



# SK500E STANDARD CONNECTION DIAGRAMS



## 1. Overview

This user manual applies to NORD SK500E AC Vector Drive products and provides general information for standard wiring configurations for the products. Information and instructions provided in this manual, safety and commissioning information and all other manuals applicable to any items supplied by NORD must be observed.

This instruction manual is not intended to include comprehensive details and information related to all possible design variations or accessories options available with NORD AC drives. If there is any uncertainty about specific procedures, instructions, please contact NORD for additional information or clarification.

Before installing, operating, or performing maintenance on any electrical device please familiarize with the following:

- The detailed operating instructions and wiring diagrams.
- All applicable national, local and system-specific regulations, codes and practices.
- The national / regional regulations governing safety and accident prevention.
- The proper use of any tools, transportation or hoisting equipment, and safety equipment needed to complete the installation.
- To avoid serious injury or possible damage to the equipment or machine, compliance with all safety and information notes is mandatory!

	<b>WARNING</b>	
<p>All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!</p>		

	<b>WARNING</b>	
<p>To avoid electrocution, injury or death, make certain the device is properly grounded, completely de-energized and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.</p>		

## 2. User Manual Reference

Compliance with the maintenance instructions is necessary for fault free operation as well as acceptance in the instance of any warranty claims.



Please refer to BU500 for any additional operation/servicing requirements other than the information listed within the following pages.

You should have received a copy of the BU0500 user manual with your device and you may also download a copy under the "Manuals" area of our website at [www.nord.com](http://www.nord.com).

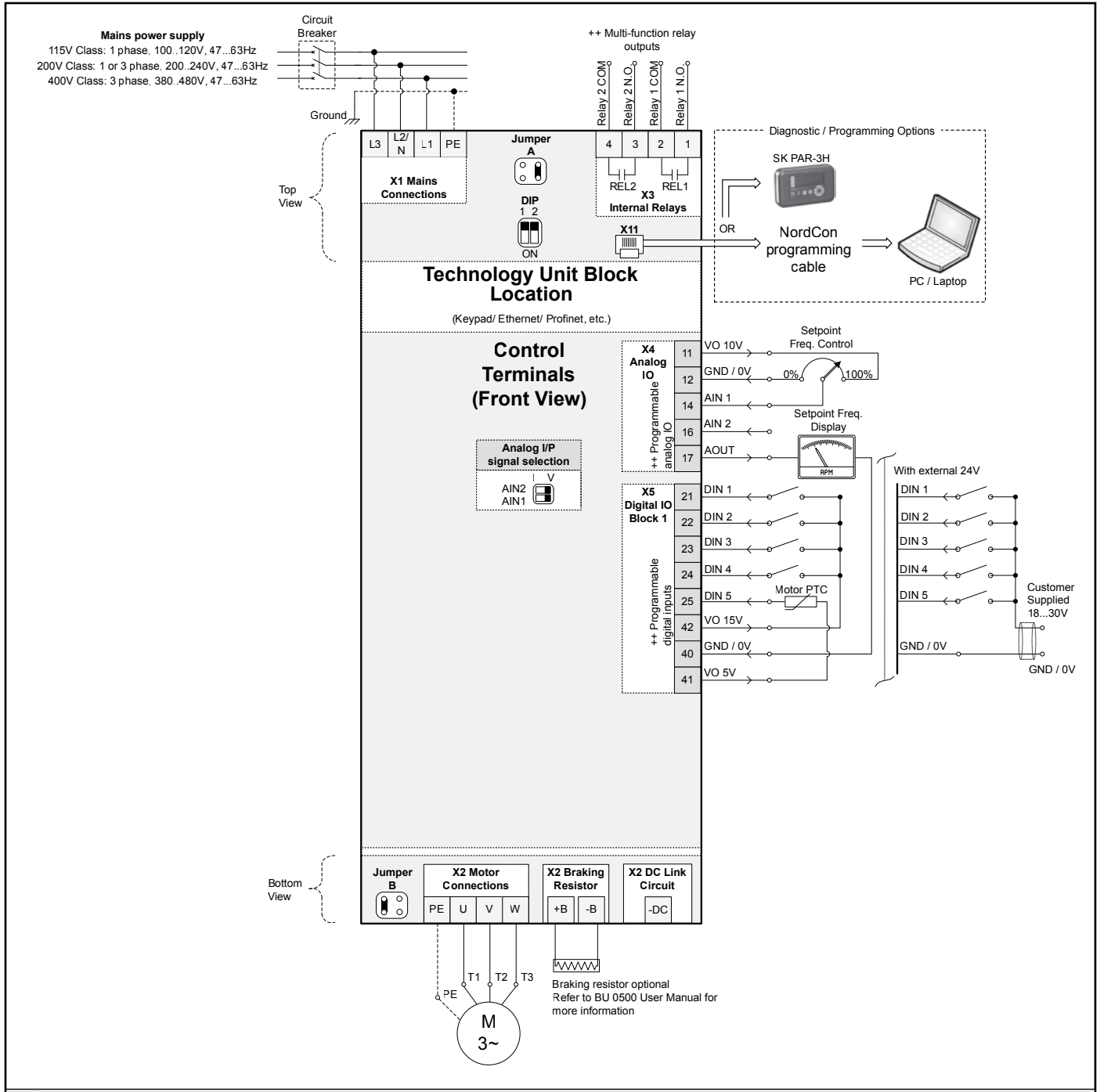
If you still are having difficulties or need further assistance please contact the NORD Gear Corporate office or your product sales representative.



# SK500E STANDARD CONNECTION DIAGRAMS



## 1. Figure 1 : SK 500E - Standard Connection Diagram



- 1) DIP switches and network jumpers depict default settings. Please refer to Table 2 & 3 on the following page for more information.
- 2) ++ Please refer to Table 1 in Appendix D for a list of all configurable functions for digital inputs, digital outputs and relays.

## 2. Tables : SK 500E Configuration Tables

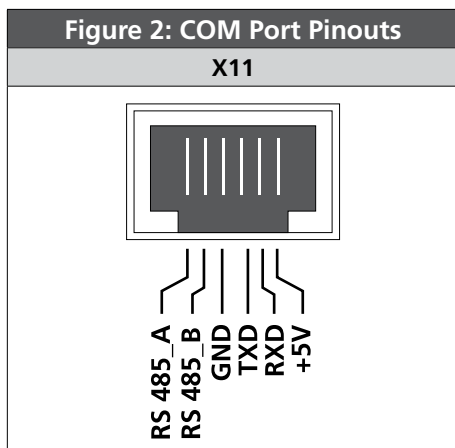
Table 1 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5....30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
REL 1	P434	1 - External brake	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
REL 2	P441	7 - Fault	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 2)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital

### IMPORTANT NOTE

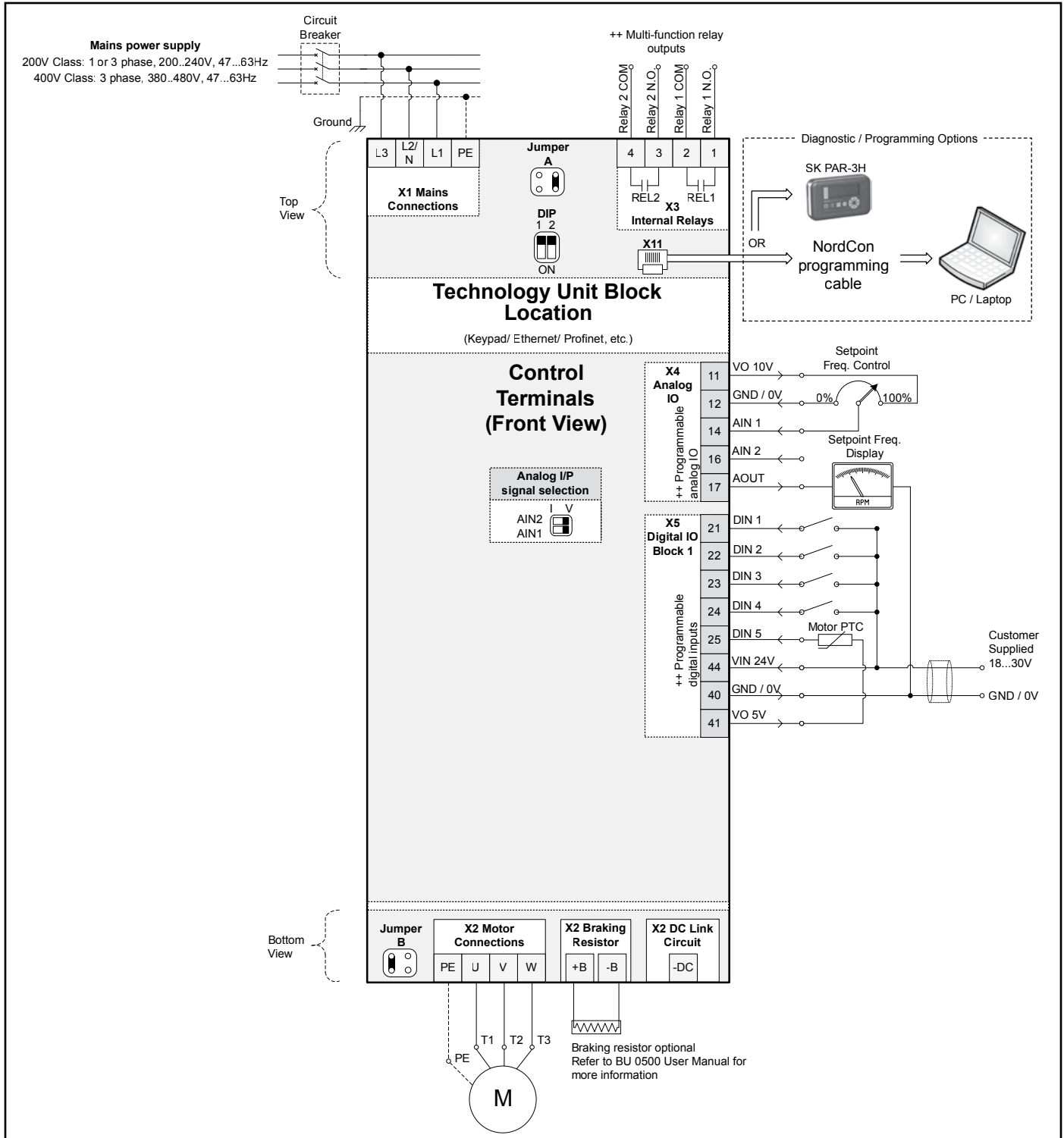
\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

Table 2 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 3 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA



### 3. Figure 3 : SK 505E - Standard Connection Diagram



- 1) DIP switches and network jumpers depict default settings. Please refer to Table 5 & 6 on the following page for more information.
- 2) \*\* Please refer to Appendix D for a list of all configurable functions for digital inputs, digital outputs and relays.

## 4. Tables : SK 505E Configuration Tables

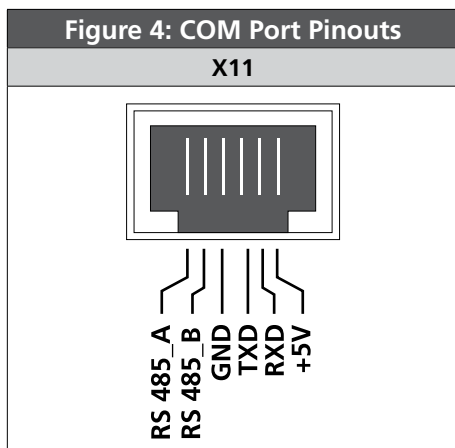
Table 4 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5....30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
REL 1	P434	1 - External brake	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
REL 2	P441	7 - Fault	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 5)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital

IMPORTANT NOTE

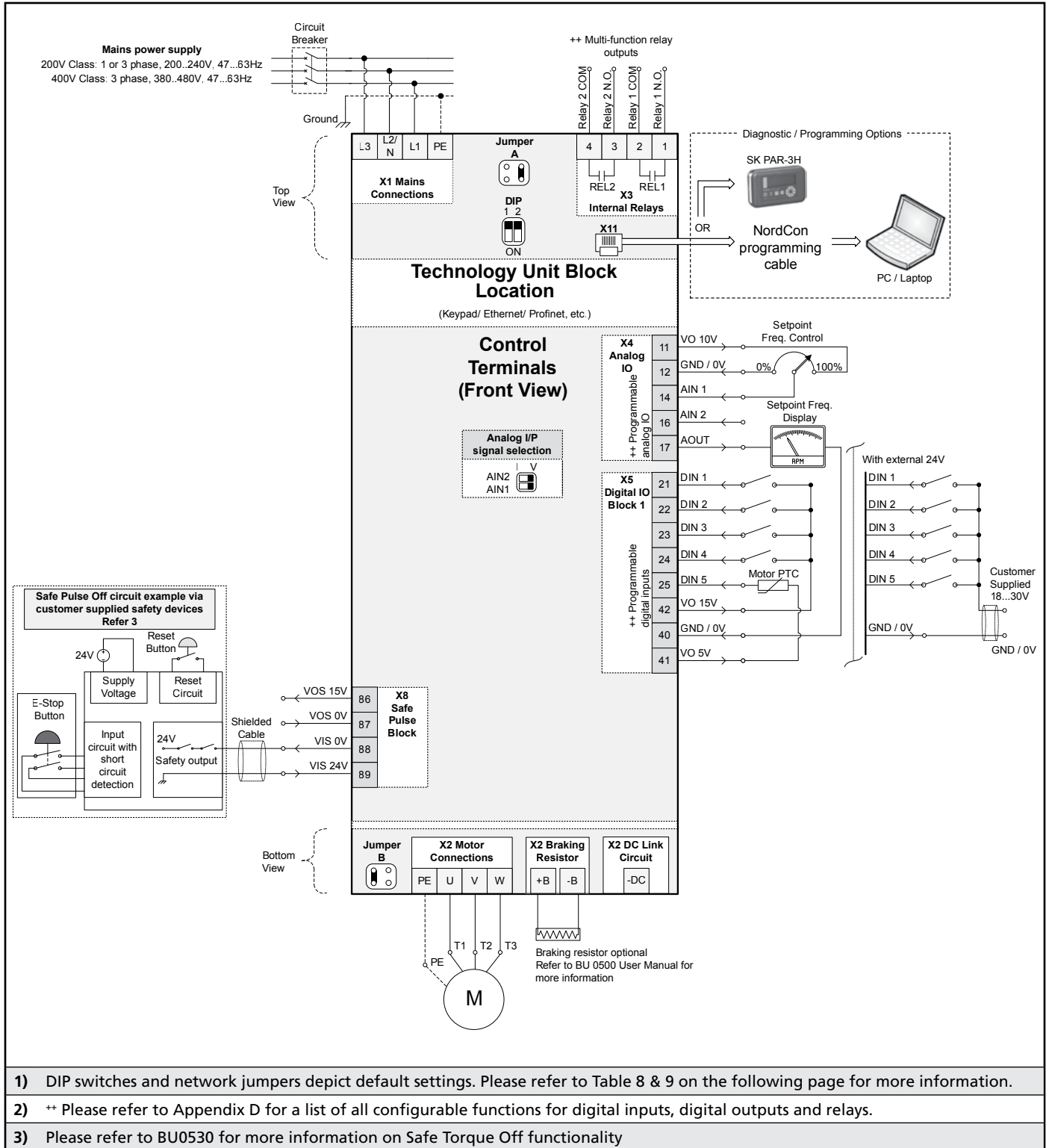
\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

Table 5 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 6 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA



## 5. Figure 5 : SK 510E - Standard Connection Diagram



## 6. Tables : SK 510E Configuration Tables

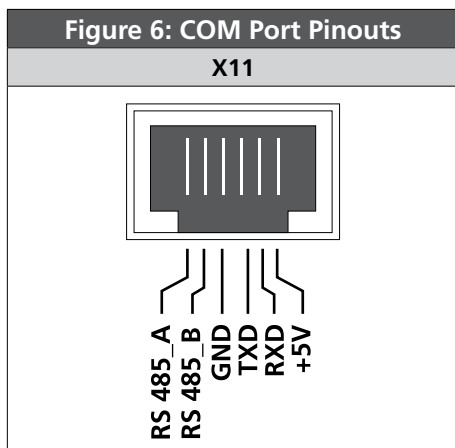
Table 7 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5....30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
REL 1	P434	1 - External brake	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
REL 2	P441	7 - Fault	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 8)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital

### IMPORTANT NOTE

\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

Table 8 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 9 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA





# SK500E STANDARD CONNECTION DIAGRAMS

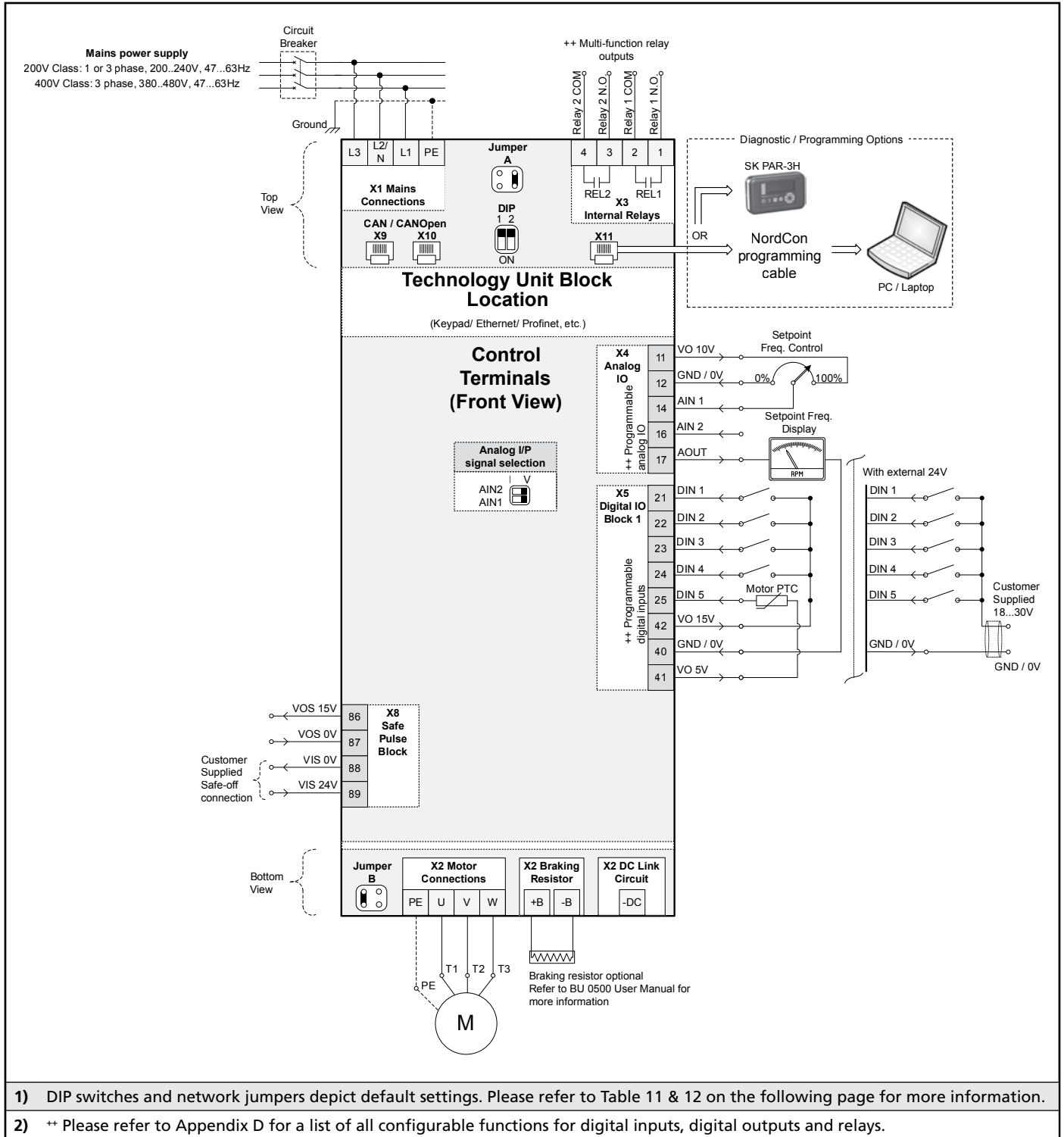


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## 7. Figure 7 : SK 511E - Standard Connection Diagram





## 8. Tables : SK 511E Configuration Tables

Table 10 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5...30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
REL 1	P434	1 - External brake	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
REL 2	P441	7 - Fault	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 11)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital



### IMPORTANT NOTE

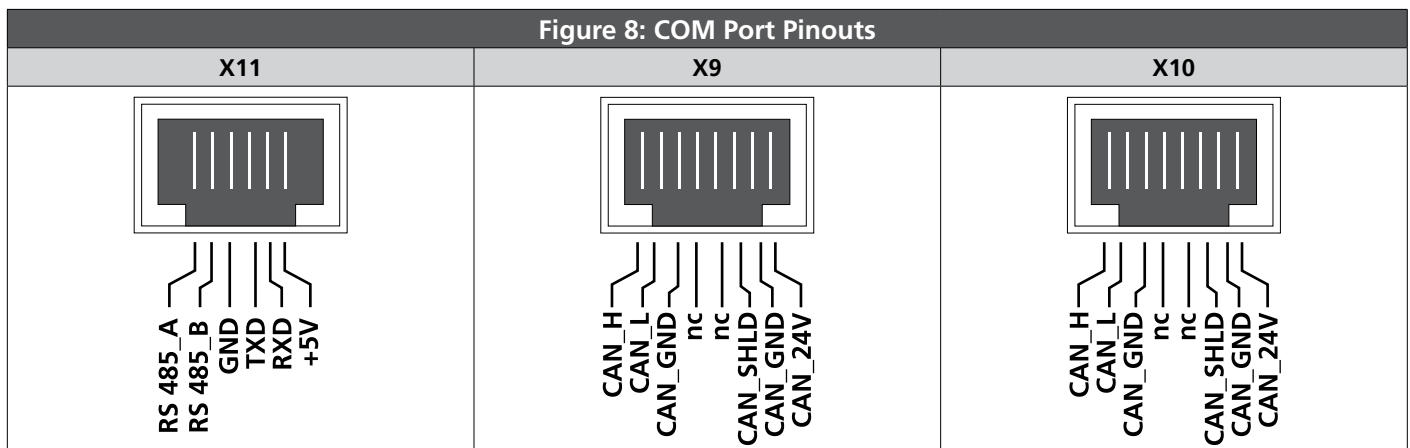


\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

Table 11 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 12 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA

### Figure 8: COM Port Pinouts





# SK500E STANDARD CONNECTION DIAGRAMS

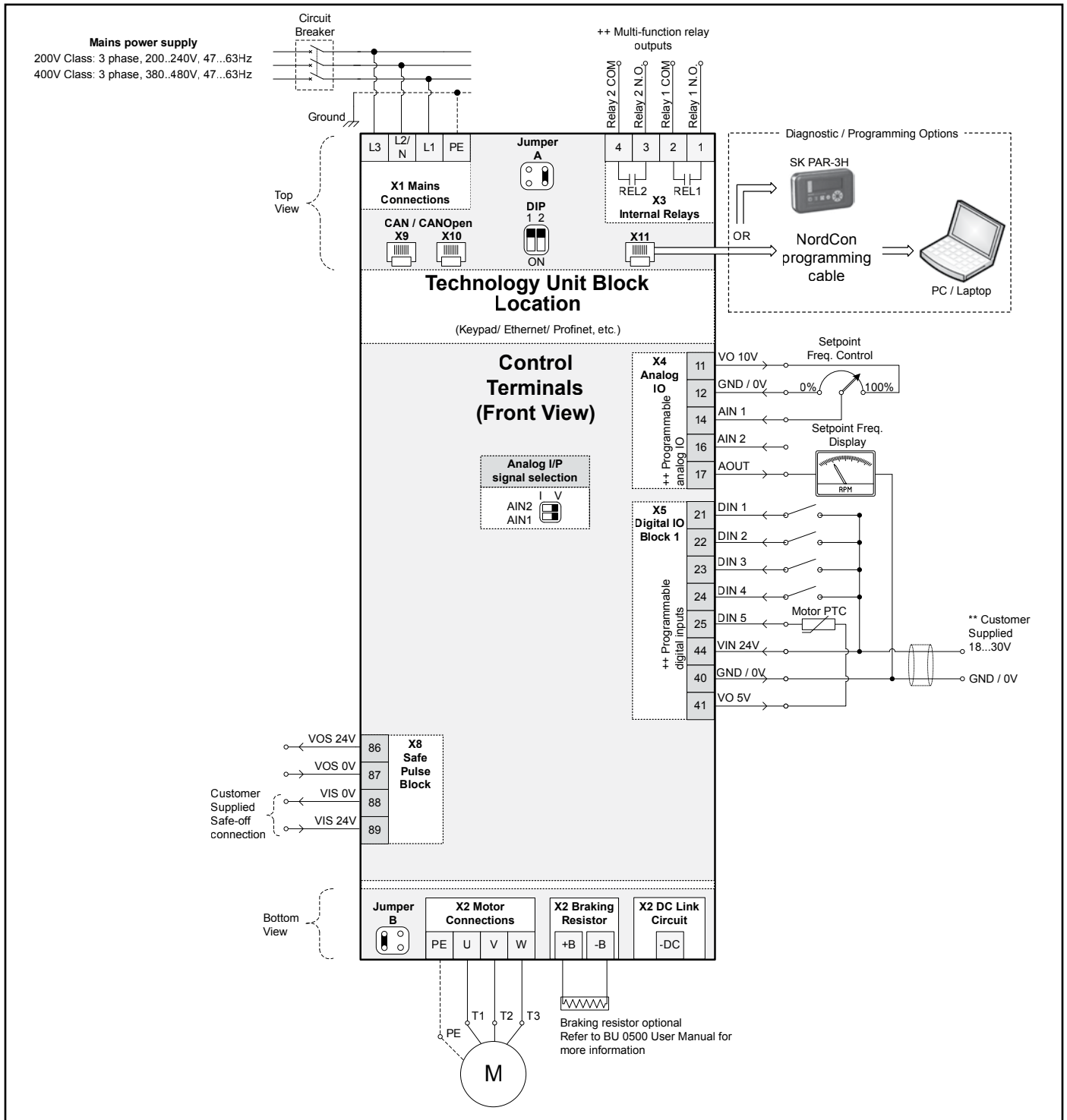


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## 9. Figure 9 : SK 515E - Standard Connection Diagram



- 1) DIP switches and network jumpers depict default settings. Please refer to Table 14 & 15 on the following page for more information.
- 2) \*\* Please refer to Appendix D for a list of all configurable functions for digital inputs, digital outputs and relays.
- 3) \*\* For sizes 5 & above, 24V supply voltage is generated by FI at X5:44,40. However, X12:44,40 (top of unit) may also be used to supply 24V.
- 4) For sizes 5...7 - X13 : T1, T2 thermistor connections are on the bottom left of the inverter.
- 5) For sizes 5...7 - X8 : 86, 87, 88, & 89 safe pulse block is on the bottom right of the inverter.

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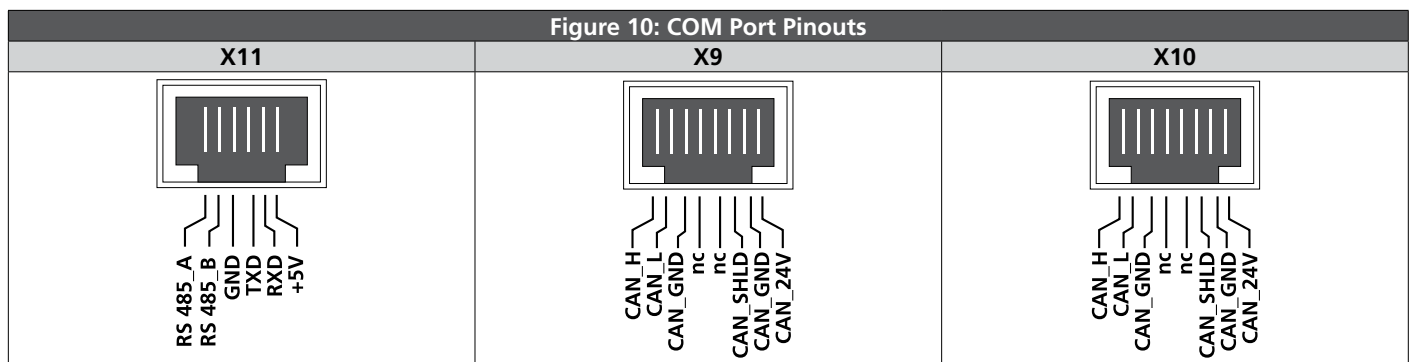
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Toll Free in the United States: 888.314.6673

## 10. Tables : SK 515E Configuration Tables

Table 13 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5....30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC**
REL 1	P434	1 - External brake	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
REL 2	P441	7 - Fault	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ
AIN 2	P405	0 - No function	I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 14)
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital

Table 14 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA
S1+	AIN1: V = OFF = Voltage I = ON = Current 0/4 to 20mA
S2+	AIN2: V = OFF = Voltage I = ON = Current 0/4 to 20mA
S3+	AIN1: V = ON = ±10V I = OFF = 0...10V
S4+	AIN1: V = ON = ±10V I = OFF = 0...10V

Table 15 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor  TT - Seperate/combined neutral & earthed conductor	< 30mA
5 & 6				< 6mA
7				NA



**IMPORTANT NOTES**

- \* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.
- \*\* For sizes 5..7, X13: T1, T2 thermistor connections are on the bottom of the inverter.
- + Size 5 and above also -10...+10V signals. Voltage and current signal selections for size 5 and above can be done by DIP switches S1...S4. If S1=ON, S3 must be OFF, If S2 = ON, S4 must be OFF.



# SK500E STANDARD CONNECTION DIAGRAMS

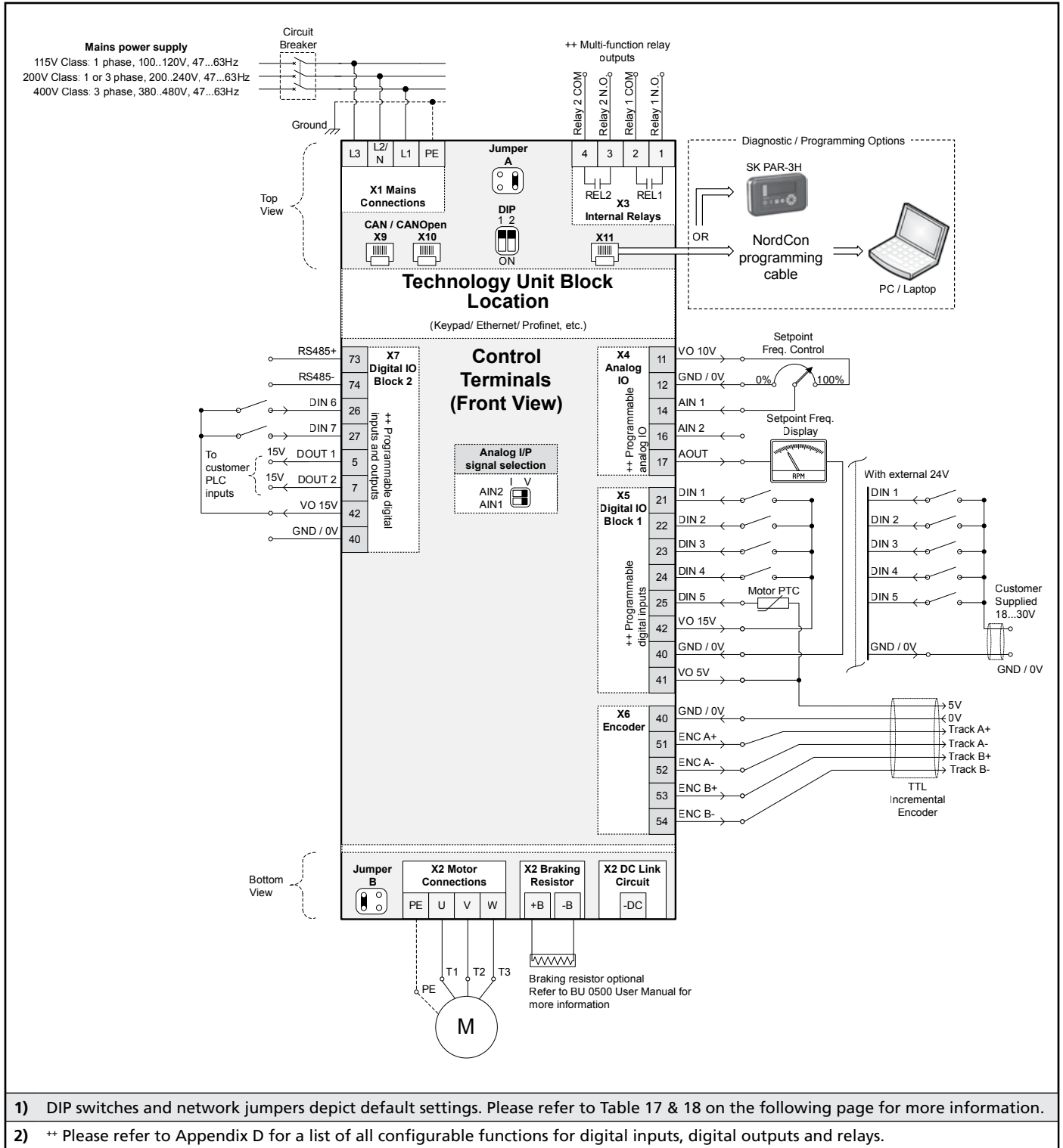


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11. Figure 11 : SK 520E - Standard Connection Diagram



## 12. Tables : SK 520E Configuration Tables

Table 16 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5...30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
DIN 6	P425	0 - No function	7.5...30V, Ri=3.3kΩ
DIN 7	P470	0 - No function	
REL 1	P434	1 - External brake	
REL 2	P441	7 - Fault	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
DOUT 1	P450	0 - No function	15V, max 20mA max 100kΩ load
DOUT 2	P455	0 - No function	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 17)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital



### IMPORTANT NOTE

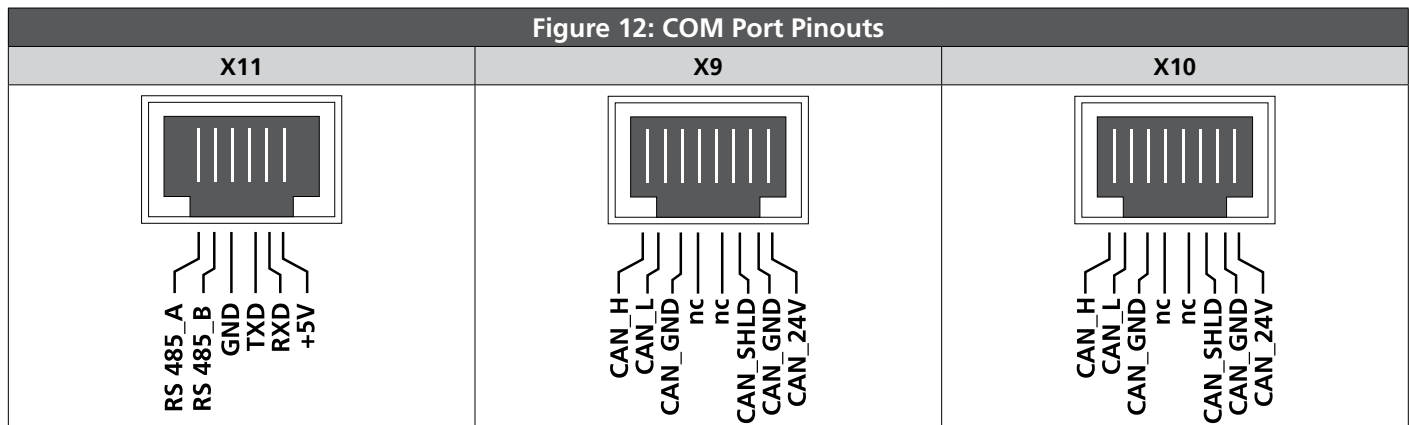


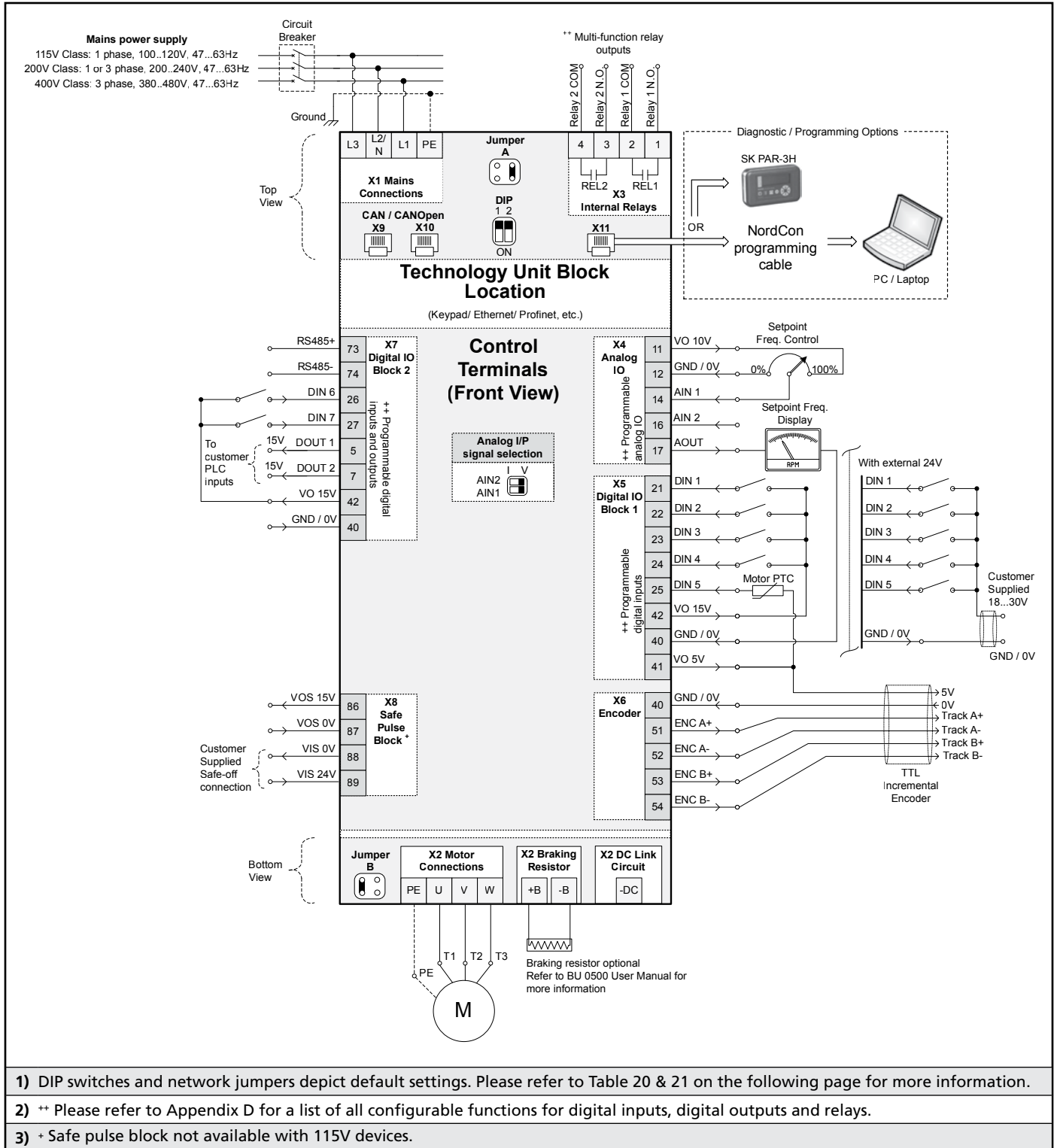
\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

Table 17 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 18 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA

Figure 12: COM Port Pinouts



**13. Figure 13 : SK 530E - Standard Connection Diagram**


## 14. Tables : SK 530E Configuration Tables

Table 19 : Parameter Assignment

Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5...30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
DIN 6	P425	0 - No function	7.5...30V, Ri=3.3kΩ
DIN 7	P470	0 - No function	
REL 1	P434	1 - External brake	
REL 2	P441	7 - Fault	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
DOUT 1	P450	0 - No function	15V, max 20mA max 100kΩ load
DOUT 2	P455	0 - No function	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 20)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital



### IMPORTANT NOTE



\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

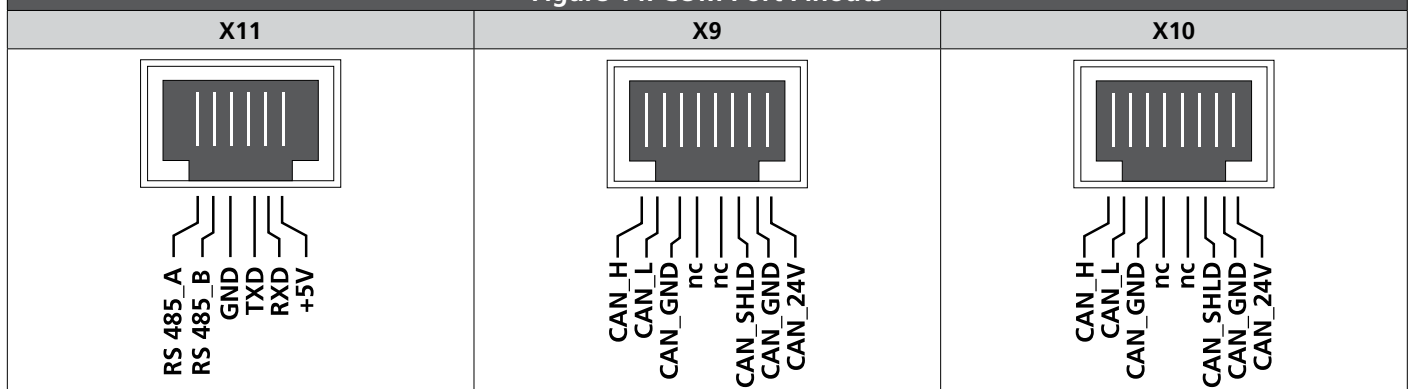
Table 20 : DIP Switch Settings

Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 21 : Network Jumper Configurations

Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA

Figure 14: COM Port Pinouts





# SK500E STANDARD CONNECTION DIAGRAMS

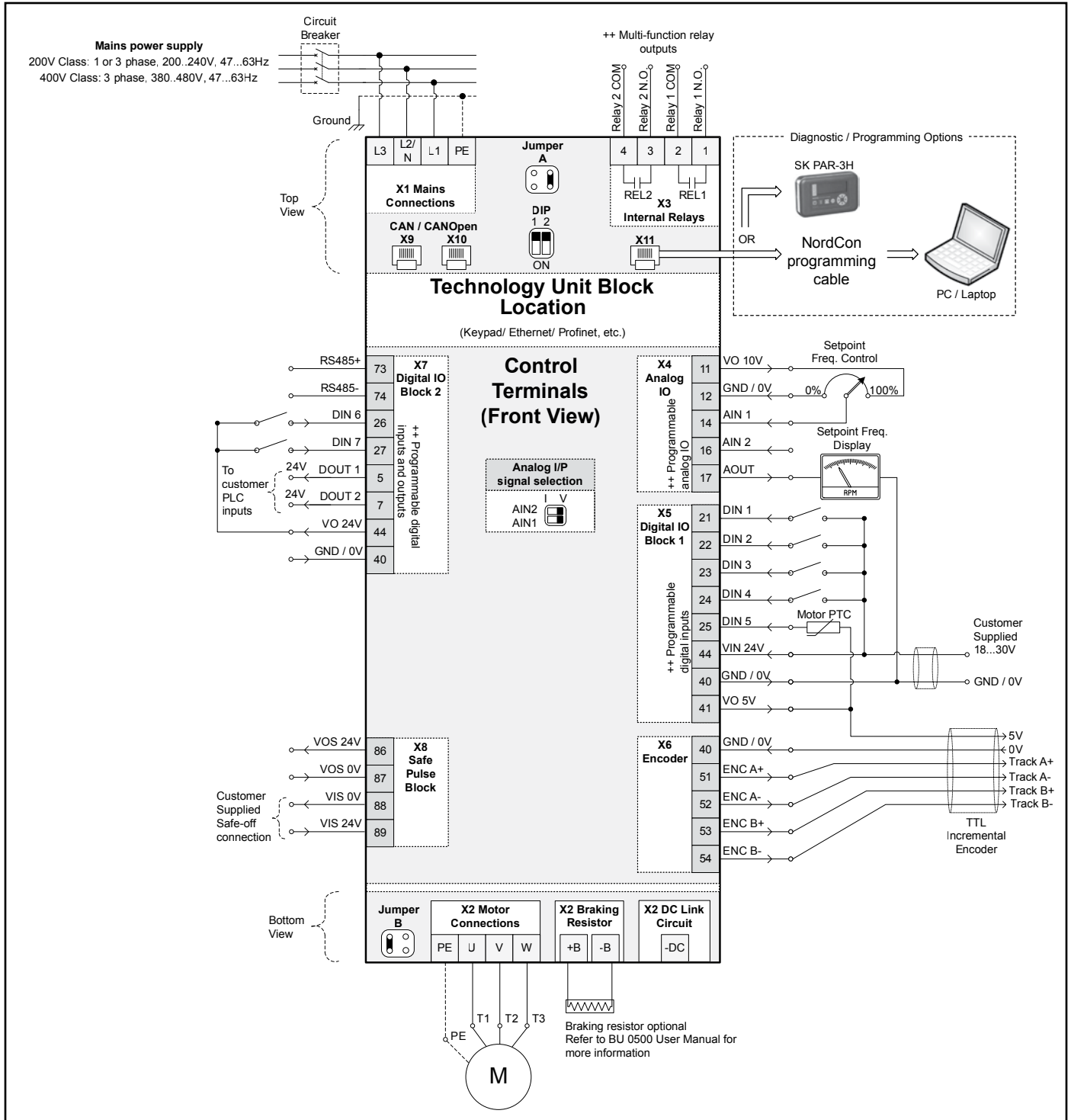


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15. Figure 15 : SK 535E - Standard Connection Diagram



- 1) DIP switches and network jumpers depict default settings. Please refer to Table 23 & 24 on the following page for more information.
- 2) \*\* Please refer to Appendix D for a list of all configurable functions for digital inputs, digital outputs and relays.
- 3) \*\* For sizes 5 & above, 24V supply voltage is generated by FI at X5:44,40. However, X12:44,40 (top of unit) may also be used to supply 24V.
- 4) For sizes 5...7 - X13 : T1, T2 thermistor connections are on the bottom left of the inverter.
- 5) For sizes 5...7 - X8 : 86, 87, 88, & 89 safe pulse block is on the bottom right of the inverter.

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# SK500E STANDARD CONNECTION DIAGRAMS



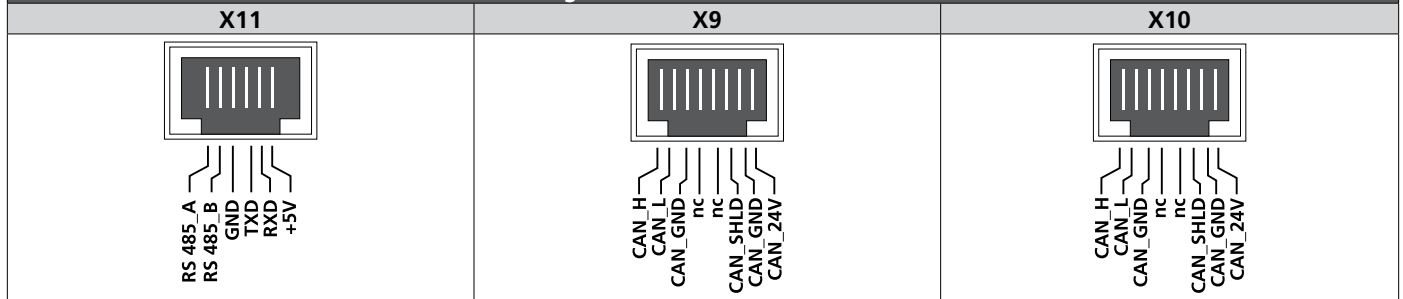
## 16. Tables : SK 535E Configuration Tables

Table 28 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5...30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
DIN 6	P425	0 - No function	7.5...30V, Ri=3.3kΩ
DIN 7	P470	0 - No function	
REL 1	P434	1 - External brake	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation, ≤2A
REL 2	P441	7 - Fault	
DOUT 1	P450	0 - No function	15V, max 20mA max 100kΩ load ++
DOUT 2	P455	0 - No function	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 29)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	
			0...10V, Max load current 5mA digital, 20mA digital

Table 23 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA
S1*	AIN1: V = OFF = Voltage I = ON = Current 0/4 to 20mA
S2*	AIN2: V = OFF = Voltage I = ON = Current 0/4 to 20mA
S3*	AIN1: V = ON = ±10V I = OFF = 0...10V
S4*	AIN1: V = ON = ±10V I = OFF = 0...10V

Table 24 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor	< 30mA
5 & 6				TT - Seperate/combined neutral & earthed conductor
7				NA

Figure 16: COM Port Pinouts



**IMPORTANT NOTES**

- \* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.
- \*\* For sizes 5..7, X13: T1, T2 thermistor connections are on the bottom left of the inverter.
- ++ Above size 5, DOUT1 and DOUT2 can provide 200mA.
- + Size 5 and above also -10...+10V signals. Voltage and current signal selections for size 5 and above can be done by DIP switches S1...S4. If S1=ON, S3 must be OFF, If S2 = ON, S4 must be OFF.



# SK500E STANDARD CONNECTION DIAGRAMS

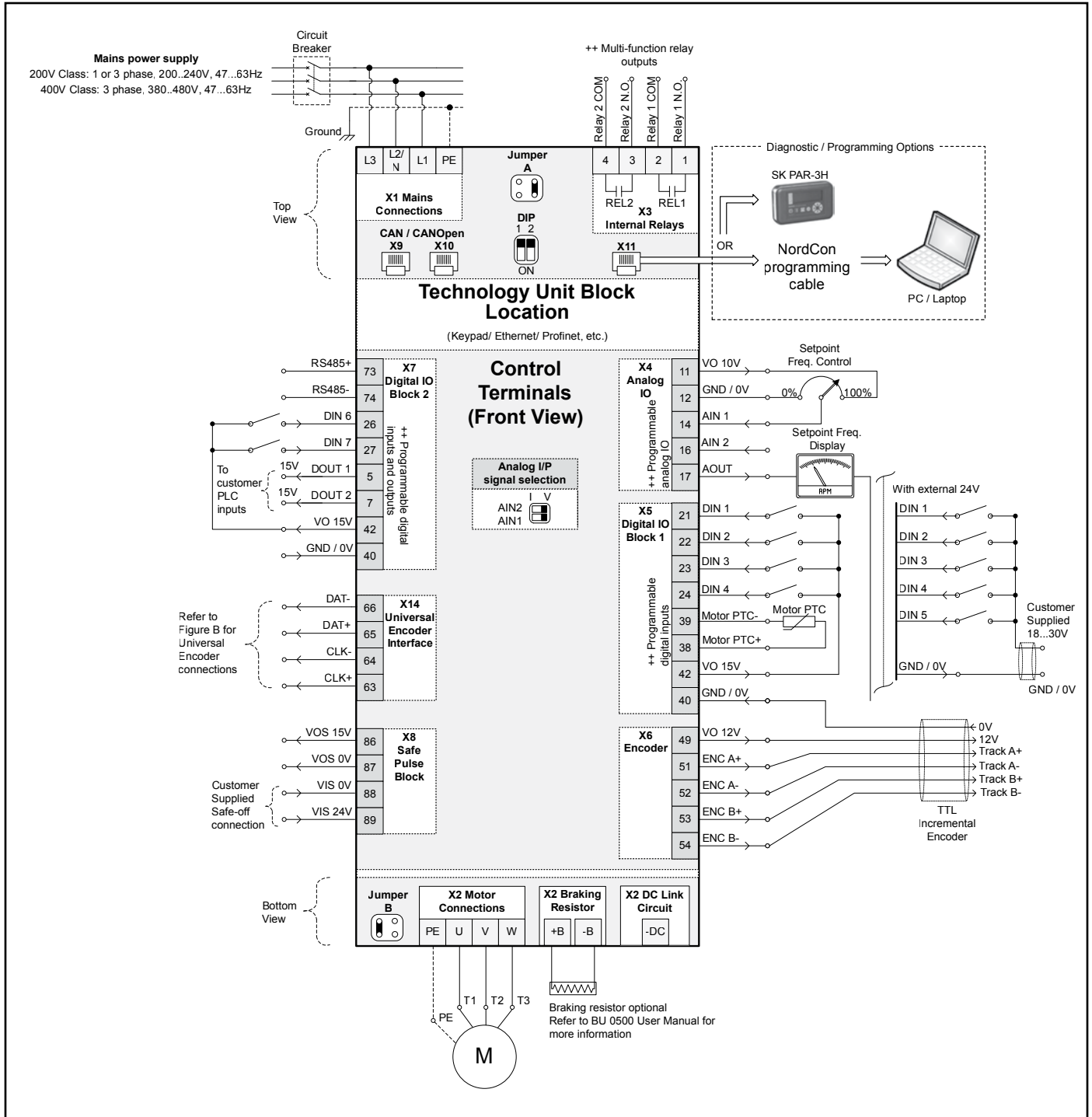


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17. Figure 17 : SK 540E - Standard Connection Diagram



- 1) DIP switches and network jumpers depict default settings. Please refer to Table 26 & 27 on the following page for more information.
- 2) \*\* Please refer to Appendix D for a list of all configurable functions for digital inputs, digital outputs and relays.



# SK500E STANDARD CONNECTION DIAGRAMS



## 18. Tables : SK 540E Configuration Tables

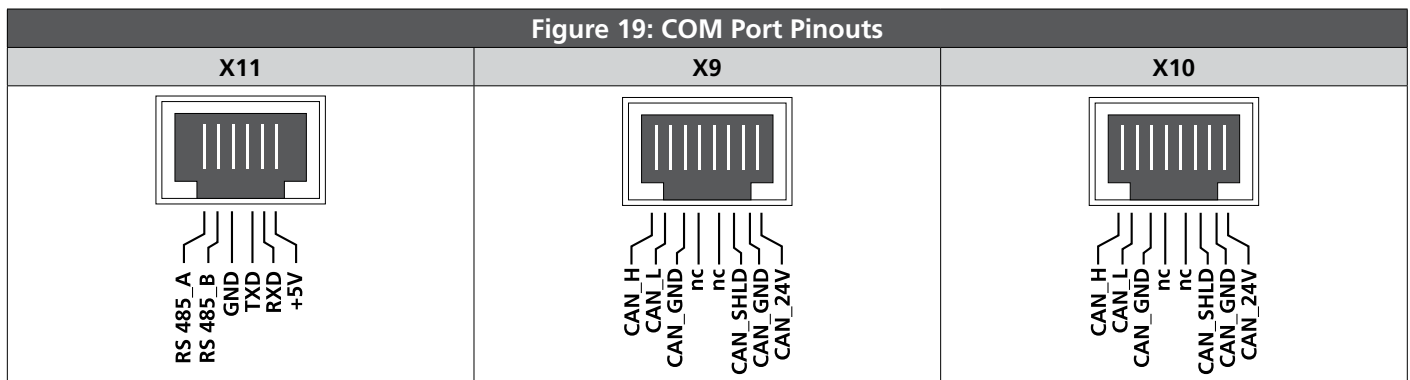
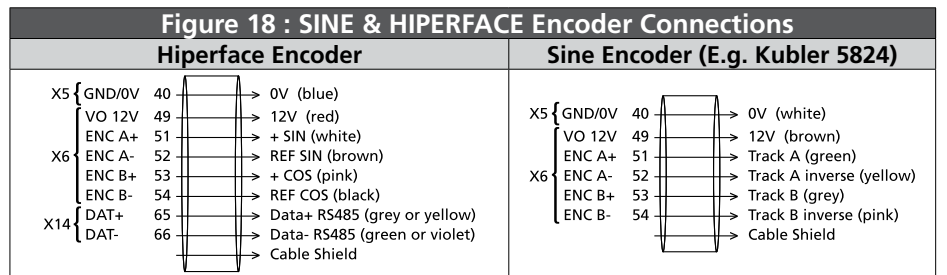
Table 25 : Parameter Assignment			
Terminal	Parameter	Default Settings*	Terminal Data
DIN 1	P420	1 - Enable right	7.5...30V, Ri=6.1kΩ, reaction time ≤ 5ms
DIN 2	P421	2 - Enable left	
DIN 3	P422	8 - Parameter set switching Bit 0	
DIN 4	P423	4 - Fixed frequency 1	
DIN 5	P424	0 - No function	2.5...30V, Ri=2.2kΩ, suitable for thermistor evaluation with 5V, P424=13 for motor PTC
DIN 6	P425	0 - No function	7.5...30V, Ri=3.3kΩ
DIN 7	P470	0 - No function	
REL 1	P434	1 - External brake	
REL 2	P441	7 - Fault	NO contacts 230V AC / 24V DC, <60V AC in circuits with safe isolation , ≤2A
DOUT 1	P450	0 - No function	15V, max 20mA max 100kΩ load
DOUT 2	P455	0 - No function	
AIN 1	P400	1 - Setpoint frequency	V=0...10V, Ri=30kΩ I= 0/4...20mA, Ri=250Ω, switch with DIP switch (Table 26)
AIN 2	P405	0 - No function	
AOUT	P418	0 - No function	0...10V, Max load current 5mA digital, 20mA digital

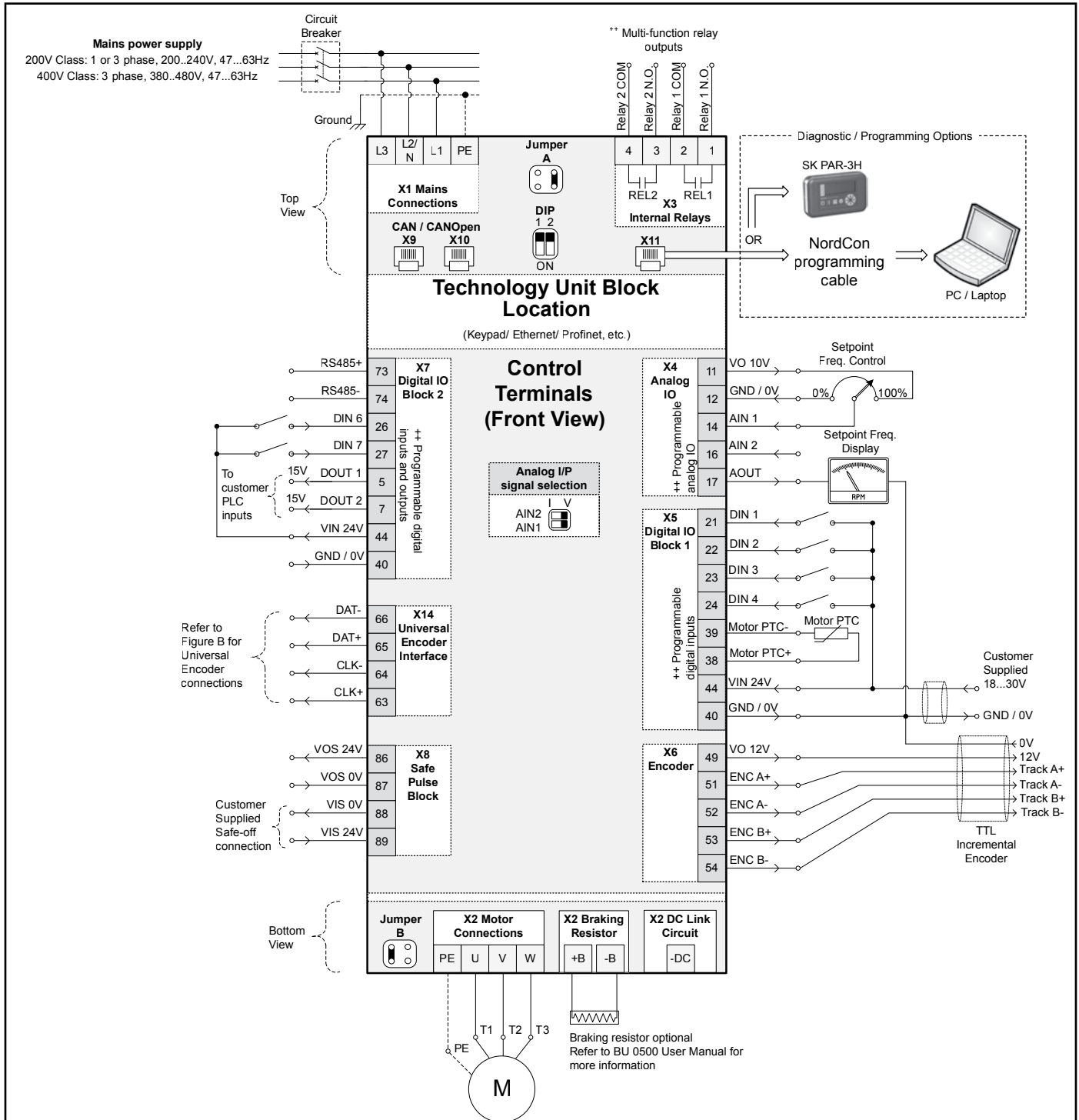
**IMPORTANT NOTE**

\* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals may be configured to.

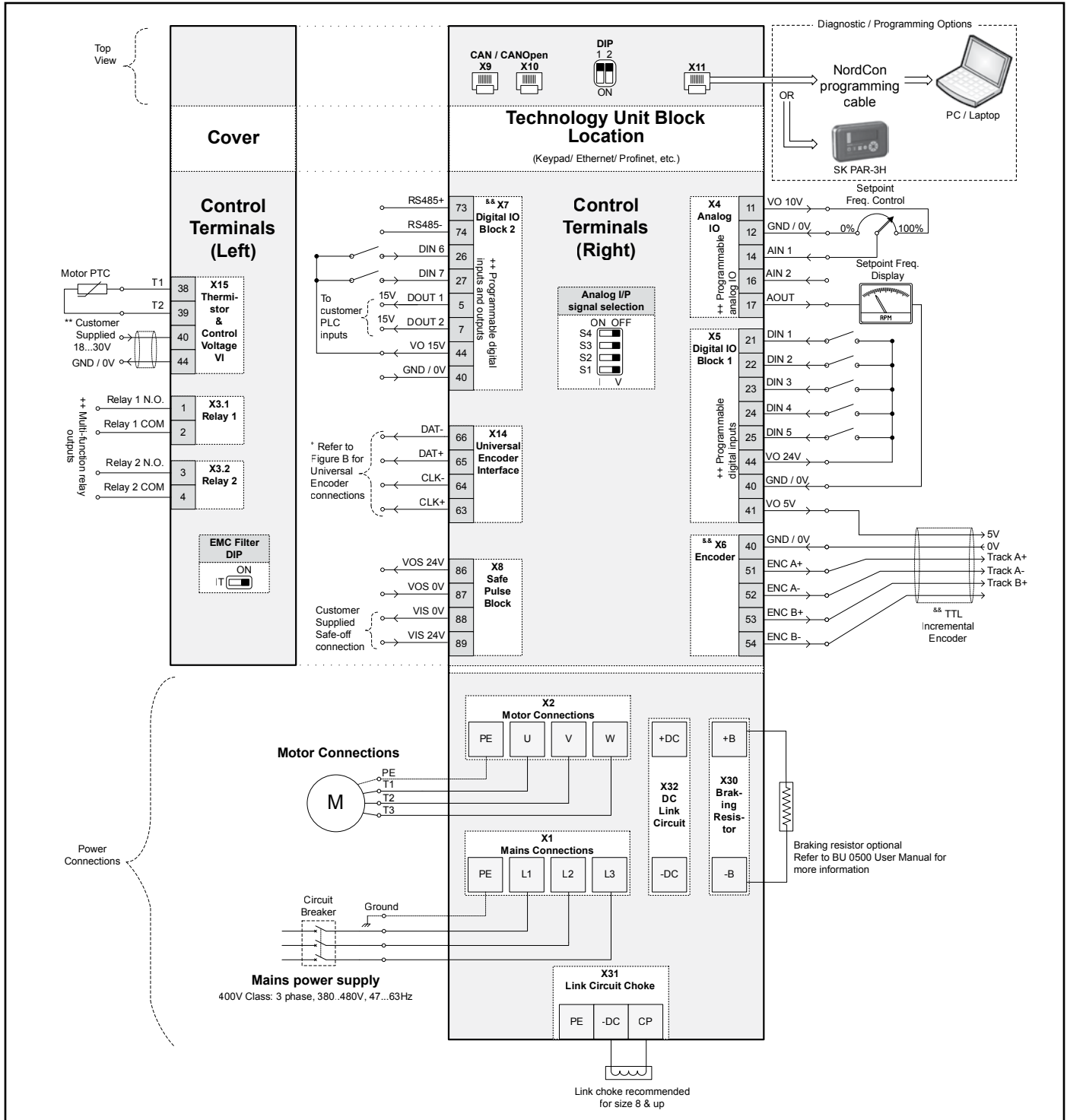
Table 26 : DIP Switch Settings	
Switch	State
DIP 1	OFF - RS232 ON - RS485
DIP 2	OFF - Default ON - Termination Resistor CAN/CANOPEN
AIN 1	V - 0...10V I - 0/4...20mA
AIN 2	V - 0...10V I - 0/4...20mA

Table 27 : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			TN - Directly earthed neutral conductor TT - Seperate/combined neutral & earthed conductor	< 30mA



**19. Figure 20 : SK 545E - Standard Connection Diagram**




**21. Figure 23 : SK 515E, SK 535E, SK 545E - Standard Connection Diagram (Size 8 & 9)**


- 1) DIP switches depict default settings. Please refer to Table 32 on page 24 for more information.
- 2) \*\* Please refer to Appendix D for a list of all configurable functions for digital inputs, digital outputs and relays.
- 3) \*\* For sizes 5 & above, 24V supply voltage is generated by FI at X5:44,40. However, X12:44,40 (top of unit) may also be used to supply 24V.
- 4) \* X14 terminal block only present in SK 545E model.
- 5) \*\* X6 & X7 terminal blocks only present above SK 535E











# SK500E STANDARD CONNECTION DIAGRAMS



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Appendix A : Typical Drive Control Wiring							
	<p><b>Two -Wire Control</b>            Run command from DIN 1 : P420 = Enable Right            Speed reference from Jog Frequency : P113 = 60 Hz</p>						
	<p><b>Two-Wire Control with Forward &amp; Reverse</b>            Run Forward command from DIN 1 : P420 = Enable Right            Run Reverse command from DIN 2 : P421 = Enable Left            Speed Reference from Jog Frequency : P113 = 60Hz</p>						
	<p><b>3-Wire Start-Stop Control (Internal Control Voltage)</b>            Stop Command from DIN1 : P420 = 3-Wire-Control Stop            Start Command from DIN 2 : P421 = 3-Wire Control Start Right            Speed Reference from Jog Frequency : P113 = 60Hz</p>						
	<p><b>3-Wire Start-Stop Control (External Control Voltage)</b>            Stop Command from DIN1 : P420 = 3-Wire-Control Stop            Start Command from DIN 2 : P421 = 3-Wire Control Start Right            Speed Reference from Jog Frequency : P113 = 60Hz</p>						
	<p><b>Digital Output</b>            Running indication from inverter : P450 = Inverter working            Fault indication from inverter : P455 = FI Fault</p>						
	<p><b>Output Relays</b>            Fault indication from inverter with Normally Open Relay 2:            P441 = FI Fault</p>						
	<p><b>0/4-20mA Analog Input Signal</b>            DIP switch AIN1 set to I</p> <table border="0"> <tr> <td><b>For a 4 to 20mA input Signal</b></td> <td><b>For a 0 to 20mA Signal</b></td> </tr> <tr> <td>P402 = 1.00V</td> <td>P402 = 0.00V</td> </tr> <tr> <td>P403 = 5.00V</td> <td>P403 = 5.00V</td> </tr> </table>	<b>For a 4 to 20mA input Signal</b>	<b>For a 0 to 20mA Signal</b>	P402 = 1.00V	P402 = 0.00V	P403 = 5.00V	P403 = 5.00V
<b>For a 4 to 20mA input Signal</b>	<b>For a 0 to 20mA Signal</b>						
P402 = 1.00V	P402 = 0.00V						
P403 = 5.00V	P403 = 5.00V						



# SK500E STANDARD CONNECTION DIAGRAMS



## 24. Appendices

Appendix B : Basic Parameters & Default Settings	
<b>Basic Parameters</b>	102 : Acceleration Time = 2 sec
	103 : Deceleration Time = 2 sec
	104 : Minimum Frequency = 0 Hz
	105 : Maximum Frequency = 50 Hz
	113 : Jog Frequency = 0 Hz
<b>Motor Data (Change Settings based on motor Nameplate)</b>	200 : Motor List = 0
	201 : Nominal Frequency
	202 : Nominal Speed
	203 : Nominal Current
	204 : Nominal Voltage
	205 : Nominal Power
	206 : Cos Phi
	207 : Star Delta Configuration
	208 : Stator Resistance
220 : Parameter Identification	
<b>Extra Functions</b>	504 : Pulse Frequency = 6 Hz
	509 : Source Control Word = Control terminals on Keypad
	523 : Factory Settings = 0 No Change
<b>Information</b>	700 [0] : Present Fault
	700 [1] : Present Warning
	700 [2] : Reason for Disabled Starting

Appendix C : Network Jumper Configurations				
Size	Jumper A	Jumper B	Default Setting	Leakage Current
1...4			IT Network	NA
1...4			Default : TN / TT Large Filtering Effect	< 30mA
1...4			Limited Filtering Effect	< 30mA > 3.5mA
5 & 6			IT Network	NA
5 & 6			Default : TN / TT Large Filtering Effect	< 6mA
7			IT Network	NA
7			Default : TN / TT Large Filtering Effect	NA



# SK500E STANDARD CONNECTION DIAGRAMS



## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

The analog inputs of the frequency inverter can also be parameterised to process digital signals. The digital functions are set in the parameter of the relevant analog input according to the following assignment.

D-1 : List of Possible Analog Functions of the Analog Inputs

Value	Function	Description
00	Off	The analog input has no function. After the FI has been enabled via the control terminals, it will supply the set minimum frequency (P104).
01	Setpoint frequency	The specified analog range (matching of analog input) varies the output frequency between the set minimum and maximum frequencies (P104/P105).
02	Torque current limit	Based on the set torque current limit (P112), this can be altered by means of an analog value. 100% setpoint here corresponds to the set torque current limit P112.
03	Actual frequency PID*	Is required in order to set up a control circuit. The analog input (actual value) is compared with the setpoint (e.g. fixed frequency). The output frequency is adjusted as far as possible until the actual value equals the setpoint (see control values P413...P415).
04	Frequency addition **	The supplied frequency value is added to the setpoint.
05	Frequency subtraction**	The supplied frequency value is subtracted from the setpoint.
06	Current limit	Based on the set current limit (P1536), this can be altered via the analog input.
07	Maximum frequency	The maximum frequency of the FI is varied. 100% corresponds to the setting in parameter P411. 0% corresponds to the setting in parameter P410. The values for the minimum/maximum output frequencies (P104/P105) cannot be undershot/exceeded
08	Actual PID frequency limited*	Like Function 3, Actual frequency PID, however the output frequency cannot fall below the programmed minimum frequency value in Parameter P104. (no change to rotation direction)
09	Actual frequency PID monitored*	Like Function 3, Actual frequency PID, however the FI switches the output frequency off when the minimum frequency P104 is reached.
10	Servo mode torque	In servo mode ((P300) = "1") the motor torque can be set or limited using this function. Here the speed controller is switched off and a torque control is activated. The analog input is then the source of the setpoint value. Above firmware version SW 2.0, this function can be also be used with reduced control precision without servo mode or for ((P300) = "0").
11	Torque precontrol	A function which enables a value for the anticipated torque requirement to be entered in the controller (interference factor switching). This function can be used to improve the load take-up of lifting equipment with separate load detection.
12	Reserved	
13	Multiplication	The setpoint is multiplied by the stated analog value. The analog value adjusted to 100% then corresponds to a multiplication factor of 1.
14	Actual value process controller *	Activates the process controller, analog input 1 is connected to the actual value sensor (compensator, air can, flow volume meter, etc.). The mode (0-10 V or 0/4-20 mA) is set in P401.
15	Process controller setpoint *	as function 14, however the setpoint is specified (e.g. by a potentiometer). The actual value must be specified using another input.
16	Process controller precontrol *:	adds an adjustable additional setpoint after the process controller.
46	Setpoint Torque Process controller	Process controller torque setpoint
48	Motor temperature	Motor temperature measurement with KTY-84, details in Section 0
53	d-correction F process	"Diameter correction for PID process controller frequency"
54	d-correction Torque	"Diameter correction of torque"
55	d-correction F + Torque	"Diameter correction for PID process controller frequency and torque"

\*) further details process controller: P400 and 4.4.

\*\*\*) The limits of these values are set by the parameters >Minimum frequency auxiliary setpoints< P410 & >Maximum frequency auxiliary setpoints< P411.

Further analog functions (47/49/56/57/58) are only relevant for POSICON.

## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

The analog inputs of the frequency inverter can also be parameterised to process digital signals. The digital functions are set in the parameter of the relevant analog input according to the following assignment.

D-2 : List of Possible Digital Functions of the Analog Inputs

Value	Function	Value	Function
21	Enable right	42	... 45 POSICON à BU 0510
22	Enable left	46	Setpoint Torque Position control
23	Change of rotation direction	48	Motor temperature
24	Fixed frequency 1	50	Disable PID
25	Fixed frequency 2	51	Disable right rotation
26	Fixed frequency 3	52	Disable left rotation
27	Fixed frequency 4	53	d-correction F process
28	... Reserved	54	d-correction Torque
29	Hold frequency	55	d-correction F + Torque
30	Disable voltage	58	... reserved for POSICON → (BU 0510)
31	Emergency stop	67	Motorpot. Freq. +
32	Fault acknowledgement	68	Motorpot. Freq. -
33	... 34 Reserved	69	... Reserved
35	Jog frequency	70	Bit 0 fixed freq. array
36	Motor potentiometer	71	Bit 1 fixed freq. array
37	... Reserved	72	Bit 2 fixed freq. array
38	Watchdog	73	Bit 3 fixed freq. array
39	... 40 Reserved	74	Bit 4 fixed freq. array
41	Fixed frequency 5	75	... 82 POSICON à BU 0510

A detailed description of the digital functions can be found after parameters P420 ... P425. The functions of the digital inputs are identical to the digital functions of the analog inputs.

Permissible voltage when using digital functions: 7.5...30 V.



### IMPORTANT NOTE



The analog inputs with digital functions do not comply with EN61131-2 (Type 1 digital inputs), because the idling currents are too low.



# SK500E STANDARD CONNECTION DIAGRAMS



## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

#### D-3 : List of Possible Analog Functions of the Analog Outputs

Value	Function	Description
00	No function	No output signal at terminals.
01	Actual frequency	The analog voltage is proportional to the output frequency of the device
02	Actual speed	Is the synchronous speed calculated by the device, based on the present setpoint value. Load-dependent speed fluctuations are not taken into account. If Servo mode is being used, the measured speed will be output via this function.
03	Current	Is the effective value of the output current delivered by the device.
04	Torque current	Indicates the motor load torque calculated by the device. (100 % = P112)
05	Voltage	Is the output voltage delivered by the device.
06	DC link voltage	Is the DC voltage in the device. This is not based on the motor rated data. 10 V Volt, standardised at 100 %, is equivalent to 450V DC (230 V mains) or 850 Volt DC (480 V mains)!
07	Value of P542	The analog output can be set with parameter P542, regardless of the actual operating status of the device. With bus control, e.g. an analog value from the control unit can be tunneled directly to the analog output of the FI.
08	Apparent power	The actual apparent power of the motor as calculated by the device
09	Effective power	The actual effective power calculated by the device
10	Torque [%]	The actual torque calculated by the device
11	Field [%]	The actual field in the motor, as calculated by the device
12	Actual frequency ±	The analog voltage is proportional to the output frequency of the device, whereby the null point is shifted to 5 V. For rotation to the right, values between 5 V and 10 V are output, and for rotation to the left values between 5 V and 0 V.
13	Actual speed ±	This is the synchronous rotation speed calculated by the FI, based on the current setpoint, where the null point has been shifted to 5 V. For rotation to the right, values from 5 V to 10 V are output and for rotation to the left, values from 5 V to 0 V. The measured speed is output via this function if servo mode is used.
14	Torque [%] ±	Is the actual torque calculated by the FI, whereby the null point is shifted to 5 V. For drive torques, values between 5 V and 10 V are output, and for generator torque, values between 5 V and 0 V.
30	Setpoint freq. before ramp	displays the frequency produced by any upstream controllers (ISD, PID, etc.). This is then the setpoint frequency for the power stage after it has been adjusted by the acceleration or braking ramp (P102, P103).
31	Output via BUS PZD	the analog output is controlled via a bus system. The process data is directly transferred (P546, P547, P548 = 20).
33	Freq. of setpt. source,	"Frequency of setpoint source" (above SW version 1.6)
60	Reserved	(above SK540E à BU 0550)



# SK500E STANDARD CONNECTION DIAGRAMS



## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

All relay functions described in parameter P434 can also be transferred via the analog output. If a condition has been fulfilled, then there will be 10 V at the output terminals. Negation of the function can be specified in parameter P419.

D-4 : List of Possible Digital Functions of the Analog Outputs			
Value	Function	Value	Function
15	External brake	32	FI ready
16	Inverter working	33	Frequency and setpoint source
17	Current limit	34	... 40 reserved (POSICON à BU 0510)
18	Torque current limit	41	... 43 reserved
19	Frequency limit	44	BusIO In Bit 0
20	Setpoint reached	45	BusIO In Bit 1
21	Fault	46	BusIO In Bit 2
22	Warning	47	BusIO In Bit 3
23	Overcurrent warning	48	BusIO In Bit 4
24	Motor overtemperature warning	49	BusIO In Bit 5
25	Torque current limit active	50	BusIO In Bit 6
26	Value of P541	51	BusIO In Bit 7
27	Generator torque current limit	52	Value from Bus setpoint. Output via Bus (if P546, P547 or P548 = 19), BUS Bit 4 then controls the analog output.
28	... 29 reserved	60	reserved (PLC à BU 0550)



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## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

#### D-5 : List of Possible Functions of the Digital Inputs

Value	Function	Description	Signal
00	No function	Input switched off.	---
01	Enable right	The inverter delivers an output signal with the rotation field right if a positive setpoint is present. 0 → 1 Flank (P428 = 0)	High
02	Enable left	The inverter delivers an output signal with the rotation field left if a positive setpoint is present. 0 → 1 Flank (P428 = 0)	High
<p>If the drive is to start up automatically when the mains is switched on (P428 = 1) a permanent High level for enabling must be provided (bridge between DIN1 and the control voltage output).</p> <p>If the functions "Enable right" and "Enable left" are actuated simultaneously, the FI is blocked.</p> <p>If the frequency controller is in fault status but the cause no longer exists, the error message is acknowledged with a 1 → 0 flank.</p>			
03	Change of rotation direction	Causes the rotation field to change direction, combined with Enable right or left.	High
04	Fixed frequency 1 <sup>1</sup>	The frequency from P429 is added to the actual setpoint value.	High
05	Fixed frequency 2 <sup>1</sup>	The frequency from P430 is added to the actual setpoint value.	High
06	Fixed frequency 3 <sup>1</sup>	The frequency from P431 is added to the actual setpoint value.	High
07	Fixed frequency 4 <sup>1</sup>	The frequency from P432 is added to the actual setpoint value.	High
<p>If several fixed frequencies are actuated at the same time, then they are added with the correct sign. In addition, the analogue setpoint (P400) and if necessary the minimum frequency (P104) are added.</p>			
08	Switch-over of parameter sets	First Bit of the parameter set switch over, selection of the active parameter set 1...4 (P100).	High
09	Hold frequency	During the acceleration or deceleration phase, a Low level will cause the actual output frequency to be "held". A high level allows the ramp to proceed.	Low
10	Block voltage <sup>2</sup>	The FI output voltage is switched off; the motor runs down freely.	Low
11	Quick stop <sup>2</sup>	The FI reduces the frequency according to the programmed fast stop time from P426.	Low
12	Error acknowledgement <sup>2</sup>	Error acknowledgement with an external signal. If this function is not programmed, a fault can also be acknowledged by a low enable setting (P506).	0→1 Flank
13	PTC input <sup>2</sup>	Analog evaluation of signal present. Switching threshold approx. 2.5 V, Switch-off delay = 2 sec, warning after 1 sec.	High
<p>NOTE: Function 13 can only be used via DIN 5 up to SK 535E, sizes 1 - 4! For SK 54xE and sizes above Size 5, there is a separate connection which cannot be deactivated. If the motor is equipped with a thermistor, for these devices both terminals must be bridged in order to deactivate the function (status as delivered) level</p>			
14	Remote control <sup>2, 4</sup>	With Bus system control, low level switch es the control to control via control terminals.	High
15	Jog frequency <sup>1</sup>	The fixed frequency value can be adjusted using the HIGHER/LOWER and ENTER keys (P113), if control is via the ControlBox or ParameterBox.	High
16	Motor potentiometer	As in setting 09, however, the frequency is not maintained below the minimum frequency P104 and above the maximum frequency P105.	Low
17	Para. Set Switchover <sup>2</sup>	Second Bit of the parameter set switch over, selection of the active parameter set 1...4 (P100).	High
18	Watchdog <sup>2</sup>	Input must see a High flank cyclically (P460), otherwise error E012 will cause a shutdown. Function starts with the 1st high flank.	0→1 Flank
19	Setpoint 1 on/off	Analog input switch-on and switch-off 1/2 (high = ON) The low signal sets the analog input to 0 % which does not lead to shut-down when the minimum frequency (P104) > than the absolute minimum frequency (P505).	High
20	Setpoint 2 on/off		High
21	Fixed frequency 5 <sup>1</sup>	The frequency from P433 is added to the actual setpoint value.	High
22	... 25	Reserved for POSICON (BU 0510)	--
26	... 29 impulse functions:	Description below:	--
30	Disable PID	Switching the PID controller / process controller function on and off (high = ON)	High
31	Disable right running <sup>2</sup>	Blocks the >Enable right/left< via a digital input or Bus control. Does not depend on the actual direction of rotation of the motor (e.g. following negated setpoint).	Low
32	Disable left running <sup>2</sup>		Low
33	... 42 impulse functions:	Description below (only SK 500E ... 535E).	---
43	... 44 Speed measurement with HTL encoder	Description below:	---
45	3-W-Ctrl.Start-Right (Closing button)	3-Wire-Control, this control function provides an alternative to enable R/L (01, 02), in which a permanently applied level is required.	0→1 Flank
46	3-W-Ctrl.Start-Left (Closing button)	Here, only a control impulse is required to trigger the function. Control of the FI can therefore be performed entirely with buttons.	0→1 Flank
49	3-Wire-Ctrl.Stop (Opening button)	A pulse on the function "Reverse direction of rotation" (see Function 65) inverts the present direction of rotation. This function is reset with a "Stop signal" or by activating a button for the functions 45, 46, 49.	0→1 Flank



# SK500E STANDARD CONNECTION DIAGRAMS



## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

#### D-5 ctd. : List of Possible Functions of the Digital Inputs

Value	Function	Description	Signal
47	Motorpot.Freq.+	In combination with enable R/L the output frequency can be continuously varied. To save a current value in P113, both inputs must be at a High voltage for 0.5 s. This value then applies as the next starting value for the same direction of rotation (Enable R/L) otherwise start at fMIN. Values from other setpoint sources (e.g. fixed frequencies) are not taken into account.	High
48	Motorpot.Freq.-		High
50	Bit 0 Fixed. freq.Array	Fixed frequency array, binary coded digital inputs to generate up to 32 fixed frequencies. (P465: -01...-31)	High
51	Bit 1 Fixed. freq.Array		High
52	Bit 2 Fixed. freq.Array		High
53	Bit 3 Fixed. freq.Array		High
54	Bit 4 Fixed. freq.Array		High
55	... 64		Reserved for POSICON (BU 0510)
65	3-Wire Direction (Rotation reversal button)	See functions 45, 46, 49	0→1 Flank
66	... 69	Reserved	
70	Evacuation run above SW 1.7	Only for devices with external 24V control voltage (SK 5x5E). There is therefore also the possibility of operation with a very low link circuit voltage. With this function the charging relay is activated and the under-voltage and phase error detection are deactivated. <b>NOTICE! There is no overload monitoring! (e.g. lifting gear)</b>	High
71	Motor pot.F+ and Save <sup>3</sup> SW 1.6 and above	Motor potentiometer function frequency +/- with automatic saving. With this motor potentiometer function (SW 1.6 and above) a setpoint value (sum) is set via the digital inputs, which is simultaneously saved. With control enabling R/L this is then started up in the correspondingly enabled direction. On change of direction the frequency is retained. Simultaneous activation of the +/- function causes the frequency setpoint value to be set to 0.	High
72	Motor pot.F+ and Save <sup>3</sup> SW 1.6 and above	The frequency setpoint can also be set in the operating value display (P001=30, 'Actual. setpoint MP-5') or displayed or set in P718 and pre-set to the operating status "Ready for switch-on". Any minimum frequency set (P104) is still effective. Other setpoint values, e.g. analogue or fixed frequencies can be added or subtracted. Adjustment of the frequency setpoint value is performed with the ramps from P102/103.	High
73 <sup>2</sup>	Right disable +fast	As for setting 31, however coupled to the function "Emergency Stop"	Low
74 <sup>2</sup>	Left disable+fast	As for setting 32, however coupled to the function "Emergency Stop"	Low
77		Reserved for POSICON (BU 0510)	
80		Reserved for PLC (BU 0550)	

<sup>1</sup> If neither of the digital inputs is programmed for left or right enable, then the actuation of a fixed frequency or jog frequency will enable the frequency inverter. The rotation field direction depends on the sign of the setpoint.

<sup>2</sup> Also effective for Bus control (e.g. RS232, RS485, CANbus, CANopen, ...)

<sup>3</sup> With SK 5x5 E devices the frequency inverter control unit must be supplied with power for a further 5 minutes after the last change of the motor potentiometer in order to permanently save the data.

<sup>4</sup> Function cannot be selected via BUS IO In Bits





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## 24. Appendices

### Appendix D : I/O Configuration (Inputs/Outputs/Relays)

#### D-6 : List of Possible Functions of the Relays & Digital Outputs

Value	Function	Description	Signal*
00	No function	Input switched off.	Low
01	External brake	For the control of a mechanical brake on the motor. The relay switches at a programmed absolute minimum frequency (P505). For typical brakes a setpoint delay of 0.2 ... 0.3 seconds should be programmed (see also P107). A mechanical brake may be directly switched by AC current. (Note the technical specification of the relay contacts!)	High
02	Inverter working	the closed relay contact indicates voltage at the inverter output (U - V - W) (also DC run-on(→ P559).	High
03	Current limit	Based on the setting of the motor rated current in P203. This value can be adjusted with the standardisation (P435).	High
04	Torque current limit	Based on motor data settings in P203 and P206. Signals a corresponding torque load on the motor. This value can be adjusted with the standardisation (P435).	High
05	Frequency limit	Based on motor nominal frequency setting in P201. This value can be adjusted with the standardisation (P435).	High
06	Setpoint reached	indicates that the FI has completed the frequency increase or decrease. Setpoint frequency = actual frequency! From a difference of 1 Hz → Setpoint not reached - contact opens.	High
07	Fault	General fault message, fault is active or not yet acknowledged. → Error: contact opens, ready: contact closes	Low
08	Warning	General warning - a limit value was reached that could lead to a later shutdown of the FI.	Low
09	Overcurrent warning	At least 130% of the nominal FI current was supplied for 30 seconds.	Low
10	Motor overtemp warning	Motor overtemperature (warning): The motor temperature is evaluated via the PTC input or a digital input. àMotor is too hot. This warning is given immediately, overheating switch-off after 2 seconds.	Low
11	Torque current limit active	Torque current limit/Current limit active (warning): The limiting value in P112 or P536 has been reached. A negative value in P435 inverts the reaction. Hysteresis = 10 %.	Low
12	Value of P541	The output can be set using parameter P541 independently of the actual operating status of the FI.	High
13	Generator torque current limit	Limit value in P112 was reached in the generator range. Hysteresis = 10 %.	High
14		... 17 Reserved	--
18	FI ready	The FI is ready for operation. After being enabled it delivers an output signal.	High
19		... 29 reserved POSICON (BU 0510)	--
30	BusIO In Bit 0	Control by Bus In Bit 0 (P546 ...)	High
31	BusIO In Bit 1	Control by Bus In Bit 1 (P546 ...)	High
32	BusIO In Bit 2	Control by Bus In Bit 2 (P546 ...)	High
33	BusIO In Bit 3	Control by Bus In Bit 3 (P546 ...)	High
34	BusIO In Bit 4	Control by Bus In Bit 4 (P546 ...)	High
35	BusIO In Bit 5	Control by Bus In Bit 5 (P546 ...)	High
36	BusIO In Bit 6	Control by Bus In Bit 6 (P546 ...)	High
37	BusIO In Bit 7	Control by Bus In Bit 7 (P546 ...)	High
38	Value from Bus setpoint	Value from bus setpoint (P546 ...)	High
<b>Details can be found in the bus manuals</b>			
39	STO inactive	The relay / bit deactivates if STO or the Safe Stop are active.	High
40		reserved PLC (BU 0550)	

\* For relay contacts (High = "Contact closed", Low = "Contact open")



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## 24. Appendices

### Appendix E : Typical motor Brake Connections & Parameter Settings

#### Typical Motor Brake Connections

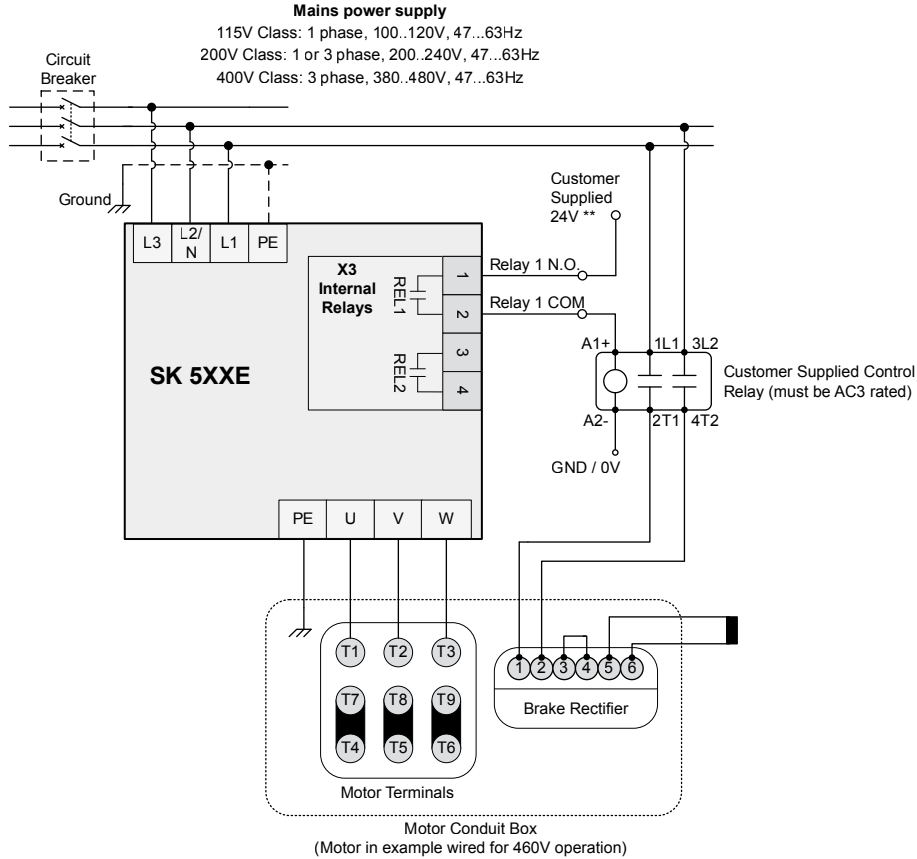
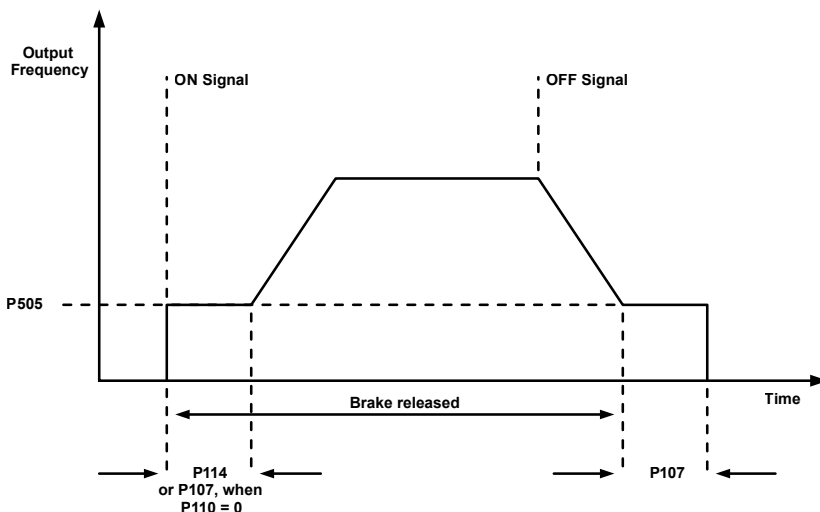


Figure 26: Typical motor brake connections

\*\* Relay 1 & Relay 2 are NO contacts rated 230V AC / 24V DC, <60V AC in circuits with safe isolation, ≤2A

#### Motor Brake Parameter Settings



Parameter	Default Settings*
P107 - Brake Reaction Time	0.00 Sec
P114 - Brake Relay Off	0.00 Sec
P505 - Absolute Minimum Frequency	2.0 Hz
* Settings listed are the default values in the parameters. Refer to Appendix D to see a list of the different functions that the control terminals can be configured to.	
<b>Parameter Recommendations for Lifting Applications</b>	
P107 = 0.02 - 0.4 seconds	
P114 = 0.02 - 0.4 seconds	
P201...P208 = Motor Data	
P434 = 1 (External Brake)	
P505 = 2...4 Hz	
<b>For Safe Start-Up</b>	
P112 = 401 (off)	
P536 = 2.1 (off)	
P537 = 150%	
P539 = 2 or 3 (Isd monitoring)	
<b>To Prevent Load Drops</b>	
P214 = 50...100% (Torque Control)	