



**TECHNICAL CATALOGUE  
Variable Frequency Drives  
x2000 Series**

# —ABOUT US—

Lauritz Knudsen Electrical & Automation, formerly known as L&T Switchgear, is a leading player in the electrical industry owing to its 70+ years of strong legacy and commitment to the nation's growth. The brand is dedicated to providing a wide range of electrical and automation products and solutions to vital sectors of the economy, including industries, utilities, infrastructure, buildings, and agriculture. Our extensive portfolio includes low-voltage and medium-voltage switchgear, automation solutions, tailored software, and services.

With manufacturing operations in Ahmednagar, Vadodara, and Coimbatore, we adhere to global standards of excellence. Our operations are supported by well-equipped, in-house design and development centers, as well as tooling facilities, ensuring precision in manufacturing.

We proudly operate six Switchgear Training Centers (STCs) across Pune, Lucknow, Coonoor, Vadodara, Delhi, and Kolkata. These centers offer tailor-made classroom courses and lab learning experiences for technicians, customers, engineers, professionals, and students.

With a deep national presence and one of the largest electrical distribution networks, comprising over 1500 partners across the country, we are committed to driving excellence and delivering superior products and solutions that power India's growth journey.



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The new **reliability edge**

## x2000 AC Drive Series

### Over Four Decades of Application Knowledge

For over four decades, various industry sectors have been reaping the benefits of Lauritz Knudsen Electrical & Automation's cost-effective, performance-oriented AC Drive solutions. LK-EA's grasp of the specific needs of each

industry enables it to offer application-specific solutions for various industries - such as processing, textile, plastic, ceramic, pharmaceutical, elevator, oil & gas, power, cement and material-handling.



## Backed by engineering knowledge across seven decades

A knowledge-based company, Lauritz Knudsen Electrical & Automation LK-EA brings you the benefits of its engineering experience and expertise, and the richness of its collaborations with technology leaders across the globe.

LK-EA's low-voltage switchgear - India's widest range - has been the preferred option of top industrial houses countrywide.



## Tested. Certified. Reliable.

LK-EA is one of the few switchgear manufacturers in India with a dedicated, NABL-certified testing facility. Our products are tested for conformity to standards that exceed mandatory requirements, giving you the assurance of high-quality performance. Our focus on continuous improvement ensures

that our quality is on par with the best in the world. Repeat orders endorse the value that we deliver.

The reliability of the x2000 series AC Drives is ensured by international test certification – UL, CE and RoHS.



## After-sales service aimed at maximum uptime

A malfunction of the drive can bring an entire assembly line or process to a halt. To ensure maximum uptime for you, our Rapid Response service team is available to analyze the situation and help you set the problem right. We have set up strategic service centres across the country to provide temporary replacement drives or ready spares to ensure that your business keeps running smoothly.



## Training your people to enhance your operations

At our countrywide Switchgear Training Centres, we can train your operators, electricians and supervisors to increase their effectiveness in the operation and maintenance and trouble-shooting of your drives. We can also conduct in-plant training and workshops at your premises to improve both power management and equipment maintenance skills. This gives you total operational excellence, minimising downtime.

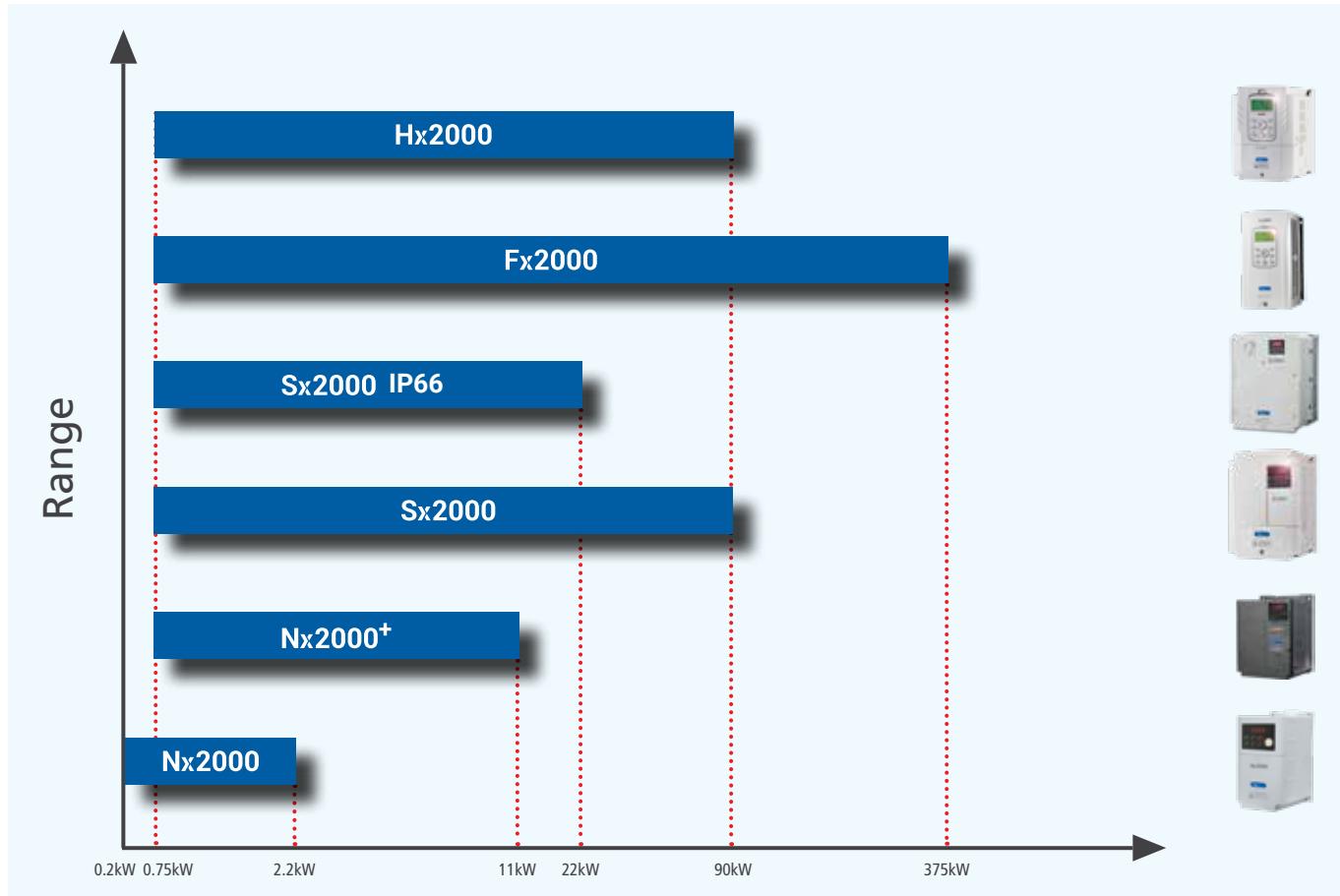
LK-EA's engineers and channel partners also upgrade their skills through seminars, workshops, training sessions and white papers on electrical practices.



## Advantages & Benefits

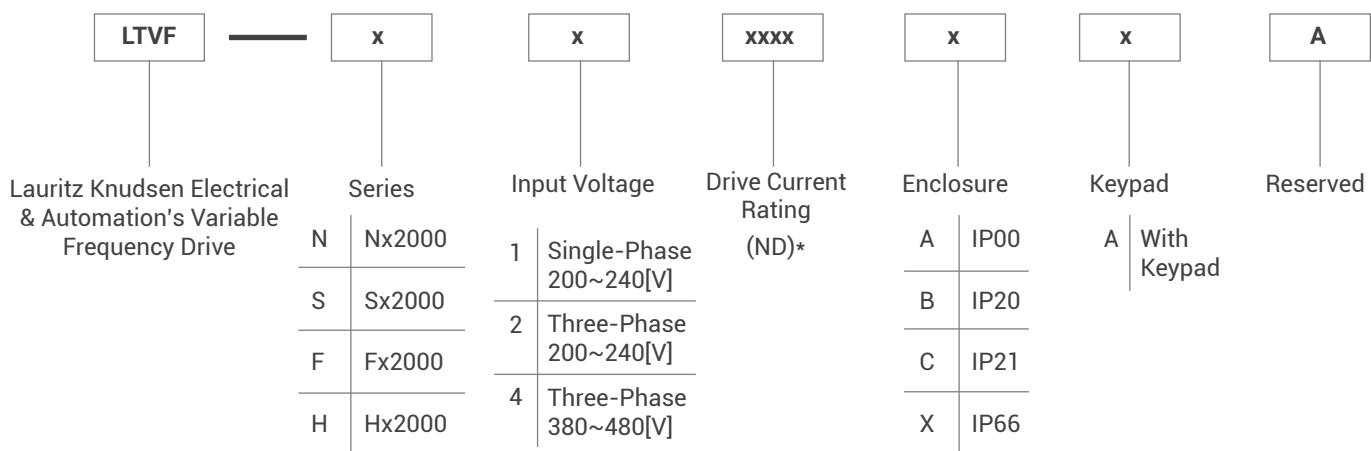


Salient Features	Advantages	Benefits
Built-in 24V Power Source	Reduced wiring & no need of external SMPS	No extra cost & space for SMPS & its mounting
Built-in potentiometer	No need of external potentiometer, possible to add reference from keypad and external signal	No extra expenditure of external potentiometer, simple panel wiring and no panel cut-out
Conformal Coating	Complies to IEC 60721-3-3 class 3C3. Improves life of electronic circuit in harsh environments, even reduces downtime	Increased life of drive
Booster Pump Control	Maintains desired pressure or flow by operating pumps run by conventional starters	Saving on cost of external controller
User Sequence (PLC Functionality)	It creates a simple sequence from a combination of different function blocks. No software required to create logic.	Saving on cost of external hardware or extra PLC
Multi Keypad	One master keypad can monitor/program 16 slave drives	Saving on cost of external display for slave drives
Peer-to-Peer Communication	Allows the drives to share any I/O via inbuilt RS485 communication	Saving on cost of external I/O expansion card
Sleep & Wake PID Function	Automatically switches OFF the drive during user-programmed low-load conditions and then to startup again when process demand increases	Energy-saving as well as saving on wear and tear of mechanical system
Brake Control	Provides external brake control function for vertical load such as crane & elevator	Improves safety
Pre PID	Performs a general acceleration until the set frequency is reached	Smooth PID operation
2nd Motor Operation	Single AC drive can maintain two motor parameters connected to two different loads, different accel / deacc time, motor current & protection for both the motors	For isolated operation of motors one VFD can be used in place of two
Built-in Chopper	Ease of wiring, saves space	No external DBU required, hence reduced cost
Built-in DC Reactor	Reduced harmonics and improved power factor	No external reactor required
Built-in Safety Circuit	If a machine needs to stop in an emergency, circuit will block the drive output.	Additional human & machine safety
Removable Terminal Block	Control card of the existing drive can be replaced to new drive without removing control wiring	Reduces downtime for AC drive replacement
Component Life Monitoring	Digital output can be triggered when components eg. capacitor have completed their lifespan	Pre-alarm for capacitor failure, avoiding breakdown
Enhanced Cooling Design	Suction structure for internal cooling system enhances their protection and improves the life of drive in dusty working environment	Improves operating life of IGBT & AC drive
RS485 Modbus Communication	Ease of communication with 3rd party devices on MODBUS	No extra cost for RS485 Modbus
RoHS-compliant	Complies to EU Directive 2002/95/EC stands for restriction of hazardous substances	Lead-free products, environment-friendly
No Motor Detection	Drive trips when all the 3 phases are disconnected	Useful protection in overhauling applications running with external mechanical brake



Nx2000: 1-Phase 230V 0.2 to 2.2kW (HD)	Sx2000: 1-Phase 230V 0.75 to 3.7kW (ND)
Nx2000 <sup>+</sup> : 3-Phase 230V 0.75 to 11kW (ND) 3-Phase 415V 0.75 to 11kW (ND)	3-Phase 230V 0.75 to 18.5kW (ND) 3-Phase 415V 0.75 to 90kW (ND), 0.4 to 22kW (HD) - IP66
Fx2000: 3-Phase 415V 0.75 to 375kW (HD)	Hx2000: 3-Phase 415V 0.75 to 90kW (ND)

## Model type & Selection



\* For 230Vac Single-Phase & Sx2000 IP66 drive mentioned current is HD rating

## Applications

x2000 Series Applications	Nx2000 & Nx2000 <sup>+</sup>	Sx2000	Fx2000	Hx2000
Blowers	●	●	●	●
ID / FD Fan	●	●	●	
Pump	●	●	●	●
Conveyors	●	●	●	
Compressors	●	●	●	●
Crane Hoisting		●	●	
Crane Traverse	●	●	●	
HVAC	●	●		●
HVLS	●			
Agitator	●			
Lifts Door Control	●			
Lifts		●	●	
Escalators	●	●	●	●
AHU	●	●		
Winders		●	●	
Wire Drawing	●	●	●	
Ball Mill		●	●	
Textile Machinery	●	●*	●	
Centrifuge	●	●	●	
Extruder		●	●	
Spinning Machine	●	●*	●	
Rotary Klins			●	
Printing	●	●	●	
Crushers		●	●	
Hydraulic Press		●	●	
Plastic Machinery	●	●*	●	
Food Packaging	●	●	●	
Solar Pump		●		
Mixers	●	●	●	
Tank Rotator	●	●	●	
Pulper		●	●	
Tea Making	●	●	●	
Rubber Machinery		●	●	
Machine Tools	●	●	●	
Material Handling	●	●	●	

Note: Above chart is only a general guideline. Please contact us with exact details of your application.

\*Sx2000 IP66 is best suitable for this application.

# Fx2000

The Fx2000 generates powerful performance and meets your precise needs through several features: superior V/F control, V/F PG, slip compensation and sensorless vector control as well as closed-loop vector control.

The Fx2000 is perfectly suited for the toughest, most complex applications – cranes, plastic winders, high-speed elevators,

cement kilns, crushers... and more. It handles loads up to 375 kW - HD / 450 kW - ND, and is engineered to keep your machine operating at optimum efficiency, even in the hot, humid and dusty conditions that characterize India's industrial environment.



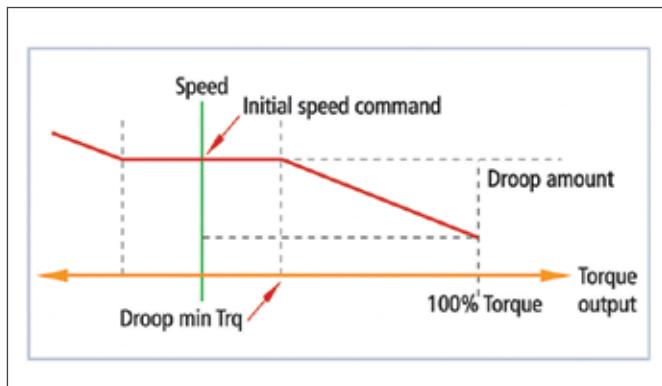
## Main Features

- › Range: 0.75kW to 375kW (HD)
- › V/F control, V/F with PG, Slip compensation, Sensorless Vector Control, Close Loop Vector Control
- › Built-in Macro for Crane
- › Starting Torque: 250% at 0Hz for Closed Loop
- › Optional Smart PLC
- › Optional Synchronization card
- › Droop Control
- › Conformal Coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)
- › Built-in RS485 Modbus RTU Communication

## Applications

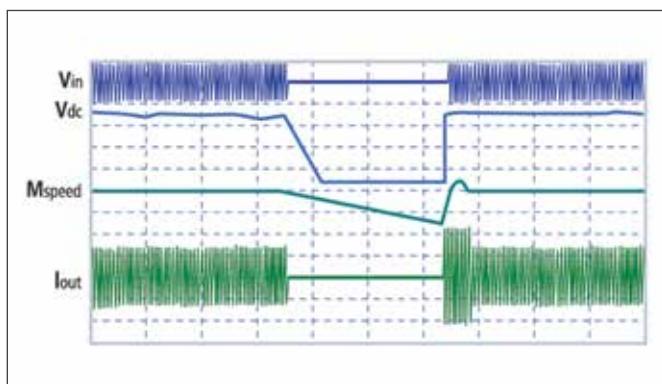
- › Crane Hoist
- › Crane Control LT / CT
- › Winders
- › Wire Drawing
- › Plastic & Textile Machines
- › Conveyors
- › Compressors
- › Extruders
- › Fan
- › Pump

## Automatic Torque Balance droop control

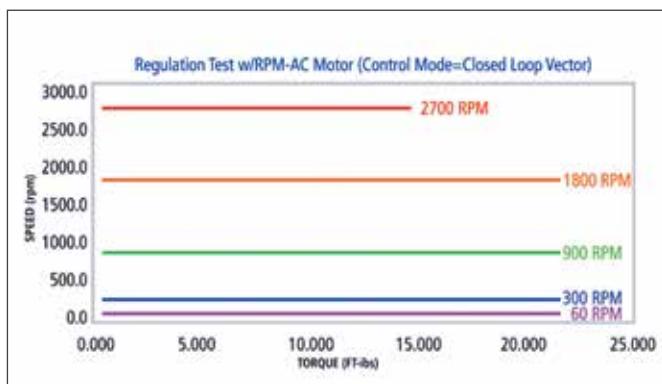


Droop control algorithm adjusts changeable torque driven by speed. This algorithm is easily applicable to open-loop linking driving and load sharing driving.

## Ride-through (LV trip delay) for sudden power loss



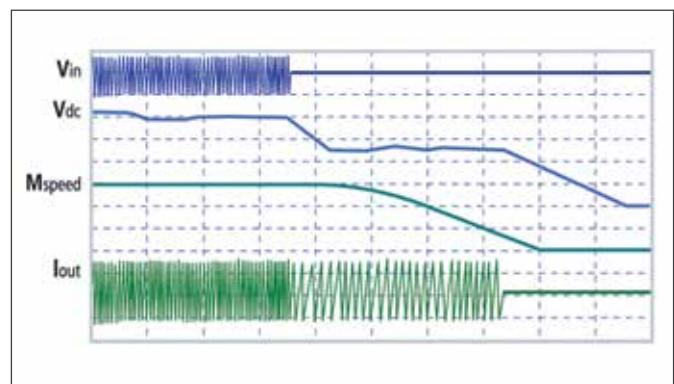
## Closed Loop Vector realizing precise speed/torque control



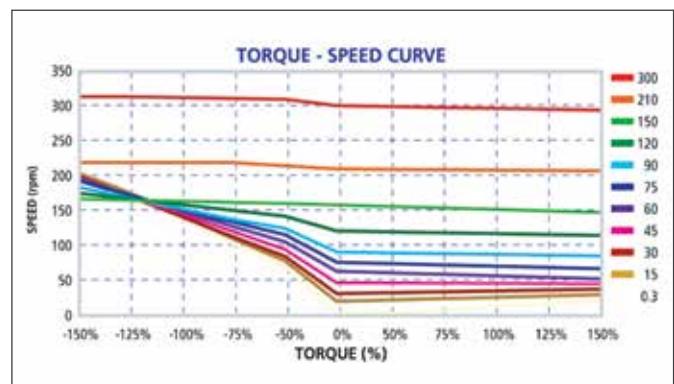
In the entire speed range including zero speed, powerful torque (up to 250%) performance is materialized through receiving Max. 200kHz frequency pulse via an encoder-dedicated board.

- › Speed control range 1000:1
- › Instant Max. torque control capability 250%
- › 50Hz speed control response

## Kinetic Energy Buffering (KEB) for a stable system stop in case of power loss or failure



## Powerful current sensorless vector control



Our Fx2000 technology includes a competitive and strong low-speed torque control and a speed-precision-driven vector algorithm.

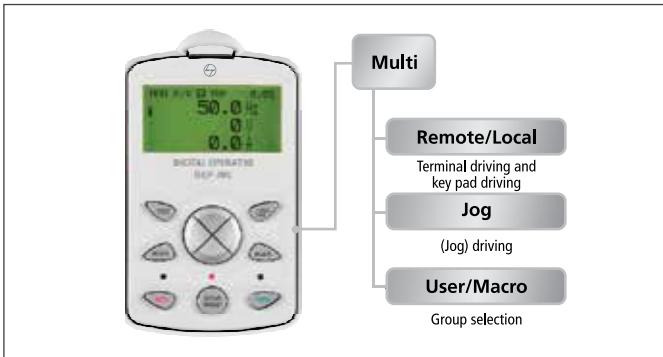
- › Speed control range 1000:1
- › Extremely low torque control capability: 0.1Hz/150% real torque
- › Max. torque control capability within the restoration range

## DC reactor built-in\* for harmonic reduction and power factor improvement



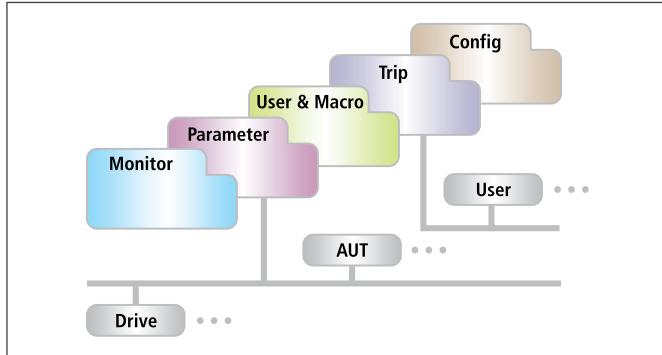
\* From 22kW to 280kW (ND)

## Multi-function key



It can be programmed for different functions like Remote / Local, User / Macro Selection & JOG

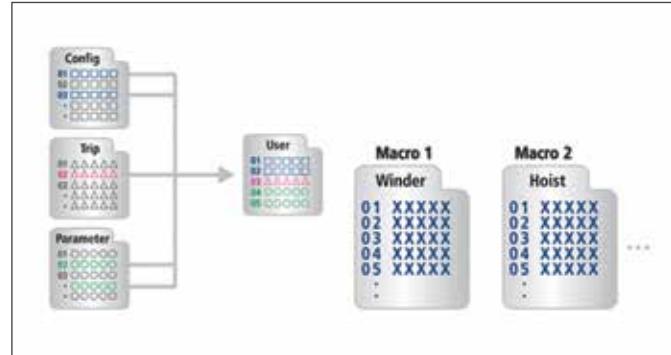
## Efficient architecture of 5-mode 15-parameter groups



Each mode has its own function items suitable for desired properties

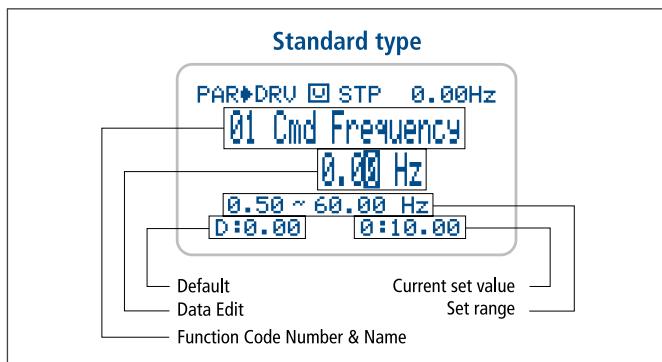
eg. Monitor: Displays information on the operating status of the inverter

## User & Macro group support



- › User can define parameters together they use often in User Macro
- › Maximum 64 number of parameters can be saved
- › Same parameter can be saved several times

## Wide viewing-angle graphic LCD keypad



- › 3 LED
- › 11 Keys
- › 4 Lines for monitoring
- › Built-in memory to store parameters on keypad

## Built-in Crane Algorithm



### Enhance-Torque Control

- › 250% starting torque in closed loop control
- › Overload capacity of 200% for 3 seconds

### Built-in Brake Control

- › Brake opening command by drive under the following conditions:
  - » Inverter Output Freq > Brake Release Frequency
  - » Inverter Output Current > Brake Release Frequency
- › Brake release with delay
- › Ensures Slip prevention
- › Brake Close frequency different settings possible for Hoisting & Lowering Motion

## Position Control Option



- › Suitable for applications like cut to length
- › Pulse train reference upto 200kHz
- › No need of external controller
- › Reduces cycle time
- › Reduces wastage of material

## Synchronisation Control



- › Suitable for applications like roving frame, ring frame
- › Maximum frequency upto 100kHz
- › Position/Speed synchronization possible

## Technical Specifications

3-Phase, 380-480VAC (-15%, +10%), 50/60Hz (±5)										
VFD CAT No.	Rated Output				Rated Input		DC Reactor	Braking Unit		
	Normal Duty		Heavy Duty		Normal Duty	Heavy Duty				
	P <sub>ND</sub> (kW)	I <sub>ND</sub> (A)	P <sub>HD</sub> (kW)	I <sub>HD</sub> (A)	Rated Capacity (kVA)	(A)				
LTVF-F40004CAA	1.5	4	0.75	2.5	1.9	3.7	2.2	External (Option) Built-in		
LTVF-F40006CAA	2.2	6	1.5	4	3.0	5.7	3.6			
LTVF-F40008CAA	3.7	8	2.2	6	4.5	7.7	5.5			
LTVF-F40012CAA	5.5	12	3.7	8	6.1	11.1	7.5			
LTVF-F40016CAA	7.5	16	5.5	12	9.1	14.7	11			
LTVF-F40024CAA	11	24	7.5	16	12.2	21.9	14.4			
LTVF-F40030CAA	15	30	11	24	18.3	26.4	22			
LTVF-F40039CAA	18.5	39	15	30	22.9	35.5	26.6			
LTVF-F40045CAA	22	45	18.5	39	29.7	41.1	35.6			
LTVF-F40061CAA	30	61	22	45	34.3	55.7	41.6			
LTVF-F40075CAA	37	75	30	61	46	67.5	55.5	Built-in External (Option)		
LTVF-F40091CAA	45	91	37	75	57	81.7	67.9			
LTVF-F40110CAA	55	110	45	91	69	101.8	82.4			
LTVF-F40152CAA	75	152	55	110	84	143.6	102.6			
LTVF-F40183CAA	90	183	75	152	116	173.4	143.4			
LTVF-F40223AAA	110	223	90	183	139	212.9	174.7			
LTVF-F40264AAA	132	264	110	223	170	254.2	213.5			
LTVF-F40325AAA	160	325	132	264	201	315.3	255.6			
LTVF-F40370AAA	185	370	160	325	248	359.3	316.3			
LTVF-F40432AAA	220	432	185	370	286	463	404			
LTVF-F40547AAA	285	547	220	432	329	590	466	External (Option)		
LTVF-F40613AAA	315	613	285	547	416	673	605			
LTVF-F40731AAA	375	731	315	613	467	796	674			
LTVF-F40877AAA	450	877	375	731	557	948	798			

### Normal Duty

I<sub>ND</sub> Continuous current with 110% overload for 60 sec for every 5 mins at 40°C

P<sub>ND</sub> Maximum capacity applied to use of a standard 4 pole motor

### Heavy Duty

I<sub>HD</sub> Continuous current with 150% overload for 60 sec for every 5 mins at 50°C

P<sub>HD</sub> Maximum capacity applied to use of a standard 4 pole motor

**Note:** 1)The output of rated current is limited according to setting of the carrier frequency (CON-04)

## Technical Specifications

Standard Specifications	<b>Range</b>	<b>Three-Phase 415V, 0.75 to 375kW (HD)</b>
	Enclosure Type	IP21 below 75kW (HD) & IP00 above 90kW till 375kW (HD)
	Isolation Type	Galvanic Isolation
	Overload Capacity	HD: 150% / 1min; ND: 110% / 1min, 200% instantaneous for 3 seconds
	Max Output Voltage	Proportional to input voltage
	Max Output Frequency	0 to 400Hz (1000Hz optional) (Sensorless-1: 0 to 300Hz, Sensorless-2, Vector: 0.0~120Hz)
	Rated Voltage	380 to 480V Three-phase (-15%/+10%)
	Rated Frequency	50/60Hz (-5/+5%)
	THDv	< 5%
	Keypad	LCD Detachable
	DC Reactor	Built-in from 22kW (HD) to 280kW (ND)
	Braking Chopper	Built-in till 22kW (HD)
Control Details	Control Method	V/F, V/F with PG, Closed Loop Vector Control, Sensorless Vector Control, Slip Compensation
	Starting Torque	150% at 3Hz (V/F), 200% at 0.3Hz (Sensorless), 250% at 0RPM (Vector)
	Frequency Control Range	0 to 400Hz in V/F, 0 to 300Hz in Sensorless 1, 0 to 120Hz in Sensorless 2 / Vector
	Frequency Precision Setting	Digital command operation : 0.01% of the maximum frequency Analog command operation : 0.1% of the maximum frequency
	Frequency Setting	Analog: 0 to 10V, -10 to 10V, 0 to 20mA Digital: keypad
	Output Frequency Resolution	0.01Hz
	V/F pattern	Linear, double reduction, user V/F
	Accel/Decel Time	0.0 to 6000 Sec
	Braking Torque	Continuous Regeneration Torque 20% (150% with DBR)
	Features	PID Control, Up-Down, 2nd Motor Operation, 3-Wire Operation, DC Brake, Frequency Limit, Frequency Jump, Second Source Function, Slip Compensation, Reverse Rotation Prevention, Auto Restarting, Auto Tuning Flying Start, Energy Buffering, Power Breaking, Flux Breaking, Leakage Current Reduction, MMC, Easy Start
Protection	Faults	Over Voltage, Low Voltage, Over Current, Earth Current Detection, Inverter Overheat, Motor Overheating, Output Imaging, Overload Protection, Communication Error, Frequency Command Loss, Hardware Failure, Cooling Fan Failure, Pre-PID Failure, No Motor Trip, External Break Trip
	Alarm	Stall Prevention, Overload, Light Load, Encoder Error, Fan Failure, Keypad Command Loss, Speed Command Loss
	Momentary Power Loss Ride Through	Continuous Operation: Heavy Loads below 15 msec & normal loads below 8msec Auto Restarts: Heavy Loads above 15 msec & normal loads above 8msec
Interface	DI	8 (Programmable NPN/PNP)
	DO	2 Programmable (1 NO/NC & 1 NO) + 1 TR
	AI	1No (4 to 20mA) & 1No (0 to 10Vdc)
	AO	1No (4 to 20mA) & 1No (0 to 10Vdc)
	Communication	Built-in RS485 Modbus RTU
Environment	Area of Use	Indoors, There shall not be corrosive air, combustible gas, oil mist, dust and other pollutants
	Ambient Temperature	-10°C to 50°C for HD, -10°C to 40°C for ND
	Storage Temperature	-20°C to 65°C
	PCB Protection	Conformal Coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)
	Application Humidity	Below relative humidity 95% RH (no condensation)
	Altitude	Below 1000m
	Vibration	5.9m/sec <sup>2</sup> (0.6G)
	Maximum Noise level	< 65dbA
	Global Compliance	CE, UL, RoHS

### Specification

- 1) In case of Sensorless-1, you can set the frequency at up to 300Hz by selecting 3 in DRV-09 (Control Mode).
- 2) In case of Sensorless-2, you can set the frequency at up to 120Hz by selecting 4 in DRV-09 (Control Mode).
- 3) The maximum output voltage does not go up over the supplied power voltage. You can select the output voltage as you want below the supplied power voltage.

## Technical Specifications

VFD CAT No.	Efficiency (at 100% load)		True Power Factor		Heat Losses			Fan Data		$I_{thd}$	
	Normal Duty	Heavy Duty	Normal Duty	Heavy Duty	Normal Duty	Heavy Duty	Internal Losses	Flow Rate/Fan	Quantity	Normal Duty	Heavy Duty
	(%)	(%)			(W)	(W)	(W)	(CFM)	(Nos)	(%)	(%)
LTVF-F40004CAA	96.7	95.6	0.92	0.91	40	33	12	150	1	37.12	38.88
LTVF-F40006CAA	96.7	96.2	0.91	0.93	73	58	16	151	1	37.84	39.14
LTVF-F40008CAA	97.0	96.5	0.93	0.93	87	77	16	152	1	38.15	38.16
LTVF-F40012CAA	97.5	97.2	0.93	0.92	142	104	16	153	1	66.13	77.14
LTVF-F40016CAA	96.9	96.9	0.93	0.93	230	173	20	154	2	37.15	39.11
LTVF-F40024CAA	97.1	97.2	0.93	0.90	324	209	20	155	2	38.70	38.34
LTVF-F40030CAA	96.9	96.8	0.92	0.91	422	355	40	156	1	38.74	37.46
LTVF-F40039CAA	97.2	97.1	0.95	0.92	548	431	40	157	1	38.44	37.21
LTVF-F40045CAA	97.2	97.3	0.94	0.91	608	503	40	158	1	33.18	35.14
LTVF-F40061CAA	97.3	97.5	0.94	0.93	796	552	40	159	1	33.21	35.55
LTVF-F40075CAA	97.9	98.0	0.94	0.91	830	588	100	175	2	32.05	33.78
LTVF-F40091CAA	97.5	97.6	0.94	0.92	1130	893	100	176	2	32.73	33.74
LTVF-F40110CAA	97.5	97.6	0.94	0.94	1348	1065	100	177	2	32.7	33.18
LTVF-F40152CAA	97.6	97.7	0.95	0.95	1847	1280	100	240	2	33.18	33.11
LTVF-F40183CAA	97.9	97.9	0.95	0.95	1896	1613	100	241	2	31.07	32.29
LTVF-F40223AAA	97.3	97.8	0.92	0.94	2043	1721	193	242	3	30.17	30.37
LTVF-F40264AAA	97.8	97.7	0.93	0.93	2128	1829	193	243	3	28.4	30.74
LTVF-F40325AAA	98.3	98.3	0.93	0.95	2614	2157	193	244	3	27.41	30.01
LTVF-F40370AAA	98.2	98.4	0.93	0.95	2714	2384	193	245	3	28.14	28.13
LTVF-F40432AAA	98.3	98.4	0.94	0.94	3478	2706	268	Fan-1 = 258 Fan-2 = 60	Fan-1 = 4 Fan-2 = 2	27.18	27.87
LTVF-F40547AAA	98.4	98.5	0.94	0.94	4151	2904	268	Fan-1 = 258 Fan-2 = 60	Fan-1 = 4 Fan-2 = 2	28.46	27.13
LTVF-F40613AAA	98.4	98.2	0.92	0.92	4644	4270	268	286	5	30.18	27.47
LTVF-F40731AAA	98.4	98.3	0.94	0.94	5337	4810	268	286	6	31.18	28.13
LTVF-F40877AAA	98.7	98.4	0.93	0.92	6524	5411	268	286	6	30.44	28.73

### Test Condition

Operation at 3-Phase, 480VAC, 50Hz supply

HD, ND Load 100% (M-G Set load, Corresponding motor to drive)

Carrier Frequency (Default, Max value)

With DC Reactor

Operation at room temperature

\* The result can be measured differently according to test conditions such as AC Reactor presence / input line length / Input impedance and transformer capacity.

## PLC Card (LTAD-PLC-F)



- › Normal input 6 points (Sink/Source selectable), Max. input 14 points when expanded
- › Normal output 4 points (N.O. Relay), Max. output 7 points when expanded
- › RTC (Real Time Clock)

## Encoder Card (LTEN-INC-F)



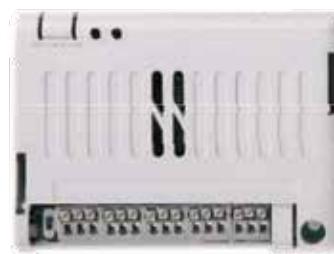
- › Closed loop control
- › Pulse train reference
- › Line driver or open collector type of encoders
- › 200kHz max. input frequency
- › Signal loss detection
- › 5/12/15 V insulated power supply

## Profibus-DP Card (LTCI-PDP-F)



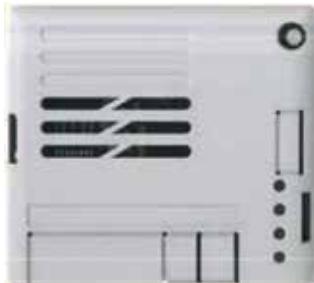
- › Profibus dedicated connector
- › Max. 12Mbps communication speed
- › Max. 32 stations per segment
- › Bus topology
- › Enhanced on-line diagnosis

## I/O Expansion Card 1 (LTIO-EX1-F)



- › Digital input - 3 (PNP / NPN)
- › Digital output - 3 (NO) AC 250V - 5A / DC 30V - 5A
- › Analog input - 2, 1 Voltage (-10 to +10V)  
1 Current (0 to 20mA)
- › Analog output - 2, 1 Voltage (-10 to +10V)  
1 Current (0 to 20mA)

## Ethernet<sup>+</sup> Card (LTCI-ETH2-F)



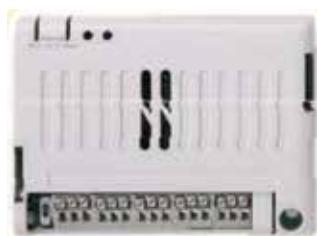
- › Dual RJ45 ports for Ring network
- › Modbus TCP, Ethernet IP, RAPIEnet Protocol support
- › 100Mbps communication speed
- › Half duplex, full duplex support
- › Auto negotiation
- › Max. 100m(328 ft.) transmission distance

## DeviceNet (LTCI-DEN-F)



- › Communication speed: 125kbps, 250kbps, 500kbps
- › Tree/Bus topology
- › Max. 64 node connection points
- › Max. 500m (1640 ft.) transmission distance (125kbps)

## CANopen Card (LTCI-CAN-F)



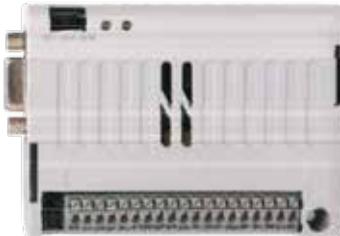
- › 1Mbps communication speed
- › Bus Topology
- › Max. 64 node connection points (include master)

## Synchronization Option Card (LTCN-SYN-F)



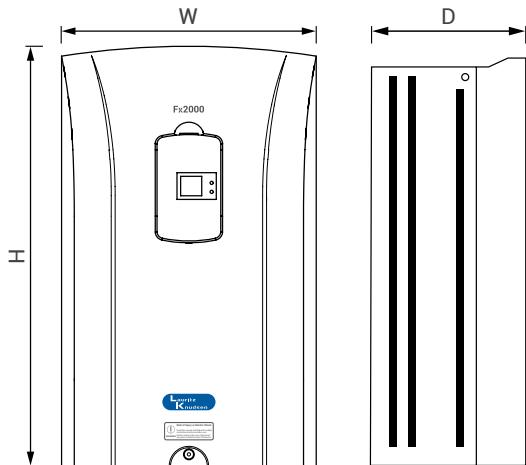
- › Closed-loop control
- › 100kHz max. input frequency
- › For parallel connection 15 slaves per master (5 parallel max)
- › For serial connection 5 slaves per master
- › Position/Speed synchronization
- › Synchronization hold (only slave)
- › Open collector output: 26V/100mA (2 points)

## Position Control Option Card (LTCN-PCN-F)



- › Closed-loop control
- › Pulse train reference
- › Line driver or open collector type of encoders
- › 200kHz max. input frequency
- › Signal loss detection
- › External brake control
- › 5/12/15V insulated power supply

## Dimensions



VFD CAT No.	Frame Size	IP Rating	W (mm)	H (mm)	D (mm)	Weight (Kg)	
LTVF-F40004CAA	F1	IP21	150	284	200	4.8	
LTVF-F40006CAA			150	284	200	4.8	
LTVF-F40008CAA			150	284	200	4.8	
LTVF-F40012CAA			150	284	200	4.8	
LTVF-F40016CAA	F2	IP21	200	355	225	8	
LTVF-F40024CAA			200	355	225	8	
LTVF-F40030CAA	F3	IP21	250	385	284	14.3	
LTVF-F40039CAA			250	385	284	14.3	
LTVF-F40045CAA	F4	IP21	280	461	298	20	
LTVF-F40061CAA			280	461	298	30.3	
LTVF-F40075CAA	F5	IP21	300.1	594.1	303.2	41.3	
LTVF-F40091CAA			300.1	594.1	303.2	41.3	
LTVF-F40110CAA	F6	IP21	300.1	594.1	303.2	41.3	
LTVF-F40152CAA			370.1	663.5	373.3	63.3	
LTVF-F40183CAA			370.1	663.5	373.3	63.3	
LTVF-F40223AAA	F7A	IP00	510	783.5	422.6	101.3	
LTVF-F40264AAA			510	783.5	422.6	101.3	
LTVF-F40325AAA	F7B	IP00	510	861	422.6	114	
LTVF-F40370AAA			510	861	422.6	114	
LTVF-F40432AAA	F8	IP00	690	1078	450	200	
LTVF-F40547AAA			690	1078	450	200	
LTVF-F40613AAA	F9	IP00	771	1138	440	252	
LTVF-F40731AAA	F10		922	1302.5	495	352	
LTVF-F40877AAA			922	1302.5	495	352	

**Note:** The above drawings are solely for reference purposes. Please refer to the technical manual.

# Sx2000

The Sx2000 adds a new dimension to Lauritz Knudsen's AC drive solutions. Built to Lauritz Knudsen's stringent quality standards, the Sx2000 is tested and certified to meet global benchmarks, giving you the assurance of total reliability. The

Sx2000 is built to deliver powerful performance. It produces a starting torque of 200% at 0.5 Hz, which provides better control at low-speed. Its compact size enables panel-size reduction, hence helps in space-efficient design.



## Main Features

- › Range: 0.75kW to 90kW
- › V/F, Sensorless Vector Control, Slip Compensation
- › Starting Torque of 200% at 0.5Hz for Sensorless Control
- › Component Life Monitor
- › Peer to Peer Communication to share I/Os
- › Built-in PLC Logic
- › Built-in Brake Control
- › Multi Keypad
- › Stores last 5 faults
- › Conformal Coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)
- › Built-in RS485 Modbus RTU Communication

## Applications

- › OEM Machines
- › Elevators
- › Plastic & Textile Machines
- › Conveyors
- › Compressors
- › Wire Drawing
- › Extruders
- › AHU Control
- › Fan & Pump
- › Crane Hoist
- › Crane Control LT / CT Solar Pump

## Multi-keypad function

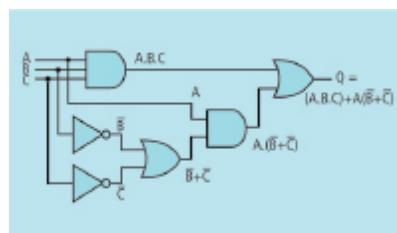
Parameter change with a single keypad.



Single LCD keypad can be used to set up the parameters of RS485 connected drives.

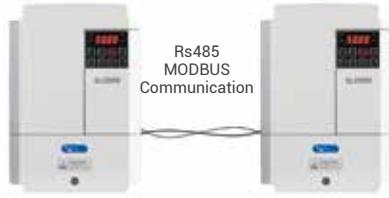
- › LCD (LTOP-DOP-200) keypad (same as Fx2000 model) enables handy parameter set-up.
- › Multi-language support available

## User sequence function (PLC Logic)



- › Simple PLC sequences can be operated with various function block combinations with direct access to Drive parameters.
- › Function blocks: AND, NOR, ADD, SUB, XOR, MIN, MAX, COMPARE, TIMER, SWITCH, UP/DWN COUNT..etc
- › No Software required to create logic

## Peer-to-Peer function embedded



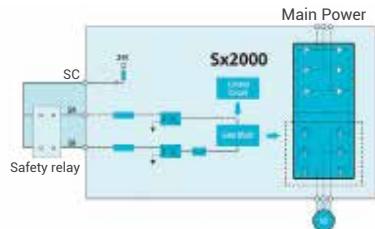
I/O's can be shared among master and slave drives. (RS485 wiring required).

## Built-in Brake Control



- › Brake opening command by drive under the following conditions:
  - » Inverter Output Frequency > Brake Release Frequency
  - » Inverter Output Current > Brake Release Current
- › Brake release with delay
- › Ensures Slip prevention
- › Brake Close frequency different settings possible for Hoisting & Lowering Motion

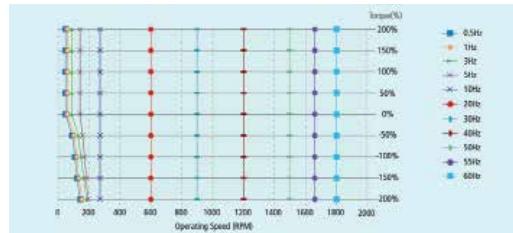
## Safety Function



Sx2000 has in-built safety functions conforming to modern safety standards.

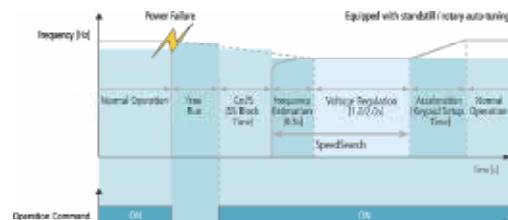
The safety input function meets EN ISO 13849-1 PLd and EN 61508 SIL2 (EN60204-1, stop category 0). This feature is standard and enables compliance with current safety standards.

## Powerful sensorless control



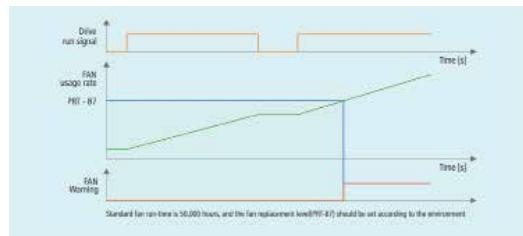
Starting torque of 200%/0.5Hz is produced and provides robust power in the low speed region. The motor auto-tuning function is optimised to maximise motor performance.

## Flying-start function



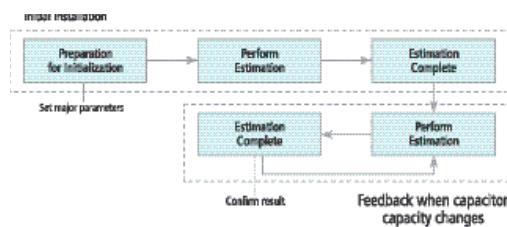
Drive capable of reliable and smooth re-starts even for bi-directional rotating loads.

## Fan lifecycle estimation



Warning signal is displayed when fan is operated over a certain amount of hours.

## Main capacitor lifecycle estimation



Estimated through monitoring the change in the capacitance value.

## Optional Accessories - easy to install & use



\*Optional fieldbus networks:  
 ① Profibus-DP (LTCI-PDP-S.)  
 ② Modbus TCP / Ethernet IP (LTCI-ETH2-S.)  
 ③ CANopen (LTCI-CAN-S)

\*I/O Expansion Card:

- › Digital input - 3 (PNP / NPN)
- › Digital output - 2 (R) AC 250V - 1A / DC 30V - 1A
- › Analog input - 2, 1 Voltage (-10 to +10V)  
1 Current (0 to 20mA) / 1 Voltage (0 to +10V)
- › Analog output - 1, 1 Voltage (0 to +10V) / 1 Current (0 to 20mA)

\*Only one option card can be used at a time.

## Simple cooling fan replacement



Tool-less replacement of cooling fan without dismantling the drive

## Flange type



To reduce heat losses inside the panel

The heat sink can be mounted outside of the panel in case the space is limited.

## Built-in DC reactor

Effective in improving power factor and decreasing THD.

- › 3-phase 400V 37~90kW (ND)

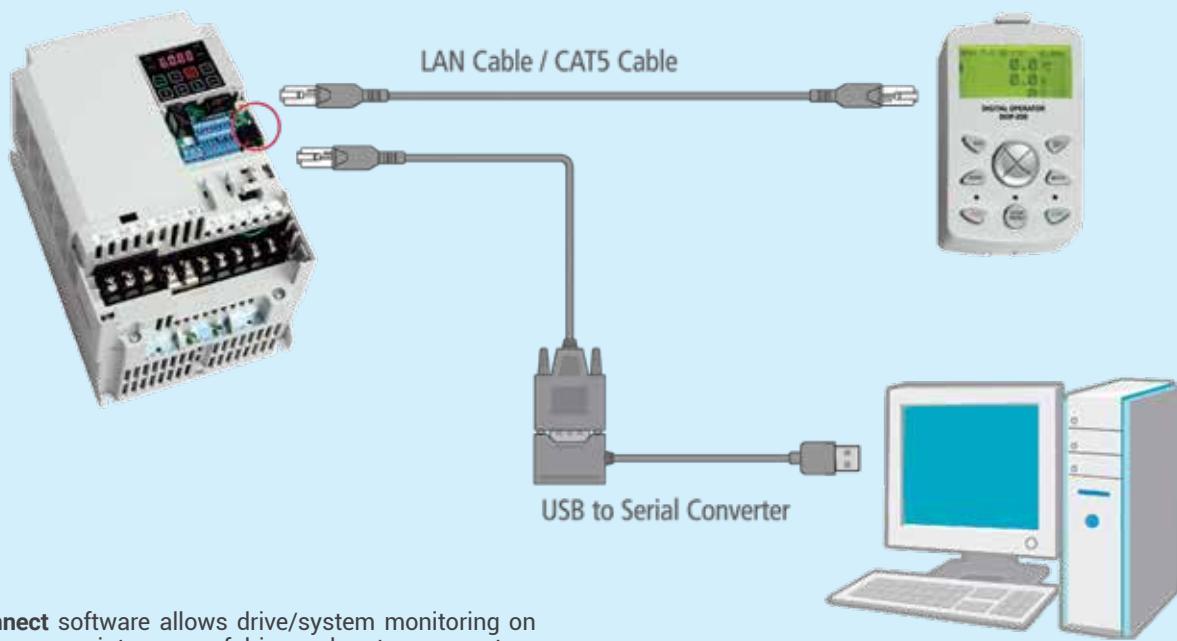
## Dual rating operation

Designed to be used for heavy and normal duty applications.

Overload capacity:

- › Heavy duty operation **150%** of rated current, 60 seconds
- › Normal duty operation **120%** of rated current, 60 seconds

## DriveConnect Software



**DriveConnect** software allows drive/system monitoring on a PC and easy maintenance of drive and motor parameters

- › Windows-based graphic user interface (GUI)
- › Modbus-RTU
- › Connecting up to 31 drives
- › Integrated control console
- › Offline editing function
- › Data upload/download
- › 4-channel oscilloscope
- › Trigger function

## Technical Specifications

VFD CAT No.	Rated Output					Rated Input		DC Reactor	Braking Unit		
	Normal Duty		Heavy Duty			Normal Duty	Heavy Duty				
	P <sub>ND</sub>	I <sub>ND</sub>	P <sub>HD</sub>	I <sub>HD</sub>	Rated Capacity						
	(kW)	(A)	(kW)	(A)	(kVA)	(A)	(A)				
1-Phase, 200-240V AC (-15%,+10%), 50/60Hz (±5)											
LTVF-S10003BAA	0.75	3.1	0.4	2.5	1.0	5.8	4.4	External (Option)	Built-in		
LTVF-S10006BAA	1.5	6.0	0.75	5.0	1.9	11.7	9.3				
LTVF-S10010BAA	2.2	9.6	1.5	8.0	3.0	19.7	15.6				
LTVF-S10012BAA	3.7	12	2.2	11	4.2	24	21.7				
3-Phase, 200-240V AC (-15%,+10%), 50/60Hz (±5)											
LTVF-S20003BAA	0.75	3.1	0.4	2.5	1.0	3.0	2.2	External (Option)	Built-in		
LTVF-S20006BAA	1.5	6.0	0.75	5.0	1.9	6.3	4.9				
LTVF-S20010BAA	2.2	9.6	1.5	8.0	3.0	10.8	8.4				
LTVF-S20012BAA	3.7	12	2.2	11	4.2	13.1	11.8				
LTVF-S20018BAA	5.5	18	4	17	6.5	19.4	18.5				
LTVF-S20030BAA	7.5	30	5.5	24	9.1	32.7	25.8				
LTVF-S20040BAA	11	40	7.5	32	12.2	44.2	34.9				
LTVF-S20056BAA	15	56	11	46	17.5	62.3	50.8				
LTVF-S20069BAA	18.5	69	15	60	22.9	77.2	66.7				
3-Phase, 380-480 V AC (-15%,+10%), 50/60Hz (±5)											
LTVF-S40002BAA	0.75	2.0	0.4	1.3	1.0	2.0	1.1	External (Option)	Built-in		
LTVF-S40003BAA	1.5	3.1	0.75	2.5	1.9	3.3	2.4				
LTVF-S40005BAA	2.2	5.1	1.5	4.0	3.0	5.5	4.2				
LTVF-S40007BAA	3.7	6.9	2.2	5.5	4.2	7.5	5.9				
LTVF-S40010BAA	5.5	10	4.0	9.0	6.5	10.8	9.8				
LTVF-S40016BAA	7.5	16	5.5	12	9.1	17.5	12.9				
LTVF-S40023BAA	11	23	7.5	16	12.2	25.4	17.5				
LTVF-S40030BAA	15	30	11	24	18.3	33.4	26.5				
LTVF-S40038BAA	18.5	38	15	30	22.9	42.5	33.4				
LTVF-S40044BAA	22	44	18.5	39	29.7	49.5	43.6				
LTVF-S40058BAA	30	58	22	45	34.3	65.7	50.7	Built-in	External (Option)		
LTVF-S40075BAA	37	75	30	61	46	69	56				
LTVF-S40091BAA	45	91	37	75	57	85	69				
LTVF-S40107BAA	55	107	45	91	69	100	85				
LTVF-S40142BAA	75	142	55	110	84	134	103				
LTVF-S40169BAA	90	169	75	152	116	160	143				

### Normal Duty

I<sub>ND</sub> Continuous current with 110% overload for 60 sec for every 5 mins at 40°C

P<sub>ND</sub> Maximum capacity applied to use of a standard 4 pole motor

### Heavy Duty

I<sub>HD</sub> Continuous current with 150% overload for 60 sec for every 5 mins at 50°C

P<sub>HD</sub> Maximum capacity applied to use of a standard 4 pole motor

1) The output of rated current is limited according to setting of the carrier frequency (CON-04)

## Technical Specifications

Range	Single-Phase 230V	Three-Phase 230V	Three-Phase 415V
	0.75 to 3.7kW (ND)	0.75 to 18.5kW (ND)	0.75 to 90kW (ND)
Standard Specifications	Enclosure Type	IP20	
	Isolation Type	Galvanic isolation	
	Overload Capacity	HD:150% for 1min; ND: 120% for 1min	
	Max Output Voltage	Proportional to Input Voltage	
	Max Output Frequency	0 to 400Hz (Sensorless: 0 to 120Hz)	
	Rated Voltage	200-240 VAC Single Phase (-15%, +10%)	200-240 VAC Three Phase (-15%, +10%)
	Rated Frequency	50/60Hz (-5/+5%)	
	THDv	< 5%	
	Keypad	Built-in LED till 30kW (ND) & Above 30kW standard Detachable LCD	
	Braking Chopper	Built-in up to 30kW (ND)	
Control Details	DC Reactor	Built-in from 37kW to 90kW	
	Control Method	V/F, Sensorless Vector Control, Slip Compensation	
	Starting Torque	200% at 0.5Hz for Sensorless Control & 150% at 3Hz for V/F	
	Frequency Control Range	0.01 to 400Hz for V/F, 0 to 120Hz for Sensorless Vector Control	
	Frequency Precision Setting	Digital command: 0.01Hz Analog command: 0.03Hz (Max. frequency: 60Hz)	
	Frequency Setting	Analog type: -10 to 10V, +0 to 10V, 4 to 20mA, Digital type: Keypad, Panel Potentiometer, Pulse Train Input	
	Output Frequency Resolution	0.01Hz	
	V/F pattern	Linear, squared, user V/F	
	Accel/Decel Time	0.0 to 6000 Sec	
	Braking Torque	Continuous Regeneration Torque 20% (150% with DBR)	
Protection	Features	Multi Keypad, Peer-to-Peer Communication to Share I/Os, User Sequence, Inbuilt PID, Component Life Monitor, No Motor Detection, Auto Tuning, KEB, DI/DO On-Off Delay, Torque Boost, DC Braking, Fire Mode, Flux Braking, 2nd Motor, Frequency Jump, Slip Compensation	
	Faults	Under Load Trip, Low Voltage Trip, Phase Loss Trip, No Motor Trip, Exterior Brake Trip, Safety Input Error, IO Board Trip, Inverter Overload Warning, Lost Command Warning, Overheat Trip, Encoder Trip, DBR %ED Warning	
	Alarm	Command Loss Trip, Overload, Inverter Overload, Fan Operation, Resistance Braking	
Interface	Momentary Power Loss Ride Through	Continuous Operation: Heavy Loads less than 15 msec, normal load less than 8 msec, Auto Restart Operation: Heavy Loads more than 15 msec, normal load more than 8 msec	
	DI	7 (Programmable NPN/PNP)	
	DO	1 (Programmable NO/NC) + 1 TR till 30kW, 2 (Programmable NO/NC) + 1TR above 30kW	
	AI	1 (-10 to +10Vdc) & 1 (4 to 20mA / -10 to +10Vdc)	
	AO	1 (4 to 20mA / 0 to 10Vdc) till 30kW, 1 (4 to 20mA / 0 to 10Vdc) & 1 (0 to 10Vdc) above 30kW	
	Pulse Train	1 Input & 1 Output (0 to 32KHz)	
	Communication	Built-in RS485 Modbus RTU	
Safety I/P	Safety I/P	2, complying with EN ISO 13849-1 Pld and EN61508SIL2 [EN60204-1, stop category 0]	

Range	Single-Phase 230V	Three-Phase 230V	Three-Phase 415V
	0.75 to 3.7kW (ND)	0.75 to 18.5kW (ND)	0.75 to 90kW (ND)
Environment	Area of Use	Indoors. There shall not be corrosive air, combustible gas, oil mist, dust and other pollutants	
	Ambient Temperature	-10°C to 50°C for HD, - 10°C to 40°C for ND	
	Storage Temperature	-20°C to 65°C	
	PCB Protection	Conformal Coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)	
	Application Humidity	Below relative humidity 95% RH (no condensation)	
	Altitude	Below 1000m	
	Vibration	9.8m/sec <sup>2</sup> (1G)	
	Maximum Noise level	< 65dBa	
	Global Compliance	CE, UL, RoHS	

**Specification**

- 1) In case of Sensorless, you can set the frequency at up to 120Hz by selecting 4 in DRV-09 (Control Mode).
- 2) The maximum output voltage does not go up over the supplied power voltage. You can select the output voltage as you want below the supplied power voltage.

**Technical Specifications**

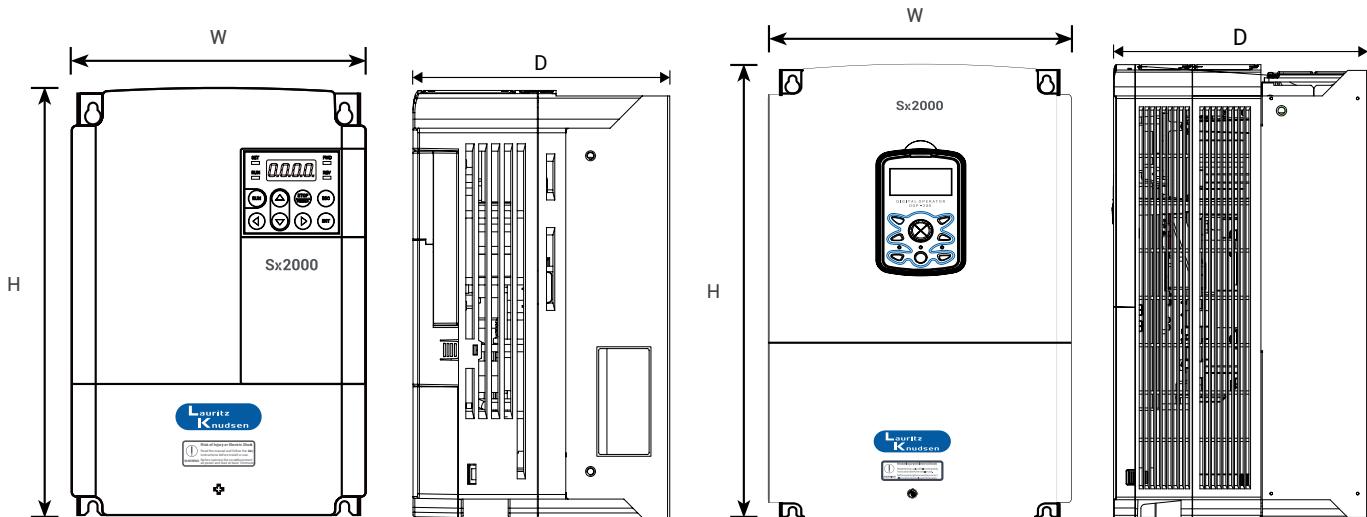
VFD CAT No.	Efficiency (at 100% load)		True Power Factor		Heat Losses			Fan Data		I <sub>thd</sub>	
	Normal Duty	Heavy Duty	Normal Duty	Heavy Duty	Normal Duty	Heavy Duty	Internal Losses	Flow Rate/Fan	Quantity	Normal Duty	Heavy Duty
	(%)	(%)			(W)	(W)	(W)	(CFM)	(Nos)	(%)	(%)
LTVF-S10003BAA	94.3	94.3	0.92	0.90	28	23	13	11	1	79.30	79.57
LTVF-S10006BAA	95.5	94.9	0.91	0.91	43	41	13	11	1	78.09	79.3
LTVF-S10010BAA	96.3	96.4	0.95	0.95	66	54	13	24	1	76.89	79.03
LTVF-S10012BAA	96.7	96.7	0.95	0.95	80	74	13	24	1	74.89	75.98
LTVF-S20003BAA	94.1	94.0	0.92	0.93	56	48	13	11	1	73.79	76.21
LTVF-S20006BAA	96.5	96.0	0.92	0.93	63	60	17	11	1	74.69	76.44
LTVF-S20010BAA	97.2	97.1	0.91	0.95	66	64	17	24	1	75.60	76.68
LTVF-S20012BAA	96.8	96.7	0.94	0.95	132	124	19	24	1	74.63	75.69
LTVF-S20018BAA	97.1	97.2	0.93	0.95	123	114	19	35	2	73.66	74.71
LTVF-S20030BAA	96.8	96.7	0.92	0.94	221	183	39	35	2	62.15	65.78
LTVF-S20040BAA	97.3	97.4	0.94	0.93	254	198	39	55	2	61.57	64.47
LTVF-S20056BAA	97.9	97.8	0.95	0.94	283	242	39	111	2	44.44	45.05
LTVF-S20069BAA	97.7	97.4	0.94	0.93	405	389	39	No fan type		44.44	45.05
LTVF-S40002BAA	96.4	94.4	0.90	0.91	23	22	13	11	1	78.18	79.15
LTVF-S40003BAA	98.0	97.6	0.91	0.90	20	19	13	11	1	75.34	78.27
LTVF-S40005BAA	97.3	96.8	0.91	0.91	51	49	17	24	1	74.77	77.61
LTVF-S40007BAA	98.1	97.9	0.92	0.91	52	47	17	24	1	74.18	76.95
LTVF-S40010BAA	97.2	97.1	0.93	0.93	124	115	21	35	2	73.53	75.23
LTVF-S40016BAA	97.7	97.4	0.92	0.93	172	143	43	35	2	64.57	69.15
LTVF-S40023BAA	98.2	98.2	0.93	0.93	192	138	43	55	2	62.48	65.62
LTVF-S40030BAA	98.2	97.8	0.93	0.93	252	240	43	55	2	55.15	50.86
LTVF-S40038BAA	98.5	98.2	0.93	0.94	294	270	43	111	2	52.45	49.91
LTVF-S40044BAA	98.3	98.3	0.94	0.93	353	320	43	111	2	63.79	62.13
LTVF-S40058BAA	98.5	98.5	0.93	0.93	425	330	43	111	2	60.25	61.72
LTVF-S40075BAA	98.5	98.4	0.94	0.93	568	495	107	111	2	36.29	38.18
LTVF-S40091BAA	98.2	98.1	0.94	0.94	792	719	107	111	2	36.31	37.57
LTVF-S40107BAA	98.5	98.3	0.93	0.94	810	747	107	189	2	36.34	36.97
LTVF-S40142BAA	98.4	98.2	0.94	0.94	1165	980	107	189	2	35.48	36.39
LTVF-S40169BAA	98.5	98.4	0.93	0.94	1251	1193	107	189	2	34.62	35.80

**Test Condition**

Operation at Rated Voltage & at 50 Hz supply  
 HD, ND Load 100% (M-G Set load, Corresponding motor to drive)  
 Carrier Frequency (Default, Max value)  
 Operation at room temperature

\* The result can be measured differently according to test conditions such as AC Reactor presence / input line length / Input impedance and transformer capacity.

## Dimensions



VFD CAT No.	Frame Size	IP Rating	W (mm)	H (mm)	D (mm)	Weight (Kg)	
LTVF-S10003BAA	F1A	IP20	100	128	128	0.88	
LTVF-S10006BAA	F2A		100	128	130	1.3	
LTVF-S10010BAA			100	128	145	1.5	
LTVF-S10012BAA	F3		140	128	145	2.2	
LTVF-S20003BAA	F1B		68	128	123	0.86	
LTVF-S20006BAA	F1A		68	128	128	0.86	
LTVF-S20010BAA	F2A		100	128	130	1.5	
LTVF-S20012BAA	F2B		100	128	145	1.5	
LTVF-S20018BAA	F3		140	128	145	2.3	
LTVF-S20030BAA	F4		160	232	140	3.3	
LTVF-S20040BAA	F5		160	232	140	3.3	
LTVF-S20056BAA			180	290	163	4.6	
LTVF-S20069BAA	F6		220	350	187	4.6	
LTVF-S40002BAA	F1B		68	128	123	0.86	
LTVF-S40003BAA	F1A		68	128	128	0.88	
LTVF-S40005BAA			100	128	130	1.5	
LTVF-S40007BAA	F2B		100	128	145	1.5	
LTVF-S40010BAA	F3		140	128	145	2.7	
LTVF-S40016BAA	F4		160	232	140	3.3	
LTVF-S40023BAA	F5		160	232	140	3.4	
LTVF-S40030BAA			180	290	163	4.6	
LTVF-S40038BAA	F6		180	290	163	4.8	
LTVF-S40044BAA			220	350	187	7.5	
LTVF-S40058BAA	F7		220	350	187	7.5	
LTVF-S40075BAA			275	450	284	26	
LTVF-S40091BAA	F8		325	510	284	35	
LTVF-S40107BAA	F9		325	510	284	35	
LTVF-S40142BAA			325	550	309	43	
LTVF-S40169BAA	F10		325	550	309	43	

**Note:** The above drawings are solely for reference purposes. Please refer to the technical manual.

# Hx2000

The Hx2000 adds a new dimension to Lauritz Knudsen's AC drive solutions. It sets the standard for the industry by introducing an innovative energy reduction, environmental-friendly system that delivers outstanding energy savings for fan, pump and compressor applications in an HVAC system.

Built to Lauritz Knudsen's stringent quality standards, the Hx2000 is tested and certified to meet global benchmarks,

thus giving you the assurance of total reliability. It handles loads from 0.75kW to 90kW, and is engineered to keep your process operating at optimum efficiency, even in the hot, humid and dusty conditions that characterise India's industrial environment.



## Main Features

- › V/F, Slip Compensation
- › Built-in RTC for Scheduling
- › Password Protection
- › Built-in EMC filter class C3
- › Optional EMC filter class C1/C2
- › Built-in DC reactor
- › Fire Mode
- › Multi-Motor Control
- › Built-in Payback Counter
- › Lubrication Control
- › Pump Clean Control
- › Dry Pump Detection
- › Built-in 4 PID
- › Flow Compensation
- › Built-in RS-485 Communication - BACnet, Modbus-RTU, Metasys N2
- › Global Specifications Compliant CE, UL (Plenum Rated)
- › Conformal Coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)

## Applications

- › Compressor
- › Supply Fan
- › Exhaust Fan
- › Cooling Tower
- › Circulation Pump
- › Vacuum Pump
- › Positive Displacement Pumps

## Multi Motor Control (MMC)



MMC is used when a single drive is used to control multiple motors in pump systems. It controls 1 main motor and 5 auxiliary motors as a default and upto 8 auxiliary motors with option card.

The main motor is connected to the drive output and is controlled by the built-in PID controller. Auxiliary motors are connected with the supply power and are turned ON/OFF by a relay within the drive.

## Time Event Scheduling: Real Time Clock (RTC)



RTC is used so that selected functions are operable during the set time. The user needs to configure the following:

- › 4 Time Period Modules (Weekly)
- › 8 Time Events
- › 8 Exception Dates (Day)

(Possible to set 29 functions including FWD (Fx), REV (Rx), multiple acceleration/deceleration times, multiple frequencies, PID related functions and pre-heat) Summer time available (Start/End date setting)

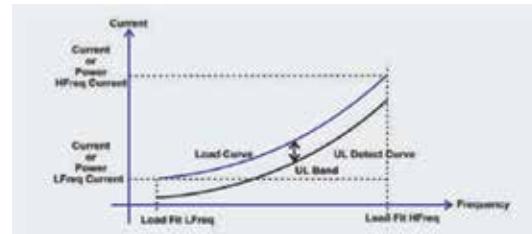
## 4 Process PIDs (1 Main + 3 EPIDs)



Main PID uses inputs from sensors to measure variables like pressure, temperature/humidity and flow, to change the motor speed by varying the output frequency to achieve the desired process output.

Three external PIDs control the external equipments of the HVAC system such as dampers, valves based on the feedback from CO<sub>2</sub>, Rh, temperature, pressure & other sensors

## Dry Pump (Under Load Protection)



It prevents pump damage when there is insufficient water in the tank. If the actual load is below the Under Load (UL) Detect curve, the drive will trigger a warning or trip signal to protect the pump.

## Energy Saving



The energy saving information is displayed as kWh, saved energy cost and CO<sub>2</sub> emission level on the drive keypad.

## Keypad Exclusive for HVAC



Used to issue commands, configure drive parameters, and for monitoring drive status

- › HAND Mode (Local Control Mode) or AUTO Mode (Remote Control Mode) can be selected
  - » HAND Mode: Used when selecting frequency or run/stop commands
  - » AUTO Mode: Drive operated using the keypad, multifunctional terminal block and communications
- › Fault Status Monitoring

## Built-in EMC Filter

A built-in EMC filter meets the specifications for noise reduction

- › 400V 0.75~90kW Built-in as default (Class C3) & optional (Class C1/C2)

## Built-in DC Reactor

A built-in DC Reactor effectively improves the power factor and reduces the THD

- › Built-in as standard for 400V 37~90kW

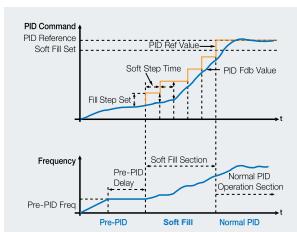
## Global Specifications Compliant

UL (Plenum Rated)  
(American standards for conditioner fire safety)

- › Suitable for installation in a compartment handling conditioned air

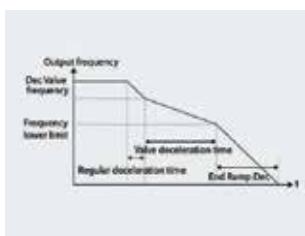


## Soft Fill Operation



Prevents pump damage caused by excessive pressure building-up in the pipe system at the time of initial operation of pumps or inside the pumps.

## Deceleration Valve Ramp



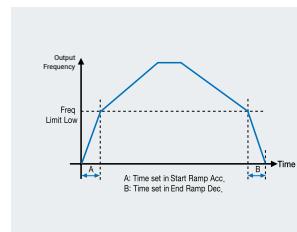
Prevents pump and pipe damage caused by sudden pressure changes when pumps are stopped or a pump valve is closed, based on specific requirements, deceleration time can be set.

## Flange-Type Mounting



If the space is too small, a heat sink can be installed outside the panel. This helps reduce heat losses inside the panel.

## Start Ramp & End Ramp



Prevents pump damage by changing ramp using acceleration/deceleration time setting upon initial pump operation and stopping.

## Easy-to-Change Cooling Fan



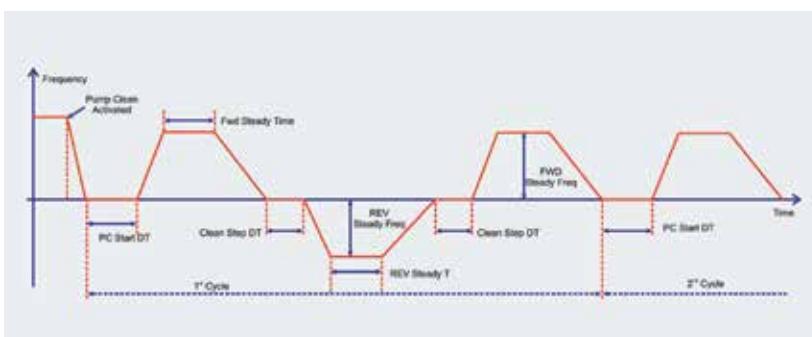
It is easy to change a cooling fan without opening the cover of the drive.

## Side-by-Side Installation



The size of the control board is significantly reduced when multiple drives are installed by minimising the distance between them. (Side-by-side installation is unavailable for 37~90kW)

## Pump Clean Operation



Scraps and deposits that get built up in impellers inside pumps, decrease the efficiency of a motor's performance. Through consecutive FWD/REV or ACC/DEC operations, the scraps get eliminated. This results in extension of the pump's lifespan, prevents pre-mature pump failure and ensures energy savings. The Pump Clean mode is initiated by a remote signal, current profile or power profile.

## Payback Counter (Energy Saving Display)

It displays energy saving information by comparing the average energy efficiency for operation with and without the drive. The energy saving information is displayed as kWh, saved energy cost and CO<sub>2</sub> emission level.

## Fire Mode

This function is used to allow the inverter to ignore minor faults during emergency situations, such as fire and provides continuous operation to protect other systems.

## Aux Motor PID Compensation

In-pipe flow increases and conduit pressure decreases as the number of auxiliary motors increases. To counter this, Aux Motor PID Compensation is used to compensate for the pressure loss.

## Lubrication Control

During a lubrication operation, the drive outputs the lubrication signal through one of the output relays when the drive receives a RUN command. The drive does not start operating until the time set at 'Lubrication OP Time' has elapsed and the Lubrication signal is turned OFF.

## Damper Control

If a fan and a damper are used together in a system, the drive may be configured to operate according to the damper's operation status. During damper operation, one of the relay outputs (Relay 1–5) may be set to 'Damper Control' to output a signal based on the damper's operation status. One of the multi-function terminal inputs may also be set 'Damper Open' to receive the damper status input. The drive starts operating when both the RUN command and the 'Damper Open' signal are turned ON.

## Pre-Heat Function

Pre-heats motors by outputting direct current when the motors or pumps are not in operation, in order to prevent condensation of the motors or pumps.

## Load Tuning

Establishes load (current and power) curves based on the drive frequency, so as to make the load characteristics curve required for 'Under Load' and 'Pump Clean' modes.

## Detection of Broken Pipe

This function detects pipe breaks when the PID operation is ON. The fault trip or a warning signal will occur if the feedback does not reach the level set by the user during the operation with the maximum output (PID maximum output or the maximum speed set).

## Power-on Resume

When the drive restarts after it was stopped due to power interruption, the drive memorises the status command, frequency reference and ACC/DEC time settings upon loss of communication control. As soon as power is resumed, 'Power-on Resume' is used to follow the previous control command.

## Level Detection

When the drive is operated above or below the user defined values i.e., beyond the set frequency and source (voltage, current) values the drive generates a trip or activates a relay for protective operation.

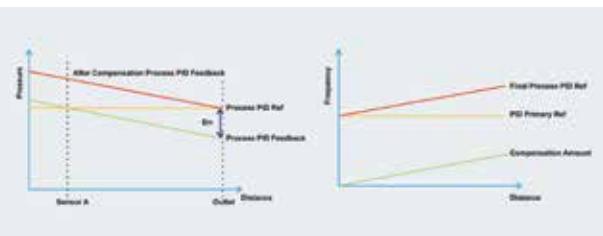
## Macro Setting

The Macro selection function is used to put various application functions together in a group. For applications with the Hx2000 drive, 7 Macro configurations are available i.e. Basic, Compressor, Supply Fan, Exhaust Fan, Cooling Tower, Circulation Pump, Vacuum Pump and Constant Torque.

## PID Sleep and Wake-up function

It is used to put the drive on standby and restart it using PID as per the load requirements in order to reduce motor losses as much as possible.

## Flow Compensation



In a system with longer pipes and a higher flow rate, a drop in pressure is often experienced. This feature helps to compensate for the pressure drop by increasing the PID reference.

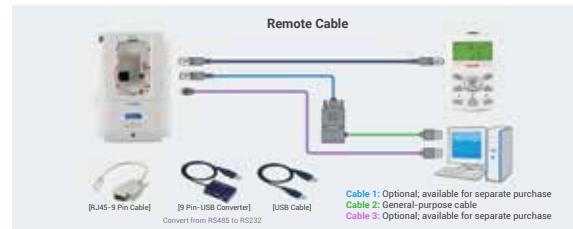
## Communication Module

Built-in RS485 communication:

- › BACnet
- › Modbus-RTU
- › Metasys N2

Optional : LonWorks

## Software Exclusive for Lauritz Knudsen Drives



DriveConnect can be connected using USB Port or RJ45 terminal.

## Optional I/O Expansion Card



### Expansion I/O 1 (LTIO-EXP-H) card

This can be installed as an option with the following specifications:

- › Digital Inputs: 2 (NPN/PNP)
- › Digital Outputs: 3 (Relay)
- › Analog Input: 1 (V/I)\*
- › Analog Output: 1 (V/I)\*

### Expansion I/O 2 (LTIO-EXP2-H) card

- › Analog Input: 3 (V/I)\*
- › Analog Output: 2 (1V & 1I)\*

## Hx2000 with I/O Expansion card 1

I/O type	Standard	IO Expansion Card	Total
DI	7	2	9
DO	5R+1T	3	9
AI	1V+1V/I	1V/I	3
AO	1V+1V/I	1V/I	3
PTI	1	0	1
PTO	1	0	1

## Hx2000 with I/O Expansion card 2

I/O type	Standard	IO Expansion Card	Total
DI	7	0	7
DO	5R+1T	0	6
AI	1V+1V/I	3V/I	5
AO	1V+1V/I	1V+1I	4
PTI	1	0	1
PTO	1	0	1

## Technical Specifications

3-Phase, 380-480V AC (-15%,+10%), 50/60Hz (±5)					
VFD CAT No.	Rated Output		Rated input	DC Reactor	
	Normal Duty				
	P <sub>ND</sub> (kW)	I <sup>1) ND</sup> (A)	Rated Capacity (kVA)		
LTVF-H40002BAA	0.75	2.5	1.9	2.4	
LTVF-H40004BAA	1.5	4.0	3.0	4.2	
LTVF-H40006BAA	2.2	6.0	4.5	6.5	
LTVF-H40008BAA	3.7	8.0	6.1	8.7	
LTVF-H40012BAA	5.5	12	9.1	12.2	
LTVF-H40016BAA	7.5	16	12.2	17.5	
LTVF-H40024BAA	11	24	18.3	26.5	
LTVF-H40030BAA	15	30	23.0	33.4	
LTVF-H40038BAA	18.5	38	29.0	42.5	
LTVF-H40045BAA	22	45	34.3	50.7	
LTVF-H40061BAA	30	61	46.5	69.1	
LTVF-H40075BAA	37	75	57.1	69.3	
LTVF-H40091BAA	45	91	69.4	84.6	
LTVF-H40107BAA	55	107	82.0	100.1	
LTVF-H40142BAA	75	142	108.2	133.6	
LTVF-H40169BAA	90	169	128.8	160.0	

### Normal Duty

I<sub>ND</sub> Continuous current with 110% overload for 60 sec for every 5 mins at 40°C

P<sub>ND</sub> Maximum capacity applied to use of a standard 4 pole motor

1) The output of rated current is limited according to setting of the carrier frequency (CON-04)

## Technical Specifications

Standard Specifications	Rated Input Voltage	3-phase 380~480 VAC (-15%, +10%)	
	Rated Frequency	50~60 [Hz] (±5%)	
	Isolation Type	Galvanic isolation	
	THDv	< 5%	
	Max Output Voltage	Proportional to Input Voltage	
	Max Output Frequency	0 to 400Hz	
	Keypad	LCD Detachable	
	DC Reactor	Built-in from 37kW to 90kW	
	EMC Filter	Built-in as default (C3)	
	Features	Multi Motor Control, Built-in RTC, USB Port, HVAC Macros, Built-in PID, Lubrication Control, Motor Pre Heat, KEB, Auto Restart, Sleep & Wake-up Function, Damper Control, Belt Broken Detection, Pump Clean Mode, Flow Compensation Mode, Dry Pump Detection, Password Protection, Payback Counter(Energy Saving on Display), Fire Mode	
Control Details	Control Method	V/F control, slip compensation	
	Frequency Setting Resolution	Digital command: 0.01 Hz Analog command: 0.06 Hz (60 Hz standard)	
	Frequency Settings	Analog type:-10~10 V, 0~10 V, 0~20 mA Digital type: key pad, pulse train input	
	V/F Pattern	Linear, squared overload reduction and user V/F	
	Overload Capacity	Rated current for 120% for 1 minute	
	Torque Boost	Manual torque boost, automatic torque boost 1, automatic torque boost 2	
	Output Frequency Resolution	0.01Hz	
	Accel/Decel Time	0.0 to 600.0 (sec)	
	Frequency Accuracy	1% of maximum output frequency	
Operation	Operating Method	Selectable among keypad/terminal block/communication operation	
	Operating Functions	PID Control, 3-wire Operation, Frequency Limit, Second Motor Function, Anti Forwardand Reverse, Direction Rotation, Commercial Transition, Speed Search, Power Braking, Leakage Reduction, Up-down Operation, DC Braking, Frequency Jump, Slip Compensation, Automatic Restart, Automatic Tuning, Energy Buffering, Flux Braking, Energy Saving	
	Input	Multi-function terminal P1-P7	7 No. Programmable NPN (Sink) / PNP (Source)
			Functions: Forward Direction Operation, Reset, Emergency Stop, Multi Step Speed, Frequency-High/Med/Low, Reverse Direction Operation, External Trip, Jog Operation, Multi Atep Acc/Dec, Second Motor Selection, DC Braking During Stop, Frequency Increase, 3-wire, Select Acc/Dec/Stop, MMC Interlock, Frequency Reduction, Fix Analog Command Frequency, Transition from PID to general operation, Pre Heat, Pump Cleaning, RTC (Time Event)
			1 (-10 to +10Vdc) & 1 (0 to 20 mA / -10 to +10Vdc)
	Output	Fault output and drive operation status output	Pulse Train input 0 to 32 kHz
			Multi-function open collector terminal 1 No., Less than DC 26 V, 50 mA
			Fault Signal relay 1No. N.O.: Less than AC 250 V/2A, DC 30 V/3A
			Multi-function relay N.C.: Less than AC 250 V/1A, DC 30 V/1A
			4 No., Less than AC 250 V, 5 A, Less than DC 30 V, 5 A
Protective Functions	RS-485 Communication	Analog output 1 (0 to 10Vdc / 0 to 20mA) & 1 (-10 to +10Vdc)	
		PulseTrain output 0 to 32 kHz	
	Built-in BACnet, Modbus-RTU, Metasys N2 as standard		
	Trip		Over-Current Trip, Trip Caused By External Signals, Arm Short-Circuit Current Trip, Overheat Trip, Pipe Broken Trip, Input Open-Phase Trip-Ground Trip, Motor Overheat Trip, IO Board Connection Trip, No Motor Trip, Parameter Write Trip, Emergency Stop Trip, Command Loss Trip, External Memory Error, CPU Watchdog Trip, Motor Under-Load Trip, Overvoltage Trip, Temperature Sensor Trip, Drive Overheat, Option Trip, Output Open-Phase Trip, Drive Overload Trip, Fan Trip, Low Voltage Trip During Operation, Low Voltage Trip, Analog Input Error, Motor Overload Trip, Keypad Command Loss Trip, Damper Trip, Level Detect Trip, All Auxiliary Motor Failure Trip, Pump Clean Failure (Fault)
	Alarm		Command Loss Trip Alarm, Overload Alarm, Normal Load Alarm, Drive Overload Alarm, Fan Operation Alarm, Resistance Braking Rate Alarm, Capacitor Life Alarm, Pump Clean Alarm, Fire Mode Alarm, LDT Alarm.
	Momentary Power Loss Ride through	Less than 8 ms: Continue Operation (must be within the rated input voltage and rated output range) More than 8 ms: Auto restart operation	

<b>Structure &amp; Environment</b>	Area of Use	Indoors. Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 2 Environment)						
	Type of Cooling	Forced fan cooling structure						
	Enclosure Type	IP20 / UL Open (default), UL Enclosed Type 1(option)						
	Ambient Temperature	-10°C to 40°C						
	Storage Temperature	-20°C ~ 65°C						
	Application Humidity	Below 90% RH of relative humidity (with no dew formation)						
	PCB Protection	Conformal Coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)						
	Altitude	1,000m or below						
	Vibration	9.8m/sec <sup>2</sup> (1.0G) or below						
	Maximum Noise level	< 65dbA						
	Global Compliance	CE, RoHS, UL (Plenum Rated)						

**Specification**

- 1) In case of Sensorless, you can set the frequency at up to 120Hz by selecting 4 in DRV-09 (Control Mode).
- 2) The maximum output voltage does not go up over the supplied power voltage. You can select the output voltage as you want below the supplied power voltage.

VFD CAT No.	Efficiency (at 100% load)	True Power Factor	Heat Losses		Fan Data		I <sub>THD</sub>
	Normal Duty	Normal Duty	Normal Duty	Internal Losses	Flow Rate/Fan	Quantity	Normal Duty
	(%)		(W)	(W)	(CFM)	(Nos)	(%)
LTVF-H40002BAA	97.1	0.90	115	43	34.6	2	69.78
LTVF-H40004BAA	97.1	0.90	115	43	34.6	2	69.78
LTVF-H40006BAA	97.1	0.90	115	43	34.6	2	69.78
LTVF-H40008BAA	97.1	0.90	115	43	34.6	2	69.78
LTVF-H40012BAA	97.1	0.90	115	43	34.6	2	69.78
LTVF-H40016BAA	98.0	0.91	110	43	34.6	2	67.18
LTVF-H40024BAA	97.9	0.92	159	43	34.6	2	63.22
LTVF-H40030BAA	98.0	0.93	222	43	57.33	2	63.86
LTVF-H40038BAA	98.1	0.93	287	43	57.33	2	51.40
LTVF-H40045BAA	98.0	0.93	370	43	189	2	62.47
LTVF-H40061BAA	97.8	0.92	491	107	189	2	37.15
LTVF-H40075BAA	98.1	0.93	570	107	105	2	36.94
LTVF-H40091BAA	97.8	0.92	823	107	105	2	33.18
LTVF-H40107BAA	98.0	0.93	896	107	105	2	34.82
LTVF-H40142BAA	98.2	0.93	990	107	189	2	35.52
LTVF-H40169BAA	98.1	0.93	1410	107	189	2	34.48

**Test Condition**

Operation at 3-Phase, 480VAC, 50Hz supply

HD, ND Load 100% (M-G Set load, Corresponding motor to drive)

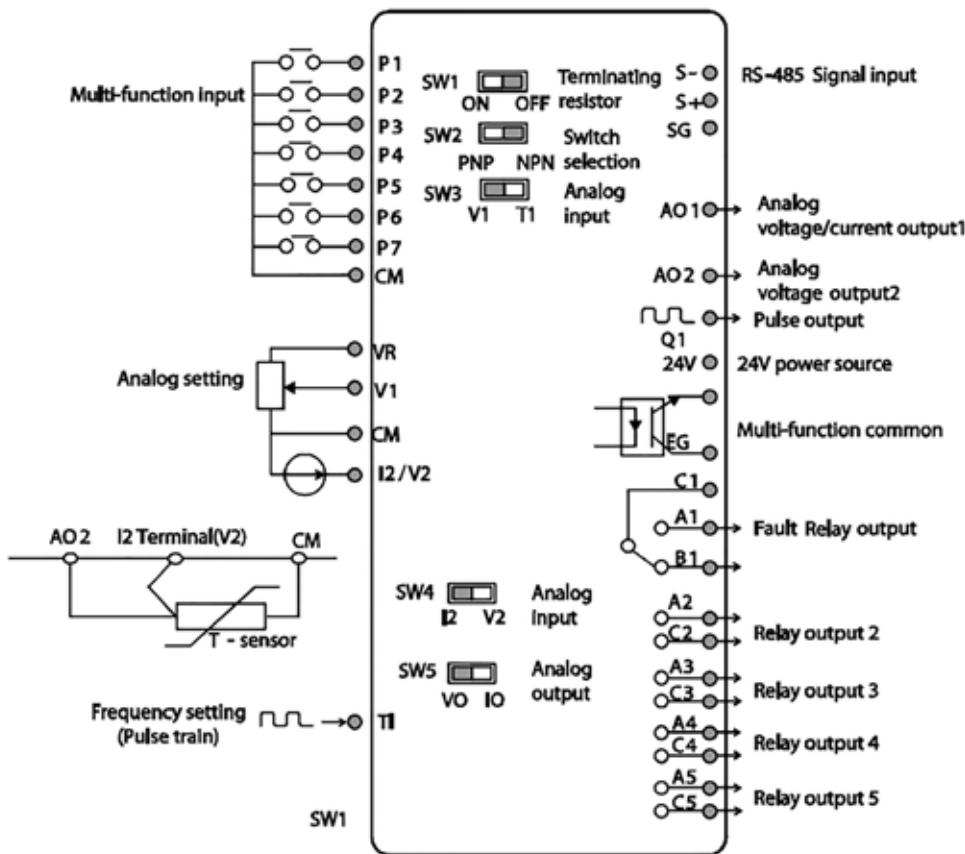
Carrier Frequency (Default, Max value)

With DC reactor

Operation at room temperature

\* The result can be measured differently according to test conditions such as AC Reactor presence / input line length / Input impedance and transformer capacity.

## I/O Configuration

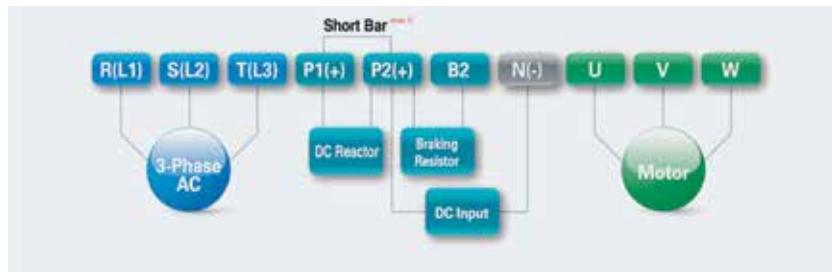


Classification	Symbol	Name	Description
Selection of contact points	P1~P7	Multifunctional Input1~7 Terminal	It can be used by setting multifunctional input. Default values from the factory are as follows: <ul style="list-style-type: none"> <li>&gt; P1: Fx</li> <li>&gt; P2: Rx</li> <li>&gt; P3: BX</li> <li>&gt; P4: RST</li> <li>&gt; P5: Speed-L</li> <li>&gt; P6: Speed-M</li> <li>&gt; P7: Speed-H</li> </ul>
	CM	Sequence Common Terminal	Common terminal of contact point input and analog I/O terminal
Analog Input	VR	Power Terminal for Frequency Setting	Power for analog frequency setting: <ul style="list-style-type: none"> <li>&gt; Max. output voltage: 12V</li> <li>&gt; Max. output current: 12mA</li> <li>&gt; Volume resistivity: 1~10kΩ</li> </ul>
	V1	Frequency Setting (Voltage) Terminal	Frequency is set depending on the voltage supplied to V1 terminal. <ul style="list-style-type: none"> <li>&gt; Unipolar: 0~10V (Max. 12V)</li> <li>&gt; Bipolar: -10~10V (Max. ±12V)</li> </ul>
	I2	Frequency Setting (Current/Voltage) Terminal	Frequency is set depending on the current capacity supplied to I2 terminal. V2 can be used by selecting analog voltage/current input terminal setting switch (SW4). <ul style="list-style-type: none"> <li>&gt; Input current: 0~20mA</li> <li>&gt; Max. input current: 24mA</li> <li>&gt; Input resistance: 249Ω</li> <li>&gt; Input voltage: 0~10V</li> </ul>
Pulse Train	T1	Frequency Setting Terminal	Frequency is set as 0~32kHz. Low Level : 0~0.8V, High Level : 3.5~12V

Output/Communication Terminal Details	Selection of contact points	Q1	Multifunctional (Open Collector) Output/Pulse Output Terminal	As a multifunctional output signal or pulse output, one of the following is chosen: Output frequency, output current, output voltage and DC voltage. DC 26V, 50mA or below Pulse output terminal › Output frequency: 0~32kHz › Output voltage: 0~12V
		EG	CommonTerminal	› Common ground terminal for external power of open collector
		24	24V PowerTerminal	› Max. output current: 100mA › Do not use external 24V except for PNP-mode terminal block
		A1/C1/B1	Abnormal Signal Output/Multifunctional Output Terminal	When power is cut-off to protect the product, signals or multifunctional signals are output. (N.O.:AC250V 2A or below, DC 30V 3A or below N.C.:AC250V 1A or below and DC 30V 1A or below) › At abnormal state: A1-C1 connected (B1-C1 disconnected) › At normal state: B1-C1 connected (A1-C1 disconnected) › Factory default value: Frequency
		A2/C2~A5/C5	Multi-functional Relay Output	Multifunctional output terminal such as signals at operation is defined and used.(AC 250V 5A or below and DC 30V 5A or below)
	Analog Output	A01	Voltage/Current Output Terminal	One of the following is chosen and output: Output frequency, output current, output voltage and DC voltage. The following voltage/current output can be chosen by selecting analog voltage/current output terminal setting switch (SW5). › Output voltage: 0~10V › Max. output voltage/current: 12V,10mA › Output current: 0~20mA › Max. output current: 20mA › Factory default value: Frequency
		A02	Voltage Output Terminal	-10 ~ 10 Vdc
	Pulse Train	TO	Frequency Setting Terminal	Frequency is set as 0~32kHz. Low Level: 0~0.8V, High Level: 3.5~12V
	Communication Terminal	S+/S-/SG	RS485 Signal Input Terminal	RS485 signal line

Note: \*Available only when used in PNP mode

## 0.75~30kW (3-Phase)



Terminal Mark	Name	Description
R(L1)/S(L2)/T(L3)	AC Power Input Terminal	It connects to commercial AC power
P1+	+DC Link Terminal	+ DC voltage terminal: This terminal is used to connect an exterior DC reactor
P2+	+DC Input Terminal	DC(+) is connected when DC is input via drive power
N-	-DC Link Terminal	DC voltage terminal: DC(-) is connected when DC is input via drive power
B2	Damping resistance connection terminal	It connects to damping resistance <sup>Note 2</sup>
U/V/W	Motor output terminal	It connects to 3-phase induction motor

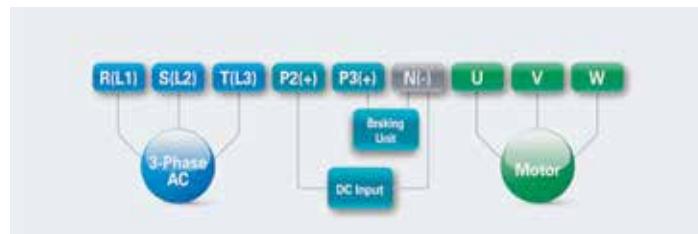
If you want to run the drive using DC input, connect DC input to P2(+) and N(-) terminal

**Note 1:** Short Bar should be removed when wiring DC Reactor

**Note 2:** In case of using with an external DC reactor, only P2(+) terminal connection is allowed

In case of not using with an external DC reactor, P1(+) or P2(+) terminal connection is allowed

## 37~90kW (3-Phase)



Terminal Mark	Name	Description
R(L1)/S(L2)/T(L3)	AC Power Input Terminal	It connects to commercial AC power
P2+	+DC Link Terminal	+ DC voltage terminal: DC(+) is connected when DC is input via drive power
P3+	+DC Input Terminal	+DC voltage terminal This terminal is used to connect DBU
N-	-DC Link Terminal	DC voltage terminal: DC(-) is connected when DC is input via drive power
U/V/W	Motor output terminal	It connects to 3-phase induction motor

If you wish to start the drive using DC input, connect it to the P2(+), N(-) terminal

## Dimensions



VFD CAT No.	Frame Size	IP Rating	W (mm)	H (mm)	D (mm)	Weight (Kg)	
LTVF-H40002BAA	F1	IP20	160	232	181	3.3	
LTVF-H40004BAA			160	232	181	3.3	
LTVF-H40006BAA			160	232	181	3.3	
LTVF-H40008BAA			160	232	181	3.3	
LTVF-H40012BAA			160	232	181	3.3	
LTVF-H40016BAA			160	232	181	3.3	
LTVF-H40024BAA			160	232	181	3.4	
LTVF-H40030BAA	F2		180	290	205.3	4.6	
LTVF-H40038BAA			180	290	205.3	4.8	
LTVF-H40045BAA	F3		220	350	223.2	7.5	
LTVF-H40061BAA			220	350	223.2	7.5	
LTVF-H40075BAA	F4		275	450	284	26	
LTVF-H40091BAA	F5		325	510	284	35	
LTVF-H40107BAA			325	510	284	35	
LTVF-H40142BAA	F6		325	550	309	43	
LTVF-H40169BAA			325	550	309	43	

**Note:** The above drawings are solely for reference. Please refer to the technical manual for more details.

# Nx2000

The Nx2000 series adds a new dimension to Lauritz Knudsen Electrical & Automation AC drive solutions. Built to LK-EA's stringent quality standards, the Nx2000 Series AC drive is

tested and certified to meet global benchmarks, thus giving you the assurance of total reliability.

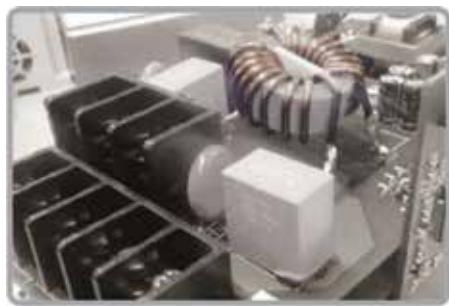


## Main Features

- › Range: 0.2kW to 2.2kW
- › V/F, Slip Compensation
- › DIN Rail mounting for Side-by-Side installation
- › Built-in EMC filter class C2 to meet IEC 61800-3
- › Built-in 2 Nos multi function relays
- › Integrated Potentiometer
- › Built-in PID
- › Built-in Braking chopper for 1.5kW & 2.2kW
- › Torque Boost for forward & reverse direction
- › Built-in 24V power source
- › RPM display on keypad
- › Conformal coating complying to IEC 60721-3-3 class 3C3 (Avg)
- › Built-in RS485 Modbus RTU Communication

## Applications

- › OEM Machines
- › Plastic & Textile Machines
- › Food & Packaging Machines
- › Conveyors
- › AHU Control
- › Fan
- › Pump
- › Machine Tool



Built-in EMC Filter

Side-by-Side Installation  
(2mm Between drives)

DIN -Rail Mountable

## Rated Input & Output

VFD CAT No.	Rated Output			Rated input	DC Reactor	Braking Unit		
	Heavy Duty			Heavy Duty				
	P <sub>HD</sub>	<sup>1)</sup> I <sub>HD</sub>	Rated Capacity					
	(KW)	(A)	(kVA)	(A)				
1-Phase, 200-240 V AC (-15%, +10%), 50/60Hz (±5)								
LTVF-N101P4BAA	0.2	1.4	0.6	1.8	NA	NA		
LTVF-N102P4BAA	0.4	2.4	0.95	3.7				
LTVF-N104P2BAA	0.75	4.2	1.9	7.1				
LTVF-N107P5BAA	1.5	7.5	3.0	13.6				
LTVF-N110P0BAA	2.2	10	4.5	18.7	Built-in			

### Heavy Duty

I<sub>HD</sub> Continuous current with 150% overload for 60 sec for every 5 mins at 50°C

P<sub>HD</sub> Maximum capacity applied to use of a standard 4 pole motor

- The output of rated current is limited according to setting of the carrier frequency (CON-04)

## Control

Control Method	V/F, Slip Compensation
Frequency Setting Resolution	Digital command : 0.01Hz Analog command : 0.05Hz
Frequency Accuracy	1% of maximum output frequency
V/F Pattern	Linear, Square reduction, UserV/F
Overload Capacity	150% for 1 min
Torque Boost	Manual / Automatic torque boost
THDv	< 5%

## Operation

Operation Mode		Select keypad, Terminal strip or Communication operation	
Frequency Setting		Analog : 0 to 10Vdc, 4 to 20mA, 0 to 20mA Digital:Keypad	
Operation Function		Anti-Forward and Reverse Direction Rotation, Frequency Jump, Frequency Limit, DC Braking, Jog Operation, Up-Down Operation, 3-wire Operation, Dwell Operation, Slip Compensation, PID Control, Energy Saving Operation, Speed Search, Automatic Restart	
Input	Multi-Function Terminal	NPN(Sink)/PNP(Source)selectable	
		Functions: Forward Run, Reverse Run, Reset, Emergency Stop, Multi-step Speed Frequency-High/Med/Low, DC Braking During Stop, Frequency Increase, 3-wire, Select Acc/Dec/Stop, Reverse Direction Operation, External Trip, Jog Operation, Multi-step Acc/Dec High/Med/Low, Second Motor Selection, Frequency Reduction, Fix Analog Command Frequency, Transition from PID to general operation	
	Analog Input	V1: 0 to 10Vdc, I2: 4 to 20mA or 0 to 20mA	
Output	Multi-function relay terminal	Fault output and inverter operation status output	(N.O., N.C.) less than AC 250V 1A, less than DC 30V 1A
	Analog output	0-10 Vdc: Frequency, Output current, Output voltage, DC terminal voltage etc. selectable	

## Environment

Enclosure Type	IP20/UL Open (Default), UL Enclosed type 1 (Option)		
Isolation Type	Galvanic Isolation		
Ambient Temperature	-10~50° C (14~122° F), Ambient temperature under the condition of no ice or frost		
Ambient Humidity	Upto 95% of relative humidity (with no dew formation)		
Storage Temperature	-20~65° C(-4~149° F)		
Surrounding Environment	Prevent contact with corrosive gases, inflammable gases,oil stains, dust and other pollutants (Pollution degree 2 environment)		
Altitude / Oscillation	Below 1,000m, below 9.8m / sec <sup>2</sup> (1G)		
Pressure	70~106 kPa		

### Specification

- 1) The maximum output voltage does not go up over the supplied power voltage. You can select the output voltage as you want below the supplied power voltage.

VFD CAT No.	Efficiency (at 100% load)	True Power Factor	Heat Losses		$I_{THD}$
			Heavy Duty		
	(%)	(W)	Total Losses	Internal Losses	Heavy Duty
LTVF-N101P4BAA	95.8	0.88	12	8	80.88
LTVF-N102P4BAA	96.6	0.90	21	13	79.57
LTVF-N104P2BAA	96.9	0.89	40	13	79.23
LTVF-N107P5BAA	96.9	0.89	74	14	78.5
LTVF-N110P0BAA	97.0	0.91	107	14	76.06

### Test Condition

Operation at Rated Voltage & at 50 Hz supply

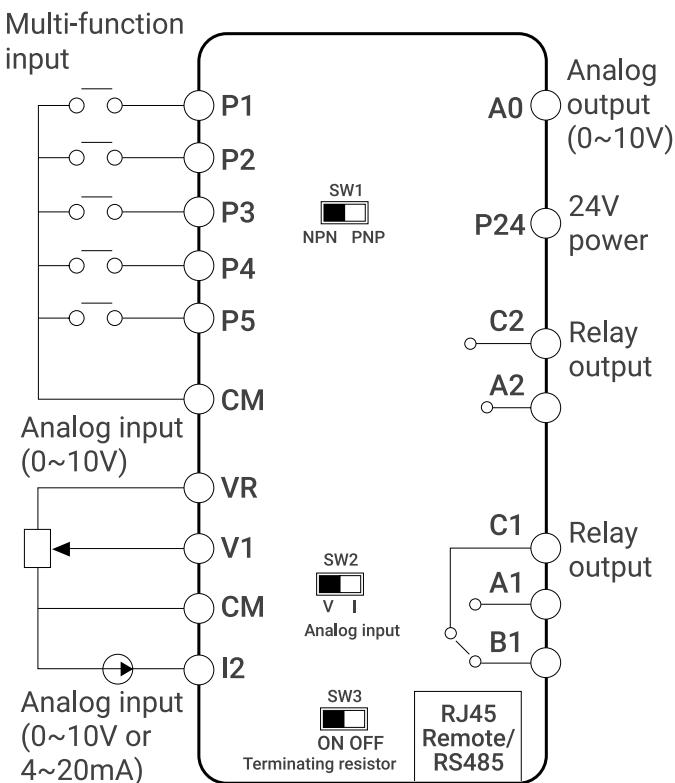
HD, ND Load 100% (M-G Set load, Corresponding motor to drive)

Carrier Frequency (Default, Max value)

Operation at room temperature

\* The result can be measured differently according to test conditions such as AC Reactor presence / input line length / Input impedance and transformer capacity.

## I/O Configuration

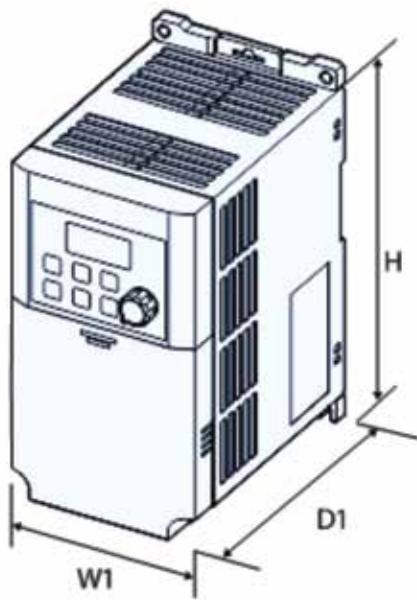


## Braking Resistor Specification

Product (kW) HD	Resistance (W)	Rated Capacity (W)
1.5	60	300
2.2	50	400

\*The standard for braking torque is 150% and the working rate (%ED) is 5%. If the working rate is 10%, the rated capacity for braking resistance must be calculated at twice the standard

## Dimensions



VFD CAT No.	Frame Size	IP Rating	W1 (mm)	H (mm)	D1 (mm)	Weight (Kg)
LTVF-N101P4BAA	F1	IP20	85	135	100	0.66
LTVF-N102P4BAA			85	153	123	1.0
LTVF-N104P2BAA			85	153	123	1.0
LTVF-N107P5BAA			100	180	140	1.45
LTVF-N110P0BAA			100	180	140	1.45

# Nx2000<sup>+</sup>

Compact, lightweight, easy to install, operate and service - the Nx2000<sup>+</sup> Series is perfectly suited for conveyors, pumps, fans and textile machinery. It handles load up to 11 kW, and

is engineered to keep your machine operating at optimum efficiency, even in the hot, humid and dusty conditions that characterise India's industrial environment.



## Main Features

- › Range: 0.4kW to 11kW
- › V/F, Slip Compensation, Sensorless Vector
- › DIN Rail mounting for Side-by-Side installation
- › Built-in EMC filter class C3 to meet IEC 61800-3
- › Built-in 2 Nos multi function relays
- › Integrated Potentiometer
- › Built-in PID
- › Built-in Braking chopper
- › Torque Boost for forward & reverse direction
- › Built-in 24V power source
- › RPM display on keypad
- › KEB for safety stop
- › Auto tuning of Motor
- › Conformal coating complying to IEC 60721-3-3 class 3C3 (Avg)
- › Built-in RS485 Modbus RTU Communication

## Applications

- › OEM Machines
- › Plastic & Textile Machines
- › Food & Packaging Machines
- › Conveyors
- › AHU Control
- › Fan
- › Pump
- › Compressor
- › Escalator
- › Press Machine
- › Crane Control LT / CT
- › Machine Tool
- › Wire Drawing

## User Convenience



- › Built-in Potentiometer & Remote Keypad Option
- › Possible to add reference from keypad & external signal
- › Provides external potentiometer for easier frequency control
- › Additional 0~5V analog input for frequency control
- › Useful in draw mode
- › Useful as auxiliary reference
- › Copy parameters (Read/Write) using remote keypad

## Easy Fan Maintenance



You can easily replace a fan without opening the drive cover

## Side-by-Side Installation by DIN Rail Mounting



The panel size can be significantly reduced thanks to the Nx2000+'s DIN Rail Mounting.

## Built in 2 No's Multi Function Relays



Cost efficient and easy to compose system with two embedded relays.

## Simplified SLVC Setup

Tuning parameters reduced to 6 Nos

Parameter	Name	Parameter Description
CON-21	Out Trq. Comp. Gain at Low Spd.	Output Torque Compensation Gain at Low speed
CON-22	Out Trq. Comp. Gain	Output Torque Compensation Gain
CON-23	Spd. Comp. Sub Gain	Speed Compensation Subsidiary Gain
CON-24	Spd. Comp. Main Gain	Speed Compensation Main Gain
CON-29	Spd. Comp. Gain at No-load	Speed Compensation Gain at No-load
CON-30	Spd. Response Adjustment Gain	Speed Response Adjustment Gain

## Easy Modbus Communication Connection



2 type of connection of Modbus communication

- › RJ45 Port
- › I/O (S+, S-)
- › Communication Speed - upto 115 kbps

### Fieldbus Options

Provides various communication options with simple mounting structure

- › Dual Port Ethernet/IP, Modbus TCP, RAPIEnet
- › Profibus-DP
- › CANopen

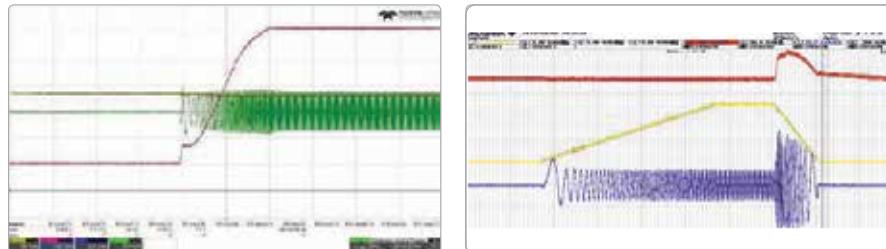
## PC Tool (Drive Connect)



New version PC tool

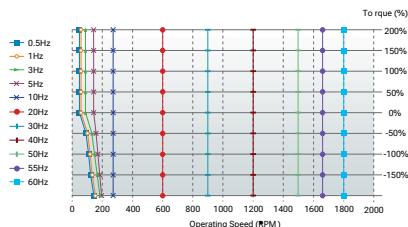
- › Connecting multiple drives
- › Integrated control console
- › Offline editing function
- › Data upload/download
- › 8-channel oscilloscope
- › Trigger function

## V/F Accelerate and Decelerate Function



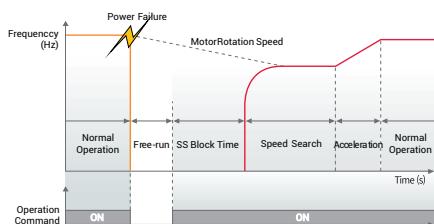
Applied ATB & Flux braking function

## Sensorless Performance



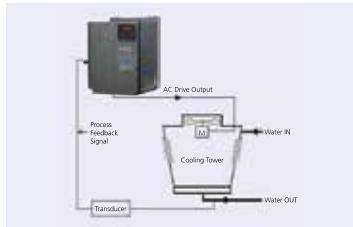
- › Low speed/High torque
- › Speed regulation +/-1% under load change
- › 0.5Hz 200% peak torque

## KEB for Safe Operating Stop



- › KEB for controlled stop in case of power loss or failure, for different speeds.
- › User has choice to start from zero speed or same speed

## Built-in PID



- › Useful in Pump, AHU applications to maintain process variables (Flow, Pressure & Temperature) as per required set-point.
- › Available with sleep & wake-up functions
- › No need for external PID Controller

## Flying Start

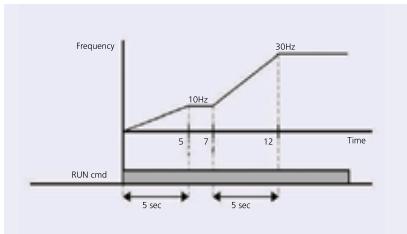
- › Select optimal flying start operation for different applications

## 2<sup>nd</sup> Motor Operation



- › Useful when drive operates 2 motors connected to two different types of loads
- › Single AC Drive can maintain 2 motor parameters with different Accel / Deccl parameter setting. It does not drive 2 motors at the same time.
- › For isolated operation of motors one VFD can be used in place of 2

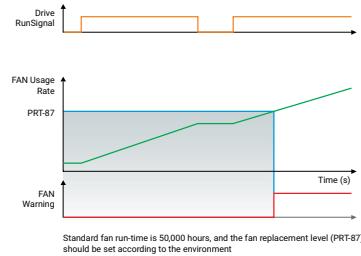
## Delta Frequency:



## Acceleration & Deceleration control

- › Useful in standalone as well as process applications
- › Acc-Dec time based on Delta frequency is normally used in process lines where gear ratio between one station to another station is different
- › In applications where there are multiple drives running at different frequencies and application demands all the drives reach prescribed frequency at the same time, delta frequency is used.
- › Settable from 0.00 sec to 6000 sec

## Fan Life Diagnosis



Displays fan replacement warning message with digital output or keypad

## UL 61800-5-1 Design

Satisfied the new UL certification

## Material Design

Enhanced thermal resistance and intensity through upgraded materials, Increased thickness to prevent damage

## Technical Specifications

VFD CAT No.	Rated Output					Rated input		DC Reactor	Braking Unit		
	Normal Duty		Heavy Duty			Normal Duty	Heavy Duty				
	$P_{ND}$	$I_{ND}$	$P_{HD}$	$I_{HD}$	Rated Capacity						
	(KW)	(A)	(KW)	(A)	(kVA)						
3-Phase, 200-240 V AC (-15%, +10%), 50/60Hz (±5)											
LTVF-N203P1BAA	0.75	3.1	0.4	2.5	1.0	3.0	2.2	NA	Built-in		
LTVF-N206P0BAA	1.5	6.0	0.75	5.0	1.9	6.3	4.9				
LTVF-N209P6BAA	2.2	9.6	1.5	8.0	3.0	10.8	8.4				
LTVF-N212P0BAA	4.0	12.0	2.2	11.0	4.2	13.1	11.8				
LTVF-N218P0BAA	5.5	18.0	4.0	17.0	6.5	19.4	18.5				
LTVF-N230P0BAA	7.5	30.0	5.5	24.0	9.1	32.7	25.8				
LTVF-N240P0BAA	11.0	40.0	7.5	32.0	12.2	44.2	34.9				
3-Phase, 380-480 V AC (-15%, +10%), 50/60Hz (±5)											
LTVF-N402P0BAA	0.75	2.0	0.4	1.3	1.0	2.0	1.1	NA	Built-in		
LTVF-N403P1BAA	1.5	3.1	0.75	2.5	1.9	3.3	2.4				
LTVF-N405P1BAA	2.2	5.1	1.5	4.0	3.0	5.5	4.2				
LTVF-N406P9BAA	4.0	6.9	2.2	5.5	4.2	7.5	5.9				
LTVF-N410P0BAA	5.5	10.0	4.0	9.0	6.5	10.8	9.8				
LTVF-N416P0BAA	7.5	16.0	5.5	12.0	9.1	17.5	12.9				
LTVF-N423P0BAA	11.0	23.0	7.5	16.0	12.2	25.4	17.5				

### Normal Duty

$I_{ND}$  Continuous current with 110% overload for 60 sec for every 5 mins at 40°C

$P_{ND}$  Maximum capacity applied to use of a standard 4 pole motor

### Heavy Duty

$I_{HD}$  Continuous current with 150% overload for 60 sec for every 5 mins at 50°C

$P_{HD}$  Maximum capacity applied to use of a standard 4 pole motor

1) The output of rated current is limited according to setting of the carrier frequency (CON-04)

## Built-in EMC Filter

Embedded EMC filter to meet IEC 61800-3 standards for noise reduction

## MIL 217Plus based Design

Reliability design basis tool (PSA, Fr-FMEA, FTA, RBD, PBS)  
Improved circuit robustness through strict quality margins

VFD CAT No.	Efficiency (at 100% load)		True Power Factor		Heat Losses			$I_{thd}$	
	Normal Duty	Heavy Duty	Normal Duty	Heavy Duty	Normal Duty	Heavy Duty	Internal Losses	Normal Duty	Heavy Duty
	(%)	(%)			(W)	(W)	(W)	(%)	(%)
LTVF-N203P1BAA	95.5	95.9	0.90	0.90	25	24	13	69.73	74.59
LTVF-N206P0BAA	96.4	95.7	0.91	0.91	26	24	13	62.26	69.44
LTVF-N209P6BAA	95.9	96.4	0.91	0.95	60	56	17	59.77	70.26
LTVF-N212P0BAA	95.9	96.2	0.92	0.95	62	59	17	62.45	69.64
LTVF-N218P0BAA	96.0	96.5	0.92	0.94	123	118	19	57.22	65.54
LTVF-N230P0BAA	95.0	96.6	0.93	0.93	208	176	39	51.99	62.20
LTVF-N240P0BAA	94.7	96.4	0.92	0.93	236	188	39	43.80	63.10
LTVF-N402P0BAA	96.0	95.2	0.90	0.91	22	21	13	67.53	80.41
LTVF-N403P1BAA	96.7	96.4	0.91	0.90	19	17	13	64.24	80.61
LTVF-N405P1BAA	96.4	97.2	0.91	0.91	55	45	17	62.32	80.50
LTVF-N406P9BAA	97.3	97.2	0.92	0.91	76	64	17	61.70	79.92
LTVF-N410P0BAA	96.5	97.4	0.92	0.92	95	84	21	59.90	80.36
LTVF-N416P0BAA	97.0	96.5	0.93	0.93	163	138	43	52.15	79.80
LTVF-N423P0BAA	96.9	97.2	0.92	0.93	179	140	43	44.16	80.45

**Test Condition**

Operation at 3-Phase, 480VAC, 50Hz supply

HD, ND Load 100% (M-G Set load, Corresponding motor to drive)

Carrier Frequency (Default, Max value)

Operation at room temperature

\* The result can be measured differently according to test conditions such as AC Reactor presence / input line length / Input impedance and transformer capacity.

**Control**

Control Method	V/F, Slip Compensation, Sensorless Vector
Frequency Setting Resolution	Digital command : 0.01Hz Analog command: 0.05Hz
Frequency Accuracy	% of the maximum output frequency
V/F Pattern	Linear, squared, user V/F
Overload Capacity	HD:150% for 1minute, ND: 120% for 1 minute
Torque Boost	Manual/Automatic torque boost
THDv	< 5%

## Operation

Operation Mode		Select keypad, terminal strip, or communication operation	
Frequency Setting		Analog: -10 to 10Vdc, 0 to 10Vdc, 4 to 20mA Digital: Keypad	
Operation Function		PID Control, 3-Wire Operation, Frequency Limit, Second Function, Anti-Forward and Reverse Direction Rotation, Commercial Transition, Speed Search, Power Braking, Leakage Reduction, Frequency Up/Down Operation, DC Braking, Frequency Jump, Slip Compensation, Automatic Restart, Automatic Tuning, Energy Buffering, Flux Braking, Fire Mode	
Input	Multi-Function Terminal (5 Points)	NPN (Sink) / PNP (Source) Selectable  Functions: Forward Run, Reverse Run, Reset, External Trip, Emergency Stop, Jog Operation, Multi-Step Frequency High/Med/Low, Multi-Step Acceleration/Deceleration High/Med/Low, DC Braking at Stop, 2nd Motor Select, Frequency Up/Down, 3-Wire Operation, Change into Normal Operation During PID Operation, Analog Command Frequency Fixing, Acceleration/Deceleration Stop etc. selectable	
	Analog Input	V1: -10 to 10Vdc, I2: 4 to 20mA	
Output	Multi-function Relay Terminal	Fault output and drive operation status output	(N.O., N.C.) less than AC 250V 1A, less than DC 30V 1A
	Analog Output	0~12Vdc: Frequency, Output current, Output voltage, DC link voltage etc. selectable	

## Protective Function

Trip	Over Current Trip, External Signal Trip, ARM Short Current Fault Trip, Over Heat Trip, Input Phase Loss Trip, Ground Trip, Motor Over Heat Trip, I/O Board Link Trip, No Motor Trip, Parameter Writing Trip, Emergency Stop Trip, Command Loss Trip, CPU Watchdog Trip, Motor Light Load Trip  Over Voltage Trip, Temperature Sensor Trip, Inverter Over Heat, Option Trip, Output Image Trip, Inverter Overload Trip, Fan Trip, Pre-Pid Operation Failure External Brake Trip, Low Voltage Trip During Operation, Low Voltage Trip, Analog Input Error, Motor Overload Trip, Over Torque Trip, Under Torque Trip
Alarm	Command Loss Trip Warning, Overload Warning, Light Load Warning, Inverter Overload Warning, Fan Operation Warning, Braking Resistance Braking Rate Warning, Rotor Time Constant Tuning Error, Inverter Pre-overheat Warning, Over Torque Warning, Under Torque Warning
Momentary Power Loss	HD below 15ms (ND below 8ms): Continuous operation (To be within rated input voltage, rated ouput) HD above 15ms (ND above 8ms): Automatic restart operation enable

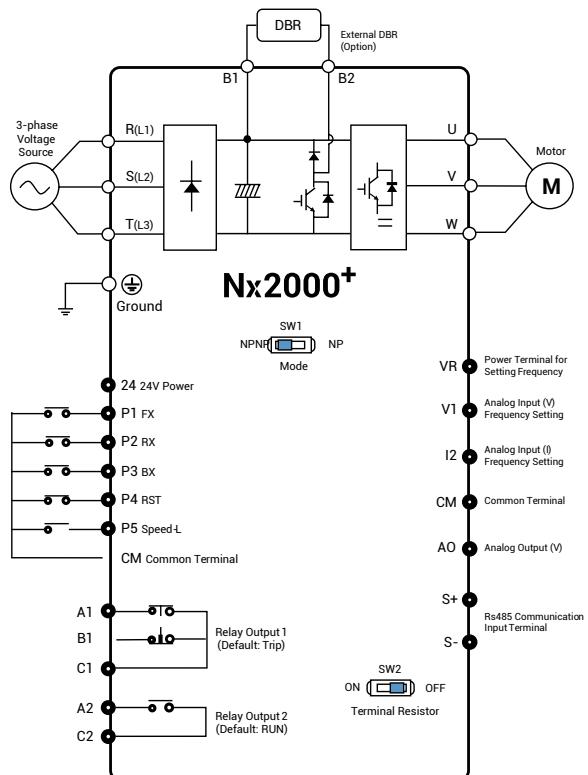
## Environment

Cooling Type	Forced fan cooling structure
Enclosure Type	IP20/ULOpen (Default), ULEnclosed type1 (Option)
Insulation Type	Galvanic Isolation
Conformal Coating	Complies to IEC 60721-3-3 class 3C3 (Avg)
Ambient Temperature	Ambient temperature under the condition of no ice or frost. HD:-10~50°C (14~122°F) / ND:- 10~40°C (14~104°F) [However, recommended to use load upto 80% when using Normal Duty rating at 50°C]
Humidity	Upto 95% of relative humidity (with no dew formation)
Storage Temperature	-20~65°C (-4~149°F)
Location	No corrosivegas, flammable gas, oil mist and dust etc. indoor (Pollution degree 2 environment)
Altitude, Vibration	Below 1,000m (From 1000 to 4000m, the rated input voltage and rated output current of the drive must be derated by 1% for every 100m.), below 9.8m/sec <sup>2</sup> (1G)
Pressure	70~106kPa
Maximum Noise level	<65dba

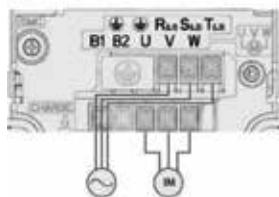
### Specification

- 1) In case of Sensorless, you can set the frequency at up to 120Hz by selecting 4 in DRV-09 (Control Mode).
- 2) The maximum output voltage does not go up over the supplied power voltage. You can select the output voltage as you want below the supplied power voltage.

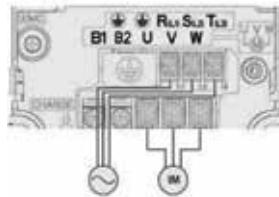
## I/O Configuration



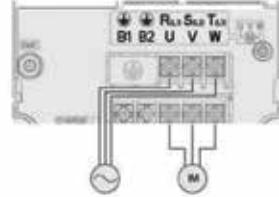
0.4/0.75kW



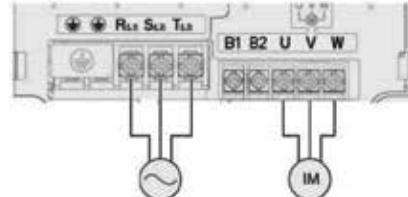
1.54/2.2kW



4.0kW



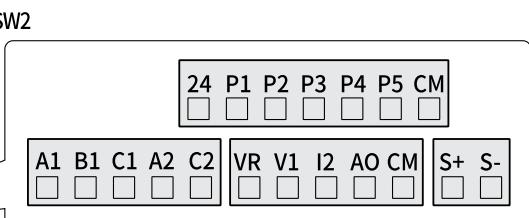
5.5/7.5kW



Terminal Labels	Name	Description
⏚	Ground terminal	Connect earth grounding
R(L1)/S(L2)/T(L3)	AC power input terminal	Mains supply AC power connections
B1/B2	Brake resistor terminals	Brake resistor wiring connection
U/V/W	Motor output terminals	3-phase induction motor wiring connections

Capacity (kW)		Terminal Screw Size	Rated Screw Torque (Kgf.cm/Nm)
3-Phase 230V Class	0.4	R/S/T, U/V/W : M3	R/S/T, U/V/W : 5.1/0.5
	0.75		
	1.5	R/S/T, U/V/W : M4	R/S/T, U/V/W : 12.1/1.2
	2.2		
	4	R/S/T, U/V/W : M4	R/S/T, U/V/W : 18.4/1.8
	5.5		
	7.5		
3-Phase 415V Class	0.4	R/S/T, U/V/W : M3.5	R/S/T, U/V/W : 10.3/1.0
	0.75		
	1.5		
	2.2		
	4	R/S/T, U/V/W : M4	R/S/T, U/V/W : 18.4/1.8
	5.5		
	7.5		

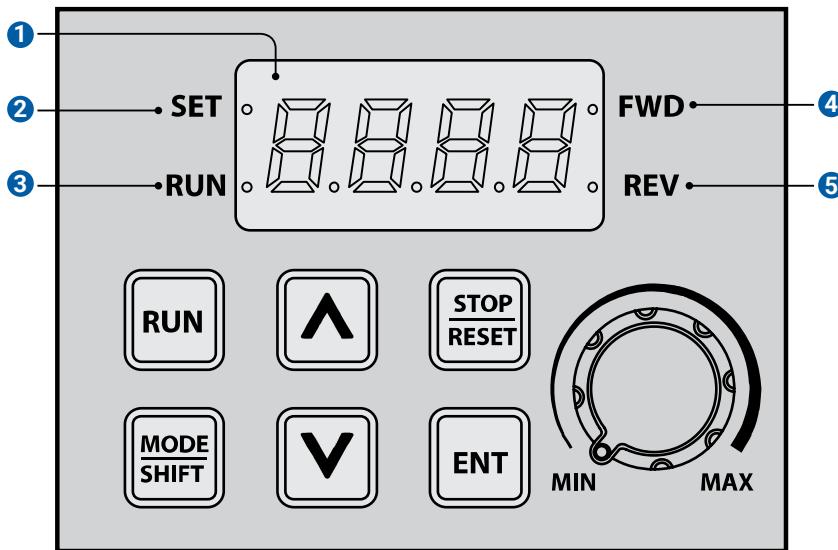
- Only use the specified torque on the screw heads otherwise damage could occur. Loose screws can cause overheating and damage.
- Use copper wires with 600V, 75 °C specification.



Terminals	Terminal Screw Size	Screw Torque (Kgf.cm/Nm)
P1~P5/CM/VR/V1/I2/AO/24/S+/S-	M2	2.2~2.5/0.22~0.25
A1/B1/C1,A2/C2	M2.6	4.0/0.4

› Only use the specified torque on the screw heads otherwise damage could occur. Loose screws can cause overheating and damage.

Category	Terminal Labels	Name	Description
Multi-function Terminal Configuration	P1~P5	Multi-function Input 1-5	Configurable for multi-function input terminal. Factory default terminal ad setup are as follows. › P1:Fx › P2:Rx › P3:Bx › P4:RST › P5:Speed-L
	24	External 24V power source	Maximum current output: 100mA
	CM	Sequence common terminal	Common terminal for digital & analog terminal inputs and outputs.
Analog Input	VR	Potentiometer frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input. › Maximum voltage output: 12V › Maximum current output: 100mA › Potentiometer: 1/5kW
	V1	Voltage input for frequency reference input	Used to setup or modify a frequency reference via analog voltage input terminal. › Unipolar : 0-10V(12VMax.) › Bipolar: -10-10V(±12VMax.)
	I2	Current input for frequency reference input terminal	Used to setup or modify a frequency reference via current input terminal. › Input current: 4-20mA › Maximum Input current: 24mA › Input resistance: 249 W
Analog Output	AO	Voltage Output terminal	Used to send inverter output information to external devices: Output frequency, output current, output voltage, or a DC voltage. › Output voltage:0-10V › Maximum output voltage/Current:12V, 10mA › Factory default output: Frequency
Digital Output	A1/C1/ B1	Fault signal output 1	Sends out alarm signals when the inverter's safety features are activated (AC 250V 1A, DC 30V 1A) › Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection) › Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection)
	A2/C2	Fault signal output 2	Sends out alarm signals when the inverter's safety features are activated (AC 250V 1A, DC 30V 1A) › Fault condition: A2 and C2 contacts are connected › Normal operation: A2 and C2 contacts are open condition
RS-485 Communication	S+/S-	RS-485 signal line	Used to send or receive RS-485 signals.



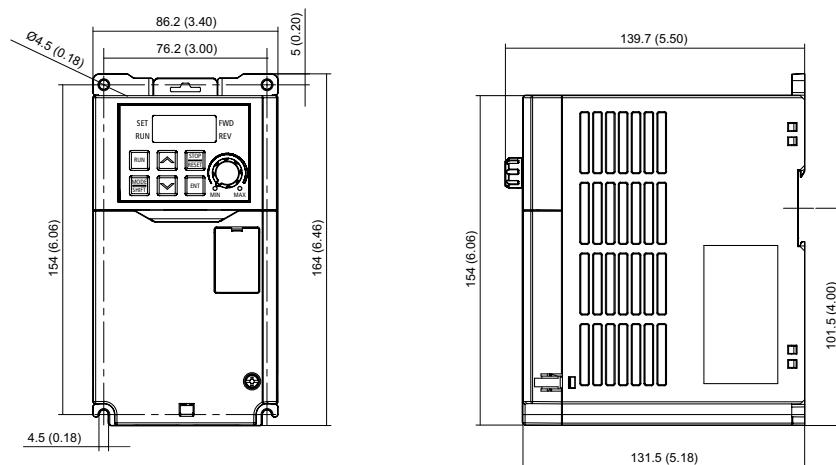
No.	Name	Function
①	7-Segment Display	Displays Current Operational status and Parameter information.
②	SET Indicator	LED flashes during parameter configuration.
③	RUN Indicator	LED turns on (Steady during an operation, and flashes during acceleration or deceleration).
④	FWD Indicator	LED turns on (Steady) during forward operation.
⑤	REV Indicator	LED turns on (Steady) during reverse operation

Key	Name	Function
[RUN]	[RUN] Key	Used to run the inverter (Inputs a RUN command).
[STOP RESET]	[STOP/RESET] Key	STOP : Stops the inverter RESET : Resets the inverter if a fault or failure occurs.
[▲] [▼]	[▲] Key, [▼] Key	Switches between codes, or increases or decreases parameter values.
[MODE SHIFT]	[MODE/SHIFT] Key	Moves between groups or moves to the digit on the left when setting the parameter. Press the MODE/SWIFT key once again on the maximum number of digits to move to the minimum number of digits.
[ENT]	[ENTER] Key	Switches from the selected state of parameter to the input state. Edits parameter and apply change. Accesses the operation information screen during failure.
[▲] + [▼] [MODE SHIFT] + [▼] [MODE SHIFT] + [▲]	-	Escape to the initial display.
Potentiometer	Potentiometer or Rotating Knob	Used to set the operation frequency.

Group	Keypad Display	Description
Operation	-	Configures basic parameters for inverter operation.
Drive		Configures parameters for basic operation. These include jog operation, motor capacity evaluation, torque boost, and other keypad related Parameters
Basic		Configures basic operation parameters These parameters include motor parameters and multi-step frequency parameters.
Advanced		Configures acceleration or deceleration patterns, frequency limits, etc.
Control		Configure sensorless vector-related features.
Input Terminal		Configures input terminal-related features, including digital multi-functional inputs and analog inputs.
Output Terminal		Configures output terminal-related features such as relays and analog outputs.
Communication		Configures communication features for RS-485 or other communication options.
Application		Configures functions related to PID control.
Protection		Configures motor and inverter protection features
Motor 2 (Secondary Motor)		Configures secondary motor related features. The secondary motor (M2) group appears on the keypad only when one of the multi-function Input terminals (In.65-In.69) has been set to 26 (secondary motor).

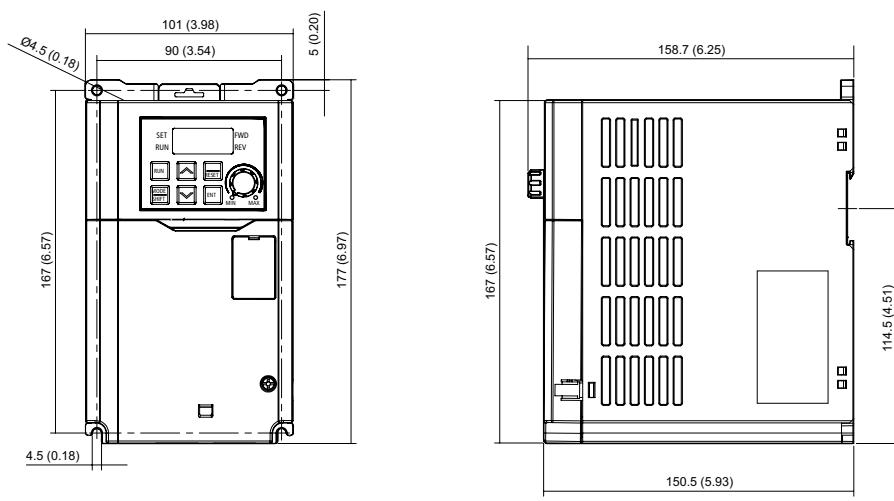
Units: mm (inches)

**LTVF-N203P1BAA, LTVF-N206P0BAA, LTVF-N402P0BAA,  
LTVF-N403P1BAA**



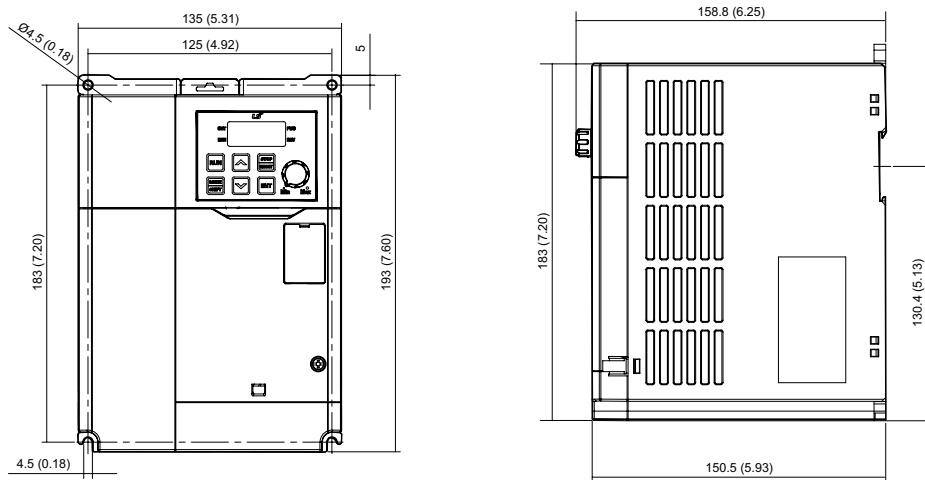
0.4~0.75kW

**LTVF-N209P6BAA, LTVF-N212P0BAA, LTVF-N405P1BAA,  
LTVF-N406P9BAA**



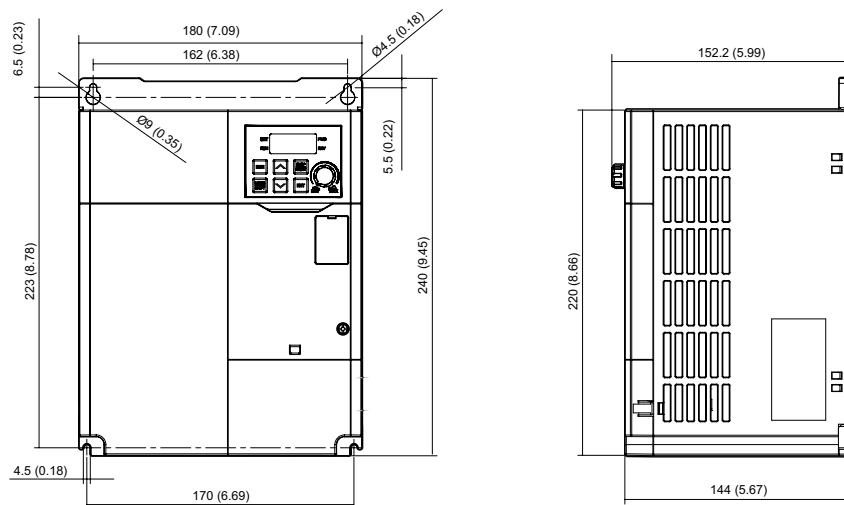
1.5~2.2kW

**LTVF-N218P0BAA, LTVF-N410P0BAA**



4.0kW HD

## LTVF-N230P0BAA, LTVF-N240P0BAA, LTVF-N416P0BAA, LTVF-N423P0BAA



5.5~7.5kW

### Dimensions

VFD CAT No.	Frame Size	IP Rating	W1 (mm)	H1 (mm)	D1 (mm)	Weight (Kg)	
LTVF-N203P1BAA	F1	IP20	86.2	154	131.5	1.04	
LTVF-N206P0BAA			86.2	154	131.5	1.06	
LTVF-N209P6BAA	F2		101	167	150.5	1.36	
LTVF-N212P0BAA			101	167	150.5	1.4	
LTVF-N218P0BAA	F3		135	183	150.5	1.89	
LTVF-N230P0BAA	F4		180	220	144	3.08	
LTVF-N240P0BAA			180	220	144	3.21	
LTVF-N402P0BAA	F1		86.2	154	131.5	1.02	
LTVF-N403P1BAA			86.2	154	131.5	1.06	
LTVF-N405P1BAA	F2		101	167	150.5	1.4	
LTVF-N406P9BAA			101	167	150.5	1.42	
LTVF-N410P0BAA	F3		135	183	150.5	1.92	
LTVF-N416P0BAA	F4		180	220	144	3.08	
LTVF-N423P0BAA			180	220	144	3.12	

# Sx2000 IP66

Sx2000 IP66 Drive provides protection against harsh environmental conditions by restricting entry of foreign

substances such as fine dust and high - pressure water spray. Satisfies NEMA standard type 4X for indoor use.



## Main Features

- › Range: 0.75kW to 22kW (HD)
- › V/f, Sensorless vector control, Slip Compensation
- › Starting Torque of 150% at 3Hz for V/f, 200% at 0.5 Hz for vector control
- › Built-in Brake Control
- › User Sequence - PLC functionality
- › Component life monitor
- › Inbuilt PID
- › No motor detection
- › Conformal coating complying to IEC 60721-3-3 class 3C2 (max) and class 3C3 (avg)
- › Built-in RS 485 Modbus RTU communication
- › Built-in braking chopper

## Applications

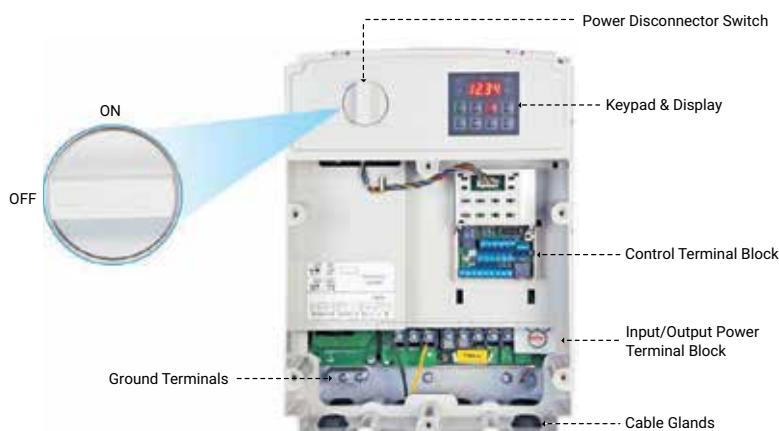
- › Textile
- › HVAC
- › Pharma
- › Food and Beverages
- › Ceramic
- › Waste Water Treatment
- › Bottling plant
- › Machine tool

## What is-IP-XX?

IP-XX denotes the degree of dust and water resistance, it is abbreviation of the IEC standard 60529 for Ingress Protection to the enclosures.

IP	6	6	
<b>First Digit - SOLIDS</b>		<b>Second Digit - LIQUIDS</b>	
Protected against access to hazardous parts with a wire of 1mm Ø		Protected against powerful water jets from any direction	
No ingress of dust - dust tight			

## Front Cover Removed



## Technical Specifications

VFD CAT No.	Input: 3-Phase, 380-480V AC (-15%,+10%), 50/60Hz (±5)					DC Reactor	Braking Unit		
	Rated Output		Rated input						
	Heavy Duty								
	P <sub>HD</sub> (kW)	<sup>1)</sup> I <sub>HD</sub> (A)	Rated Capacity (kVA)	(A)					
LTVF-S40001XAA	0.4	1.3	1	1.1	External (Option)	Built-In			
LTVF-S40003XAA	0.75	2.5	1.9	2.4					
LTVF-S40004XAA	1.5	4.0	3	4.2					
LTVF-S40006XAA	2.2	5.5	4.2	5.9					
LTVF-S40009XAA	4.0	9	6.5	9.8					
LTVF-S40012XAA	5.5	12	9.1	12.9					
LTVF-S40016XAA	7.5	16	12.2	17.5					
LTVF-S40024XAA	11.0	24	18.3	26.5					
LTVF-S40030XAA	15.0	30	22.9	33.4					
LTVF-S40039XAA	18.5	39	29.7	43.6					
LTVF-S40045XAA	22.0	45	34.3	50.7					

### Heavy Duty

I<sub>HD</sub> Continuous current with 150% overload for 60 sec for every 5 mins at 50°C

P<sub>HD</sub> Maximum capacity applied to use of a standard 4 pole motor

1) The output of rated current is limited according to setting of the carrier frequency (CON-04)

## Technical Specifications

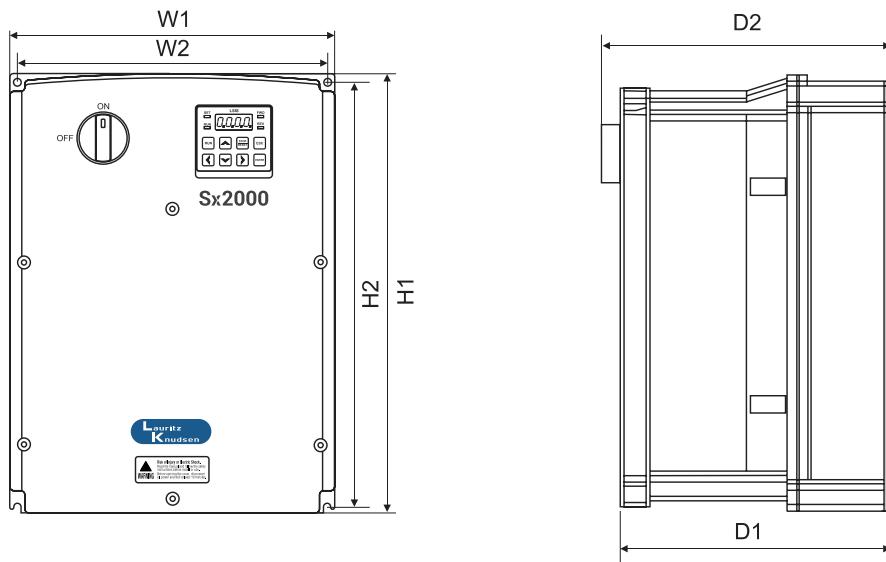
<b>Standard Specifications</b>	Overload Capacity	HD:150% for 1min & 200% instantaneous for 1 second
	Max Output Voltage	Proportional to Input Voltage
	Max Output Frequency	0 to 400Hz (Sensorless: 0 to 120Hz)
	Rated Voltage	380 to 480V Three-phase (-15%/+10%)
	Rated Frequency	50/60Hz (-5%/+5%)
	THDv	< 5%
	Keypad	Built-in LED
	Braking Chopper	Built-in
<b>Control Details</b>	Control Method	V/F, Sensorless Vector Control, Slip Compensation
	Starting Torque	200% at 0.5Hz for Sensorless Control & 150% at 3Hz for V/F
	Torque Boost	Manual torque boost, Automatic torque boost
	Frequnacy Accuracy	1% of maximum output frequency
	Frequency Control Range	0.01 to 400Hz for V/F, 0 to120Hz for Sensorless Vector Control
	Frequency Setting	Analog type:-10 to 10V, +0 to 10[V], 4 to 20[mA], Digital type: Keypad, pulse train input
	Output Frequency Resolution	0.01Hz
	V/F pattern	Linear, squared, user V/F
	Accel/Decel Time	0.0 to 6000 Sec
	Braking Torque	Continuous Regeneration Torque 20% (150% with DBR)
<b>Protection</b>	Features	Multi keypad, peer-to-peer communication to share I/Os, user sequence, inbuilt PID, component life monitor, no motor detection, auto tuning, Brake Control, KEB, Flying start, Safety Function
	Faults	Over current trip, External signal trip, ARM short circuit current trip, Over heat trip, Ground trip, Motor over heat trip, I/O board link trip, No motor trip, Parameter writing trip, Emergency stop trip, Command loss trip, CPU watchdog trip, Motor normal load trip, Over voltage trip, Temperature sensor trip, Inverter over heat, Option trip, Output imaging trip, Inverter overload trip, Fan trip, Pre-PID operation failure, External break trip, Low voltage trip during operation, Low voltage trip, Safety A (B) trip, Analog input error, Motor overload trip
	Alarm	Command Loss trip alarm, overload alarm, normal load alarm, inverter overload alarm, fan operation alarm, resistance braking alarm, number of corrections on rotor tuning error
<b>Interface</b>	Instantaneous Interruption	Heavy load less then 15ms: continue operation (must be within the rated input voltage and rated output range) Heavy load more then 15ms: auto restart operation
	DI	5 (Programmable NPN/PNP)
	DO	1 (Programmable NO/NC) + 1 TR
	AI	1Nos: 0 to 10V & 1 Nos: 0 to 10V/4 to 20mA
	AO	1 (4-20mA/0 to 10Vdc)
	Pulse Train	1 I/P & 1 O/P (0 to 32kHz)
	Built-in PID	1
<b>Option</b>	Communication	Built-in RS485 Modbus RTU
	SafetyI/P	2, complying with EN ISO 13849-1 Pld and EN61508SIL2 [EN60204-1, stop category 0]
<b>Expansion Card</b>	Expansion Card	3DI (PNP/NPN), 2DO (R), 2AI (-10 to 10V), (0 to 10V/0 to 20mA), 1AO (0 to 10V/0 to 20mA)
	Communication Card	CANopen, Profibus DP+, Profinet, Modbus TCP / Ethernet IP
<b>Environment</b>	Cooling Type	Forced fan cooling structure
	Area of Use	Prevent contact with corrosive gases, inflammable gases, oil stains, and other pollutants (Pollution Degree 3 Environment)
	Enclosure Type	IP66 (NEMA 4X Indoor Only)
	Isolation type	Galvanic Isolation
	Ambient Temperature	-10 to 40°C for HD
	Storage Temperature	-20°C to 65°C
	PCB Protection	Conformal coating complying to IEC 60721-3-3 class 3C2(max) and 3C3(avg)
	Altitude	Below 1000m
	Vibration	9.8m/sec <sup>2</sup> (<1G)
	Maximum Noise level	<65dba
	Global Compliance	CE, UL (Plenum Rated), RoHS

\*Profibus DP option is available from 5.5kW to 22kW

### Specification

- 2) In case of Sensorless, you can set the frequency at up to 120Hz by selecting 4 in DRV-09 (Control Mode).
- 3) The maximum output voltage does not go up over the supplied power voltage. You can select the output voltage as you want below the supplied power voltage.

## Dimensions



VFD CAT No.	Frame Size	IP Rating	W1 (mm)	W2 (mm)	H1 (mm)	H2 (mm)	D1 (mm)	D2 (mm)	Weight (Kg)	
LTVF-S40001XAA	F1	IP66	180	170	256.6	245	174.2	188.2	3.7	
LTVF-S40003XAA			180	170	256.6	245	174.2	188.2	3.7	
LTVF-S40004XAA	F2		220	204	258.8	241	201	215	5.3	
LTVF-S40006XAA			220	204	258.8	241	201	215	5.5	
LTVF-S40009XAA	F3		220	204	258.8	241	201	215	5.6	
LTVF-S40012XAA			250	232	328	308	227.2	241.2	8.8	
LTVF-S40016XAA	F4		250	232	328	308	227.2	241.2	8.9	
LTVF-S40024XAA			260	229	399.6	377	245.5	259.6	9.6	
LTVF-S40030XAA	F5		260	229	399.6	377	245.5	259.6	9.8	
LTVF-S40039XAA			300	270.8	460	436.5	250	264	12.4	
LTVF-S40045XAA			300	270.8	460	436.5	250	264	12.4	

**Note:** The above drawings are solely for reference purposes. Please refer to the technical manual.

# Accessories for AC Drives

Suitable for Drive	Description	CAT No.
Nx2000	Remote Keypad with 3m cable	LTOP-DOP-51
Nx2000+	Remote Keypad with 3m cable	LTOP-DOP-52
	CANOpen Communication Interface Card	LTCI-CAN-NP
	Ethernet IP/Modbus TCP/RAPIDnet Communication Interface	LTCI-ETH-NP
	Profibus-DP Communication Interface Card	LTCI-PDP-NP
Sx2000	LCD Digital Operator	LTOP-DOP-200
	LED Digital Operator with 3m cable for Sx2000	LTOP-DOP-150
	I/O Expansion Card for Sx2000 (3DI, 2DO, 2AI, 1AO)	LTIO-EXP-S.
	Profinet communication card	LTCI-PFN-S
	Dual Port EthernetIP/ModbusTCP Comm card	LTCI-ETH2-S
	CANOpen Communication card	LTCI-CAN-S
	Profibus-DP Communication card	LTCI-PDP-S.
Fx2000	LCD Digital Operator	LTOP-DOP-200
	I/O Expansion Card 1 for Fx2000	LTIO-EX1-F
	Synchronization Option Card	LTCN-SYN-F
	Position control option card for Fx2000	LTCN-PCN-F
	Profinet communication card	LTCI-PFN-F
	BCD Option Card for Fx2000	LTIO-BCD-F
	Dual Port EthernetIP/ModbusTCP Comm card	LTCI-ETH2-F
	Incremental card for Open collector and Line Drive Encoder	LTEN-INC-F
	Profibus-DP Communication Interface card	LTCI-PDP-F
	Application Development PLC Option card	LTAD-PLC-F
	CANOpen Communication Interface card	LTCI-CAN-F
	Device Net Communication Interface card	LTCI-DEN-F
	Ethernet IP/Modbus TCP Communication Interface card	LTCI-ETH-F
	PLL option card for Fx2000	LTCN-PLL-F
Hx2000	I/O Expansion Card 1 for Hx2000	LTIO-EXP-H
	I/O Expansion Card 2 for Hx2000	LTIO-EXP2-H
DBU for Sx2000, Fx2000	Dynamic Braking Unit for 11 - 15 kW	LTDBU-0150-4
	Dynamic Braking Unit for 18.5 - 22kW	LTDBU-0220-4
	Dynamic Braking Unit for 30 - 37 kW	LTDBU-0370-4
	Dynamic Braking Unit for 45 - 55kW	LTDBU-0550-4
	Dynamic Braking Unit for 75kW	LTDBU-0750-4
	Dynamic Braking Unit for 220 - 375kW	LTDBU-2200-4

## Peripheral Devices

### Incomer (MPCB / MCCB) & Magnetic Contactor (MC) for Nx2000<sup>+</sup>, Sx2000 & Fx2000

Cat nos	Specification of Breaker (MPCB /MCCB)						Magnetic Contactor (MC)			
	Heavy Duty			Normal Duty			Heavy Duty		Normal Duty	
	VFD kW HD	Type	A	VFD kW ND	Type	A	Type	A	Type	A
LTVF-N402P0BAA	0.4	MOG-H1M	2.5	0.75	MOG-H1M	4	MO	9	MO	9
LTVF-S40002BAA										
LTVF-S40001XAA										
LTVF-N403P1BAA	0.75	MOG-H1M	4	1.5	MOG-H1M	6.3	MO	9	MO	9
LTVF-S40003BAA										
LTVF-S40003XAA										
LTVF-F40004CAA										
LTVF-N405P1BAA	1.5	MOG-H1M	6.3	2.2	MOG-H1M	10	MO	9	MO	9
LTVF-S40005BAA										
LTVF-S40004XAA										
LTVF-F40006CAA										
LTVF-N406P9BAA	2.2	MOG-H1M	10	3.7	MOG-H1M	10	MO	9	MO	9
LTVF-S40007BAA										
LTVF-S40006XAA										
LTVF-F40008CAA										
LTVF-N410P0BAA	3.7	MOG-H1M	10	5.5	MOG-H1M	16	MO	9	MO	18
LTVF-S40010BAA										
LTVF-S40009XAA										
LTVF-F40012CAA										
LTVF-N416P0BAA	5.5	MOG-H1M	16	7.5	MOG-H1M	20	MO	18	MO	18
LTVF-S40016BAA										
LTVF-S40012XAA										
LTVF-F40016CAA										
LTVF-N423P0BAA	7.5	MOG-H1M	20	11	MOG-H2M	32	MO	18	MO	25
LTVF-S40023BAA										
LTVF-S40016XAA										
LTVF-F40024CAA										

Cat nos	Specification of Breaker (MPCB /MCCB)						Magnetic Contactor (MC)			
	Heavy Duty			Normal Duty			Heavy Duty		Normal Duty	
	VFD kW HD	Type	A	VFD kW ND	Type	A	Type	A	Type	A
LTVF-S40030BAA	11	MOG-H1M	32	15	MOG-H2M	40	MO	25	MO	40
LTVF-S40024XAA										
LTVF-F40030CAA										
LTVF-S40038BAA	15	MOG-H2M	40	18.5	MOG-H2M	50	MO	40	MO	45
LTVF-S40030XAA										
LTVF-F40039CAA										
LTVF-S40044BAA	18.5	MOG-H2M	50	22	DN0-100M	63	MO	45	MO	50
LTVF-S40039XAA										
LTVF-F40045CAA										
LTVF-S40058BAA	22	MOG-H2M	63	30	DN0-100M	80	MO	50	MNX	60/70
LTVF-S40045XAA										
LTVF-F40061CAA										
LTVF-S40075BAA	30	DN0-100M	80	37	DN1 - 160M	100	MO	70	MNX	80
LTVF-F40075CAA										
LTVF-S40091BAA	37	DN0-100M	100	45	DN1 - 160M	125	MO	80	MNX	110
LTVF-F40091CAA										
LTVF-S40107BAA	45	DN1 - 160M	125	55	DN2 - 250M	160	MO	110	MNX	140
LTVF-F40110CAA										
LTVF-S40142BAA	55	DN1 - 160M	160	75	DN2 - 250M	200	MO	140	MNX	185
LTVF-F40152CAA										
LTVF-S40169BAA	75	DN2 - 250M	200	90	DN2 - 250M	250	MO	185	MNX	225
LTVF-F40183CAA										
LTVF-F40223AAA	90	DN2 - 250M	250	110	DN3 - 400M	320	MO	225	MNX	250
LTVF-F40264AAA	110	DN3 - 400M	320	132	DN3 - 400M	400	MO	250	MNX	300
LTVF-F40325AAA	132	DN3 - 400M	400	160	DN3 - 630M	500	MO	300	MNX	400
LTVF-F40370AAA	160	DN3 - 630M	500	185	DN3 - 630M	500	MNX	400	MNX	550
LTVF-F40432AAA	185	DN3 - 630M	500	220	DN3 - 630M	630	MNX	550	MNX	550
LTVF-F40547AAA	220	DN3 - 630M	630	280	DN4 - 1250N	800	MNX	550	MNX*	650
LTVF-F40613AAA	285	DN4 - 1250N	800	315	DN4 - 1250N	1000	MNX	650	MNX*	400*
LTVF-F40731AAA	315	DN4 - 1250N	1000	375	DN4 - 1250N	1250	MNX*	400*	MNX*	550*
LTVF-F40877AAA	375	DN4 - 1250N	1250	450	DN4 - 1250N	1250	MNX*	550*	MNX*	550*

## Peripheral Devices

### Incomer (MPCB / MCCB) & Magnetic Contactor (MC) for Hx2000

Cat nos	Specification of Breaker (MPCB /MCCB)			Magnetic Contactor (MC)	
	Normal Duty				
	VFD kW ND	Type	A	Type	A
LTVF-H40002BAA	0.75	MOG-H1M	4	MO	9
LTVF-H40004BAA	1.5	MOG-H1M	6.3	MO	9
LTVF-H40006BAA	2.2	MOG-H1M	10	MO	9
LTVF-H40008BAA	3.7	MOG-H1M	10	MO	9
LTVF-H40012BAA	5.5	MOG-H1M	16	MO	18
LTVF-H40016BAA	7.5	MOG-H1M	20	MO	18
LTVF-H40024BAA	11	MOG-H2M	32	MO	25
LTVF-H40030BAA	15	MOG-H2M	40	MO	40
LTVF-H40038BAA	18.5	MOG-H2M	50	MO	45
LTVF-H40045BAA	22	DNO - 100M	63	MO	50
LTVF-H40061BAA	30	DNO - 100M	80	MO	70
LTVF-H40075BAA	37	DN1 - 160M	100	MO	80
LTVF-H40091BAA	45	DN1 - 160M	125	MO	110
LTVF-H40107BAA	55	DN2 - 250M	160	MO	140
LTVF-H40142BAA	75	DN2 - 250M	200	MO	185
LTVF-H40169BAA	90	DN3 - 400M	250	MO	225

**Note:**

- 1) MC (Magnetic Contactor) current is 1.3 ~ 1.5 times of Drives rated current
- 2) MCCB should be used to protect against overload and damage of drive installation from the fault current.
- 3) From 220kW MCCB dsine with frame size DN0 to DN3 with thermal-magnetic realease & for above 220kW MCCB dsine with frame DN4-1250N is used with MTX1.0 release.
- 4) \*2 contactors are used in parallel

# Peripheral Devices

## DBU & DBR Selection Chart for Nx2000<sup>+</sup>, Sx2000 & Fx2000

Inverter Capacity (1)	Motor kW (HD)	Dynamic Braking Unit		Specifications of the Breaking Resistor when ED is 5%		Specifications for Crane / Hoist *(2)		
		DBU Cat. No.	Qty	Resistor [2]	Qty	Resistor [2]	Qty	
LTVF-N402POBAA	0.4	Built-in	1200 Ω -100 W	1	-	-	-	
LTVF-S40002BAA			1200 Ω -100 W	1	-	-	-	
LTVF-N403P1BAA	0.75		600 Ω - 150 W	1	-	-	-	
LTVF-S40003BAA			600 Ω - 150 W	1	600 Ω -450 W	1	600 Ω -450 W	
LTVF-F40004CAA	1.5		600 Ω - 150 W	1	600 Ω -450 W	1	600 Ω -450 W	
LTVF-N405P1BAA			300 Ω - 300 W	1	-	-	-	
LTVF-S40005BAA			300 Ω - 300 W	1	300 Ω -900 W	1	300 Ω -900 W	
LTVF-F40006CAA	2.2		300 Ω - 300 W	1	300 Ω -900 W	1	300 Ω -900 W	
LTVF-N406P9BAA			200 Ω - 400 W	1	-	-	-	
LTVF-S40007BAA			200 Ω - 400 W	1	200 Ω -1200 W	1	200 Ω -1200 W	
LTVF-F40008CAA	3.7		200 Ω - 400 W	1	200 Ω -1200 W	1	200 Ω -1200 W	
LTVF-F40012CAA			130 Ω - 600 W	1	130 Ω - 2000 W	1	130 Ω - 2000 W	
LTVF-N410P0BAA			130 Ω - 600 W	1	-	-	-	
LTVF-S40010BAA	4		130 Ω - 600 W	1	130 Ω - 2000 W	1	130 Ω - 2000 W	
LTVF-N416P0BAA			85 Ω - 1000 W	1	-	-	-	
LTVF-S40016BAA			85 Ω - 1000 W	1	85 Ω - 3000 W	1	85 Ω - 3000 W	
LTVF-F40016CAA	5.5		85 Ω - 1000 W	1	85 Ω - 3000 W	1	85 Ω - 3000 W	
LTVF-N423P0BAA			60 Ω - 1200 W	1	-	-	-	
LTVF-S40023BAA			60 Ω - 1200 W	1	60 Ω - 4000 W	1	60 Ω - 4000 W	
LTVF-F40024CAA	7.5		60 Ω - 1200 W	1	60 Ω - 4000 W	1	60 Ω - 4000 W	
LTVF-S40030BAA			40 Ω - 2000 W	1	40 Ω - 6000 W	1	40 Ω - 6000 W	
LTVF-F40030CAA			40 Ω - 2000 W	1	40 Ω - 6000 W	1	40 Ω - 6000 W	
LTVF-S40038BAA	11		30 Ω - 2400 W	1	30 Ω - 8000 W	1	30 Ω - 8000 W	
LTVF-F40039CAA			30 Ω - 2400 W	1	30 Ω - 8000 W	1	30 Ω - 8000 W	
LTVF-S40044BAA			20 Ω - 3600 W	1	20 Ω - 10000 W	1	20 Ω - 10000 W	
LTVF-F40045CAA	15		20 Ω - 3600 W	1	20 Ω - 10000 W	1	20 Ω - 10000 W	
LTVF-S40058BAA			20 Ω - 3600 W	1	20 Ω - 12000 W	1	20 Ω - 12000 W	
LTVF-F40061CAA			20 Ω - 3600 W	1	20 Ω - 12000 W	1	20 Ω - 12000 W	
LTVF-S40075BAA	30	LTDBU-0370-4	1	16.9 Ω - 5000 W	1	16.9 Ω - 17000 W	1	
LTVF-F40075CAA		LTDBU-0370-4	1	16.9 Ω - 5000 W	1	16.9 Ω - 17000 W	1	
LTVF-S40091BAA	37	LTDBU-0370-4	1	16.9 Ω - 5000 W	1	16.9 Ω - 20000 W	1	
LTVF-F40091CAA		LTDBU-0370-4	1	16.9 Ω - 5000 W	1	16.9 Ω - 20000 W	1	
LTVF-S40107BAA	45	LTDBU-0550-4	1	11.4 Ω - 10000 W	1	11.4 Ω - 25000 W	1	
LTVF-F40110CAA		LTDBU-0550-4	1	11.4 Ω - 10000 W	1	11.4 Ω - 25000 W	1	
LTVF-S40142BAA	55	LTDBU-0550-4	1	11.4 Ω - 10000 W	1	11.4 Ω - 30000 W	1	
LTVF-F40152CAA		LTDBU-0550-4	1	11.4 Ω - 10000 W	1	11.4 Ω - 30000 W	1	
LTVF-S40169BAA	75	LTDBU-0750-4	1	8.4 Ω - 10000 W	1	8.4 Ω - 41000 W	1	
LTVF-F40183CAA		LTDBU-0750-4	1	8.4 Ω - 10000 W	1	8.4 Ω - 41000 W	1	
LTVF-F40223AAA	90	LTDBU-0550-4	2	11.4 Ω - 15000 W	2	11.4 Ω - 25000 W	2	
LTVF-F40264AAA	110	LTDBU-0750-4	2	8.4 Ω - 17000 W	2	8.4 Ω - 30000 W	2	
LTVF-F40325AAA	132	LTDBU-0750-4	2	8.4 Ω - 20000 W	2	8.4 Ω - 36000 W	2	
LTVF-F40370AAA	160	LTDBU-2200-4	1	2 Ω - 25000 W	1	2 Ω - 96000 W	1	
LTVF-F40432AAA	185	LTDBU-2200-4	1	2 Ω - 30000 W	1	2 Ω - 111000 W	1	
LTVF-F40547AAA	220	LTDBU-2200-4	1	2 Ω - 30000 W	1	2 Ω - 132000 W	1	
LTVF-F40613AAA	280	LTDBU-2200-4	2	2 Ω - 40000 W	2	2 Ω - 84000 W	2	
LTVF-F40731AAA	315	LTDBU-2200-4	2	2 Ω - 60000 W	2	2 Ω - 95000 W	2	
LTVF-F40877AAA	375	LTDBU-2200-4	2	2 Ω - 60000 W	2	2 Ω - 113000 W	2	

Note: 1) DBR rating for Single-Phase 230Vac drive & Three-Phase 230V drive, contact nearest branch office.

\*2) Above DBR chart is for Crane/Hoist Applications

3) DBU shall be purchased from LK-EA however DBR of given value must be purchased from local vendors.

4) For Elevator please contact nearest branch office.

## Peripheral Devices

### Input Fuse for Nx2000+

CAT No.	Capacity in kW (ND)	Capacity in kW (HD)	Fuse	Bussmann (Class J / Class L)		Bussmann (Class T)	
			(Rating in Amp)	Model No.	I^2.t (clearing)	Model No.	I^2.t (clearing)
LTVF-N405P1BAA	1.5	0.75	10	JKS-10	3000	JJS-10	1500
LTVF-N406P9BAA	2.2	1.5	10	JKS-10	3000	JJS-10	1500
LTVF-N410P0BAA	3.7	2.2	10	JKS-10	3000	JJS-10	1500
LTVF-N416P0BAA	5.5	3.7	15	JKS-15	4000	JJS-15	2000
LTVF-N423P0BAA	7.5	5.5	20	JKS-20	5000	JJS-20	2500

## Peripheral Devices

### Input Fuse for Sx2000 IP66

CAT No.	Capacity in kW (ND)	Capacity in kW (HD)	Fuse	Bussmann (Class J / Class L)		Bussmann (Class T)	
			(Rating in Amp)	Model No.	I^2.t (clearing)	Model No.	I^2.t (clearing)
LTVF-S40005XAA	1.5	0.75	10	JKS-10	3000	JJS-10	1500
LTVF-S40007XAA	2.2	1.5	10	JKS-10	3000	JJS-10	1500
LTVF-S40010XAA	3.7	2.2	10	JKS-10	3000	JJS-10	1500
LTVF-S40016XAA	5.5	3.7	15	JKS-15	4000	JJS-15	2000
LTVF-S40023XAA	7.5	5.5	20	JKS-20	5000	JJS-20	2500
LTVF-S40030XAA	11	7.5	30	JKS-30	7000	JJS-30	3500
LTVF-S40038XAA	15	11	40	JKS-40	17000	JJS-40	8500
LTVF-S40044XAA	18.5	15	50	JKS-50	22000	JJS-50	9000
LTVF-S40058XAA	22	18.5	70	JKS-70	50000	JJS-70	25000

## Peripheral Devices

### Input Fuse for Sx2000

CAT No.	Capacity in kW (ND)	Capacity in kW (HD)	Fuse	Bussmann (Class J / Class L)		Bussmann (Class T)	
			(Rating in Amp)	Model No.	I^2.t (clearing)	Model No.	I^2.t (clearing)
LTVF-S40005BAA	1.5	0.75	10	JKS-10	3000	JJS-10	1500
LTVF-S40007BAA	2.2	1.5	10	JKS-10	3000	JJS-10	1500
LTVF-S40010BAA	3.7	2.2	10	JKS-10	3000	JJS-10	1500
LTVF-S40016BAA	5.5	3.7	15	JKS-15	4000	JJS-15	2000
LTVF-S40023BAA	7.5	5.5	20	JKS-20	5000	JJS-20	2500
LTVF-S40030BAA	11	7.5	30	JKS-30	7000	JJS-30	3500
LTVF-S40038BAA	15	11	40	JKS-40	17000	JJS-40	8500
LTVF-S40044BAA	18.5	15	50	JKS-50	22000	JJS-50	9000
LTVF-S40058BAA	22	18.5	70	JKS-70	50000	JJS-70	25000
LTVF-S40069BAA	30	22	80	JKS-80	60000	JJS-80	30000
LTVF-S40075BAA	37	30	110	JKS-110	100000	JJS-110	50000
LTVF-S40091BAA	45	37	125	JKS-125	150000	JJS-125	75000
LTVF-S40107BAA	55	45	175	JKS-175	225000	JJS-175	115000
LTVF-S40142BAA	75	55	200	JKS-200	300000	JJS-200	150000
LTVF-S40169BAA	90	75	250	JKS-250	450000	JJS-250	225000

## Peripheral Devices

### Input Fuse for Hx2000

CAT No.	Capacity in kW (ND)	Capacity in kW (HD)	Fuse (Rating in Amp)	Bussmann (Class J / Class L)		Bussmann (Class T)	
				Model No.	I <sup>2</sup> t (clearing)	Model No.	I <sup>2</sup> t (clearing)
LTVF-H40004BAA	1.5	0.75	10	JKS-10	3000	JJS-10	1500
LTVF-H40006BAA	2.2	1.5	10	JKS-10	3000	JJS-10	1500
LTVF-H40008BAA	3.7	2.2	10	JKS-10	3000	JJS-10	1500
LTvh-H40012BAA	5.5	3.7	15	JKS-15	4000	JJS-15	2000
LTvh-H40016BAA	7.5	5.5	20	JKS-20	5000	JJS-20	2500
LTvh-H40024BAA	11	7.5	30	JKS-30	7000	JJS-30	3500
LTvh-H40030BAA	15	11	40	JKS-40	17000	JJS-40	8500
LTvh-H40038BAA	18.5	15	50	JKS-50	22000	JJS-50	9000
LTvh-H40045BAA	22	18.5	70	JKS-70	50000	JJS-70	25000
LTvh-H40061BAA	30	22	80	JKS-80	60000	JJS-80	30000
LTvh-H40075BAA	37	30	110	JKS-110	100000	JJS-110	50000
LTvh-H40091BAA	45	37	125	JKS-125	150000	JJS-125	75000
LTvh-H40107BAA	55	45	175	JKS-175	225000	JJS-175	115000
LTvh-H40142BAA	75	55	200	JKS-200	300000	JJS-200	150000
LTvh-H40169BAA	90	75	250	JKS-250	450000	JJS-250	225000

## Peripheral Devices

### Input Fuse for Fx2000

CAT No.	Capacity in kW (ND)	Capacity in kW (HD)	Fuse (Rating in Amp)	Bussmann (Class J / Class L)		Bussmann (Class T)	
				Model No.	I <sup>2</sup> t (clearing)	Model No.	I <sup>2</sup> t (clearing)
LTVF-F40004CAA	1.5	0.75	10	JKS-10	3000	JJS-10	1500
LTVF-F40006CAA	2.2	1.5	10	JKS-10	3000	JJS-10	1500
LTVF-F40008CAA	3.7	2.2	10	JKS-10	3000	JJS-10	1500
LTVF-F40012CAA	5.5	3.7	15	JKS-15	4000	JJS-15	2000
LTVF-F40016CAA	7.5	5.5	20	JKS-20	5000	JJS-20	2500
LTVF-F40024CAA	11	7.5	30	JKS-30	7000	JJS-30	3500
LTVF-F40030CAA	15	11	40	JKS-40	17000	JJS-40	8500
LTVF-F40039CAA	18.5	15	50	JKS-50	22000	JJS-50	9000
LTVF-F40045CAA	22	18.5	70	JKS-70	50000	JJS-70	25000
LTVF-F40061CAA	30	22	80	JKS-80	60000	JJS-80	30000
LTVF-F40075CAA	37	30	110	JKS-110	100000	JJS-110	50000
LTVF-F40091CAA	45	37	125	JKS-125	150000	JJS-125	75000
LTVF-F40110CAA	55	45	175	JKS-175	225000	JJS-175	115000
LTVF-F40152CAA	75	55	200	JKS-200	300000	JJS-200	150000
LTVF-F40183CAA	90	75	250	JKS-250	450000	JJS-250	225000
LTVF-F40223CAA	110	90	350	JKS-350	800000	JJS-350	400000
LTVF-F40264CAA	132	110	400	JKS-400	1100000	JJS-400	550000
LTVF-F40325CAA	160	132	450	JKS-450	1500000	JJS-450	600000
LTVF-F40370CAA	185	160	600	JKS-600	2500000	JJS-600	1000000
LTVF-F40432CAA	220	185	650	KTU-650	*	KTU-650	*
LTVF-F40547CAA	280	220	800	KTU-800	10000000	KTU-800	10000000
LTVF-F40613CAA	315	280	1000	KTU1000	*	KTU1000	*
LTVF-F40731CAA	375	315	1200	KTU-1100	*	KTU-1100	*
LTVF-F40877CAA	450	375	1200	KTU-1200	*	KTU-1200	*

**Notes:**

1. Clearing I<sup>2</sup>t values are declared as per UL248 standard for 100kA breaking capacity.
2. Maximum breaking capacity is 200kA. For more details please refer Bussmann catalogue.
3. Class T fuses (JJS series) are lower in size compared to Class J (JKS series) fuses.

\*Please contact Cooper Bussmann or their representative.

## Peripheral Devices

### Selection Chart for Input & Output Choke for Fx2000

kW (ND)	CAT NO	Drive Current (A)		Chokes		
		Normal Duty	Heavy Duty	I/P AC Choke	DC Choke	O/P Choke
				mH/A	mH/A	mH/A
1.5	LTVF-F40004CAA	4	2.5	4.81/4.8	16/4.27	6.54/5
2.2	LTVF-F40006CAA	6	4	3.23/7.5	12/6.41	3.71/7
3.7	LTVF-F40008CAA	8	6	2.34/10	8/8.9	2.45/9
5.5	LTVF-F40012CAA	12	8	1.22/15	5.34/14	1.9/12
7.5	LTVF-F40016CAA	16	12	1.22/18	3.2/17	1.1/18
11	LTVF-F40024CAA	24	16	0.78/27	2.5/25	0.81/25
15	LTVF-F40030CAA	30	24	0.59/35	1.9/32	0.54/35
18.5	LTVF-F40039CAA	39	30	0.46/44	1.4/41	0.45/40
22	LTVF-F40045CAA	45	39	0.4/52	1.0/49	0.36/46
30	LTVF-F40061CAA	61	45	0.3/68		0.29/62
37	LTVF-F40075CAA	75	61	0.232/98		0.23/78
45	LTVF-F40091CAA	91	75	0.195/118		0.2/95
55	LTVF-F40110CAA	110	91	0.157/142		0.16/115
75	LTVF-F40152CAA	152	110	0.122/196		0.12/160
90	LTVF-F40183CAA	183	152	0.096/237		0.12/190
110	LTVF-F40223AAA	223	183	0.081/289		0.077/230
132	LTVF-F40264AAA	264	223	0.069/341		0.067/270
160	LTVF-F40325AAA	325	264	0.057/420		0.050/330
185	LTVF-F40370AAA	370	325	0.042/558		0.045/380
220	LTVF-F40432AAA	432	370	0.042/558		0.034/475
280	LTVF-F40547AAA	547	432	0.029/799		0.033/600
315	LTVF-F40613AAA	613	547	0.029/799	0.09/836	0.031/630
375	LTVF-F40731AAA	731	613	0.024/952	0.076/996	0.031/800
450	LTVF-F40877AAA	877	731	0.024/952	0.064/1195	0.028/930

## Selection Chart for Input & Output Choke for Sx2000

kW (ND)	CAT NO	Drive Current (A)		Chokes		
		Normal Duty	Heavy Duty	I/P AC Choke	DC Choke	O/P Choke
				mH/A	mH/A	mH/A
0.75	LTVF-S40002BAA	2	1.3	4.81/4.8	16/4.27	8.1/3
1.5	LTVF-S40003BAA	3.1	2.5	4.81/4.8	16/4.27	6.54/5
2.2	LTVF-S40005BAA	5.1	4	3.23/7.5	12/6.41	3.71/7
3.7	LTVF-S40007BAA	6.9	5.5	2.34/10	8/8.9	2.45/9
5.5	LTVF-S40010BAA	10	9	1.22/15	5.34/14	1.9/12
7.5	LTVF-S40016BAA	16	12	1.22/18	3.2/17	1.1/18
11	LTVF-S40023BAA	23	16	0.78/27	2.5/25	0.81/25
15	LTVF-S40030BAA	30	24	0.59/35	1.9/32	0.54/35
18.5	LTVF-S40038BAA	38	30	0.46/44	1.4/41	0.45/40
22	LTVF-S40044BAA	44	39	0.4/52	1.0/49	0.36/46
30	LTVF-S40058BAA	58	45	0.3/68	0.7/64	0.29/62
37	LTVF-S40075BAA	75	61	0.232/98	Built-in	0.23/78
45	LTVF-S40091BAA	91	75	0.195/118		0.2/95
55	LTVF-S40107BAA	107	91	0.157/142		0.16/115
75	LTVF-S40142BAA	142	110	0.122/196		0.12/160
90	LTVF-S40169BAA	169	152	0.096/237		0.12/190

## Selection Chart for Input & Output Choke for Hx2000

kW (ND)	CAT NO	Drive Current (A)	Chokes		
			I/P AC Choke	DC Choke	O/P Choke
		Normal Duty	mH/A	mH/A	mH/A
0.75	LTVF-H40002BAA	2.5	4.81/4.8	16/4.27	8.1/3
1.5	LTVF-H40004BAA	4	4.81/4.8	16/4.27	6.54/5
2.2	LTVF-H40006BAA	6	3.23/7.5	12/6.41	3.71/7
3.7	LTVF-H40008BAA	8	2.34/10	8/8.9	2.45/9
5.5	LTVF-H40012BAA	12	1.22/15	5.34/14	1.9/12
7.5	LTVF-H40016BAA	16	1.22/18	3.2/17	1.1/18
11	LTVF-H40024BAA	24	0.78/27	2.5/25	0.81/25
15	LTVF-H40030BAA	30	0.59/35	1.9/32	0.54/35
18.5	LTVF-H40038BAA	38	0.46/44	1.4/41	0.45/40
22	LTVF-H40045BAA	45	0.4/52	1.0/49	0.36/46
30	LTVF-H40061BAA	61	0.3/68	0.7/64	0.29/62
37	LTVF-H40075BAA	75	0.232/98	Built-in	0.23/78
45	LTVF-H40091BAA	91	0.195/118		0.2/95
55	LTVF-H40107BAA	107	0.157/142		0.16/115
75	LTVF-H40142BAA	142	0.122/196		0.12/160
90	LTVF-H40169BAA	169	0.096/237		0.12/190

## Selection Chart for Input & Output Choke for Nx2000+

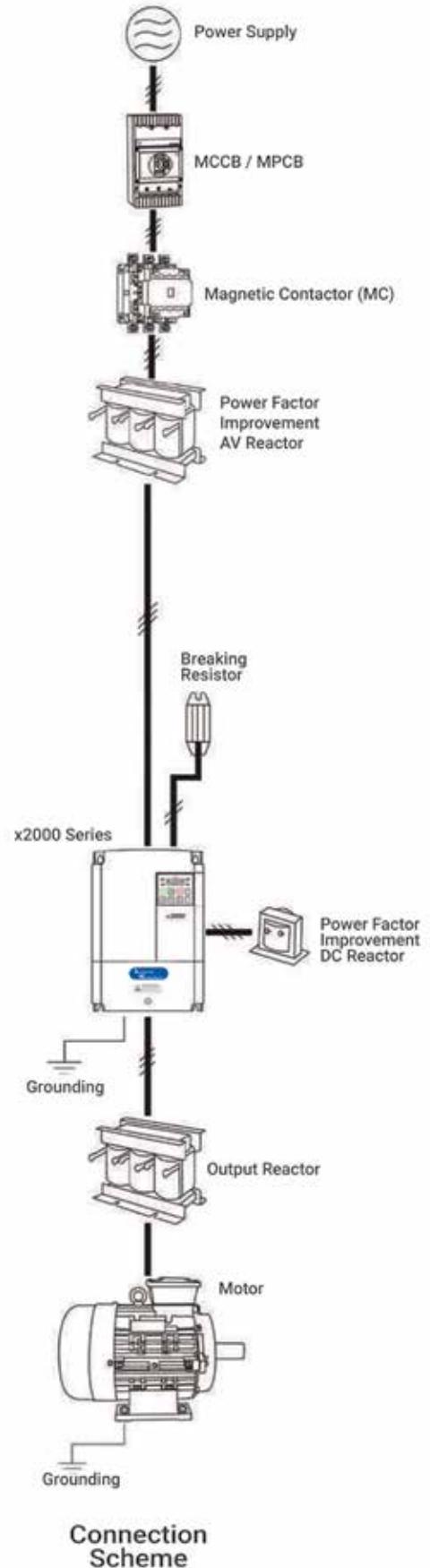
kW (ND)	CAT NO	Drive Current (A)		Chokes		
		Normal Duty	Heavy Duty	I/P AC Choke	DC Choke	O/P Choke
				mH/A	mH/A	mH/A
0.75	LTVF-N402P0BAA	2	1.3	4.81/4.8	16/4.27	8.1/3
1.5	LTVF-N403P1BAA	3.1	2.5	4.81/4.8	16/4.27	6.54/5
2.2	LTVF-N405P1BAA	5.1	4	3.23/7.5	12/6.41	3.71/7
4	LTVF-N406P9BAA	6.9	5.5	1.22/15	5.4/13.2	1.9/12
5.5	LTVF-N410P0BAA	10	9	1.22/15	5.34/14	1.9/12
7.5	LTVF-N416P0BAA	16	12	1.22/18	3.2/17	1.1/18
11	LTVF-N423P0BAA	23	16	0.78/27	2.5/25	0.81/25

## Selection Chart for Input & Output Choke for Sx2000 IP66

kW (ND)	CAT NO	Drive Current (A)	Chokes		
			I/P AC Choke	DC Choke	O/P Choke
		Heavy Duty	mH/A	mH/A	mH/A
0.4	LTVF-S40001XAA	1.3	4.81/4.8	16/4.27	8.1/3
0.75	LTVF-S40003XAA	2.5	4.81/4.8	16/4.27	8.1/3
1.5	LTVF-S40004XAA	4	4.81/4.8	16/4.27	6.54/5
2.2	LTVF-S40006XAA	5.5	3.23/7.5	12/6.41	3.71/7
4	LTVF-S40009XAA	9	1.22/15	5.4/13.2	1.9/12
5.5	LTVF-S40012XAA	12	1.22/15	5.34/14	1.9/12
7.5	LTVF-S40016XAA	16	1.22/18	3.2/17	1.1/18
11	LTVF-S40024XAA	24	0.78/27	2.5/25	0.81/25
15	LTVF-S40030XAA	30	0.59/35	1.9/32	0.54/35
18.5	LTVF-S40039XAA	39	0.46/44	1.4/41	0.45/40
22	LTVF-S40045XAA	45	0.4/52	1.0/49	0.36/46

# Peripheral Device Selection Chart for Input and Output Choke

Device	Purpose	Details
MCCB or MPCB	To protect inverter wiring	Always install the MCCB or MPCB on the power supply side to protect the inverter from Short Circuit & Overload protection
Magnetic Contactor	For Isolation	Used at Input side to provide complete isolation when drive is switched off thus protecting the internal components. Also used for preventing burning of braking resistor with thermal feedback
Input AC or DC Reactor	To improve Inverter Power Factor	Use for further improving the power factor of the inverter by suppressing the harmonics from the power supply
Output Reactor	To avoid nuisance tripping of inverter	To avoid nuisance tripping of inverter due to leakage current caused because of the capacitive effect in longer cables between inverter & motor
Braking Resistor	To stop the machine within the preset time	Shortens the deceleration time by consuming the regenerative energy of the motor by the resistor
Braking Unit	To stop the machine within the preset time	Used in combination with the braking resistor to reduce the deceleration time of the motor



Connection Scheme

# Other Automation Products

## Soft Starter: Standard Applications



Range: 7.5 to 110kW

### xS1000 & xS2000

#### Feature:

- › Built-in bypass contactor
- › Soft start/soft stop/adjustable current limit
- › Essential motor protections against:
  - » Overload & single phasing
  - » Instantaneous overcurrent
  - » Phase sequence reversal
  - » Abnormality in supply
  - » Unbalanced current
- › Thermistor protection through PTC
- › Excess start time setting
- › Communication and PC Interface options available

## Soft Starter xS3000



#### Feature:

- › Built in bypass contactor
- › Compact & Flexible Design
- › Screw-less design for easy and fast servicing
- › USB port for easy and fast commissioning and data extraction
- › Full graphical display with multi-languages support
- › Built-in Simulation Mode
- › 384 event logs
- › Communication options available
- › Fire Mode function available
- › Starts per hour counter

#### Applications:

Centrifugal pumps, fans, conveyors, crusher, etc.

Range: 24A to 580A

## Soft Starter xS4000



### Feature:

- › Built in bypass contactor
- › Compact & Flexible Design
- › Screw-less design for easy and fast servicing
- › USB port for easy and fast commissioning and data extraction
- › Full graphical display with multi-languages support
- › Real time graphs of motor operating performance
- › 384 event logs
- › Advanced protection system
- › Communication options available
- › Smart card for level controlled pump activation and pump protection
- › Under voltage Over voltage protection
- › Starts per hour counter
- › Fire Mode function available
- › Power through function available

### Applications:

Centrifugal pumps, fans, conveyors, crusher, etc.

Range: 24A to 1250A

## HMI



### Feature:

- › Large Memory: Upto 128MB display and 1MB back-up
- › Various Communication Interface: Ethernet/RS-232C/485
- › USB host and device, SD memory card interface
- › Web server/Data Monitoring, Remote controlling and monitoring
- › Presence sensor (within 1m), Sound Output

Range: Text Display & 4" to 15" TFT color LCD

## PLC



### Feature:

- › Processing speed: 0.06 µs/st
- › Built-in Function: RTC, HSC, MO, PID, Interrupt, Analog VO
- › Various communication Intece: Built-in USB/RS-232C/485/Ethernet, optional other communication modules
- › Built-in Web-server, Email
- › EtherCAT based motion control modules with Virtual Axis
- › Built-in SD Card interface & Smart Remote VO

**Range: Upto 352 local I/O, Upto 5728 remote I/O points**

## Detuned Reactors



### Feature:

- › Copperand Aluminumwo und reactors
- › Lower operating lossas - 3 to 5 W/KVAR
- › High linearity -1.8 times the ated curent 200% linearity also available on request.
- › With in-built the real cut off

**Range: 5 kVAr to 100 kVAr**

## High V-THD Reactors



### Feature:

- › Operates at safer temperature. It will not overheat due to high V-THD%.
- › Lower Power loss and doesn't make humming noise.
- › Mitigates significant current harmonic amplification & resonance.
- › Avoids capacitor over-loading
- › AHF rating can be optimized

**Range: 5 kVAr to 100 kVAr**

## Power Factor Correction Capacitors



### Feature:

- › Available in Standard Duty, Heavy Duty, Super Heavy Duty and Ultra Heavy Duty Capacitors
- › Safety Features – Over pressure disconnector, self-healing, finger-proof terminals
- › Operating losses – less than 0.45 W/kVAr
- › Ultra-Heavy Duty Capacitors with Max ambient temperature up to 70C
- › Ultra-Heavy Duty Capacitors with operating life up to 3 lakh hours

Range: up to 50kVAr, 440V, 480V and 525V

## etaSYS Standard APFC Panels



### Feature:

- › Covers the typical requirement of APFC panel ratings
- › Offers optimal step resolution which would be suitable to all types of industries/buildings
- › Pre-selected switchgear with accurate ratings offers reliable operation, protection and isolation
- › Accurate combination of capacitor and reactor offers better protection against harmonics
- › IP42 panels

Range: 20 to 500 kVAr

## Active Harmonic Filters



### Feature:

- › Mitigates 2<sup>nd</sup> to 50<sup>th</sup> order Harmonics
- › Reduces THD within IEEE limits
- › Improves power factor
- › Load balancing and neutral current reduction
- › Any number of units can be connected in parallel
- › 7 inch TFT touch screen for monitoring and diagnostics
- › Modular design for easy maintenance and upgradation
- › Various alarms for easy diagnostics

Range: 30A to 800A in 3-Ph 3-W and up to 300A in 3-Ph 4-W versions

## Hybrid Power Factor Correction Panel



### Feature:

- › Fully Automatic in Operation
- › Can be used to achieve consistently high Power Factor under fluctuating load
- › Help in achieving True Power factor close to unity
- › Mitigates harmonics in any Industry
- › Minimises the total kVar consumption of the industry
- › Reduces kVA demand charges
- › Lower energy consumption in the installation by reducing losses
- › Prevents leading power factor in an installation
- › Elimination of low power factor penalty levied by electrical supply authorities

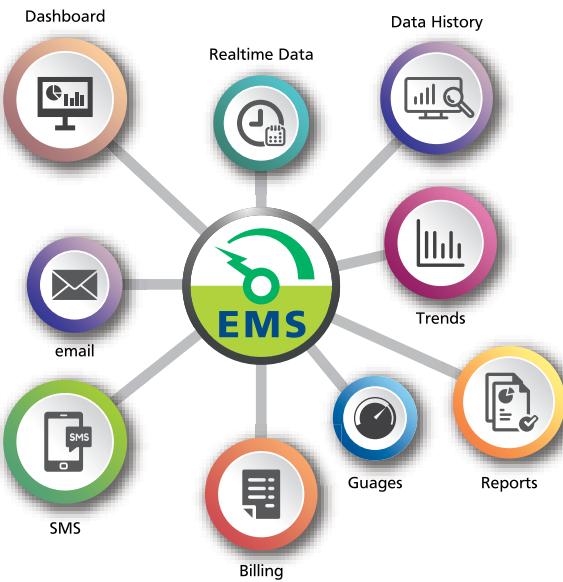
## Multifunction Meters



### Feature:

- › Available with multiple parameters including Basic, Power, Energy, THD, Max Demand, Import-Export
- › Four row LED and LCD versions
- › Accuracy Class 1, 0.5, 0.5S, 0.2, 0.2S
- › Site selectable for 3-Ph 4-W, 3-Ph 3-W, 1-Ph
- › Data logging provision
- › Individual harmonics for voltage and current available up to 31st harmonics
- › Analog and digital inputs and outputs available
- › Time-of-day provision
- › RS-485, Ethernet option
- › MD controller with 4 relay outputs for proper load control

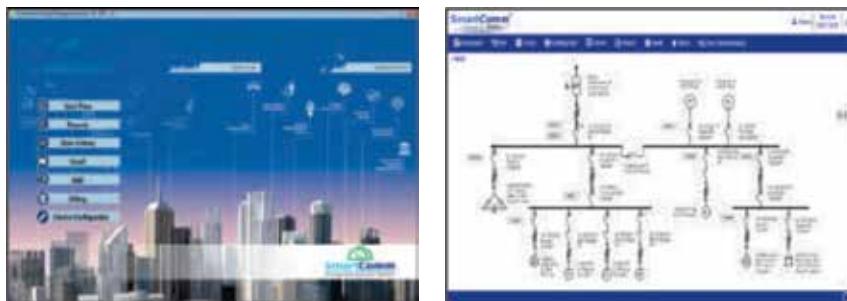
## SmartComm Energy Management Solution



### Feature:

- › Glimpse of entire energy consumption in the plant on a dashboard
- › Quick understanding of energy consumption of today compared to yesterday, this month consumption compared to last month as well as Y-o-Y energy comparison
- › Easy navigation through the modules
- › All parameters in the device can be monitored from the software
- › Multiple combination of devices and parameters for analysis
- › Various spreadsheet reports with charts
- › Specific energy consumption report
- › Access to features defined by user levels
- › LK-EA meters preconfigured in the software
- › Provision for auto emails and SMS
- › Provision for Breaker status monitoring of ON, OFF, TRIP and RTC status along with control through UNCO module.
- › Web view
- › On Premise and cloud based solution

## SmartComm Integrated Solution



### Feature:

- › Real-time communication for Monitoring, Control & Diagnostics.
- › Single platform integrating entire range of LK-EA communicable products with option of integrating third party products
- › Supports multiple protocols and drivers like Modbus TCP/IP, Modbus RTU, BACnet, IEC 61850, DeviceNet, Profibus & Profinet
- › Customised SLD Creation by user based on IEC 617-2-8 symbol library Graphical or mimic view for enabling operator level users to understand reports easily
- › Real-time & historical trends for user-selectable parameters
- › Fully customized reports with user-created templates
- › System provides various alarms & events – alerts & acknowledgement
- › Email/SMS facility for predetermined events/schedules/alarms user management.
- › Energy analytics dashboard, alerts and report.