

INSTALLATION CONDITION FOR UL RECOGNITION

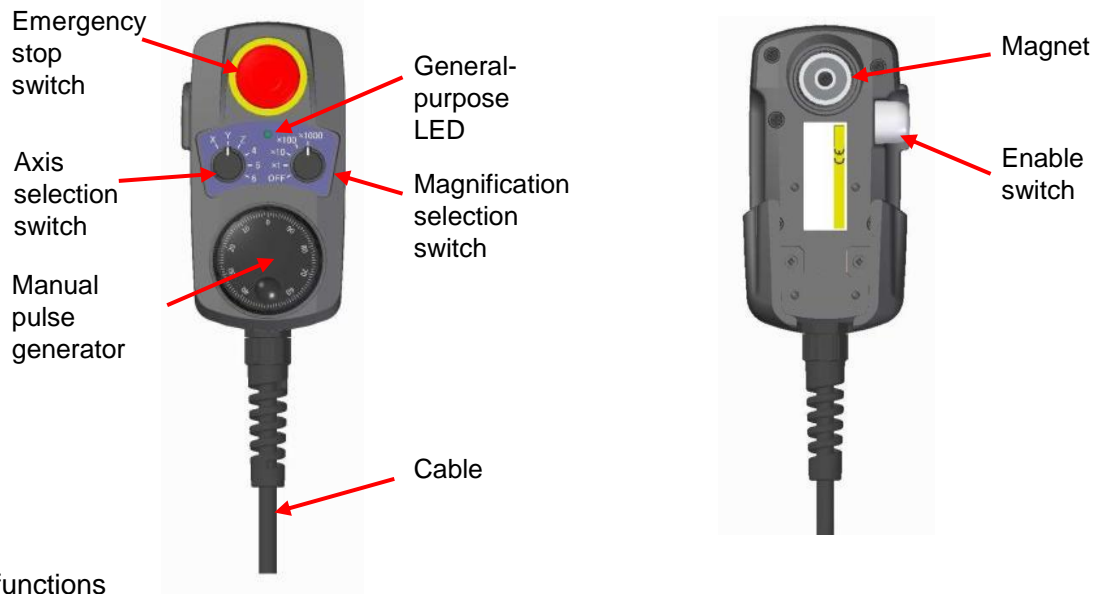
PORTABLE MANUAL PULSE GENERATOR SPECIFICATIONS

1. SPECIFICATIONS

1.1 OVERVIEW

The portable manual pulse generator is an I/O device for manual handle feed that is equipped with a manual pulse generator, emergency stop switch, enable switch, axis selection switch, magnification selection switch, and LED.

Connect it to a FANUC I/O device, and connect it to a CNC with the I/O Link or I/O Link i.



Main functions

- Emergency stop switch
This is the switch which makes a system in emergency stop state.
- Enable switch
This switch is used to enable manual handle feed.
- Axis selection switch
This switch is used to select the axis on which to perform manual handle feed.
- Magnification selection switch
This switch is used to set the travel distance per pulse of manual handle feed, using a magnification of the minimum unit of the travel distance per pulse.
- Manual pulse generator
This generator outputs pulses for manual handle feed.
- General-purpose LED
This is a LED for general-purpose.
It is turned ON/OFF by connecting it to the DO of a FANUC I/O device.

•Guard

Risk assessment considered the specifications of the machine is conducted by each machine tool builder, and if there is a risk due to one-hand operation as a result, it is necessary to take a countermeasure appropriately.

As the following figure shows, this guard builds walls around the rotary knob of manual pulse generator.

Building walls can be used as a means for leading the operator to operate the manual pulse generator with both hands.

If the guard is necessary, please select the portable manual pulse generator with guard.



Portable manual pulse generator with Guard



Portable manual pulse generator without Guard

! CAUTION

- A magnet is mounted at the rear side of the portable manual pulse generator. Watch out people wearing a medical electronics pacemaker for example. If the magnet gets close the medical electronics, the electronics may have a serious malfunction.
- When you put the portable manual pulse generator on a machine tool by the magnet, check it that there is no apparatus susceptible to magnetism around the place where the unit is put on.

NOTE

- Do not disassemble this unit.
- Do not apply to each cable any voltage other than the one stated in the Specifications.
- If incorrect routing or connection is made, the device may be damaged or burned.
- A magnet is mounted at the rear side of this unit. Do not bring any device susceptible to magnetism close to the unit. If you do, the contents stored by its memory are damaged, or, the device is magnetized and it cannot be used any more.
- Be careful not to drop this unit or give strong impact to it.
- Do not pull the cable strongly.

1.2. DETAILS OF SPECIFICATIONS

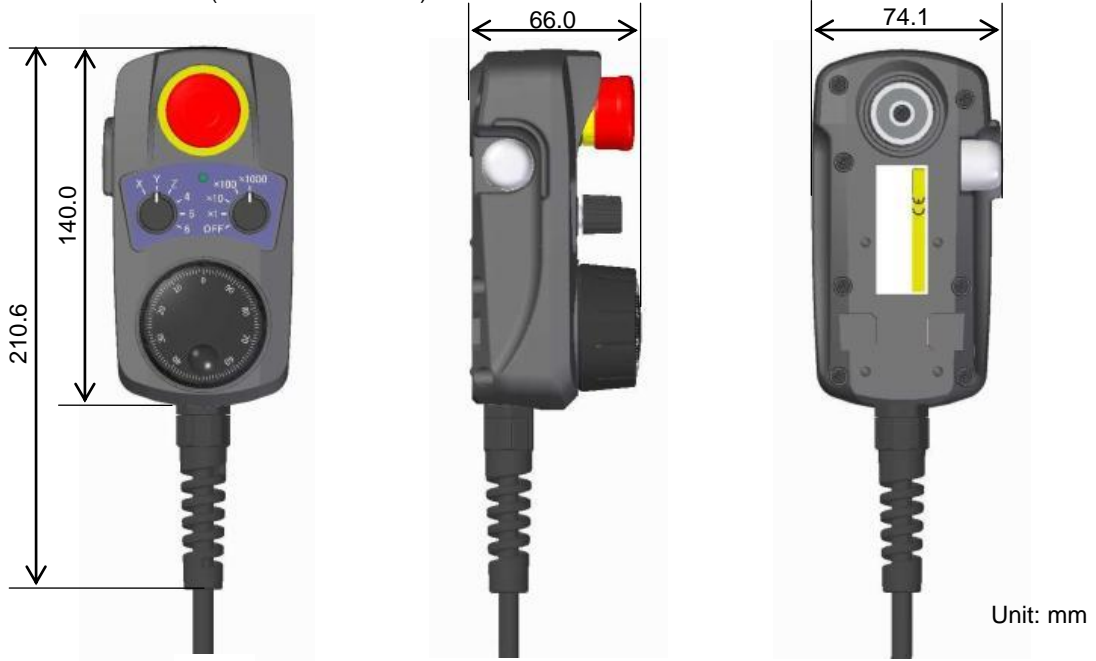
Overview

Item	Description
External dimensions	Refer to the next page.
Weight	Refer to the next page.

Individual specifications

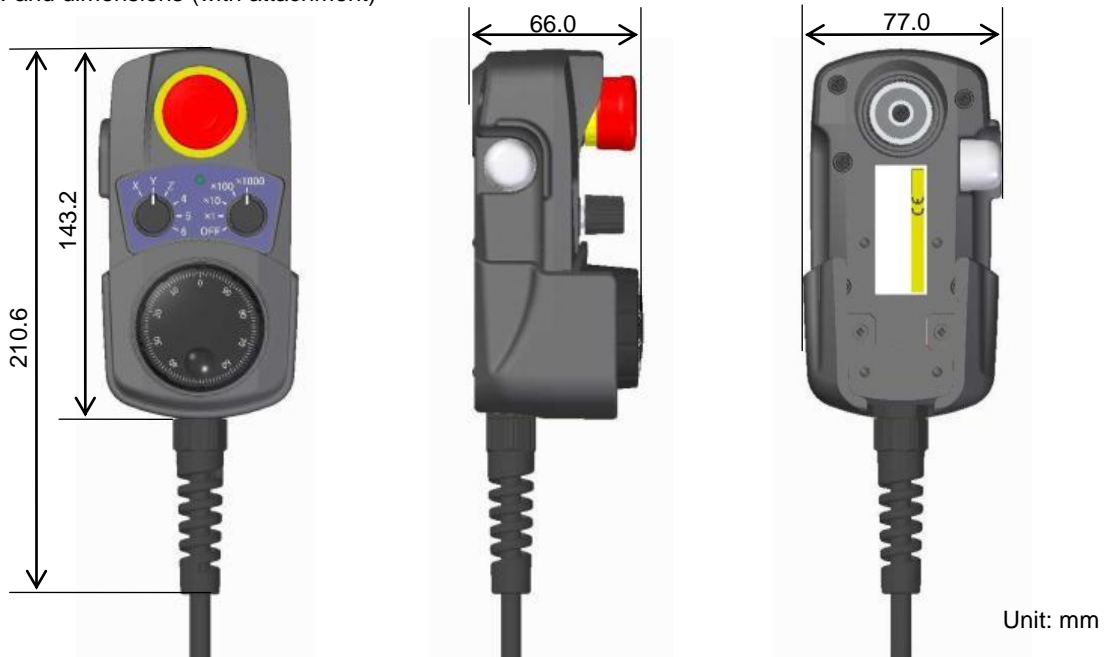
Item	Description
Manual pulse generator	Phases A and B, phase difference: 90 degrees, 100 pulses/rotation
Axis selection switch	Selectable from 3 contacts (X, Z, and C) and 6 contacts (X, Y, Z, 4, 5, and 6)
Magnification selection switch	5 contacts (OFF, x1, x10, x100, and x1000)
Emergency stop switch	NC, 2 contacts
Enable switch	NO, 3 positions, 2 contacts
General-purpose LED	1 pc., to be turned ON with the DO of an I/O device.
Cable	24-conductor shielded straight cable or coiled cable
Cable length	Straight: selectable from 3.5m and 5.0m Coiled: 1.0m (coiled part: 0.5m)
Cable end treatment	Connector: round shaped, 24 pins type
Guard	Optional

External view and dimensions (without attachment)



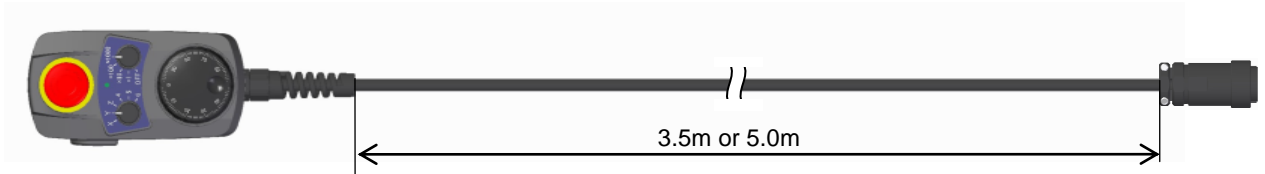
Weight: Approx. 300g
(excluding the cable)

External view and dimensions (with attachment)

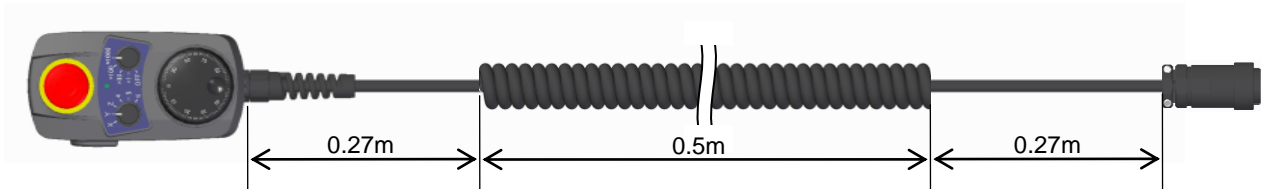


Weight: Approx. 342g
(excluding the cable)

Cable length (straight cable, connector at the end)



Cable length (coiled cable, connector at the end)



Weight of the portable manual pulse generator

Option type	Cable type	Weight (approx.)
Without guard	Straight, 3.5m	800 g
	Straight, 5.0m	1,000 g
	Coiled	810 g
With guard	Straight, 3.5m	850 g
	Straight, 5.0m	1,050 g
	Coiled	860 g

1.3. CONDITIONS FOR USE

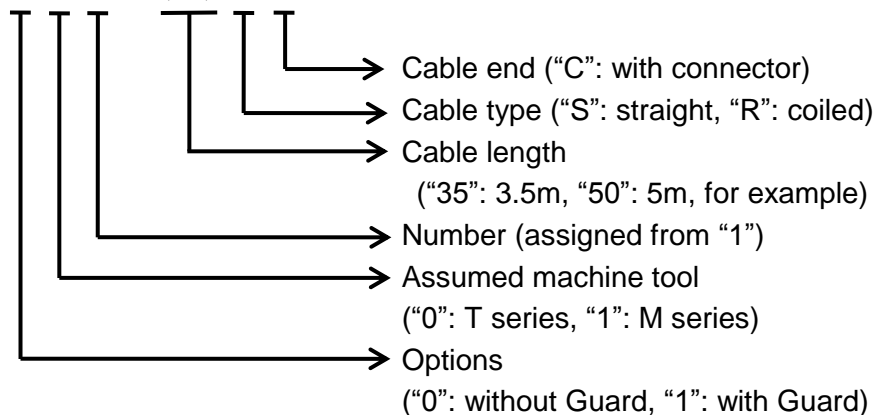
Item		Description
Ambient temperature	Operating	0°C to 45°C
	Non-operating (including storage and transportation)	-20°C to 60°C
	Temperature change	0.3°C/minute or less
Humidity	Normal	75%RH or less, no condensation.
	Short period (less than 1 month)	95%RH or less, no condensation
Vibration	Operating	4.9m/s ² (0.5G) or less. FANUC's evaluation test was conducted under the following conditions complying with IEC 60068-2-6. 10 to 58Hz: 0.075mm (amplitude) 58 to 500Hz: 9.8m/s ² (1.0G) Vibration direction: Each of the X, Y, and Z directions Number of sweep cycles: 10
	Non-operating (including storage and transportation)	9.8m/s ² (1.0G) or less
Meters above sea level	Operating	1000m or less
	Non-operating (including storage and transportation)	12000m or less
Environment		Coolant, lubricant, or cutting chips shall not be sprinkled directly over it. No corrosive gas shall be allowed. Pollution degree 3. Indoor use only.

1.4. ORDERING INFORMATION

Models A13B-0206-C001, A13B-0206-C011, A13B-0206-C101, A13B-0206-C111. All models followed by #, followed by two-digit number, followed by S or R, followed by F or C.

The ordering information is as follows:

A13B-0206-C△□○#◇◇☆▽



Specifications list

Ordering information	Attach-ment	Axis selection switch	Magnification selection switch	Cable		
				Length	Shape	End treatment
A13B-0206-C001#35SC	No	X, Z, C	OFF, x1, x10, x100, x1000	3.5m	Straight	Connector
A13B-0206-C001#50SC				5.0m		
A13B-0206-C001#10RC				1.0m	Coiled	
A13B-0206-C011#35SC		X, Y, Z, 4, 5, 6		3.5m	Straight	
A13B-0206-C011#50SC				5.0m		
A13B-0206-C011#10RC				1.0m	Coiled	
A13B-0206-C101#35SC	Yes	X, Z, C		3.5m	Straight	
A13B-0206-C101#50SC				5.0m		
A13B-0206-C101#10RC				1.0m	Coiled	
A13B-0206-C111#35SC		X, Y, Z, 4, 5, 6		3.5m	Straight	
A13B-0206-C111#50SC				5.0m		
A13B-0206-C111#10RC				1.0m	Coiled	

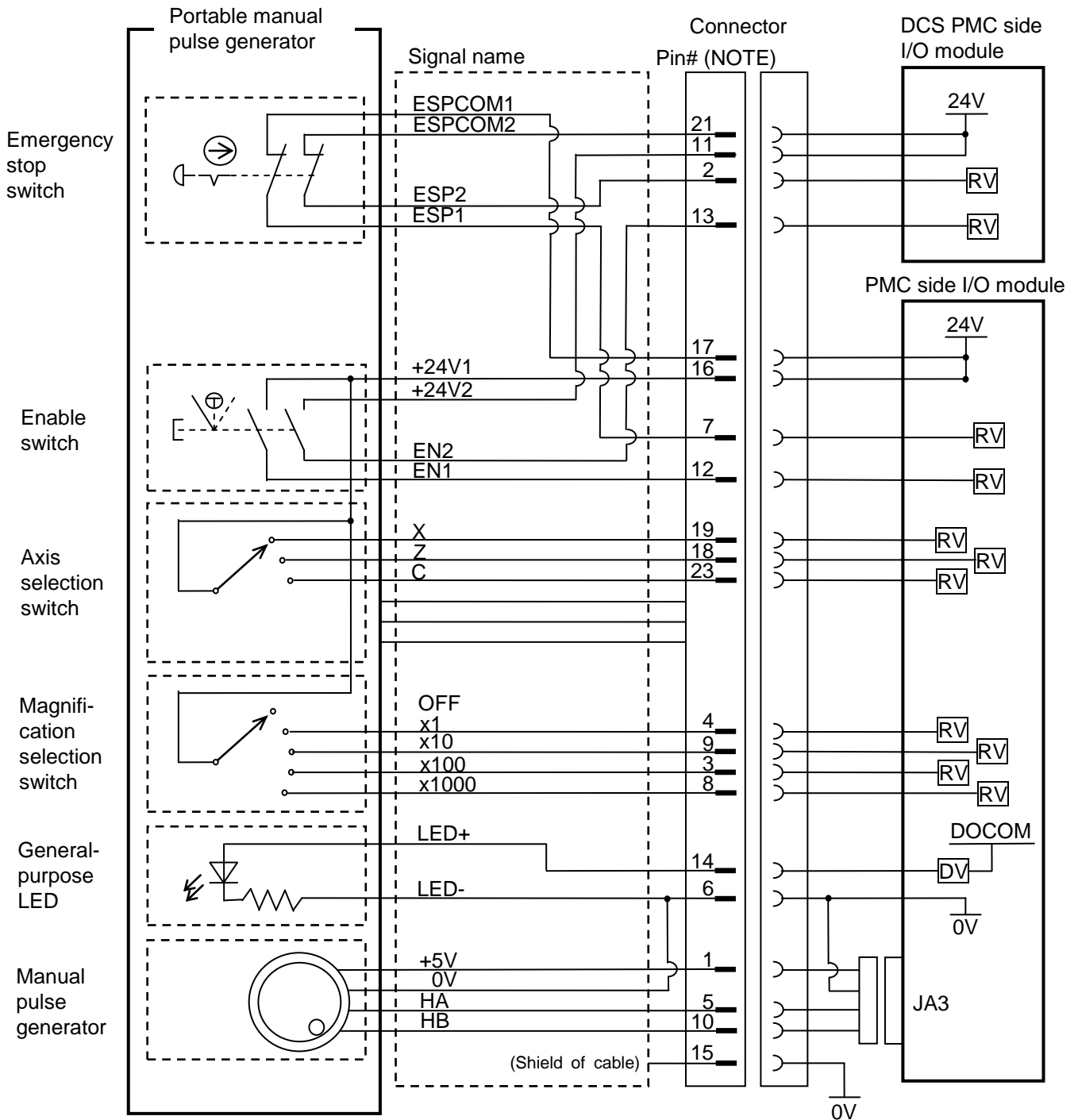
When the portable manual pulse generator is installed on a machine, it is necessary to order the following item:

Name	Ordering information	Remarks
Connector for machine tool side	A13B-0206-K001	Hirose Electric Co., Ltd., JR25WR-24S(71)

2. CONNECTION

2.1 OVERVIEW

Connection example for the T series (axis selection switch: X, Z, and C)



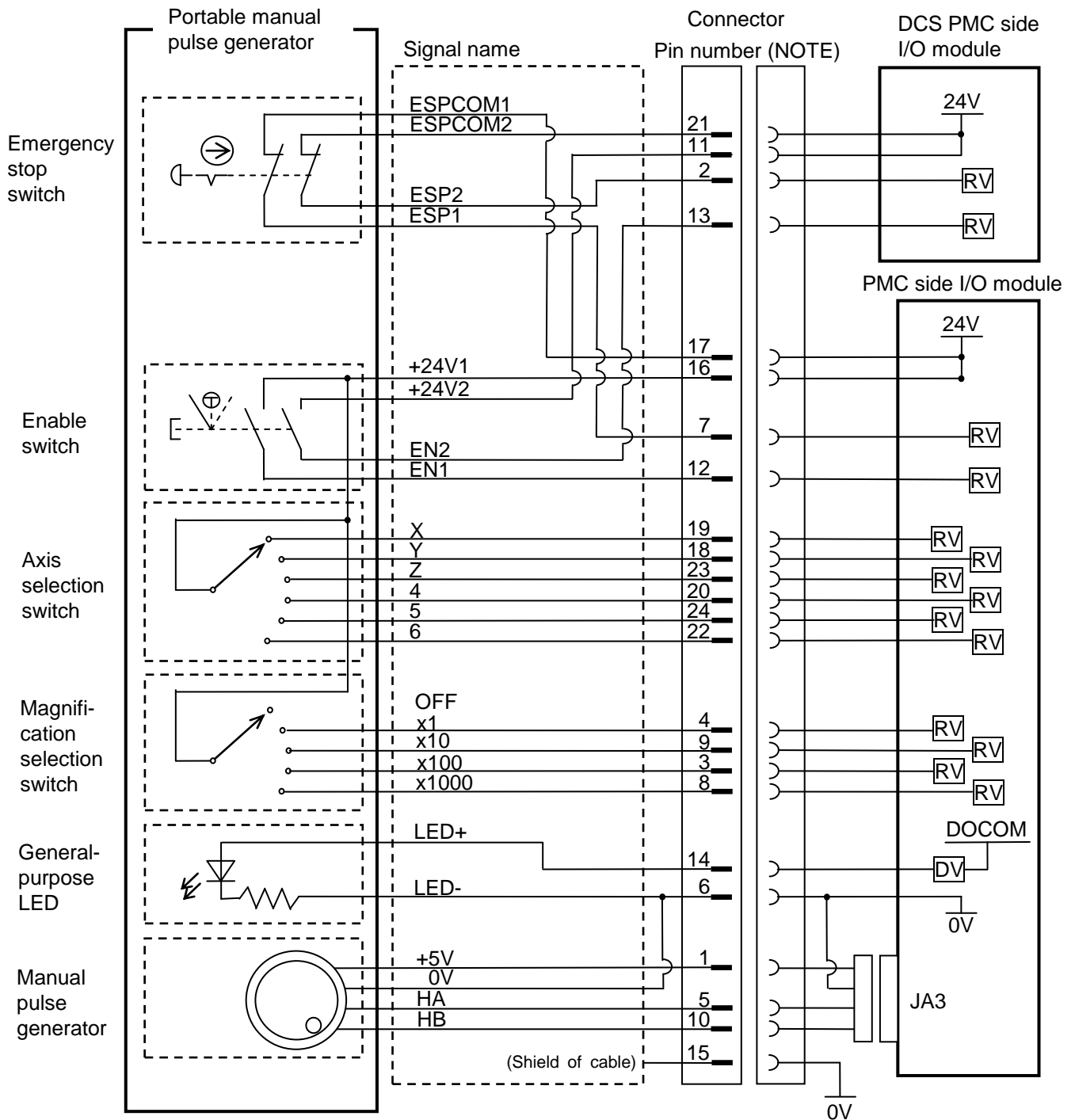
⚠ CAUTION

If not using +24V for DI that is output from a FANUC I/O device, be sure to mount a fuse (with a capacity of 1A or less). Otherwise, if a fault such as a ground fault occurs on the path, this can cause fire, breakdown, blowout, malfunctions, etc.

NOTE

For information about Pin number, see Section 2.9.
The cable of the portable manual pulse generator is shielded.
Connect the cable shield (Pin# 15) to the ground on the machine side.

Connection example for the M series (axis selection switch: X, Y, Z, 4, 5, and 6)



CAUTION
 If not using +24V for DI that is output from a FANUC I/O device, be sure to mount a fuse (with a capacity of 1A or less). Otherwise, if a fault such as a ground fault occurs on the path, this can cause fire, breakdown, blowout, malfunctions, etc.

NOTE
 For information about Pin number, see Section 2.9.
 The cable of the portable manual pulse generator is shielded.
 Connect the cable shield (Pin# 15) to the ground on the machine side.

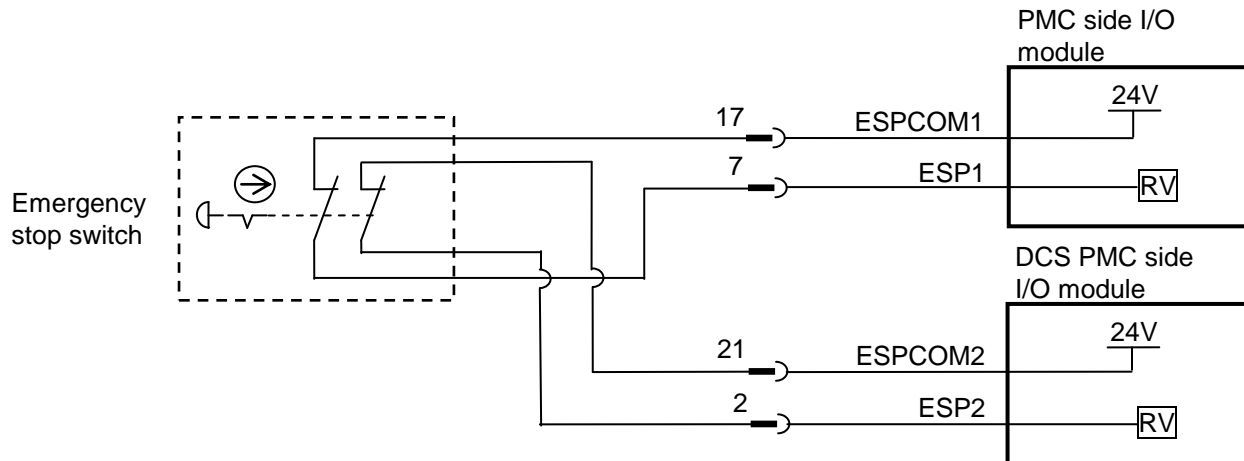
2.2 EMERGENCY STOP SWITCH

To detect contact failures, the emergency stop switch has two contacts.

For safety reasons, use the two contacts to detect mismatches.

Connect the emergency stop signal (ESP1, ESP2) to the safety circuit for the entire machine.

Condition	Specifications
Contacts	NC, 2 contacts
Insulating resistance	100MΩ or greater
Maximum voltage	30V (DC)
Maximum current	10mA



⚠ CAUTION

- 1 Periodically check that the emergency stop switch functions normally.
- 2 When using the portable manual pulse generator, make sure that the CNC and the servo amplifier can be brought to an emergency stop, using the emergency stop switch of the portable manual pulse generator.
- 3 If using the portable manual pulse generator with a detachable connection, remove the portable manual pulse generator from the connection panel when not operating it, and store it in a location where it cannot be operated. (This is required to prevent other people from misunderstanding that the emergency stop switch on the portable manual pulse generator is effective.)
- 4 At the uppermost stream of the emergency stop line, be sure to mount a fuse (with a capacity of 1A or less). Otherwise, if a fault such as a ground fault occurs on the path, this can cause fire, breakdown, blowout, malfunctions, etc.

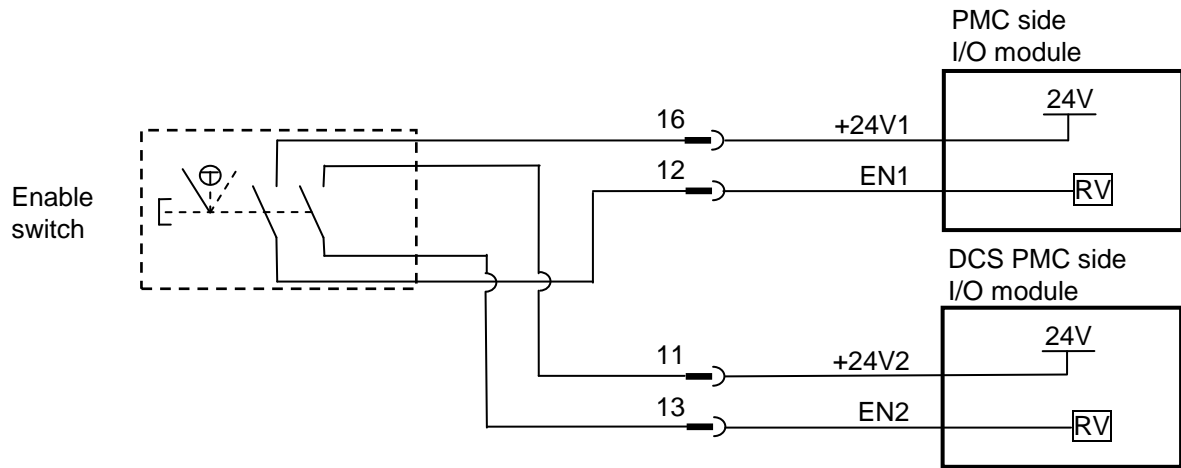
2.3 ENABLE SWITCH

To detect contact failures, the enable switch has two contacts.

For safety reasons, use the two contacts to detect mismatches.

This switch has three positions, OFF, ON, and OFF. For use, it must be held in a hand. When kept in the intermediate position, the switch is in the ON (contact closed) state. If the operator faces danger, for example, and releases the switch from his or her hand or, conversely, holds it tight, the switch is placed in the OFF (contact open) state.

Condition	Specifications
Contacts	NO, 3 positions, 2 contacts
Maximum voltage	30V (DC)
Maximum current	10mA



When operating the enable switch, hold it tight until it reaches the intermediate position. The enable switch incorporates two independent contacts. Because of the structure, a mismatch may occur between the two contacts if operations such as the following are performed: Keeping the switch before the intermediate position; and holding the switch slowly. The force required to hold the enable switch to the intermediate position is about 3N, and the force required to hold it beyond the intermediate position is about 12N. When the enable switch is operated, it is not necessary to search for the intermediate position.

If, during machine operation, the enable switch is held strongly, first release the enable switch for safety reasons and then restart the operation.

If the machine is operated (with jog feed or with the manual pulse generator), category 3 of ISO13849-1 may be required due to safety standards, etc. By using the machine with the enable switch, it is possible to conform to the category. (NOTE 1)

⚠ CAUTION

- 1 If the operator may face danger when operating the machine with the portable manual pulse generator, be sure to configure a safety circuit so that the machine can be placed in the interlock state, using the enable switch on the portable manual pulse generator.
- 2 Before performing any operations that may cause the operator to face danger, such as opening the protective cover and entering inside the safety fence, the operator must check that the enable switch functions normally in a state in which he or she is safe.

NOTE

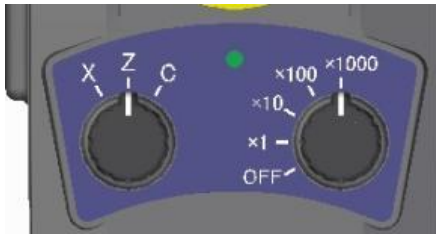
- 1 The safety standard may differ from one machine to another. Check the relevant safety standard. Using Dual Check Safety (DCS) function in a system, the enable switch in the portable manual pulse generator is complied with Category 3 PL d.

2.4 AXIS SELECTION SWITCH

This switch is used to select the axis on which to perform manual handle feed.

The switch is available in two types, one for the T series (3 contacts X, Z, and C) and the other for the M series (6 contacts X, Y, Z, 4, 5, and 6). Rotary switches with 3 contacts and 6 contacts are used for them, respectively.

The contact of the power for DI (+24V1) and the selected axis will be closed (ON).

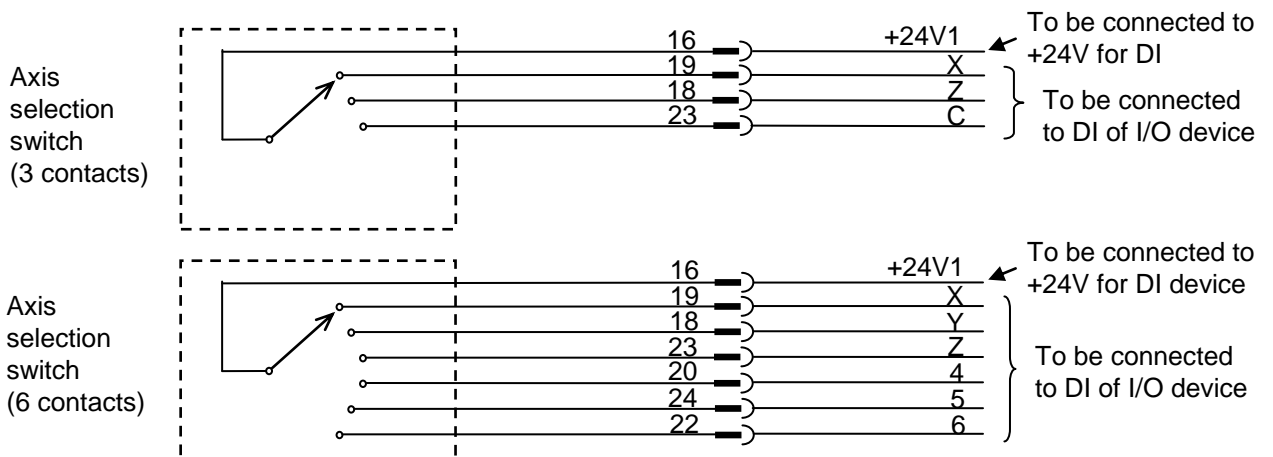


Axis selection switch, 3 contacts



Axis selection switch, 6 contacts

Condition	Specifications
Contacts	3 or 6
Maximum voltage	30V (DC)
Maximum current	10mA



NOTE

- We have two types of the axis selection switch: with 3 contacts and 6 contacts. Please select the switch in order to the axial composition in a machine tool.
- It is only two types that the scale description of the axis selection switch: X, Z and C (for T series), and X, Y, Z, 4, 5 and 6 (for M series). If you need other description, please make new label sheet following Appendix A (see p.18).

2.5 MAGNIFICATION SELECTION SWITCH

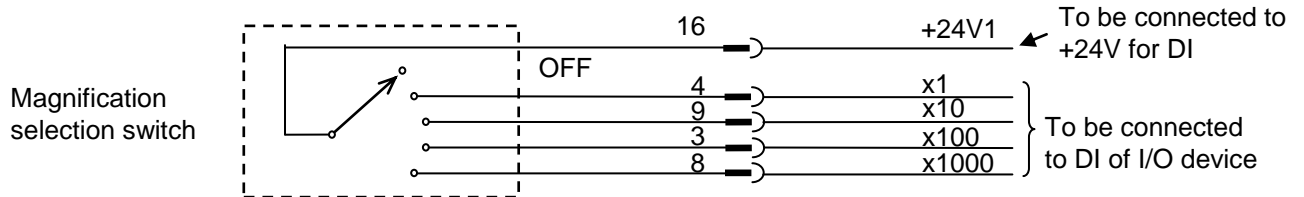
Set the travel distance per pulse of manual handle feed, using a magnification of the least input increment.

This is a switch with 5 contacts (OFF, x1, x10, x100, and x1000).

The contact of the power for DI (+24V1) and the selected magnification will be closed (ON).

If OFF is selected, no signal will be output.

Condition	Specifications
Contacts	5
Maximum voltage	30V (DC)
Maximum current	10mA



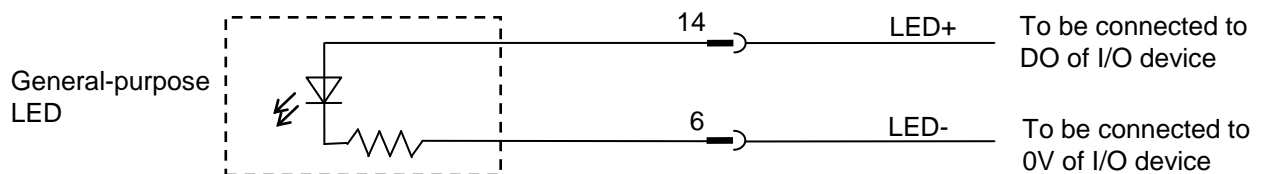
NOTE

- It is only one type that the scale description of the magnification switch: OFF, x1, x10, x100 and x1000. If you need other description, please make new label sheet following Appendix A (see p.18).

2.6 GENERAL-PURPOSE LED

The LED can be turned ON/OFF with DO signals.

Condition	Specifications
Maximum voltage	30V (DC)
LED allowable dissipation (absolute maximum rating)	62mW
LED forward current (absolute maximum rating)	25mA
Reverse voltage (absolute maximum rating)	5V
Resistance	5.6kΩ

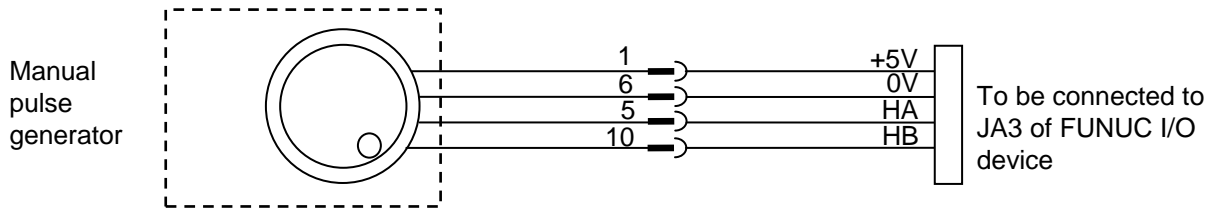


2.7 MANUAL PULSE GENERATOR

This generator outputs pulses for manual handle feed.

Mount the connector for connecting to JA3 of an I/O device.

Connect +5V and 0V to any of the following.



The connector for connecting to JA3 is lined up at FANUC.

Recommended connector:

A02B-0120-K303

(including the following connector and case

Connector: Hirose Electric Co., Ltd. FI40-2015S, type to be soldered

Case: Hirose Electric Co., Ltd. FI40-20-CV5)

Connection of JA3

1	HA	11	
2	HB	12	0V
3		13	
4		14	0V
5		15	
6		16	0V
7		17	
8		18	+5V
9	+5V	19	
10		20	+5V

NOTE

- Connect the shield of the cable of the portable manual pulse generator to the ground on the machine side.
- In the cabinet, separate the signals of the I/O device and the manual pulse generator from the power line when routing them.

2.8 CABLE

The cable is of straight or coiled type.

In the straight type, its length can be selected from 3.5m and 5.0m.

In the coiled type, its length is only 1.0m.

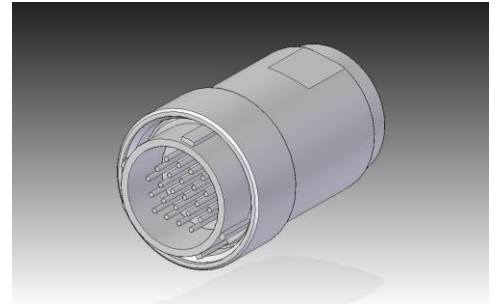
Both the straight type and the coiled type are shielded type cable.

2.9 CONNECTOR

Signals which connected to each contacts of a connector are following.

Signals "0V" and "LED-" are connected together in "6" of pin number.

Signal "SHIELD" means shield of cable, and it is connected in "15" of pin number.



Connection for the T series (axis selection switch: X, Z, and C)

1	2	3	4		
+5V	ESP2	x100	x1		
5	6	7	8	9	
HA	0V, LED-	ESP1	x1000	x10	
10	11	12	13	14	15
HB	+24V2	EN1	EN2	LED+	SHIELD
16	17	18	19	20	
+24V1	ESPCOM1	Z	X		
21	22	23	24		
ESPCOM2		C			

Connection for the M series (axis selection switch: X, Y, Z, 4, 5, and 6)

1	2	3	4		
+5V	ESP2	x100	x1		
5	6	7	8	9	
HA	0V, LED-	ESP1	x1000	x10	
10	11	12	13	14	15
HB	+24V2	EN1	EN2	LED+	SHIELD
16	17	18	19	20	
+24V1	ESPCOM1	Y	X	4	
21	22	23	24		
ESPCOM2	6	Z	5		

Connector for machine tool side is lined up at FANUC.

Ordering information

Connector for machine tool side: A13B-0206-K001 (supplied by FANUC)

or

JR25WP-24S(71) (supplied by Hirose Electric Co., Ltd.)



NOTE

- Please put the length of wiring inside machine tool within 1.0 m.

3. MAINTENANCE

A connector for machine tool side is mounted by the machine tool builder.

The connector treatment differs from one machine tool builder to another and, therefore, FANUC cannot perform maintenance on the connector treatment inside machine tool.

FANUC merely supplies the portable manual pulse generator. (including cable with connector).

4. SAFETY

For the safety of the machine, note the following:

- Connect the emergency stop signal of the portable manual pulse generator to the safety circuit of the entire machine so that the machine can stop in a safe manner when the emergency stop switch of the portable manual pulse generator is pressed.
- To detect contact failures, the emergency stop switch and the enable switch offer contacts for two systems.
Conducts mismatch detection with the signals of the two contacts.
- Prepare a ladder program so that the machine enters the interlock state when the signal of the enable switch is OFF.

5. INSTALLATION CONDITION FOR UL RECOGNITION

The portable manual pulse generator complies with UL standard.

Power supply unit for I/O unit to connect this unit must have an isolating device and the DC 24 Volt output must be isolated from AC mains supply.

 **WARNING**

- 1 When designing, be sure to observe all rules stated in this manual and any related manuals. Otherwise, failures and malfunctions may occur.
- 2 If the customer is to use a FANUC product for an application that can pose a significant danger to human lives and property, he or she is requested to confirm beforehand that the entire system is designed so that the risk is reported, that the necessary safety is ensured with redundant design, and that the FANUC product gets electric power and is installed in the entire system appropriately for the intended application.
- 3 Failures in the portable manual pulse generator, as well as input power abnormalities and communication failures, can hamper the normal operation of the portable manual pulse generator. Design the system in such a way that the machine can operate safely by, for example, providing a safety circuit outside the portable manual pulse generator so that no accidents will occur even if such failures occur.
Using the dual check safety function makes it possible to detect a single fault related to safety. For details of the dual check safety function, refer to the dual check safety manual for the CNC unit to use.
- 4 Coolants containing sulfur or chlorine at a high activation level, oil-free coolants called synthetic type coolants, and water-soluble coolants at a high alkali level, in particular, can largely affect the portable manual pulse generator. Note that such coolants can cause problems such as those described below.
 - Coolants containing sulfur or chlorine at a high activation level
Some coolants containing sulfur or chlorine are at an extremely high activity level. If such a coolant adheres to the portable manual pulse generator, it reacts chemically with resin and other materials, possibly leading to corrosion or deterioration. If it gets in the portable manual pulse generator, it corrodes copper, silver, and other metals used as component materials, possibly leading to component defects.
 - Synthetic type coolants having a high permeability
Some synthetic type coolants whose lubricating component is, for example, PAG (polyalkylene glycol) have an extremely high permeability. Even for equipment with a high airtightness, such a coolant can easily flow into the equipment through, for example, packings. If the coolant gets in the portable manual pulse generator, it may cause insulation deterioration and component failures.
 - Water-soluble coolants at a high alkali level
Some coolants whose pH is increased using alkanolamine are so strongly alkali that their standard dilution will reach pH10 or higher. If such a coolant spatters over the surface of the portable manual pulse generator, it reacts chemically with resin and other materials, possibly leading to corrosion or deterioration.
- 5 If the equipment is used in a manner not specified by FANUC, the protection provided by the equipment may be impaired.

 **CAUTION**

- 1 Install the portable manual pulse generator in such a place that neither cutting chips nor coolant will spatter over it. Otherwise, damage or malfunctions may occur.
- 2 Use the portable manual pulse generator within the rated voltage and current that are stated in this manual. Using it with any voltage and current other than the rated ones can cause fire, malfunctions, and failures.
- 3 We shall not guarantee the function and performance of a product used outside the standards stated in this manual or of a product altered by the customer.

FANUC CORPORATION
Oshino-Mura, Yamanashi Pref., 401-0597 JAPAN

