Lauritz Knudsen
Electrical & Automation


# 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.






# Index

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.

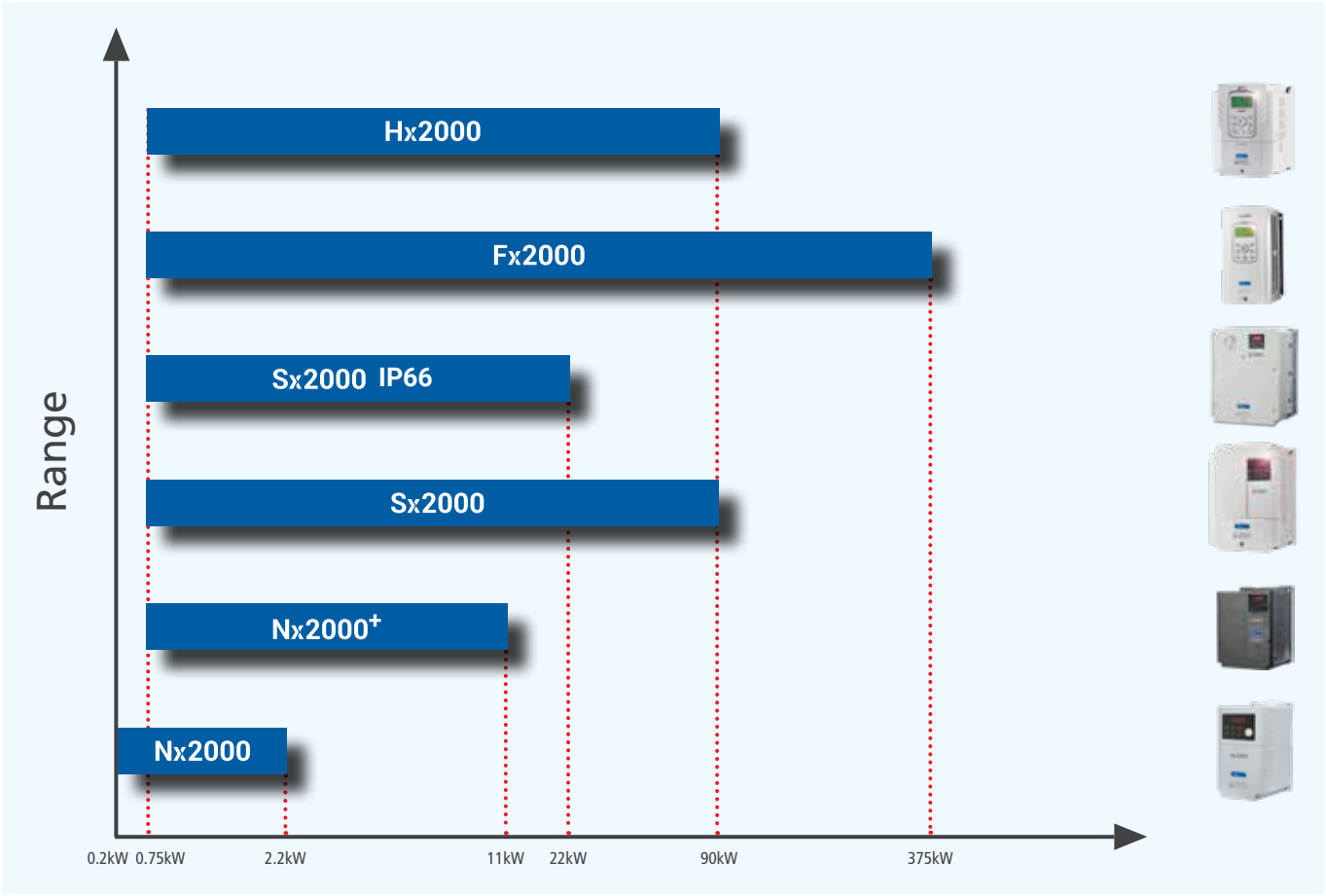
## Training your people to enhance your operations

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 / deaccl 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)<br>3-Phase 230V 0.75 to 18.5kW (ND)<br>3-Phase 415V 0.75 to 90kW (ND), 0.4 to 22kW (HD) - IP66 |
| Nx2000+: 3-Phase 230V 0.75 to 11kW (ND)<br>3-Phase 415V 0.75 to 11kW (ND) | |
| Fx2000: 3-Phase 415V 0.75 to 375kW (HD) | Hx2000: 3-Phase 415V 0.75 to 90kW (ND) |

## Model type & Selection

| LTVF | — | x | x | xxxx | x | x | A |
|---|---|---|---|---|---|---|---|
| Lauritz Knudsen Electrical & Automation's Variable Frequency Drive | | Series | Input Voltage | Drive Current Rating (ND)* | Enclosure | Keypad | Reserved |

| Series | |
|---|---|
| N | Nx2000 |
| S | Sx2000 |
| F | Fx2000 |
| H | Hx2000 |

| Input Voltage | |
|---|---|
| 1 | Single-Phase 200~240[V] |
| 2 | Three-Phase 200~240[V] |
| 4 | Three-Phase 380~480[V] |

| Enclosure | |
|---|---|
| A | IP00 |
| B | IP20 |
| C | IP21 |
| X | IP66 |

| Keypad | |
|---|---|
| A | With Keypad |

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

## Applications

| x2000 Series Applications | Nx2000 & Nx2000+ | 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 suaitable 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.

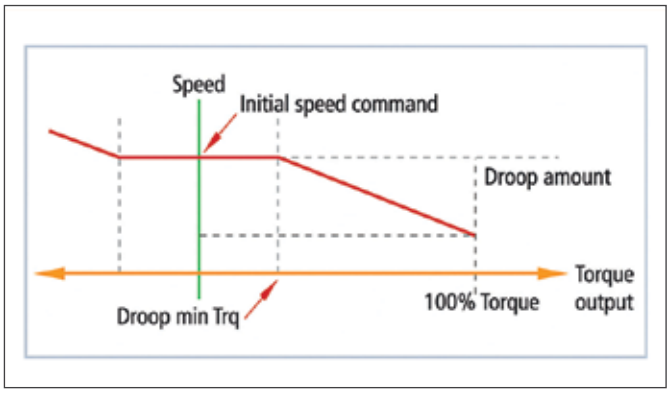

## Main Features

- 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

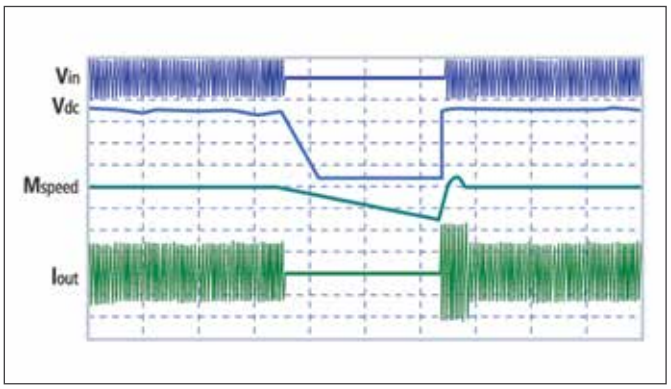
- Crane Hoist
- Crane Control LT / CT
- Winders
- Wire Drawing
- Plastic & Textile Machines
- Conveyors
- Compressors
- Extruders
- Fan
- Pump

## Automatic Torque Balance droop control

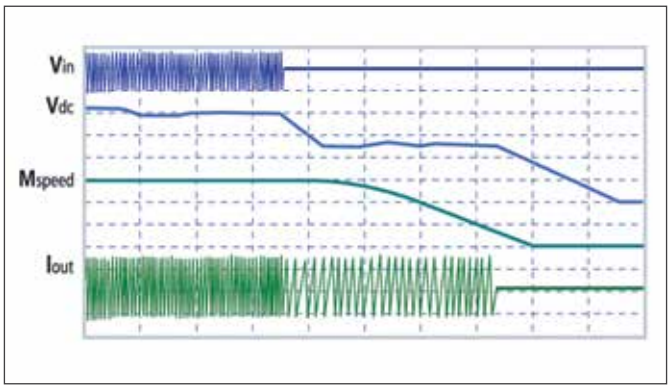



Droop control algorithm adjusts changeable torque driven by speed. This algorithm is easily applicable to open-loop linking driving and load sharing driving.

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




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

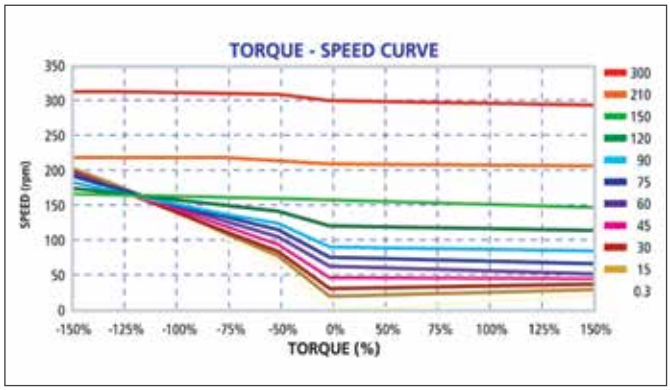



## Closed Loop Vector realizing precise speed/torque control


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

## Powerful current sensorless vector control



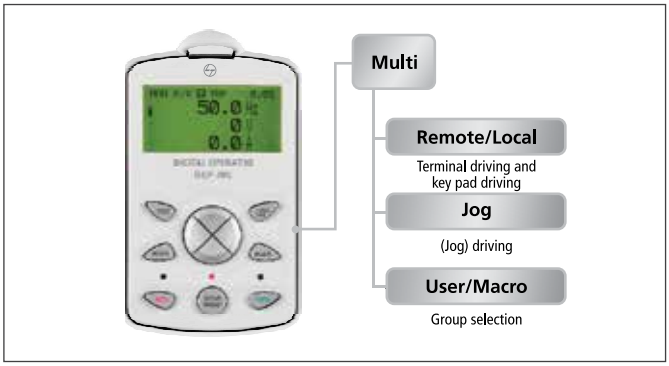

Our Fx2000 technology includes a competitive and strong low-speed torque control and a speed-precision-driven vector algorithm.

- Speed control range 100:1
- 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

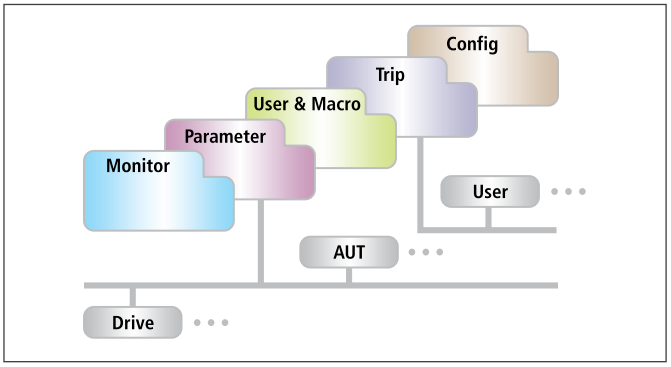
* From 22kW to 280kW (ND)

## Multi-function key




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

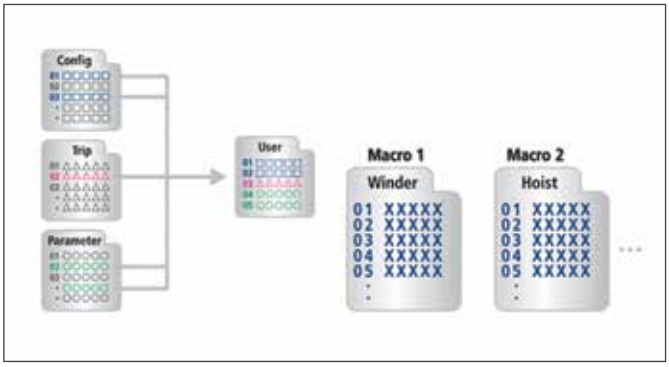
## Efficient architecture of 5-mode 15-parameter groups




Each mode has its own function items suitable for desired properties

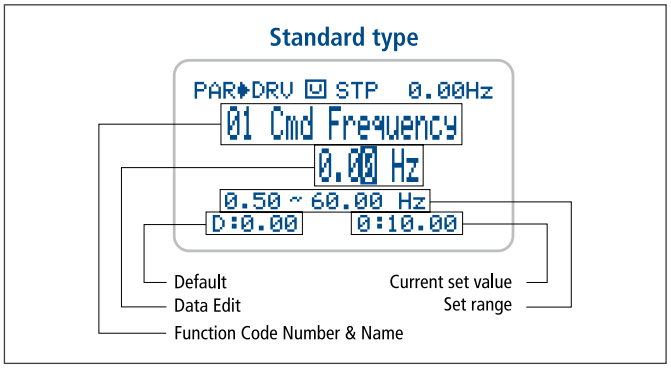
eg. Monitor: Displays information on the operating status of the inverter

## 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

## Synchronisation Control

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

## 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

## 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 | | |
| | $P_{ND}$ | 1) $I_{ND}$ | $P_{HD}$ | 1) $I_{HD}$ | Rated Capacity | | | | |
| | (kW) | (A) | (kW) | (A) | (kVA) | (A) | (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 | Built-in | |
| LTVF-F40075CAA | 37 | 75 | 30 | 61 | 46 | 67.5 | 55.5 | | 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 | | |
| LTVF-F40613AAA | 315 | 613 | 285 | 547 | 416 | 673 | 605 | External (Option) | |
| LTVF-F40731AAA | 375 | 731 | 315 | 613 | 467 | 796 | 674 | | |
| LTVF-F40877AAA | 450 | 877 | 375 | 731 | 557 | 948 | 798 | | |

**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 stadard 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 stadard 4 pole motor

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

# Technical Specifications

| | | |
|---|---|---|
| Standard Specifications | **Range** | **Three-Phase 415V, 0.75 to 375kW (HD)** |
| | 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)<br>(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<br>Analog command operation : 0.1% of the maximum frequency |
| | Frequency Setting | Analog: 0 to 10V, -10 to 10V, 0 to 20mA<br>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<br>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$^2$ (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<br>Fan-2 = 60 | Fan-1 = 4<br>Fan-2 = 2 | 27.18 | 27.87 |
| LTVF-F40547AAA | 98.4 | 98.5 | 0.94 | 0.94 | 4151 | 2904 | 268 | Fan-1 = 258<br>Fan-2 = 60 | Fan-1 = 4<br>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+ 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)

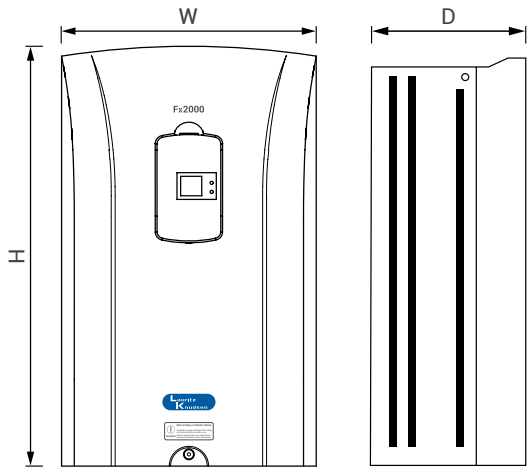
## Synchronization Option Card (LTCN-SYN-F)

- 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 | | 200 | 355 | 225 | 8 |
| LTVF-F40024CAA | | | 200 | 355 | 225 | 8 |
| LTVF-F40030CAA | F3 | | 250 | 385 | 284 | 14.3 |
| LTVF-F40039CAA | | | 250 | 385 | 284 | 14.3 |
| LTVF-F40045CAA | F4 | | 280 | 461 | 298 | 20 |
| LTVF-F40061CAA | | | 280 | 461 | 298 | 30.3 |
| LTVF-F40075CAA | F5 | | 300.1 | 594.1 | 303.2 | 41.3 |
| LTVF-F40091CAA | | | 300.1 | 594.1 | 303.2 | 41.3 |
| LTVF-F40110CAA | | | 300.1 | 594.1 | 303.2 | 41.3 |
| LTVF-F40152CAA | F6 | | 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 | | 510 | 861 | 422.6 | 114 |
| LTVF-F40370AAA | | | 510 | 861 | 422.6 | 114 |
| LTVF-F40432AAA | F8 | | 690 | 1078 | 450 | 200 |
| LTVF-F40547AAA | | | 690 | 1078 | 450 | 200 |
| LTVF-F40613AAA | F9 | | 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.

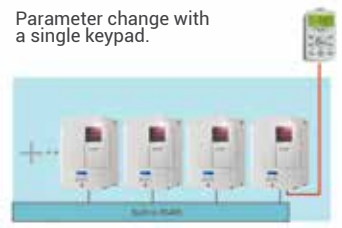

## Main Features

- 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

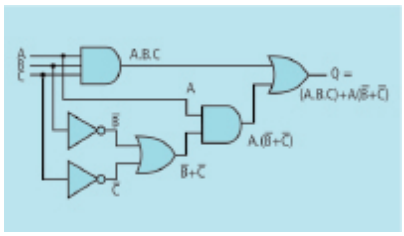
## Multi-keypad function




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

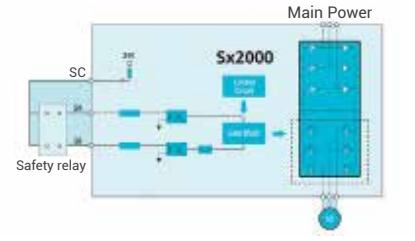
## Peer-to-Peer function embedded


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

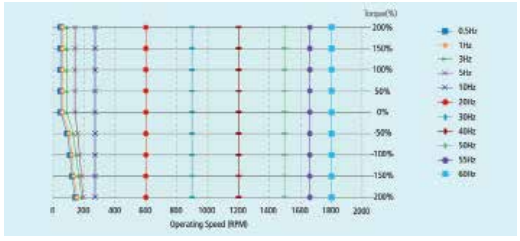
## Safety Function




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

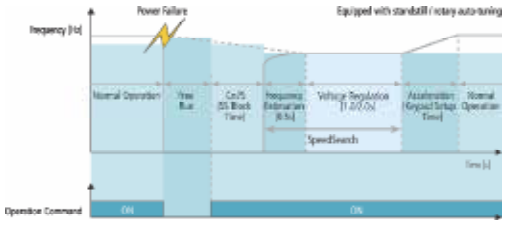
The safety input function meets EN ISO 13849-1 PLd and EN 61508 SIL2 (EN60204-1, stop category 0). This feature is standard and enables compliance with current safety standards.

## Powerful sensorless control



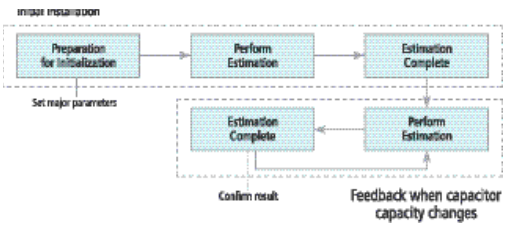
Starting torque of 200%/0.5Hz is produced and provides robust power in the low speed region. The motor auto-tuning function is optimised to maximise motor performance.

## Flying-start function



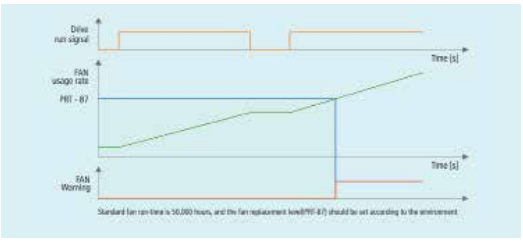

Drive capable of reliable and smooth re-starts even for bi-directional rotating loads.

## Main capacitor lifecycle estimation




Estimated through monitoring the change in the capacitance value.

## Fan lifecycle estimation




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

## Optional Accessories - easy to install & use

*Optional fieldbus networks:

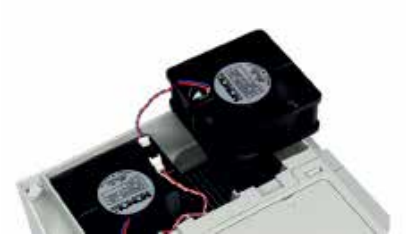
❶ Profibus-DP (LTCI-PDP-S.)
❷ Modbus TCP / Ethernet IP (LTCI-ETH2-S.)
❸ CANopen (LTCI-CAN-S)

*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

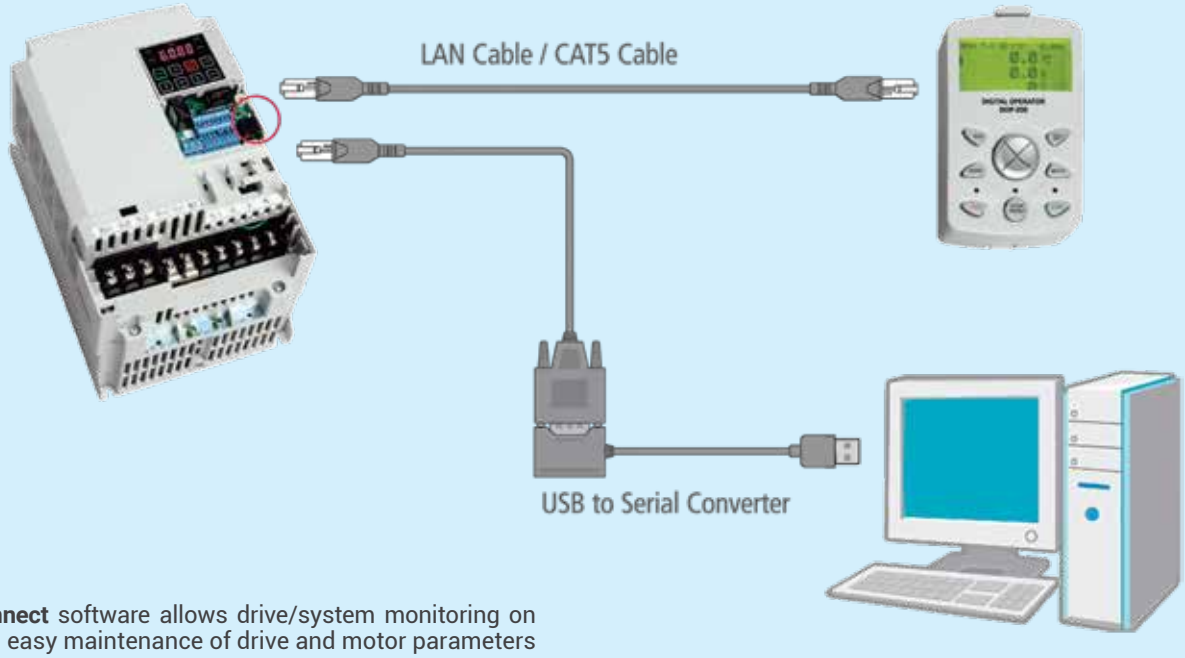
Designed to be used for heavy and normal duty applications.

Overload capacity:

› Heavy duty operation **150%** of ratedcurrent, 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 | | |
| | $P_{ND}$ | 1) $I_{ND}$ | $P_{HD}$ | 1) $I_{HD}$ | 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 | | |
| LTVF-S40075BAA | 37 | 75 | 30 | 61 | 46 | 69 | 56 | Built-in | External (Option) |
| 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**

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

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

1) The output of rated current is limitted 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%) | 380 to 480V 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) | | |
| | DC Reactor | Built-in from 37kW to 90kW | | |
| Control Details | 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<br>Analog command: 0.03Hz (Max. frequency: 60Hz) | | |
| | Frequency Setting | Analog type: - 10 to 10V, +0 to 10V, 4 to 20mA,<br>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) | | |
| | 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 | | |
| Protection | 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 | | |
| | Momentary Power Loss Ride Through | Continuous Operation: Heavy Loads less then 15 msec, normal load less then 8 msec,<br>Auto Restart Operation: Heavy Loads more then 15 msec, normal load more then 8 msec | | |
| Interface | DI | 7 (Programmable NPN/PNP) | | |
| | DO | 1 (Programmable NO/NC) + 1 TR till 30kW,<br>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,<br>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 | 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$^2$(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.

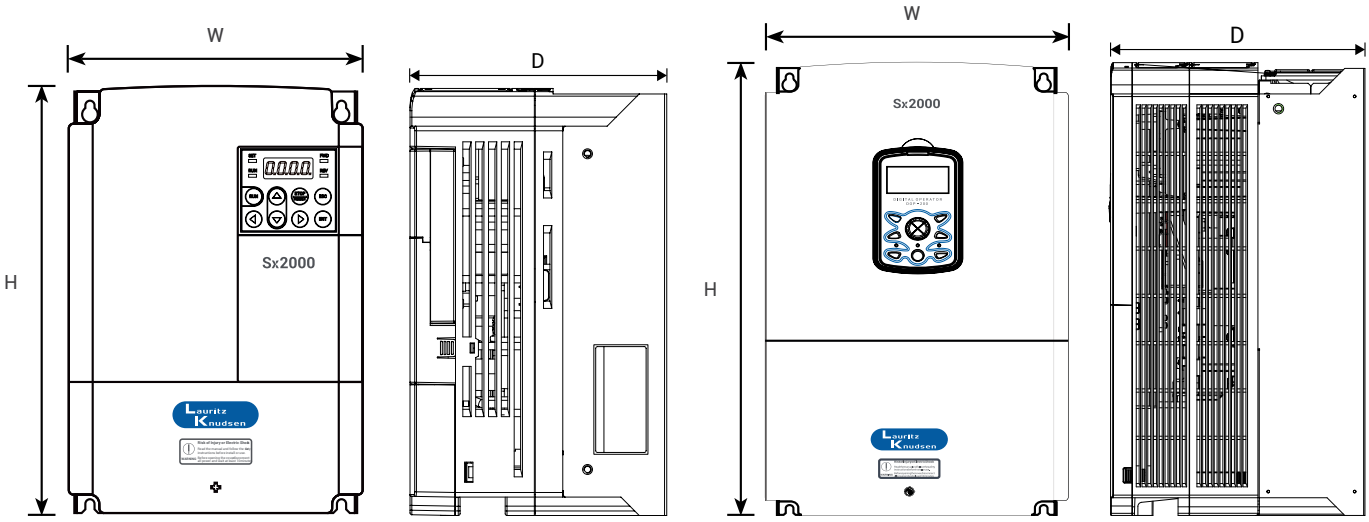
## Technical Specifications

| VFD CAT No. | Efficiency (at 100% load) | | True Power Factor | | Heat Losses | | | Fan Data | | $I_{thd}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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-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.

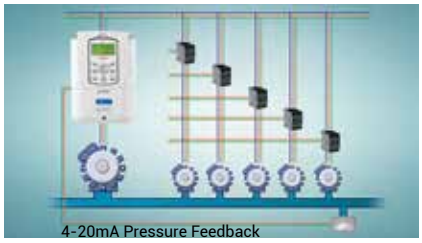

## Main Features

- 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
- Vaccume 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)

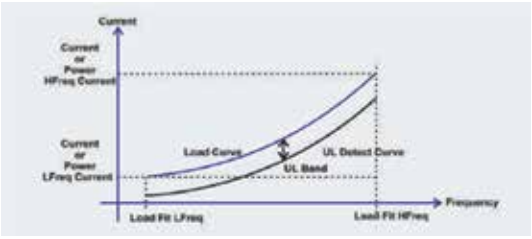
(Possible to set 29 functions including FWD (Fx), REV (Rx), multiple acceleration/deceleration times, multiple frequencies, PID related functions and pre-heat) Summer time available (Start/End date setting)

## 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 CO2, 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 $CO^2$ 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

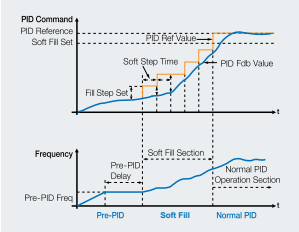
- Built-in as standard for 400V 37~90kW

## Global Specifications Compliant

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

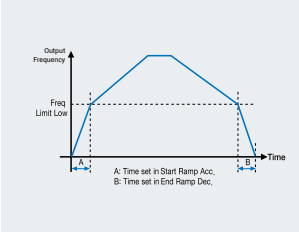
- Suitable for installation in a compartment handling conditioned air

## Soft Fill Operation



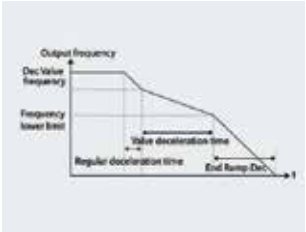

Prevents pump damage caused by excessive pressure building-up in the pipe system at the time of initial operation of pumps or inside the pumps.

## Start Ramp & End Ramp




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

## 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.

## Easy-to-Change Cooling Fan

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

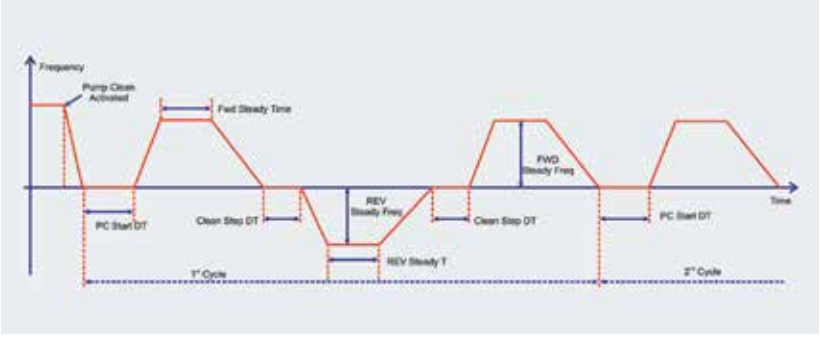
## Flange-Type Mounting

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

## 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 $CO^2$ emission level.

## 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.

## 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.

## 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).

## 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.

## 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.

## 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.

## 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.

## 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.

## 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.

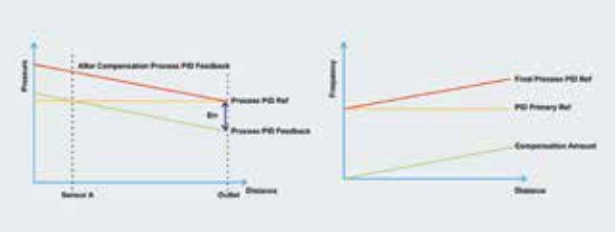
## Pre-Heat Function

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.

## PID Sleep and Wake-up function

It is used to put the drive on standby and restart it using PID as per the load requirments 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.

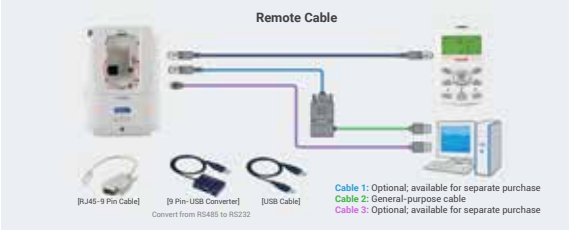
## Communication Module

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

*V = 0-10 V, I = 0-20mA

**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 | | | | |
| | $P_{ND}$ | 1) $I_{ND}$ | Rated Capacity | | |
| | (KW) | (A) | (kVA) | (A) | |
| LTVF-H40002BAA | 0.75 | 2.5 | 1.9 | 2.4 | External (Option) |
| 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 | Built-in |
| 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**

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

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

1) The output of rated current is limitted 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<br>Analog command: 0.06 Hz (60 Hz standard) | | |
| | Frequency Settings | | Analog type:-10–10 V, 0–10 V, 0–20 mA<br>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) | | |
| | | Analog input | 1 (-10 to +10Vdc) & 1 (0 to 20 mA / -10 to +10Vdc) | | |
| | | Pulse Train input | 0 to 32 kHz | | |
| | Output | Multi-function open collector terminal | Fault output and drive operation status output | 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 |
| | | | | | N.C.: Less than AC 250 V/1A, DC 30 V/1A |
| | | Multi-function relay | | 4 No., Less than AC 250 V, 5 A, Less than DC 30 V, 5 A | |
| | | Analog output | 1 (0 to 10Vdc / 0 to 20mA) & 1 (-10 to +10Vdc) | | |
| | | PulseTrain output | 0 to 32 kHz | | |
| | RS-485 Communication | | Built-in BACnet, Modbus-RTU, Metasys N2 as standard | | |
| Protective Functions | 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 | | |

| | | |
|---|---|---|
| Structure & Environment | 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$^2$(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.

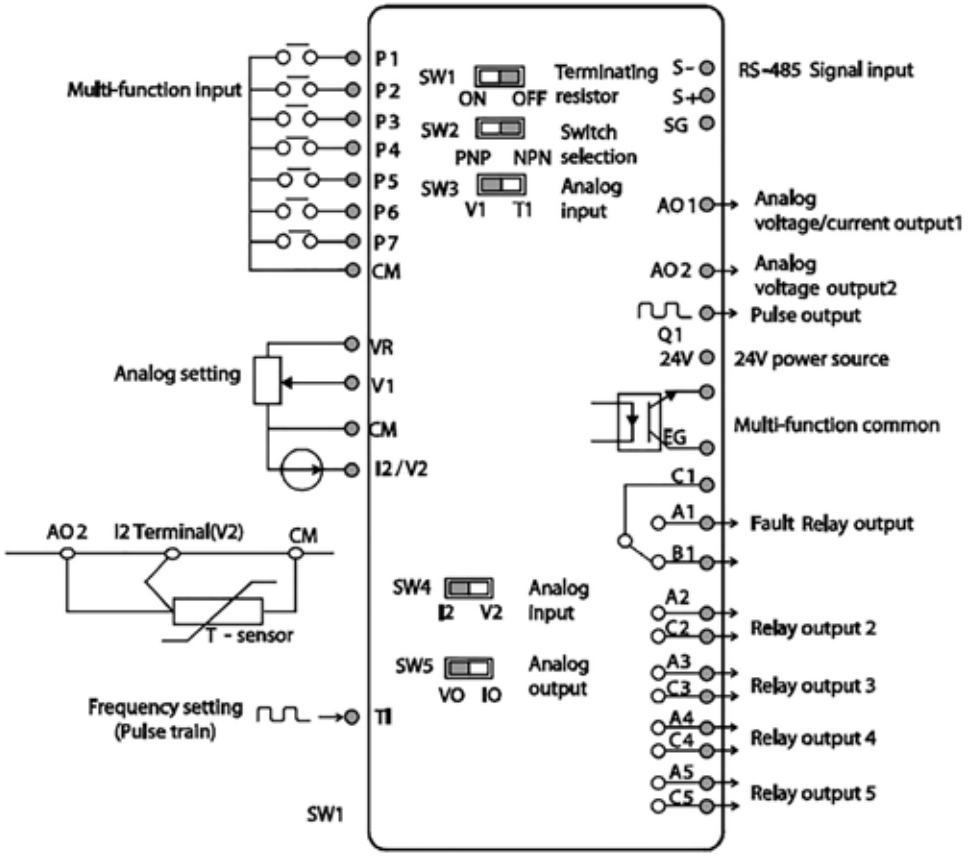
| VFD CAT No. | Efficiency (at 100% load) | True Power Factor | Heat Losses | | Fan Data | | $I_{THD}$ |
|---|---|---|---|---|---|---|---|
| | Normal Duty | Normal Duty | Normal Duty | Internal Losses | Flow Rate/Fan | Quantity | Normal Duty |
| | (%) | | (W) | (W) | (CFM) | (Nos) | (%) |
| LTVF-H40002BAA | 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

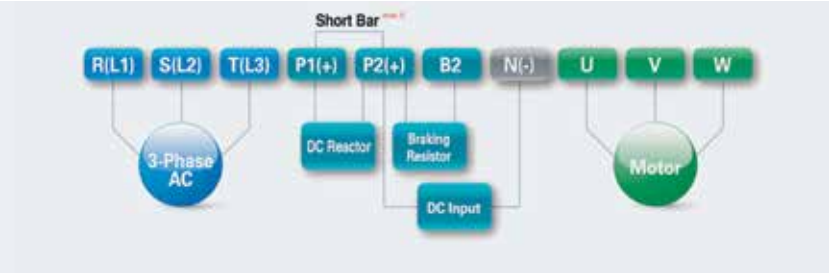



| Classification | | Symbol | Name | Description |
|---|---|---|---|---|
| Input Terminal Details | Selection of contact points | P1~P7 | Multifunctional Input1~7 Terminal | It can be used by setting multifunctional input. Default values from the factory are as follows:<br>› P1: Fx<br>› P2: Rx<br>› P3: BX<br>› P4: RST<br>› P5: Speed-L<br>› P6: Speed-M<br>› P7: Speed-H |
| | | 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:<br>› Max. output voltage: 12V<br>› Max. output current: 12mA<br>› Volume resistivity: 1~10kΩ |
| | | V1 | Frequency Setting (Voltage) Terminal | Frequency is set depending on the voltage supplied to V1 terminal.<br>› Unipolar: 0~10V(Max. 12V)<br>› Bipolar:- 10~10V(Max. ±12V) |
| | | 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).<br>› Input current: 0~20mA<br>› Max. input current: 24mA<br>› Input resistance: 249Ω<br>› Input voltage: 0~10V |
| | Pulse Train | TI | Frequency Setting Terminal | Frequency is set as 0~32kHz.<br>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.<br>DC 26V, 50mA or below<br>Pulse output terminal<br>› Output frequency: 0~32kHz<br>› Output voltage: 0~12V |
| | | EG | CommonTerminal | › Common ground terminal for external power of open collector |
| | | 24 | 24V PowerTerminal | › Max. output current: 100mA<br>› 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.<br>(N.O.:AC250V 2A or below, DC 30V 3A or below<br>N.C.:AC250V 1A or below and DC 30V 1A or below)<br>› At abnormal state: A1-C1 connected (B1-C1 disconnected)<br>› At normal state: B1-C1 connected (A1-C1disconnected)<br>› 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 | AO1 | 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<br>output terminal setting switch (SW5).<br>› Output voltage: 0~10V<br>› Max. output voltage/current: 12V,10mA<br>› Output current: 0~20mA<br>› Max. output current: 20mA<br>› Factory default value: Frequency |
| | | AO2 | Voltage Output Terminal | -10 ~ 10 Vdc |
| | Pulse Train | TO | Frequency Setting Terminal | Frequency is set as 0~32kHz.<br>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[Note 2] |
| 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<br>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

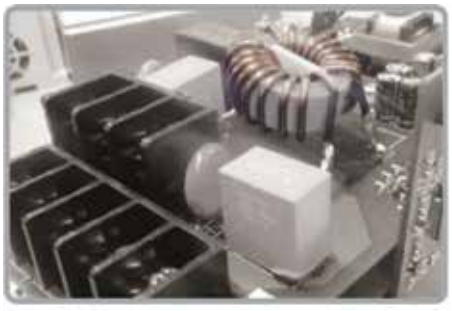
The Nx2000 series adds a new dimension to Lauritz Knudsen Electrical & Automation AC drive solutions. Built to LK-EA's stringent quality standards, the Nx2000 Series AC drive is tested and certified to meet global benchmarks, thus giving you the assurance of total reliability.


## 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 | | |
| | $P_{HD}$ | $^{1)}I_{HD}$ | 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 | | Built-in |
| LTVF-N110P0BAA | 2.2 | 10 | 4.5 | 18.7 | | |

**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 stadard 4 pole motor

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

## Control

| | |
|---|---|
| Control Method | V/F, Slip Compensation |
| Frequency Setting Resolution | Digital command : 0.01Hz<br>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<br>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$^2$ (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 | | Total Losses | Internal Losses | Heavy Duty |
| | (%) | | (W) | (W) | (%) |
| 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

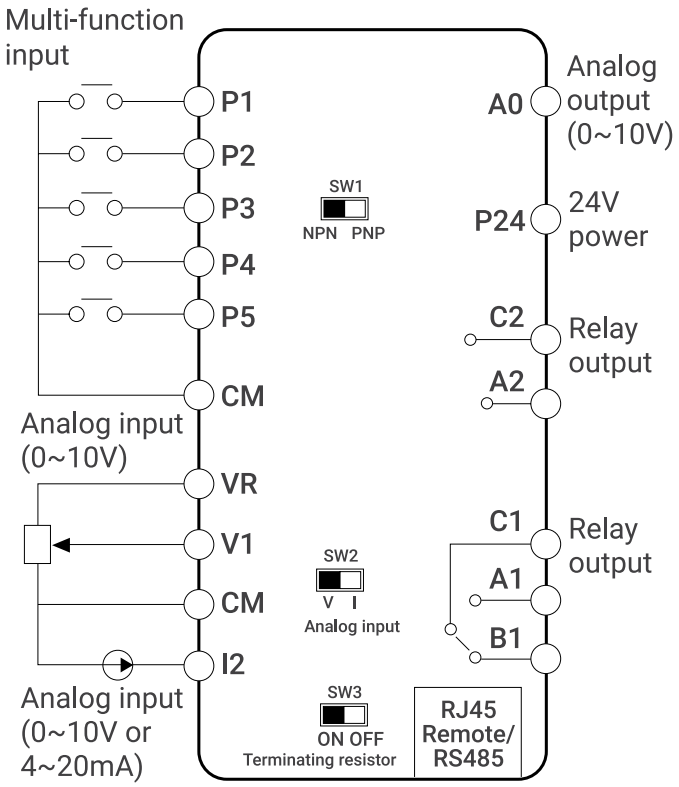
HD, ND Load 100% (M-G Set load, Corresponding motor to drive)

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

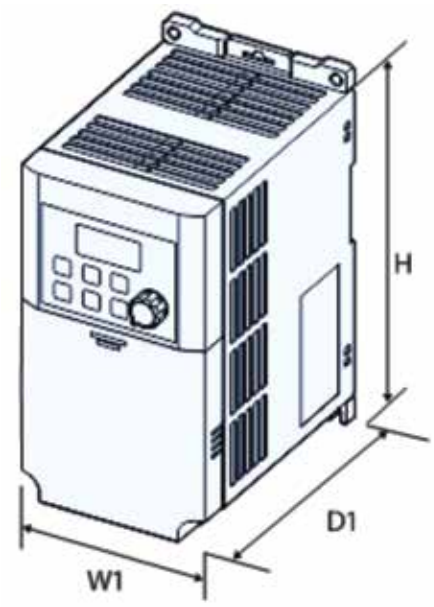



## Braking Resistor Specification

| 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 | F2 | | 85 | 153 | 123 | 1.0 |
| LTVF-N104P2BAA | | | 85 | 153 | 123 | 1.0 |
| LTVF-N107P5BAA | F3 | | 100 | 180 | 140 | 1.45 |
| LTVF-N110P0BAA | | | 100 | 180 | 140 | 1.45 |

# Nx2000+

Compact, lightweight, easy to install, operate and service - the Nx2000+ 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

LTOP-DOP-52

- 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. Gainat 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

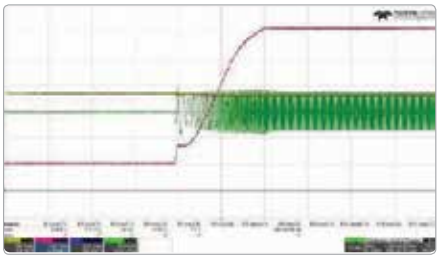
- Dual Port Ethernet/IP, Modbus TCP, RAPIEnet
- Profibus-DP
- CANopen

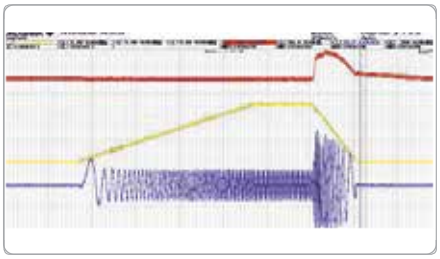
## PC Tool (Drive Connect)

New version PC tool

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

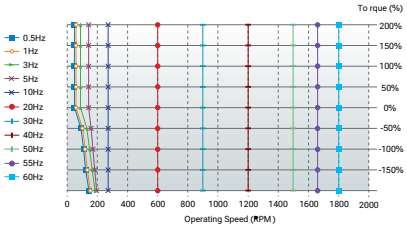
## V/F Accelerate and Decelerate Function





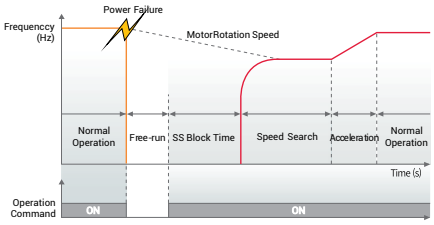
Applied ATB & Flux braking function

## Sensorless Performance




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

## KEB for Safe Operating Stop

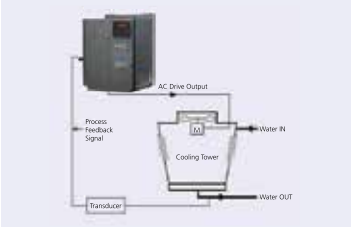



- KEB for controlled stop in case of power loss or failure, for different speeds.
- User has choice to start from zero speed or same speed

## Flying Start

- Select optimal flying start operation for different applications

## Built-in PID

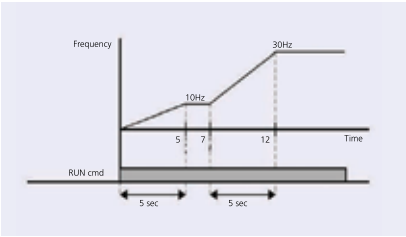



- Useful in Pump, AHU applications to maintain process variables (Flow, Pressure & Temperature) as per required set-point.
- Available with sleep & wake-up functions
- No need for external PID Controller

## 2nd 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

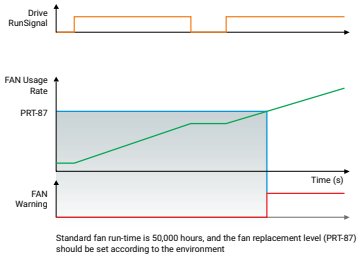
## Delta Frequency:




**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

## Built-in EMC Filter

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

## Material Design

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

## MIL 217Plus based Design

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

## Technical Specifications

| VFD CAT No. | Rated Output | | | | | Rated input | | DC Reactor | Braking Unit |
|---|---|---|---|---|---|---|---|---|---|
| | Normal Duty | | Heavy Duty | | | Normal Duty | Heavy Duty | | |
| | $P_{ND}$ | 1)$I_{ND}$ | $P_{HD}$ | 1)$I_{HD}$ | Rated Capacity | | | | |
| | (KW) | (A) | (KW) | (A) | (kVA) | (A) | (A) | | |
| 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 stadard 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 stadard 4 pole motor

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

| 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<br>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<br>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-funaction 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

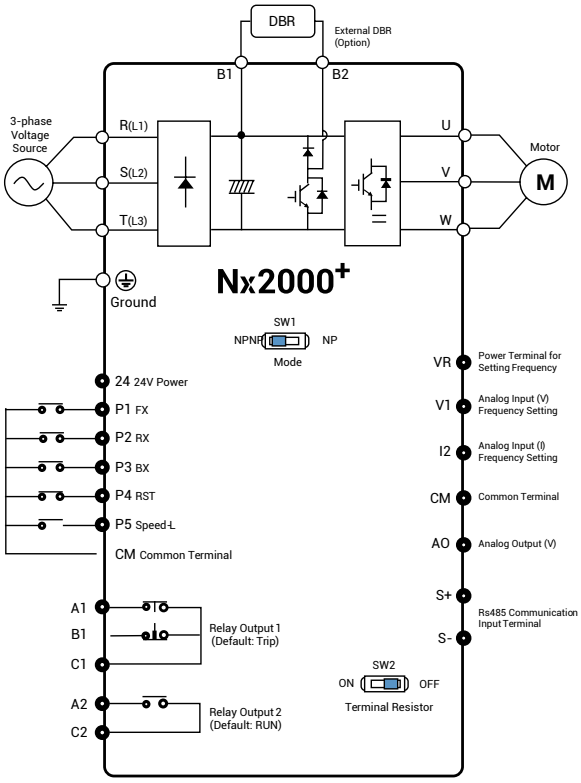
| | |
|---|---|
| Trip | Over Current Trip, External Signal Trip, ARM Short Current Fault Trip, Over Heat Trip, Input Phase Loss Trip, Ground Trip, Motor Over Heat Trip, I/O Board Link Trip, No Motor Trip, Parameter Writing Trip, Emergency Stop Trip, Command Loss Trip, CPU Watchdog Trip, Motor Light Load Trip<br>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)<br>HD above 15ms (ND above 8ms): Automatic restart operation enable |

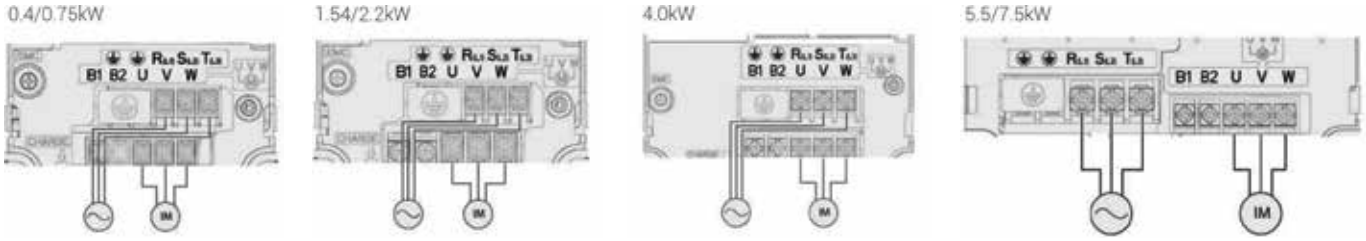
## Environment

| | |
|---|---|
| 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.<br>HD:-10~50°C (14~122°F) / ND:- 10~40°C (14~104°F)<br>[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$^2$(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

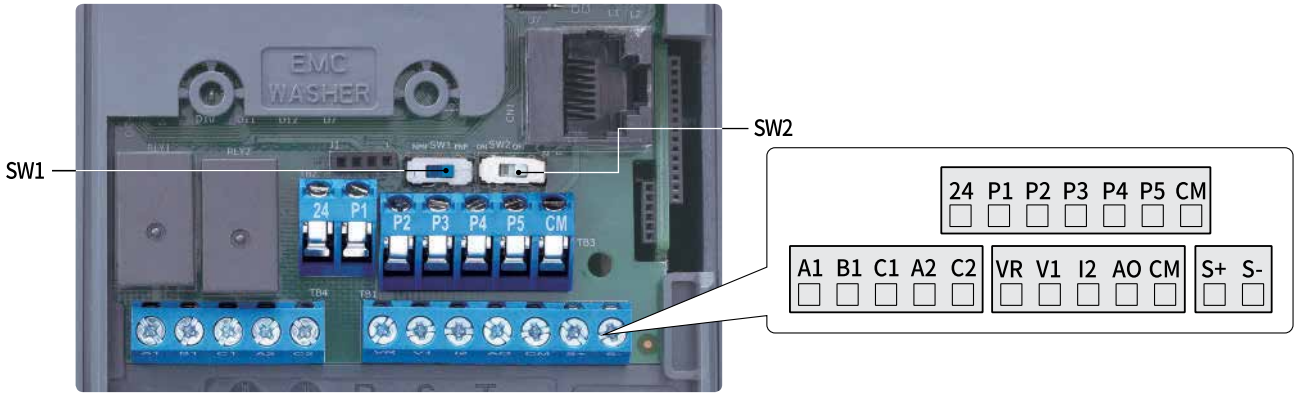



| Terminal Labels | Name | Description |
|---|---|---|
| ⏚ | Ground terminal | Connect earth grounding |
| R(L1)/S(L2)/T(L3) | AC power input terminal | Mains supply AC power connections |
| B1/B2 | Brake resistor terminals | Brake resistor wiring connection |
| U/V/W | Motor output terminals | 3-phase 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 | R/S/T, U/V/W : M4 | R/S/T : 24.0/2.4 U/V/W : 15.0/1.5 |
| | 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 | R/S/T, U/V/W : M4 | R/S/T : 14.3/1.4<br>U/V/W : 18.4 / 1.8 |
| | 7.5 | | |

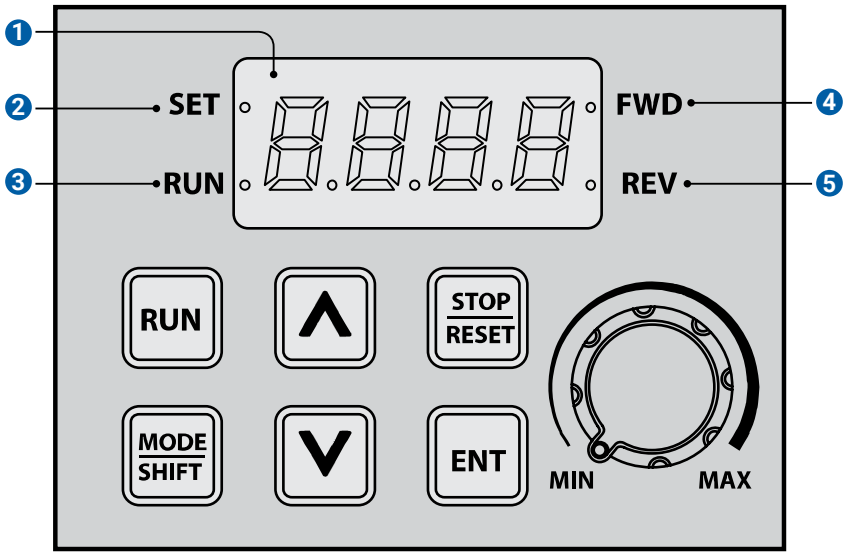
› Only use the specified torque on the screw heads otherwise damage could occur. Loose screws can cause overheating and damage.
› Use copper wires with 600V, 75 °C specification.




| 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.<br>› P1:Fx<br>› P2:Rx<br>› P3:Bx<br>› P4:RST<br>› 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.<br>› Maximum voltage output: 12V<br>› Maximum current output: 100mA<br>› Potentiometer: 1/5kW |
| | V1 | Voltage input for frequency reference input | Used to setup or modify a frequency reference via analog voltage input terminal.<br>› Unipolar : 0-10V(12VMax.)<br>› Bipolar: -10-10V(±12VMax.) |
| | I2 | Current input for frequency reference input terminal | Used to setup or modify a frequency reference via current input terminal.<br>› Input current: 4-20mA<br>› Maximum Input current: 24mA<br>› 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.<br>› Output voltage:0-10V<br>› Maximum output voltage/Current:12V, 10mA<br>› 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)<br>› Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection)<br>› 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)<br>› Fault condition: A2 and C2 contacts are connected<br>› 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. |



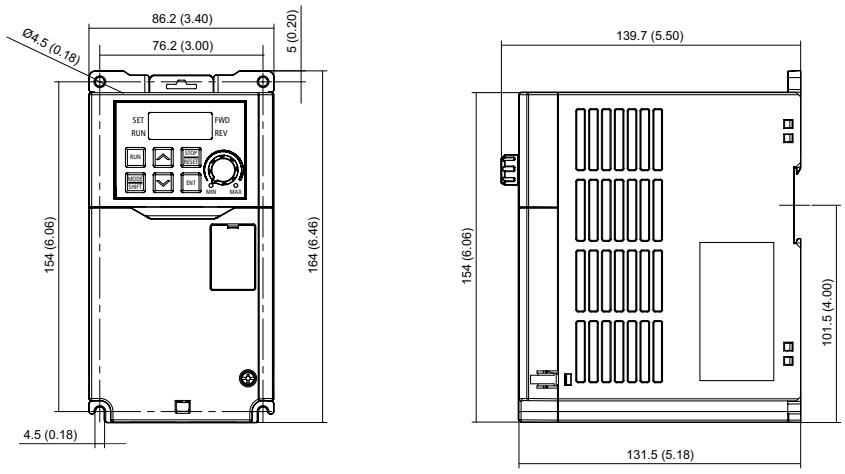

| No. | Name | Function |
|---|---|---|
| 1 | 7-Segment Display | Displays Current Operational status and Parameter information. |
| 2 | SET Indicator | LED flashes during parameter configuration. |
| 3 | RUN Indicator | LED turnson (Steady during an operation, and flashes during acceleration or deceleration). |
| 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<br>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/SHIFT 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.Editsparameter and apply change. Accesses the operation information screen during failure. |
| ▲ + ▼<br>MODE SHIFT + ▼<br>MODE SHIFT + ▲ | - | Escape to the initial display. |
| MIN MAX | Potentiometer or Rotating Knob | Used to set the operation frequency. |

| Group | Keypad Display | Description |
|---|---|---|
| Operation | - | Configures basic parameters for inverter operation. |
| Drive |  | Configuresparameters forbasic operation.<br>These include jog operation, motor capacity evaluation, torque boost, andother keypad related Parameters |
| Basic |  | Configures basic operation parameters<br>These parameters include motor parameters and multi-step frequency parameters. |
| Advanced |  | Configures acceleration or deceleration patterns, frequency limits, etc. |
| Control |  | Configure ssensorless 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.<br>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). |

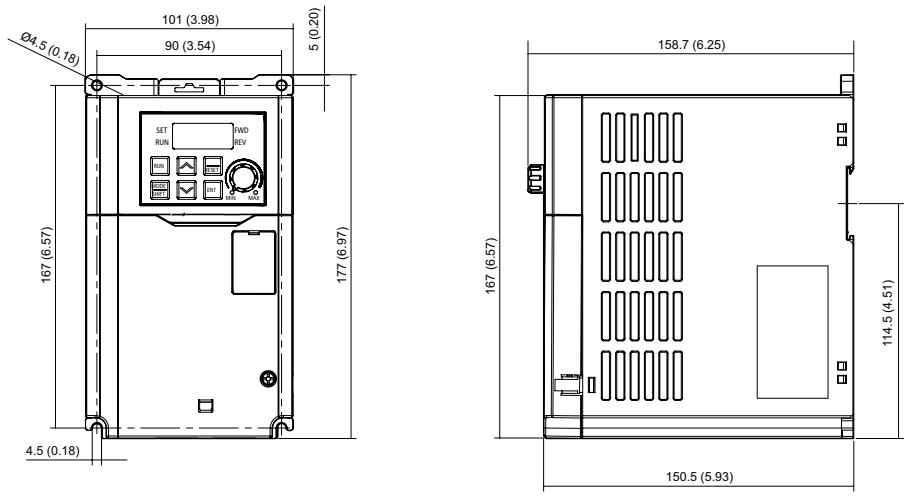
Units: mm (inches)

## LTVF- N203P1BAA, LTVF-N206P0BAA, LTVF-N402P0BAA, LTVF-N403P1BAA



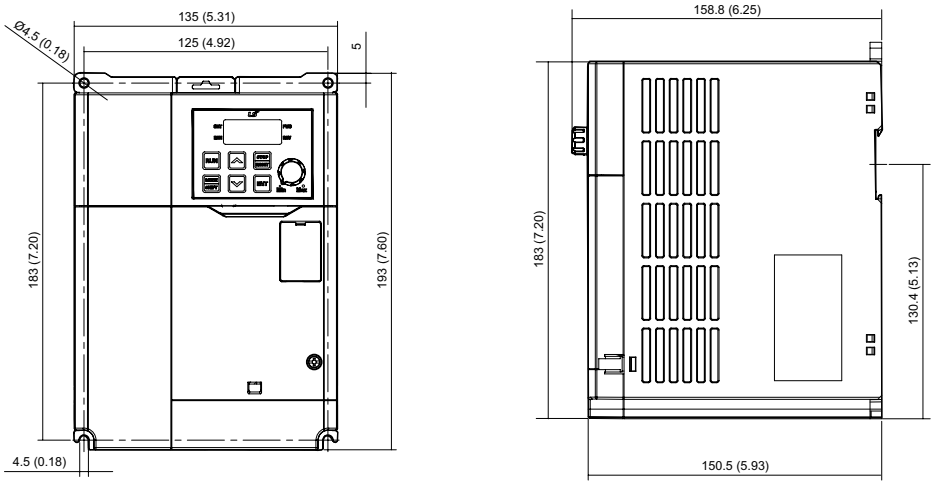

**0.4~0.75kW**

## LTVF-N209P6BAA, LTVF-N212P0BAA, LTVF-N405P1BAA, LTVF-N406P9BAA



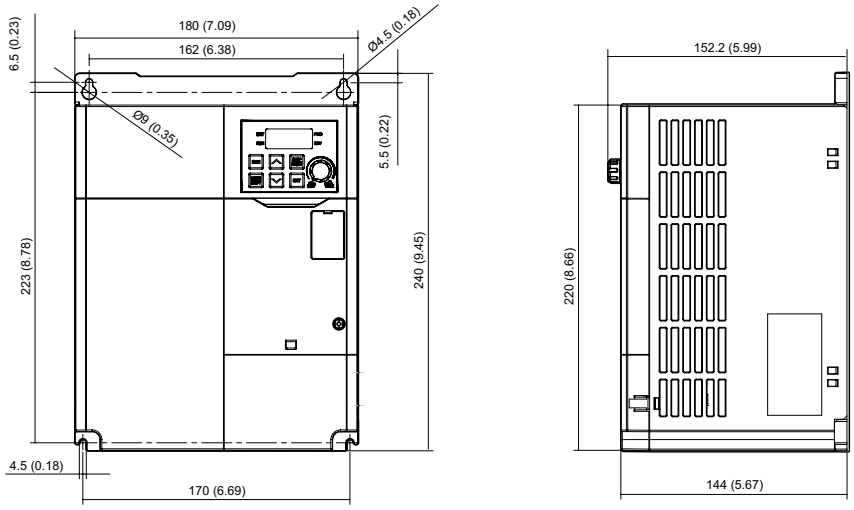

**1.5~2.2kW**

## 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 it abbreviation of the IEC standard 60529 for Ingress Protection to the enclosures.

IP 6 6

| First Digit - SOLIDS | Second Digit - LIQUIDS |
|---|---|
| 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

| Input: 3-Phase, 380-480V AC (-15%,+10%), 50/60Hz (±5) | | | | | | |
|---|---|---|---|---|---|---|
| VFD CAT No. | Rated Output | | | Rated input | DC Reactor | Braking Unit |
| | Heavy Duty | | | | | |
| | $P_{HD}$ | $^{1)}I_{HD}$ | Rated Capacity | | | |
| | (KW) | (A) | (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**

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

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

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

# Technical Specifications

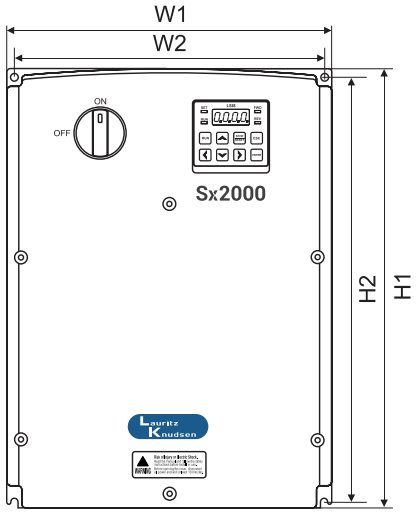
| | | |
|---|---|---|
| Standard Specifications | Overload Capacity | HD:150% for 1min & 200% instantaneous for 1 second |
| | Max Output Voltage | Proportional to Input Voltage |
| | Max Output Frequency | 0 to 400Hz (Sensorless: 0 to 120Hz) |
| | Rated Voltage | 380 to 480V Three-phase (-15%/+10%) |
| | Rated Frequency | 50/60Hz (-5%/+5%) |
| | THDv | < 5% |
| | Keypad | Built-in LED |
| | Braking Chopper | Built-in |
| Control Details | 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 |
| | Frequqncy 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],<br>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) |
| | 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 |
| Protection | 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 |
| | 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 |
| Interface | 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 |
| | Communication | Built-in RS485 Modbus RTU |
| | SafetyI/P | 2, complying with EN ISO 13849-1 Pld and EN61508SIL2 [EN60204-1, stop category 0] |
| Option | Expansion Card | 3DI (PNP/NPN), 2DO (R), 2AI (-10 to 10V), (0 to 10V/0 to 20mA), 1A0 (0 to 10V/0 to 20mA) |
| | Communication Card | CANopen, Profibus DP*, Profinet, Modbus TCP / Ethernet IP |
| Environment | 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/sec² (<1G) |
| | Maximum Noise level | <65dbA |
| | Global Compliance | CE, UL (Plenum Rated), RoHS |

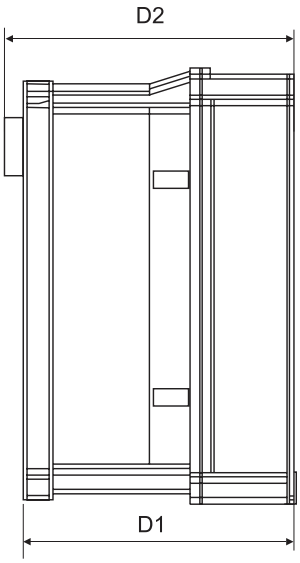
*Profibus DP option is available from 5.5kW to 22kW

**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 | | | 220 | 204 | 258.8 | 241 | 201 | 215 | 5.6 |
| LTVF-S40012XAA | F3 | | 250 | 232 | 328 | 308 | 227.2 | 241.2 | 8.8 |
| LTVF-S40016XAA | | | 250 | 232 | 328 | 308 | 227.2 | 241.2 | 8.9 |
| LTVF-S40024XAA | F4 | | 260 | 229 | 399.6 | 377 | 245.5 | 259.6 | 9.6 |
| LTVF-S40030XAA | | | 260 | 229 | 399.6 | 377 | 245.5 | 259.6 | 9.8 |
| LTVF-S40039XAA | F5 | | 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/RAPIEnet 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+, 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 | DN0 - 100M | 63 | MO | 50 |
| LTVF-H40061BAA | 30 | DN0 - 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+, 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-N402P0BAA | 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 |
| LTVF-F40004CAA | | | | 600 Ω - 150 W | 1 | 600 Ω -450 W | 1 |
| LTVF-N405P1BAA | 1.5 | | | 300 Ω - 300 W | 1 | - | - |
| LTVF-S40005BAA | | | | 300 Ω - 300 W | 1 | 300 Ω -900 W | 1 |
| LTVF-F40006CAA | | | | 300 Ω - 300 W | 1 | 300 Ω -900 W | 1 |
| LTVF-N406P9BAA | 2.2 | | | 200 Ω - 400 W | 1 | - | - |
| LTVF-S40007BAA | | | | 200 Ω - 400 W | 1 | 200 Ω - 1200 W | 1 |
| LTVF-F40008CAA | | | | 200 Ω - 400 W | 1 | 200 Ω - 1200 W | 1 |
| LTVF-F40012CAA | 3.7 | | | 130 Ω - 600 W | 1 | 130 Ω - 2000 W | 1 |
| LTVF-N410P0BAA | 4 | | | 130 Ω - 600 W | 1 | - | - |
| LTVF-S40010BAA | | | | 130 Ω - 600 W | 1 | 130 Ω - 2000 W | 1 |
| LTVF-N416P0BAA | 5.5 | | | 85 Ω - 1000 W | 1 | - | - |
| LTVF-S40016BAA | | | | 85 Ω - 1000 W | 1 | 85 Ω - 3000 W | 1 |
| LTVF-F40016CAA | | | | 85 Ω - 1000 W | 1 | 85 Ω - 3000 W | 1 |
| LTVF-N423P0BAA | 7.5 | | | 60 Ω - 1200 W | 1 | - | - |
| LTVF-S40023BAA | | | | 60 Ω - 1200 W | 1 | 60 Ω - 4000 W | 1 |
| LTVF-F40024CAA | | | | 60 Ω - 1200 W | 1 | 60 Ω - 4000 W | 1 |
| LTVF-S40030BAA | 11 | | | 40 Ω - 2000 W | 1 | 40 Ω - 6000 W | 1 |
| LTVF-F40030CAA | | | | 40 Ω - 2000 W | 1 | 40 Ω - 6000 W | 1 |
| LTVF-S40038BAA | 15 | | | 30 Ω - 2400 W | 1 | 30 Ω - 8000 W | 1 |
| LTVF-F40039CAA | | | | 30 Ω - 2400 W | 1 | 30 Ω - 8000 W | 1 |
| LTVF-S40044BAA | 18.5 | | | 20 Ω - 3600 W | 1 | 20 Ω - 10000 W | 1 |
| LTVF-F40045CAA | | | | 20 Ω - 3600 W | 1 | 20 Ω - 10000 W | 1 |
| LTVF-S40058BAA | 22 | | | 20 Ω - 3600 W | 1 | 20 Ω - 12000 W | 1 |
| LTVF-F40061CAA | | | | 20 Ω - 3600 W | 1 | 20 Ω - 12000 W | 1 |
| 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 (Rating in Amp) | Bussmann (Class J / Class L) | | Bussmann (Class T) | |
|---|---|---|---|---|---|---|---|
| | | | | 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 (Rating in Amp) | Bussmann (Class J / Class L) | | Bussmann (Class T) | |
|---|---|---|---|---|---|---|---|
| | | | | 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 (Rating in Amp) | Bussmann (Class J / Class L) | | Bussmann (Class T) | |
|---|---|---|---|---|---|---|---|
| | | | | 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^2.t (clearing) | Model No. | I^2.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^2.t (clearing) | Model No. | I^2.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^2.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 | Built-In | 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 | | |
|---|---|---|---|---|---|
| | | Normal Duty | I/P AC Choke | DC Choke | O/P Choke |
| | | | 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+

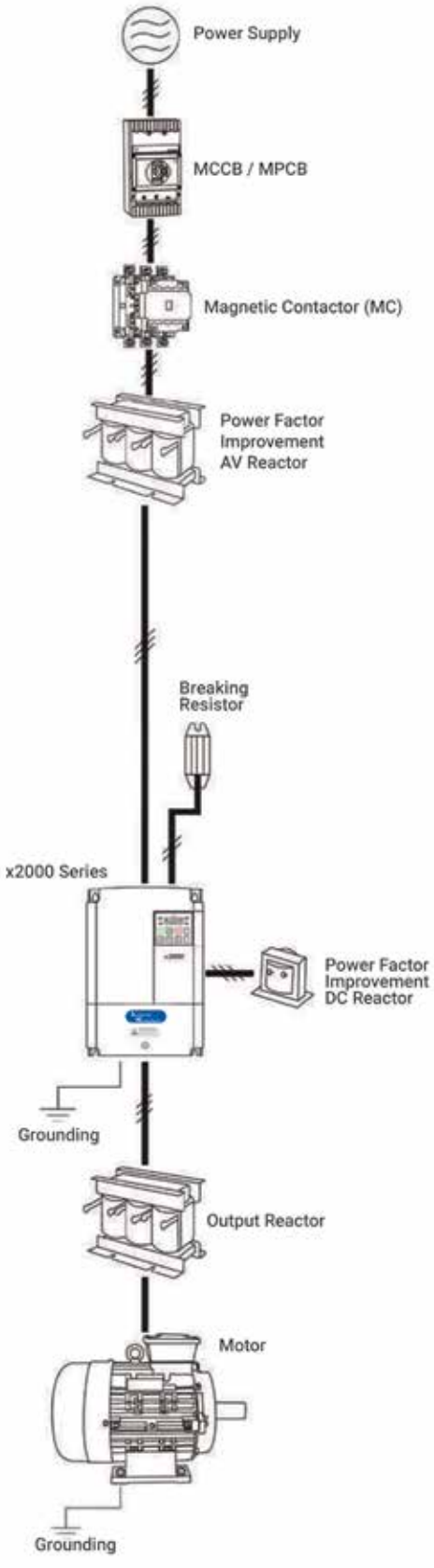
| kW (ND) | CAT NO | Drive Current (A) | | Chokes | | |
|---|---|---|---|---|---|---|
| | | Normal Duty | Heavy Duty | I/P AC Choke | DC Choke | O/P Choke |
| | | | | mH/A | mH/A | mH/A |
| 0.75 | LTVF-N402P0BAA | 2 | 1.3 | 4.81/4.8 | 16/4.27 | 8.1/3 |
| 1.5 | LTVF-N403P1BAA | 3.1 | 2.5 | 4.81/4.8 | 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 | | |
|---|---|---|---|---|---|
| | | Heavy Duty | I/P AC Choke | DC Choke | O/P Choke |
| | | | 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.<br>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

### 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

**Range: 7.5 to 110kW**

## 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$^{nd}$ to 50$^{th}$ 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:**

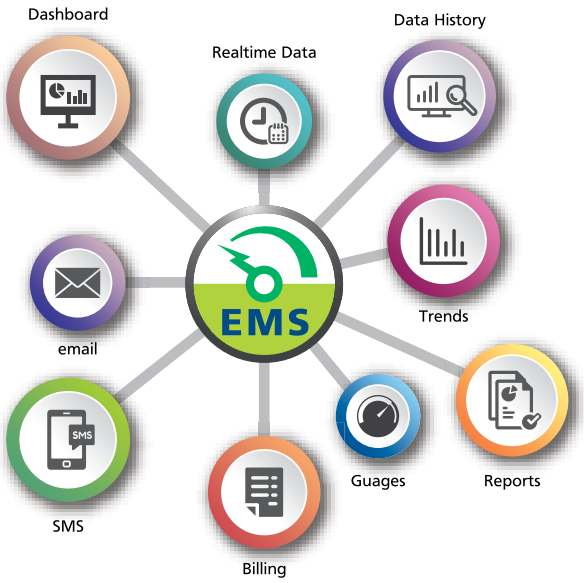
- Fully Automatic in Operation
- Can be used to achieve consistently high Power Factor under fluctuating load
- Help in achieving True Power factor close to unity
- Mitigates harmonics in any Industry
- Minimises the total kVAr consumption of the industry
- Reduces kVA demand charges
- Lower energy consumption 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

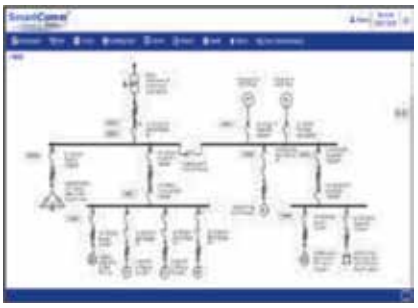
## SmartComm Energy Management Solution




**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.

# Electrical Standard Products (ESP) Offices

## HEAD OFFICE

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Product improvement is a continuous process. For the latest information and special application, please contact any of our offices listed here. Product photographs shown for representative purpose only.

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