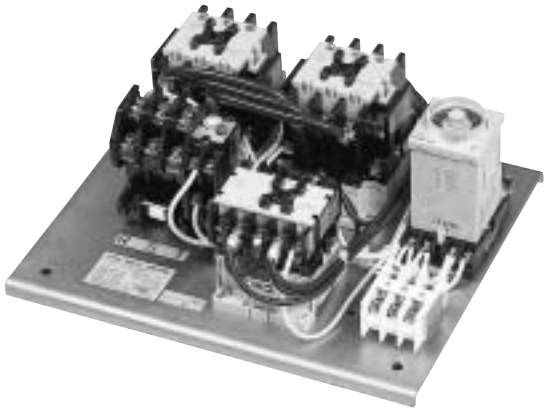
STAR-DELTA MAGNETIC STARTERS



Model identification

SDH [ ] **— 25 HMC**

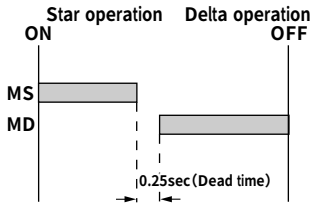
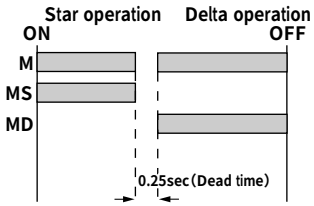
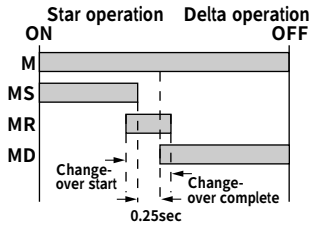
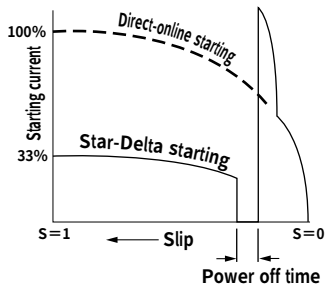
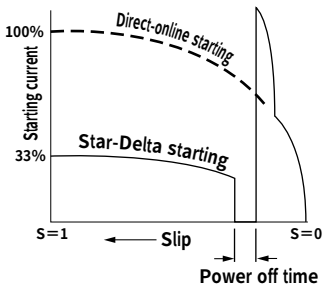
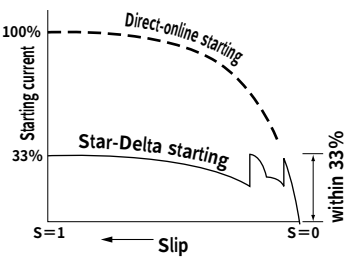
Type	Number of contactors	Model	Specifications
	Blank···Two magnetic contactors 3 ·····Three magnetic contactors 4 ·····Four magnetic contactors	25 35 50 80 100 150 220 300	HMC···with enclosure HTC···w/o enclosure

Available types of star-delta starters

1. 2-contactor type Star-Delta starter (2 contactors are used) ·····SDH
2. 3-contactor type Star-Delta starter (3 contactors are used) ·····SDH3
3. Closed-transition type Star-Delta starter (4 contactors are used) ·····SDH4

Starting current characteristics

In star-delta starters, the contactor recloses at the changeover from star operation to delta operation. At this time, a large transient current greater than the direct starting current of motor flows for a moment for 2-contactor type and 3-contactor type.
The closed-transition type star-delta starter with a shunt resistor is available to resolve this problem.

	Open transition		Closed transition
	SDH	SDH3	SDH4
Magnetic contactor operation chart			
Starting current			
Starting torque	Starting torque is reduced to approximately 1/3 of the values for direct-online starting.		

Handling precautions

1. Always turn off the power before adjusting the timer, or erroneous operation may result.
2. Setting the change-over time of timer
   ★SDH and SDH3 modes
   The change-over time can be adjusted with the knob on the front of the timer, between 5 and 60s to match motor starting time. The standard time in which the maximum starting current flows contineously is within 15s. The rated voltages of the control circuit are 100V and 200V. Please contact us for 400V control.
   ★SDH4 model
   (1)Time (T_1) is adjustable from 5 to 50s. Use the following table to select starting time and starting interval.
   (2)The dead time (T_2) for changeover from star to delta has been set to 0.25s, and (T_3) to 2s. Please do not change these settings.

Model	Star starting time (T_1)	Starting interval
SDH4-25HT SDH4-25HM	within 5 s	more than 10 m
SDH4-(35~300)HT SDH4-(35~300)HM	within 15 s	more than 20 m

3. The thermal overload relay and shunt resistor (SDR) for the SDH4 model must be selected to match motor voltage and capacity.
4. For 2-contactor type starters, the power to the motor remains on even when the motor is not operating. Depending on the operating environment, this may cause motor burnout or electrical shock. For this reason, the use of 3-contactor starters is recommended.
5. The number of operating cycles is three times/hour. If the successively starting is necessary in such as a test operation, it must be within 3 times. After this operations, leave at least one hour.

Ratings and specifications

＊SDH

Model		Rated capacity (kW)		Contactor used		Thermal overload relay	Timer used
Enclosed type	Open type	200−220V	380−440V	MD	MS	OCR	TM
SDH− 25HMC	SDH− 25HTC	5.5	5.5	PAK− 21J	PAK− 12J31	TJ−35	H3CR−G8EL
SDH− 35HMC	SDH− 35HTC	7.5	11	PAK− 26J	PAK− 21J	〃	〃
SDH− 50HMC	SDH− 50HTC	11	19	PAK− 35J	PAK− 26J	〃	〃
SDH− 80HMC	SDH− 80HTC	19	26	PAK− 50H	PAK− 35J	TJ−50	〃
SDH−100HMC	SDH−100HTC	26	37	PAK− 65H	PAK− 50H	〃	〃
SDH−150HMC	SDH−150HTC	40	55	PAK−100H	PAK− 65H	TJ−125	〃
SDH−220HMC	SDH−220HTC	55	90	PAK−150H	PAK−100H	〃	〃
SDH−300HMC	SDH−300HTC	75	150	PAK−220H	PAK−125H	TJ−35C＋CT	〃

Notes. ①Refer to P9 for the contrast table of the motor capacity and the rated current of thermal overload relay.

＊SDH3 (with power cut-off contactor)

Model		Rated capacity (kW)		Contactor used			Thermal overload relay	Timer used
Enclosed type	Open type	200−220V	380−440V	M	MD	MS	OCR	TM
SDH3− 25HMC	SDH3− 25HTC	5.5	5.5	PAK− 21J		PAK− 21J	TJ−35	H3CR−G8EL
SDH3− 35HMC	SDH3− 35HTC	7.5	11	PAK− 26J	PAK− 21J	〃	〃	〃
SDH3− 50HMC	SDH3− 50HTC	11	19	PAK− 35J		〃	〃	〃
SDH3− 80HMC	SDH3− 80HTC	19	26	PAK− 50H		PAK− 26J	TJ−50	〃
SDH3−100HMC	SDH3−100HTC	26	37	PAK− 65H		PAK− 35J	〃	〃
SDH3−150HMC	SDH3−150HTC	40	55	PAK−100H		PAK− 50H	TJ−125	〃
SDH3−220HMC	SDH3−220HTC	55	90	PAK−150H		PAK− 65H	〃	〃
SDH3−300HMC	SDH3−300HTC	75	150	PAK−220H		PAK−100H	TJ−35C＋CT	〃

Notes. ①Refer to P9 for the contrast table of the motor capacity and the rated current of thermal overload relay.

＊SDH4 (closed-transition type star-delta starter)

Item / ※ Model	Rated capacity (kW)		Contactor used				Thermal overload relay	Shunt resistor	
	200−220V	380−440V	M	MS	MD	MR	OCR	220−220V	380−400V
SDH4− 25HTC	5.5	5.5	PAK− 21J	PAK− 21J	PAK− 21J	PAK− 20J	TJ−35	SDR− 50−2	SDR−100−4
SDH4− 35HTC	7.5	11	PAK− 26J	PAK− 21J	PAK− 26J	〃	〃	〃	〃
SDH4− 50HTC	11	19	PAK− 35J	PAK− 26J	PAK− 35J	PAK− 21J	〃	〃	SDR−150−4
SDH4− 80HTC	19	26	PAK− 65H	PAK− 35J	PAK− 65H	PAK− 35J	TJ−50	SDR−100−2	〃
SDH4−100HTC	26	37	〃	PAK− 50H	〃	〃	〃	〃	〃
SDH4−150HTC	40	55	〃	PAK− 65H	PAK−100H	〃	TJ−125	〃	SDR−150−2×2
SDH4−220HTC	55	90	PAK−150H	PAK−100H	PAK−150H	PAK− 65H	〃	SDR−150−2	〃
SDH4−300HTC	75	150	PAK−220H	PAK−125H	PAK−220H	PAK− 80H	TJ−220	〃	〃

Notes. ①Timer T_1 used for H3CR-G8EL, and timers T_2,T_3 for H3Y-2.
②Enclosed types can also be manufactured.
③The thermal overload relay is connected to the phase current side, so the setting current is $1/\sqrt{3}$ of the motor current.

Operation coil rating

Nominal coil voltage	Rated coil voltage
AC100V	100V 50Hz 100-110V 60Hz
AC200V	200V 50Hz 200-220V 60Hz

Notes. ①Nominal coil voltage is designed to simplify specification in ordering. Please use nominal coil voltage when ordering.
②Please ask about 400V coil.

Standard service conditions

Ambient temperature	40℃
Ambient temperature range	5℃～40℃
Relative humidity	45%～85%RH
Environment	No corrosive or explosive gas, no excessive vibration or shock
Mounting position	Mounted vertically
Altitude	2000m max

Transformer capacity for control

(Capacity must be greater than the values listed below.)

Type / Model	SDH−	SDH3−	SDH4−
25	25VA	50VA	70VA
35	50VA	100VA	100VA
50	50VA	100VA	100VA
80	100VA	200VA	150VA
100	100VA	200VA	150VA
150	170VA	350VA	200VA
220	250VA	500VA	300VA
300	350VA	700VA	450VA

2-contactor type star-delta starter SDH-□

Dimensions and mounting method

①Enclosed type SDH-□HMC

(in mm, Weight kg)

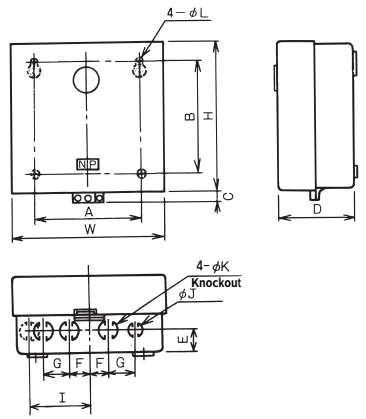
Model	W	H	D	A	B	C	E	F	F'	G	G'	I	J	K	L	Weight
SDH− 25HMC	300	300	150	220	240	14	40	45	45	55	55	100	28	28	7	8.5
SDH− 35HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	8.8
SDH− 50HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	35	〃	9.1
SDH− 80HMC	350	350	165	250	270	〃	45	〃	〃	70	70	120	〃	43	〃	10.3
SDH−100HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	11.0
SDH−150HMC	300	560	220	200	460	〃	60	20	60	80	60	90	〃	52	9.5	15.0
SDH−220HMC	457	640	226	350	540	15	104	35	80	115	90	150	〃	78	〃	22.6
SDH−300HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	26.5

②Open type SDH-□HTC

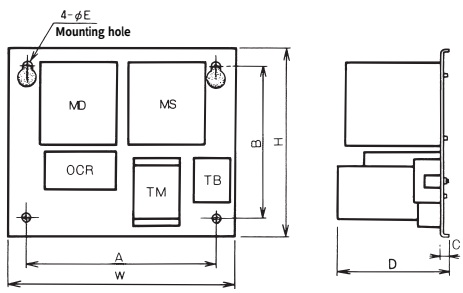
(in mm, Weight kg)

Model	W	H	D	A	B	C	E	Weight
SDH− 25HTC	240	200	122	200	160	10	7	2.8
SDH− 35HTC	〃	〃	〃	〃	〃	〃	〃	3.1
SDH− 50HTC	〃	〃	〃	〃	〃	〃	〃	3.4
SDH− 80HTC	280	235	124	240	195	〃	〃	4.6
SDH−100HTC	〃	〃	129	〃	〃	〃	〃	5.3
SDH−150HTC	240	360	143	200	320	〃	9.5	8.0
SDH−220HTC	360	460	171.5	310	360	15	〃	12.6
SDH−300HTC	〃	〃	〃	〃	〃	〃	〃	16.5

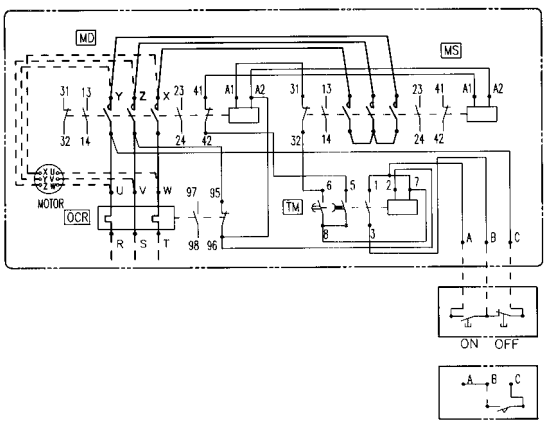
①Enclosed type

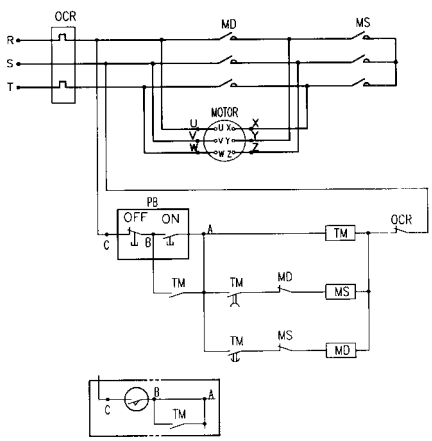


②Open type



Connection diagram





Notes.①For 25HM and HT models, auxiliary contacts 23-24 and 41-42 of MD contactor and 13-14, 23-24 and 41-42 of MS contactor are not provided with.

②For 35HM and HT models, auxiliary contacts 23-24 and 41-42 of MS contactor are not provided with.

3-contactor type star-delta starter SDH3-□

Dimensions and mounting method

①Enclosed type SDH3-□HMC

(in mm, Weight kg)

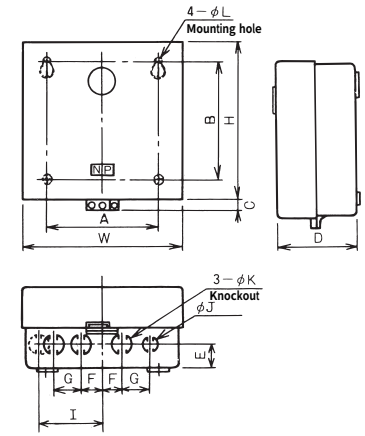
Model	W	H	D	A	B	C	E	F	G	I	J	K	L	Weight
SDH3－ 25HMC	300	300	150	220	240	14	40	45	55	100	28	28	7	9.1
SDH3－ 35HMC	350	350	165	250	270	〃	45	〃	70	120	〃	〃	〃	9.9
SDH3－ 50HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	35	〃	10.1
SDH3－ 80HMC	400	400	180	300	320	〃	50	50	80	〃	〃	43	〃	16.1
SDH3－100HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	16.4
SDH3－150HMC	480	480	200	360	380	〃	55	55	100	150	〃	52	9.5	22.0
SDH3－220HMC	560	560	220	440	460	〃	60	70	120	190	〃	78	〃	27.1
SDH3－300HMC	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	36.2

②Open type SDH3-□HTC

(in mm, Weight kg)

Model	W	H	D	A	B	C	E	Weight
SDH3－ 25HTC	240	200	122	200	160	10	7	3.4
SDH3－ 35HTC	280	235	〃	240	195	〃	〃	4.2
SDH3－ 50HTC	〃	〃	〃	〃	〃	〃	〃	4.4
SDH3－ 80HTC	320	280	145	280	240	〃	〃	6.7
SDH3－100HTC	〃	〃	129	〃	〃	〃	〃	7.0
SDH3－150HTC	360	320	143	310	270	〃	9.5	12.0
SDH3－220HTC	450	410	171.5	400	360	15	〃	17.0
SDH3－300HTC	〃	〃	〃	〃	〃	〃	〃	26.1

①Enclosed type



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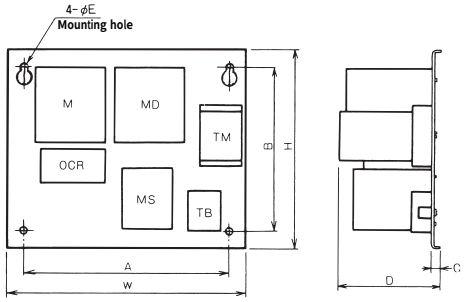
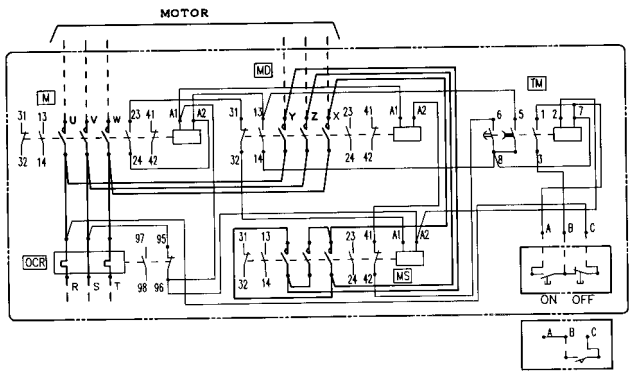
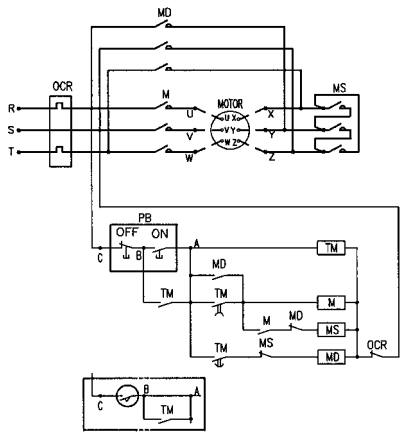


Connection diagram





Notes. ①For 25HM and HT models, auxiliary contacts 23-24 and 41-42 are not provided with.
②For 35HM and HT models, auxiliary contacts 23-24 and 41-42 of MD and MS contactors are not provided with.
③For 50HM and HT models, auxiliary contacts 23-24 and 41-42 of MS contactor are not provided with.

Closed-transition type star-delta starter SDH4-□

Dimensions and mounting method

①Enclosed type SDH4-□HMC

(in mm, Weight kg)

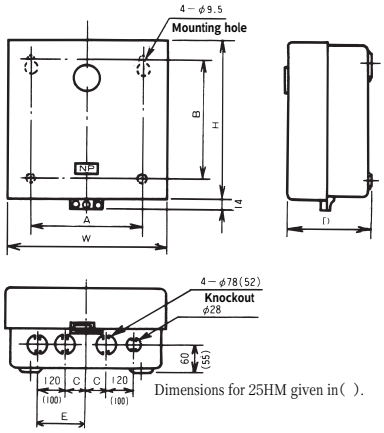
Model	W	H	D	A	B	C	E	Weight
SDH4— 25HMC	480	480	200	360	380	55	150	21.0
SDH4— 35HMC	560	560	220	440	460	70	190	29.0
SDH4— 50HMC	〃	〃	〃	〃	〃	〃	〃	30.0
SDH4— 80HMC	〃	〃	〃	〃	〃	〃	〃	32.0
SDH4—100HMC	610	770	〃	490	670	95	215	38.0
SDH4—150HMC	〃	〃	〃	〃	〃	〃	〃	40.0
SDH4—220HMC	700	942	〃	580	840	140	260	63.8
SDH4—300HMC	〃	〃	〃	〃	〃	〃	〃	66.4

②Open type SDH4-□HTC

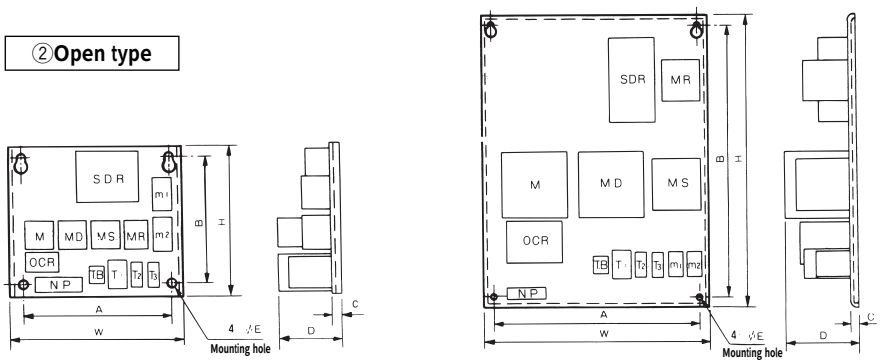
(in mm, Weight kg)

Model	W	H	D	A	B	C	E	Weight
SDH4— 25HTC	340	320	128	310	270	20	9.5	9.0
SDH4— 35HTC	450	410	〃	400	360	〃	〃	11.0
SDH4— 50HTC	〃	〃	〃	〃	〃	〃	〃	12.0
SDH4— 80HTC	〃	〃	134	〃	〃	〃	〃	15.0
SDH4—100HTC	500	620	〃	450	570	20	9.5	19.0
SDH4—150HTC	〃	〃	148	〃	〃	〃	〃	21.0
SDH4—220HTC	590	790	171.5	540	740	〃	〃	31.8
SDH4—300HTC	〃	〃	〃	〃	〃	〃	〃	33.4

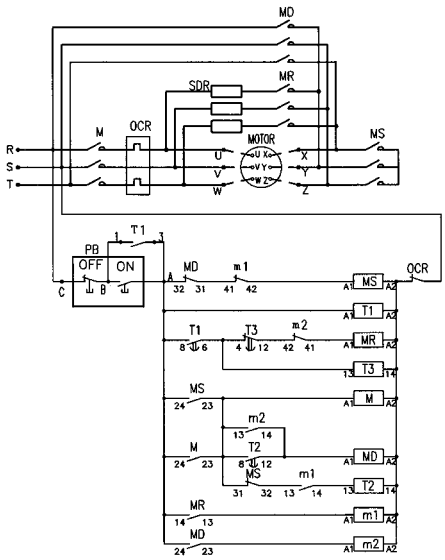
①Enclosed type



②Open type



Connection diagram



Applicable wire size and terminal tightening torque

Line terminals（R.S.T）of SDH, SDH3.

Model	Screw size		Applicable wire		Applicable crimp-type terminal		Tightening torque N•m (kgf•cm)	
	Main circuit	Aux. circuit	Main circuit	Aux. circuit	Main circuit	Aux. circuit	Main circuit	Aux. circuit
SDH － 25 SDH3－ 25	M5	M4	φ1.6～3.2 1.25～14㎟	φ1～2 0.5～3.5㎟	1.25－5～14－5	1.25－4 ≀ 2－4	2.4～3.5 (24～36)	1.2～1.8 (12～18)
SDH － 35 SDH3－ 35	M5							
SDH － 50 SDH3－ 50	M5							
SDH － 80 SDH3－ 80	M6		2～38㎟ (Crimp-type terminal)		2－6～38－6S ①		3.9～5.9 (40～60)	
SDH －100 SDH3－100	M6							
SDH －150 SDH3－150	M8		2～80㎟ (Crimp-type terminal)		2－8～CB80－8 ②		9.0～13.5 (92～138)	
SDH －220 SDH3－220	M10		2～150㎟ (Crimp-type terminal)		2－10～CB150－10 ②		18.1～27 (185～275)	
SDH －300 SDH3－300	M10		2～200㎟ (Crimp-type terminal)		2－10～CB200－10S ③			

Load terminals（U.V.W. Y.Z.X）of SDH, SDH3

Model	Screw size		Applicable wire		Applicable crimp-type terminal		Tightening torque N•m (kgf•cm)	
	Main circuit	Aux. circuit	Main circuit	Aux. circuit	Main circuit	Aux. circuit	Main circuit	Aux. circuit
SDH － 25 SDH3－ 25	M4	M4	φ1～2・0.5～3.5㎟	φ1～2 0.5～3.5㎟	1.25－4・5.5－4	1.25－4 ≀ 2－4	1.2～1.8(12～18)	1.2～1.8 (12～18)
SDH － 35 SDH3－ 35	M5(U.V.W) M4(Y.Z.X)		φ1.6～3.2 1.25～14㎟		1.25－5～14－5		2.4～3.5 (24～36)	
SDH － 50 SDH3－ 50	M5							
SDH － 80 SDH3－ 80	M6		2～38㎟ (Crimp-type terminal)		2－6～38－6S ①		3.9～5.9 (40～60)	
SDH －100 SDH3－100	M6							
SDH －150 SDH3－150	M8		2～80㎟ (Crimp-type terminal)		2－8～CB80－8 ②		9.0～13.5 (92～138)	
SDH －220 SDH3－220	M10		2～100㎟ (Crimp-type terminal)		2－10～CB100－8 ②			
SDH －300 SDH3－300	M10		2～150㎟ (Crimp-type terminal)		2－10～150－10		18.1～27 (185～275)	

Line・Load terminals（R.S.T. U.V.W. Y.Z.X）of SDH4

Model	Screw size		Applicable wire		Applicable crimp-type terminal		Tightening torque N•m (kgf•cm)	
	Main circuit	Aux. circuit	Main circuit	Aux. circuit	Main circuit	Aux. circuit	Main circuit	Aux. circuit
SDH4－ 25	M4	M4	φ1～2・0.5～3.5㎟	φ1～2 0.5～3.5㎟	1.25－4・5.5－4	1.25－4 ≀ 2－4	1.2～1.8(12～18)	1.2～1.8 (12～18)
SDH4－ 35	M5		φ1.6～3.2 1.25～14㎟		1.25－5～14－5		2.4～3.5 (24～36)	
SDH4－ 50	M5							
SDH4－ 80	M6		2～38㎟ (Crimp-type terminal)		2－6～38－6S ①		3.9～5.9 (40～60)	
SDH4－100	M6							
SDH4－150	M8		2～80㎟ (Crimp-type terminal)		2－8～CB80－8 ②		9.0～13.5 (92～138)	
SDH4－220	M8		2～100㎟ (Crimp-type terminal)		2－10～CB100－8 ②			
SDH4－300	M10		2～150㎟ (Crimp-type terminal)		2－10～150－10		18.1～27 (185～275)	

Notes. ①：Standard 38-6 crimp-type terminal lug is too wide, and not suitable for the terminal. Please use 38-6S (Nichifu Terminal Industries Co., Ltd.) or 38-S6 (Japan Solderless Terminal Mfg. Co., Ltd.).

②：Standard 80-8, 100-8 and 150-8 crimp-type terminal lugs are too wide, and not suitable for the terminal. Please use CB-type terminal connectors for low-voltage switching devices (Nichifu Terminal Industries Co., Ltd.) or for molded case circuit breakers (Japan Solderless Terminal Mfg. Co., Ltd.).

③：Nichifu Terminal Industries Co., Ltd.

SDH4 shunt resistors

※Heat-resistant ceramic base incorporating resistor and heat absorbing material enhances safety construction. The 3-phase design is also very compact.

※The resistor suppresses transient current during changeover, reducing the voltage drop and minimizing problems on other loads.

Shunt resistor selection

Voltage	Applicable model	Motor(kW)
200 to 220V	SDR－ 50－2	5.5～11
	SDR－100－2	15～45
	SDR－150－2	55～150
380 to 440V	SDR－100－4	5.5～11
	SDR－150－4	15～45
	※(SDR－150－2)×2	55～150

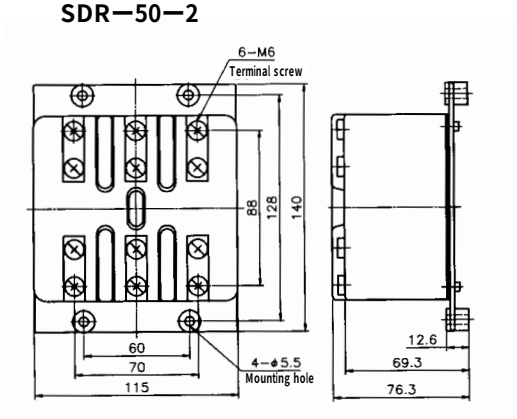
The SDR internal resistance varies with the motor capacity (kW), So please specify model, voltage and capacity (kW).
The ※ indicates that multiple identical units should be connected in series.

Rated current conducting time

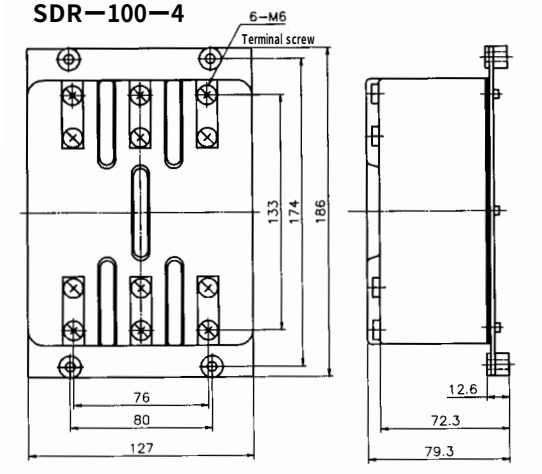
Set the shunt resistor timer circuit to 0.25s or less.
Refer to the connection diagram for the SDH4.
Please contact us for applications of high switching operation.

Dimensions

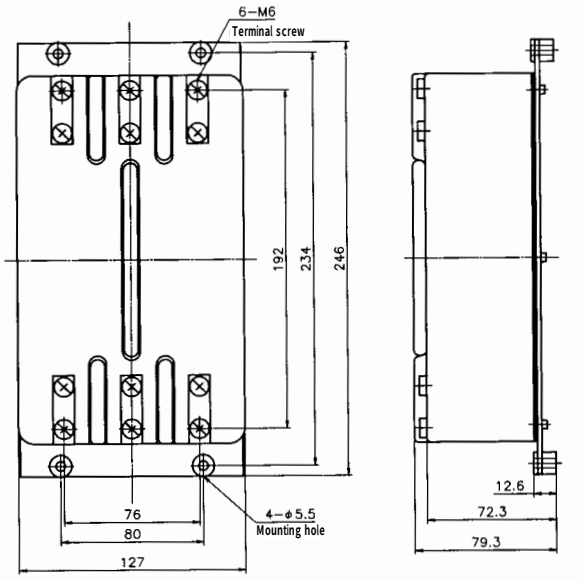
SDR－50－2

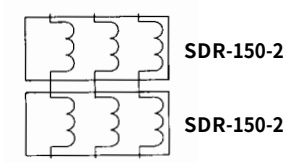


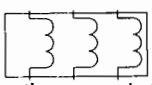
SDR－100－2
SDR－100－4



SDR－150－2
SDR－150－4







For 400V 55 to 150kW