功率调整器

TPR-3SL

简易说明书

HANYOUNG NUX

KSA

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非常感谢您购买韩荣乐嗣（上海）电子有限公司的产品。
使用本产品前，请认真阅读产品说明书，并按照说明使用
另外，请将说明书保管于随时方便查看的位置。

MB0601KE180810

安全注意事项

为正确使用本产品,请务必在使用前认真阅读安全注意事项。
安全注意事项区分为危险、警告、注意。

⚠ **危险**	表示不遵守时，存在紧急危险情况，导致死亡或重伤。
⚠ **警告**	表示不遵守时，可能会导致死亡或重伤。
⚠ **注意**	表示不遵守时，可能轻伤或财产损失。

⚠危险

- 工作中为防止触电，产品主体的固定螺栓必须接地。散热板温度非常高，请勿触摸。
- 请勿触摸输入输出端子，可能导致触电。

⚠警告

- 为避免因本机故障及异常原因发生重大事故,请在外围安装适当的保护线路。
- 使用制造商指定以外的使用方法，可能导致人身伤害或财产损失。
- 在存在人身伤害或严重财产损失的设备上使用时，本产品应与双重或三重安全装置一起使用。
- 为了防止本机器损坏及故障，请使用额定电源电压.
- 为防止触电和故障，在所有接线完成之前，请勿打开电源。
- 切勿拆卸，修改或维修本机。否则操作异常，可能导致触电或起火。
- 在拆卸或安装本机之前，请务必关闭电源。否则会导致触电，误动作或故障。

⚠注意

- 由于安装的场所对产品的性能和寿命有很大的影响，避免在以下场所安装。
  - 潮湿,空气不流通的场所.
  - 灰尘及杂物堆积， 周围温度高或有震动的场所.
  - 在有腐蚀性气体（特别是有害气体，氨等）、易燃性气体的场所使用。
  - 对本机有振动或冲击的场所
  - 请勿在有水,油,化学品,重型机械,灰尘,盐分,铁粉（污染等级1或2级）的场所使用。
  - 请避免干扰比较大,静电和磁干扰的场所。
- 请误使用酒精,苯等有机溶剂来擦拭本产品（用中性洗剂擦拭）。
- 必须检查进水漏电，有火灾的危险。
- 请切断所有机器的电源后再接线.
- 务必垂直安装功率调整器。
- 安装在面板内部，并将排气扇安装在面板顶部。
- 散热片的边缘很尖锐，可能会造成伤害。
- 安装产品时，请将其安装在带盖的封闭空间内，然后盖上盖子。
- 产品连接的外部线路,请连接基本绝缘以上的绝缘线路。
- 当电流流动时，主机和散热片的温度可能变得非常高，导致灼伤。

型号

型号	代码							内容
TPR-3SL	□	□	-	□	□	□	□	超薄型三相电源调整器
额定负载电流	040							40 A
	055							55 A
	070							70 A
	090							90 A
	130							130 A
	160							160 A
电源电压		L						100 - 240 VAC (低压用)
		H						380 - 440 VAC (高压用)
选择规格			C					RS485
				N				无风机
							F	装有风机(40-55A产品选择项目)

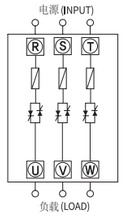
※ 电路电源和风扇电源需100 - 240V AC。

规格

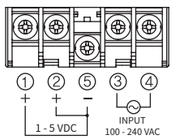
型号		TPR-3SL040L	TPR-3SL055L	TPR-3SL070L	TPR-3SL090L	TPR-3SL130L	TPR-3SL160L
	低压用	TPR-3SL040H	TPR-3SL055H	TPR-3SL070H	TPR-3SL090H	TPR-3SL130H	TPR-3SL160H
电源电压	低压用	100 - 240 VAC					
	高压用	380 - 440 VAC					
电路输入电源		100 - 240 VAC 18 W			100 - 240 VAC 20 W		
使用频度		50 / 60 Hz (通用)					
额定电流		40 A, 55 A, 70 A, 90 A, 130 A, 160 A					
适用负载		负载电阻					
控制输入	电流输入	4 - 20 mA DC (抗阻：100 Ω)					
	电压输入	1 - 5 VDC					
	触点输入	ON / OFF					
	外部调钮	外部旋钮 (10 KΩ)					
控制方式		相位控制，固定周期控制，可变周期控制，ON/OFF控制					
驱动方式		SOFT START, SOFT UP/DOWN					
输出电压		电源电压98 % 以上 (电流输出最大时)					
冷却方式		自然冷却 (40 A, 55 A), 强制冷却 (70 A, 90 A, 130 A, 160 A)					
显示方式		LED输出显示					
绝缘电阻		100 MΩ 以上 (标准500 VDC)					
调整输出范围		0 ~ 100 %					
耐电压		3000 VAC 50/60 Hz1分钟内					
抗干扰		干扰模拟器产生的干扰 (2,500 V)					
使用环境温湿度		0 ~ 40 ℃(但不结露), 30 ~ 85 % RH					
存储温度		-25 ℃ ~ 70 ℃					
认证		CE					
重量 (g)		4,044	4,324	9,100			

接线图

■ 负载端子接线图



■ 输入信号和电源端子连接图

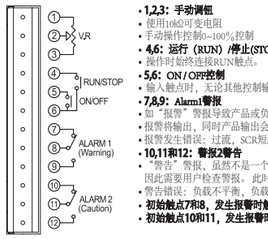


· 电流输入：4 - 20 mA DC.（连接1和5）
· 电压输入：1 - 5 V DC.（连接2和5）
· 独立输入电源（电路电源和风机驱动电源）：
100 - 240 V a.c.（3，4号），即使不使用风机，接通电源，产品也能正常工作。

· 根据功率调整器的选项规格，在RST电源输入端安装熔断器。
· 因为有高电流，连接端子时请使用压接端子连接，并扭紧。(压接端子与组装端子的间隔 40/55/70 A:16 mm, 90/130/160 A:26 mm)

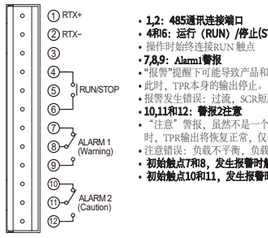
■ 信号及警报端子接线图

● 一般类型



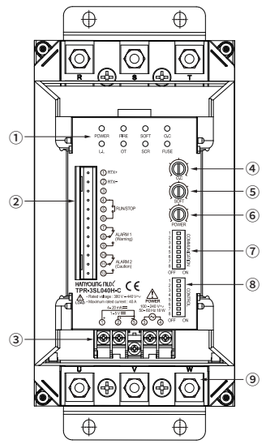
- **1,2,3: 手动调钮**
- 使用10kΩ可变电阻
- 手动操作控制0~100%控制
- **4,6: 运行（RUN）/停止(STOP)**
- 操作时始终连接RUN触点。
- **5,6: ON / OFF控制**
- 输入触点时，无论其他控制输入如何，100%输出都会熄灭
- **7,8,9: Alarm1警报**
- 如“报警”警报导致产品或负载损坏，在发生紧急情况时，
- 报警将输出，同时产品输出会停止。
- 报警发生错误：过流，SCR短路，保险丝断线，电源故障
- **10,11和12: 警报2警告**
- “警告”警报，虽然不是一个严重的问题，但由于发生了异常症状，因此需要用户检查警报。此时，TPR将正常输出，仅输出警报。
- 警告错误：负载不平衡，负载断开，散热片过热（85度）
- **初始触点7和8，发生报警时触点8和9**
- **初始触点10和11，发生报警时触点11和12**

● 通讯类型



- **1,2: 485通讯连接端口**
- **4和6: 运行（RUN）/停止(STOP)**
- 操作时始终连接RUN 触点
- **7,8,9: Alarm1警报**
- “报警”提醒下可能导致产品和负载损坏的情况，在以下紧急情况下将输出报警
- 此时，TPR本身的输出停止。
- 报警发生错误：过流，SCR短路，保险丝断线，电源故障
- **10,11和12: 警报2注意**
- “注意”警报，虽然不是一个严重的问题，但由于发生了异常症状，因此需要用户检查警报。此时，TPR输出将恢复正常，仅输出警报。
- 注意错误：负载不平衡，负载断开，散热片过热（85度）
- **初始触点7和8，发生报警时触点8和9**
- **初始触点10和11，发生报警时触点11和12**

各部位名称



■ 各部名称

编号	名称
①	LED 指示灯
②	信号及警报输出端子
③	输入信号及警报输出端子
④	过电流设置功能旋钮
⑤	Soft start， UP/DOWN设置用旋钮
⑥	限制输出功能旋钮
⑦	通讯用拨码开关 (仅限通讯类型)
⑧	设置用拨码开关
⑨	负载端子

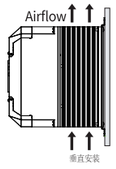
■ 显示LED及说明

LED 名称	说明
POWER	电路单独供电时亮起。
FIRE	根据控制输入与输出量成比例亮灯。输出越多，亮灯越久，当100%输出时，持续亮灯
SOFT	为了使用Soft start, Soft up/down功能，将软调钮向右旋转，灯亮
O.C	发生过电流时，当过电流超过过电流旋钮设定值，为了保护产品和负载，亮灯。（报警1输出）
L.L	当负载断开时：如果在输出为10%或更多时未检测到负载电流，则报警输出。 负载不平衡时：输出为10%以上时，负载不平衡为5 A以上时的报警输出。
O.T	在控制过程中，当散热片温度升至80℃以上时灯亮。 警报2输出，运行正常;低于70℃时，再次报警解除。
FUSE	内部保险丝断开/未接入负载电源时/（投入电路电源（100 - 240 V AC），负载电源未接入任何相线，或内部保险丝熔断时），报警1输出。
SCR	在某些情况下，当内部SCR短路时，即使没有控制输入和TPR输出，电源继续导通，由于加热器继续过热，在没有控制输入的状态下，当电流在任何部段持续流动超过10 A时亮灯。

■ 内部拨码开关操作方法

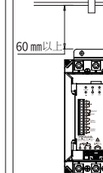
● 一般类型

编号	OFF	ON	初始模式
1号	-	重置 (功能停止)	1. 输入模式：4 - 20mADC 2. 控制模式：相位控制 3. 其他 :使用重启 , 内部调钮
2号	使用外部调钮	内部使用电源调钮	
3号	使用重启模式	禁用重启模式	
4号	-	循环控制固定周期方式	
5号		循环控制可变周期方式	
4,5号		相位控制	
6号	禁用		
7号	-	1 - 5 VDC	
8号		只使用外部调钮	
7,8号		4 - 20 mA DC	

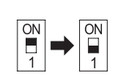


● 通讯类

编号	OFF	ON	初始模式
1号	-	重置 (功能停止)	1. 输入模式：4 - 20mADC 2. 控制模式：相位控制 3. 其他 :使用重启
2号	禁用		
3号	使用重启模式	禁用重启模式	
4号	-	循环控制固定周期方式	
5号		循环控制可变周期方式	
4,5号		相位控制	
6号	禁用		
7号	-	1 - 5 VDC	
8,8号		4 - 20 mA DC	

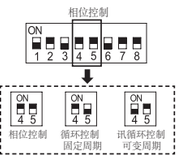


■ 重置(Reset) 设定

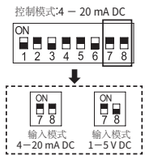


• 使用重置时，将DIP S / W No.1打开后再设置为关闭。

■ 控制模式设定

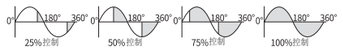


■ 输入模式设定



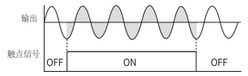
功能说明

■ 相位控制



相位控制是将1/2周期输入AC电源。根据控制信号在8.33ms期间在 0 ~ 180度之间，这是一种按比例输出功率的方式。

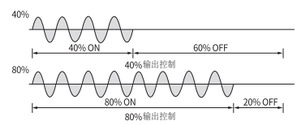
■ ON/OFF 控制



触点输入ON / OFF端子时，输出为100%。通常在零点附近进行开关。

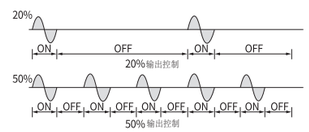
•即使施加控制输入信号， 如使用ON/OFF功能，输出为100%。

■ 固定周期循环控制



输出设置为固定周期（1s），并根据控制输入以恒定速率重复控制ON / OFFde。

■ 可变周期循环控制



这是一种通过使用AC正弦波的周期数来控制的方法。不使用控制周期来控制。

■ 重启功能

Restart 功能用于如果发生警告或警报状况，则可使用警报输出，操作停止等功能。 此时，如果错误原因消失，则重新恢复正常的功能。保险丝/电源故障，OT散热片过热，SCR短路时可设定此功能。（发生过电流时不应用此功能。）

■ 调钮说明

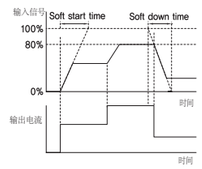
● O.C(过电流设定功能)

发生过电流时保护功率调整器（TPR）和负载的功能。（仅限相位控制）

• 各个调钮刻度的位置为过电流设置的位置

TPR-3SL040/055/070	TPR-3SL090/130/160
17A 37A 58A O.C	23A 51A 82A O.C

• 过电流设置位置取决于负载类型和调钮误差，
如需设定正确的过流位置，请使用想设置的电流来调整控制输出，
然后转动过电流调钮，来设定过电流报警的输出位置的。

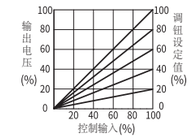


※ 通讯类型

· 出厂值：40A，55A，70A过流限制：840/90A，130A，160A过流限制：1920
（过流限制设置为过电流调钮设定值X10的值。）
· 当地址[7]用于通讯时，通信值将被应用。 通讯设定范围为（0~2000）

● SOFT

用于设置Soft start及 Soft up / down时间的调钮。（限于相位控制, ON/OFF 模块）
- Soft start是指为了保护大负载的启动电流（浪涌电流）。并逐渐提高输出功能。当打开电源，并施加控制输入时，当阶梯信号激活，软启动运行。调钮最大时设置为50秒。例，20 mA：50秒，12 mA：25秒）
Soft up / down：当控制输入打开并且RUN信号和电源接通时激活。调钮最多设置为10秒。
-如果调钮调向最小，则该功能不起作用，调钮越向左转，时间减少。



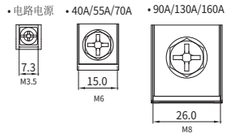
● POWER (输出限制功能)

此功能用于将输出与控制输入分别限制。100%时，将POWER VR向左更改将减少输出。 - 出厂时设置为100%

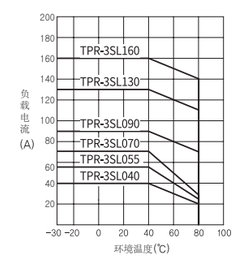
安装说明和注意事项

1. 沿垂直方向安装。在不可避免的情况下，横向或水平安装产品时，请仅使用额定电流的50%。
2. 如果要紧密安装多个产品，请以横5cm和竖10cm以上的间隔安装，如图所示。
3. 为了时接线管不妨碍空气的流通，安装时请不要超过散热片一半的高度。
4. 注意气流。环境温度越低，产品的耐用性和可靠性越好，寿命越长。环境温度为0~40 C 。请参考以下项目。但是，如果环境温度超过40° C，最大负载电流如下述减少。
5. 接线时，高电流通过的端子部分，用压接端子拧紧，如果接头不好，接线和端子过热可能导致火灾。
6. 为防止触电，本产品在接通电源前需要三种以上接地。因为没有单独的接地端子，建议在安装面板时将支架与接地端子一起安装。

7. 用规定的扭矩拧紧接线端子的螺钉。
M3.5: 0.6 ~1.2 N.m / M6: 4.41~4.9 N.m /
M8: 8.82~9.80 N.m



● 电流 - 温度特性



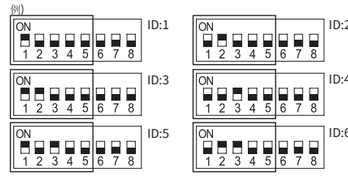
通讯规格(通讯设置拨码开关)

1.通讯方式:RS485 2线式半双工
2.通讯速度：9600, 19200, 38400, 57600 bps
3.最多连接台数：31台
4.协议：ModBus RTU, ModBus ASC II

■ Address(ID) 设定

•使用DIP S/W 1~5号来设置ID
•除0外，设置为1到31
•更改通讯设置时，必须使用RESET键.

例)

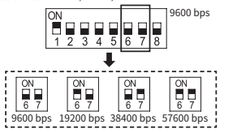


■ 选择通讯协议

•使用DIP S/W 8号来设置通讯协议

■ 设定通讯速度

•将波特率设置为DIP S / W的6,7号



■ 通讯设定 (ModBus RTU/ASC II)

通讯设定			
通讯速度	9600, 19200, 38400, 57600		bps
协议	ModBus RTU	ModBus ASC II	
奇偶校验位	Even	None	bit
数据位	8	7	bit
停止位	1		bit
站位(ID)	1 ~ 31		

Structure (RTU)					
分类	Address(ID)	Function	Start Address	No. of Data	CRC
Request	1	1	2	2	2
分类	Address(ID)	Function	No. of Data	Data	CRC
Response	1	1	1	2	2

Example (RTU)							
分类	Address (ID)	Function	Start Address		No. of Data		CRC
Request	0x01	0x03	0x00	0x01	0x00	0x01	0xD5 0xCA
分类	Address (ID)	Function	No. of Data		Data		CRC
Response	0x01	0x03	0x02		0x00	0x00	0xB8 0x44

Structure (ASC II)					
分类	Address (ID)	Function	Start Address	No. of Data	LRC
Request	2	2	4	4	2
分类	Address (ID)	Function	No. of Data	Data	LRC
Response	2	2	4	4	2

Example (ASC II)															
分类	Address(ID)		Function		Start Address				No. of Data				LRC		END
Request	0x01	0x31	0x03	0x33	0x30	0x30	0x30	0x31	0x30	0x30	0x30	0x31	0x46	0x41	0x0D 0x0A
分类	Address(ID)		Function		No. of Data				Data				LRC		END
Response	0x30	0x31	0x30	0x33	0x30	0x32	0x30	0x30	0x30	0x30	0x46	0x41	0x0D	0x0A	

Protocol	MODBUS RTU	MODBUS ASCII
Speed	9600, 19200, 38400, 57600 bps	
Parity	Even	None
Data bit	8	7
Stop bit	1	1
ID	1 ~ 31	

BOLD : RAM DATA
READ 只读
READ/WRITE 读写

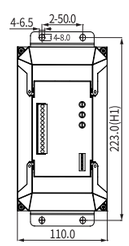
通讯地图	
	PROCESS
Address	0
0	
1	AlarmStatus
2	U Current
3	V Current
4	W Current
5	PWR LMT
6	DIP SW Status
7	OC VR
8	SOFT VR
9	MV OUT

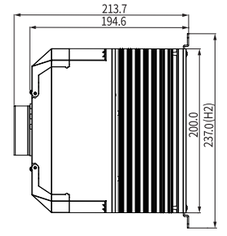
各地址说明				
Process (0x0000 ~)				
地址	参数	说明	设定范围	单位
0x0001	AlarmStatus	警报状态信息	参考Bit Information	
0x0002	U Current	“U”相负载电流值	0 ~ CT max (X 10)	A
0x0003	V Current	“V”相负载电流值	0 ~ CT max (X 10)	A
0x0004	W Current	“W” 相负载电流值	0 ~ CT max (X 10)	A
0x0005	PWR LMT	限制输出设定值	0 ~ 100	%
0x0006	DIP SW Status	拨码开关设定值	参考Bit Information	
0x0007	OC VR	过电流设定值	0 ~ 200A (x10)	A
0x0008	SOFT VR	Soft时间设定值	0 ~ 60	SEC
0x0009	MV OUT	输出量	0 ~ 100	%

外形尺寸及面板加工尺寸

■ 40/55/70 A

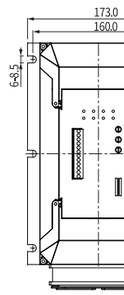
[单位 : mm]

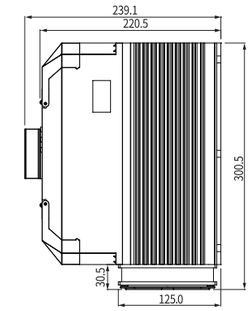




	H1	H2
70 A (添加冷却风扇)	249.5 mm	263.5 mm

■ 90/130/160 A





Thyristor Power Regulator

TPR-3SL

INSTRUCTION MANUAL

Thank you for purchasing Hanyoung Nux products. Please read the instruction manual carefully before using this product, and use the product correctly. Also, please keep this manual where you can view it any time.

MB0601KE180810

HANYOUNGNUX CO.,LTD
28, Gilpa-ro 71beon-gil,
Michuhol-gu, Incheon, Korea
TEL : +82-32-876-4697
http://www.hynux.com

Safety information

Please read the safety information carefully before the use, and use the product correctly. The alerts declared in the manual are classified into Danger, Warning and Caution according to their importance

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor injury or property damage

⚠ DANGER

To prevent electric shock while it is running, put to earth with the fixed screw of the unit and do not touch the heat sink since it is very hot. Do not touch or contact the input/output terminals because they cause electric shock.

⚠ WARNING

- If there is a possibility that a malfunction or abnormality of this product may lead to a serious accident, install an appropriate protection circuit on the outside.
- Any use of the product other than those specified by the manufacturer may result in personal injury or property damage.
- Since this product is not designed as a safety device if it is used with systems, machines and equipment that could lead to a risk of life or property damage, please implement safety devices and protections for both lives and the applications and plan for preventing accidents.
- Please supply the rated power voltage, in order to prevent product breakdowns or malfunctions.
- To prevent electric shocks and malfunctions, do not supply the power until the wiring is completed.
- Never disassemble, modify, process, improve or repair this product, as it may cause abnormal operations, electric shocks or fires.
- Please disassemble the product after turning OFF the power. Failure to do so may result in electric shocks, product abnormal operations or malfunctions.

⚠ CAUTION

- Since the product operating environment influences the product performance and expected life span, please avoid using in the following places.
  · a place where humidity is high and air flow is inappropriate.
  · a place where dust or impurity accumulates, ambient temperature is high and vibration level is high.
  · a place where corrosive gases (such as harmful gases, ammonia, etc.) and flammable gases occur.
  · a place where there is direct vibration and a large physical impact to the product.
  · a place where there is water, oil, chemicals, steam, dust, salt, iron or others (Contamination class 1 or 2).
  · a place where excessive amounts of inductive interference and electrostatic and magnetic noise occur.
  · a place where heat accumulation occurs due to direct sunlight or radiant heat.
- Please do not wipe the product with organic solvents such as alcohol, benzene, etc. (use neutral detergents).
- When water enters, short circuit or fire may occur, so please inspect the product carefully.
- Please connect the product and other units after turning off all the power of the product, instruments and units.
- Please make sure that the thyristor power regulator (TPR) is installed vertically.
- Please install the product inside of the control panel and install an exhaust fan onto the top of the control panel.
- Pay attention to the edge of heat sink which is sharp.
- Please close the cover after installation in the place in which there is a cover.
- The external circuit connected with the product should be connected by an insulated circuit more than basic insulation.
- The temperature of the body and the heat sink may be extremely high when electric current is applied, which may cause burns.

Suffix code

Model	Code							Content
TPR-3SL	□	□	-	□	□	□		Slim type 3-phase thyristor power regulator
Rated current	040							40 A
	055							55 A
	070							70 A
	090							90 A
	130							130 A
	160							160 A
Power voltage		L						100 - 240 VAC (Low)
		H						380 - 440 VAC (High)
Option			C					RS485
				N				No Fuse
							F	Fan mounted (option for 40A, 55 A models)

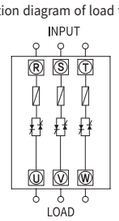
※ Circuit and fan need 100 - 240 VAC voltage power separately.

Specifications

Model		TPR-3SL040L	TPR-3SL055L	TPR-3SL070L	TPR-3SL090L	TPR-3SL130L	TPR-3SL160L
	Low	TPR-3SL040H	TPR-3SL055H	TPR-3SL070H	TPR-3SL090H	TPR-3SL130H	TPR-3SL160H
Power voltage		100 - 240 VAC 380 - 440 VAC					
Circuit input power		100 - 240 VAC 18 W			100 - 240 VAC 20 W		
Power frequency		50 / 60 Hz (Dual usage)					
Rated current		40 A, 55 A, 70 A, 90 A, 130 A, 160 A					
Applying load		Resistive load					
Control Input	Current input	4 - 20 mA DC (Impedance : 100 Ω)					
	Input	1 - 5 VDC					
	Contact input	ON / OFF					
	External VR	External volume (10 kΩ)					
Control method		Phase control, Fixed Cycle control, Variable Cycle control, ON/OFF control					
Movement type		SOFT START, SOFT UP/DOWN					
Output voltage		More than 98 % of the power voltage (in case of maximum current input)					
Cooling method		Natural cooling (40 A, 55 A), Forced cooling (70 A, 90 A, 130 A, 160 A)					
Display method		Output display by LED					
Insulation resistance		Min 100 MΩ (based on 500 VDC mega)					
Output control range		0 ~ 100 %					
Dielectric strength		3,000 VAC 50/60 Hz for 1 min					
Line noise		Noise by noise simulator (2,500 V)					
Ambient temperature & humidity		0 ~ 40 °C (without condensation), 30 ~ 85 % RH					
Storage temperature		-25 °C ~ 70 °C					
Approval		CE					
Weight (g)		4,044	4,324	9,100			

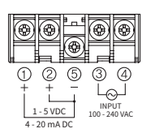
Connection diagrams

■ Connection diagram of load terminal



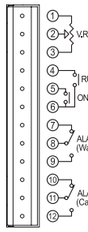
· Inside the thyristor power regulator (TPR), a fuse (FUSE) is mounted on the R, S, T input power part as standard.
· When connecting terminals, please use crimp connectors and securely fasten them due to the high current flow. (Max space for solder less terminal connection is 40/55/70 A: 16 mm, 90/130/160 A: 26 mm)

■ Connection diagram of input signal and power terminals



· Current input : 4 - 20 mA DC (connect no. ① and ⑤)
· Voltage input : 1 - 5 VDC (connect no. ② and ⑤)
· Extra input power supply (for circuit power and fan operation power) : 100 - 240 VAC (③, ④) need to connect power to operate unit (even if the fan is not used).

■ Connection diagrams of signal and alarm terminal



● Standard type

- **No. ① , ② , ③ : manual VR**
  · Use variable resistor of 10 kΩ
  · Control 0 ~ 100 % manually
- **No. ④ and ⑥ : RUN/STOP**
  · Be sure to attach RUN contact while it is operating.
- **No. ⑤ and ⑥ : ON/OFF control**
  · When inputting contact, it is operated with 100% output, irrespective of other control input.
- **No. ⑦, ⑧ and ⑨ : Alarm 1 - Warning**
  This is a "warning" alarm which implies that there may be a cause of damage to the product and load. The alarm will be activated when the following emergency situations occur. At this moment, TPR stops the output by itself.
  · Warning errors: overcurrent, SCR short-circuit, fuse disconnection, power failure
- **⑩, ⑪, ⑫ : Alarm 2 (Caution)**
  This is a "caution" alarm which implies there is not a serious problem, but user needs to check for its system because minor problems cause this alarm. At this moment, the output of TPR is normally operating and only "caution" alarm is activated.
  · Caution error: load unbalance, load disconnection, overheated heat sink (85 °C)
- **Initially ⑦ and ⑧ connected. If alarm 1 is activated, ⑧ and ⑨ will be connected.**
- **Initially ⑩ & ⑪ connected. If alarm 2 is activated, ⑪ & ⑫ will be connected.**

● Communication type

- **No. ① and ② : 485 communication connection port**
- **No. ④ and ⑥ : RUN/STOP**
  · Be sure to attach RUN contact while it is operating.
- **No. ⑦, ⑧ and ⑨ : Alarm 1 - Warning**
  This is a "warning" alarm which implies that there may be a cause of damage to the product and load. The alarm will be activated when the following emergency situations occur. At this moment, TPR stops the output by itself.
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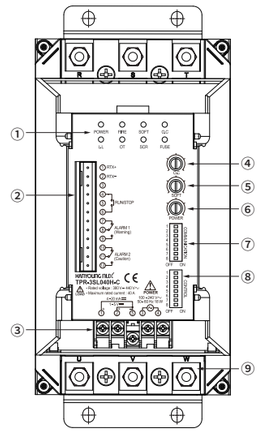
  · Caution error : load unbalance, load disconnection, overheated heat sink (85 °C)
- **Initially ⑦ & ⑧ connected. If alarm 1 is activated, ⑧ & ⑨ will be connected.**
- **Initially ⑩ & ⑪ connected. If alarm 2 is activated, ⑪ & ⑫ will be connected.**

Part names and functions



■ LED indicators and descriptions

LED indicator name	Description
POWER	POWER indicator turns ON when the power is being supplied separately
FIRE	FIRE indicator turns ON proportionally to the control output according to the control input. It lights longer if the output amount is large and it is continuously ON if it outputs 100 % continuously.
SOFT	To use Soft start, Soft up/down function, turn Soft VR clockwise and SOFT indicator will turn ON.
O.C	When there is overcurrent, if the current flows higher than O.C VR set value, then O.C indicator turns ON, to protect the product and the load and alarm 1 is activated.
L.L	When the load is disconnected: in a situation where output is over 10 %, if load current is not detected, the alarm is activated. When the load is unbalanced: in a situation where output is over 10 %, if the load unbalance between phases is over 5 A, the alarm is activated.
O.T	When heat sink temperature rise over 80 °C, O.T indicator turns ON. Alarm 2 output will be activated but the operation will continue normally. When temperature goes 70 °C, alarm will turn OFF.
FUSE	When inner fuse is disconnected, when load power is not input, or in a situation where circuit power supply (100 - 240 VAC) is applied, if any phase of load power supply is not working or inner part of FUSE is disconnected, alarm output ALARM1 is activated.
SCR	Under certain circumstances, if the internal SCR is shorted, the power supply will continue to be conductive even if there is no control input and TPR output, so that the heater will continue to overheat. So SCR indicator turns ON if current continues to flow for more than 10 A in any phase without control input.

■ Part names

No	Name	No	Name
①	LED display	⑥	Output limit volume
②	Signal and alarm terminals	⑦	Communication dip switch (only for communication type)
③	Input signal and alarm terminal	⑧	Control dip switch
④	Over current setting volume	⑨	Load terminal
⑤	Soft start or UP/DOWN setting volume		

■ Internal dip switch operation

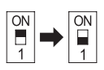
● Standard type

Number	OFF	ON	Initial setup mode
No. 1	-	RESET (function stop)	1. Input mode 4 - 20 mA DC 2. Control Mode: Phase control 3. Extra : Restart is in use, Inner VR is in use OFF ON 1 ■□ 2 ■□ 3 ■□ 4 ■□ 5 ■□ 6 ■□ 7 ■□ 8 ■□
No. 2	External VR in use	Inner Power VR in use	
No. 3	Restart mode in use	Restart mode not used	
No. 4	-	Fixed Cycle Control	
No. 5		Variable Cycle Control	
No. 4,5		Phase control	
No. 6	Not Used		
No. 7	-	1 - 5 V DC	
No. 8		Only external VR in use	
No. 7,8		4 - 20 mA DC	

● Communication type

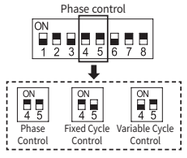
Number	OFF	ON	Initial setup mode
No. 1	-	RESET (function stop)	1. Input mode 4 - 20 mA DC 2. Control Mode: Phase control 3. Extra : Restart is in use OFF ON 1 ■□ 2 ■□ 3 ■□ 4 ■□ 5 ■□ 6 ■□ 7 ■□ 8 ■□
No. 2	Not used		
No. 3	Restart mode in use	Restart mode not used	
No. 4	-	Fixed Cycle Control	
No. 5		Variable Cycle Control	
No. 4,5		Phase control	
No. 6	Not Used		
No. 7	-	1 - 5 VDC	
No. 7,8		4 - 20 mA DC	

■ Reset description

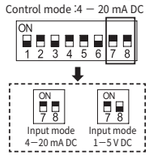


· When using RESET, set DIP S / W No. 1 to ON and then OFF again.

■ Control mode setting

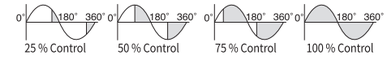


■ Input mode setting



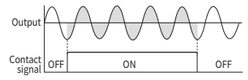
Function descriptions

■ Phase control



The phase control method is to input 1/2 CYCLE to AC power and output power proportionally between 0 and 180 degrees for 8.33 ms according to the control signal.

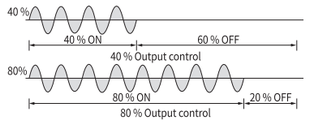
■ ON/OFF control



If ON/OFF contact is ON, then the output is 100 %.
ON/OFF always operates near zero point.

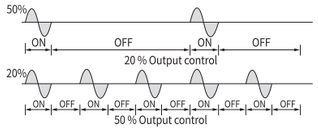
• Even though the control input signal is ON, the output is 100 % when ON/OFF control is used.

■ Fixed cycle control



As setting the constant cycle of the output, (1 sec), fixed cycle control is to control the AC power supply repeatedly with a constant rate of ON/OFF according to the control input.

■ Variable cycle control



Without setting a constant cycle, variable cycle control is to control AC power supply with using the number of cycle.

■ Restart function

When a warning or caution alarm occurs, TPR gives alarm 1 or 2 or stop the output.
This function is used to return to normal operation mode when factors caused errors are eliminated.
This function is able to set up when Fuse/Power Supply is in disorder, Heat sink over heat, SCR Short is occurred.
(When Overcurrent is occurred, this function is not working)

■ VR Explanation

● O.C (overcurrent setting function)
When overcurrent occurs, protection function for TPR and load (only for phase control)

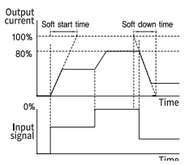
• VR gradation for overcurrent setting position.

TPR-3SL040/055/070	TPR-3SL090/130/160
37 A 17 A 58 A O.C	51 A 23 A 82 A O.C

• Depending on load type and VR error, overcurrent setting position can be different.
• The overcurrent setting position may differ depending on the load type and VR error. To adjust the correct overcurrent position, adjust the control input to the current to be set, then turn the OC VR. The OC alarm output position is set to the overcurrent setting.

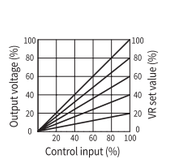
※ Communication type

• Default: 40A, 55A, 70A overcurrent limit: 840 / 90A, 130A, 160A overcurrent limit: 1920 (overcurrent limit value is set to O.C VR set value X 10)
• When address [7] is used for communication, the communication value is applied. The communication setting range is (0 ~ 2000)



● SOFT

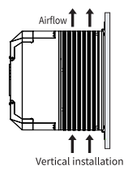
This volume is to set time for Soft start or Soft up/down. (only applicable to phase control, ON/OFF control)
- **Soft start :** Protection functions against big load of start current (inrush current). It increases output softly. When control input is applied and power is on, Soft start operates when rung signal is applied. In case of maximum VR, it set 50 second. (Example : 20 mA : 50 sec, 12 mA : 25 sec)
- **Soft up / down :** When run signal and power are applied and if control input is applied, it will operate. It case of maximum VR, it set 10 second.
- If VR turn up to the right, the function does not work. And if VR turn right, time will be reduced.



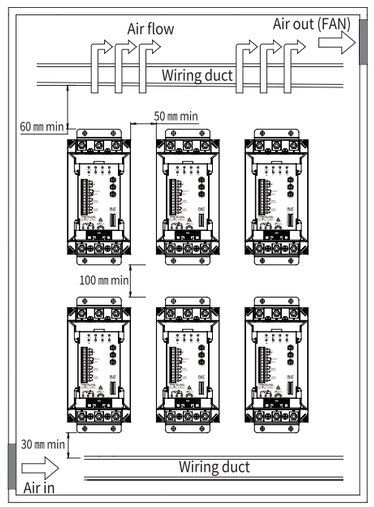
● POWER (output limit function)

This function is to limit the output regardless of he control input amount. Even though the control input is 100%, the output will decrease as turning POWER volume counterclockwise.

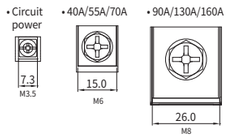
Installation



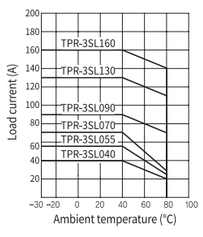
1. Please install it perpendicularly. If the product is installed vertically in unavoidable circumstances, please use 50 % of rated current.
2. When multiple products are closely installed, install them keeping a distance of more than a width of 5 cm and a length of 10 cm as shown in the picture.
3. In order to not block the air flow, please install the wiring duct less than the half of the heat sink height.
4. Please consider if the air flow is good enough when installing the product. If the ambient temperature is as low as possible in the inside then the product life span, durability and reliability improve. The operating ambient temperature is 0 °C ~ 40 °C. Please refer to the following graph. However, if the ambient temperature is higher than 40 °C, the max. load current decreases as below.
5. When wiring, use crimp connectors to high current flows terminal. If the contact surface of the connectors and terminals are poor, it may lead to a fire since the wires and terminal get overheated
6. Before applying power, this model need more than the third class grounding to prevent electric shock. This model does not have separate grounding terminal so we suggest using grounding terminal and bracket together when install this model to a panel.



7. Tighten the screws of the terminal block with the specified torque.
M3.5: 0.6 ~1.2 N.m / M6: 4.41~4.9 N.m / M8: 8.82~9.80 N.m



● Current - temperature characteristics

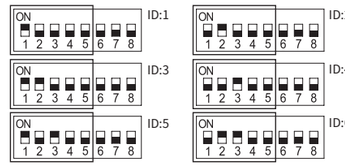


Communication (communication setting dip switch)

1. Communication method: RS485 2-wire half-duplex
2. Communication speed: 9600, 19200, 38400, 57600 bps
3. Maximum number of connections: 31
4. Protocol: ModBus RTU, ModBus ASCII

■ Address (ID) setting

• Set the ID with DIP S/W no. 1~5
• Set 1 ~ 31 (except 0).
• When communication setting is changed, the change is applied after reset.

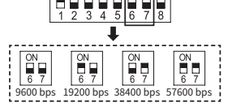


■ Communication protocol selection

• Set the communication protocol with DIP S/W no. 8

■ Communication speed setting

• Set the communication speed with DIP S/W no. 6 or 7



■ Communication setting (ModBus RTU/ASC II)

Communication settings			
Communication speed	9600, 19200, 38400, 57600		bps
Protocol	ModBus RTU	ModBus ASC II	
Parity bit	Even	None	bit
Data bit	8	7	bit
Stop bit	1		bit
ID	1 ~ 31		

Structure (RTU)					
Division	Address(ID)	Function	Start Address	No. of Data	CRC
Request	1	1	2	2	2
Division	Address(ID)	Function	No. of Data	Data	CRC
Request	1	1	1	2	2

Example (RTU)								
Division	Address (ID)	Function	Start Address		No. of Data		CRC	
Request	0x01	0x03	0x00	0x01	0x00	0x01	0xD5	0xCA
Division	Address (ID)	Function	No. of Data	Data		CRC		
Response	0x01	0x03	0x02	0x00	0x00	0xB8	0x44	

Structure (ASC II)					
Division	Address (ID)	Function	Start Address	No. of Data	LRC
Request	2	2	4	4	2
Division	Address (ID)	Function	No. of Data	Data	LRC
Response	2	2	2	4	2

Example (ASC II)													
Division	Address(ID)	Function	Start Address			No. of Data				LRC		END	
Request	0x01	0x31	0x03	0x33	0x30	0x30	0x30	0x31	0x30	0x30	0x30	0x31	0x46	0x41	0x0D	0x0A
Division	Address(ID)	Function	No. of Data		Data						LRC		END			
Response	0x30	0x31	0x30	0x33	0x30	0x32	0x30	0x30	0x30	0x30	0x46	0x41	0x0D	0x0A		

BOLD : RAM DATA	
READ	monitoring
READ/WRITE	configurable

Protocol	MODBUS RTU	MODBUS ASCII
Speed	9600, 19200, 38400, 57600 bps	
Parity	Even	None
Data bit	8	7
Stop bit	1	1
ID	1 ~ 31	

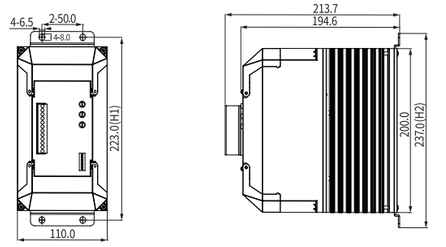
Communication MAP	
	PROCESS
Address	0
0	
1	AlarmStatus
2	U Current
3	V Current
4	W Current
5	PWR LMT
6	DIP SW Status
7	OC VR
8	SOFT VR
9	MV OUT

Content by Address				
Process (0x0000 ~)				
Address	Parameter	Content	Setting range	Unit
0x0001	AlarmStatus	Alarm status information	Refer to Bit Information	
0x0002	U Current	"U" phase load current value	0 ~ CT max (X 10)	A
0x0003	V Current	"V" phase load current value	0 ~ CT max (X 10)	A
0x0004	W Current	"W" phase load current value	0 ~ CT max (X 10)	A
0x0005	PWR LMT	Output limit set value	0 ~ 100	%
0x0006	DIP SW Status	DIP switch set value	Refer to Bit Information	
0x0007	OC VR	Overcurrent set value	0 ~ 200A (x10)	A
0x0008	SOFT VR	Soft time set value	0 ~ 60	SEC
0x0009	MV OUT	Output amount	0 ~ 100	%

Appearance

[Unit : mm]

■ 40/55/70 A



	H1	H2
70 A (With cooling fan)	249.5 mm	263.5 mm

■ 90/130/160 A