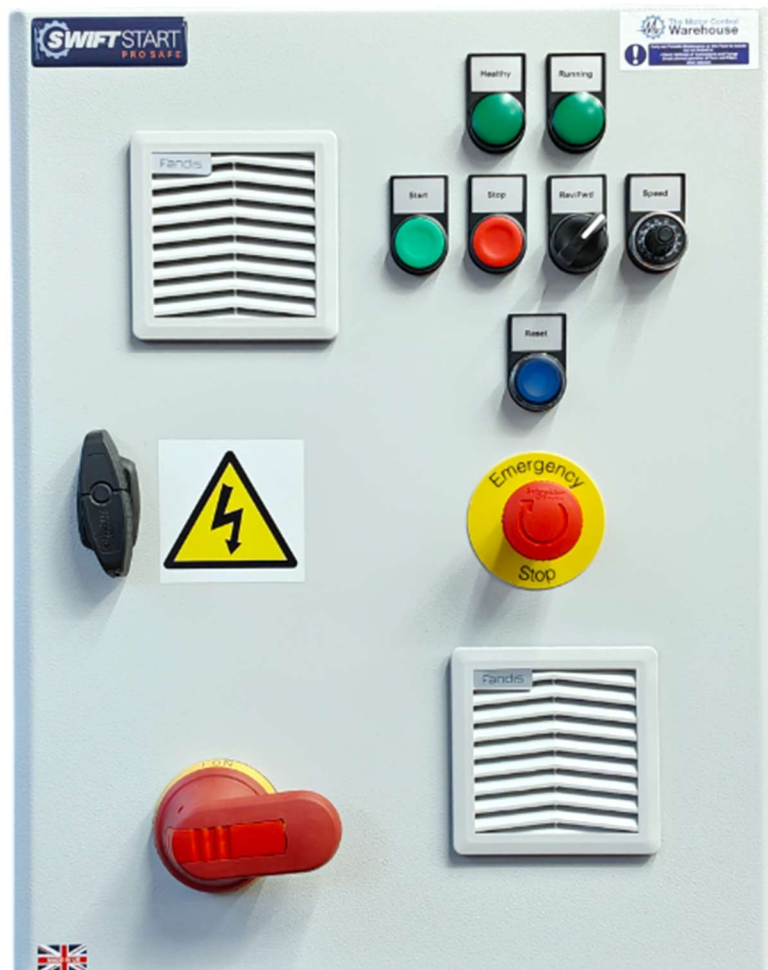




Swift Start Pro Safe Enclosed Inverter User Guide

(0.75kW~55kW)



V0.0.0

Contents

1 Safety information	1
2 Technical Data	2
3 Motor Connection	4
4 Operation	5
5 Single phase circuit diagram	7
6 Three phase circuit diagram	8

Declaration of Conformity

Willpower Electrical Limited trading as Motor Control Warehouse hereby states that the Enclosed Inverter range (SSPS) conforms to the relevant safety provisions of the **Low Voltage Directive 2006/95/EC** and the **EMC Directive 2004/108/EC** and have been designed and manufactured in accordance with the following harmonised European standards:

EN61000-6-2	EMC immunity in industrial environment
EN61000-6-4	EMC emission in industrial environment
EN61010-1	Safety
EN60529: 1992	Specifications for the degrees of protection provided by enclosures

Model	kW Rating	Input Voltage (+/-10%)
SSPS0075EN200V	0.75kW	230VAC
SSPS0150EN200V	1.5kW	230VAC
SSPS0220EN200V	2.2kW	230VAC
SSPS0400EN200V	4.0kW	230VAC
SSPS0075EN400V	0.75kW	400VAC
SSPS0150EN400V	1.5kW	400VAC
SSPS0220EN400V	2.2kW	400VAC
SSPS0400EN400V	4.0kW	400VAC
SSPS0550EN400V	5.5kW	400VAC
SSPS0750EN400V	7.5kW	400VAC
SSPS1100EN400V	11kW	400VAC
SSPS1500EN400V	15kW	400VAC
SSPS1850EN400V	18.5kW	400VAC
SSPS2200EN400V	22kW	400VAC
SSPS3000EN400V	30kW	400VAC
SSPS3700EN400V	37kW	400VAC
SSPS4500EN400V	45kW	400VAC
SSPS5500EN400V	55kW	400VAC

	
Name	Gareth Lloyd
Position	Technical Director
Date	21.11.2025

Safety Information

This chapter provides very important information so that you can use the **SSPS Enclosed Inverter** safely, prevent injury or death, or damage to equipment. Please read this information thoroughly and make sure you observe all the safety information shown below and elsewhere in this manual and in the Invertek P2 Easy Start Guide. Please make this User Guide and the Invertek P2 Easy Start Guide available for the end user.

Please read this safety information in conjunction with the safety information in the Invertek P2 Easy Start Guide. Please read the Invertek P2 Easy Start Guide for details such as Fuse/MCB and cable sizes etc.

Safety symbols



Danger: Danger of electrical shock which can cause injury or death, or damage to equipment



Warning: Potential hazard, other than electrical, that can cause physical injury or damage to equipment



Danger

- The SSPS Enclosed Inverter should **ONLY** be installed, commissioned and maintained by qualified and competent personnel.
- The SSPS must be installed to the latest IEE wiring regulations taking into account local regulations.
- Before power is applied to the SSPS, ensure the SSPS cubicle door is closed.
- Dangerous voltages are present when the input power supply is connected to the SSPS. Before attempting any work on the SSPS cubicle or motor, isolate and lock off the input power supply. After disconnecting the supply, wait at least 10 minutes (to let the SSPS drives internal capacitors discharge) before opening the cubicle door. Prove dead using a voltage tester. The voltage tester itself should be proved immediately before and after testing using a proving unit with a low power output.
- The SSPS cubicle must be connected to system ground using the cubicles earth terminals. The size of the earth conductor and earth loop impedance must comply with national and local electrical regulations.
- Do not flash test the components within the SSPS cubicle.
- If the SSPS cubicle is supplied from a pluggable power connector, the SSPS interlocked isolator must be turned off before unplugging the connector.
- The SSPS is a non-field repairable unit. Contact the supplier of the SSPS.
- The SSPS cubicle must be protected by the recommended fuses/MCB (See Invertek P2 Easy Start Guide).



Warning

- All machinery, in which this SSPS is used, within the European Union, must comply with directive 98/37/EC, Safety of Machinery.
- Do not install the SSPS in an explosive environment.
- The motor must be used within the manufacturers guidelines.
- Do not allow conductive material to enter the components within the SSPS, e.g. from drilling during installation.

Technical data

Model	kW rating	Input phase	Input voltage (VAC +/-10%)	Max motor current (A)
SSPS0075EN200V	0.75	1	230	4.3
SSPS0150EN200V	1.5	1	230	7
SSPS0220EN200V	2.2	1	230	10.5
SSPS0400EN200V	4.0	1	230	15.3
SSPS0075EN400V	0.75	3	400	2.2
SSPS0150EN400V	1.5	3	400	4.1
SSPS0220EN400V	2.2	3	400	5.8
SSPS0400EN400V	4.0	3	400	9.5
SSPS0550EN400V	5.5	3	400	14
SSPS0750EN400V	7.5	3	400	18
SSPS1100EN400V	11	3	400	24
SSPS1500EN400V	15	3	400	30
SSPS1850EN400V	18.5	3	400	39
SSPS2200EN400V	22	3	400	46
SSPS3000EN400V	30	3	400	61
SSPS3700EN400V	37	3	400	72
SSPS4500EN400V	45	3	400	90
SSPS5500EN400V	55	3	400	110

Approvals	CE approval	CE
Environment	Altitude	1000m rated 1000m~3000m, 1% rated current de-rating per 100m
	Operating Temperature	-10°C~+40°C
	Max. Humidity	≤90%RH, non-condensing
	Vibration	≤5.9m/s ² (0.6g)
	Storage Temperature	-40°C~+70°C
	Running Environment	Non-flammable, No corrosive gasses, no contamination with electrically conductive material, avoid dust which may restrict the fan
Supported Power Supply Systems		TT & TN
		IT (removal of drives internal EMC filter and VAR required)
SSPS Enclosure		IP54
Breaking capacity of protective devices		10kA
Supply frequency		49 to 61Hz
Input supply voltage	200V models	Single phase 200 – 240VAC ±10%
	400V models	3 phase 400VAC ±10%
Output Voltage	200V models	0 to input (230V 3 phase)
	400V models	0 to input (400V 3 phase)

Maximum Motor Cable Lengths

The maximum motor cable lengths for standard SWA (steel wire armoured) or screened cable is 100m for all SSPS cubicles.

If high capacitance motor cables are used, the maximum motor cable should be halved to 50m. If the maximum motor cable length is to be exceeded, an output motor reactor or sine filter must be used.

Braking Resistors



WARNING:

If braking resistors are being installed for use with the SSPS:

Braking resistors can reach high temperatures and therefore must be located as not to cause damage. They must be connected using cables suitable for these high temperatures.

It is essential that the braking resistor is protected against overload. A thermal device that disconnects the AC supply to the drive must be fitted.

NOTE: Please observe the minimum braking resistor value in the tables in the Invertek P2 Easy Start Guide.

SSPS Cubicle Dimensions & Weights

Model	Dimensions (H x W x D)	Weight (kg)
SSPS0075EN200V	400 x 300 x 200	20
SSPS0150EN200V	400 x 300 x 200	20
SSPS0220EN200V	500 x 400 x 250	24
SSPS0400EN200V	600 x 400 x 250	28
SSPS0075EN400V	400 x 300 x 200	20
SSPS0150EN400V	400 x 300 x 200	20
SSPS0220EN400V	500 x 400 x 250	24
SSPS0400EN400V	500 x 400 x 250	24
SSPS0550EN400V	600 x 400 x 250	28
SSPS0750EN400V	600 x 400 x 250	28
SSPS1100EN400V	800 x 600 x 250	40
SSPS1500EN400V	800 x 600 x 300	43
SSPS1850EN400V	800 x 600 x 300	43
SSPS2200EN400V	800 x 600 x 300	43
SSPS3000EN400V	1000 x 800 x 400	70
SSPS3700EN400V	1000 x 800 x 400	70
SSPS4500EN400V	1000 x 800 x 400	75
SSPS5500EN400V	1200 x 800 x 400	80

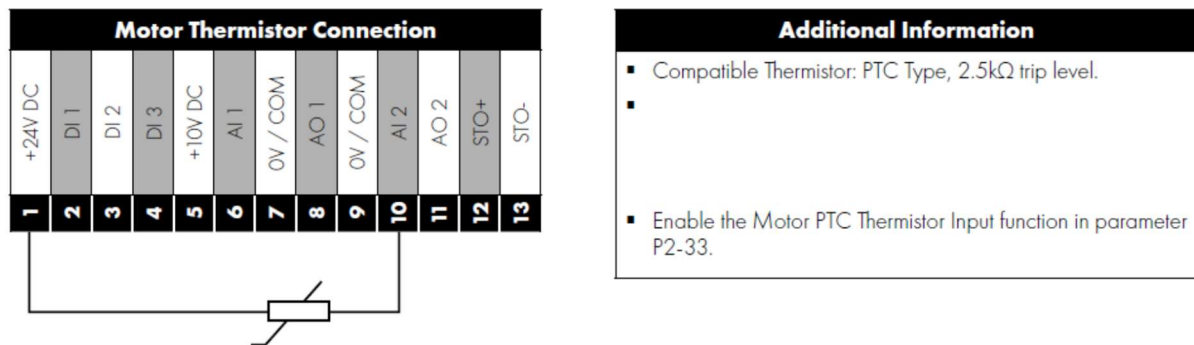
Motor cooling

The SSPS can be used to reduce the speed of the motor. If the motor is going to be run at low speed for extended periods of time, the cooling air from the motor fan may become ineffective and therefore the motor could overheat. The fitting of a motor force vent cooling fan may be necessary.

NOTE: The SSPS inverter drive can be configured to accept a motor thermistor. The thermistor will cause the drive to trip to prevent the motor overheating.

4.12.2. Motor Thermistor Connection

Where a motor thermistor is to be used, it should be connected as follows:



When using the motor thermistor adjust parameter P9-08 (External trip input source.) to 5.

Motor connection

When connecting a 3 phase motor to an AC inverter drive, it is important that the motor terminal box connections are correct for the supply voltage being used. Generally up to 3kW, the motor is wound for 230V delta, 400V star. Generally above 3kW, the motor is wound for 400V delta, 690V star.

Please check the motor nameplate for the correct connection.

Inverter Supply Voltage	Motor Nameplate Voltages	Connections	
230V	230V / 400V	Delta △	
400V	400V / 690V		
400V	230V / 400V	Star ∧	

The usual issues when the wrong connections are made:

230V AC drive connected to a 400V star connected motor or 400V AC drive connected to a 690V star connected motor:

The motor will probably run if starting a lightly loaded motor. If the motor tries to start a heavy load or if a heavy load is applied to the motor while running, the motor will stall due to a lack of torque and the drive will trip on an over current or I x t trip.

400V AC drive connected to a 230V delta connected motor:

On enable, the drive will either trip on an over current trip or the drive will go into current limit and trip on an “I x t trip”.

NOTE: Please make sure there are no phase to earth short circuits on the motor/motor cable before powering up the SSPS. A phase to earth

Operation

The SSPS range of enclosed motor inverters is designed to be as close to a plug and play product as possible. They require a suitable 3 phase and earth or single phase and earth power supply and a three wire and earth motor cable. Please note it is best practice to use a screened motor cable.

The SSPS is equipped with:

- Green start button
- Red stop button
- Red latching **Inverter emergency stop** button
- Blue illuminated reset button
- Drive healthy lamp
- Drive running lamp
- Forward/Reverse switch
- A single turn speed potentiometer
- An interlocked mains isolator is also provided; the enclosure door cannot be opened unless the isolator is in the off position.

The SSPS will provide a soft start and a soft stop along with motor thermal protection.

Start Button - When pressed (providing the inverter disable button is not pressed) the inverter will start and ramp up to the speed set by the speed potentiometer.

Stop Button - When pressed the inverter will ramp to a stop.

Inverter Emergency Stop Button – When pressed the power is removed from the drive via the safety contactor and the STO of the drive is removed.

Speed Potentiometer - When turned in the anti clockwise direction this will reduce inverter output speed. When turned in the clockwise direction this will increase inverter output speed.

Forward/Reverse Switch - When set in the forward position the inverter will turn a motor in the clockwise direction of rotation when looking at the motor shaft from in front of the motor (providing U,V,W on the inverter are connected to U1, V1, W1 on the motor).

When set in the reverse position the inverter will turn a motor in the anti-clockwise direction of rotation when looking at the motor shaft from in front of the motor (providing U,V,W on the inverter are connected to U1, V1, W1 on the motor).

Healthy Lamp - This lamp will be illuminated when the SSPS inverter is in the healthy state (not tripped).

Running Lamp - This lamp will be illuminated when the SSPS inverter is running (inverter output enabled).

Mains Isolator - With the mains isolator in the off position mains power will be removed from the control box. Mains power will still be present at the input connections to the isolator only.

Reset Button – This is used to reset the safety relay after the emergency stop has been activated.

SSPS Parameter Settings

The following parameters should be set by the user in the SSPS Invertek P2 Inverter drive:

Parameter	Default Setting	User Setting
P1-01 Maximum Frequency/Speed Limit	50.0Hz	Set to maximum frequency/ Speed required
P1-02 Minimum Frequency/Speed limit	0Hz	Set to minimum frequency/Speed Required
P1-03 Acceleration ramp time	5.0/10.0 Seconds	Set to time required to achieve speed set in P1-01
P1-04 Deceleration ramp time	5.0/10.0 Seconds	Set to time required to come to a standstill
P1-07 Motor Rated Voltage	N/A	Set to voltage rating on motor nameplate
P1-08 Motor rated current	N/A	Set to current rating on motor nameplate
P1-09 Motor rated frequency	50 (60)	Set to frequency on motor nameplate

The following parameters have been pre-programmed to allow the drive to function as indicated in the wiring diagram.

Parameter	Default Setting	Preset setting
P1-13 Digital inputs function select	1	0
P1-14 Extended menu access	0	201
P9-01 Enable input source	1	2
P9-05 latch function enable	0	1
P9-06 Reverse enable source	2	3
P9-07 Reset input source	1	0
P9-18 Speed select input 0	3	0
P9-21 Preset speed select input 0	5	0

Emergency Stop Information

The Swift Start Pro Safe Enclosed Inverter has been designed with a consideration towards safety, having a robust E-Stop system suitable for applications requiring a basic E-Stop that is both robust and reliable. The safety circuit comprises of a door mounted twist release E-Stop button and a blue illuminated reset button both monitored by a dual channel safety relay. The safety relay provides removal of power to the Inverter via an isolation contactor and removal of the Inverter STO input. As per EN/IEC 60204-1 the E-Stop function is defined as a Stop category 0: stopping by immediate removal of power to the machine actuators/motors. This is an uncontrolled stop with the motor coasting to a stop.

The safety relay has been set up to work with Application Function 2 for the following typical applications.

Characteristic	Value/Description
Typical applications	 Monitoring of Emergency Stop circuits as per ISO 13850 and IEC 60204-1, stop category 0  Monitoring of guards as per ISO 14119/14120 with electrical switches
Type of outputs of sensor/device providing the input signal for application function	Normally open, normally closed and/or changeover outputs
S• terminals to be connected	S11-S12 and S21-S22 The safety-related input S21-S22 is positive.
Dynamization	Yes
Signal interlock monitoring	Between terminals S12 and S22

Synchronization:

Synchronized terminals	Synchronization time
S12 synchronized with S22	If S12 is activated before S22, S22 has to be activated within 2 s. If S22 is activated before S12, S12 has to be activated within 4 s.

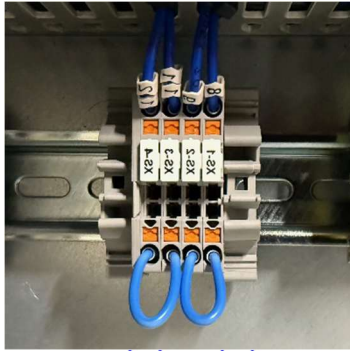
Note - A suitable safety risk assessment should be conducted on the equipment where the SSPS panel is intended to be used to determine the suitability of the Emergency stop function provided by the Pro Safe Enclosed Inverter panel. MCW cannot accept responsibility for the product being used on a system/ application requiring a more robust emergency stop system.

Wiring to external devices

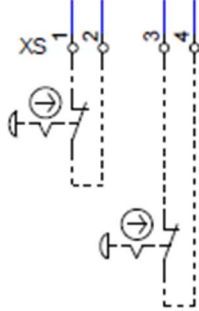
Input Channels

In addition to the door mounted twist release E-Stop button there are terminals provided for wiring to suitable external E-Stop buttons/ door switches. These should be wired as per the following information.

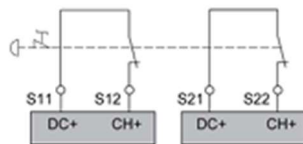
The SSPS has din rail terminals labels as XS, 1, 2, 3 & 4. These terminals should be used as pairs XS 1 & 2, XS 3 & 4, they provide 2 separate E-Stop loops that can be wired to an E-Stop button or guard with 2 x NC contacts (one per channel). From factory these terminals will have link wires fitted to bypass the external connections, these will need to be removed to allow wiring of any external E-Stop devices. Any device connected needs to have 2 x NC contacts to independently break each channel, if one channel is broken the safety relay will report this as an error and will not reset without either a power cycle of pressing and releasing the door E-Stop button.



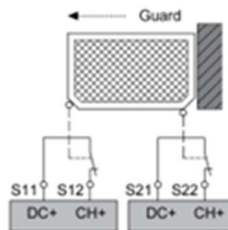
These terminals are linked out as standard, if the use of your own E-stop is required please remove these links.



Wiring of the inputs for Emergency Stop



Wiring of the inputs for guards



Note - the terminals labelled XS, 1, 2, 3 & 4 should be connected to volt free contacts only, no voltage can be applied to these connections nor can these connections be used to supply power to any sensors etc. Incorrect wiring of these connections can cause damage to the safety relay and failure of the E-Stop function.

Operation

On 1st power up or after the E-Stop has been activated the system will need to be reset before the motor can be operated, this state will be indicated by the blue illuminated reset button being illuminated. A reset will only be allowed when the door mounted E-Stop button is released and external E-Stops if connected are healthy, and there are no detected faults with the system (i.e isolation contactor not welded). On successful reset the blue illuminated reset button will not be lit and the Inverter will power up and become ready to operate.

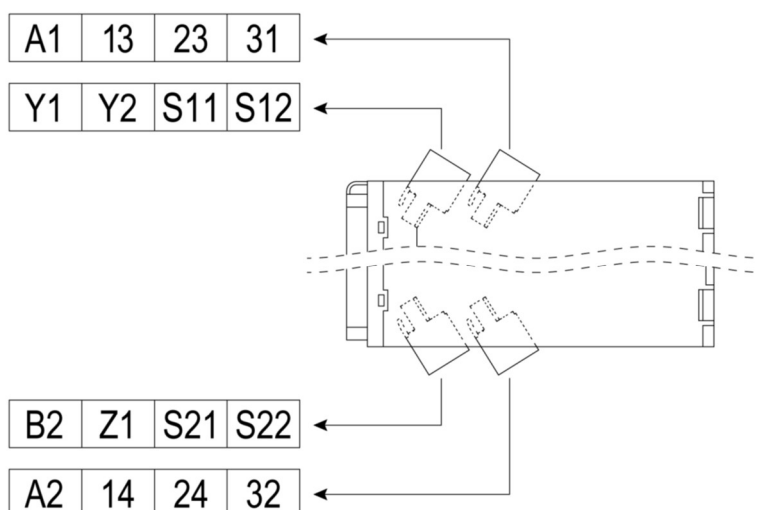
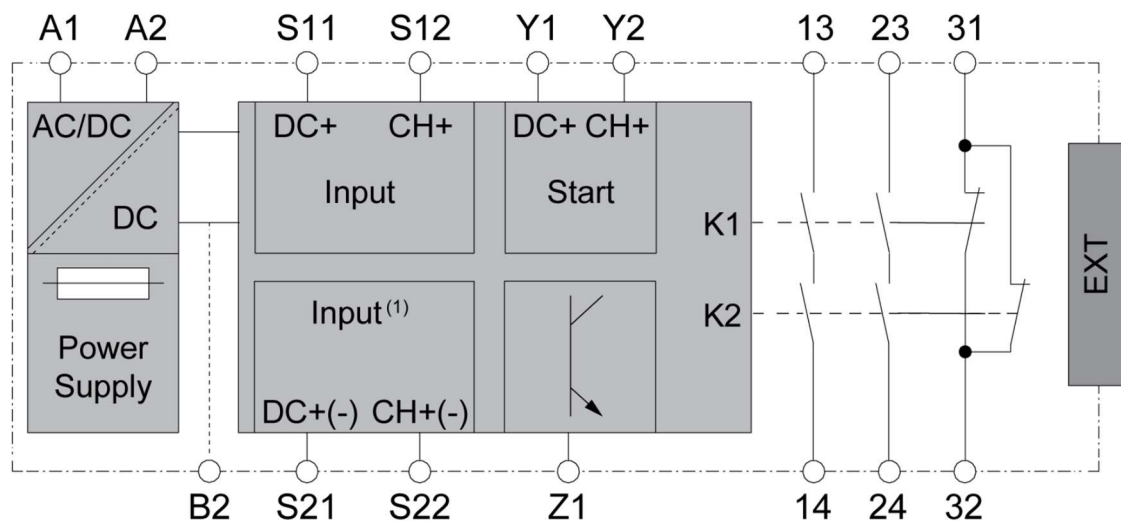
Safety relay information

The Swift Start Pro Safe range uses a Schneider XPSUAK12AP safety relay. Here is some basic information relating to the device, for further information please refer to the manufacturers user guide 'XPSUAK Safety Module Original instructions' this can be found on the Schneider product page.

<https://www.se.com/uk/en/product/XPSUAK12AP/preventa-module-cat-4-features-xpsuaf-+-pnp-npn-safety-mat-24vac-dc-screw/>

Safety Relay

The following drawings present the block diagram and the terminals with their designations in the removable terminal blocks.



Terminal Designation	Explanation
A1, A2	Power supply
Y1	Control output (DC+) of start input
Y2	Input channel (CH+) of start input
S11, S21	Control outputs (DC+ for S11, DC+ or DC- for S21) of safety-related inputs(1)
S12, S22	Input channels (CH+ for S12, DC+ or DC- for S22) of safety-related inputs(1)
B2	Terminal for common reference potential for 24 Vdc signals. The power supplies of the connected equipment must have a common reference potential to be connected to this terminal.
13, 14, 23, 24, 31, 32	Terminals of the safety-related outputs
Z1	Pulsed output for diagnostics, not safety-related
EXT	Connector for output extension module XPSUEP
(1)	Depending on the selected application function, the safety-related input is used as positive or negative safety-related input. Refer to the chapter Application Functions (see page 46) for configuration and to the section Safety-Related Inputs (see page 41) for details on positive and negative logic.

How the safety relay stops motor rotation

The safety rated output channels of the safety relay provide separate means for preventing the motor from rotating, having 2 methods allows for redundancy to ensure the motor will not rotate even if one of the functions fails to operate. The 2 functions are as follows.

Function 1 - Isolation contactor

A contactor will remove the mains power supply from the inverter ensuring the unit powers down and has no power available to rotate the connected motor. This is monitored by the reset loop, if the safety relay will no reset check this contactor has not stuck in.

Function 2 - removal of inverter STO input

This function will remove the 24V supply to the Inverter STO terminal (Drive terminal 12). Removal of this will prevent the inverter from producing torque in the motor.

STO Function

4.14. Safe Torque Off.

Safe Torque OFF will be referred to as “STO” through the remainder of this section.

4.14.1. Responsibilities.

The overall system designer is responsible for defining the requirements of the overall “Safety Control System” within which the drive will be incorporated; furthermore the system designer is responsible for ensuring that the complete system is risk assessed and that the “Safety control System” requirements have been entirely met and that the function is fully verified, this must include confirmation testing of the “STO” function before drive commissioning. The system designer shall determine the possible risks and hazards within the system by carrying out a thorough risk and hazard analysis, the outcome of the analysis should provide an estimate of the possible hazards, furthermore determine the risk levels and identify any needs for risk reduction. The “STO” function should be evaluated to ensure it can sufficiently meet the risk level required.

4.14.2. What STO Provides.

The purpose of the “STO” function is to provide a method of preventing the drive from creating torque in the motor in the absence of the “STO” input signals (Terminal 12 with respect to Terminal 13), this allows the drive to be incorporated into a complete safety control system where “STO” requirements need to be fulfilled.¹ The “STO” function can typically eliminate the need for electro-mechanical contactors with cross-checking auxiliary contacts as per normally required to provide safety functions.² The drive has the “STO” function built-in as standard and complies with the definition of “Safe torque off” as defined by IEC 61800-52:2007. The “STO” function also corresponds to an uncontrolled stop in accordance with category 0 (Emergency Off), of IEC 60204-1. This means that the motor will coast to a stop when the “STO” function is activated, this method of stopping should be confirmed as being acceptable to the system the motor is driving. The “STO” function is recognised as a fail-safe method even in the case where the “STO” signal is absent and a single fault within the drive has occurred, the drive has been proven in respect of this by meeting the following safety standards:

	SIL (Safety Integrity Level)	PFHD (Probability of dangerous Failures per Hour)	SFF (Safe failure fraction %)	Lifetime assumed
EN 61800-5-2	2	1.23E-09 1/h (0.12 % of SIL 2)	50	20 Yrs
	PL (Performance Level)	CCF (%) (Common Cause Failure)	MTTFd	Category
EN ISO 13849-1	PL d	1	4525a	3
	SILCL			
EN 62061	SILCL 2			

4.14.4. "STO" Operation.

When the "STO" inputs are energised, the "STO" function is in a standby state, if the drive is then given a "Start signal/command" (as per the start source method selected in P1-13) then the drive will start and operate normally. When the "STO" inputs are de-energised then the STO Function is activated and stops the drive (Motor will coast), the drive is now in "Safe Torque Off" mode. To get the drive out of "Safe Torque Off" mode then any "Fault messages" need to be reset and the drive "STO" input needs to be re-energised.

4.14.5. "STO" Status and Monitoring.

There are a number of methods for monitoring the status of the "STO" input, these are detailed below:

Drive Display

In Normal drive operation (Mains AC power applied), when the drives "STO" input is de-energised ("STO" Function activated) the drive will highlight this by displaying "InHibit".

NOTE If the drive is in a tripped condition then the relevant trip will be displayed and not "InHibit".

4.14.6. "STO" Function Response Time

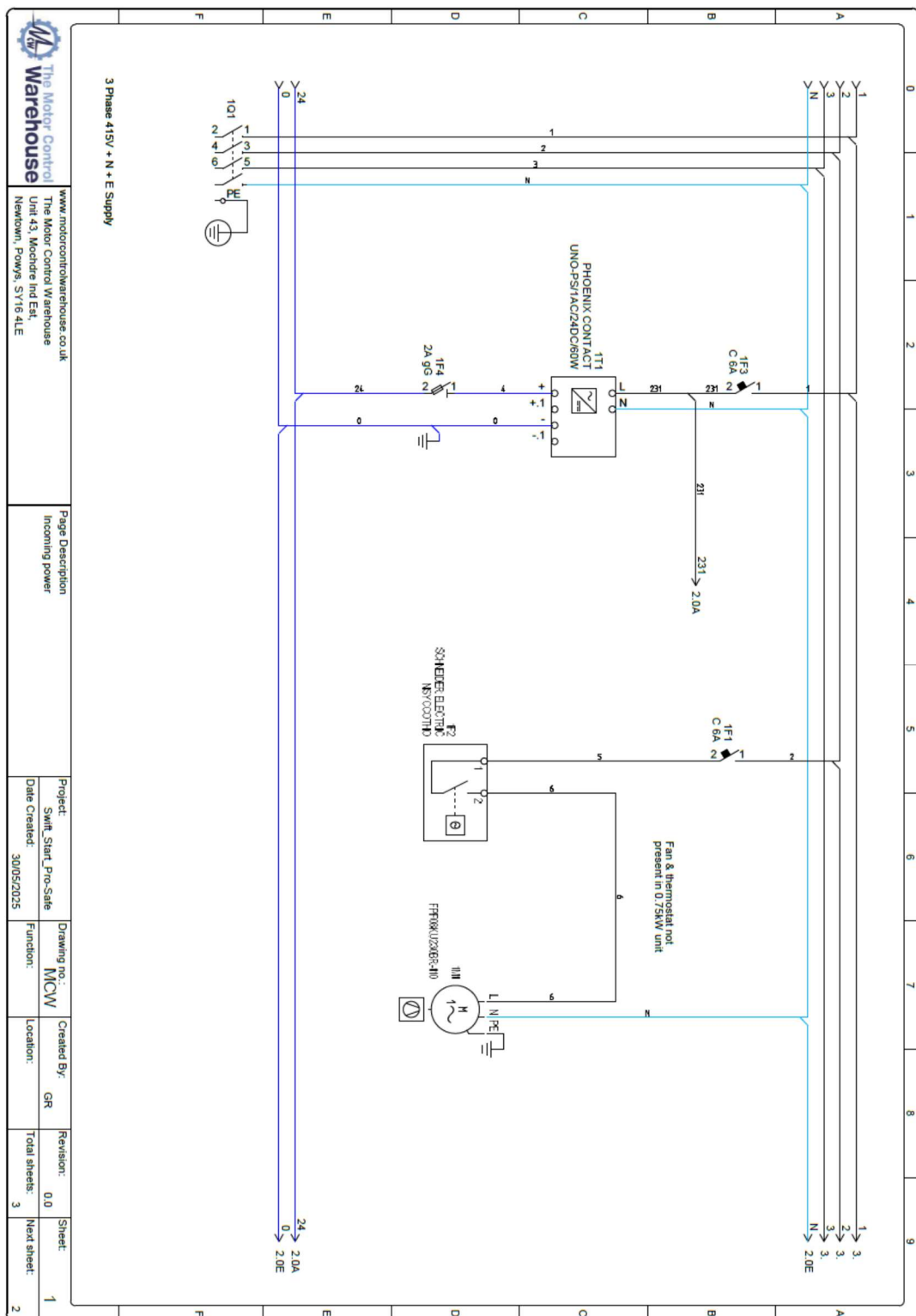
The total response time is the time from a safety related event occurring to the components (sum of) within the system responding and becoming safe. (Stop Category 0 in accordance with IEC 60204-1).

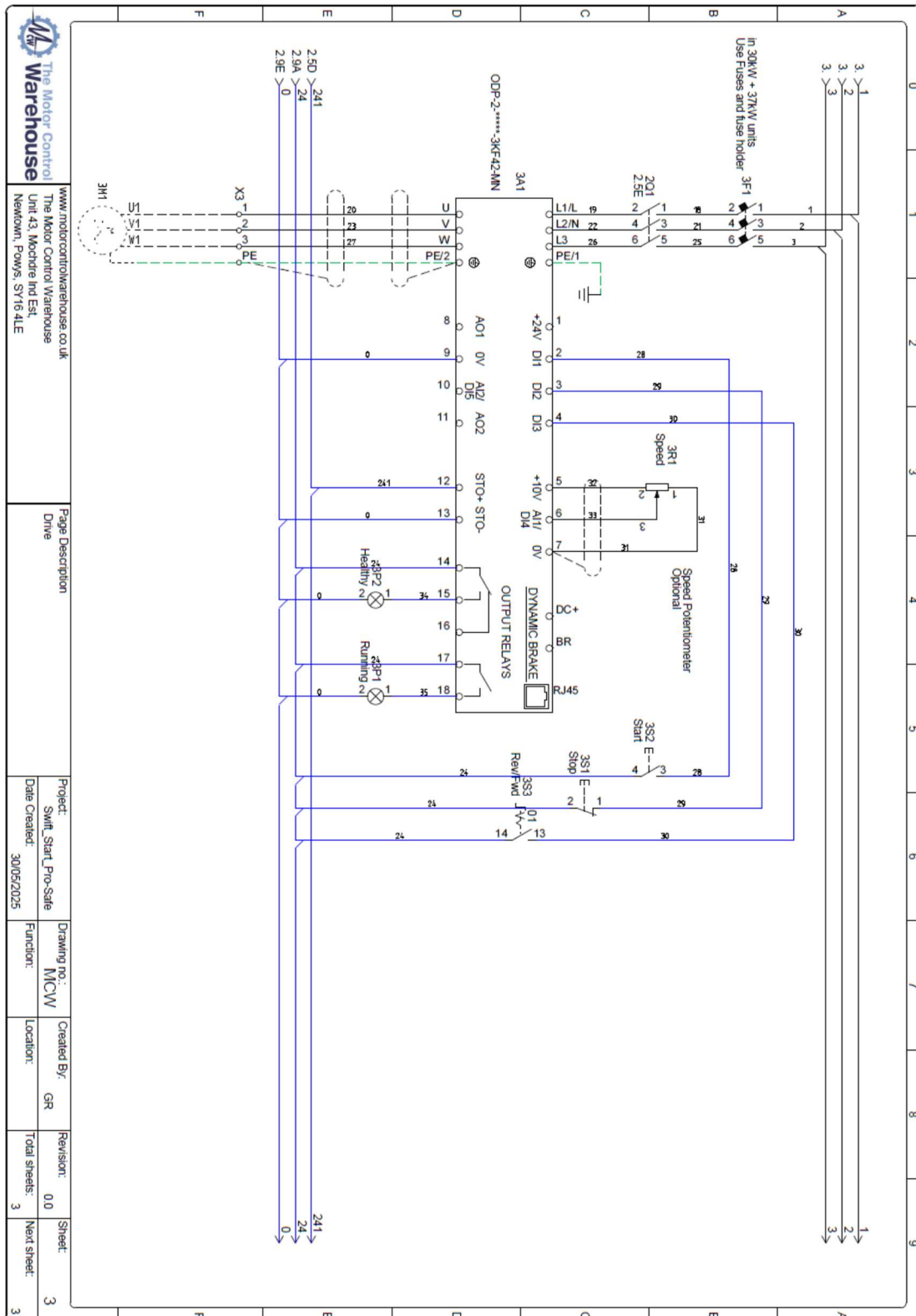
The response time from the "STO" inputs being de-energised to the output of the drive being in a state that will not produce torque in the motor ("STO" active) is less than 1ms.

The response time from the "STO" inputs being de-energised to the "STO" monitoring status changing state is less than 20ms.

The response time from the drive sensing a fault in the STO circuit to the drive displaying the fault on the display/Digital output showing drive not healthy is less than 20ms.

400V Wiring Diagram





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	The Motor Control Warehouse			Drive		Swit. Start Pro-Safe		M/CV		GR		0.0		3	
						Date Created:						Total sheets:		Next sheet:	
						30/05/2025						3		3	

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Other Swift Start Products from Motor Control Warehouse



Features:

IP65 steel powder coated enclosure.

Interlocked mains isolator.

Start/stop buttons

Motor outputs to terminals

Simplified installation and function.



Features:

IP65 steel powder coated enclosure.

Interlocked mains isolator.

Start/stop buttons

Fwd/Rev switch

Speed potentiometer

Inverter disable button.

Motor outputs to terminals

The classic inverter in a box with all the control at your fingertips.

V0.0.0