HITACHI
Inspire the Next

SH1 Series Low Voltage Drives

Range - 0.75 kW to 55 kW

SH1 Series

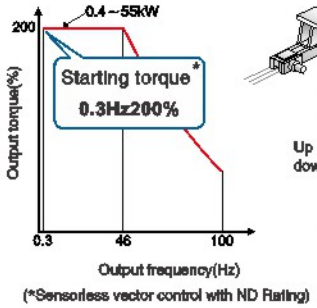
Most Energy Efficient Means of Process Control

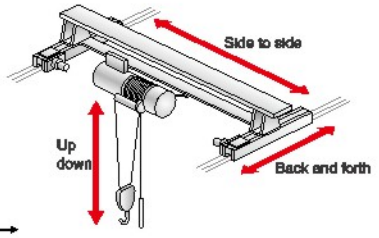
A High Performance drive for the most demanding of applications

• Smooth operation" in critical and demanding applications, such as vertical lift

High starting torque at low speed range while in control of heavy loads.(ND rating).

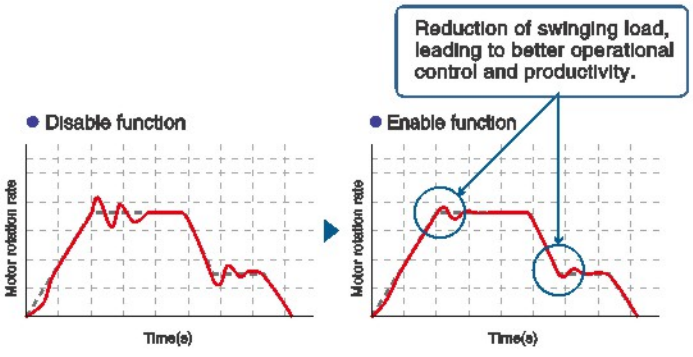
[Sensor less vector control(SLV)]
[Ohz sensor less vector control





Decreasing overshoot and undershoot contributes to smooth and stabilized operation with reduced load shock.

[Gain mapping Function]



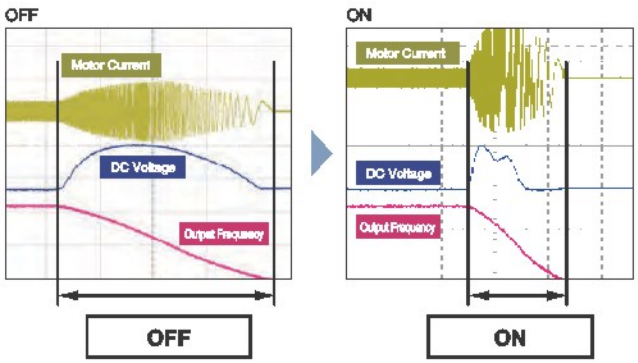
• Cog-less motor operation for crane, lift, transport, etc.

Trip-less operation for better productivity.

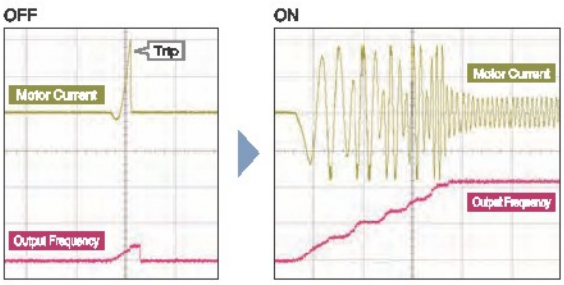
• Reduce trips on acceleration and deceleration

Automatic speed adjustment manages ideal acceleration /deceleration speed to reduce the trip possibility from over current, over voltage, and impact load.

Over magnetize function



Over-current suppress function



*Turn off this function for lifting equipment.

Support for cost reductions

• EzSQ (programming function for customization)

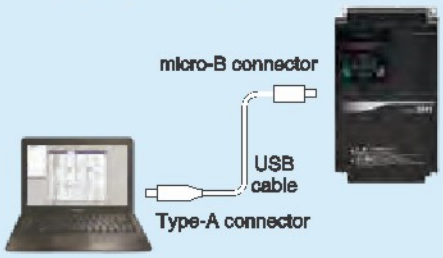
Line	ラベル	ニーモニック	パラメータ1	パラメータ2	パラメータ3	パラメータ4	パラメータ5
Line							
7		Call	1				
8		Case	RUN_FW				
9		Call	2				
10		Case	RUN_RV				
11		Call	3				
12		Case	WAIT_RUN				
13		Call Else					
14		Call	STOP				
15		End Select					
16		Coto	LOOP				
17							
18		Sub	STOP				
19		Ubw=	Xw	and	3		
20		If	UBw	<>	2	then	LBLO
21		FW	1				
22		Timer Set	TD(0)	U(00)			
23		U(31)=			1		
24	LBLO	End Sub					
25							

The program is easy to create with available condition branches and timer settings.

Hitachi's EzSQ makes it possible to achieve a level of control that cannot be realized by a general purpose inverter. Providing a unique solution and added value through cost savings and improved performance.

Simultaneous execution task in SH1 extended to 5tasks/2ms

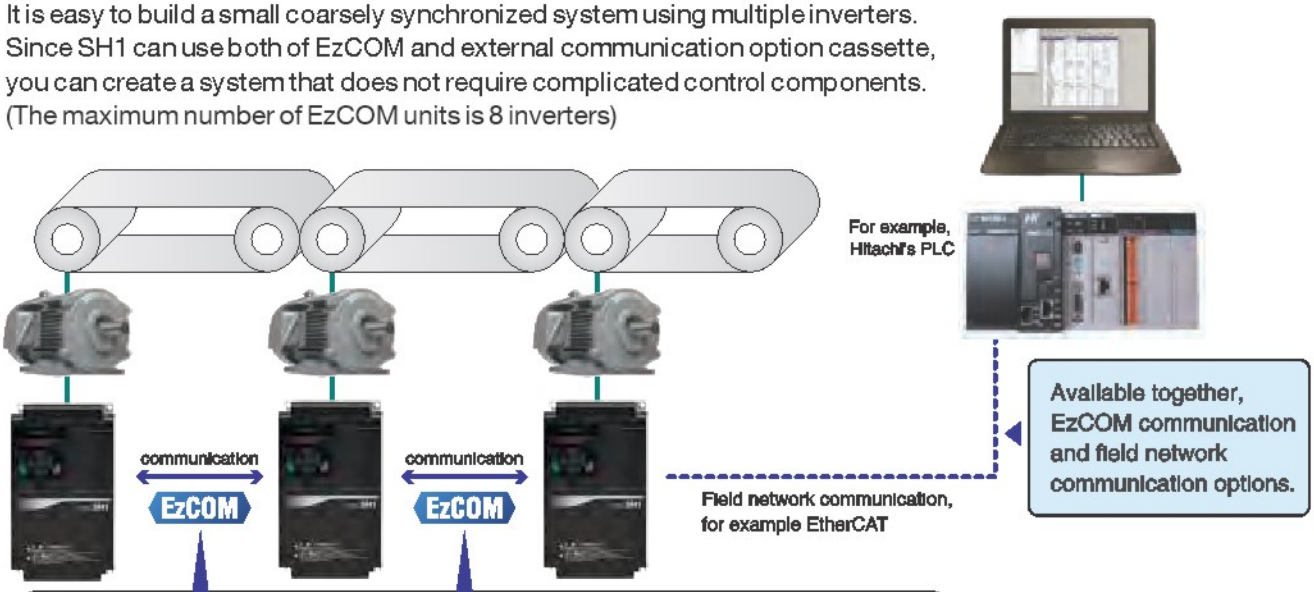
The program is created on a PC setting software (ProDriveNext).
It is easy to programming because similar BASIC!



• Inverter-to-Inverter communication)

SH1 makes it possible to have Inverter-to-Inverter communication without a PLC or PC. [EzCOM function]

It is easy to build a small coarsely synchronized system using multiple inverters. Since SH1 can use both of EzCOM and external communication option cassette, you can create a system that does not require complicated control components. (The maximum number of EzCOM units is 8 inverters)



By simple wiring and easy parameter settings, the synchronous operation can be achieved without the host controller (Resulting in cost and wiring savings).

Model Configuration

• Model Name Indication

SH1-□-□□□□

- F : Integtrated EMC filter
- Region C : China ,Southeast Asia
  E : Europe Version
- Operator F : Digital operator
  V : Digital operator(with Volume)
  T : TFT LCD operator
- Power source H : 3-phase 400V class
- Motor maximum rated curren (tat VLD rated current)
- Type Name

• Applicable Motor Capacity by Rating

3-phase 400V class						
Motor capacity (KW) 3-phase AC380V,4P	VLD mode		LD mode		ND mode	
	SH1-□-H□CF	Rated current	SH1-□-H□CF	Rated current	SH1-□-H□CF	rated current
0.75					00041	2.5A
1.5	00041	4.1A	00041	3.1A	00054	4.0A
2.2	00054	5.4A	00054	4.8A	00083	5.5A
3.7	00083	8.3A	00083	6.7A	00126	9.2A
5.5	00126	12.6A	00126	11.1A	00175	14.8A
7.5	00175	17.5A	00175	16.0A	00250	19.0A
11	00250	25.0A	00250	22.0A	00310	25.0A
15	00310	31.0A	00310	29.0A	00400	32.0A
18.5	00400	40.0A	00400	37.0A	00470	39.0A
22	00470	47.0A	00470	43.0A	00620	48.0A
30	00620	62.0A	00620	57.0A	00770	61.0A
37	00770	77.0A	00770	70.0A	00930	75.0A
45	00930	93.0A	00930	85.0A	01160	91.0A
55	01160	116.0A	01160	105.0A	01470	112.0A
Overload current rating	110% 60s / 120% 3s		120% 60s / 150% 3s		150% 60s / 200% 3s	
Applications	Air blower, water pump, air conditioner and other applications which need light load.		Air blower, water pump, air conditioner, conveyor, textile machinery and other applications which need normal load.		lifting machinary, rolling machinary, compressor, punch, metal working, textile machinery, construction machinery and woodworking machinary which need heavy load.	

Standard Specification

Model name SH1-*****-H			00041	00054	00083	00126	00175	00250	00310	00400	00470	00620	00770	00930	01160	01470
ND standard capacity SH1-***/****H			007	015	022	037	055	075	110	150	185	220	300	370	450	550
Applicable Motor capacity(kW) (4poles)		VLD	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
		LD	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
		ND	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated output current (A)	VLD	4.1	5.4	8.3	12.6	17.5	25.0	31.0	40.0	47.0	62.0	77.0	93.0	116	147
		LD	3.1	4.8	6.7	11.1	16.0	22.0	29.0	37.0	43.0	57.0	70.0	85.0	105	135
		ND	2.5	4.0	5.5	9.2	14.8	19.0	25.0	32.0	39.0	48.0	61.0	75.0	91.0	112
	Overload current rating	VLD	110% 60sec / 120% 3sec													
		LD	120% 60sec / 150% 3sec													
		ND	150% 60sec / 200% 3sec													
	Rated output voltage		Three-phase(3 wire)380 to 460V (Corresponding to the incoming voltage)													
	Rated capacity (kVA) 400V	VLD	2.8	3.7	5.8	8.7	12.1	17.3	21.5	27.7	32.6	43.0	53.3	64.4	80.4	101.8
		LD	2.1	3.3	4.6	7.7	11.1	15.2	20.1	25.6	29.8	39.5	48.5	58.9	72.7	93.5
		ND	1.7	2.8	3.8	6.4	10.3	13.2	17.3	22.2	27.0	33.3	42.3	52.0	63.0	77.6
	Rated capacity (kVA) 500V	VLD	3.6	4.7	7.2	10.9	15.2	21.7	26.8	34.6	40.7	53.7	66.7	80.5	100.5	127.3
		LD	2.7	4.2	5.8	9.6	13.9	19.1	25.1	32.0	37.2	49.4	60.6	73.6	90.9	116.9
		ND	2.2	3.5	4.8	8.0	12.8	16.5	21.7	27.7	33.8	41.6	52.8	65.0	78.8	97.0
Input	Rated input current (A)*1)	VLD	4.9	6.4	9.9	15.0	20.8	29.8	36.9	47.6	56.0	73.8	91.7	110.7	138.1	175.0
		LD	3.7	5.7	8.0	13.2	19.0	26.2	34.5	44.0	51.2	67.9	83.3	101.2	125.0	160.7
		ND	3.0	4.8	6.5	11.0	17.6	22.6	29.8	38.1	46.4	57.1	72.6	89.3	108.3	133.3
	Rated input AC voltage *2)		Control power supply: Single-phase supply 380 to 460V (Permissible AC voltage 323 to 506V) , 50Hz(allowable variation range: 47.5 to 52.5Hz)/60Hz (allowable variation range:57 to 63Hz)													
			Main circuit power supply: Three-phase(3 wire) 380 to 460V (Permissible AC voltage 323 to 506), 50Hz(allowable variation range: 47.5 to 52.5Hz)/60Hz(allowable variation range: 57 to 63Hz)													
	Power supply capacity (kVA) *3)*8)	VLD	3.7	4.9	7.5	11.4	15.9	22.7	28.1	36.3	42.6	56.3	69.9	84.4	105.2	133.4
		LD	2.8	4.4	6.1	10.1	14.5	20.0	26.3	33.6	39.0	51.7	63.5	77.1	95.3	122.5
		ND	2.3	3.6	5.0	8.3	13.4	17.2	22.7	29.0	35.4	43.5	55.3	68.0	82.6	101.6
Carrier frequency variation *4)		VLD	0.5 to 10.0kHz													
		LD	0.5 to 12.0kHz													
		ND	0.5 to 16.0kHz													
Starting torque *5)			200%/0.3Hz													
Braking	Regenerative		Internal BRD circuit (external discharge resistor value)												*7)	
	Minimum resistance value(Ω)		100	100	100	70	70	35	35	24	24	20	15	15	10	10
Dimensions*6)	H(height)(mm)		255	255	255	255	260	260	260	390	390	390	540	550	550	550
	W(width)(mm)		150	150	150	150	210	210	210	245	245	245	300	390	390	390
	D(Depth)(mm)		140	140	140	140	170	170	170	190	190	190	195	250	250	250
Protective structure			IP20 – UL Open Type													
Aprox.weight (kg)			3	3	3	3	6	6	6	8.5	8.5	8.5	22	31	31	31

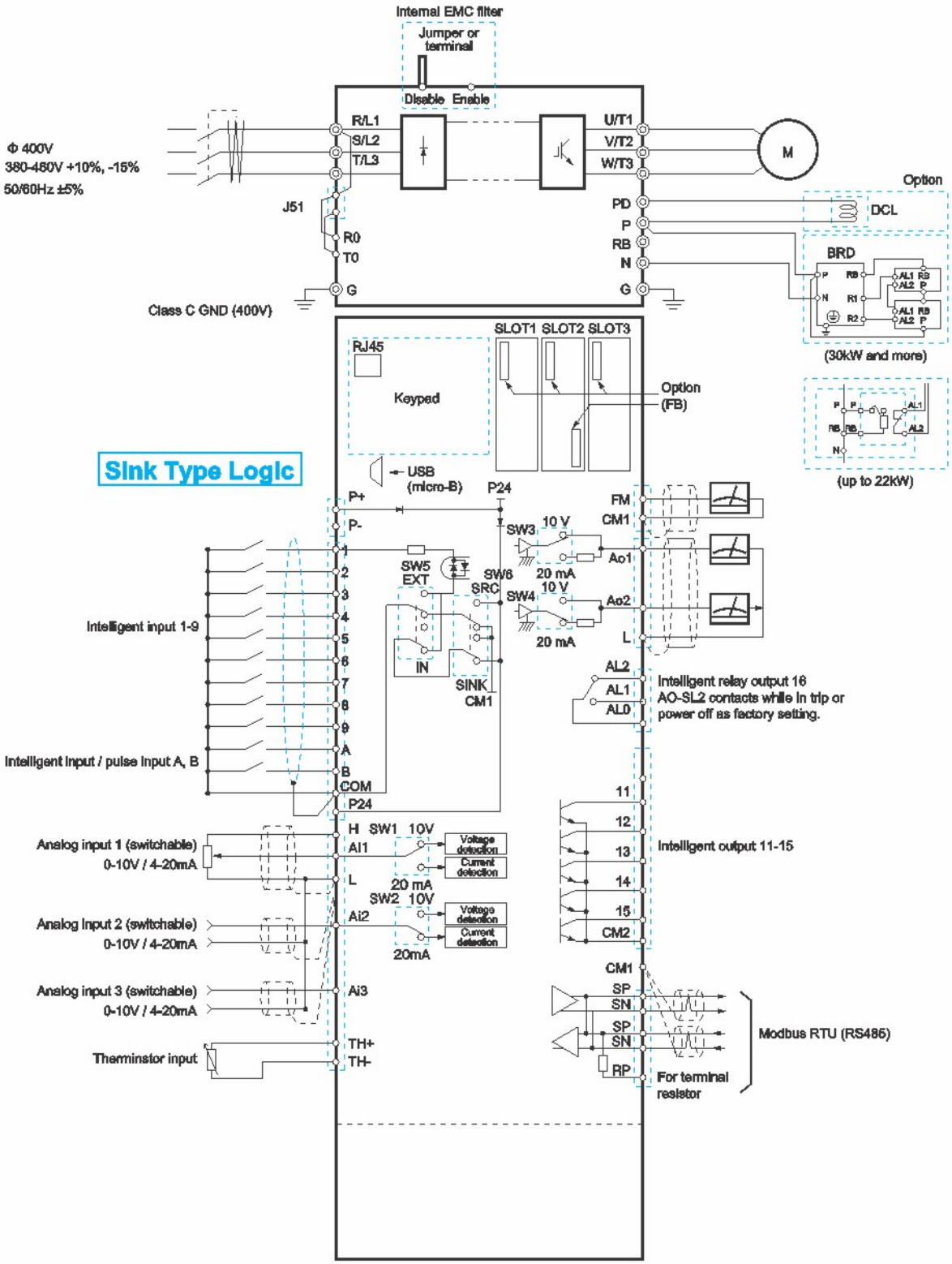
*1) The rated input current is the value when the drive is operated in the rated output current. The value of the impedance at the supply side changes due to the wiring, breaker, input reactor, etc. *2) Make sure the following for Low Voltage Directive (LVD) compliant. *3) The power supply capacity is the value of the rated output current at 440V. The value of the impedance at the supply side changes due to the wiring, breaker, input reactor, etc. *4) The setting range of carrier frequency [bb101] / [bb201] is limited according to the [Ub-03] setting(load type selection). It is recommended to set the carrier frequency settings [bb101]/[bb201] equal or greater than the (maximum output frequency x 10)Hz. For induction motor IM, it is recommended to set the carrier frequency to 2 kHz or more except V/f control. For synchronous motor (SM)/Permanent magnet motor (PMM), it is recommended to set the carrier frequency to 8 kHz or more. *5) The value is specified for the Hitachi standard motor controlled by the sensorless vector control when ND rating. Torque characteristics may vary by the control system and the use of the motor. *6) The key height of keypad is excluded from dimensions. When an option is connected, the depth is increased. Refer to the each optional Guide. *7) Usually an external regenerative braking unit is required. However, with an optional built –in chopper braking circuit and external discharge resistor can eliminate a external regenerative unit. The built-in chopper braking circuit is offered by order. In order to purchase, contact the nearest sales office.

Common Specifications

Items			General Specifications	
PWM system			Sine-wave PWM system	
Output frequency range (*1)			0.00 to 590.00Hz	
Frequency accuracy			For the highest frequency, digital ±0.01%, analogue ±0.2% (25±10°C)	
Frequency resolution			Digital: 0.01Hz, Analogue: Max. frequency / 4000 (AI1 terminal / AI2 terminal: 12 bit / 0 to +10V or 0 to +20 mA, AI3 terminal: 12 bit / -10 to +10V)	
Control system (*2)			IM	V/f control (constant torque / reduced torque / free), Automatic boost control,V/f control with encoder (constant torque / reduced torque / free), Automatic boost control with encoder, Cascade type sensorless vector control, 0Hz sensorless vector control, Cascade type vector control with encoder (position and torque).
			SM/PMM	Methods of synchronous startup for vectorless smart control / Methods of IVMS startup for vectorless smart control
Speed fluctuation (*3)			±0.5% (sensorless vector control)	
Acceleration/deceleration time			0.00 to 3600.00s (Linear, S-curve, U-curve, Inverted-U-curve, EL-S-curve)	
Display			Output frequency, Output current, output torque, trip history, input/output terminal function, input/output power (*4), PN voltage, etc.	
Start functions			DC braking after the start, matching frequency after the start, active frequency matching start, Low-voltage start, retry restart.	
Stop functions			After free run stop, deceleration stop; DC braking or external DC braking operation (Braking force, time, adjustment of operation speed)	
Stall prevention function			Overload limit function, overcurrent supression, overvoltage suppresion function	
Protection functions (*5)			Overcurrent error, overload error, brake resistor overload, overvoltage error, memory error, undervoltage error, current detector error, CPU error, external trip error, USP error, ground error, supply overvoltage error, power loss error, temperature detector error, Cooling-fan rotation speed decrease, temperature error, phase input error, IGBT error, phase output error, thermistor error, brake error, low-speed range overload error, Inverter overload, RS485communication error, RTC error etc.	
Other functions			V/f free setting (7 points), upper and lower frequency limit, frequency jump, curve acceleration and deceleration, manual torque boost, energy-saving operation, analogue output adjustment, minimum speed, carrier frequency adjustment, motor electronic thermal function(free is possible), Inverter thermal function, external start-end(speed and rate), frequency input selection, trip retry, restart stop, various signal output, initialization setting, PID control, auto-decel at shut-off, brake control function, commercial switching function, auto-tuning (on/offline) etc.	
Input	Frequency setting	Panel	up, down,left and right keys to the set parameter.	
		External signal (*6)	AI1 / AI2 terminal (Current and Voltage is able to switched.)	0 to 10Vdc (Input impedance: 10kΩ) / 0 to 20mA (Input impedance: 100Ω)
			AI3 terminal	-10 to +10Vdc (Input impedance: 10kΩ)
			Multi-speed terminal	16multi-speed (With the use of the intelligent input terminal)
			Pulse train-input	Maximum 32 kHz ×2
		External port	RS485serial communication (Protocol: Modbus-RTU, Maximum: 115.2kbps)	
	Forward / reverse Start / stop	Panel	By RUN / Stop key (With the set parameter, forward / reverse can be switched)	
		External signal	Forward (FW) / Reverse (RV) / 3-wire input allowed (STA,STP,FR) (When input terminal functions are assigned)	
		External port	RS485serial communication (Protocol: Modbus-RTU, Maximum: 115.2kbps)	
	Intelligent input terminals		11 terminals (A or B terminal accept a pulse train) FW (Forward rotation) / RV (Reverse rotation), CF1 to 4 (Multi-speed 1 to 4), SF1 to 7 (Multi-speed bit 1 to 7), ADD (Trigger for frequency addition), SCHG (Command change), STA (3-wire start) / STP (3-wire stop) / FR (Forward / reverse by 3-wire), AHD (Analogue command holding), FUP (Remote control up) / FDN (Remote control down), UDC (Remote data clearance), F-OP(Forcible operation), SET (2nd-motor), RS (Reset), JG (Jogging), DB (External DC braking), 2CH (2-stage acc / decel), FRS (Free-run stop), EXT (External trip), USP (Unattended start protection), CS (Commercial power supply switching), SFT (Software lock), BOK (Braking confirmation), OLR (Overload restriction selection), KHC (Accumulated input power clear), OKHC (Accumulated input), PID (PID1 disable), PIDC (PID1 integration reset), PID2 (PID2 disable), PIDC2 (PID2 integration reset), SVC1 to 4 (PID1 multistage target value 1 to 4), PRO (PID gain change), PIO1 (PID output change), SLP (SLEEP trigger) / WAKE (WAKE trigger), TL (Enable torque limit), TRQ1/2 (Torque limit 1/2), PPI (P/PI switching), CAS (Control gain switching), FOC (Forcing), ATR (Enable torque command input), TBS (Enable torque bias), LAC (Acceleration / Deceleration cancellation), MI1 to 11 (General-purpose input1 to 11), PCC (Pulse counter clearance), ECOM (EzCOM activation), PRG (EzSQ programme start), HLD (Acc / decel stop), REN (Motion enable signal), DISP (Display lock), PLA (Pulse train input A), PLB (Pulse train input B), DTR (Data trace start), DISP (Display lock), SON (servo on), ORT (orientation), PCLR (Clearance of position deviation), STAT (pulse train position command input enable), PUP (Position bias (ADD)), PDN (Position bias (SUB)), CP1 to 4 (Multistage position settings selection 1 to 4), ORL (Limit signal of Homing function), ORG (Start signal of Homing function), FOT (Forward Over Travel), ROT (Reserve Over Travel), SPD (speed / position switching), PSET (Position data presetting),	
	Backup supply terminal		P+ / P-: DC24V input (Input allowable voltage: 24V±10%)	
	Thermistor input terminal		1 terminal (PTC / NTC resistor allowed)	
Output	Intelligent output terminals		Transistor output terminal 5, 1c contact relay 1 point	
	Intelligent alarm relay (1c)		RUN (While in run), FA1 to 5 (Reached frequency signal), IRDY (Inverter ready), FWR (Forward rotation), RVR (Reverse rotation), FREF (panel frequency reference), REF (panel motion operation), SETM (2nd-motor selected), AL (Alarm signal), MJA (Major failure signal), OTQ (Over-torque), IP (Power loss), UV (Undervoltage), TRQ (Torque limited), IPS (Decel. Power loss), RNT (RUN time exceeded), ONT (ON time exceeded), THM (Motor electronic thermal warning), THC (Electronic thermal warning), WAC (Capacitor life warning), WAF (Cooling-fan life warning), FR (Operation signal), OHF (heat sink overheat warning), LOC / LOC2 (Low-current indication signal), OL / OL2 (Overload warning signal 1/2), BRK (Brake release), BER (Brake error), ZS (0Hz detection signal), OD / OD2 (Output deviation for PID control), FBV / FBV2 (PID feedback comparison), NDc (Communication disconnection), AI1Dc / AI2Dc / AI3Dc (Analogue AI1 / AI2 / AI3 disconnection), WCAI1 / WCAI2 / WCAI3 (Window comparator AI1 / AI2 / AI3), LOG1 to 7 (logical operation result 1 to 7), MO1 to 7 (General-output 1 to 7), OVS (Over-Voltage power supply), PCMP (Pulse counter compare output), WFT (Trace function waiting for triger), TRA (Trace function data logging), PDD (Position deviation over), POK (Positioning completed),etc.	
	Output terminal monitor (*7)		The data of the monitor can be selected by the parameter of the output.	
EMC filter activation (*8)			EMC filter can be activated (method to switch bares)	
PC external access			USB Micro-B	
Environment	Ambient temperature (*9)		-10 to 50°C (ND), -10 to 45°C (LD), -10 to 40°C (VLD)	
	Storage temperature(*10)		-20 to 65°C	
	Level of humidity		20 to 90%RH(No condensation allowed)	
	Vibration tolerance (*11)		SH1-00041-H to SH1-00620H	5.9m/s² (0.6G), 10 to 55Hz
			More than SH1-00770-H	2.94m/s² (0.3G), 10 to 55Hz
	Installation Place (*12)		A maximum altitude of 1000 m, without gases or dust.	
Components life span(*13)			Main circuit smoothing capacitors is 10 years. / Cooling-fan is 10 years.	
Conformity standars			CE marking(EN 61800-3:2004/A1:2012,EN 61800-5-1:2007)	
Optional slots			3 ports	
Option	Input / ouput		Analog I/O (available soon)	
	Communication		Ethernet (Modbus TCP), EtherCAT, PROFIBUS-DP, PROFINET(available soon)	
	Feedback		Line driver input (RS422)	
Other optional components			Braking resistor, AC reactor, noise filter, operator cable, harmonics suppresion unit, noise filter, LCRfilter, analog panel, regenerative braking unit, PC software ProdriveNext, Screw type terminal block(P1-TM2)	

*1: To operate the motor beyond 50/60Hz, please consult with the motor manufacturer about the maximum allowable rotation speed. *2: If the setting of the motor constant is not appropriate, there is a case when the starting torque is not sufficient or unstable. *3: Speed fluctuation will vary depending on your system and the motor of the use environment. Please contact us for more information. *4: Both input power and the output power are reference (not actual) value. Not suitable for calculations for such as the actual efficiency. *5: IGBT error [E030] also occurs by IGBT damage not only by short-circuit protection. Depending on the operating status of the inverter, Overcurrent error [E001] occurs instead of the IGBT error [E030]. *6: The frequency command is the maximum frequency at 9.8V for input voltage 0 to 10Vdc, or at 19.8 mA for input current 4 to 20 mA. Characteristic change is adjusted by using external start-end function. *7: The analogue voltage and analogue current monitor are estimated outputs of the analogue meter connection. Maximum output value might deviate slightly from 10V or 20 mA by variation of the analogue output circuit. If you want to change the characteristics, adjust the Ao1 and Ao2 adjustment functions. There is monitor data that cannot be part of the output. *8: When the EMC filter is enabled, please connected to the power supply with neutral grounding. Otherwise, it may increase leakage current. *9: Derating is set in accordance to carrier frequency. *10: Storage temperature is the temperature during transport. *11: In accordance with the test methods of JIS C 60068-2-6: 2010 (IEC 60068-2-6:2007). *12: In case of utilization at an altitude of 1000 m or more, take into account that the atmospheric pressure is reduced by 1% for very 100 m up. Please apply a derating of a 1% from the rated current every 100 m. Conduct and evaluation and contact us if you plan on using it above 2500 m. *13: The ambient temperature is 40 °C (annual average).Without corrosive gas, flammable gas, oil mist and dust.)The above design life is a calculated value, not a guaranteed value.Output current at the calculation is 80% of the rated current of the inverter.

Connection Diagram



Note1: Common to each terminal varies.
Note2: Disconnect J51 when to supply R0-T0 separately. UV error is issued when main supply is off while in operation.

Error Events

Code	Details	Corrective Actions	Related Parameter
E001	• By the load and the operating conditions, overcurrent has occurred	• If the acceleration is fast, increase the acceleration time	[AC120]
		• Use the overcurrent suppression function	[bA120]
		• Use the overload restriction function	[bA122]
		• Use the overcurrent retry function	[bb-22]
		• In order to stabilize the control, adjust the constant	[HA-01]
E005 E039	• By the load and the operating conditions, current has increased.	• If the acceleration is fast, increase the acceleration time	[AC120]
		• Use the overload restriction function	[bA122]
		• If the motor sound is abnormal, in order to stabilize the control, adjust the constant	[HA-01]
E006	• Braking resistor use is limited.	• If the deceleration is fast, increase the deceleration time	[AC122]
		• Reselection of the braking resistor is necessary	[bA-60]
E007	• Internal voltage has increased • Insufficient capacity of the inverter	• If the deceleration is fast, increase the deceleration time	[AC122]
		• Use the overvoltage suppression functions	[bA140][bA146]
		• Use the overvoltage retry function	[bb-23]
		• Use a braking option	-
E008 E011	• Main CPU abnormality	• Carry out counter measures for the inverter noise	-
		• Consecutive errors may cause a failure	-
E009	• Main circuit supply has drop	• To disable the undervoltage error, change setting	[bb-27]
		• Use the undervoltage retry function	[bb-21]
E010 *1)	• Current detector abnormality	• Carry out counter measures for the inverter noise	-
		• Consecutive errors may cause a failure, replacement of the components is necessary	-
		• Check the signal status of the input terminal	[dA-51]
E012	• [EXT] input terminal is ON	• Check if there are no operations by communication or programme	
E013	• [USP] input terminal is ON if at the start-up, the RUN command was issued right at the start up	• Make sure that an operation command is not introduced at the time of turning ON the inverter	[dA-51]
E014 *1)	Ground fault is detected at main power supply turned ON.	• Check insulation deterioration and ground fault such as motor and wiring	-
E015	The main power supply voltage has been continuously above the limit.	• Review the power circumstances, such as the power supply capacity	[dA-40]
E016	The control circuit power source was off due to instantaneous power failure.	• If avoiding this trip is required, use the power loss retry function	[bb-20]

***1) As a major failure error, the output terminal function [MJA] turns ON. And these errors could not be canceled with input terminal 028[RS].**

Error Events

Code	Details	Corrective Actions	Related Parameter
E019 *1)	Abnormality in temperature detector circuit	• Carry out counter measures for the inverter noise	-
		• If it occurs consecutively, there is a possibility of inverter failure	-
E020 *1)	The internal temperature of the inverter is rising because the rotational speed of the cooling fan is reduced and the cooling is insufficient	• The cooling fan is reached its lifetime, and it is needed replacement	-
		• Lower the carrier frequency	[bb101]
E021	▪ Internal temperature has increased	• Requires a review of the installation circumstances	-
		• Due to clogging or life of the cooling fan, The cooling fan may not be operating normally	-
		• Lower the carrier frequency	[bb101]
E024	• Disconnection of the wiring in the supply side has occurred	• Check the fastening of the input wiring with screws	-
		• Check that the 3 phases are correctly inserted	-
E030	▪ Sudden increase of current	• Verify if a ground fault or a cable disconnection/rupture has occurred at the output wiring.(possible short circuit)	-
		• Check that the motor is not locked.	-
E034	• Disconnection of the wiring in the motor side has occurred	• Check the output wiring disconnection, motor insulation failure, ...etc.	-
		• Check that the 3 phases are correctly inserted	-
E035	▪ Abnormal motor temperature	• Improve the motor cooling circumstances	-
		• Use the overload restriction function	[bA122]
	• Thermistor abnormality	• Check if the thermistor is damaged	-
		• Check the thermistor settings	[Cb-40]
E036	• Brake abnormality	• Check if the brake is damaged and if the wiring for the [BOK] signal is disconnected	[dA-51]
		• Check the brake waiting time	[AF134][AF141]
E038	Increase of current during slow speed operation	• If torque is needed during slow speed, a review of the inverter capacity is necessary	-
E040	▪ Keypad disconnection error	• Check for the disconnection of the keypad MOP from the inverter	[UA-20]
		• Noise counter-measures are necessary	-
E041	• RS485 communication error	• Noise counter-measures are necessary	-
		• Check the communication setting	[CF-01]to[CF-08]
E042	▪ RTC error	• Battery replacement for the keypad VOP(option) is necessary	-
E043 to E045 E050 to E059	▪ There is an error in the EzSQ programme	• For more information, contact to your supplier or local Hitachi distributor or service station	
E060 to E089	▪ There is an error in the option	• For more information, contact to your supplier or local Hitachi distributor or service station	
1:E090 to E093 2:E094 to E097	1:There is an error in the STO path *2) 2:There is an error in the P1-FS *2)	• For more information, contact to your supplier or local Hitachi distributor or service station	
E100	A disconnection error of the signal line occurred at P1-FB	• This error related to the feedback option	-
E104	The current position has exceeded the setting range of [AE-52] and [AE-54] in position control	• These are errors related to feedback control. Review the operating conditions, check the wiring, encoder settings and other related parameter settings again.	[AE-52] [AE-54]
E105	The speed deviation exceeded "[bb-83] Speed deviation error detection level"		[bb-82] [bb-83]
E106	Position deviation exceeded "[bb-86] Position deviation error detection level"		[bb-86] [bb-87]
E107	The speed has exceeded "[bb-80] Over-speed detection level"		[bb-80] [bb-81]
E110	A contactor error has occurred	• Re-check [AF120] to [AF123] and wiring etc. of external contactor	[AF120] to [AF123]
E112	This error related to the feedback option	• For more information, contact your supplier or local Hitachi inverter sales office	-
E120	This is an error when starting up PID function	▪ Check the wiring and check the parameter settings related to PID soft start such as [AH-76]	[AH-75] to [AH-82]

※For others errors not shown above, contact your supplier or local Hitachi inverter sales office .
***1) As a major failure error, the output terminal function [MJA] turns ON. And these errors could not be canceled with input terminal 028[RS]. However the E020 error can be reset after the inverter temperature drops down.**
***2) For SH1 series, function safety is invalid.**

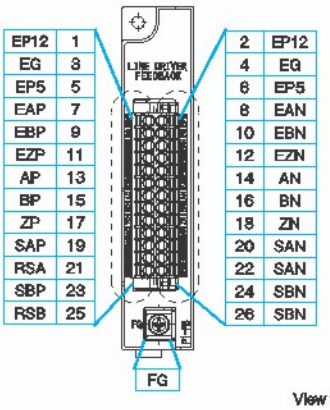
Optional Cassets

Three option cassettes can be installed in SH1. Please extend according to machine and system specifications.

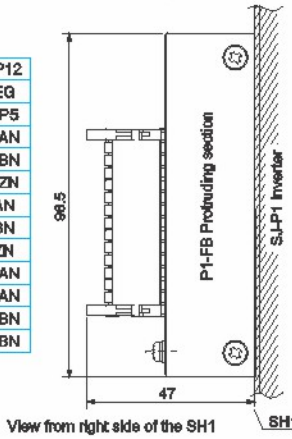
● Encoder feedback option [P1-FB]

P1-FB successfully detects the rotation speed of the motor equipped with an encoder and feedbacks to the inverter. Thus, it contributes to suppressing the speed variation and helps to operate with high accuracy.
In addition, such function can be realized such as position command, synchronous operation and orientation function.
[Application example]
High precision operation of main motor for Winding machine, Wire drawing machine, Transport machine, Extruder and more.

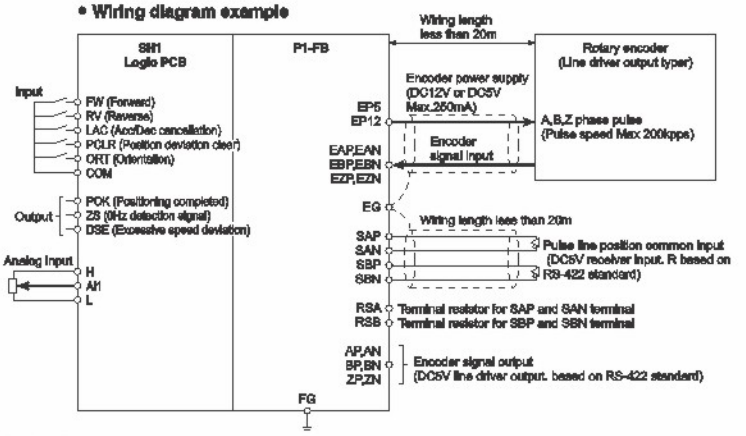
• Terminal sequence



• Wiring diagram example



• Wiring diagram example



[unit : mm]

● Field network communication option [P1-ECT, P1-EN, P1-PB]

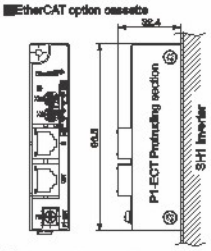
With the field network option, the inverter can be operated, status monitor, parameter management etc from the host controller. Since these are cassette type mounted on the front of the Inverter, Installation, wiring, station number setting and status check of various indicators are very easy.

Item		Specification
EtherCAT OPTION	Communication protocol	EtherCAT CiA402 Drive profile
	Physical layer	100BASE-TX (IEEE802.3)
	Connector	RJ45 (IN / OUT)
	Communication distance	Distance between nodes(between devices) : 100[m]max
	Station address*1	1 to 99 : Set by the address setting switch, 1 to 65535 : Set by configuration (The station address setting depends on the addressing mode used by the EtherCAT master.)
	Distributed clock	Free run mode (asynchronous)
	Process data	PDO free mapping
	Mailbox (CoE)	Emergency messages, SDO requests, SDO responses, Abort SDO
	CiA402 drive profile	Velocity mode
	Applicable cable	100BX-TX support (category 5e or higher) STP(Shield twist pair) cable (Straight or Crossed).
Ethernet (Modbus-TCP) OPTION	Applicable standards	IEEE802.3
	Communication protocol	TCP/IP (Available for IPv4 and IPv6)
	Communication protocol (application layer)	Modbus TCP
	Physical layer	10BASE-T,100BASE-TX (IEEE802.3)
	Connector	RJ45 (PORT1/PORT2)
	Communication distance	Distance between nodes(between devices) : 100[m]max
	Communication method (transmission speed)	Fixed transmission speed : 10Mbps Full/Half-duplex or 100Mbps Full/Half-duplex Auto detection transmission speed : Auto negotiation
	Auto MDI-X	According to selection of communication method (transmission speed). Selecting the auto negotiation: the function Auto MDI-X is enable. Selecting others: the function Auto MDI-X is disable.
	Port number	502 (It can be configured by the inverter parameter setting)
	Maximum number of sessions	4 (Do not connect our PC setup software(ProDriveNext) multiple at the same time)
	External power supply	DC24V±10%, Current consumption: 1A to 1.5A (Current consumption fluctuates with inverter and/or other options operating and so on.)
	Dielectric strength	AC500V (Between insulation circuit)
	Applicable cable	100BX-TX support (category 5e or higher) STP(Shield twist pair) cable (Straight or Crossed).
PROFIBUS OPTION	Communication protocol	PROFIBUS DPV0 PROFIBUS DPV1
	Connector, Cable	D-sub 9 pin, PROFIBUS DP cable (EN 50170 part 8-2 as "Cable Type A")
	Node address	0 to 99 : set by rotary switches 1 to 126 : set by parameters (In case of rotary switch setting is in 0)
	Profile	PROFIdrive
Common environment specification	Ambient operating temperature, Ambient operating humidity, Storage temperature	-10 to 50°C, 20 to 90%RH, -20 to 65°C (No icing or condensation conditions.)
	Vibration resistance	5.9m/s2(0.6G), 10 to 55Hz
	Conformance to EMC and electrical safety standards	IEC/EN61800-3 Second environment, Category C3 IEC/EN61800-5-1 SELV
	Enclosure rating	IP00
	Weight	170g

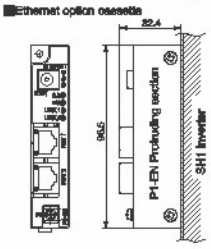
[unit : mm]

Appearance and
Dimensions of protrusion at installation.

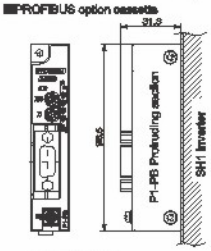
■EtherCAT option cassette



■Ethernet option cassette



■PROFIBUS option cassette



SH1 front surface,
View from right side of the SH1

*NOTE: When installing the optional cassette, it protrudes from the SH1 surface as shown in the figure.Please design the depth dimension of enclosure considering this protrusion, connector, wiring etc. EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
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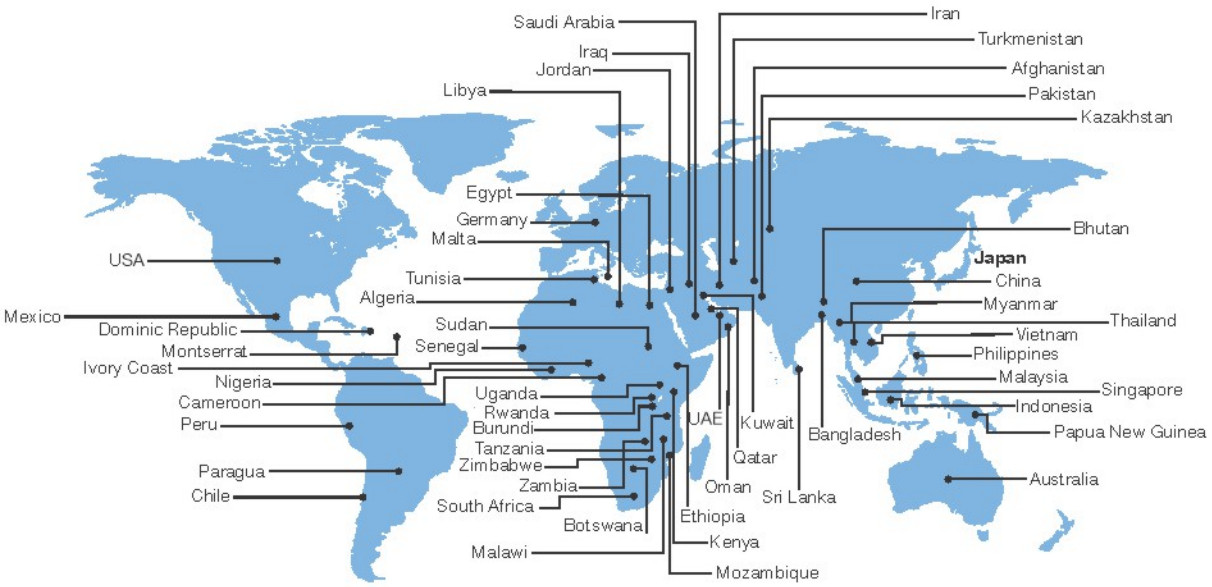
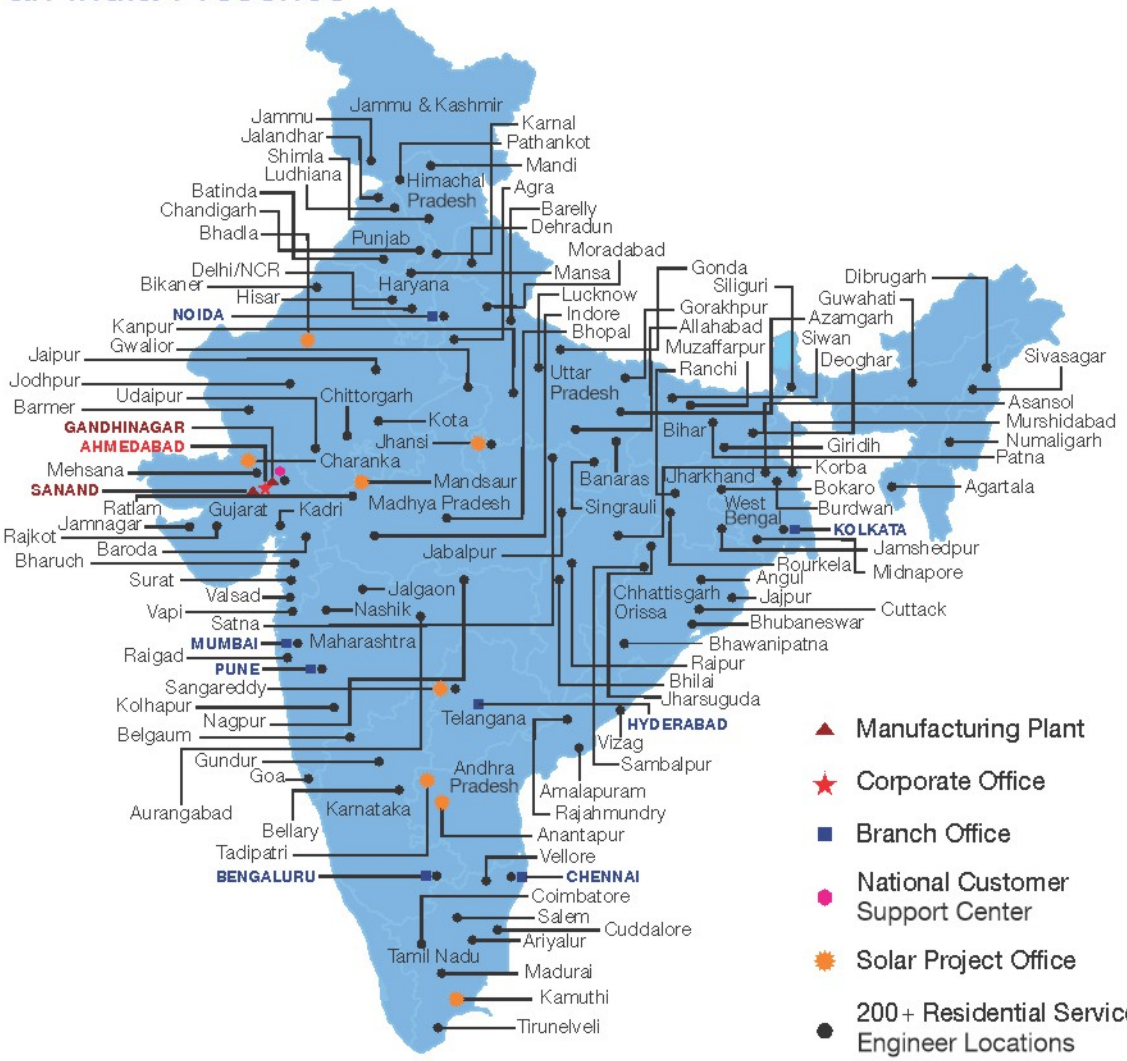
Worldwide Presence



Pan India Presence



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