated voltage (DC)		24
Allowable voltage fluctuation ^{Note 1)} (V)	JSY1000 Non plug-in type	-7 to +10% of rated voltage
	JSY3000/5000 Plug-in type	±10% of rated voltage
Power consumption (W)	Standard JSY3000/5000	0.4
	With power saving circuit (Made to Order)	0.2 ^{Note 2, 3)} [Inrush 0.5, Holding 0.2] 0.1 ^{Note 3)} [Inrush 0.4, Holding 0.1]
Surge voltage suppressor		Diode (Varistor for non-polar type)
Indicator light		LED

Table 5

Note 1) Valve state is not defined if electrical input is outside of specified operating ranges.
 Note 2) JSY1000 series available as power saving type only. Standard type (without power saving circuit) cannot be selected.
 Note 3) Refer to section 3.9 for details.

2.4 Special products

Warning

Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

2 Specifications - continued

2.5 Pneumatic symbols

Refer to catalogue for pneumatic symbols.

2.6 LED light indication

2.6.1 Plug-in

When equipped with indicator light and surge voltage suppressor, the light window turns orange when solenoid 'a' is energized, and it turns green when solenoid 'b' is energized.

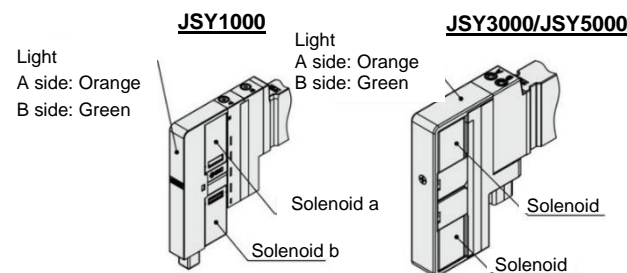


Figure 1 – Light indication for Plug-in type

2.6.2 Non plug-in

The non-plug-in type has an indicator light and surge voltage suppressor. The light turns orange when the solenoid is energized.

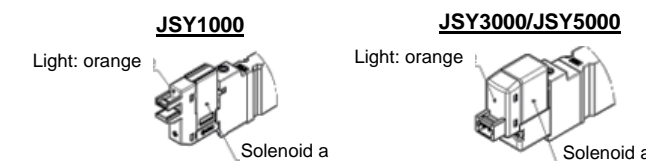


Figure 2 – Light indication for Non plug-in type

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.
- When using double solenoid type for the first time, actuators may travel in an unexpected direction depending on the switching position of the valve. Implement countermeasures to avoid any danger that may occur due to the actuator's operation.

3.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- Products with IP67 enclosures (based on IEC60529) are protected against dust and water; however, these products cannot be used in water.
- Products compliant to IP67 satisfy the specifications by mounting the product appropriately.
- When using built-in silencer type manifold with an IP67 enclosure, keep the exhaust port of the silencer from coming in direct contact with water or other liquids.
- Do not use in high humidity environment where condensation can occur.
- If using in an atmosphere where there is possible contact with water drop-lets, oil, weld spatter, etc., take suitable preventive measures.
- When the solenoid valve is mounted in a control panel or it is energized for a long time, make sure that the ambient temperature is within the specification of the valve.
- Contact SMC for altitude limitations.

3.3 Piping

Caution

3 Installation - continued

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Connection thread size (R, NPT)	Tightening Torque (N·m)
M3	0.4 to 0.5
M5	1 to 1.5
1/16	2 to 3
1/8	3 to 5
1/4	8 to 12

Table 6

Caution

- For internal pilot valves, even though the inlet pressure is within the operating pressure range, when the pipe diameter is restricted due to size reduction of supply port (P), the flow will be insufficient. In this case, the valve does not switch completely, and the cylinder may malfunction.

3.4 Lubrication

Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

3.5 One-touch fittings

3.5.1 Tube attachment and detachment

Caution

Refer to the Specific Precautions in the catalogue.

3.6 Precautions on other tube brands

Caution

- When using non-SMC brand tubes, refer to the Specific Precautions in the catalogue.

3.7 Indicator light/surge voltage suppressor

If a valve type without suppression is used, suppression should be provided as close as possible to the valve by the host controller.

3.8 Polarity

3.8.1 Polar type (plug-in type)

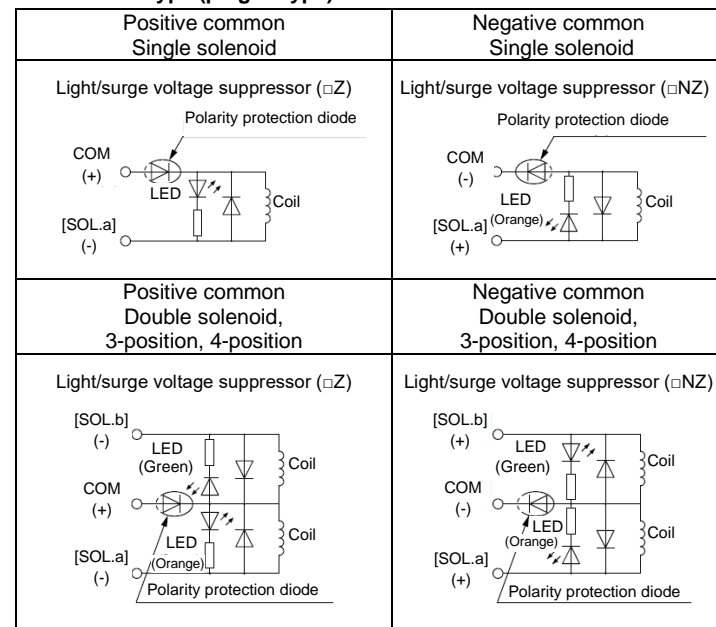


Figure 3

3 Installation - continued

3.8.2 Non-polar type (plug-in type)

With surge voltage suppressor (□U)

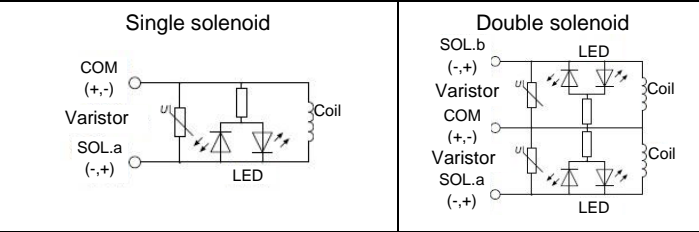


Figure 4

3.8.3 Polar type (non plug-in type) [for JSY3000/5000]

L/M plug connector

With light/surge voltage suppressor (□Z)

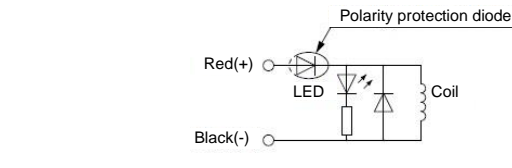


Figure 5

3.9 With power saving circuit

Power consumption is decreased by approximately 1/2.5 to 1/4 of the amount required at start up by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 67 ms at 24 VDC for plug-in type and 62 ms at 24 VDC for non plug-in type).

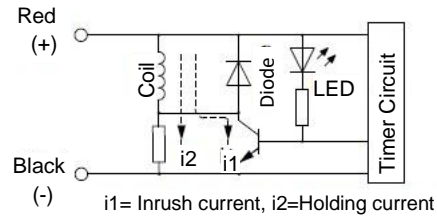


Figure 6 - Non plug-in type

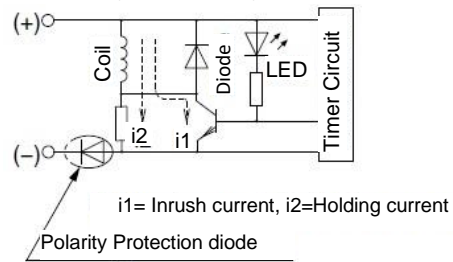


Figure 7 - Plug-in type

The above circuit reduces the power consumption for holding in order to save energy. Refer to the catalogue for details.

- Since the voltage will drop by approx. 0.5 V due to the transistor, pay attention to the allowable voltage fluctuation. (For details, refer to the solenoid specifications of each type of valve.)

3.10 Residual voltage

If a varistor or diode surge voltage suppressor is used, the suppressor arrests the back emf voltage from the coil to the level indicated in Table 7. Ensure the transient voltage is within the specification of the host controller. Valve response time is dependent on surge suppression method selected.

Surge voltage suppressor	DC24 V
Z	Approx. 1 V
U	Approx. 47 V

Table 7

Caution

3.11 Countermeasure for surge voltage

At times of sudden interruption of the power supply, the energy stored in a large inductive device may cause non-polar type valves in a de-energised state to switch.

3 Installation - continued

When installing a breaker circuit to isolate the power, consider a valve with polarity (with polarity protection diode), or install a surge absorption diode across the output of the breaker.

3.12 Continuous duty

Caution

If a valve is energized continuously for a long period of time, the rise in temperature due to heating-up of the coil assembly may cause a decline in solenoid valve performance, reduce service life, or have adverse effects on peripheral equipment.

If the valve is energized continuously for a long period of time, be sure to use a valve with power saving circuit. In particular, if three or more adjacent stations on the manifold are energized simultaneously for extended periods of time or if the valves on A side and B side are energized simultaneously for a long period of time, take special care as the temperature rise will be greater. Additionally, select the product with power saving circuit when it is used at a duty ratio over 50%.

3.13 Momentary energization

Caution

If a double solenoid valve will be operated with momentary energization, it should be energized for at least 0.1 second. However, depending on the secondary load conditions, it should be energized until the cylinder reaches the stroke end position, as there is a possibility of malfunction otherwise.

3.14 Energization of a 2-position double solenoid valve

Caution

To avoid operation failure, do not energize the 4(A) side and 2(B) side of a 2-position double solenoid valve at the same time.

3.15 Valve mounting

Caution

Mount the valve so that there is no slippage or deformation in gaskets and tighten with the tightening torque as shown below.

Model	Thread size	Tightening torque (N·m)
JSY1000	M1.4	0.06

JSY3000	M2	0.16
JSY5000	M3	0.8

Table 8

3.16 Manual override

Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Connected actuator is started by manual operation. Only use the manual override after confirming that there is no danger.

Warning

Locked manual overrides might prevent the valve responding to being electrically de-energised or cause unexpected movement in the equipment.

Warning

Refer to the catalogue for details of manual override operation.

3.17 Use as a 3-port valve

Caution

The JSY1000/3000/5000 can be used as normally closed (N.C.) or normally open (N.O.) 3-port valves by closing one of the cylinder ports 4(A) or 2(B) with a plug. However, they should be used with the exhaust ports kept open. Refer to the catalogue for additional details.

3.18 Reverse flow

Caution

Only the external pilot variants are suitable for reverse flow with pressure supplied on ports 3 and 5 provided the pressure is less than 0.7 MPa.

3.19 Effect of back pressure when using a manifold

Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure. For 3-position exhaust centre valve or single acting cylinder, take appropriate measures to prevent malfunction by using it with an individual EXH interface block or an individual exhaust manifold.

3 Installation - continued

3.20 External pilot exhausts

Caution

The external pilot variants use the manifold PE connection for pilot exhaust. Ensure that this connection is always vented to atmosphere and not subject to any pressure pulses from other devices.

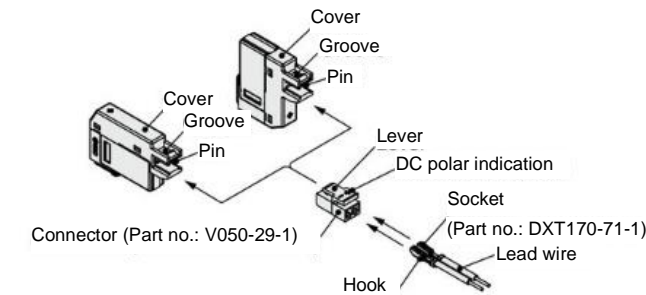


Figure 8 - For JSY1000

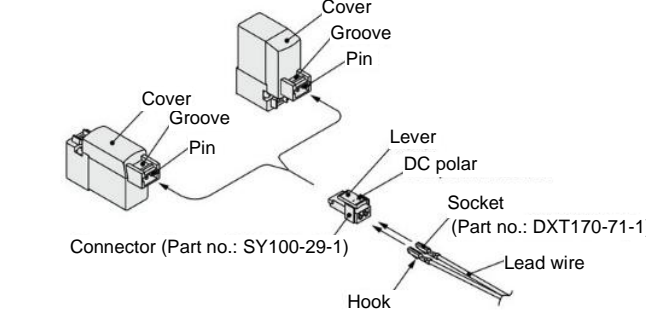


Figure 9 - For JSY3000/5000

3.21 One-touch fittings

Caution

When fittings are used, they may interfere with one another depending on their types and sizes. Therefore, the dimensions of the fittings to be used should first be confirmed in their respective catalogues.

3.22 How to use plug connector (non plug-in type only)

Caution

3.22.1 Attaching and detaching connectors

Refer to catalogue for additional details.

3.22.2 Crimping connection of a lead wire and socket

Refer to catalogue for additional details

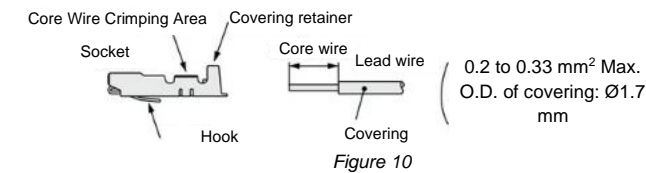


Figure 10

3.23 Changing connector entry direction (plug-in type only)

Caution

Refer to the Specific Product Precautions in the catalogue.

3.24 Tightening torque for mounting and holding screws

Caution

Refer to the catalogue and/or Specific Product Precautions for more details. The recommended tightening torque for the screws is shown below.

Model	Thread size	Tightening torque (N·m)
JSY1000/3000/5000	M3	0.8
JSY1000/3000	M4	1.4
JSY5000	M5	2.9

Table 9

NOTE: The tightening torque for screws of the cover and the drip proof plug of the terminal block box are given in table 10.

3 Installation - continued

Type	Thread size	Tightening torque (N·m)
"TC" Connection	M3	0.54 to 0.66
"T" connection	M4	0.7 to 1.2
Dip proof plug (SY30M-133-1)	-	0.8

Table 10

3.25 Electrical wiring specifications

Refer to catalogue for electrical wiring specifications.

3.26 Air supply

Warning

Use clean air

If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas etc., it can lead to damage or malfunction.

Caution

Install an air filter

Install an air filter upstream of the valve. Select an air filter with a filtration size of 5µm or smaller.

4 How to Order

4.1 Standard products

Refer to catalogue for 'How to order' information.

4.2 Special products

For special products (-X number) refer to product drawing for 'How to order' details and specifications.

5 Outline Dimensions

Refer to the catalogue for outline dimensions.

6 Maintenance

6.1 General maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.

- Maintenance of pneumatic systems should be performed only by qualified personnel.

- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.

- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.

- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.

- Do not make any modification to the product.

- Do not disassemble the product, unless required by installation or maintenance instructions.

- When the 3-position closed centre type is in its rest position, air can be trapped between the valve and the cylinder. Exhaust this air pressure before removing piping or performing any maintenance.

- When the equipment is operated after remounting or replacement, first confirm that measures are in place to prevent lurching of actuators, etc. Then, confirm that the equipment is operating normally.

- Operate the valve at least once every 30 days.

6.2 Increase manifold stations (plug-in type)

Refer to catalogue for details on how to increase connector type manifold stations.

Caution

Make sure that power and air supplies are shut off before disassembly. Furthermore, since air may remain inside the actuator, piping and manifold, confirm that the air is completely exhausted before performing any work.

When disassembly and assembly is performed, if the tightening of the tension bolt is inadequate, it may result in air leakage. The tightening torque for tension bolts is 0.8 N·m.

7 Limitations of Use

Warning

The system designer should determine the effect of the possible failure modes of the product on the system.

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

7.2 Leakage voltage

Caution

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes $\leq 3\%$ of the rated voltage across the valve.

7.3 Low temperature operation

Caution

Unless otherwise indicated in the specifications for each valve, operation is possible to -10°C , but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

7.4 Intermediate stopping

Warning

Refer to Handling Precautions for 3/4/5 port Solenoid Valves.

7.5 Holding of pressure

Warning

Since valves are subject to air leakage, they cannot be used for applications such as holding pressure (including vacuum) in a system.

7.6 Cannot be used as an emergency shut-off valve

Warning

This product is not designed for safety applications such as an emergency shut-off valve. If the valves are used in this type of system, other reliable safety assurance measures should be adopted.

7.7 Momentary energization

Caution

If a double solenoid valve is operated with momentary energization, it should be energized for at least 0.1 second. However, depending on the secondary load conditions, it should be energized until the cylinder reaches the stroke end position, as there is a possibility of malfunction otherwise.

7.8 Air returned or air/spring returned spool valves

Warning

The use of 2-position single valves with air returned or air/spring returned spools has to be carefully considered.

The return of the valve spool into the de-energized position depends on the pilot pressure. If the pilot pressure drops below the specified operating pressure the position of the spool cannot be defined.

The design of the system must take into account such behaviour.

Additional measures might be necessary. For example, the installation of an additional air tank to maintain the pilot pressure. Such measures must be evaluated by risk assessment within the validation process.

Energy source status	Single	Double	3 position	Dual 3 Port
Air supply present, electricity cut	Spool returns to the off position by air force	Spool stops moving after electricity cut (Position cannot be defined)	Spool returns to off position by spring force	Spools return to off position by air force
Air supply cut before electricity cut	Spool stops moving after air pressure cut (Position cannot be defined)	Spool stops moving after air pressure cut (Position cannot be defined)	Spool returns to off position by spring force	Spool stops moving after air pressure cut (Position cannot be defined)

Table 11

7 Limitations of Use - continued

7.9 Safety relays or PLC

Warning

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

8 Product disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

9 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
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