



Entwurf

SEW
EURODRIVE



MOVITRAC[®] LT E

EA390000

Edition 04/2005

11336617 / EN

System Manual





1	Important Notes on the Operating Instructions	4
1.1	Explanation of symbols	4
1.2	Application environment.....	5
1.3	Waste disposal.....	5
2	Safety Notes	6
2.1	Installation and startup.....	6
2.2	Operation and servicing.....	6
3	Product overview	7
3.1	Technology	7
3.2	Mains supply compatibility	7
3.3	Markets and applications	7
3.4	Accessories available	7
4	General specifications.....	8
4.1	Input voltage ranges	8
4.2	Product designation	8
4.3	Output power and current ratings	9
4.4	Overload capability	12
4.5	Protection features.....	12
4.6	Conformance	12
4.7	Environmental.....	12
4.8	Physical dimensions	13
4.9	Wiring of power section and brake.....	15
4.10	Signal terminals overview	16
4.11	User interface.....	17
5	Parameters.....	18
5.1	Parameter access and reset	18
5.2	Parameter specifications.....	20
5.3	Selection of Parameter-19, Digital input function.....	33
6	Accessories	35
6.1	Input filter	35
6.2	Line chokes.....	36
6.3	Output chokes.....	37
6.4	DIN rail mounting kit.....	38
6.5	Second analog input	38
6.6	Second relay output	39
6.7	PI Controller	40
7	Project planning	41
7.1	Schematic procedure	41
7.2	Motor selection for asynchronous AC motors	42
7.3	Inverter → motor combinations.....	44
7.4	Match a filter / choke to the inverter.....	46
7.5	Motor potentiometer function (remote pushbutton mode).....	47
8	Startup.....	49
8.1	Startup procedure	49
8.2	Minimum parameter setup	49
8.3	Starting the motor	49
8.4	Group drive with MOVITRAC® LT E.....	50
8.5	Connecting explosion-proof AC motors	50
9	Operation and Service	51
9.1	Drive status	51
9.2	Fault codes and fault history	52
10	SEW electronics service.....	53



1 Important Notes on the Operating Instructions

1.1 *Explanation of symbols*

**Danger**

Identifies information about practices or circumstances that will lead to personal injury or death, property damage, or economic loss.

**Warning**

Identifies information about practices or circumstances that may lead to personal injury or death, property damage, or economic loss.

**Caution**

Identifies information about practices or circumstances that may lead to property damage, or economic loss.

**Note**

Identifies information that is critical for successful application and understanding of the equipment.

**Documentation reference**

Operators are made aware of existing documentation, such as operating instructions, catalogs, data sheets.



Unless the information in the operating instructions is adhered to, it will be impossible to ensure:

- Trouble-free operation
- Fulfillment of any rights to claim under guarantee

Consequently, read the operating instructions before you start working with the unit!

The operating instructions contain important information about servicing. Therefore, keep the operating instructions close to the unit.



1.2 Application environment

The following applications are forbidden unless measures are expressly taken to make them possible:

- Use in explosion-proof areas
- Use in environments with harmful substances:
 - Oils
 - Acids
 - Gases
 - Vapors
 - Dust
 - Radiated interference
 - Other harmful environments
- Use subject to mechanical vibration and shock loads in excess of the requirements in EN 50178
- If the inverter performs safety functions which have to guarantee the protection of machinery and people

1.3 Waste disposal

Please follow the current instructions: dispose in accordance with the regulations in force:

- Electronics scrap (printed-circuit boards)
- Plastic (housing)
- Sheet metal
- Copper



2 Safety Notes

2.1 Installation and startup



- **Never install damaged products or take them into operation.** Please submit a complaint to the transport company immediately in the event of damage.
- **Installation, startup and service work** on the unit only by **trained personnel**. The personnel must be trained in the relevant aspects of accident prevention and must comply with the regulations in force (e.g. EN 60204, VBG 4, DIN-VDE 0100/0113/0160).
- Follow the **specific instructions** during **installation** and **startup** of the motor and the brake!
- Make sure that **preventive measures** and **protection devices** correspond to the **applicable regulations** (e.g. EN 60204 or EN 50178).
Grounding the unit is a necessary protective measure.
Overcurrent protection devices are a necessary protective measure.
- **The unit meets all requirements for reliable isolation** of power and electronics connections in accordance with EN 50178. **All connected circuits** must also **satisfy the requirements for reliable isolation** so as to guarantee reliable isolation.
- Take **suitable measures** to ensure that the connected **motor does not start up automatically when the inverter is switched on**. To do this, you can connect binary inputs DI01 through DI03 to GND.
- Connection to the frequency inverter output is only permitted in size 0S, 0M and 0L when the output stage is inhibited.

2.2 Operation and servicing



- **Disconnect the unit from the supply system** prior to **removing the protective cover**. **Dangerous voltages** may still be present for up to **10 minutes after mains disconnection**.
- The unit has **IP 00** enclosure with the **protective cover removed**. **Dangerous voltages** are present at all subassemblies except for the control electronics. Keep the unit closed during operation.
- **Dangerous voltages** are present at the **output terminals** and the **cables and motor terminals connected to them when the unit is switched on**. Dangerous voltages may also be present when the unit is inhibited and the motor at a standstill.
- The unit is **not** necessarily **deenergized** when the **LEDs and the 7-segment display are off**.
- **Safety functions inside the unit** or a **mechanical blockage** may cause the **motor to stop**. The **removal of the source of the malfunction** or a **reset** can result in an **automatic restart of the drive**. If, for safety reasons, this is **not permissible** for the driven machine, **disconnect the unit from the supply system** before correcting the fault.





3 Product overview

3.1 Technology

The MOVITRAC® LT E range consists of a series of products in 2 physical sizes designed to provide cost-effective, easy-to-use drives for 3-phase induction motors in the power range 0.37 kW to 4.0 kW (0.5 hp to 5 hp).

The MOVITRAC® LT E employs open loop voltage and frequency control to regulate the speed of the motor. Digital control is combined with the latest IGBT power semiconductor technology to give a compact, robust solution for general purpose drive applications. The product is designed for ease of use and ease of installation, together with simple programming and commissioning thereby minimizing the overall applied cost of a drive solution.

3.2 Mains supply compatibility

The MOVITRAC® LT E is designed for direct on-line connection to world wide supplies. The single-phase 115 V output voltage doubler operates on 115 V mains. The 220 V single phase unit operates on 220 ... 240 V 1 or 3-phase mains, whereas the 380 V 3-phase unit operates on 380 ... 480 V 3-phase mains.

3.3 Markets and applications

The MOVITRAC® LT E product range is aimed at a broad market where general motor speed control is required. Real benefits are offered to both low volume end users and to OEM customers, where the ease of use and the innovative mechanical design significantly reduce commissioning time.

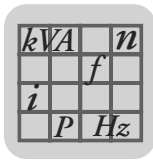
The simple but powerful features make the MOVITRAC® LT E, in combination with the available accessories, suitable for a wide range of applications.

Typical applications are:

- Pumps in the water supply industry, paper industry and sewage systems
- Fan controllers in air conditioning systems, energy saving applications and refrigeration systems
- Compressors in refrigeration systems and compressed air supply systems
- Conveyor belts

3.4 Accessories available

- External EMC filter
- Line choke to reduce supply harmonic distortion and offer additional protection to the drive
- Output choke to improve quality of output waveform and for long motor cables
- PI controller for simple feedback control systems
- Second analog input to switch between 2 references
- Second relay output for a second programmable relay output
- DIN rail mounting kit



4 General specifications

4.1 Input voltage ranges

Depending upon model and power rating, the drives are designed for direct connection to the following supplies:

MOVITRAC® LT E sizes 1, 2 (115 V input, 230 V output):

115 V \pm 10 %, 1 ph, 50 ... 60 Hz \pm 5 %

MOVITRAC® LT E sizes 1, 2 (220 V):

220 V ... 240 V \pm 10 %, 1 ph (3 ph*), 50 ... 60 Hz \pm 5 %



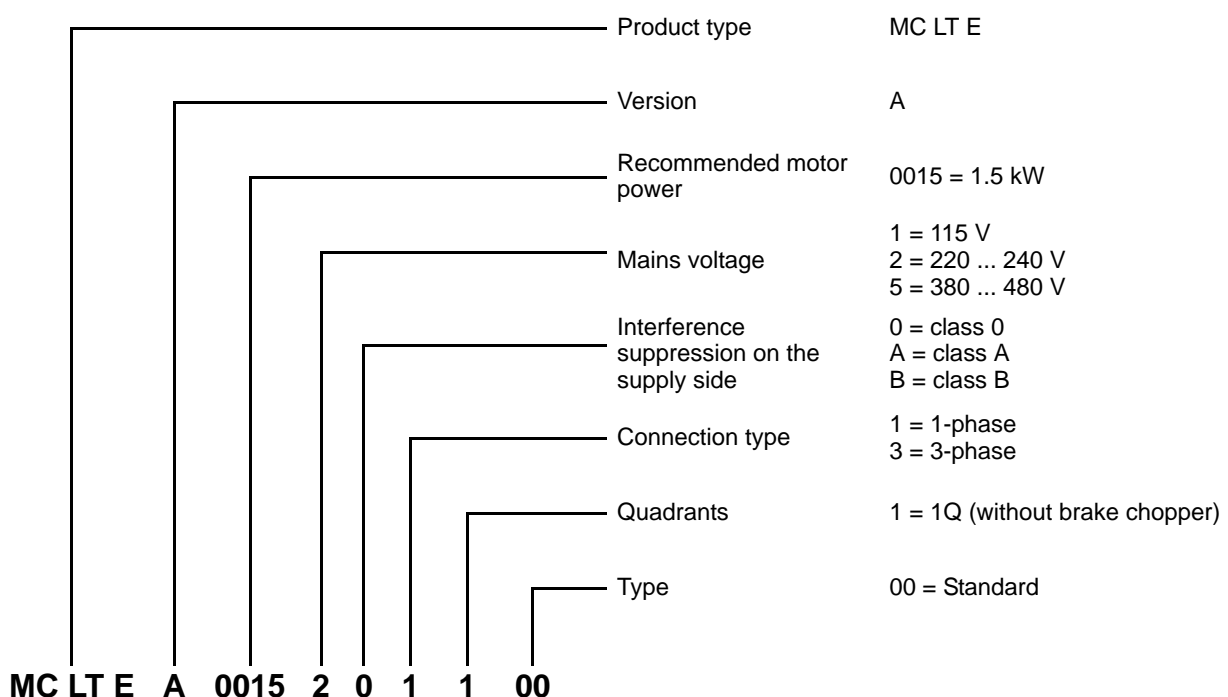
*It is also possible to connect 1-phase MOVITRAC® LT E to 2-phases of a 220 ... 240 V 3-phase mains.

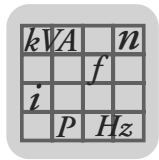
MOVITRAC® LT E sizes 1, 2 (400 V):

380 V ... 480 V \pm 10 %, 3 ph, 50 ... 60 Hz \pm 5 %

Products used with a 3-phase supply are designed for a maximum supply imbalance of 3 % between phases. For input supplies which have a supply imbalance greater than 3 % (typically the Indian subcontinent and parts of Asia Pacific including China) we recommend that input chokes are used.

4.2 Product designation



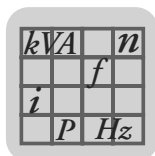


4.3 Output power and current ratings

1-phase system AC 115 V / 0.37 ... 1.1 kW

The 115 V drives have an internal voltage doubler so the motor voltage is 220 ... 230 V.

MOVITRAC® MC LT E A...		0004 101 1 00	0008 101 1 00	0011 101 1 00
Part number		828 357 5	828 358 3	828 359 1
Interference suppression according to EMC EN 61000-3		0		
INPUT				
Supply voltage	V _{mains}	1 × AC 115 V ± 10 %		
Supply frequency	f _{mains}	50 / 60 Hz ± 10 %		
Supply fuse rating	[A]	20	20	30
Recommended motor power	[kW]	0.37	0.75	1.1
	[hp]	0.5	1.0	1,5
OUTPUT				
Output voltage	V _{mains}	220 ... 230 V (voltage doubler)		
Output current	[A]	2.3	5.8	9.5
Motor cable size Cu 75C	[mm ²]	1.0		1.5
	[AWG]	17		16
Max motor cable length (unshielded cable @ 8 kHz)	[m]	50	75	150
GENERAL				
Max. ambient temperature [°C]	8 kHz	50	50	50
Dimensions W × H × D	[mm]	80 × 155 × 130	100 × 260 × 175	
	[in]	3.15 × 6.10 × 5.12	3.94 × 10.24 × 6.89	
Size		1	2	2



General specifications

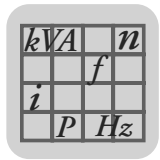
Output power and current ratings

1-phase (3-phase¹⁾) system AC 220 ... 240 V / 0.37 ... 2.2 kW

MOVITRAC® MC LT E A...		0004 201 1 00	0008 201 1 00	0015 201 1 00	0022 201 1 00
Part number		828 360 5	828 361 3	828 362 1	828 364 8
Interference suppression according to EMC EN 61000-3		0			
INPUT					
Supply voltage	V _{mains}	1 × AC 220 ... 240 V ± 10 %			
Supply frequency	f _{mains}	50 / 60 Hz ± 10 %			
Supply fuse rating	[A]	10	10	20	30
Recommended motor power	[kW]	0.37	0.75	1.5	2.2
	[hp]	0.5	1.0	2.0	3.0
OUTPUT					
Output current	[A]	2.3	4.3	7.0	10.5
Motor cable size Cu 75C	[mm²]	1.0			1.5
	[AWG]	17			16
Max motor cable length (unshielded cable @ 8 kHz)	[m]	50	50	50	150
GENERAL					
Max. ambient temperature [°C]	8 kHz	50	50	50	50
Dimensions W × H × D	[mm]	80 × 155 × 130			100 × 260 × 175
	[in]	3.15 × 6.10 × 5.12			3.94 × 10.23 × 6.89
Size		1	1	1	2

MOVITRAC® MC LT E A...		0004 2B1 1 00	0008 2B1 1 00	0015 2B1 1 00	0022 2B1 1 00
Part number		828 365 6	828 366 4	828 367 2	828 368 0
Interference suppression according to EMC EN 61000-3		B (integrated EMC filter)			
INPUT					
Supply voltage	V _{mains}	1 × AC 220 ... 240 V ± 10 %			
Supply frequency	f _{mains}	50 / 60 Hz ± 10 %			
Supply fuse rating	[A]	10	10	20	30
Recommended motor power	[kW]	0.37	0.75	1.5	2.2
	[hp]	0.5	1.0	2.0	3.0
OUTPUT					
Output current	[A]	2.3	4.3	7.0	10.5
Motor cable size Cu 75C	[mm ²]	1.0			1.5
	[AWG]	17			16
Max motor cable length (unshielded cable @ 8 kHz)	[m]	50	50	50	150
GENERAL					
Max. ambient temperature [°C]	8 kHz	50	50	50	50
Dimensions W × H × D	[mm]	80 × 155 × 130			100 × 260 × 175
	[in]	3.15 × 6.10 × 5.12			3.94 × 10.23 × 6.89
Size		1	1	1	2

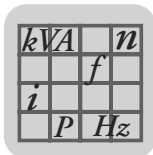
1) It is also possible to connect 1-phase MOVITRAC® LT E to 2-phases of a 220 ... 240 V 3-phase mains.



3-phase system AC 380 ... 480 V / 0.75 ... 4.0 kW

MOVITRAC® MC LT E A...		0008 503 1 00		0015 503 1 00		0022 503 1 00		0040 503 1 00	
Part number		828 369 9		828 370 2		828 371 0		828 372 9	
Interference suppression according to EMC EN 61000-3		0							
INPUT									
Supply voltage		V _{mains}	3 × AC 380 ... 480 V ± 10 %						
Supply frequency		f _{mains}	50 / 60 Hz ± 10 %						
Supply fuse rating		[A]	5	10	10	16			
Recommended motor power		[kW]	0.75	1.5	2.2	4.0			
		[hp]	1.0	2.0	3.0	5.0			
OUTPUT									
Output current		[A]	2.2	4.1	5.8	9.5			
Motor cable size Cu 75C		[mm ²]	1.0				1.5		
		[AWG]	17				16		
Max motor cable length (unshielded cable @ 8 kHz)		[m]	15	15	150	150			
GENERAL									
Max. ambient temperature [°C]		8 kHz	50	50	50	50			
Dimensions W × H × D		[mm]	80 × 155 × 130			100 × 260 × 175			
		[in]	3.15 × 6.10 × 5.12			3.94 × 10.23 × 6.89			
Size			1	1	2	2			

MOVITRAC® MC LT E A...		0008 5A3 1 00	0015 5A3 1 00	0022 5A3 1 00	0040 5A3 1 00
Part number		828 373 7	828 374 5	828 375 3	828 376 1
Interference suppression according to EMC EN 61000-3		A (integrated EMC filter)			
INPUT					
Supply voltage	V _{mains}	3 × AC 380 ... 480 V ± 10 %			
Supply frequency	f _{mains}	50 / 60 Hz ± 10 %			
Supply fuse rating	[A]	5	10	10	16
Recommended motor power	[kW]	0.75	1.5	2.2	4.0
	[hp]	1.0	2.0	3.0	5.0
OUTPUT					
Output current	[A]	2.2	4.1	5.8	9.5
Motor cable size Cu 75C	[mm ²]	1.0			1.5
	[AWG]	17			16
Max motor cable length (unshielded cable @ 8 kHz)	[m]	15	15	150	150
GENERAL					
Max. ambient temperature [°C]	8 kHz	50	50	50	50
Dimensions W × H × D	[mm]	80 × 155 × 130		100 × 260 × 175	
	[in]	3.15 × 6.10 × 5.12		3.94 × 10.23 × 6.89	
Size		1	1	2	2



4.4 Overload capability

All MOVITRAC® LT E have a possible overload of:

- 150 % for 60 seconds
- 175 % for 2 seconds

4.5 Protection features

The range of drives can detect and shut down in the event of the following fault conditions arising:

- Output phase - output phase short circuit
- Output phase - earth short circuit
- Output phase over-current trip
- Output current thermal overload ($I \times t$)
- Heatsink thermal overload (trip @ 95 °C)
- DC link over voltage
- DC link under voltage
- External (thermistor) trip

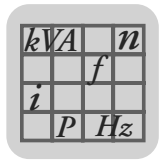
4.6 Conformance

All products conform to the following international standards:

- CE marked for low voltage directive
- IEC 664-1 Insulation co-ordination within low voltage systems
- UL 508C Power conversion equipment
- EN 61800-3 Adjustable Speed electrical power drive systems - Part 3
- EN 61000-6 / -2, -3, -4 Generic immunity/ Emission standards (EMC)
- Enclosure protection level according to NEMA 250, EN 60529
- Flammability rating according to UL 94
- C-Tick
- cUL

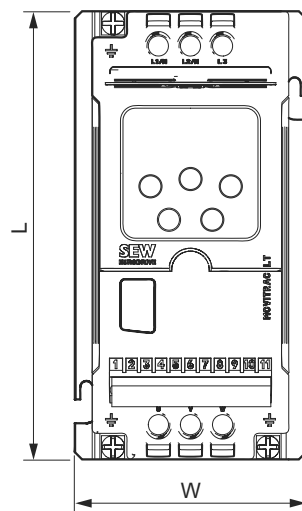
4.7 Environmental

Ambient temperature range operational	0 ... 50 °C @ 8 kHz PWM frequency
Ambient temperature range storage	–40 °C ... 60 °C
Max. altitude for rated operation	1000 m
Derating above 1000 m	1 % / 100 m to 2000 m max.
Relative humidity	<95 % (non condensing)
Protection rating	IP20, NEMA 0

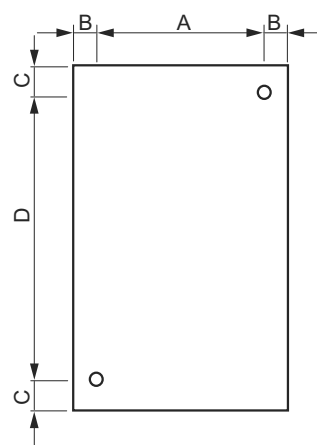


4.8 Physical dimensions

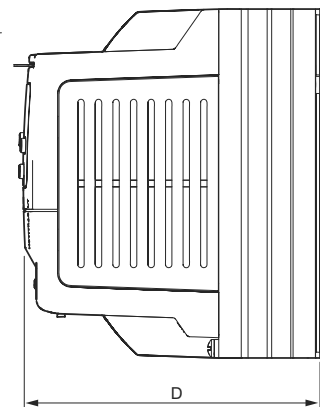
Dimension	Size 1	Size 2
Length / mm (in)	155 (6.10)	260 (10.23)
Width / mm (in)	80 (3.15)	100 (3.94)
Depth / mm (in)	130 (5.11)	175 (6.89)
Weight / kg (lb)	1.1 (2.42)	2.6 (5.73)
A / mm (in)	72 (2.83)	92 (3.62)
B / mm (in)	4 (0.16)	
C / mm (in)	25 (0.98)	
D / mm (in)	105 (4.13)	210 (8.27)
Fixings	2 × M4	
Power terminal torque settings	1 Nm	1 Nm
	8.85 lb.in	8.85 lb.in
Control terminal torque settings	0.5 Nm	0.5 Nm
	4.43 lb.in	4.43 lb.in



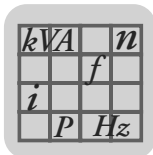
54769AXX



54770AXX

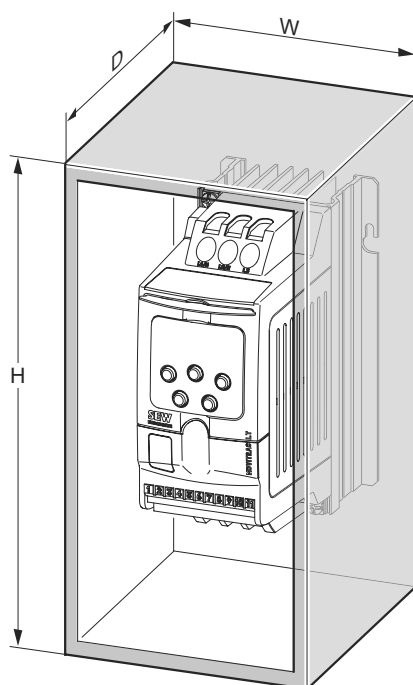


54781AXX



4.8.1 Dimensions for non vented metal housing

Drive power rating		Sealed unit					
		W		H		D	
		[mm]	[in]	[mm]	[in]	[mm]	[in]
Size 1	0.37 kW 200 V / 115 V	200	7.87	250	9.84	200	7.87
Size 1	0.75 kW 200 V / 400 V	250	9.84	300	11.81	200	7.87
Size 1	1.5 kW 200 V / 400 V	300	11.81	400	15.75	250	9.84
Size 2	0,75 kW 115 V / 1.1 kW 115 V 2.2 kW 400 V	300	11.81	400	15.75	300	11.81
Size 2	2.2 kW 200V / 4.0 kW 400 V	450	17.71	600	23.62	300	11.81



54784AXX

Figure 1: Housing

4.8.2 Dimensions for vented metal housing

Drive power rating		Vented unit						Force Vented (with fan)						
		W		H		D		W		H		D		Air Flow
		[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	
Size 1	All ratings	300	11.81	400	15.75	150	5.91	200	7.87	300	11.81	150	5.91	> 15m³ / h
Size 2	All ratings	400	15.75	600	23.62	250	9.84	200	8.87	400	15.75	250	9.84	> 45m³ / h

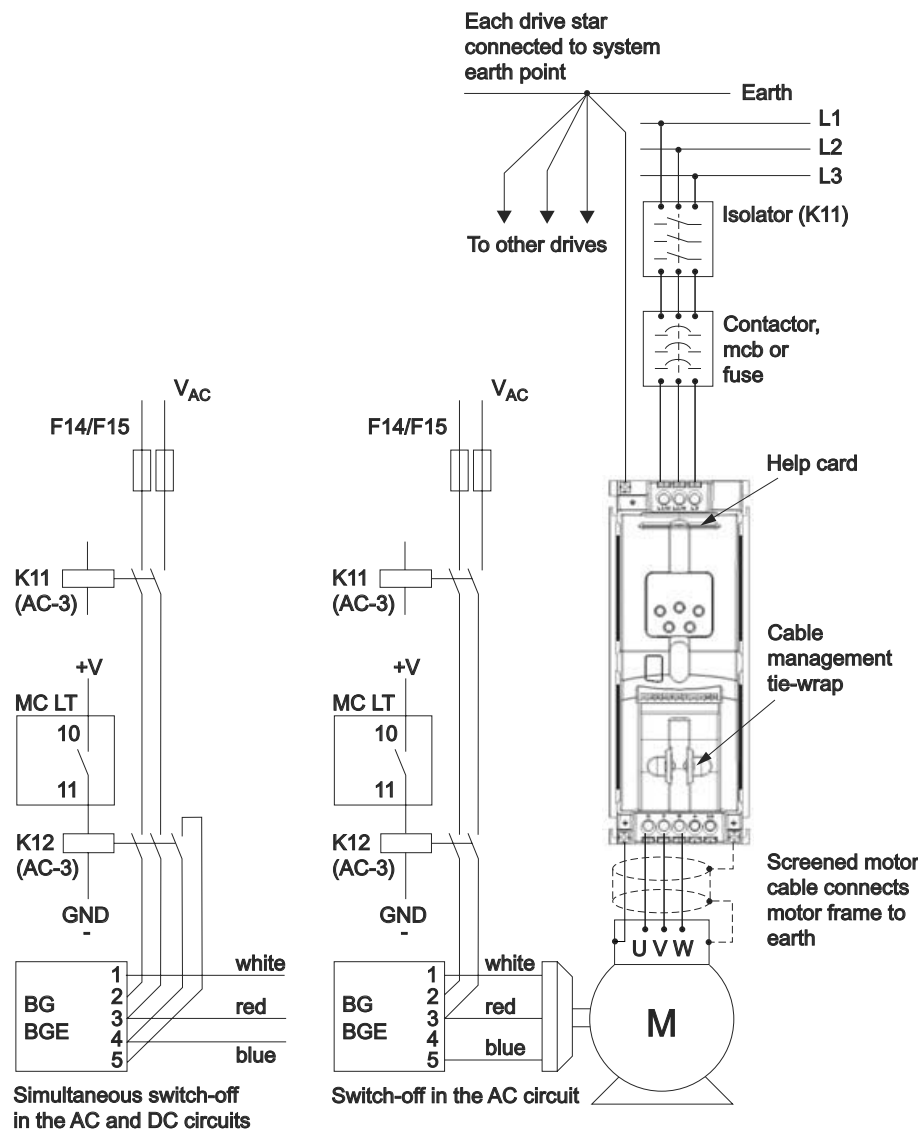
4.9 Wiring of power section and brake



Possible damage to the drive and brake and possible injury.

Incorrect connection will destroy the drive and the brake and may also cause injuries

It is essential to observe the connection sequence.



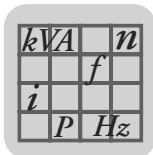
56036AEN

Figure 2: Wiring diagram for power section and brake

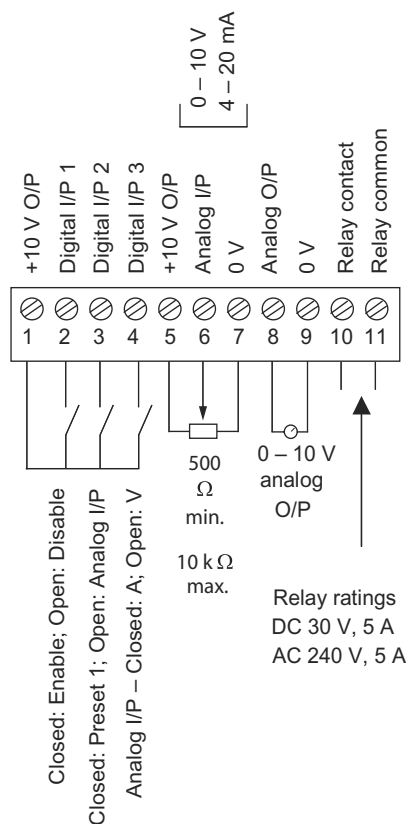


The connection to the brake rectifier requires a separate supply system cable. Supply from the motor voltage is not permitted.

If the brake rectifier is installed in the switch cabinet the connecting cable between the brake rectifier and the brake must be routed separately to other power cables. Routing together with other cables is only permitted if the other cables are shielded.



4.10 Signal terminals overview



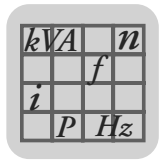
54790AXX

The signal terminal block has the following signal connections:

Terminal no.	Description	Connection
1	+10 V ref out	Ref. to activate DI1 ... DI3
2	Digital input 1	Connect to +8 V ... 30 V DC to activate
3	Digital input 2	Connect to +8 V ... 30 V DC to activate
4	Digital input 3	Connect to +8 V ... 30 V DC to activate
5	+10 V ref out	10 V ref for analog input (pot supply +) (10 mA max)
6	Analog input (12 bit)	0 ... 10 V (4 ... 20 mA when Iref enabled)
7	0 V common	0 V ref for analog input (pot supply -)
8	Analog output (10 bit)	0 ... 10 V, 10 V / 20 mA digital programmed
9	0 V common	0 V ref for analog output
10	Relay N.O	N.O. relay contact (250 V AC / 30 V DC @ 5 A)
11	Relay Common	N.O. relay contact (250 V AC / 30 V DC @ 5 A)



All digital inputs activated by input voltage in range +8 V ... 30 V
i.e. +28 V compatible



4.11 User interface

4.11.1 Keypad

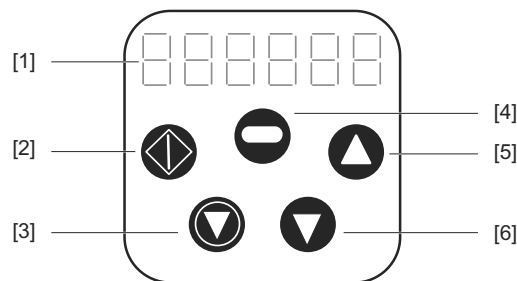
Each MOVITRAC® LT E has an integrated keypad as standard, allowing drive operation and set up without any additional equipment.

The keypad consists of 5 keys with the following functions:

Start / Run	Enable running of motor
Stop / Reset	Stop motor / Reset trip
Navigate	Press and release to display A / Hz / rpm Press and hold to enter / exit parameter edit mode
Up	Increase Parameter / Value
Down	Decrease Parameter / Value

The Start / Stop buttons on the keypad are disabled when the parameters have their factory default settings. To enable the operation of the Start / Stop buttons on the keypad, set P-12 to 1 or 2 (see chapter 5.2.1, "Standard parameters").

The Navigate key alone is used to gain access to the parameter edit menu. Pressing and holding this key (> 1 sec.) allows the user to toggle between the parameter edit menu and the real time display (where the drive operating status / running speed is displayed). By pressing this key (< 1 sec.) the user is able to toggle between the operating speed and operating current during drive operation.

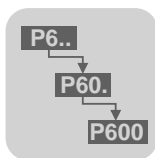


54787AXX

- [1] Display
- [2] Start
- [3] Stop / Reset
- [4] Navigate
- [5] Up
- [6] Down

4.11.2 Display

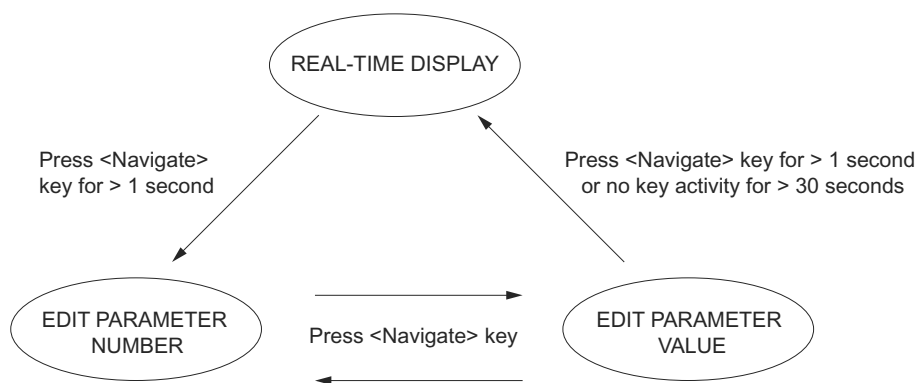
A standard 6-digit, 7-segment display is integrated into each drive to allow drive operation to be monitored and parameters to be set.



5 Parameters

5.1 Parameter access and reset

Accessing and changing parameters is done in an intuitive manner, as illustrated below:



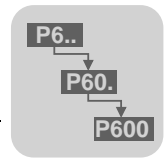
55992AEN

5.1.1 Real time display

Normal (real-time) display mode allows the key variables listed below to be displayed in real time.

Information type	Letter displayed	Value displayed	Unit of measurement
Estimated speed	–	0 ... ±60000	rpm
Output frequency	H	0 ... ±500	Hz
Output current	A	0 ... 100.0	Amp

The user can scroll between these variables by pressing and releasing the <Navigate> key within 1 second. The scrolling mechanism rolls over from motor current back to speed.



5.1.2 Parameter access mode

To enter the *parameter access mode*, press the <Navigate> button for more than 1 second. The display changes from indicating operational speed to "P-XX", where XX represents the parameter last accessed during the previous commissioning session. The value of XX can be incremented or decremented using the <up> / <down> keys. The parameter scrolling mechanism rolls over from the max. to min. parameter number and vice versa.

Pressing and releasing the <Navigate> key once more will then display the current value of the selected parameter. This can then be edited within the limits of that parameter, unless *parameter write access* has been disabled (P-38).

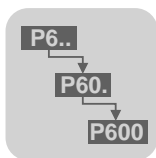
Pressing the <Navigate> key once more toggles back to display the parameter number in case further editing is required. If the <Navigate> key is held for approx. 1 second, the display reverts to displaying the real-time values (speed / frequency or current / load). The display will also revert to displaying the selected real-time value if no buttons are pressed for >30 seconds if P-01 ... P-40 are being accessed, and >60 seconds if P-00 (watch windows) is being accessed.

The parameters are split into standard parameters (e.g. max / min speed), which can be accessed in the basic menu and advanced parameters, which can be accessed in the extended menu.

5.1.3 Factory default setting

To restore the factory default parameters, hold the <up>, <down> and <stop> keys simultaneously for >1 second. This will also reset the access code, but will not affect the hours run meter. The hours run meter cannot be reset or changed.

Pressing the <up> and <down> keys simultaneously in *parameter edit mode* resets the selected parameter number / value to zero (or the minimum value as defined by the limits for that parameter).



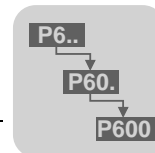
5.2 Parameter specifications

5.2.1 Standard parameters overview

Par	Description	Range	Default
P-01 ¹⁾	Max speed limit (Hz or rpm)	max. 500 Hz	50 Hz (60 Hz ²⁾)
P-02 ¹⁾	Min speed limit (Hz or rpm)	0 ... P-01 (max. 500 Hz)	0 Hz
P-03	Acceleration ramp time (sec.)	0.0 sec. ... 3000 sec.	5 sec.
P-04	Deceleration ramp time (sec.)	0.0 sec. ... 3000 sec.	5 sec.
P-05	Stop mode select	Ramp to stop / coast to stop	Ramp to stop
P-06	V/F characteristic	0 Constant torque V/f	0 (V/f)
		1 Pump-Fan V/f ²	
P-07	Rapid deceleration ramp time	0.0 sec. ... 25 sec. (disabled when 0.0 sec.)	0.0 sec.
P-08	Motor rated current limit	0 to current rating of drive (Amps)	Rated I-Drive
P-09	Motor rated frequency	25 ... 500 Hz	50 Hz 60 Hz ²⁾
P-10	Motor rated speed	0 ... 60,000 rpm	0
P-11	Voltage boost	0 ... 25 % of max output voltage	3 %
P-12	Terminal / Keypad control of drive	0 Terminal control	0 (terminal)
		1 Keypad control (fwd only)	
		2 Keypad control (fwd / rev to toggle between fwd and rev using start button)	
P-13	Trip log	Last 4 trips stored	no fault
P-14	Extended menu access code	0 ... 9999	0

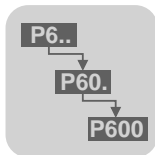
1) If the motor rated speed in rpm has been entered into P-10, parameters P-01, P-02, P-20 ... P-23, P-27 and P-28 are in rpm.

2) If the default value is 60 Hz this is shown on the name plate as 60 Hz.



5.2.2 Standard parameters detailed description

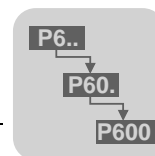
Parameter	Title	Description
P-01	Maximum speed limit	<p>This parameter sets the upper limit boundary defining the maximum frequency (speed) that can be applied to the motor in any mode of operation.</p> <p>This parameter will be displayed in Hz in the factory default state or whenever the motor rated speed parameter (P-10) is zero. If the motor rated speed in rpm has been entered into P-10, this parameter will be displayed in rpm.</p>
		Maximum value: $5 \times$ base frequency (i.e. $5 \times$ P-09)
		Minimum value: value of P-02
		Default value: 50 Hz (60 Hz for the USA and Canada) NB: If the default setting is 60 Hz this is shown on the name plate as 60 Hz.
P-02	Minimum speed limit	<p>This parameter sets the lower limiting boundary defining the minimum frequency (speed) that can be applied to the motor in any mode of operation.</p> <p>This parameter will be displayed in Hz in the factory default state or whenever the motor rated speed parameter (P-10) is zero. If the motor rated speed in rpm has been entered into P-10, this parameter will be displayed in rpm.</p> <p>The speed will only drop below this level after the drive enable signal has been removed, when the drive will ramp the output frequency to zero.</p>
		Maximum value: Value of P-01
		Minimum value: 0
		Default value: 0 Hz
P-03	Acceleration ramp time	<p>This parameter defines the time taken in seconds for the output frequency (speed) to increase from zero to the rated frequency (speed), as defined in parameter P-09.</p> <p>Note that the ramp rate is unaffected by changing either the maximum or minimum speed limits (P-01, P-02) since the ramp time is related to P-09 and not P-01 / P-02.</p> <p>When set to the minimum ramp time of 0 seconds, the output will change to the requested value within 8 milliseconds of the action being requested.</p>
		Maximum value: 3000 seconds
		Minimum value: 0 seconds
		Default value: 5.0 seconds
P-04	Deceleration ramp time	<p>This parameter defines the time taken in seconds for the output frequency (speed) to decrease from the rated frequency (value in P-09) to zero.</p> <p>Note that the ramp rate is unaffected by changing either the maximum or minimum speed limits (P-01, P-02) since the ramp time is related to P-09 and not P-01 / P-02.</p> <p>When set to the minimum ramp time of 0 seconds, the output will change to the requested value within 8 milliseconds of the action being requested.</p>
		Maximum value: 3000 seconds
		Minimum value: 0 seconds
		Default value: 5.0 seconds



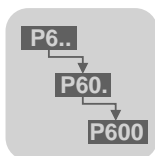
Parameters

Parameter specifications

Parameter	Title	Description	
P-05	Stop mode select	<p>This parameter defines the way in which the motor comes to standstill when the drive enable signal is removed.</p> <p>When set to zero (factory default), the drive speed is ramped down to zero according to the setting of P-04 whenever the drive enable signal is removed. The drive will only be disabled when the MOVITRAC® LT E output frequency reaches zero. (Note that DC injection braking can be used to hold zero speed if required - see parameters P-31 and P-32).</p> <p>In the event of the mains supply being lost, the MOVITRAC® LT E will automatically attempt to keep itself operating by braking (regenerating) a rotating motor. The rate of deceleration is set also by P-04, unless P-07 has been set to a non-zero value. In this case, the deceleration ramp rate set in P-07 is used.</p> <p>In general, best performance is achieved when P-07 is somewhat longer than the normal braking time and is also improved when slip compensation is activated (whenever the motor rated speed is entered into P-10).</p> <p>When P-05 is set to 1, coast-to-stop is selected. In this case, the MOVITRAC® LT E output will be disabled as soon as the enable signal is removed, leaving the motor to coast down to zero in an uncontrolled fashion.</p> <p>When P-05 is set to 2, the motor will be ramped down to zero similarly to the case above where P-05 = 0 whenever the drive enable signal is removed.</p> <p>When the mains supply is removed, however, the drive will ramp the output down to zero at the rate defined in P-04 if P-07 = 0, otherwise at the rate defined in P-07. This allows the motor to be stopped rapidly (a form of Emergency Stop), independently of the main deceleration ramp time, in the event of the mains supply being lost.</p>	
		Maximum value:	2
		Minimum value:	0
		Default value:	0
P-06	V/F characteristic select	<p>This parameter defines the rate at which the voltage is applied to the motor as the output frequency increases. For many applications the required characteristic is linear (constant torque selected when P-06 = 0), but for fan and some pump applications, a significant energy saving can be achieved at lower speeds by selecting the variable torque setting (P-06 = 1).</p>	
		Maximum value:	1
		Minimum value:	0
		Default value:	0
P-07	Rapid deceleration ramp rate	<p>The second deceleration ramp can be selected manually or automatically under certain conditions to effectively provide an independent, rapid stop facility that can be used in conjunction with an E-Stop. In most cases, this will be set to a lower value than the standard deceleration ramp rate in P-04.</p> <p>When P-07 = 0, the second deceleration ramp function is disabled.</p> <p>The second deceleration ramp is activated automatically when P-06 = 0 or 2 and the mains supply is lost / removed. This ramp can also be activated manually by closing digital inputs 1 and 2 simultaneously when P-19 has been set to 5, 7 or 9. These inputs would normally be connected to a rapid stop button and could for example be linked in with an E-Stop function.</p>	
		Maximum value:	25 seconds
		Minimum value:	0.0 seconds
		Default value:	0.0 seconds



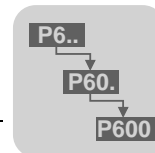
Parameter	Title	Description
P-08	Motor rated current	The rated current of the motor to be connected to the MOVITRAC® LT E (as stamped on the motor rating plate) should be entered into this parameter. This allows the MOVITRAC® LT E to match its internal motor thermal protection (I x t protection) to the motor itself. This ensures that the drive will trip on motor overload (I.t-trP) before any thermal damage results in the motor.
		Maximum value: Rated current of the MOVITRAC® LT E
		Minimum value: $0.25 \times$ rated current of the MOVITRAC® LT E
		Default value: Rated current of the MOVITRAC® LT E
P-09	Motor rated frequency	The rated frequency of the motor to be connected to the MOVITRAC® LT E (as stamped on the motor rating plate) should be entered into this parameter. This defines the frequency at which maximum (rated) output voltage is applied to the motor. Above this frequency, the voltage is held constant at this maximum value. At frequencies below the value entered in P-09, the output voltage varies in accordance with the setting of P-06 (V/F characteristic).
		Note that the V/F curve can also be modified using parameters P-26 and P-29, allowing the user to adapt the V/F curve to suit non-standard motors.
		Maximum value: 500 Hz
		Minimum value: 25 Hz
P-10	Motor rated speed	The rated speed of the motor (in rpm) to be connected to the MOVITRAC® LT E (as stamped on the motor rating plate) should be entered into this parameter if it is required that the MOVITRAC® LT E displays its speed in rpm. Once a value (non-zero) has been entered into this parameter, the operating speed of the motor in rpm will be available on the display. The speed related parameters (i.e. P-01, P-02, P-20...P-23, P-27, P-28) will also be displayed in rpm once an rpm value has been entered into P-10.
		Maximum value: $60 \times$ value of P-09 (e.g. 3000 rpm when P-09 = 50 Hz)
		Minimum value: $12 \times$ value of P-09 (e.g. 600 rpm when P-09 = 50 Hz)
		Default value: 0
P-11	Voltage boost level	The voltage boost level parameter sets the level of voltage that is applied to the motor at zero output frequency (DC). This is used to ensure that the motor has sufficient starting torque to accelerate cleanly away from zero.
		It may be necessary to increase the level of boost if operation at low speeds is required, or if the load connected to the motor needs a particularly large starting torque.
		If operation at very low speed for long periods of time is required, then this parameter should be used with some caution, as large values of voltage boost can cause excessive heating in the motor at low speed. This is due to the fact that the fan connected to the rotor is virtually ineffective at low speed and little or no cooling of the motor results.
		The effect of the voltage boost decreases linearly from the specified value at 0 Hz to zero at half rated frequency (25 Hz for a 50 Hz motor). This approach gives a smoother transition from maximum to zero boost as output frequency increases.
		Maximum value: 25 % of rated motor voltage
		Minimum value: 0
		Default value: 3 % of rated motor voltage



Parameters

Parameter specifications

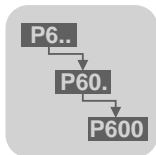
Parameter	Title	Description
P-12	Terminal / Keypad mode select	<p>This parameter allows the user to define whether the MOVITRAC® LT E should be controlled from the User terminal connector (factory default setting) or from the push-buttons on the front of the keypad.</p> <p>When P-12 = 0, terminal control mode is selected. In this case, the drive speed will be controlled either using switches and / or a potentiometer. The function of the digital inputs can be defined using P-19.</p> <p>When P-12 = 1, keypad mode is selected. In this case, the speed of the motor is controlled using the keys on the MOVITRAC® LT E keypad. The <START> and <STOP> buttons will enable and disable the MOVITRAC® LT E output respectively. When enabled, the speed of the MOVITRAC® LT E can be ramped up and down using the <UP> and <DOWN> buttons. If remote keypad operation is required, <START>, <STOP>, <UP> and <DOWN> keys can be mounted on the front of a panel and connected electrically to the digital inputs. See Application Note AN21 for further details. If the MOVITRAC® LT E is stopped whilst running at a particular speed, it will return to that same speed when re-enabled (pushing the <START> button. Note that the MOVITRAC® LT E must have the hardware enable signal applied (digital input 1 closed) before keypad operation is possible. When P-12 = 1, only forward (positive) speeds are possible and a reversal in direction cannot occur.</p> <p>When P-12 = 2, the same functionality as above is achieved except for the fact that reverse operation is possible. In this case, the <START> button doubles up as a reverse "toggle" button. Each press of the <START> button will cause a reversal in direction. After having been stopped, the MOVITRAC® LT E will always start in a positive speed direction. This ensures that there is no ambiguity as to which direction the motor will start in.</p>



5.2.3 Extended parameters overview

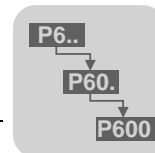
Parameter	Description	Range		Default
P-15	Motor rated voltage	40 V up to mains voltage		0 (motor voltage = mains voltage)
P-16	Analog input V / mA	0-10 V, 4-20 mA, 0-20 mA, 20-4 mA, 10-0 V		0-10 V
P-17	Effective switching frequency	8, 16, 32 kHz		8 kHz
P-18	Relay output function	0	MOVITRAC® LT E Enabled	1 Drive healthy
		1	Drive healthy (not tripped)	
		2	Motor at set speed	
		3	Motor at zero speed (<5 % of P-09)	
		4	Motor at max speed (P-01)	
		5	Motor current overload	
P-19	Digital inputs function select	0 to 12. See chapter 5.3.		0
P-20 ¹⁾	Preset speed 1	P-02 (min) ... P-01 (max)		50 Hz
P-21 ¹⁾	Preset speed 2	P-02 (min) ... P-01 (max)		0 Hz
P-22 ¹⁾	Preset speed 3	P-02 (min) ... P-01 (max)		0 Hz
P-23 ¹⁾	Preset speed 4	P-02 (min) ... P-01 (max)		0 Hz
P-24	Not used			
P-25	Analog output function select	0	Motor speed (analog)	0
		1	Motor current (analog)	
		2	Drive enabled (digital)	
		3	Motor at set speed (digital)	
P-26	V/F characteristic adjustment factor	20 % ... 250 % (Used together with P29.)		100 %
P-27 ¹⁾	Skip frequency / speed	P-02 (min) ... P-01 (max)		0 Hz
P-28 ¹⁾	Skip frequency / speed band	0 upto 100 % of base frequency (P-09)		0 Hz
P-29	V/F characteristic adjustment frequency	0 Hz up to base frequency (P-09). Function disabled when set to 0. (Used together with P26.)		0 Hz
P-30	Drive start mode	Edge-r	requires the run signal once after trip or power down	Auto 0
	Drive start mode	Auto-0	enables whenever a run signal is applied	
	Drive start mode	Auto-1 ... 4	Inverter will attempt to restart after a trip 1 ... 4 times	
P-31	DC injection voltage	0.1 ... 20 %		10 %
P-32	DC injection braking time(s)	0 ... 250 sec.		0 sec.
P-33	DC injection on enable	0	Disable	0
		1	Enable	0
P-34	Not used			
P-35	Analog input scaling factor	1 % ... 500 %		100 %
P-36	Not used			
P-37	Access code definition	0 ... 9999		101
P-38	Parameter access lock	0	All parameters can be changed and are auto- saved on power down	0 (write access and auto-save enabled)
		1	Parameter changes not saved on power down	
		2	Parameter read-only access. No changes allowed.	
P-39	Hours run meter	0 ... 99999 hours		Read only
P-40	Drive identifier software checksum	0000 ... FFFF (hex) Drive rating / software version		Read only

1) If the motor rated speed in rpm has been entered into P-10, parameters P-01, P-02, P-20 ... P-23, P-27 and P-28 are in rpm.

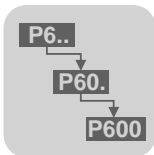


5.2.4 Extended parameters detailed description

Parameter	Title	Description	
P-15	Motor rated voltage	<p>This parameter allows the user to scale the applied motor voltage such that the value set in P-15 is reached when the output frequency reaches rated frequency (as set in P-09). It is therefore possible to run a 220 V motor correctly when the MOVITRAC® LT E has a 400 V supply.</p> <p>In addition, when P-15 has a non-zero value, voltage compensation is activated. This ensures that the output voltage is controlled correctly independent of supply voltage and / or in internal DC bus voltage which may vary significantly during deceleration.</p> <p>When this parameter is set to zero, the motor voltage is equal to the mains voltage when the output frequency reaches rated frequency (as set in P-09). As there is no compensation of the DC link, the output voltage will vary with input voltage and during deceleration. The significant increase in motor voltage during deceleration will increase motor current and motor losses, which may help to brake the motor.</p>	
		Maximum value:	500 V
		Minimum value:	40 V
		Default setting:	0 (motor voltage is equal to mains voltage)
P-16	Analog input format (V / mA)	<p>This parameter allows the user to configure the analog input to suit the format of the signal connected to the analog input. The following formats are supported:</p> <p>Voltage 0 ... 10 V, 10 ... 0 V Current 4 ... 20 mA, 0 ... 20 mA, 20 ... 4 mA</p> <p>When set to 0 ... 10 V or 10 ... 0 V, all negative voltages will give zero speed.</p> <p>All current input formats are unipolar. When 4 ... 20 mA or 20 ... 4 mA is selected, the MOVITRAC® LT E will automatically trip when the input current falls below 2 mA. This is especially important for the inverse (20 ... 4 mA) setting where the drive would otherwise give maximum output speed if the current input was to be interrupted.</p> <p>The analog input format can be switched using digital input 3 when P-19 = 0. A voltage input format will be selected when the input is open, otherwise a current input format is selected. This allows switching between a local (e.g.voltage) signal and a remote (e.g.current) signal.</p>	
P-17	Effective switching frequency	<p>This parameter allows the user to select the drive output switching frequency to cater for different application requirements.</p> <p>All MOVITRAC® LT E are shipped with the effective output switching frequency set to 8 kHz. This minimizes the thermal losses in the MOVITRAC® LT E which therefore runs cooler.</p> <p>When operating at a particular switching frequency, there will be an associated acoustic noise produced by the motor at that particular switching frequency. In most industrial applications, this is of little consequence as the background noise is much greater.</p>	



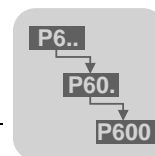
Parameter	Title	Description	
P-18	Relay output function	This parameter allows the user to select under what operating conditions the output user relay contacts are closed. The following settings are available:	
		P18 = 0:	Relay contacts closed when drive output is enabled
		P18 = 1:	Relay contacts closed when drive is healthy (not trip)
		P18 = 2:	Relay contacts closed when the output frequency is within 0.25 Hz of the target (requested) frequency
		P18 = 3:	Relay contacts closed when the output frequency is greater than "zero frequency" (5 % × P-09, i.e. 5 % of base frequency)
		P18 = 4:	Relay contacts closed when the output frequency reaches the maximum (P-01) frequency
		P18 = 5:	Relay contacts closed when the motor output current is greater than the continuous rated current (as specified in P-08)
		Default setting:	1 (drive healthy)
P-19	Digital inputs function select	See chapter 5.3.	
P-20 ... P-23	Preset / Jog speeds 1 ... 4	Parameters P-20 ... P-23 permit the user to define up to 4 individual preset speeds. The preset speeds are selected using the programmable digital inputs and can be set to any value within the range P-02 (minimum value) to P-01 (maximum value).	
		Maximum value:	P-01
		Minimum value:	P-02
		Default setting:	50.0 Hz for P-20 0.0 Hz for P-21 ... P-23
P-25	Analog output function	<p>The function of the analog output can be controlled using this parameter. The following options are available:</p> <p>Using Analog output mode P-25 = 0: Motor Speed. 0 V = zero speed, +10 V = max speed (P-01) P-25 = 1: Motor Current. +10 V = 200 % of the motor rated current (P-08)</p> <p>Using Digital output mode P-25 = 2: +5 V when drive enabled, 0 V when disabled P-25 = 3: +5 V when motor at set speed, 0 V otherwise</p> <p>Digital output mode can be used in conjunction with the optional 2nd relay output module. This 2nd relay is driven by the digital output and effectively adds an independent relay output to that within the MOVITRAC® LT E (controlled from P-18). Default setting: 0 (analog speed output)</p>	



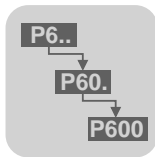
Parameters

Parameter specifications

Parameter	Title	Description
P-26, P-29	V/F characteristic adjustment	<p>The V/F characteristic defines the level of voltage that is applied to the motor at any given frequency. Depending on the setting of P-06, this will have either a linear or quadratic characteristic:</p> <ul style="list-style-type: none"> Linear characteristic <ul style="list-style-type: none"> – Voltage increases linearly to frequency – P-09 = 0 quadratic characteristic <ul style="list-style-type: none"> – Voltage increases in proportion to – $(\text{Frequency})^2$ - P-06 = 1 <p>P-06 set to 0 V/f (constant torque)</p> <p>P-06 set to 1 V/f² (fan pump)</p>



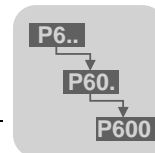
Parameter	Title	Description																
P-26, P-29 (continued)	V/F characteristic adjustment (continued)	<p>Firstly, the above characteristic will be modified by the setting of P-11 (voltage boost level). Parameters P-26 and P-29 then give an extra level of adaptation, allowing the user to further modify the V/F characteristic should this be required.</p> <p>Parameter P-29 can be set to any frequency between 0 and the base frequency (P-09) and represents the frequency at which the percentage adjustment level set in P-26 is applied.</p> <p>This is best visualized by considering a rubber band stretched along a line representing the V/F characteristic. The effect on the V/F characteristic of changing P-26 / P-29 is the same as getting hold of the rubber band at the frequency specified in P-29 and moving it up or down to represent the voltage adjustment level specified in P-26. In this way, there is a smooth change in voltage as frequency increases, thereby avoiding voltage discontinuities.</p> <p>Note that the voltage at any particular frequency can be increased or decreased to suit the needs of the application.</p> <p>When P-29 = 0 this function is disabled.</p> <table><tr><td colspan="2">P26:</td></tr><tr><td>Maximum value:</td><td>250 %</td></tr><tr><td>Minimum value:</td><td>20 %</td></tr><tr><td>Default setting:</td><td>100 %</td></tr><tr><td colspan="2">P-29:</td></tr><tr><td>Maximum value:</td><td>P-09</td></tr><tr><td>Minimum value:</td><td>0 Hz</td></tr><tr><td>Default setting:</td><td>0 Hz</td></tr></table>	P26:		Maximum value:	250 %	Minimum value:	20 %	Default setting:	100 %	P-29:		Maximum value:	P-09	Minimum value:	0 Hz	Default setting:	0 Hz
P26:																		
Maximum value:	250 %																	
Minimum value:	20 %																	
Default setting:	100 %																	
P-29:																		
Maximum value:	P-09																	
Minimum value:	0 Hz																	
Default setting:	0 Hz																	
P-27, P-28	Skip frequency / Skip frequency band	<p>The skip frequency parameters are used to set up a band of frequencies through which the drive output frequency may pass, but never stop in. This is used typically to prevent continuous operation close to any frequency at which mechanical resonances may occur. Such resonances may simply cause excessive acoustic noise or may in some cases cause mechanical stresses that could lead to mechanical failure.</p> <div><p>The graph plots Output frequency on the y-axis against Set point on the x-axis. A solid line represents the 'Default' V/F characteristic, which is a straight line starting from the origin. A dashed line represents the 'Skip frequency band activated' characteristic. This dashed line follows the solid line until it reaches a point labeled P-27 on the y-axis. At this point, it becomes horizontal, extending to a point labeled P-27 + 1/2 P-28 on the y-axis. From there, it continues as a dashed line parallel to the original solid line. The vertical distance between the original solid line and the horizontal segment of the dashed line is labeled P-28. A legend indicates that the solid line is 'Default' and the dashed line is 'Skip frequency band activated'.</p></div> <p>Parameter P-27 specifies the centre point of the skip frequency band and P-28 the width of that band. Consider the following example:</p> <ul style="list-style-type: none">• P-27 = 30Hz, P-28 = 10Hz <p>This will give a skip frequency band between 25Hz and 35Hz, centred on 30Hz. If the analog speed reference then requests a speed within these limits, the speed will remain at the nearest limit. When the output frequency ramps between these 2 limits, it will do so at the ramp rates specified in P-03 and P-04.</p> <p>In the event of the output / motor running at negative speeds, the skip frequency band will have exactly the same effect as in the positive direction.</p> <table><tr><td colspan="2">P27:</td></tr><tr><td>Maximum value:</td><td>P-01</td></tr><tr><td>Minimum value:</td><td>0</td></tr><tr><td>Default setting:</td><td>0</td></tr></table>	P27:		Maximum value:	P-01	Minimum value:	0	Default setting:	0								
P27:																		
Maximum value:	P-01																	
Minimum value:	0																	
Default setting:	0																	



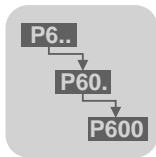
Parameters

Parameter specifications

Parameter	Title	Description
P-27, P-28 (continued)	Skip frequency / Skip frequency band (continued)	P-28:
		Maximum value: P-01
		Minimum value: 0
		Default setting: 0
P-30	Start mode / Auto reset select	This parameter allows the user to define the start-up mode of the MOVITRAC® LT E and operates in conjunction with the hardware enable signal applied between terminals 1 and 2.
		Possible settings:
		Edge-r Requires the run signal to start after a trip or power-down.
		Auto-0 Enables whenever a run signal is present (assuming no trip).
		Auto-1 to Auto-4 As Auto-0 except for the fact that the inverter will attempt to auto restart after a trip. The number of re-start attempts is given by the number following "Auto-". The re-start counter is reset after a power-down.
P-31, P-32, P-33	DC Injection braking control	In the factory default setting (Auto-0), the MOVITRAC® LT E will start and run whenever terminals 1 and 2 are linked, provided there is no trip condition.
		"Edge-r" may be used where the drive should not start automatically on power up should the run switch be closed. In this case, the run switch must be opened and then re-closed before the drive will start. The same rule applies after clearing / re-setting a trip condition.
		If the application requires that the drive attempts to re-start after a trip condition, parameter P-30 can be set to Auto-1 ... Auto-4, in which case the drive will attempt to clear the trip and restart between 1 and 4 times after a trip. After this number of re-starts have been attempted, the drive will remain in a tripped state. Typically, an operator would investigate the cause of the trips at this stage.
		In each of these cases, a delay of 20 seconds will elapse after a trip before the MOVITRAC® LT E attempts a re-start. Default setting: Auto-0 (enables whenever a run signal is present)
		DC injection braking is typically applied just before the output of the MOVITRAC® LT E is disabled (when a stop command has been issued) to ensure that the motor has come to standstill. This is often used in conjunction with a mechanical brake which can be activated using the on-board relay (configured using P-18). The relay contacts will only open when the MOVITRAC® LT E disables its output (P-18 = 0) i.e. after DC injection braking has been applied.
		To cater for different motors / inertias, the level of DC injection braking (voltage) can be set using P-31 and the duration in seconds in P-32.
		Note that DC injection braking is only applied after a stop signal has been issued (drive enable removed) and the output has ramped to zero. If coast to stop has been selected (P-05 = 1), DC injection braking will not be applied.
		In some applications (typically fans and pumps) a motor / load may freewheel when not being driven by the MOVITRAC® LT E (due to air / fluid flow). In these cases, it is beneficial to brake the motor to standstill before attempting to accelerate it up to the operational speed. This prevents possible over-current trips that may otherwise occur. In such cases, the motor can be also braked to zero using DC injection braking. In this case, it must be applied after an enable signal has been applied prior to the output ramping up from zero.



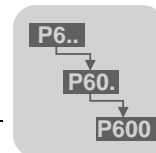
Parameter	Title	Description	
P-35	Speed reference input scaling factor	<p>This parameter is used to scale either the analog speed reference or the digital speed reference, depending on whether the MOVITRAC® LT E is in terminal or keypad mode.</p> <p>When the MOVITRAC® LT E is in terminal mode (P-12 = 0), this parameter is used to scale the analog input so that a 0 ... 10 V signal on the input controls the output speed linearly between the minimum (P-02) and maximum (P-01) speed limits. The adjustment of P-35 to match the operating range P-02 to P-01 is done automatically by the MOVITRAC® LT E whenever P-01 or P-02 is changed.</p> <p>When the MOVITRAC® LT E is in keypad mode (P-12 = 1 or 2), P-35 will typically have a value of 100 %, irrespective of the settings of P-01 and P-02. If the MOVITRAC® LT E is being controlled from its own keypad, or via keys connected to the input terminal strip (remote push-button control), there will normally be no need to change P-35.</p>	
P-37	Advanced menu access code definition	Parameter P-37 can be used to allow the user to specify their own extended menu access code. Access to the extended menu (P-15 to P-40) is only permitted when the value entered into P-14 equals that stored in P-37. In this way, the user may change to code from the standard value of "101" to any desired value. This feature is often used in conjunction with P-38 (parameter write access).	
		Maximum value:	9999
		Minimum value:	0
		Default setting:	101
P-38	Parameter access control	This parameter allows the user to specify what type of access to parameters is to be permitted and can as such be used to lock all parameter write (change) operations.	
		The following settings are available:	
		P-38 = 0	All parameters can be accessed and changed. All changes will be saved in permanent memory and will apply even after a power down. The parameter save-to-memory process is automatic.
		P-38 = 1	All parameters can be accessed and changed. All changes will be saved in temporary memory and will be functional until the MOVITRAC® LT E is powered down. After the next power up, the parameter settings will be extracted from permanent memory such that all changes made with P-38 = 1 will be lost. This setting may be used to test experimental settings without risk of losing a known set of parameter settings.
		P-38 = 2	All parameters can be accessed for read purposes but changes are not permitted. This ensures that a set of working parameters are not changed by unauthorized users. If P-38 has been set to 2, the user can then specify an extended access code in P-37. Only with this code can access to the extended menu be obtained and P-38 changed to 1 or 2.
		Maximum value:	2
		Minimum value:	0
		Default setting:	0 (all changes permitted and changes automatically saved)
P-39	Hours run indicator	This is a read only parameter indicating the number of hours that the MOVITRAC® LT E has been running. It is not resettable and therefore holds useful information on the lifetime of the MOVITRAC® LT E and / or the equipment that it is driving.	
P-40	Drive type identifier / software version	<p>This read only parameter allows the user to determine the MOVITRAC® LT E voltage and power rating in addition to the software version.</p> <p>A typical display indicating the voltage/power rating would be H3 4.0, indicating a 400 V, 3-phase 4.0 kW rating. Similarly, a display of L1 0.75 would indicate a rating of 230 V, 1-phase 0.75 kW.</p> <p>The software version (e.g. 1.05) will be displayed if the user presses the <UP> key on the MOVITRAC® LT E keypad.</p>	



Parameters

Parameter specifications

Parameter	Title	Description																											
P-00	Parameter zero	<p>Parameter zero (P-00) is a special read-only parameter which provides visibility, a window, into the internal control functions of the drive, allowing key internal nodes to be monitored and is intended primarily as a commissioning and diagnostic aid. It is accessible in the extended parameter set. Any one of these values can be selected by scrolling between them using the <up> and <down> keys, as in the case of any other parameter. The currently selected variable is indicated by a single digit number (0 to 9) on the left hand side of the drive display.</p> <p>The following internal variables can be monitored using P-00:</p> <table> <tr> <td>1</td><td>Unscaled analog output (from user terminals)</td><td>Percentage of analog input voltage</td></tr> <tr> <td>2</td><td>Speed ref from scaled (P-35) analog input</td><td>Hz</td></tr> <tr> <td>3</td><td>Pre ramp frequency ref</td><td>Hz</td></tr> <tr> <td>4</td><td>Post ramp frequency ref</td><td>Hz</td></tr> <tr> <td>5</td><td>Not available</td><td></td></tr> <tr> <td>6</td><td>Stator frequency</td><td>Hz</td></tr> <tr> <td>7</td><td>Applied motor voltage</td><td>V</td></tr> <tr> <td>8</td><td>DC Bus Volts</td><td>V</td></tr> <tr> <td>9</td><td>Thermistor voltage</td><td></td></tr> </table>	1	Unscaled analog output (from user terminals)	Percentage of analog input voltage	2	Speed ref from scaled (P-35) analog input	Hz	3	Pre ramp frequency ref	Hz	4	Post ramp frequency ref	Hz	5	Not available		6	Stator frequency	Hz	7	Applied motor voltage	V	8	DC Bus Volts	V	9	Thermistor voltage	
1	Unscaled analog output (from user terminals)	Percentage of analog input voltage																											
2	Speed ref from scaled (P-35) analog input	Hz																											
3	Pre ramp frequency ref	Hz																											
4	Post ramp frequency ref	Hz																											
5	Not available																												
6	Stator frequency	Hz																											
7	Applied motor voltage	V																											
8	DC Bus Volts	V																											
9	Thermistor voltage																												



5.3 Selection of Parameter-19, Digital input function

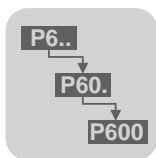
The functionality of the digital inputs within the MOVITRAC® LT E is user programmable, allowing the user to select the functions required for the application.

The following tables define the functions of the digital inputs depending on the value of parameter P12 (Terminal / keypad control) and P-19 (Selection of digital input function).

5.3.1 Selection table if P12 = 0

If P12 = 0 then use the following table.

P-19	Digital input 1 function	Digital input 2 function	Digital input 3 function
0	Open: Stop (Disable) Closed: Run (Enable)	Open: Analog input Closed: Speed Preset 1	Voltage input Current analog input
1	Open: Stop (Disable) Closed: Run (Enable)	Open: Analog input Closed: Speed Preset 1/2 (Digital input 3 selects)	Open: Speed Preset 1 Closed: Speed Preset 2
2	Open: Stop (Disable) Closed: Run (Enable)	Digital input 2: open \ Digital input 3: open / Digital input 3: open \ Digital input 2: closed / Digital input 3: closed \ Digital input 2: open / Digital input 3: closed \ Digital input 2: closed /	→ Selects Speed Preset 1 → Selects Speed Preset 2 → Selects Speed Preset 3 → Selects Speed Preset 4
3	Open: Stop (Disable) Closed: Run (Enable)	External trip input Open: trip, Closed: OK	Open: Analog Input Closed: Speed Preset 1
4	Open: Stop (Disable) Closed: Run (Enable)	Open: Forward Closed: Reverse	Open: Analog Input Closed: Speed Preset 1
5	Open: Stop (Disable) Closed: Fwd Enable	Open: Stop (Disable) Closed: Reverse Enable	Open: Analog Input Closed: Speed Preset 1
6	Open: Stop (Disable) Closed: Run (Enable)	Open: Forward Closed: Reverse	External trip input Open: trip, Closed: OK
7	Open: Stop (Disable) Closed: Fwd Enable	Open: Stop (Disable) Closed: Reverse Enable	External trip input Open: trip, Closed: OK
8	Open: Stop (Disable) Closed: Run (Enable)	Open: Forward Closed: Reverse	Open: Speed Preset 1 Closed: Speed Preset 2
9	Open: Stop (Disable) Closed: Fwd Enable	Open: Stop (Disable) Closed: Reverse Enable	Open: Speed Preset 1 Closed: Speed Preset 2
10	Normally Open (N.O.) Momentarily Close to run	Normally Closed (N.C.) Momentarily Open to stop	Open: Analog Input Closed: Speed Preset 1
11	Normally Open (N.O.) Push to run forwards	Normally Closed (N.C.) Momentarily Open to stop	Normally Open (N.O.) Push to run reverse
12	Open: Stop (Disable) Closed: Fwd Enable	Closed to run Open to activate fast stop	Open: Analog Input Closed: Speed Preset 1



Parameters

Selection of Parameter-19, Digital input function

5.3.2 Selection table if P12 = 1 or 2

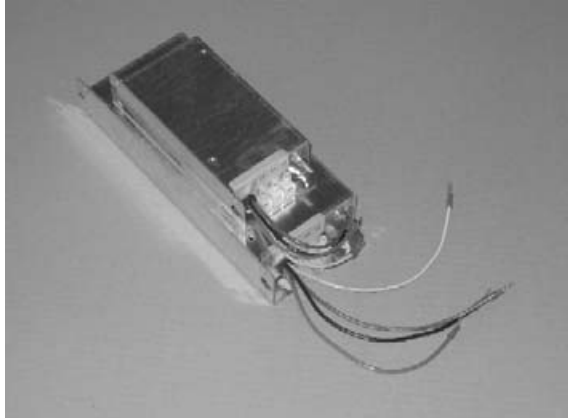
If P12 = 1 or 2 then use the following table.

P-19	Digital input 1 function	Digital input 2 function	Digital input 3 function
0, 1, 2, 4, 5, 8, 9, 10, 11, 12	Open: Stop (Disable) Closed: Run (Enable)	Closed: Remote up pushbutton ¹⁾	Closed: Remote down pushbutton ¹⁾
3	Open: Stop (Disable) Closed: Run (Enable)	External trip input Open: trip, Closed: OK	Open: Keypad speed Closed: Speed Preset 1
6	Open: Stop (Disable) Closed: Run (Enable)	Open: Forward Closed: Reverse	External trip input Open: trip, Closed: OK
7	Open: Stop (Disable) Closed: Run Enable	Open: Stop (Disable) Closed: Reverse Enable	External trip input Open: trip, Closed: OK

1) Closing inputs 1 & 2 at the same time starts the drive.

6 Accessories

6.1 Input filter



54800AXX

The MOVITRAC[®] LT E is available with or without an internal EMC filter. The filter option is used where it is required to meet conducted emission standard EN61000-6-3/4. Please note that all MOVITRAC[®] LT E inherently comply with the EMC radiated emission standards (EN61000-6-2) when good wiring practice is employed.

The internal EMC filters are specified as follows:

- 220 ... 240 V MOVITRAC[®] LT E with internal filter meet EN61000-6-3 Domestic (Class B)
- 380 ... 480 V MOVITRAC[®] LT E with internal filter meet EN61000-6-4 Industrial (Class A)

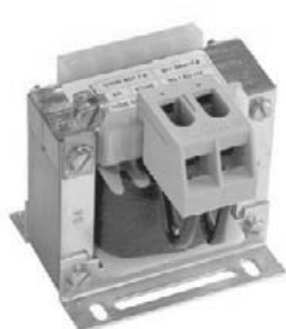
All relevant part numbers are detailed in chapter 4.2, "Product designation".

The external EMC filters can be used for more demanding applications where, for example, the 480 V drive is required to meet domestic (class B) emission requirements. They are specified as follows:

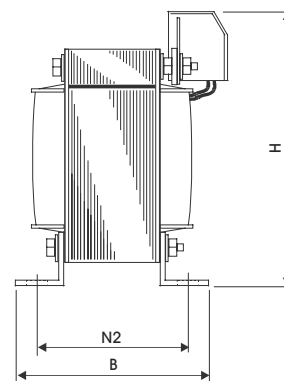
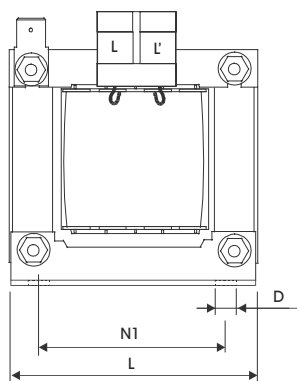
MOVITRAC [®] LT E size	1	1	2	2
Input filter model	NF LT 2B1 010	NF LT 5B3 006	NF LT 2B1 016	NF LT 5B3 016
Part number	18201571	18201601	18201598	18201628
Supply voltage [V] \pm 10 %	220 ... 240	220 ... 480	220 ... 240	220 ... 480
Phases	1	3	1	3
Max output current [A]	10	6	16	16

6.2 Line chokes

Line chokes reduce supply harmonic distortion and protect MOVITRAC® LT E units against harmful supply disturbances. They are also used to reduce the effects of the MOVITRAC® LT E upon supply harmonic distortion.



54801AXX



54886AXX

Line chokes are also used to protect the power input circuits of the MOVITRAC® LT E against voltage spikes which might originate from lightning strikes or other equipment on the same supply.

Type	Part number	MOVITRAC® LT E Size	Rated voltage [V]	Phase	Rated current [A]	Inductance / limb [mH]
ND LT 010 290 21	18201644	1	<230	1	10	2.9
ND LT 025 110 21	18201652	2	<230	1	25	1.1
ND LT 006 480 53	18201660	1	<500	3	6	4.8
ND LT 010 290 53	18201679	2	<500	3	10	2.9

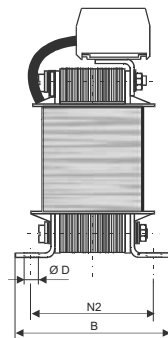
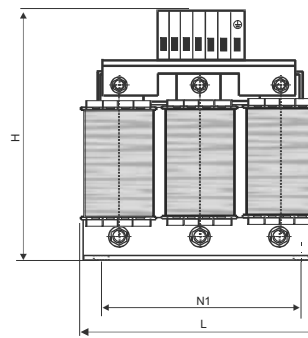
Type	L		B		H		N1		N2		D		Mass	
	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[kg]	[lb]
ND LT 010 290 21	66	2.60	80	3.15	70	2.76	50	1.97	51	2.00	5 × 8	0.2 × 0.31	0.8	1.76
ND LT 025 110 21	85	3.35	95	3.74	95	3.74	64	2.52	59	2.32	5 × 8	0.2 × 0.31	1.8	3.97
ND LT 006 480 53	95	3.74	56	2.20	107	4.21	56	2.20	43	1.69	5 × 9	0.2 × 0.35	1.3	2.87
ND LT 010 290 53	125	4.92	71	2.80	127	5.00	100	3.94	55	2.17	5 × 8	0.2 × 0.31	2.5	5.51

6.3 Output chokes

Output chokes improve the quality of the output waveform.



54803AXX



54887AXX

MOVITRAC® LT E, like the majority of other inverter drives, have unfiltered outputs. In the majority of applications this will give satisfactory performance, however, in a small number of applications output filtering is strongly recommended to improve system functionality, reliability and lifetime.

These applications include:

- High capacitance motor cables
- Long motor cables, up to 300 m
- Multiple motors connected in parallel
- Motors without inverter grade insulation

A range of high quality output chokes are available for MOVITRAC® LT E with the following key features:

- Limits output voltage gradient
- Limits transient over voltages at motor terminals, typically <1000 V
- Suppression of mains conducted interference in lower frequency ranges
- Compensation of capacitive load currents
- Reduction of RFI emissions of the motor cable
- Reduction of motor losses and audible noise caused by ripple

Type	Part number	MOVITRAC® LT E Size	Rated voltage [V]	Rated current [A]	Inductance / limb [mH]
HD LT 008 200 53	18201695	1	500 V	8	2
HD LT 012 130 53	18201709	2	500 V	12	1.3

Type	L		B		H		N1		N2		D		Mass	
	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[kg]	[lb]
HD LT 008 200 53	100	3.94	90	3.54	75	2.95	60	2.37	48	1.89	4	0.16	1.5	3.31
HD LT 012 130 53	125	4.92	115	4.52	85	3.35	100	3.94	55	2.17	5	0.2	3.0	6.61

6.4 DIN rail mounting kit

A mounting kit is available to fit the MOVITRAC® LT E onto a DIN rail.

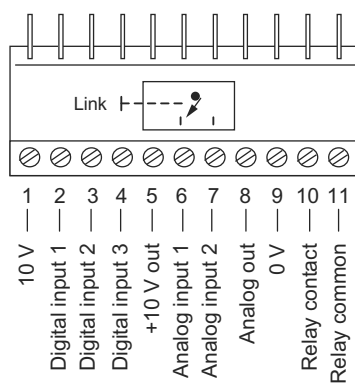
Type	Part number	MOVITRAC® LT E Size
FH LT DINHS 01	18201776	1
FH LT DINHS 02	18201784	2



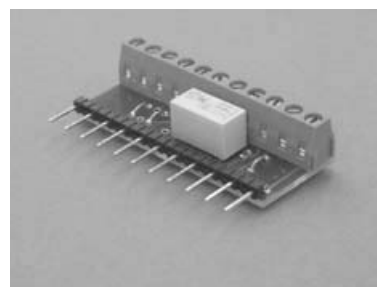
54888AXX

6.5 Second analog input

Type	Part number
OB LT 2ANIN	18201547



54813AXX



54816AXX

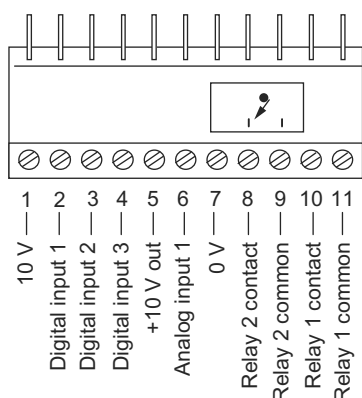
This board allows automatic switching between 2 analog references.

6.5.1 Specification of second analog input

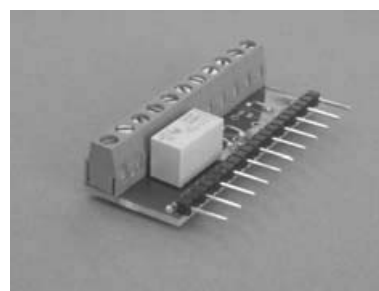
Analog input 1	± 10 V DC or 4 ... 20 mA	
Analog input 2	± 10 V DC or 4 ... 20 mA	
Conformity	IP00, UL94V-0	
Environmental	-10 ... +50 °C	
Dimensions	[mm]	56 × 24 (not pins) × 14
	[in]	2.20 × 0.98 (not pins) × 0.56

6.6 Second relay output

Type	Part number
OB LT 2ROUT	18201555



54929AXX



54821AXX

This board provides a programmable second relay output which is controlled using P-25.

The second relay output is controlled using MOVITRAC® LT E Parameter 25:

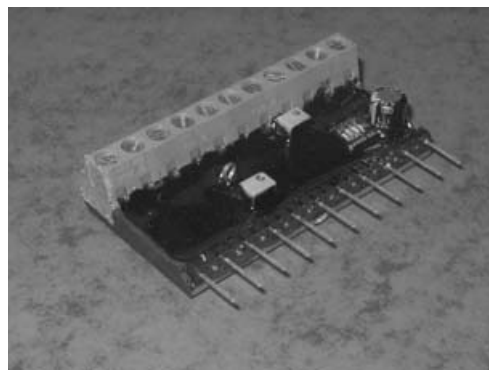
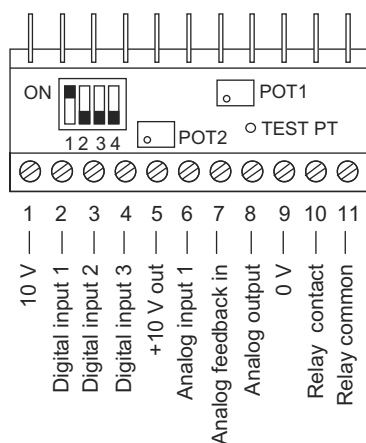
- P-25 = 2: Relay 2 contacts closed when inverter enabled
- P-25 = 3: Relay 2 contacts closed when inverter at set (requested) speed

6.6.1 Specification of second relay output

Max. relay switching voltage	250 V AC / 220 V DC
Max. relay switching current	1 A
Conformity	IP00, UL94V-0
Environmental	-10 ... +50 °C
Dimensions	[mm] 56 × 24 (not pins) × 14
	[in] 2.20 × 0.98 (not pins) × 0.56

6.7 PI Controller

Type	Part number
OB LT PICON	18201563



54835AXX

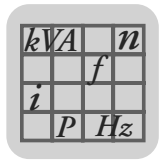
54832AXX

Key benefits:

- Small physical size
- Potted for robustness and environmental protection
- Minimal setup for quick and easy commissioning
 - integral gain set by 2 switches
 - proportional gain set by potentiometer
- Built in reference potentiometer for convenient setup for feedback reference point.

6.7.1 Specification of PI Controller

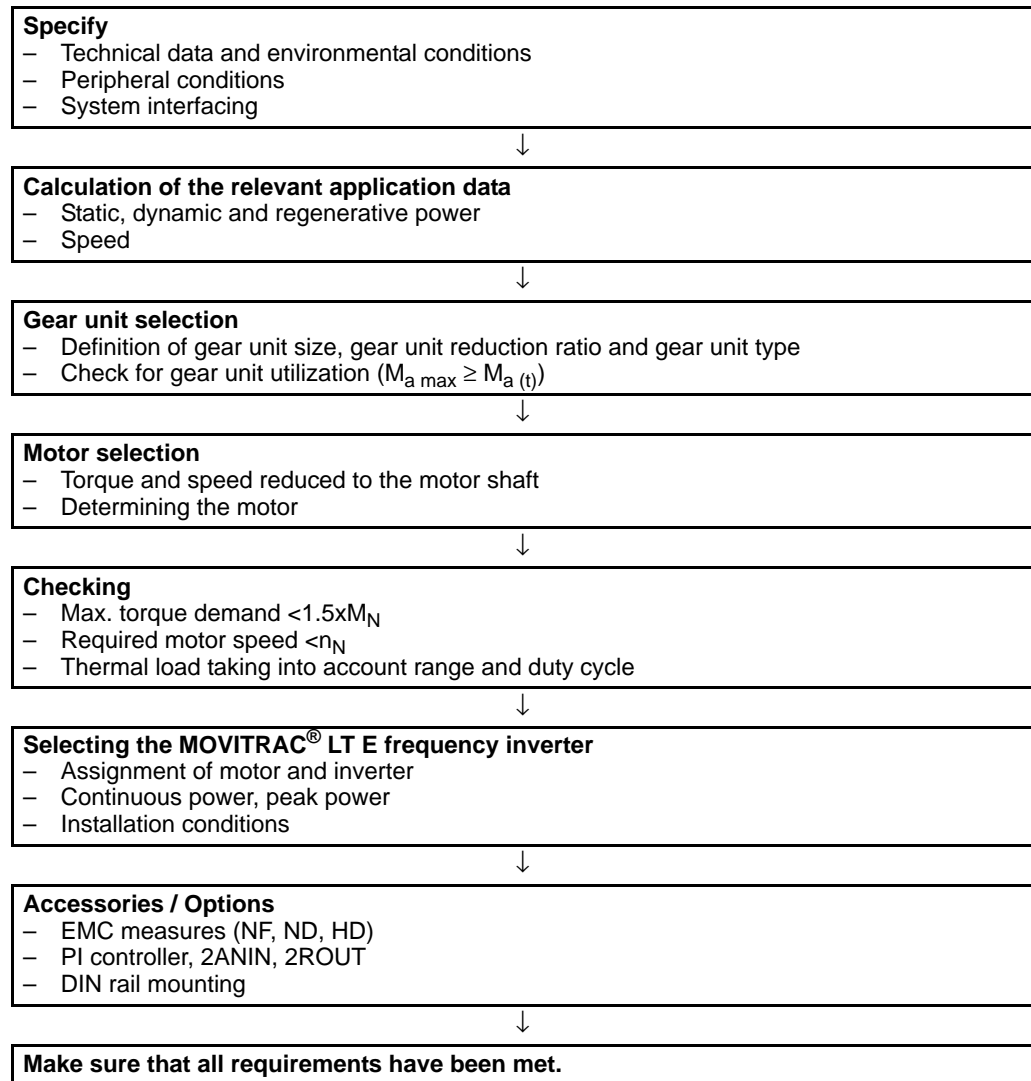
Rated reference input	$\pm 10 \text{ V}$ or $4 \dots 20 \text{ mA}$
Proportional gain range	$0.2 \dots 30$
Rated feedback input	$\pm 10 \text{ V}$ or $4 \dots 20 \text{ mA}$
Conformity	IP00, UL90V-0
Environmental	$-10 \dots +50 \text{ }^{\circ}\text{C}$
Dimensions	[mm]
	[in]
	$56 \times 33 \text{ (not pins)} \times 16$
	$2.20 \times 1.31 \times 0.64$

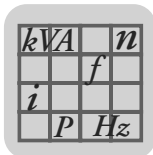


7 Project planning

7.1 Schematic procedure

The required drive properties are the main factors determining the selection of the inverter. The following figure is intended to provide assistance when selecting the inverter.





7.2 Motor selection for asynchronous AC motors

7.2.1 Basic recommendations

Observe the following recommendations for selecting the motor:

- Only use motors with a thermal classification of at least F.
- Use TF thermistor sensors or TH winding thermostats. TH should be taken in the case of group drives on one inverter. The series connection of TH contacts (NC contacts) is not subject to any restriction if joint monitoring is provided.
- For group drives, we recommend that the motors should not differ from one another by more than 3 motor types.
- 4-pole motors should be used. This recommendation particularly applies to gearmotors that are operated with a high oil filling level due to their vertical mounting position.
- The motor can be operated at its listed power without forced cooling if the operating conditions differ from S1 operation, e.g. positioning drive with 1:20 speed range in S3 operation.
- Avoid selecting a motor which is too large, especially in case of a delta connection. Otherwise, the inverter may trigger a short circuit detection function due to the small winding resistance of the motor (1/3 that of a star connection).
- A MOVITRAC® LT E is required for speed control.

7.2.2 Voltage / Frequency characteristics (V/F)

The asynchronous motor follows a load-dependent voltage / frequency characteristic in V/F operating mode. This characteristic curve is set by entering the rated motor voltage and the rated frequency of the motor in the startup function.

The following figure shows an example of the voltage / frequency characteristic curves of an asynchronous AC motor 230 / 400 V, 50 Hz.

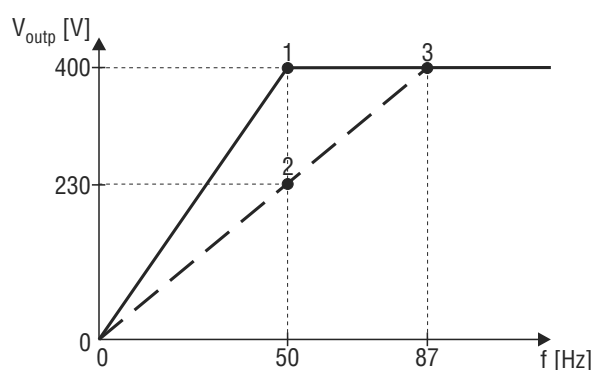
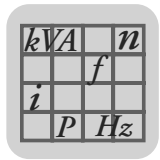


Figure 3: Voltage / frequency characteristics of the asynchronous motor

01650BEN

- | | | |
|---|------------------|--|
| 1 | Star connection | V_{mains} 400 V, P-09 = 50 Hz |
| 2 | Delta connection | V_{mains} 230 V, P-09 = 50 Hz |
| 3 | Delta connection | V_{mains} 400 V, P-09 = 87 Hz |



7.2.3 Project planning

The inverter output voltage V_2 is limited by the connected supply voltage. The "rated supply voltage" input value in the startup function limits the effective value of the maximum output voltage. This restriction is used whenever the connected motor has a lower rated voltage than the power supply of the inverter. The maximum permitted motor voltage should be entered in P-15. Furthermore, make sure that the "rated supply voltage" input value is less than or equal to the supply voltage of the inverter.

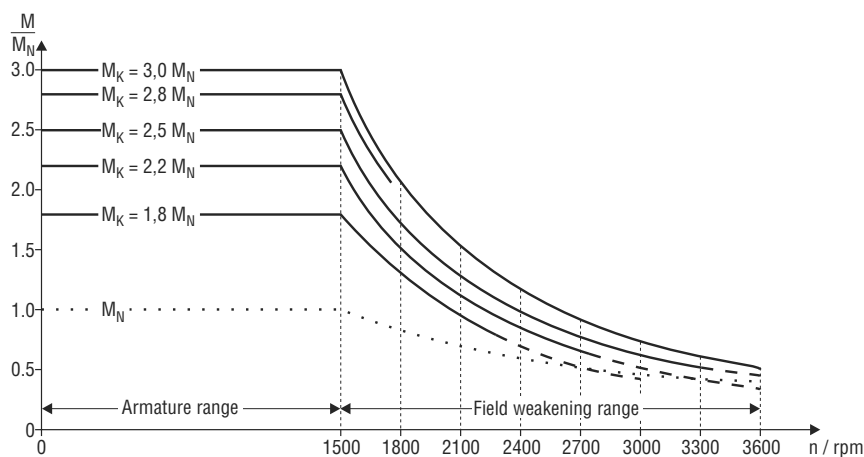
7.2.4 Speed and torque characteristics

The field weakening range starts when the set maximum output voltage of the inverter is reached. Consequently, the speed range of the motor is divided into 2 ranges:

Basic speed range	Constant torque with increasing power
Field weakening range	Constant power with an inversely proportionate decrease in torque

When determining the maximum speed in the field weakening range, note that the rate torque M_N (in relation to the rated speed, e.g. $n_N = 1500 \text{ min}^{-1}$) falls in inverse proportion and the breakdown torque M_K is reduced in an inverse quadratic relationship. The M_K / M_N ratio is a motor-specific parameter.

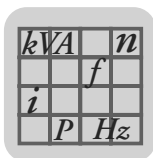
The following figure shows an example of different motor characteristic curves in the basic speed range and in the field weakening range.



01729BEN

Figure 4:

With gearmotors, the maximum motor speed depends on the size and mounting position of the gear unit. The speed should not exceed 3000 min^{-1} due to the resulting noise and oil churning losses.



7.2.5 Motor selection for asynchronous AC motors (P_{inverter} greater than P_{motor})

Special measures must be taken during project planning and startup in the case of inverter / motor combinations where the inverter power is greater than 4 times the motor power. The reason is the considerable difference between rated inverter current and rated motor current.

Please note the following measures:

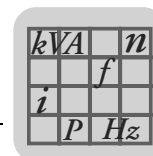
- Project planning for connecting the motor in a delta connection. This means the motor current is increased by a factor $\sqrt{3}$ and the unfavorable ratio is reduced.
- If this measure does not suffice a smaller inverter has to be used.

7.3 Inverter → motor combinations

The tables below are an extract from the SEW-EURODRIVE catalog for gearmotors.

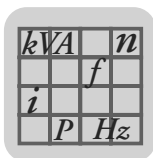
Motors for 220 V ... 240 V, 50 / 60 Hz connection

SEW-EURODRIVE Motor type	Motor power		Motor rated speed	Inverter type MC LT E -201-00 MC LT E -2B1-00
	[kW]	[hp]		
DT71D4	0.37	(0.5)	1380	0004
DT71D4 NEMA	0.37	(0.5)	1700	0004
DT80K4	0.55	(0.75)	1360	0008
DT80K4 NEMA	0.55	(0.75)	1700	0008
DT80N4	0.75	(1.0)	1380	0008
DT80N4 NEMA	0.75	(1.0)	1700	0008
DT90S4	1.1	(1.5)	1400	0015
DT90S4 NEMA	1.1	(1.5)	1740	0015
DT90L4	1.5	(2.0)	1410	0015
DT90L4 NEMA	1.5	(2.0)	1720	0015
DV100M4	2.2	(3.0)	1410	0022
DT100LS4 NEMA	2.2	(3.0)	1720	0022



Motors for 380 V ... 480 V, 50 / 60 Hz connection

SEW-EURODRIVE Motor type	Motor power		Motor rated speed	Inverter type MC LT E -501-00 MC LT E -5A1-00
	[kW]	[hp]		
DT80K4	0.55	(0.75)	1360	0008
DT80K4 NEMA	0.55	(0.75)	1700	0008
DT80N4	0.75	(1.0)	1380	0008
DT80N4 NEMA	0.75	(1.0)	1700	0008
DT90S4	1.1	(1.5)	1400	0015
DT90S4 NEMA	1.1	(1.5)	1740	0015
DT90L4	1.5	(2.0)	1410	0015
DT90L4 NEMA	1.5	(2.0)	1720	0015
DV100M4	2.2	(3.0)	1410	0022
DV100LS4 NEMA	2.2	(3.0)	1720	0022
DV100L4	3.0	(4.0)	1400	0040
DV100L4 NEMA	3.7	(5.0)	1680	0040
DV112M4	4.0	(5.4)	1420	0040
DV112M4 NEMA	4.0	(5.4)	1730	0040



Project planning

Match a filter / choke to the inverter

7.4 Match a filter / choke to the inverter

In most applications one inverter is connected to one choke or filter. Some applications however require more than one inverter to be connected to a choke. If there are more inverter connected to one input filter or line choke, the input current of all inverters must be less or equal to the rated current of the filter or choke.

The following table relates the input filters, line chokes and the output chokes to the MOVITRAC® LT E.

Unit type MC LT E A..	Size	Input Filters NF LT xxx xxx				Line Chokes ND LT xxx xxx xx				Output Chokes HD LT xxx xxx xx	
		2B1 010	5B3 006	2B1 016	5B3 016	010 290 21	025 110 21	006 480 53	010 290 53	008 200 53	012 130 53
0004 101 1 00	1									X	
0008 101 1 00	2										X
0011 101 1 00	2										X
0004 201 1 00	1	X				X				X	
0008 201 1 00	1	X				X				X	
0015 201 1 00	1	X				X				X	
0022 201 1 00	2			X			X				X
0004 2B1 1 00	1	X				X				X	
0008 2B1 1 00	1	X				X				X	
0015 2B1 1 00	1	X				X				X	
0022 2B1 1 00	2			X			X				X
0008 503 1 00	1		X					X		X	
0015 503 1 00	1		X					X		X	
0022 503 1 00	2				X				X		X
0040 503 1 00	2				X				X		X
0008 5A3 1 00	1		X					X		X	
0015 5A3 1 00	1		X					X		X	
0022 5A3 1 00	2				X				X		X
0040 5A3 1 00	2				X				X		X



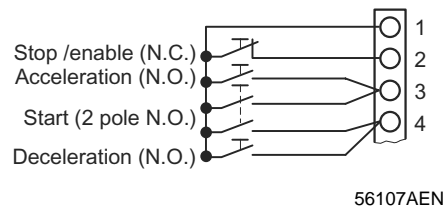
A detailed description of each product is given in chapter 6, "Accessories".

7.5 Motor potentiometer function (remote pushbutton mode)

When P-12 = 1, keypad mode is selected motor potentiometer function is enabled. In this case, the speed of the motor is controlled using the keys on the MOVITRAC® LT E keypad or using remote push-buttons on the digital inputs 1, 2 and 3.

For using motor potentiometer function P-19 should be not be set to 3, 6 or 7, as the related function interfere with the remote pushbutton operation.

The following wiring diagram relates the control function to the push-buttons:



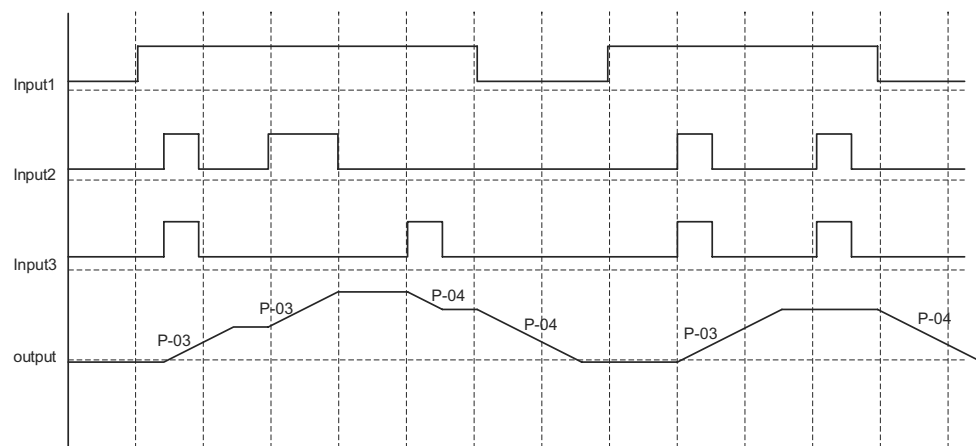
The <STOP> button will enable and disable (stop) the MOVITRAC® LT E. When the drive is enabled, the motor can be started using a 2 pole push-button on digital input 2 and 3. During operation the speed of the MOVITRAC® LT E can be ramped up and down using the <UP> button on digital input 2 and the <DOWN> button on digital input 2.

All remote push-buttons can be mounted on the front of a panel and connected electrically to the digital inputs. If the MOVITRAC® LT E is stopped whilst running at a particular speed, it will return to that same speed after re-enabled when the <START> button is pushed.

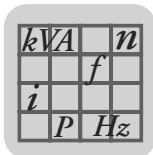
7.5.1 Forward only remote pushbutton mode (P-12 = 1)

The following graphic illustrates the forward only remote pushbutton mode.

P-12 = 1 (unidirectional)



When P-12 = 1, only forward (positive) speeds are possible and a reversal in direction cannot occur.

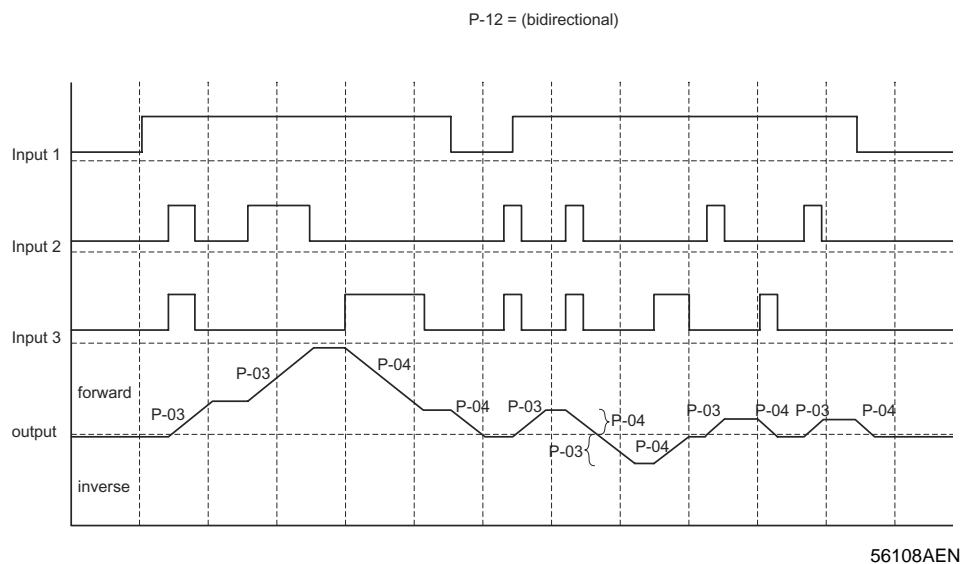


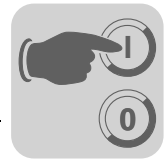
Project planning

Motor potentiometer function (remote pushbutton mode)

7.5.2 Forward and reverse remote pushbutton mode (P-12 = 2)

The following graphic illustrates the forward only remote pushbutton mode.





8 Startup

8.1 Startup procedure

The MOVITRAC® LT E will spin a motor without any parameter adjustments being made to the drive, however a minimum of parameter setup is recommended to ensure maximum motor power.

In general, the "nameplate data" taken from the rating plate of the motor should be entered into the MOVITRAC® LT E to ensure that the drive is matched to the motor, thereby avoiding risk of damage to the motor.

8.2 Minimum parameter setup

Parameter	Title	Description
P-08	Motor rated current	<p>The motor rated current in Amps should be entered into this parameter. Most industrial motors have a Star / Delta rating to allow operation at different voltages. Care should be taken to ensure that the current rating taken from the ratings plate corresponds to the motor voltage rating (this depends on the way in which the motor is connected (Star or Delta). Typically, this will be displayed as 220 V / 400 V, 3.3 A / 1.9 A.</p> <p>When this parameter has been set, the MOVITRAC® LT E will monitor the current and be able to determine whether or not the motor is in overload. Should the motor run in an overload condition for long periods of time (minutes), the MOVITRAC® LT E will trip on "l.t trp". This provides one level of protection to prevent the motor from overheating.</p> <p>The factory default setting for this parameter is the rated current of the MOVITRAC® LT E.</p>
P-09	Motor rated frequency	<p>The motor rated frequency in Hertz should be entered into this parameter. In general, this value will be 50 Hz so that no change is required to the factory default setting.</p> <p>The 60 Hz drives have this parameter set to 60 Hz as default. This is displayed as (60 Hz) on the label of the inverter.</p> <p>This parameter can be changed in the range of 0 to 500 Hz for use with high-speed motors.</p>
P-10	Motor rated speed in RPM	<p>This parameter only needs to be set if the user requires the output frequency converted to speed in RPM.</p> <p>When the rated speed has been set, all speed-related parameters (e.g. maximum or minimum speed etc.) will be in RPM.</p> <p>The MOVITRAC® LT E display will also show the running speed in RPM in addition to the speed in Hertz and current in Amps during normal operation.</p>

8.3 Starting the motor

With P-12 = 0 (terminal mode) and 10 V on terminal 2 the motor speed is controlled by the analog setpoint (terminal 6).



8.4 Group drive with MOVITRAC® LT E

With MOVITRAC® LT E a group of asynchronous motors can be operated on one inverter.

Motor currents The total of the motor currents must not exceed the rated output current of the inverter.

Motor lead The permitted length of all motor leads connected in parallel is determined as follows:

$$l_{ges} \leq \frac{l_{max}}{n}$$

04999AXX

l_{tot} = Total length of the motor leads connected in parallel

l_{max} = Recommended maximum motor lead length

n = Number of motors connected in parallel

For this kind of application it is recommended to use unshielded motor leads.

Motor size The motors in a group must not be more than 3 motor types apart.

Output filter There is usually no need for an output filter for small groups of 2 to 3 motors. An output filter HF.. is required if the maximum motor lead length (l_{max}) given in the table is inadequate. This may be the case in large groups (n) or when there are long motor lead lengths connected in parallel (l_{tot}).

The maximum lead length is then no longer restricted by the limit given in the table but rather is restricted by the voltage drop on the motor lead.

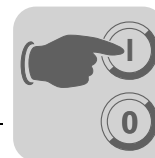
The total value of the rated motor currents must not exceed the rated current of the output filter.

The parameter settings apply to all connected motors.

8.5 Connecting explosion-proof AC motors

Comply with the following instructions when connecting explosion-proof AC motors to MOVITRAC® LT E drive inverters:

- The inverter must be installed outside the potentially explosive atmosphere.
- Comply with regulations specific to the industry and country.
- Comply with the regulations and instructions issued by the motor manufacturer with regard to operation on a frequency inverter, e.g. requirement for a sine filter.
- In future, all tools and fixtures in the potentially explosive atmosphere must comply with directive 94/9/EC (ATEX 100a).
- The TF/TH input on the MOVITRAC® LT E must not be used for thermal monitoring of the motor. Use a TF/TH trip switch which is approved for use in potentially explosive atmospheres for thermal monitoring.
- In the case of motors with speed feedback (PI control), the tachometer must also be approved for use in potentially explosive atmospheres. The tachometer can be directly connected to the PI Controller.



9 Operation and Service

To enable the operational status of the drive to be determined at any time, the following information is displayed:

Drive OK	Drive status mnemonics static
Drive running	Drive status mnemonics operational
Fault / trip	Fault mnemonic

9.1 Drive status

9.1.1 Status mnemonics static

The following list indicates which mnemonics will be displayed as drive status information when the motor is at a standstill.

Mnemonic	Description
StoP	Drive power stage disabled. This message will be displayed when drive is stopped and no faults are present. The drive is ready for normal operation.
P-deF	Default parameters loaded. This message will be displayed when the user invokes the command to load the factory default parameters. This message has to be quit before the drive go back into operation.
Stndby	Drive is in standby. This message will be displayed 30 seconds after the drive is on 0 speed and the setpoint is 0 as well.

9.1.2 Status mnemonics operational

The following list indicates which mnemonics will be displayed as drive status information when the motor is in operation.

Use the NAVIGATE button on the keypad to toggle between output frequency, output current and speed.

Mnemonic	Description
H xxx	This message will be displayed when drive is running. The drive output frequency is displayed.
A xxx	This message will be displayed when drive is running. The drive output current is displayed.
xxxx	This message will be displayed when drive is running and the motor rated speed is put in parameter P-09. The drive output speed is displayed in rpm.
. (flashing dots)	Output current of the drive exceeds the current which is set in P-09. MOVITRAC® LT E will monitor the level and duration of the overload. Depending on the overload level, the MOVITRAC® LT E will trip with "I.t-trP".



9.2 Fault codes and fault history

9.2.1 Fault mnemonic

The following list indicates which mnemonics will be displayed as error message under certain conditions.

Mnemonic	Description
O-I	Over-current on drive output. If this occurs during normal operation, it may indicate an excessive acceleration rate or that the kW rating of the motor is greater than that of the drive.
O-Volt	Over-voltage on DC bus. This may occur if the deceleration rate is too rapid. Normally, this can be resolved by fitting an external braking resistor(s) to the MOVITRAC® LT E power terminals. Ensure that P-34 is set to 1 or 2 to enable the MOVITRAC® LT E internal braking circuit.
U-Volt	Under voltage on DC bus. This indicates that the mains supply voltage is below the minimum limit. This message occurs naturally every time the supply to the drive is switched off.
I.t-trP	Motor thermal overload. When the motor current level exceeds 100 % of the motor current value entered into P-08, the MOVITRAC® LT E will monitor the level and duration of the overload. Depending on the overload level, the MOVITRAC® LT E will trip with this message after a certain time period. Typically, the MOVITRAC® LT E will deliver 150 % of the current in P-08 for 1 minute.
th-Flt	Faulty thermistor on heatsink. This is not a user serviceable part. The user must refer to their authorized MOVITRAC® LT E distributor to rectify this fault.
EE-F	EEPROM checksum failure. Parameters not saved, defaults reloaded. This is not a user serviceable part. The user must refer to SEW to rectify this fault.
PS-trp	Internal power stage fault, indicating an over-current or a thermal overload within the power switching module. If this fault occurs as soon as the MOVITRAC® LT E is enabled, it may indicate a failed power module. In this case, The user must refer to SEW to rectify this fault.
O-t	Heatsink over temperature. This generally indicates that the MOVITRAC® LT E is operating at too high a switching frequency for the operating load and / or environmental temperature. Reduce the switching frequency or improve airflow / cooling to overcome this problem.
E-trP	External trip. This trip message occurs when one of the digital inputs has been configured (using P-19) to support an external trip. Depending on the setting of P-19, this may be Digital input 2 or 3. Both of these inputs are suitable for thermistor connection (type PT100). When this input is shorted to 0 V (or < 2 k), no trip will occur. When the resistance increases beyond 5 k, the MOVITRAC® LT E will trip on E-trP.
lin-F	The current level on the analog input has fallen below 2 mA when the input is configured for 4 ... 20 mA operation. The current should remain within the expected range.

9.2.2 Fault history

The parameter P-13 in the parameter mode holds a record of the most recent 4 trips and / or events that have occurred. Each trip will be displayed in abbreviated text, with the most recent trip being displayed first (on entering into the value of P-13).

Whenever a new trip occurs, this is entered at the top of the list and the other trips move down. The oldest trip will then be removed from the trip log.



If the most recent trip in the trip log is an "under-voltage" trip, further under-voltage trips will not be entered into the trip log. This is to ensure that the trip log does not fill up with under-voltage trips which occur naturally every time the MOVITRAC® LT E is turned off.



10 SEW electronics service

Send in for repair

Please contact the **SEW-EURODRIVE electronics service** if a fault cannot be rectified.

When contacting the SEW electronics service, please always quote the digits of your service code to enable our service personnel to assist you more effectively.



Please provide the following information when sending the unit in for repair:

- Serial number (→ nameplate)
- Unit designation
- Digits of the service code
- Brief description of the application (application, control via terminals or serial)
- Connected components (inverter, etc.)
- Nature of the error
- Accompanying circumstances
- Your own presumption of what has happened
- Any unusual events preceding the problem, etc.



Index

A

Accessories	7, 35
Application environment	5
Applications	7

C

Conformance	12
-------------------	----

D

Dimensions	13
<i>Non vented metal housing</i>	14
<i>Vented metal housing</i>	14
DIN rail mounting kit	38
Display	17

E

Environment, application	5
Environmental	12
Explanation of symbols	4
Explosion-proof areas	5
Extended parameters	25

I

Important Notes	4
Input filter	35
Input voltage ranges	8
Installation	6
Interface, user	17

K

Keypad	17
--------------	----

M

Mains supply compatibility	7
Markets	7
Motor and inverter selection	44
Motor selection	41

O

Operation	6
Operation and service (MDR60A0370/0750)	
<i>SEW Electronics Service</i>	53
Output indicators	37
Output power	9
Overload	12
Overview, product	7

P

P-19 Digital inputs	33
Parameters	
<i>Extended</i>	25
<i>Standard</i>	20
Physical dimensions	13
PI Controller	40
Power, output	9
Product designation	8
Product overview	7
Project planning flowchart	41
Protection features	12

R

Rail mounting kit, DIN	38
Repair	53

S

Safety Notes	6
Second analog input	
<i>Analog input</i>	38
Second relay output	
<i>Relay output</i>	39
Select a motor	41
Servicing	6
Signal terminals overview	16
Specifications	8
Standard parameters	20
Startup	6
Symbols, explanation	4

T

Technology	7
------------------	---

U

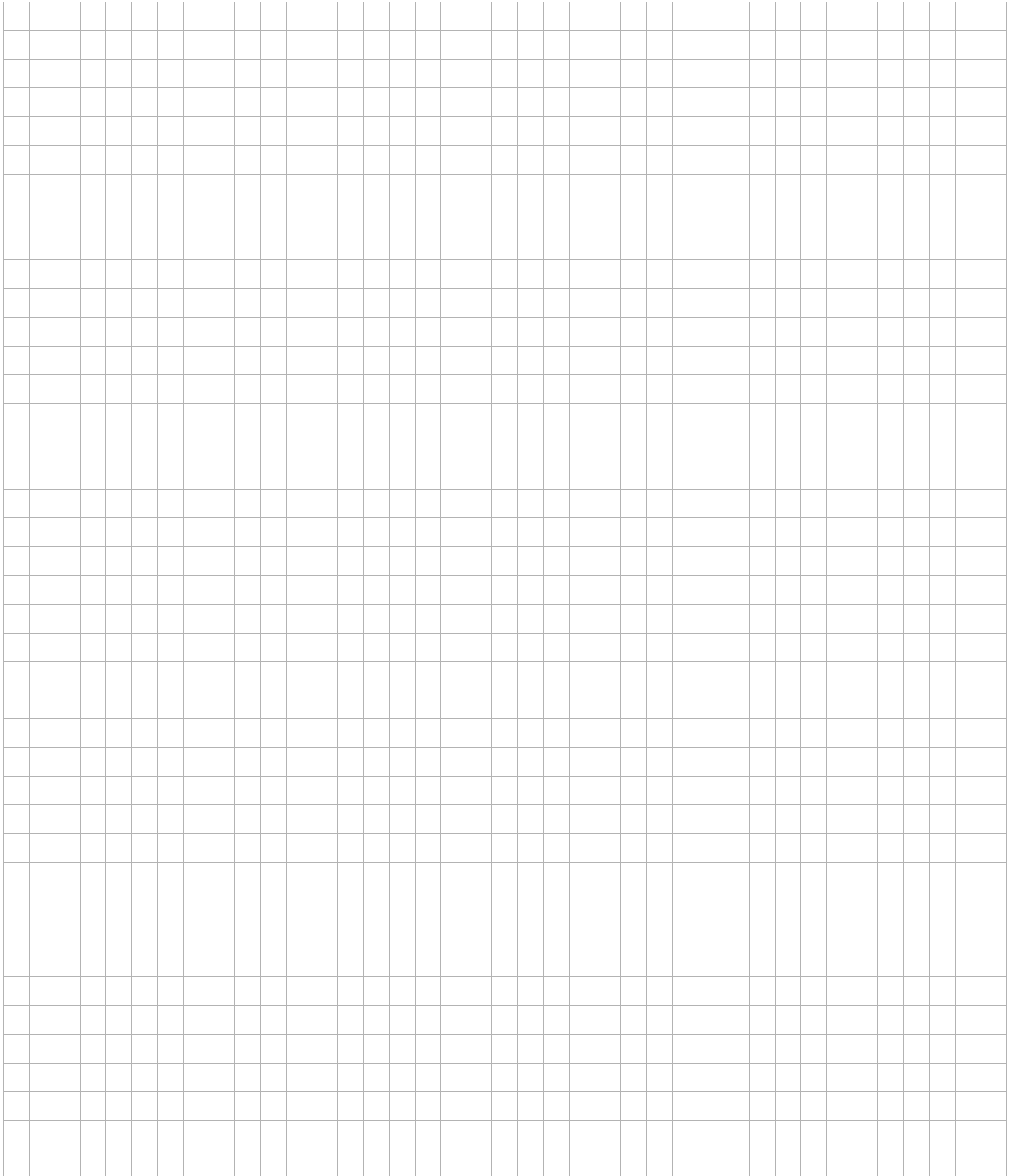
User interface	17
----------------------	----

V

Voltage ranges, input	8
-----------------------------	---

W

Waste disposal	5
----------------------	---



How we're driving the world

With people who think fast and develop the future with you.



With a global presence that offers responsive and reliable solutions. Anywhere.

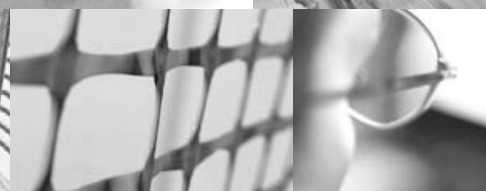


With a worldwide service network that is always close at hand.

With drives and controls that automatically improve your productivity.



With innovative technology that solves tomorrow's problems today.



With comprehensive knowledge in virtually every branch of industry today.



With online information and software updates, via the Internet, available around the clock.

With uncompromising quality that reduces the cost and complexity of daily operations.



SEW-EURODRIVE
Driving the world



**SEW
EURODRIVE**

SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023 · D-76642 Bruchsal / Germany
Phone +49 7251 75-0 · Fax +49 7251 75-1970
sew@sew-eurodrive.com

→ www.sew-eurodrive.com