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TPC-Jr SERIES NC CONTROLLERS

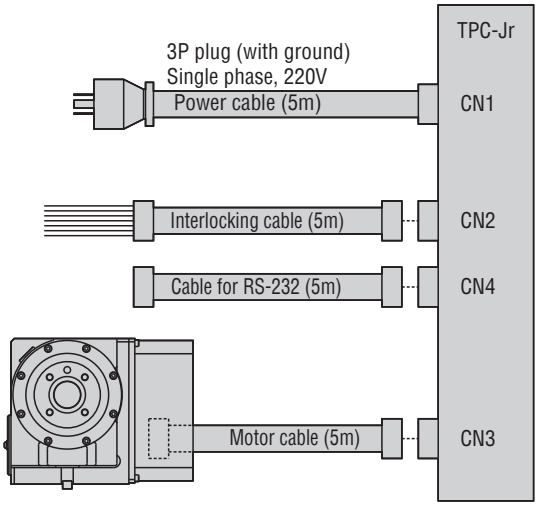
SINGLE AXIS NC CONTROLLER

The TPC-Jr is an "M" code triggered single axis NC controller package which includes a servomotor, amplifier, and cables. The TPC-Jr has a Remote Mode M+ feature which allows the downloading of program commands from a Fanuc, Mitsubishi, Yasnac, or Okuma machine tool control via an RS-232 port.

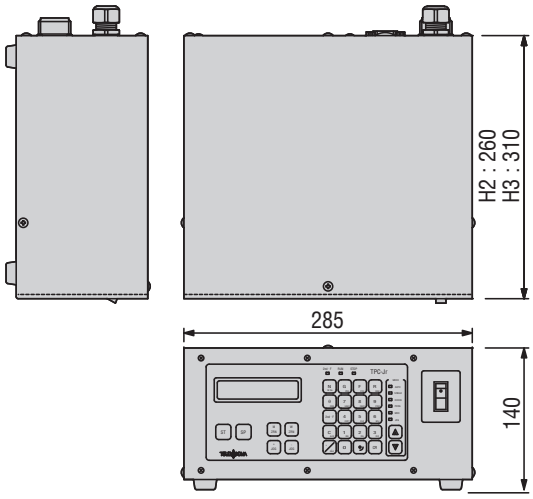
TPC MODEL SELECTION

NC Rotary Table		TPC-Jr Model	
		K2	K3
RN-100		●	
RWA-160		●	
RWA-200			●
RWA-250			●
RWA-320			●
RN-100,2/3/4			●
RN-150R,2			●
TN-101	Rotary & Tilt	●	
TWA-130	Rotary & Tilt	●	
TWA-160	Rotary & Tilt	●	
TWA-200	Rotary & Tilt		●
TBS-130		●	
TBS-160		●(R)	●(T)

TPC CABLES



TPC DIMENSIONS



TPC5 SERIES NC CONTROLLERS

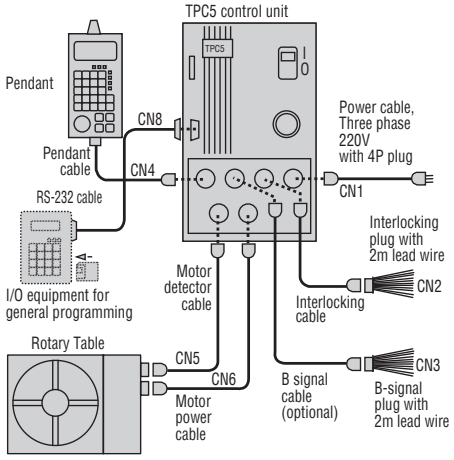
SINGLE AXIS NC CONTROLLER

The TPC5 has all of the features of the TPC-Jr with the addition of a hand pendant for easy set-up. An available TPC5 option allows a machine tool control to call up a work number, block number, and rotary angle command from the TPC5 via a binary signal.

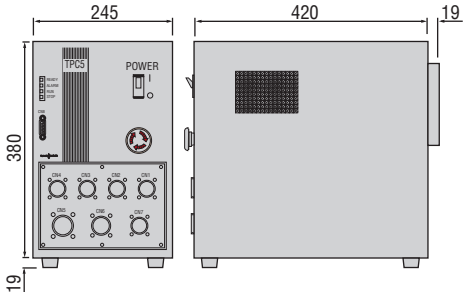
TPC5 MODEL SELECTION

NC Rotary Table	TPC5 Model		
	SR6	SR12	SR30
RNCM-251	●		
RNCM-301 ~ 631		●	
RWB-250	●		
RWB-320, 400, 500		●	
RNC (V,K) - 401 ~ 801		●	
RNC (V,K) - 1001 ~ 2001			●
TN-320	●		
THNC-251, 301	●		
TTNC-451, 631		●	
TTNC-1001			●
RBS-160, 250	●		
RBS-320		●	
TBS-250	●		

TPC5 CABLES



TPC5 DIMENSIONS



TPC-Jr FUNCTIONS

OPERATION PANEL

OPERATION MODE

- AUTO : Automatic operation by an M code signal from the machining center.
- SINGLE : Single operation of TPC-Jr. By pressing ST, the indexing is done one time.
- CHECK : Block number call, program check and self diagnosis.
- PROG : Program input edit.
- MDI : One block program carrying out. Useful when setting up workpiece.
- JOG : Manual feed, step feed

PROGRAM EDIT KEYS

2nd•F + N W No **Workpiece No. (Program No.)** 0000 ~ 9999 100 programs registrable

N W No **Block No.** 000 ~ 999

G PRG **Operation command** G0 ~ G4: Movement command G5 ~ G9: Secondary functions

F POS **Feedrate select command** F0: Rapid positioning speed F1 ~ F9: Cutting feedrate

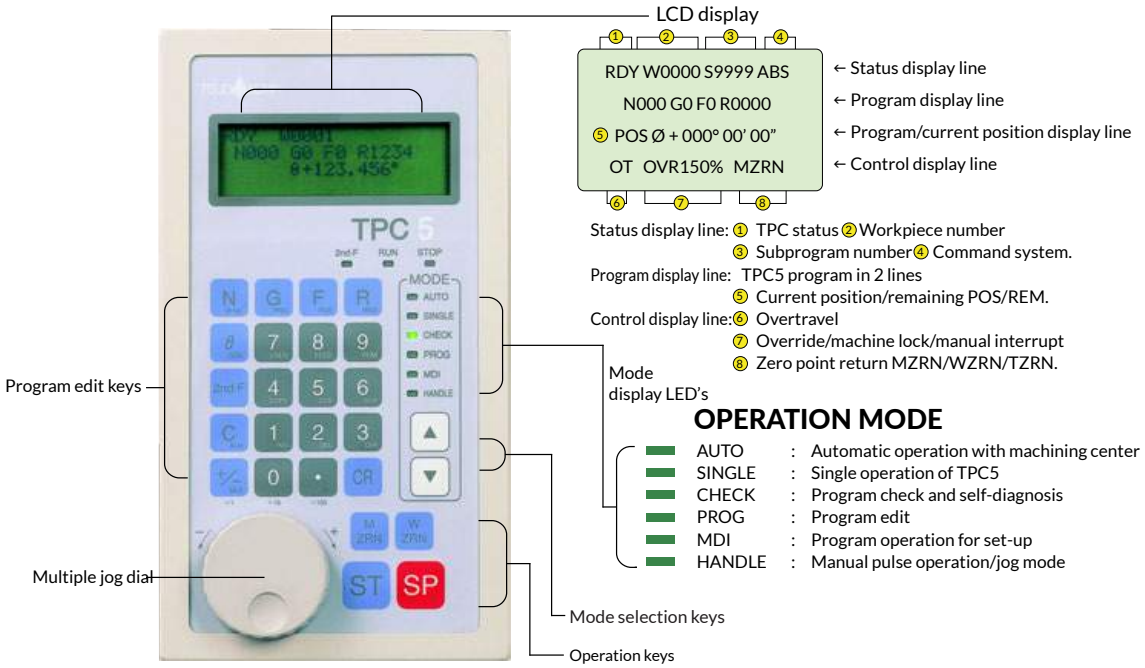
R REM **Defines "G" code function**

θ DGN **Movement amount command** (angle value, divisions, or repetition #)

G code		R code		θ code	
No.	Command	No.	Command	Command	Setting
G0	Direct angle command	001~999	Number of repetitions (INC)	Command angle	±000.000° ~ ±999.999°
		000	(ABS)	Command angle	±000.000° ~ ±360.000°
G1	Direct indexing number command	001~999	Number of repetitions	# of divisions for 360°	±1 ~ ±999,999 div.
G2	Arc-indexing number command	001~999	Number of divisions/repetitions	Arc-angle indexed	±000.001° ~ ±360.000°
G3	Lead cutting command	000~045	Number of table rotations	Command angle	±0 ° ~ ±360.000°
G4	Zero point return command	000	1st zero point return (mechanical zero point)	Not required	
		001	2nd zero point return		
		002	3rd zero point return		
G5	Sub-program call command	000~999	Number of repetitions	Sub-program No.	0000~ 9999
G6	Sub-program return command	Not required		Not required	
G7	Program end command	Not required		Target address	000~999
G8	Workpiece coordinate system setting command	Not required		Reference coordinate	±0° ~ ±360.000°
G9	Declaration command	000	No operation	Not required	
		001/002	Clamp OFF/ON		
		003/004	Dowe l OFF/ON	Dwell time	000 ~ 999 (x10msec)
		005/006	Indexing group control OFF/ON	Not required	
		007/008	Directional positioning OFF/ON		
		009/010	Completion signal control command OFF/ON	Completion signal selection	
		011	Program display selection command	Not required	
		012	Current position display selection command		
		013	Remaining angle display selection command		

TPC5 FUNCTIONS

OPERATION PANEL



OPERATION MODE

AUTO	:	Automatic operation with machining center
SINGLE	:	Single operation of TPC5
CHECK	:	Program check and self-diagnosis
PROG	:	Program edit
MDI	:	Program operation for set-up
HANDLE	:	Manual pulse operation/jog mode

PROGRAM EDIT KEYS

2nd•F + N W No — **Workpiece No. (Program No.)** — 0000 ~ 9999 100 programs registrable

N W No — **Block No.** — 000 ~ 999

G PRG — **Operation command** — G0 ~ G4: Movement command G5 ~ G9: Secondary functions

F POS — **Feedrate select command** — F0: Rapid positioning speed F1 ~ F9: Cutting feedrate

R REM — **Defines "G" code function**

θ DGN — **Movement amount command** (angle value, divisions, or repetition #)

G code		R code		θ code	
No.	Command	No.	Command	Command	Setting
G0	Direct angle command	0001~9999	Number of repetitions (INC)	Command angle	±000.000° ~ ±999.999°
		0000	(ABS)	Command angle	±000.000° ~ ±360.000°
G1	Direct indexing number command	0001~9999	Number of repetitions	# of divisions for 360°	±1 ~ ±999,999 div.
G2	Arc-indexing number command	0001~9999	Number of divisions, Number of divisions/ repetitions	Arc-angle indexed	±000.001° ~ ±360.000°
G3	Lead cutting command	0000~0045	Number of table rotations	Command angle	±0° ~ ±360.000°
G4	Zero point return command	0000	1st zero point return (mechanical zero point)	Not required	
		0001	2nd zero point return		
		0002	3rd zero point return		
G5	Sub-program call command	0000~9999	Number of repetitions	Sub-program No.	0000 (0001) ~ 9999
G6	Sub-program return command	Not required		Not required	
G7	Program end command	Not required		Target address	000~999
G8	Workpiece coordinate system setting command	Not required		Reference coordinate	±0° ~ ±360.000°
G9	Declaration command	0000	No operation	Not required	
		0001/0002	Clamp OFF/ON		
		0003/0004	Dwell OFF/ON	Dwell time	000 ~ 999 (x10msec)
		0005/0006	Indexing group control OFF/ON	Not required	
		0007/0008	Directional positioning OFF/ON		
		0009/0010	Completion signal control command OFF/ON	Completion signal selection	
		0011	Program display selection command	Not required	
		0012	Current position display selection command		
		0013	Remaining angle display selection command		

SPECIFICATIONS OF TPC

		TPC-Jr	TPC5
Control Axis		1 axis	
Servo Motor		AC Servo: ABS Detector	
Command Unit		0.001° (Decimal)	1 sec,0.001°,0.0001° (Decimal)
Indexing Number	Direct Indexing	1~999999 even indexing	
	Arc-Indexing	1~999 even indexing	1~9999 even indexing
Max. Command Angle		±999.999°	±999°59'59",±999.999°,±999.9999
Command System		INC, ABS, Shortcut ABS, INC/ABS mixed system	
Input System		MDI	
Program Control		Workpiece No. (W0000 to 9999)	
Program Capacity		1,000 blocks (total of main & sub programs)	2,000 blocks (total of main & sub programs)
Positioning Speed		Max. motor rotation speed: 3,000rpm	Max. motor rotation speed: 3,000rpm
Operation Mode		AUTO: Operation interlocked w/ mach. ctr.	AUTO: Operation interlocked w/ mach. ctr.
		SINGLE: Single operation of TPC	SINGLE: Single operation of TPC
		CHECK: Program check & call	CHECK: Program check & call
		PROG: Program edit	PROG: Program edit
		MDI: Set-up operation	MDI: Set-up operation
		JOG: Manual feed, step feed	JOG: Manual pulse operation
Display		LCD screen: 20 figures x 2 lines	LCD screen: 20 figures x 4 lines
Direct Indexing # Command		Move angle is directly commanded	
Repetition		Command of # of move amount repetitions 999 (TPC-Jr) 1~9999 (TPC5)	
Direct Indexing # Command		Indexing number of 6 digits for 360°	
Arc-Indexing # Command		Command of arbitrary 3-digit angle (TPC-Jr) or 4-digit angle (TPC5)	
Lead Cutting Command		Interlocked operation with one axis of the machining center in the open loop status	
Zero Point Return Command		Allows return to the first, second or third-zero point	
Feedrate Command		F0: positioning speed F1~9: cutting feedrate	
Feedrate Setting		1. By radius and surface speed setting 2. By move amount per second	
Sub-Program		Up to 8 levels of nesting are possible	
Workpiece coordinate System Setting		Allows a workpiece coordinate to be set at any point	
Dwell		Allows output of a positioning completion signal to be delayed	
Single Directional Positioning		Allows positioning of one direction	
Backlash Compensation		In increments of 0.001°	In increments of detecting unit
Soft Limit Function		Sets a soft limit measured from the 1st zero position	
Automatic Setting at power ON		1. Mode selection, AUTO/CHECK 2. Workpiece number setting 3. Block number setting	
Edit Function		1. Insert 2. Delete 3. Copy	
Alarm		1. Program format errors 2. Program memory errors 3. Communication Errors 4. Soft limit alarms 5. Overtravel 6. Servo motor alarms 7. Overheat in the cabinet (TPC5)	
Override Function		X	5~200% 5% steps
JOG/HANDLE Feeding		Jog feed, step feed	Manual pulse feed, jog feed
Overtravel		The rotation range of the rotary table can be limited by limit switches. (Std. tilting axis)	
Manual 2nd Zero Setting		Enables the 2nd zero position to be set and changed at any point in the JOG (HANDLE) mode	
Input/Output Signal Check			
Contrast		The concentration on the LCD screen can be adjusted	
Power Earth (less than 100 ohm earth resistance)		1ø200/220V±10% 50/60Hz	3ø200/220V±10% 50/60Hz
		Model / Pwr Capacity / Fuse Rating	Model / Pwr Capacity / Fuse Rating
		Jr G2 / 1.2KVA / 8A	TPC5-SR6 / 2.3KVA / 10A
		Jr G3 / 2.2KVA / 12A	TPC5-SR12 / 4.3KVA / 15A
			TPC5-SR30 / 5.9KVA / 20A
Environmental Conditions		Ambient temperature: 0-40° • Relative humidity: 20-80% (no condensation) Vibration: 0.3G or less, no corrosive gas	
External Dimensions		**Jr H2 Unit** Weight: 7.2kg/16lbs 285mm (w) x 260mm (d) x 128mm (h)	**Control Unit** Weight: 22kg/48lbs 245mm (w) x 420mm (d) x 380mm (h)
		Jr H3 Unit Weight: 8.1kg/18lbs 285mm (w) x 310mm (d) x 128mm (h)	**MDI Unit** Weight: 0.5kg/1lb 111mm (w) x 30mm (d) x 1998mm (h)
External Output Signal		From TPC to machining center Contact ratings: 24VDC, 0.5A or less	

SPECIFICATIONS OF TPC

	TPC-Jr	TPC5
FIN1	Positioning completion signal during interlocking operation	
	●	●
FIN2	Output of G7 completion or workpiece # setting completion (selectable by parameters)	
	● (AUTO mode)	◇
FIN3	Output of G7 completion or workpiece # setting completion (selectable by parameters)	
	X	◇
FIN4	Output of zero position (selectable by parameters)	
	X	◇
Workpiece number setting completion	Output at workpiece # setting completion (selectable by parameters)	
	X	◇
In AUTO mode	Output in AUTO mode	
	X	◇
LEVEL	Output during positioning (selectable by parameters)	
	● (Rotary table zero position)	◇
ALARM	Output in AUTO mode	
	●	◇
External input signal	From machining center to TPC (External power 24VDC is also available)	
START	Positioning start signal during interlocking operation (M-signal)	
	●	●
STOP	Input to stop rotary table	
	●	●
INTERLOCK	Input to interlock rotary table	
	X	◇
4-digit BCD code or 16bit BIN	Workpiece number can be set externally	
	● (16 kinds)	◇
BF (strobe signal)	Strobe signal for setting workpiece number externally	
	X	◇
M-signal	Fixed indexing angle input system by M-signal	
	X	◇
MDI lock	Input for locking MDI key operation	
	X	◇
Zero point return	1st zero return command	
	●	◇
Manual pulse generator	Manual operation can be performed with a manual pulse generator	
	X	● (movement magnification:X1,X10,X100)
Full-closed feedback control	X	Enable full-closed control (highly precise) with the inductsyn or rotary encoder
MP scale	Detecting unit 0.0001° (360 poles) or 0.00005 (720 poles)	
	X	◈
Encoder	Detecting unit 0.0001° or 0.00005°	
	X	◈
Serial Channel	TPC program, feed rate and parameters can be stored in an external device	
	Format: IISO	Format: IISO or EIA
	◈ (RS-232)	◈ (RS-232 or RS-422)
Cable supplied (standard)	Between rotary table and TPC-Jr (1 pc) For motor: 5m	Between rotary table and TPC5 (2 pcs) For motor power supply: 5m For motor detector: 5m
	-	Between TPC5 and MDI unit: 7m
	Power cable: 5m	Power cable: 5m
	Interlocking cable: 5m	Interlocking cable: 5m
Cable supplied (option)	Cables of different lengths are available	
	RS-232 cable: 5m	Interlocking cable: 5m
	-	B signal cable: 5m
	-	RS-232 cable: 5m

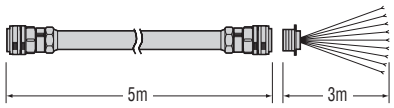
● - Standard

◇ - Optional interlocking cables are supplied

◈ - Optional units and parts are supplied

TPC OPTION

TPC5 Full-Featured Interlocking Cable

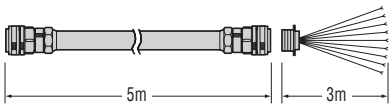


Required for the following functions:

- Stop or interlock input signal
- Positioning completion 2,3,4
- AUTO mode
- Positioning
- Alarm signal

- Full-featured interlocking cable (Standard length: 5m)

TPC5 B Signal Cable

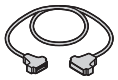


Required for the following functions:

- External input of workpiece numbers
- External input of angles
- Fixed indexing angle input system by M-signal

- Full-featured interlocking cable (Standard length: 5m)

TPC-Jr TPC5 RS-232 Cable



Input and output of program, parameter and feed data for TPC5 and TPC-Jr, and data printout are carried out through external equipment, which is to be prepared by the customer.

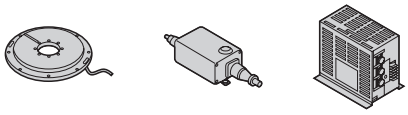
- RS-232 cable (Standard length: 5m)
- RS-422 cable (Standard length: 5m)

TPC5 High Resolution Capability Rotary Encoder Type

Fully-closed loop control is possible by the feed-back from the rotary encoder.

- Rotary encoders
- IBV unit (by HEIDENHAIN)
- TPC5 RE

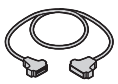
TPC5 High Resolution Capability MP Scale Type



Fully-closed loop control is possible by the feed-back from the MP scale.

- MP scale
- Pre-amplifier
- A/D converter (Mitsubishi Heavy Industries)
- TPC5 RE

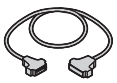
TPC-Jr TPC5 "Remote Mode" Specification



Available for measuring system construction. To be connected with a personal computer using serial channel.

- RS-232 cable

TPC-Jr TPC5 "Remote Mode + M" Specification



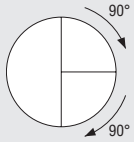
A function to unify the program to start the rotary table by M-signal, by feeding a command for the indexing angle from the RS-232 port at the NC controller of the machining center.

Note: This function may not be available for some machining centers.

- RS-232 cable

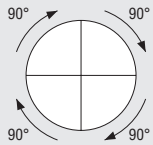
TPC MACHINING PROGRAM EXAMPLES

Direct angle command: G0



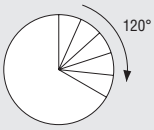
N W No 000 G PRG 0 F POS 0 R REM 002 θ DGN 90.000 CR	Quick; Repetition #; Indexing angle/time	Positioning at 90° twice
N W No 001 G PRG 7 θ DGN 000 CR	End of program	Return to N W No 000 at the program end

Direct indexing number command: G1 (even indexing)



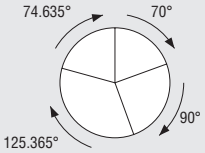
N W No 000 G PRG 1 F POS 0 R REM 004 θ DGN 000004d CR	Dividing 360° by 4	Dividing 360° by 4, four times
N W No 001 G PRG 7 θ DGN 000 CR		Return to N W No 000 at the program end

Arc-indexing number command: G2 (even indexing by an arbitrarily-set angle)



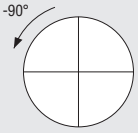
N W No 000 G PRG 2 F POS 0 R REM 005 θ DGN 120.000 CR	Division #; Arc-angle for dividing	Dividing 120° by 5, five times
N W No 001 G PRG 7 θ DGN 000 CR		Return to N W No 000 at the program end

Uneven indexing



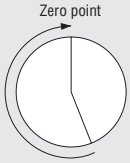
N W No 000 G PRG 0 F POS 0 R REM 001 θ DGN 70.000 CR	Positioning at 70° once
N W No 001 G PRG 0 F POS 0 R REM 001 θ DGN 90.000 CR	Positioning at 90° once
N W No 002 G PRG 0 F POS 0 R REM 001 θ DGN 125.365 CR	Positioning at 125.365° once
N W No 003 G PRG 0 F POS 0 R REM 001 θ DGN 74.635 CR	Positioning at 74.635° once
N W No 004 G PRG 7 θ DGN 000 CR	Return to N W No 000 at the program end

(-) direction indexing



N W No 000 G PRG 0 F POS 0 R REM 001 θ DGN -90.000 CR	Reverse	Positioning at -90° once
N W No 001 G PRG 7 θ DGN 000 CR		Return to N W No 000 at the program end

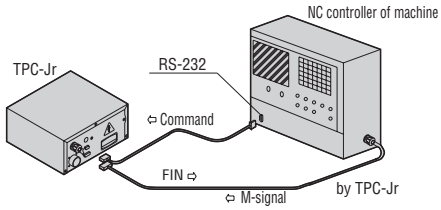
Zero point return command: G4

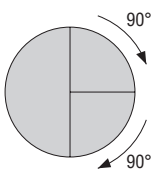


N W No 000 G PRG 4 R REM 000 CR	Zero return; To 1st zero position	Return to 1st zero position

REMOTE MODE + M SPECIFICATION

The TPC control is capable of receiving indexing information from the machining center control via the RS-232 ports. An "M" code is required to execute the move command. An RS-232 cross cable is provided with the TPC control. Machining center requirements: an RS-232 connector and Custom Macro B (optional) (for FANUC).





POPEN: = RS-232 port opens
DPRINT[/MOVA90.]: = Command of absolute positioning at 90° is transmitted to TPC
M70: = Positioning starts
GO1Z100.F200: = Machining center in operation
DPRINT[/MOVA180.]: = Command of absolute positioning at 180° is transmitted to TPC
M70: = Positioning starts
GO1Z100.F200: = Machining center in operation
PCLOS: = RS-232 port closes

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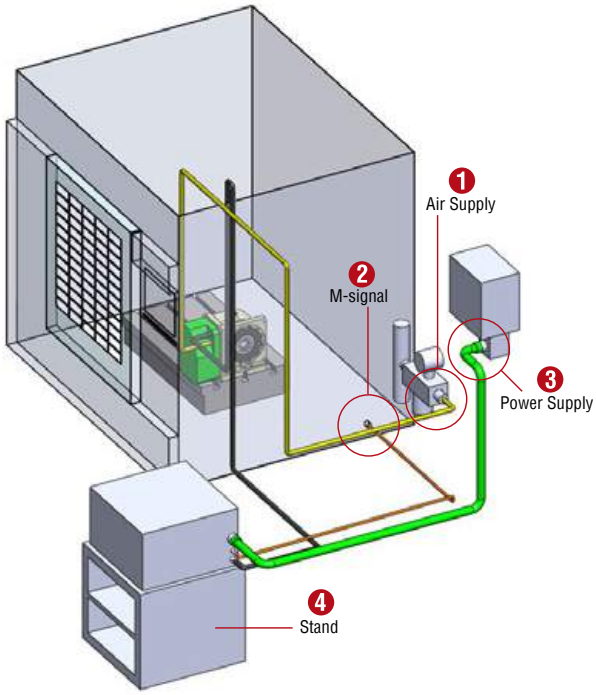
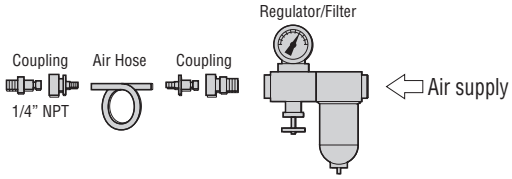
INSTALLATION OF TPC CONTROLLER



1 Air Supply

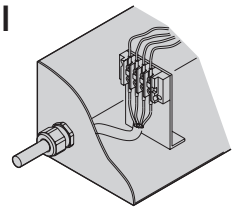


A pneumatic or air/hydraulic clamp system is available for an NC rotary table mounted with the TPC5 or TPC-Jr controller, and air supply is required.

The following are to be provided by customers.

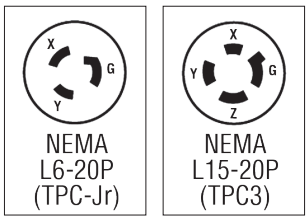
- Air filter and regulator (Air pressure: 72 psi)
- Air hose
- Joint coupler (1/4" NPT fitting for the table)

2 M-signal



When a machining center controls the rotary table, the command is normally made by M-signal. All machine tool M-signal cables must be connected to a terminal block in the machine tool cabinet. For connection with an interlocking cable

3 Power supply



The TPC-Jr controller is supplied with a NEMA L6-20P plug (20 amp, 1 phase, 250V). The TPC5 controller is supplied with a NEMA L15-20P plug (20 amp, 3 phase, 250V).

If connectors other than the above are used, they are to be supplied by the customer. For the power requirements of TPC controllers, refer to the TPC specifications page.

The TPC controller should be connected to the machine tool emergency stop circuit. If the available power supply voltage is different from the required voltage, a transformer must be used. See the TPC specifications page for complete power requirements.

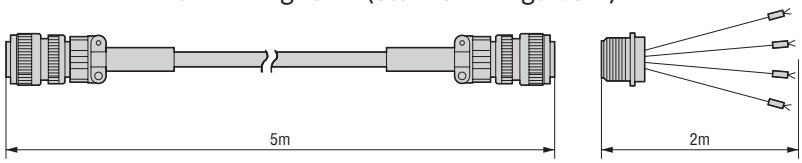
4 Stand

A stand for the TPC controller should be provided by the customer. For the dimensions and weight of the controller, refer to the TPC specifications page.

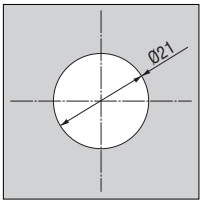
TPC CONTROLLERS TO INTERLOCK WITH MACHINING TOOLS

TPC-Jr

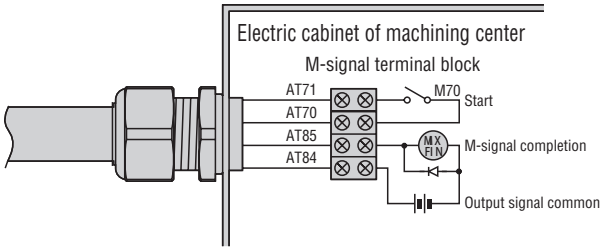
Interlocking cable (Standard length: 5m)



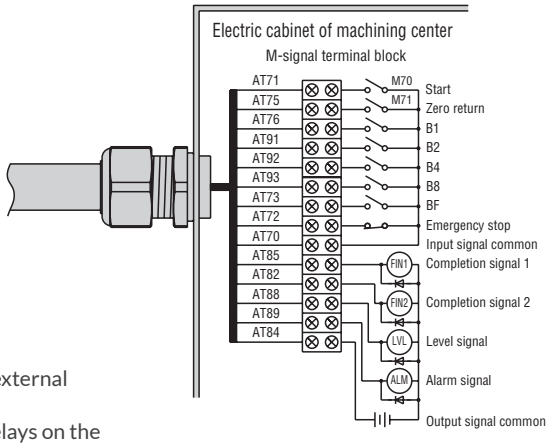
Connector hole diameter
for machining center cabinet



Standard interlocking cable set-up: when a start signal and an indexing completion signal are used.



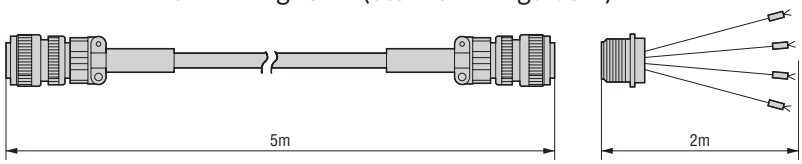
All features cable set-up: when the signals available on an interlocking cable are used.



Note 1: When completion signals are received by a relay, the power supply should be 24VDC. Do not use AC100V or 200V.
2: By changing the switch in the controller, a start signal is also available with a 24VDC external power supply.
3: Be sure to take countermeasures against electric noise by attaching surge killers to relays on the machining center.

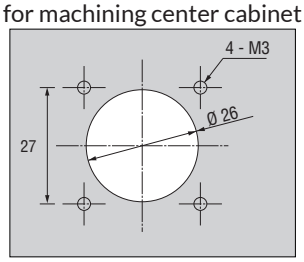
TPC5

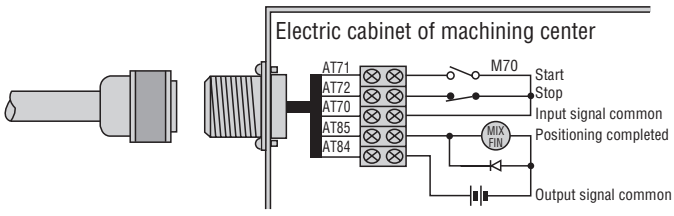
Interlocking cable (Standard length: 5m)



Standard interlocking cable set-up: for interlocking only with M-signal and the completion signal.

Connector hole diameter
for machining center cabinet



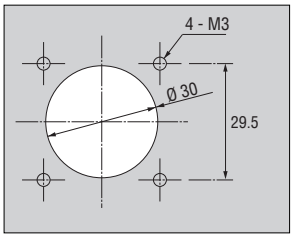


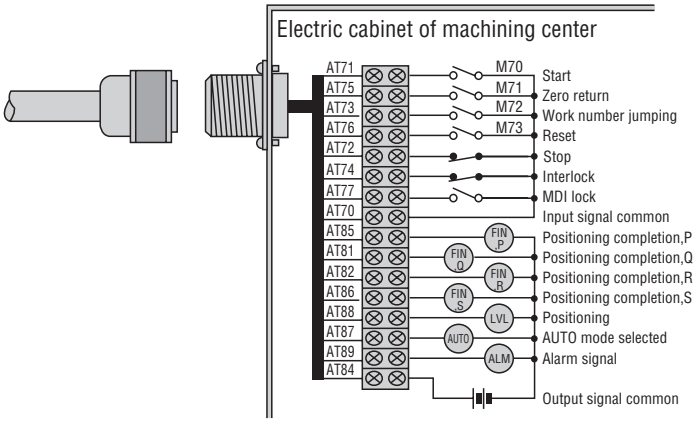
TPC CONTROLLERS TO INTERLOCK WITH MACHINING TOOLS (cont.)

All features interlocking cable set-up (optional)

A variety of signals, such as a stop or interlock input signal and a level or alarm output signal are available with this cable. A "B" signal cable is required with the setting functions for the workpiece number and angle data are used, or when the fixed indexing angle input system by an M-signal is used.

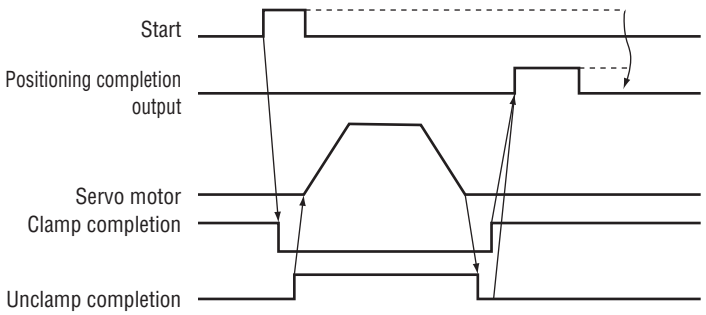
Connector hole diameter
for machining center cabinet





Note 1: When completion signals are received by a relay, the power supply should be 24VDC. Do not use AC100V or 200V.
2: By changing the switch in the controller, a start signal is also available with a 24VDC external power supply.
3: Be sure to take countermeasures against electric noise by attaching surge killers to relays on the machining center.

TIME CHART



Note 1: A start input signal, in the form of either a pulse signal (of more than 10 msec) or level signal can be accepted.
2: During an interlock operation with a machining center by means of an M-signal, the positioning completion should coincide with the M-signal completion.

RN-100, RWA-160, 200, 250, 320 / TPC CONTROL SPECIFICATIONS

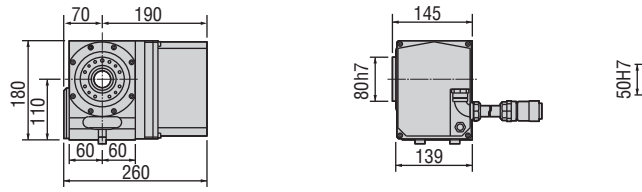
TPC MODEL / TABLE & MOTOR SPEED

Table Model	RN-100	RWA-160	RWA-200	RWA-250	RWA-320	RN-100,2	RN-100,3	RN-100,4
TPC Model	TPC-Jr K2	TPC-Jr K2	TPC-Jr K3	TPC-Jr K3	TPC-Jr K3	TPC-Jr K3	TPC-Jr K3	TPC-Jr K3
Speed reduction ratio	1/36	1/72	1/72	1/120	1/180	1/36	1/60	1/60
Table/Motor RPM	66.7/2,400	41.7/3,000	41.7/3,000	25/3,000	16.7/3,000	55.6/2,000	50/3,000	50/3,000

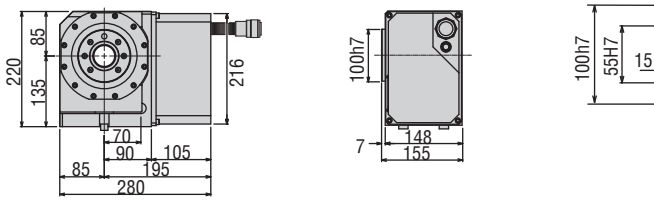
Dimensions

Drawings not to scale • Dimensions = mm

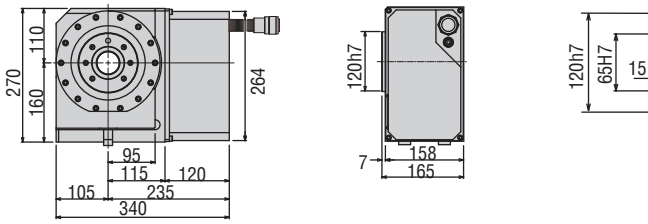
RN-100R/TPC-Jr K2



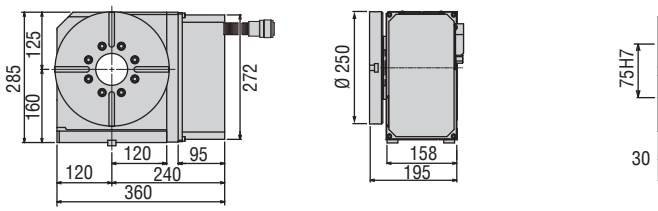
RWA-160R/TPC-Jr K2



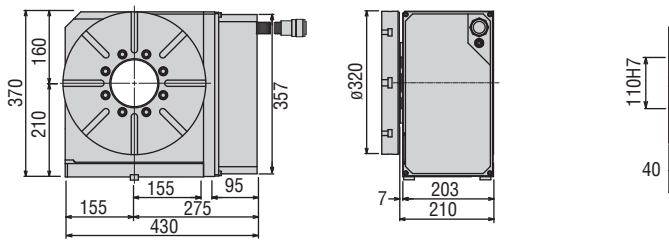
RWA-200R/TPC-Jr K3



RWA-250R/TPC-Jr K3



RWA-320R/TPC-Jr K3



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TN-101/320 | TWA-130/160/200 TPC CONTROL SPECIFICATIONS

TPC MODEL / TABLE & MOTOR SPEED

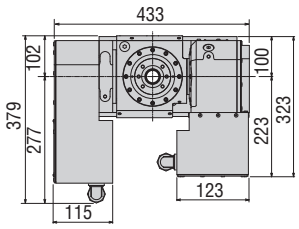
Table Model	TN-101		TWA-130		TWA-160		TWA-200		TN-320	
Table axis	Rotary	Tilt	Rotary	Tilt	Rotary	Tilt	Rotary	Tilt	Rotary	Tilt
TPC model	TPC-Jr K2		TPC-Jr K2		TPC-Jr K2		TPC-Jr K3		TPC5 SR6	
Speed reduction ratio	1/60	1/120	1/60	1/120	1/72	1/120	1/45	1/90	1/120	1/240
Table rpm (motor @2,000)	33.3	16.7	33.3	16.7	27.8	16.7	44.4	27.8	16.7	8.3

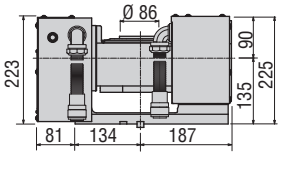
Contact for TPC use with continuous cutting or eccentric load applications.

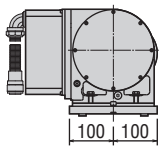
Dimensions

Drawings not to scale • Dimensions = mm

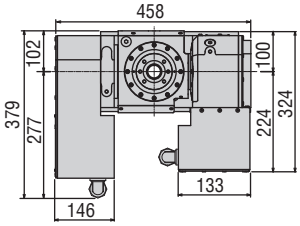
TN-101/TPC-Jr K2

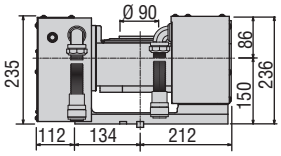


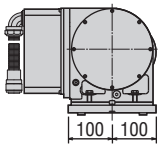




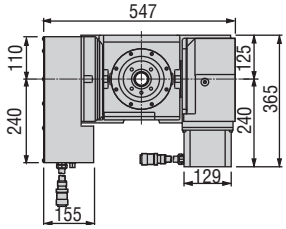
TWA-130/TPC-Jr K2

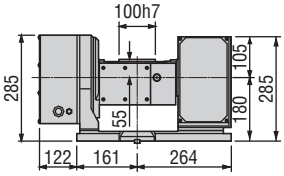


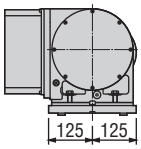




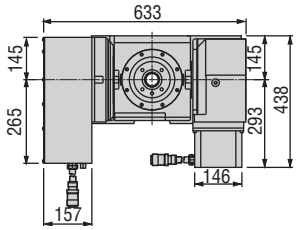
TWA-160/TPC-Jr K2

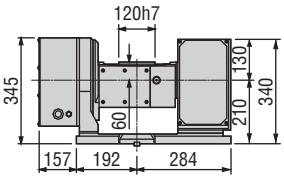


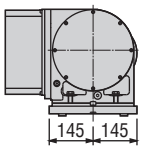




TWA-200/TPC-Jr K3







TN-320/TPC5 SR6