

## SED2 Variable Speed Drive Application Guide «Fire Mode»

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# 1 About this document

## 1.1 Revision history

Version	Date	Changes	Section	Pages
V01	13.07.2007	None (new document)	—	—

## 1.2 Reference documents

Ref.	Document title	Type of document	Document No.
[1]	SED2 Getting Started Guide	Commissioning	CM1G5192X
[2]	SED2 Commissioning Guide	Commissioning, Configuration	CM1G5192xx
[3]	SED2 Data Sheet	Technical Data	CM1N5192xx

## 1.3 Before you start

### 1.3.1 Copyright

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This document may be duplicated and distributed only with the express permission of Siemens, and may be passed only to authorized persons or companies with the required technical knowledge.

### 1.3.2 Quality assurance

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These documents have been prepared with great care.

- The contents of all documents are checked at regular intervals.
- Any corrections necessary are included in subsequent versions.
- Documents are automatically amended as a consequence of modifications and corrections to the products described.

Please ensure that you are aware of the latest revision date of the documentation. If you find any lack of clarity while using this document, or if you have any criticisms or suggestions, please contact the product manager in your nearest branch office, or write directly to the support team at Headquarters in Zug (see below).

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### 1.3.3 Document use/request to the reader

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## 2 Safety and CE compliance

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Before installing and putting the equipment into operation, read these safety instructions and warnings carefully. Also read and obey all warning signs attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace any missing or damaged labels.

### Warning

- This equipment contains dangerous voltages and controls dangerous rotating mechanical parts. Loss of life, severe personal injury or property damage can result if the instructions contained in this Manual are not followed
- Only suitably qualified personnel should work on this equipment, and only after being familiar with all safety notices, installation, operation and maintenance procedures contained in this manual
- Use only permanently wired input power connections. The equipment must be grounded (IEC 536 Class 1, NEC, and other applicable standards)
- If a Residual Current Circuit Breaker (RCCB or ELCB) is required, type B with a 300 mA tripping current must be used (the RCCB should only supply one VSD). An unfiltered VSD should be used or if the VSD has an EMC filter this must be disconnected, due to the filter leaking current to earth. The neutral conductor in the system must be grounded
- Wait at least 5 minutes after the power has been turned off, before opening the equipment. The dc-link capacitor remains charged to dangerous voltages even when the power is removed. When working on open equipment, note that live parts are exposed and do not touch such parts
- Do not connect machines with a three-phase power supply, fitted with EMC filters, to a supply via an ELCB (Earth Leakage Circuit Breaker - see EN 50 178, section 6.5)
- Note that certain parameter settings may cause the VSD to restart automatically after an input power failure
- Do not use this equipment as an “emergency stop” mechanism (see EN 60 204, 9.2.5.4)
- Note that certain parameter settings may cause the VSD to start automatically
- Obey all general and regional installation and safety regulations relating to work on high-voltage installations, as well as regulations covering correct use of tools and personal protective equipment
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. An external PTC can also provide motor overload protection via a special input
- This equipment is suitable for use in a circuit capable of delivering not more than 100,000 symmetrical amps (rms) for a maximum voltage of AC 230/460 V when protected by a time delay fuse.
- Do not use the unit with a motor of a higher nominal power rating than the VSD, or a nominal power less than half that of the VSD. Only operate the VSD when the nominal current in P0305 exactly matches the motor rating plate nominal current
- When using the analog inputs, the DIP switches must be correctly set and the analog inputs correctly configured before enabling them. If this is not done, the motor may start inadvertently

## Caution

- Do not allow children or the general public to access or approach this equipment
- Do not install the VSD where it will be subjected to shock, vibration, electromagnetic radiation, water hazards, or atmospheric pollutants such as dust or corrosive gasses
- Keep Operating Instructions, etc., with this equipment or with the end-user
- Use this equipment only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any spare parts, which are not sold or recommended by the manufacturer; as this could cause fire, electric shock or other injuries

## 2.1 Exclusion of liability

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The user of the SED2 variable speed drive must be aware that fire/emergency operation may only be activated should crucial events occur (e.g. fire), where continued operation of the motor (fan) is mandatory to ensure smoke and heat extraction, for instance, in order to facilitate the evacuation of people.

When triggering fire/emergency operation, certain alarm and fault status messages of the SED2 (e.g. overtemperature of SED2, breakdown of bus communication) will be suppressed. In the case of other faults (e.g. overvoltage or overcurrent), restarts will permanently be triggered. Suppression of the protective functions shall ensure that – during fire/emergency operation – the motor continues to run as long as possible.

When using this operating mode, damage to the SED2 itself cannot be excluded, be it due to failure of internal components or fire caused by excessive heat. In addition, it must be taken into account that – due to the parameterized behavior of the SED2 – other HVAC plant components can also be damaged during fire/emergency operation. This includes air dampers, for example, which can be damaged as a result of overpressure (e.g. when the maximum motor speed is parameterized). Such damage can lead to HVAC plant malfunction or failure – a fact to be considered when triggering fire/emergency operation.

For these reasons, Siemens Building Technologies assumes no responsibility for any faults, malfunctions and damage of the SED2 itself or of any other types of components used in the relevant HVAC plant, or for direct or indirect damage resulting from activation of fire/emergency operation.

The correct functioning of fire/emergency operation depends on the right selection of the HVAC system components of which the SED2 constitutes only one component. Plant used in vital sectors, such as ventilation plant that need to mandatory and constantly deliver a certain amount of outside air, must be approved by the respective authorities.

Fire/emergency operation can be triggered via one of the six digital inputs DIN1...6. The BOP display shows alternately "ES" and the motor's frequency.

Fire/emergency operation can be deactivated any time via the digital input that was used for activation. Then, the SED2 will resume normal operation as parameterized.



## 2.2 Qualified personnel

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In the sense of this documentation, qualified personnel are those who are knowledgeable and qualified to install, mount, commission, operate and service/maintain the SED2 Variable Speed Drive product. He or she must have the appropriate qualifications to carry-out these activities, for example:

- Trained and authorized to energize and de-energize, ground and tag circuits and equipment according to applicable safety standards.
- Trained or instructed according to the latest safety standards in the care and use of the appropriate safety equipment.
- Trained in rendering first aid.

There is no explicit warning information in this documentation. However, reference will be made to warning information and instructions in the Operating Instructions for the particular product.

## 2.3 User group

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These Guidelines were drawn-up to support customers and employees of Siemens AG when engineering plants and machines.

The functions and features described in this document refer only to the SED2 Variable Speed Drive with version [Firmware 1.40](#) or greater.

## 3 Introduction

### 3.1 Smoke and heat extraction in the building

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"There is no smoke without a fire". This old proverb can still be applied to our time – and the order of the 2 risk factors "smoke and fire" is correct too. A number of fires in recent times have demonstrated that, very often, smoke poses a greater threat to people than the fire itself. This shall be in indication of the importance of smoke when discussing the safety of people in the case a building fire has broken out.

On the one hand, strong smoke limits visibility or produces toxic gases, which make breathing much more difficult so that escape routes can no longer be used without wearing appropriate clothing. On the other hand, the accumulation of gases produced by the fire will lead to enormous heat concentrations near the source of the fire so that flashover to other spaces or plant can occur.

The necessity of smoke and heat extraction is uncontested. In general, however, contractors must first be persuaded to include this requirement in their planning work and to approve the investment since this feature does not constitute part of a HVAC plant's comfort requirements, but is "only" considered as a "preventive measure".

Present national fire protection guidelines and standards, which sometimes even give consideration to regional needs, partly define the requirements placed on smoke and heat extraction in buildings. Proven applications come primarily from Australia (S/NZ 1668.1-1998) and the U.S. (ASHRAE publication, Design of Smoke Management). For European countries, EN 12101 lays down the requirements for smoke and heat extraction components and the methods applied to differential pressure systems (overpressure plants) in buildings.

### 3.2 Guidelines and standards for smoke and heat extraction

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USA	NFPA 92A, NFPA 92B, ASHARE Guideline 5 <i>Design of Smoke Management System</i>
Europe	EN 12101 Part1-6 <i>Smoke and heat control systems</i>
Germany	VDMA 24200-1 <i>Automatisierte Brandschutz- und Entrauchungssysteme ABE</i>
Australia, New Zealand	AS/NZS 1668.1:1998 <i>The use of ventilation and airconditioning in buildings - Fire and smoke control in multi-compartment buildings</i>
Switzerland	prSWKI BT101 Teil 1-6 <i>Rauch- und Wärmefreihaltung</i>

### 3.3 Interplay of ventilation plant and smoke and heat extraction in the event of fire

The illustration below shows a possible scenario in the event of fire and the interplay between ventilation plant and smoke and heat extraction. According to the scenario chosen, a fire broke out on the floor in the middle of the building. In principle, the change from ventilation mode (comfort mode) to fire mode (smoke extraction mode) can take place automatically via the fire alarm center, or through a key switch on the fire alarm panel.

In both cases, the ventilation plant in section 2 will be shut down first of all. Both fire protection and smoke extraction dampers will be closed or opened as shown. Then, the fume gas fan (smoke extraction) in section 3 will be activated. The hot and usually toxic fumes will thus be vented to atmosphere. The resupply air duct and the open damper ensure that the space will be adequately vented.

The fire protection dampers on the respective floor prevent smoke from reaching the other floors via the supply and extract air ducts. However, open doors, passage ways or other openings between the floors and the stairwell or lift shaft allow smoke to spread. In order to keep escape routes and the other floors free from smoke as long as possible, ventilation plant in these zones will purposely be operated under overpressure.

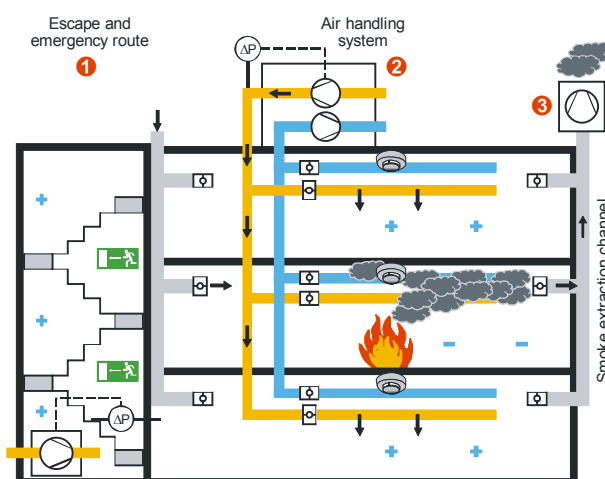
In zone 1 (stairwell), overpressure of 50 to 100 Pa is produced with the help of a differential pressure sensor and a speed-controlled fan (using a PID controller). Overpressure prevents smoke from entering the stairwell. Pressure changes caused by the opening and closing of doors are compensated by the control system, which also ensures that doors can still be opened in case pressure differentials exceed a certain level.

The supply air fan in zone 2 will also be activated, producing overpressure like in the stairwell. Naturally, differential pressure control could also be employed. But in most cases, the fan operates at a fixed speed.

The interplay of smoke and heat extraction and ventilation plant pursues the following targets:

- To minimize the amount of smoke and heat, the fume gases produced by the fire shall be conducted to atmosphere as quickly as possible.
- Overpressure operation of the ventilation plant shall ensure that escape routes and neighboring spaces will be kept free from smoke as long as possible.

Functioning principle of smoke and heat extraction and ventilation plant in the event of fire:



## 3.4 Operation of SED2 in the event of fire

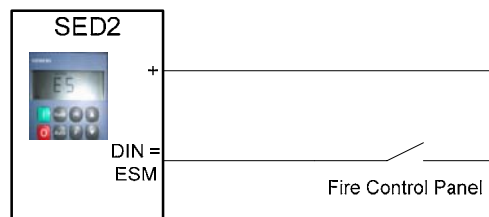
The new firmware V1.40 actively supports operation in the event of fire. The focus is clearly on the above mentioned overpressure plants, which can be easily implemented through the use of speed-controlled fans. The change from comfort to fire operation is accomplished by the Essential Service Mode (ESM). For use with the SED2, this function has been completely revised and extended.

The ESM function was also available with former firmware versions of the SED2, but has been constantly optimized based on experience made in the field and feedback received from the Regional Companies (RC). This means that V1.40 includes all findings made thus far so that the SED2 also represents state of the art as far as ESM is concerned.

### Activation of ESM

ESM can be activated via digital inputs DIN1...6. Hence, the ESM function must be assigned to one of these inputs.

Typically, the signal is delivered by the fire control panel. In that case, "ES" appears on the BOP display, which alternates with the motor's frequency.



When the command for ESM is deactivated again, the SED2 will resume normal operation.

### Difference between ESM and normal operation

The primary objective of ESM is to ensure fan operation “under all circumstances“. As soon as ESM is activated, the SED2 starts its operation independently of the operating state predefined by the building automation and control system. This means that **ESM is given priority over normal operation**. In addition – when using ESM – the protective VSD functions (soft errors and warnings), such as over-temperature or faulty communication, will be suppressed and the hard errors, such as overvoltage and overcurrent, acknowledged an infinite number of times and the motor restarted. The hard errors must not be suppressed and ignored!

### Definition of the SED2s behavior in ESM

It is possible to define any setpoint as the ESM setpoint. The flexibility of the SED2 allows this unlike other competitor drive that can only supply a fixed frequency setpoint in Fire-Mode. However, a fixed-frequency (e.g. maximum frequency) is the most common setpoint and this can easily be configured.

Sometimes, ESM also calls for controlled operation (internal PID), when full over- or low-pressure operation is not permitted because it shall still be possible to open or close doors. When using ESM, it is also possible to reverse the motor's direction of rotation.

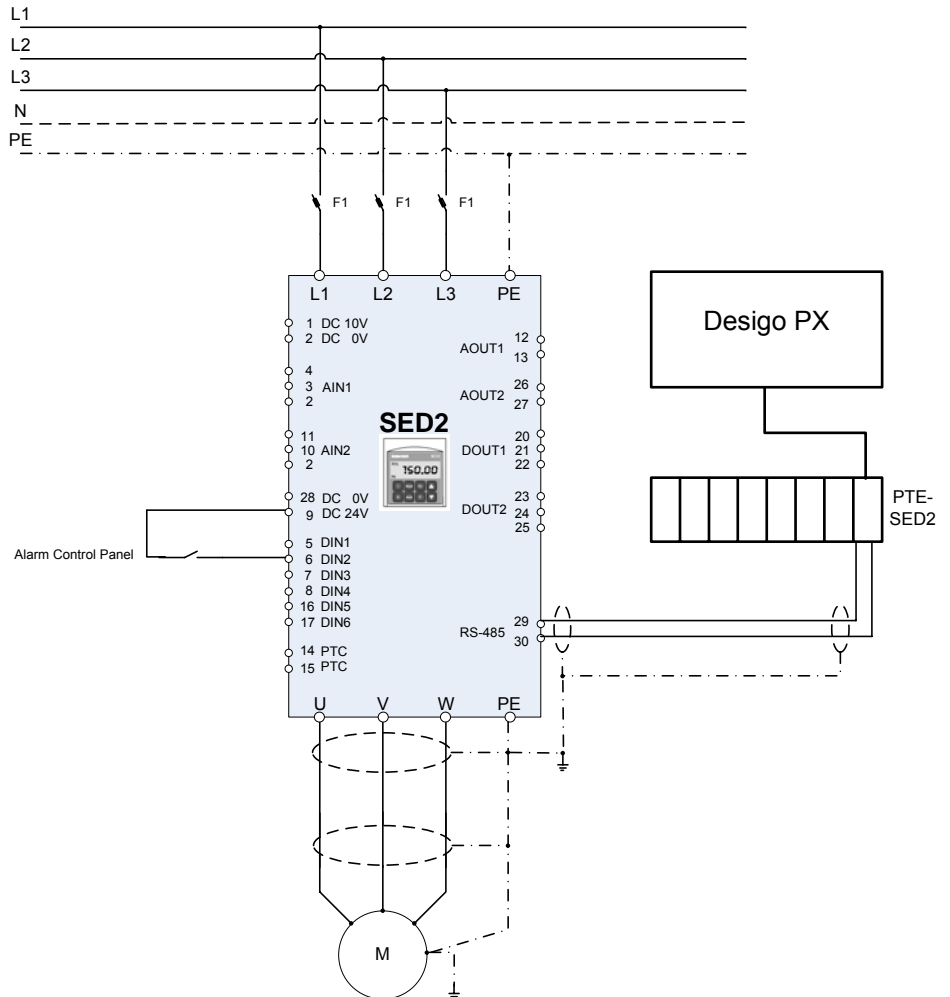
For that purpose, V1.40 offers a new parameter with 2 control words. These control words are used to define the behavior in ESM. The following applications can be implemented, either individually or in combination:

- Running to a defined fixed speed
- PID control with a defined fixed setpoint
- PID control with a preselected setpoint via analog input or bus
- Reversal of the direction of rotation

Once ESM is activated, "ES" is displayed on the SED2 BOP (Basic operating Panel). ESM activation can also be assigned to one of the relays of the SED2.

### Application example of ESM

The SED2 firmware offers ESM as a standard feature which can be enabled via a parameter and also appropriately parameterized. We envisage a number of typical applications for the ESM function. The following example shows a typical SED2 application in a shopping mall, including ESM:



- Several air handling plants are installed in a shopping center, using several SED2 for the supply and extract air fans
- In normal operation, the Desigo system delivers the switch-on command and setpoint to the VSD via bus
- If the fire alarm center activates ESM, the SED2 will start to operate with the maximum speed at 50 Hz and suppresses the protective functions and error messages as described above
- The plant will switch to overpressure operation in order to keep the rooms free from smoke

# 4 Application Examples

## Commissioning ESM/Fire Mode with EasyComm software

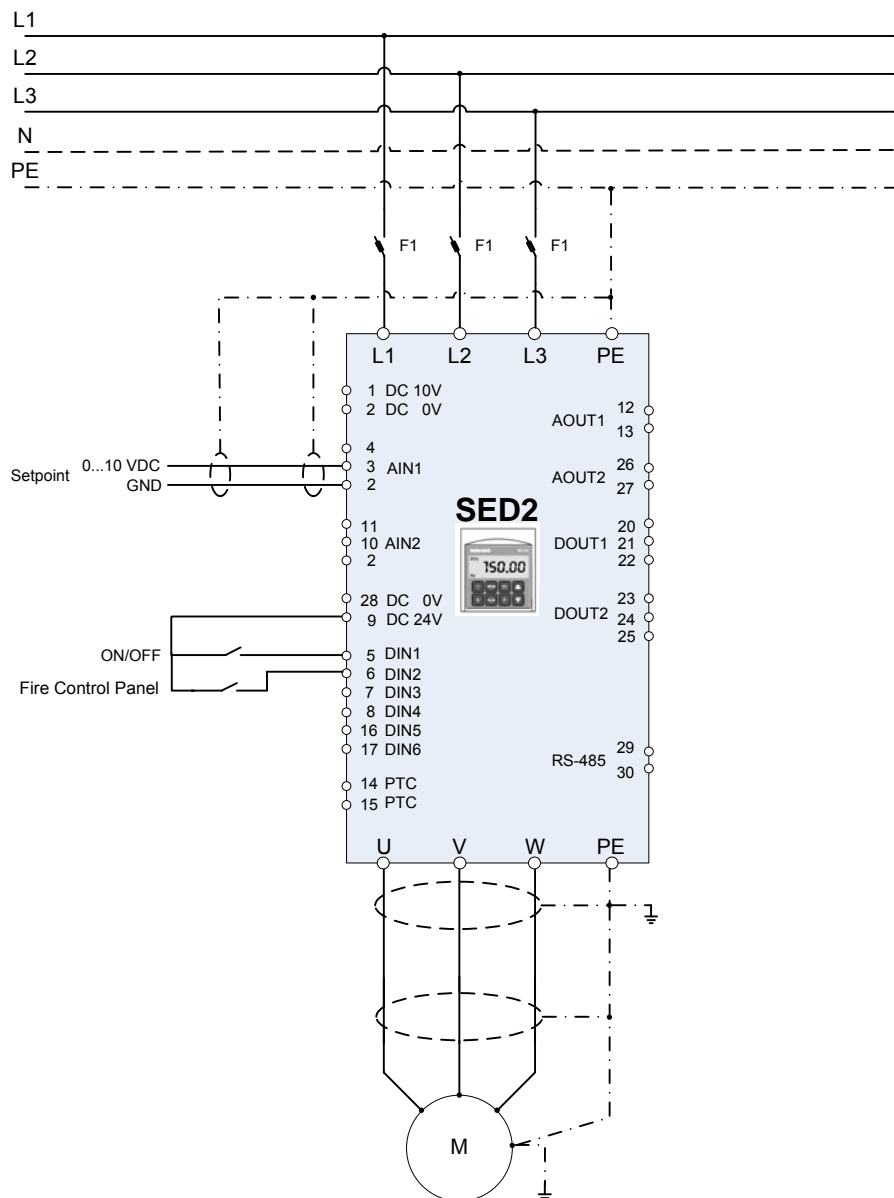
The use of EasyComm to commission the functions within ESM will greatly simplify setting certain bits in the ESM control words.

### 4.1 Application Example 1

#### 4.1.1 Description

- In normal operation the SED2 is receiving the setpoint over the analogue input 1, e.g. from a BAC, e.g. DESIGO PX.
- In case of fire the fire control panel signals this to the SED2, it is going in the ESM mode and the setpoint is still coming over the analogue input.

#### 4.1.2 Wiring diagram



### 4.1.3 Parameter setting

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<b>Start with quick commissioning according the commissioning guide CM1G5192. It is very important to enter the right motor data!</b>			
<b>Par. Nr.</b>	<b>Value</b>	<b>Parameter function</b>	<b>Function selection</b>
P0003	3	User access level 3	Expert access
P0702(0)	26	Function of DIN2 in Auto mode	ESM
P0702(1)	26	Function of DIN2 in Hand mode	ESM
P1271(0)	<b>b0000</b>	Activation of ESM control word	press ▼ once; <b>b0000</b> will appear and ESM control word is activated

For further information please see also Chapter 5 – Commissioning Wizard for Essential Service Mode.

### 4.1.4 Remarks

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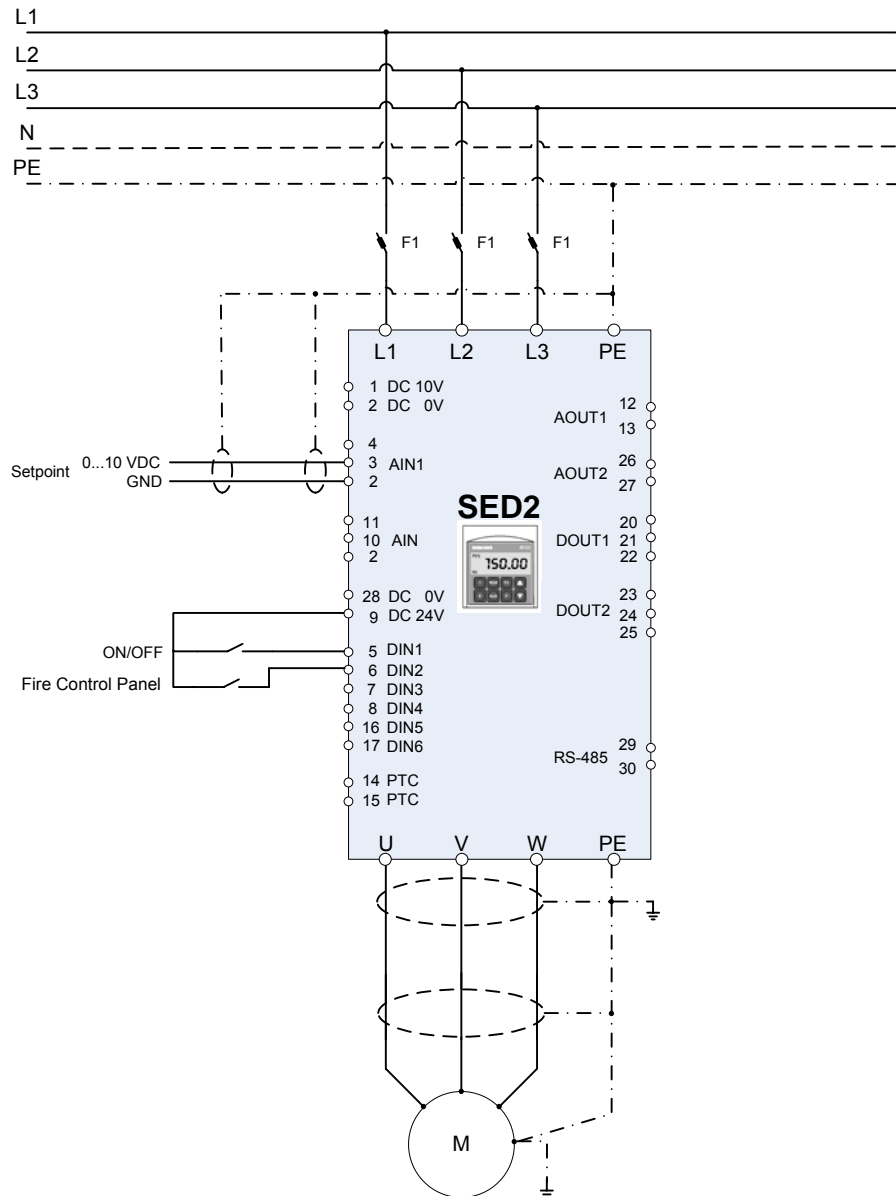
- The hand mode will be disabled automatically when ESM is active.
- The information “drive fault” and “drive running” is still available on the 2 relay outputs.  
On demand the information “ESM active” can be configured to a relay output.

## 4.2 Application Example 2

### 4.2.1 Description

- In normal operation the SED2 is receiving the setpoint over the analogue input 1 e.g. from a BAC e.g. DESIGO PX.
- In case of fire the fire control panel signals this to the SED2, it is going in the ESM mode and to a fixed frequency e.g. 40Hz.

### 4.2.2 Wiring diagram





### 4.2.3 Parameter setting

<b>Start with quick commissioning according the commissioning guide CM1G5192. It is very important to enter the right motor data!</b>			
<b>Par. Nr.</b>	<b>Value</b>	<b>Parameter function</b>	<b>Function selection</b>
P0003	3	User access level 3	Expert access
P0702(0)	99	Function of DIN2 in „Auto“ mode	BICO = free parameterization
P0702(1)	99	Function of DIN2 in „Hand“ mode	BICO = free parameterization
P1000(0)	23	Setpoint source in Auto	AI1 + FF
P1001	40	Fixed frequency when ESM is active	in Hz
P1074(0)	722.1	Disable Additional Setpoint in Auto	Disable AI1
P1074(1)	722.1	Disable Additional Setpoint in Hand	Disable AI1
P1270(0)	722.1	Activate ESM in Auto	DI2
P1270(1)	722.1	Activate ESM in Hand	DI2
P1271(0)	<b>bnnnr</b>	Activation of ESM control word	press ▼ once; <b>bnnnr</b> will appear and ESM control word is activated
P1271(1)	<b>bnnnr</b>	Enable FF in ESM mode	press ▲ once

For further information please see also Chapter 5 – Commissioning Wizard for Essential Service Mode.

### 4.2.4 Remarks

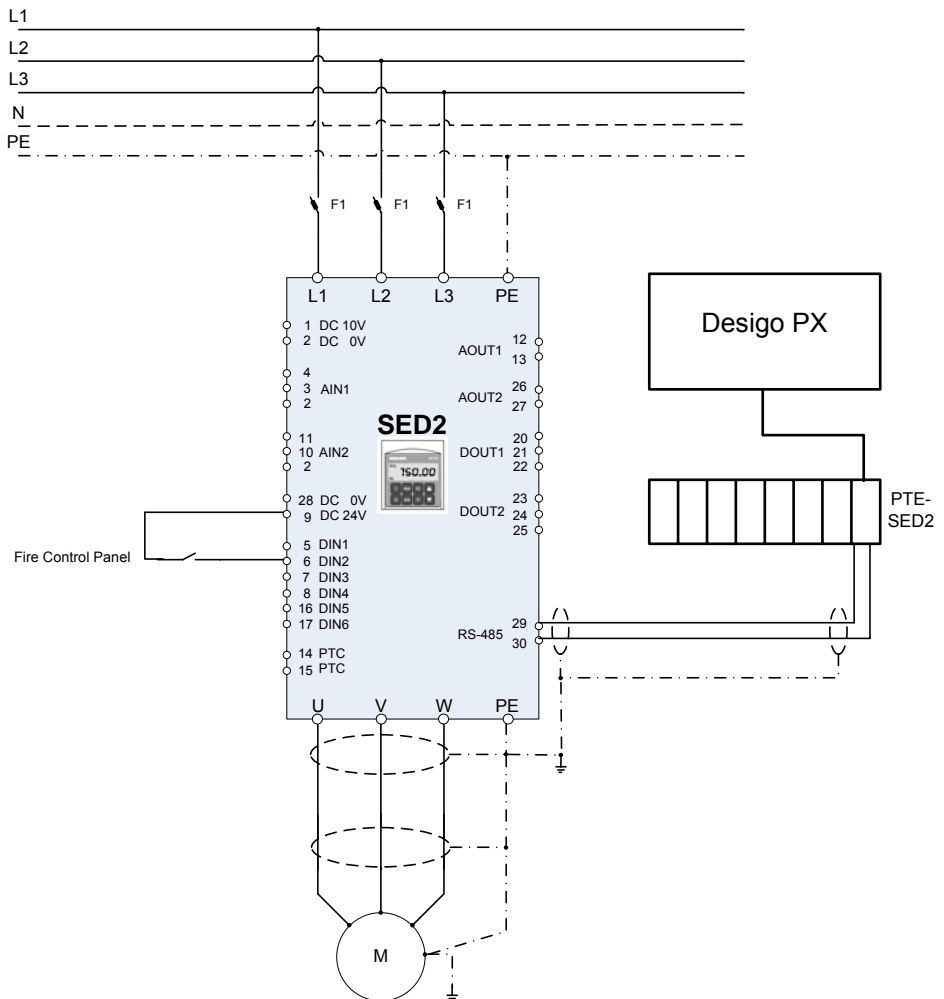
- The hand mode will be disabled automatically when ESM is active.
- The information “drive fault” and “drive running” is still available on the 2 relay outputs.  
On demand the information “ESM active” can be configured to a relay output.

## 4.3 Application Example 3

### 4.3.1 Description

- In normal operation the SED2 is controlled from the Desigo PX via bus communication using the PTE module.
- In case of fire the fire control panel signals this to the SED2, it is going in the ESM mode and the setpoint is still coming from the Desigo over the bus.

### 4.3.2 Wiring diagram



### 4.3.3 Parameter setting

<b>Start with quick commissioning according the commissioning guide CM1G5192.</b> <i>It is very important to enter the right motor data!</i>			
Par. Nr.	Value	Parameter function	Function selection
P0003	3	User access level 3	Expert access
P0700	5	Command source	DESIGO (USS on COM link)
P0702(0)	26	Function of DIN2 in Auto mode	ESM
P0702(1)	26	Function of DIN2 in Hand mode	ESM
P1000	5	Setpoint source	DESIGO (USS on COM link)
P1271(0)	<b>bnnnr</b>	Activation of ESM control word	press ▼ once; <b>bnnnr</b> will appear and ESM control word is activated
P2009(0)	1	USS normalization COM-Link	Enabled
P2010(0)	6	USS baud rate COM-Link	9600 baud
P2011(0)	1 (e.g.)	USS address COM-Link	Address range 1 to 31
P2014(0)	0...65535	USS telegram off time	0...65535ms (Defines a time after which a fault message will be generated (F0072 if no telegram is received via the USS channels)

For further information please see also Chapter 5 – Commissioning Wizard for Essential Service Mode.

### 4.3.4 Remarks

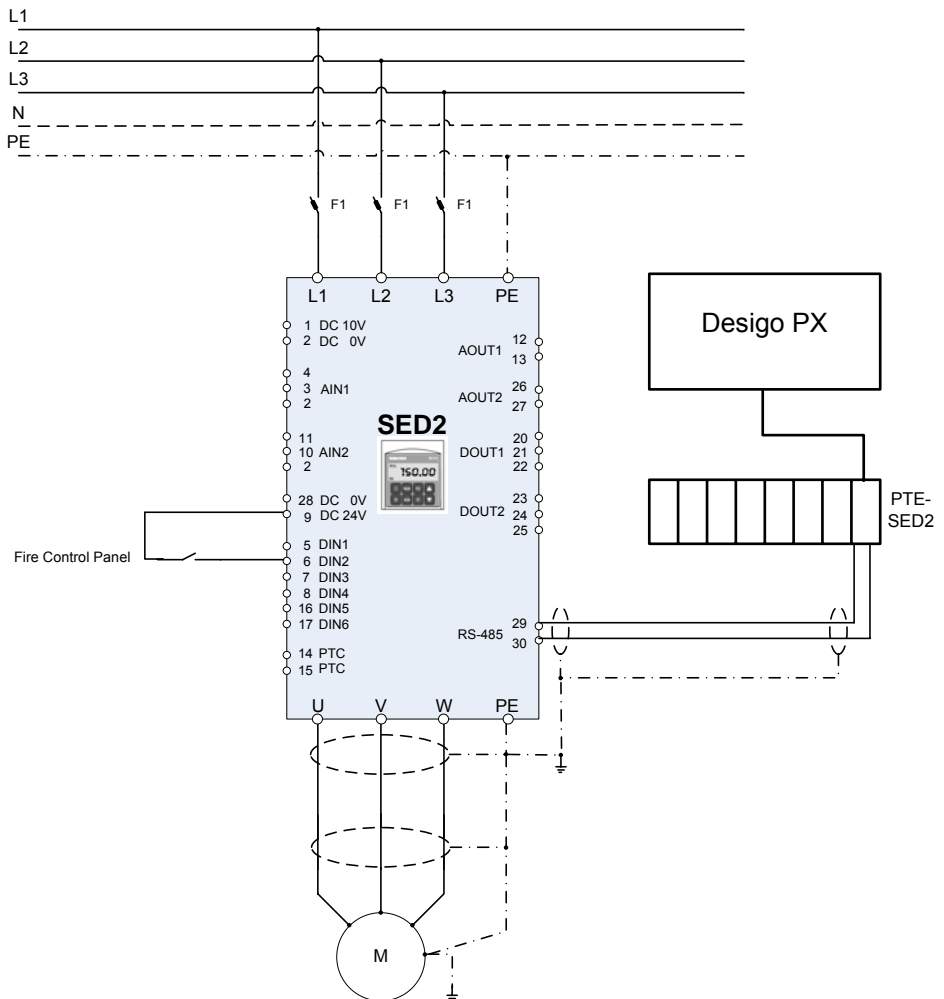
- The hand mode will be disabled automatically when ESM is active.
- The information “drive fault” and “drive running” is still available on the 2 relay outputs.  
On demand the information “ESM active” can be configured to a relay output.
- The fault F0072 (bus communication failure) will be ignored whilst ESM is active.
- In this example a DESIGO PX is used as the communication master but any communication (FLN, P1, N2) could be used just as effectively.

## 4.4 Application Example 4

### 4.4.1 Description

- In normal operation the SED2 is controlled from the Desigo PX via bus communication using the PTE module.
- In case of fire the fire control panel signals this to the SED2, it is going in the ESM mode and to a fixed frequency e.g. 40Hz.

### 4.4.2 Wiring diagram



### 4.4.3 Parameter setting

<b>Start with quick commissioning according the commissioning guide CM1G5192.</b> <b>Set P0700 to 5 (command source = Desigo = USS on COM link)</b> <b>and P1000 to 53 (setpoint source = Desigo = USS on COM link).</b> <b>It is very important to enter the right motor data!</b>			
Par. Nr.	Value	Parameter function	Function selection
P0003	3	User access level 3	Expert access
P0700	5	Command source	DESIGO (USS on COM link)
P0702(0)	99	Function of DIN2 in Auto mode	BICO = free parameterization
P0702(1)	99	Function of DIN2 in Hand mode	BICO = free parameterization
P1000	53	Setpoint source	DESIGO (USS on COM link)
P1001	40	Fixed frequency when ESM is active	in Hz
P1074(0)	722.1	Disable Additional Setpoint in Auto	Disable AI1
P1074(1)	722.1	Disable Additional Setpoint in Hand	Disable AI1
P1270(0)	722.1	Activate ESM in Auto	DI2
P1270(1)	722.1	Activate ESM in Hand	DI2
P1271(0)	bnnnr	Activation of ESM control word	press ▼ once; bnnnr will appear and ESM control word is activated
P1271(1)	b---r	Enable FF in ESM mode	press ▲ once
P2009(0)	1	USS normalization COM-Link	Enabled
P2010(0)	6	USS baud rate COM-Link	9600 baud
P2011(0)	1 (e.g.)	USS address COM-Link	Address range 1 to 31
P2014(0)	0...65535	USS telegram off time	0...65535ms (defines a time after which a fault message will be generated (F0072 if no telegram is received via the USS channels)

For further information please see also Chapter 5 – Commissioning Wizard for Essential Service Mode.

### 4.4.4 Remarks

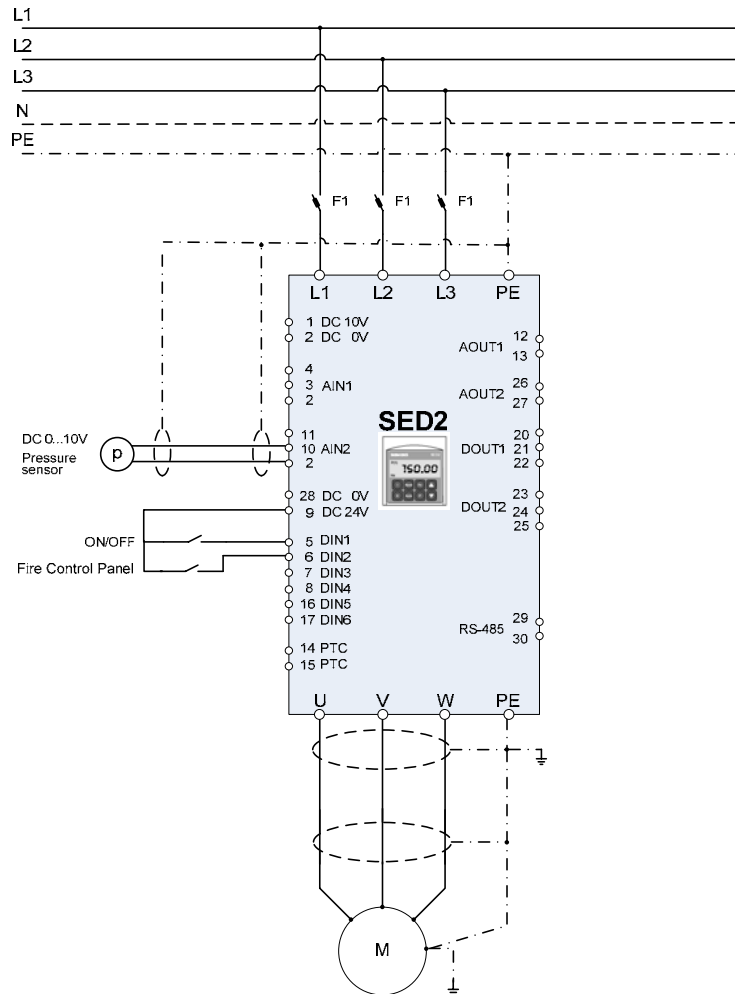
- The hand mode will be disabled automatically when ESM is active.
- The information “drive fault” and “drive running” is still available on the 2 relay outputs.  
On demand the information “ESM active” can be configured to a relay output.
- The fault F0072 (bus communication failure) will be ignored whilst ESM is active.
- In this example a DESIGO PX is used as the communication master but any communication (FLN, P1, N2) could be used just as effectively.

## 4.5 Application Example 5

### 4.5.1 Description

- In normal operation the internal SED2 PID loop is working and managing the pressure e.g. in a stairway. This application is equivalent to application 4 in the Commissioning Guide CM1G5192 just enhanced with the ESM function.
- In case of fire the fire control panel signals this to the SED2, it is going in the ESM mode and the internal PID loop keeps on working.

### 4.5.2 Wiring diagram



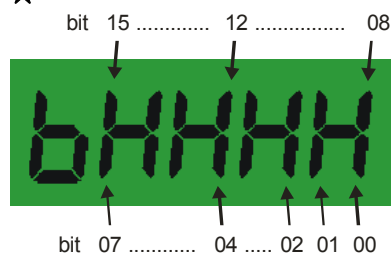
### 4.5.3 Parameter setting

**Start with quick commissioning according the commissioning guide CM1G5192.**

**It is very important to enter the right motor data!**

Par. Nr.	Value	Parameter function	Function selection
P0003	3	User access level 3	Expert access
P701 (0)	16	Function of DIN2 in Auto mode	On + PID setpoint 1
P0702(0)	26	Function of DIN2 in Auto mode	ESM
P0702(1)	26	Function of DIN2 in Hand mode	ESM
P0756(1)	1	Type of analog input 2	DC 0...10V
P0757(1)		Scaling of AIN2: x1	(Default)
P0758(1)		Scaling of AIN2: y1	(Default)
P0759(1)		Scaling of AIN2: x2	(Default)
P0760(1)		Scaling of AIN2: y2	(Default)
P1271(0)	<b>bnnnr</b>	Activation of ESM control word	press ▼ once; <b>bnnnr</b> will appear and ESM control word is activated
P1271(1)	<b>b----d</b>	ESM control word	press ▲ until you get <b>b----d</b> (see ★ below)
P2200(0)	1	Enable PID controller	Enabled
P2201	50	PID Setpoint of pressure control	50%
P2253(0)	2224	Setpoint source	Internal setpoint
P2280	1.2 (e.g.)	PID proportional gain	
P2285	30s (e.g.)	PID integral action time	
P2306	1	PID acting direction	Indirect
2262		Current setpoint	
2272		Current feedback	
2273		PID error	
2280		PID output	

★



With pressing ▲ this parameter counts binary up.

To get the value **b----d** you'll have to press ▲ for **10 s** approx.

For further information please see also Chapter 5 – Commissioning Wizard for Essential Service Mode.

### 4.5.4 Remarks

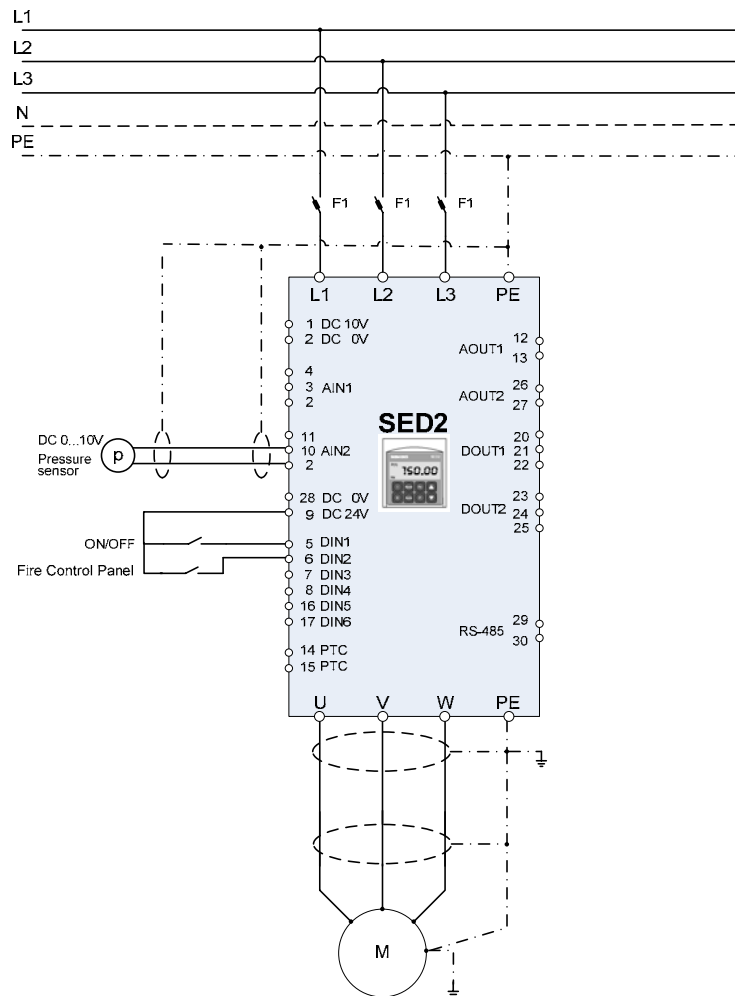
- The hand mode will be disabled automatically when ESM is active.
- The information “drive fault” and “drive running” is still available on the 2 relay outputs.  
On demand the information “ESM active” can be configured to a relay output.

## 4.6 Application Example 6

### 4.6.1 Description

- In normal operation the internal SED2 PID loop is working and managing the pressure e.g. in a stairway. This application is equivalent to application 4 in the Commissioning Guide CM1G5192 just enhanced with the ESM function.
- In case of fire the fire control panel signals this to the SED2, it is going in the ESM mode and to a fixed frequency e.g. 40Hz.

### 4.6.2 Wiring diagram





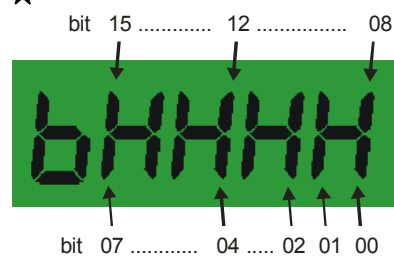
### 4.6.3 Parameter setting

**Start with quick commissioning according the commissioning guide CM1G5192.**

**It is very important to enter the right motor data!**

Par. Nr.	Value	Parameter function	Function selection
P0003	3	User access level 3	Expert access
P701 (0)	16	Function of DIN2 in Auto mode	On + PID setpoint 1
P0702(0)	26	Function of DIN2 in Auto mode	ESM
P0702(1)	26	Function of DIN2 in Hand mode	ESM
P0756(1)	1	Type of analog input 2	DC 0...10V
P0757(1)		Scaling of AIN2: x1	(Default)
P0758(1)		Scaling of AIN2: y1	(Default)
P0759(1)		Scaling of AIN2: x2	(Default)
P0760(1)		Scaling of AIN2: y2	(Default)
P1000(0)	3	Setpoint source in Auto	FF
P1001	40	Fixed frequency when ESM is active	in Hz
P1271(0)	bnnnr	Activation of ESM control word	press ▲ once
P1271(1)	b-2-7	ESM control word	press ▲ until you get b-2-7 (see ★ below)
P2200(0)	1	Enable PID controller	Enabled
P2201	50	PID Setpoint of pressure control	50%
P2253(0)	2224	Setpoint source	Internal setpoint
P2280	1.2 (e.g.)	PID proportional gain	
P2285	30s (e.g.)	PID integral action time	
P2306	1	PID acting direction	Indirect
2262		Current setpoint	
2272		Current feedback	
2273		PID error	
2280		PID output	

★



With pressing ▲ this parameter counts binary up.

To get the value b-2-7 you'll have to press ▲ for 12 s approx.

For further information please see also Chapter 5 – Commissioning Wizard for Essential Service .

### 4.6.4 Remarks

- The hand mode will be disabled automatically when ESM is active.
- The information “drive fault” and “drive running” is still available on the 2 relay outputs.  
On demand the information “ESM active” can be configured to a relay output.

# 5 Commissioning Wizard for Essential Service Mode

## 5.1 Introduction

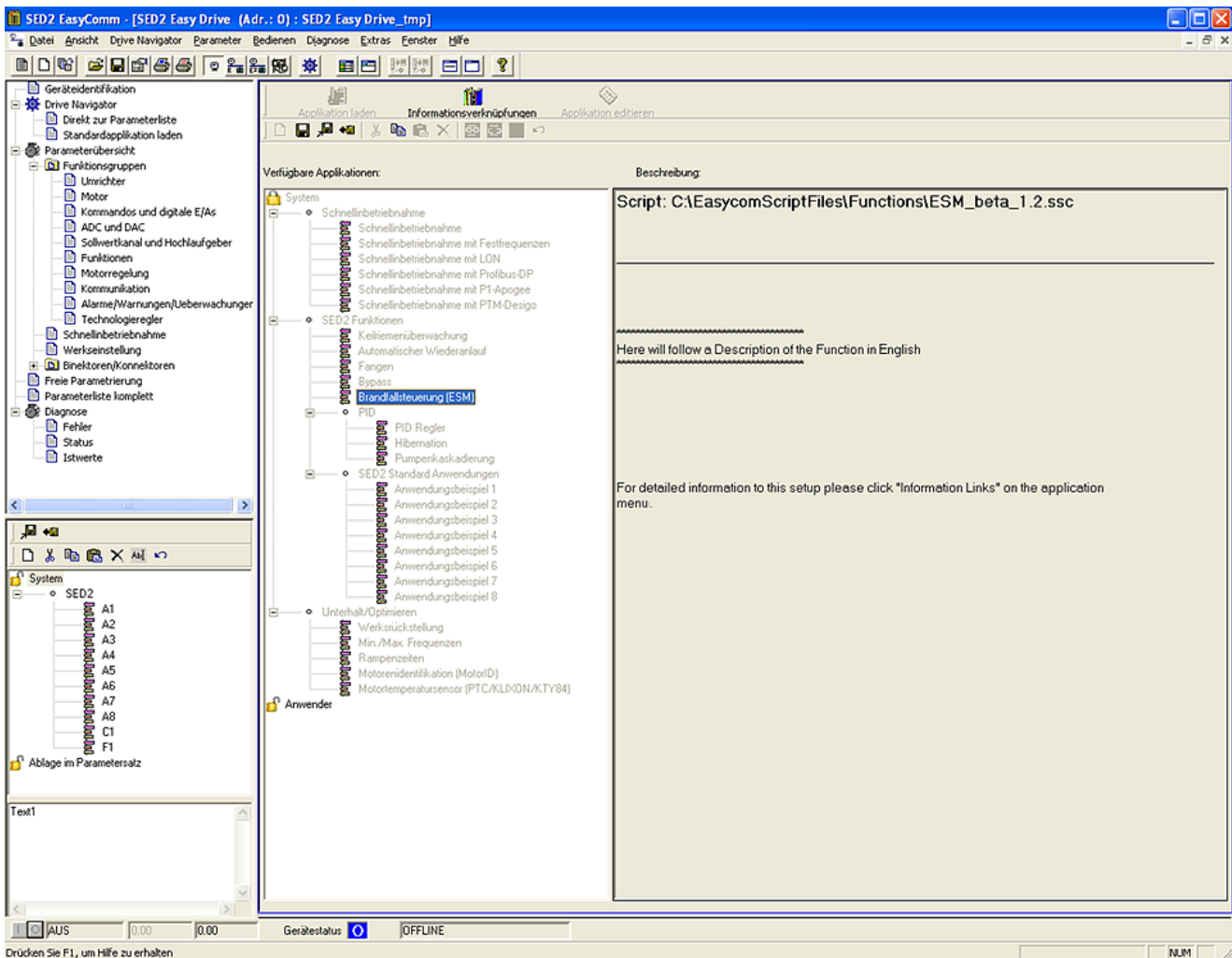
Up to now the SED2 drives have been commissioned over the BOP/AOP respectively over EasyComm which is a parameterisation and monitoring tool for the SED2 family.

This may be inefficient particularly with more complex applications such as ESM and bigger projects.

We have recognized that we can simplify significantly this commissioning process by using the so-called SED2 Commissioning Wizard. Thereby the user will be guided via dialog through the whole commissioning process without being faced with any parameter numbers.

Basically every SED2 function can be commissioned by means of script files

After the installation of the Commissioning Wizard the following additional tree will be visible in the EasyComm window under "Drive Navigator"/"Load Standard Application":

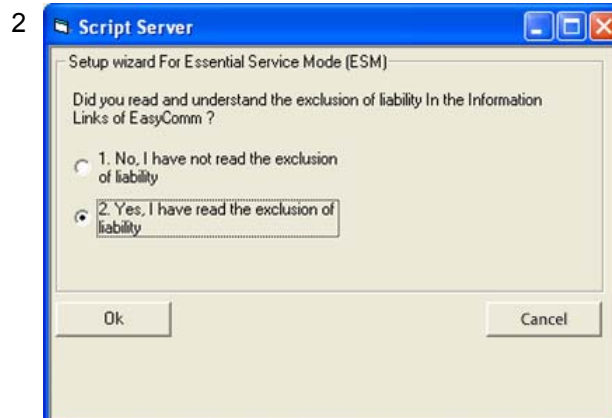
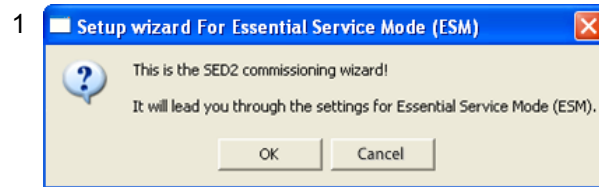


Before you setup the ESM function you have to perform a Quick Commissioning.

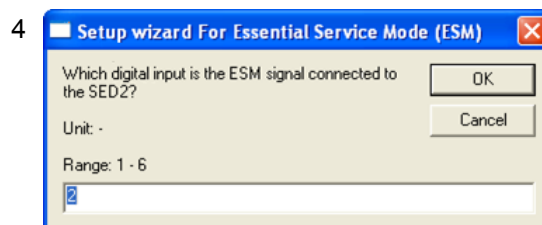
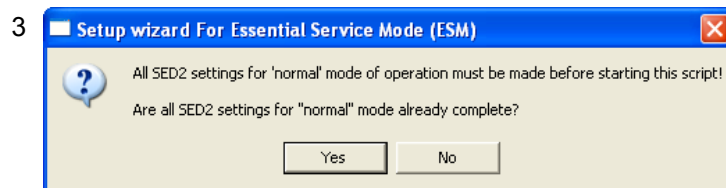
## 5.2 Parameterisation of ESM function

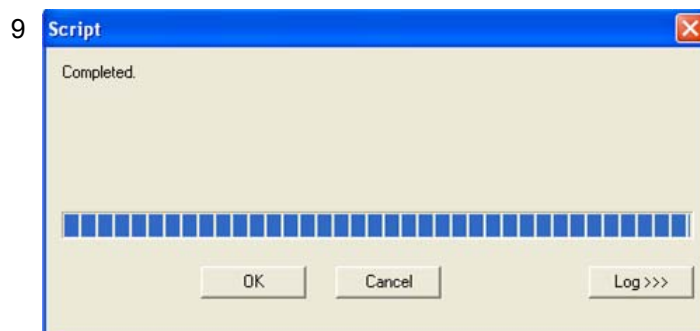
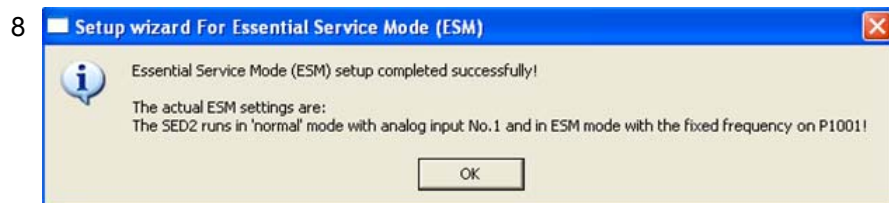
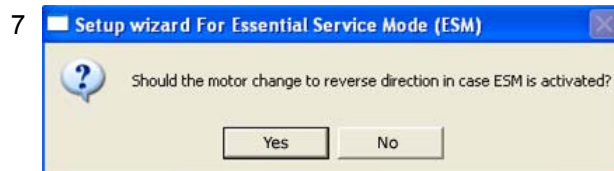
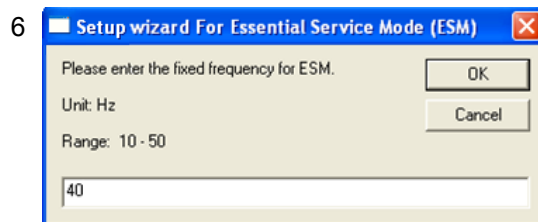
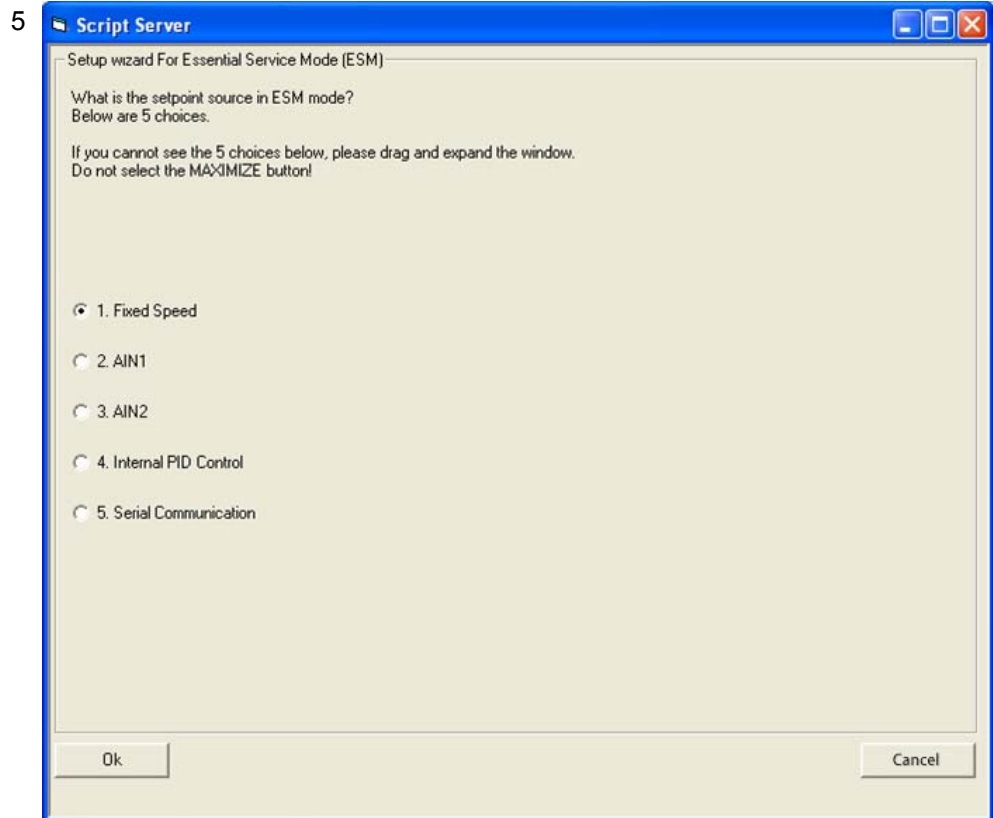
This example shown is equivalent to example 2 in Chapter 4.2 – Application Example 2.

Following windows will show up, to make life as easy as possible:



**Note**  
If the user clicks «No» it will take him back to the start.





## 5.3 Languages

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If the EasyComm language is set to English the Commissioning Wizard windows and the description respectively help files will automatically appear in English.

## 5.4 Distribution

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The SED2 Commissioning Wizard is available from you local sales representative free of charge. An automatic installer makes the installation of the Commissioning Wizard easy.

## 6 Essential Service Mode (in-depth information)

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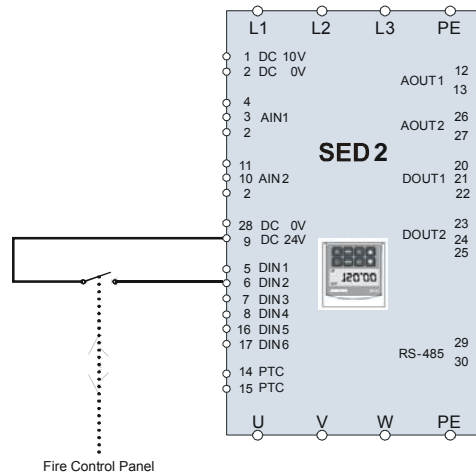
- With V1.40 and higher, all SED2 errors and warnings will be ignored, the exception being hard errors, such as F0001, F0002, F0003, F0022 and F0023. These hard errors can not be ignored since they could lead to the destruction of the VSD. But they will be acknowledged an infinite number of times, if permitted by the situation
- Another improvement is that the current limit warning will be ignored and that the SED2 can reach the maximum output frequency, if required
- V1.40 now offers a new parameter with 2 indices: P1271(0) and P1271(1) with so-called control words. These facilitate parameterization of the ESM function (e.g. reversal of the motor's direction of rotation in the event of fire). With the former V1.30, the direction of rotation had to be reversed with a separate digital input, for example, or with a special internal connection. The control words take on priority when ESM is activated. They have no impact on normal operation.

The new parameter is also described in the Commissioning Guide (CM1G5192). They are enclosed with the SED2.

- In ESM, automatic restart (P1210) is automatically set to 6, independent of the setting used in normal operation. This means that in the case of hard errors, such as F0001 (overcurrent) or F0002 (overvoltage), continuous acknowledgements will be made and SED2 restarts initiated. For a detailed description of automatic restarts, refer to CM1G5192en, SED2 Variable Speed Drives, Commissioning Guide, Chapter 6.10 **Automatic Restart**. Setting 6 ensures the highest possible level of availability of the SED2 when operating in ESM.

## 6.1 Assigning the ESM function to a DIN (Digital Input)

In accordance with the standards, all functions required of ESM can be assigned to the **same** DIN and therefore eliminate the need for any additional inputs. Our recommendation is to use DIN2 for ESM. However, any one of the DIN's can be used (DIN1~DIN6)



### Note

Ensure DIN2 is OPEN during commissioning.

Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	<b>Access Level</b> Set access level to Expert
P0702	in 000 in001	12 0	99 99	<b>Function of DIN2</b> Enable BICO parameterisation
P1270	in000 in001	0.0 0.0	722.1 722.1	<b>Source command for ESM</b> Defines source as DIN2

## 6.2 Activating P1271 (ESM Control Word)

### Note

This should be carried out using the **BOP** (Basic Operating Panel)

Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	<b>Access Level</b> Set access level to Expert
P0702	in 000 in001	12 0	99 99	<b>Function of DIN2</b> Enable BICO parameterisation
P1270	in000 in001	0.0 0.0	722.1 722.1	<b>Source command for ESM</b> Defines source as DIN2
P1271	in000	b - - - -	b n n n n	<b>ESM Control word 1</b> Press? ( <u>o</u> nce) and b n n n n will appear and ESM control word is activated

Once P1271 has been activated, the ESM control word will take priority once the DIN assigned to ESM/Fire Mode is enabled.

## 6.3 Defining the main Speed (Frequency) Setpoint for ESM

---

The speed/frequency setpoint will generally be defined during Quick Commissioning and relates to P1000 in000 only.  
PID control is **not** activated.

### 6.3.1 ESM and standard setpoint are the same

---

If the ESM setpoint is going to use the same source of setpoint as is used in standard mode, then there is no need to change P1000 in000 from what is set during Quick Commissioning.

#### Example

If the SED2 in Standard mode is controlled by a 0-10Vdc signal via AIN1 and the same method of speed control is required when ESM is activated, then:

**P1000 in000 = 2**      Normal operation and ESM use the same setpoint (AIN1 in this example)

The choices of Setpoint settings are:

- 1 = OP Setpoint (UP/DOWN keys on BOP)
- 2 = Analogue Input via AIN1 (terminals 2-3) 0-10Vdc or 0-20mA
- 3 = Fixed Frequencies via DIN1~6
- 4 = Using AOP or Easycomm (with PC connect kit) to replace BOP
- 5 = RS485 (P1, N2 or USS) via terminals 28-29
- 6 = Communications Module (LON)
- 7 = Analogue Input via AIN2 (terminals 2-10) 0-10Vdc or 0-20mA

### 6.3.2 ESM and standard setpoint are different

---

If the ESM speed setpoint is different to the standard setpoint, then P1000 in000 needs changing.

P1000 has the capability of defining a **Main Setpoint** and an **Additional Setpoint**. When ESM is being used, the ESM setpoint should be defined as the **Main Setpoint** and the standard mode should be defined as the **Additional Setpoint**.

P1000 allows you to combine any two of these inputs, a Main Setpoint and an Additional Setpoint.

When the ESM setpoint is different to the standard setpoint, then the ESM setpoint will always be the **Main Setpoint and the standard will be the Additional Setpoint**.

#### Example

ESM setpoint            = Fixed Frequency  
standard setpoint    = AIN1

**P1000 in000 = 2 3**

ESM set point (main)  
"Standard" set point (additional)

Complete range of choices for combined ESM and standard setpoints:



P1000 in000=		ESM set-point	MOP Up/Down Keys	Analogue input 1	Fixed Frequencies	AOP or EasyComm via RS232 port	P1/N2/USS via RS485 terminals	Comms Module LON	Analogue input 2
	<b>setting</b>		1	2	3	4	5	6	7
<b>'Standard' set-point</b>									
MOP Up/Down Keys	1		11	12	13	14	15	16	17
Analogue input 1	2		21	22	23	24	25	26	27
Fixed Frequencies	3		31	32	33	34	35	36	37
AOP/EasyComm via RS232	4		41	42	43	44	45	46	47
P1/N2/USS via RS485	5		51	52	53	54	55	56	57
Comms Module LON	6		61	62	63	64	65	66	67
Analogue input 2	7		71	72	73	74	75	76	77

### Example 1

The standard setpoint controlling the SED2 is via AIN1.  
**ESM** setpoint is via a Fixed Frequency.  
(See also next section on “disabling the Additional Setpoint”)

**P1000 in000 = 23**

### Example 2

The standard setpoint controlling the SED2 is via a LON system (optional LON module needs to be connected).  
**ESM** setpoint is from a Fixed Frequency  
(Note: Next section on “disabling the Additional Setpoint”).

**P1000 in000 = 73**

Any of the combinations shown in the chart can be used.

## 6.3.3 Disabling the Additional Setpoint

Parameter	Index	Default	Set to	Function and description
P0003	- -	1	3	<b>Access Level</b> Set access level to Expert
P0702	in 000 in001	12 0	99 99	<b>Function of DIN2</b> Enable BICO parameterisation
P1270	in000 in001	0.0 0.0	722.1 722.1	<b>Source command for ESM</b> Defines source as DIN2
P1271	in000	b - - - bnnnr	bnnnr	<b>ESM Control word 1</b> Press? ( once) and bnnnr will appear and ESM control word is activated
P1074	in000 in001	0.0 0.0	722.1 722.1	<b>Source command to Disable additional set-point</b> Defines source as DIN2 (ESM)

In the above examples of defining the setpoint for standard and ESM, it is very important to ensure that when ESM is activated that it disables the standard setpoint otherwise the two setpoints will add.

## 6.3.4 Basic settings as ESM Fixed Frequency setpoint

The most common method of ESM speed control is a preset fixed frequency.

Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	<b>Access Level</b> Set access level to Expert
P1000	in000	2	x3	<b>Frequency setpoint</b> Ensure FF(3) is the main setpoint and x=additional setpoint
P1271	in001	b----	b----	<b>ESM Control word 2</b> Change bit0 to active. Enables FF1
P1001	-	0.00	? 0~50Hz	<b>Fixed Frequency 1</b> Input desired frequency

Required: **P1000 in000= x3** (x =standard setpoint)

Display of **P1271 in001** (ESM Control word 2) on the **BOP**

b----

Alternatively, use EasyComm to set the correct bit.

```

P1271 CO/BO: ESM ControlWord 1/2
P1271 'CO/BO:'
Bit0: 1 (0:=(not used), 1:=(not used))
... Bit1: 0 (0:=(not used), 1:=(not used))
... Bit2: 0 (0:=(not used), 1:=(not used))
... Bit3: 0 (0:=(not used), 1:=(not used))
... Bit4: 0 (0:=(not used), 1:=(not used))
... Bit5: 0 (0:=(not used), 1:=(not used))
... Bit6: 0 (0:=(not used), 1:=(not used))
... Bit7: 0 (0:=(not used), 1:=(not used))
... Bit8: 0 (0:=(not used), 1:=(not used))
... Bit9: 0 (0:=(not used), 1:=(not used))

```

## 6.4 Reverse Direction in ESM/Fire Mode

If no changes are made, the direction of rotation in ESM will be the same as it is in normal operation mode.

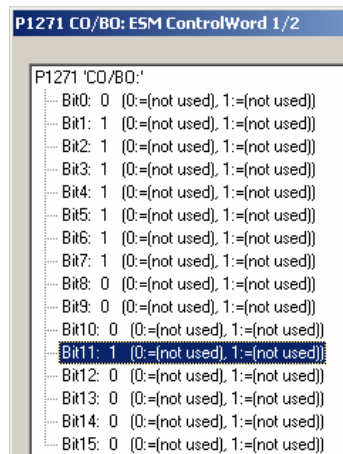
Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	<b>Access Level</b> Set access level to Expert
P1271	in000	bnnnr	bnnhr	<b>ESM Control word1</b> Activate bit 11 for reverse in ESM
P1110	in000	1.0	0.0	<b>Inhibit negative frequency set-point</b> Allows the motor to turn in opposite direction

However, if it is required that the motor/fan turns in the opposite direction to normal operation mode, the following change is required:

Display of **P1271 in000** (ESM Control word 1) on the **BOP**:

bnnhr

Alternatively, use EasyComm to set the correct bit.



### Example 1

If a digital input is set to reverse (e.g. DI4 to 12) and in addition the ESM is set to reverse the behaviour of the SED2 is as follows:

DIN2 (ESM)	DIN4 (Reverse)	Motor Direction
0	0	Normal
0	1	Reverse
1	0	Reverse
1	1	Reverse

If the digital input 2 (ESM) and the digital input 4 (Reverse) are given at the same time the SED2 will run in reverse.

### Example 2

If you use DIN1 as ON/OFF1 (setting 1 = default) and DIN2 as ON reverse/OFF1 (setting 2) and in addition the ESM is set to reverse the behaviour of the SED2 is as follows:

DIN1 (ON/OFF1)	DIN4 (ON reverse/OFF1)	DIN2 (ESM)	Motor Direction
0	0	0	Normal (Off)
0	0	1	Reverse
0	1	0	Reverse
0	1	1	Normal
1	0	0	Normal
1	0	1	Reverse
1	1	0	Normal or Reverse*
1	1	1	Normal or Reverse*

\* Depending on which command is given first (DIN1 or DIN4).

If the digital inputs 2 (ESM) and 4 (Reverse) are active simultaneously the SED2 will run in normal direction. In this case the reverse signals cancel each other out.

## 6.5 PID Control in ESM/Fire Mode

It is possible to configure PID Control as follows:

Standard Mode	ESM/Fire Mode	Chapter
Yes	Yes	6.5.1
Yes	No	6.5.2
No	Yes	6.5.3
No	No	6.5.4

### 6.5.1 PID Control in both ESM and Standard Mode

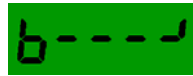
Normal operation mode PID control should be configured as described in the Commissioning Guide.

P2200 in000/in001= 1.0 or whatever the source is.

P22xx~P23xx PID parameters set as per application ESM/Fire Mode:

Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	<b>Access Level</b> Set access level to Expert
P1271	in001	b----	b----	<b>ESM Control word1</b> Activate bit 08 and de-activate bi12 to enable PID in ESM
P2xxx				<b>Configure PID related parameters</b> P2201~P23xx accordingly to application

Display of **P1271 in001** (ESM Control word 2) on the **BOP**



Alternatively, use EasyComm to set the correct bit.

P1271 CO/BO: ESM ControlWord 1/2	
P1271 'CO/BO:'	
Bit0:	0 (0=(not used), 1=(not used))
Bit1:	1 (0=(not used), 1=(not used))
Bit2:	1 (0=(not used), 1=(not used))
Bit3:	1 (0=(not used), 1=(not used))
Bit4:	1 (0=(not used), 1=(not used))
Bit5:	1 (0=(not used), 1=(not used))
Bit6:	1 (0=(not used), 1=(not used))
Bit7:	1 (0=(not used), 1=(not used))
Bit8:	1 (0=(not used), 1=(not used))
Bit9:	0 (0=(not used), 1=(not used))
Bit10:	0 (0=(not used), 1=(not used))
Bit11:	0 (0=(not used), 1=(not used))
Bit12:	0 (0=(not used), 1=(not used))
Bit13:	0 (0=(not used), 1=(not used))
Bit14:	0 (0=(not used), 1=(not used))
Bit15:	0 (0=(not used), 1=(not used))

## 6.5.2 PID Control in Standard mode but disabled in ESM/Fire Mode

Normal operation mode PID control should be configured as described in the Commissioning Guide.

P2200 in000/in001= 1.0 or whatever the source is.

P22xx~P23xx PID parameters set as per application ESM/Fire Mode:

Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	Access Level Set access level to Expert
P1271	in001	bnnnr	b-1--	ESM Control word1 Activate bit 12 and de-activate bi08 to disable PID in ESM
P2xxx				Configure PID related parameters P2201~P23xx accordingly to application

Display of **P1271 in001** (ESM Control word 2) on the **BOP**

b-1--

Alternatively, use EasyComm to set the correct bit.

```

P1271 CO/BO: ESM ControlWord 1/2
P1271 'CO/BO:'
... Bit0: 0 (0:=(not used), 1:=(not used))
... Bit1: 1 (0:=(not used), 1:=(not used))
... Bit2: 1 (0:=(not used), 1:=(not used))
... Bit3: 1 (0:=(not used), 1:=(not used))
... Bit4: 1 (0:=(not used), 1:=(not used))
... Bit5: 1 (0:=(not used), 1:=(not used))
... Bit6: 1 (0:=(not used), 1:=(not used))
... Bit7: 1 (0:=(not used), 1:=(not used))
... Bit8: 0 (0:=(not used), 1:=(not used))
... Bit9: 0 (0:=(not used), 1:=(not used))
... Bit10: 0 (0:=(not used), 1:=(not used))
... Bit11: 0 (0:=(not used), 1:=(not used))
... Bit12: 1 (0:=(not used), 1:=(not used))
... Bit13: 0 (0:=(not used), 1:=(not used))
... Bit14: 0 (0:=(not used), 1:=(not used))
... Bit15: 0 (0:=(not used), 1:=(not used))

```

### 6.5.3 PID Control in ESM/Fire Mode but disabled in standard Mode

PID control in normal operation mode is switched **off**. P2200in000=0.0  
 All other PID parameters are set to suit application ESM/Fire Mode:

Parameter	Index	Default	Set to	Function and description
P0003	-	1	3	<b>Access Level</b> Set access level to Expert
P1271	in001	b-----	b-----	Activate bit 08 and de-activate bit12 to enable PID in ESM
P2200	in000	0.0	0.0	<b>PID Controller</b> leave setting at 0.0 to disable main PID controller
P2xxx				<b>Configure PID related parameters</b> P2201~P23xx accordingly to application

Display of **P1271 in001** (ESM Control word 2) on the **BOP**

b-----

Alternatively, use EasyComm to set the correct bit.

```

P1271 CO/BO: ESM ControlWord 1/2
P1271 'CO/BO:'
...Bit0: 0 (0:=(not used), 1:=(not used))
...Bit1: 1 (0:=(not used), 1:=(not used))
...Bit2: 1 (0:=(not used), 1:=(not used))
...Bit3: 1 (0:=(not used), 1:=(not used))
...Bit4: 1 (0:=(not used), 1:=(not used))
...Bit5: 1 (0:=(not used), 1:=(not used))
...Bit6: 1 (0:=(not used), 1:=(not used))
...Bit7: 1 (0:=(not used), 1:=(not used))
...Bit8: 1 (0:=(not used), 1:=(not used))
...Bit9: 0 (0:=(not used), 1:=(not used))
...Bit10: 0 (0:=(not used), 1:=(not used))
...Bit11: 0 (0:=(not used), 1:=(not used))
...Bit12: 0 (0:=(not used), 1:=(not used))
...Bit13: 0 (0:=(not used), 1:=(not used))
...Bit14: 0 (0:=(not used), 1:=(not used))
...Bit15: 0 (0:=(not used), 1:=(not used))
    
```

### 6.5.4 PID Control disabled in ESM/Fire Mode and Standard mode

Leave P2200 at factory default (0.0) and leave P1271 in000 bit08 inactive.

bnnnr

## 6.6 Indication of ESM/Fire Mode

### 6.6.1 BOP indication of ESM/Fire Mode

---

Once ESM has been activated by closing the DIN, the display on the BOP will flash every 6 seconds ES and alternate with the value set in P0005.

This will not appear on the AOP.

### 6.6.2 Relay output indication of ESM/Fire Mode

---

If a relay is required to change state once ESM is activated, the same value that is used to activate P1270 can be used for the relay.

For example, if DIN2 is used to activate ESM, then P1270 will be set with the value 722.1. This value will also be used to set the relay (e.g. using relay 2):

P732 in000= 722.1

		Digital Input used for ESM/Fire Mode					
		DIN1	DIN2	DIN3	DIN4	DIN5	DIN6
Relay 1	P0731in000=	722.0	722.1	722.2	722.3	722.4	722.5
Relay 2	P0732in000=	722.0	722.1	722.2	722.3	722.4	722.5

**Note:** This only works when the responding DIN is set to «99» (BICO). Please take note of the indexes of the DINs.

### 6.6.3 Fault Handling in ESM/Fire Mode

---

The SED2 is designed to ignore all faults and warnings when ESM has been activated except 'hard faults'.

Hard faults are determined as:

F0001: Short-circuit, phase to phase and ground faults typically seen within the SED2.

F0002/F0003: Overvoltage and undervoltage conditions will cause the drive to trip  
F0023: The disconnection of the motor while the SED2 is running

In the event any of these faults occur, the SED2 will shut down with an OFF2 stop (coast to stop) and attempt a fault acknowledge and automatic restart. It will attempt this process indefinitely, or until the SED2 is destroyed.

### 6.6.4 Automatic re-start in ESM/Fire Mode

---

When ESM has been activated and enabled (closing the DIN assigned for ESM), the setting within P1210 (automatic restart) will internally change to setting 6. Setting 6 will allow automatically restart after mains brown-out, mains black-out or fault. The number of restarts will be indefinite.



The following parameters will need to be considered for ESM even if P1210 is different to setting 6 in normal operation mode:

P1212 (time to first restart) = 30 seconds default  
 P1213 (restart time increment) = 30 seconds default

**Note**

If P1210 = any setting other than 6 when ESM is not activated (normal operation mode), when ESM is active the setting of 6 will not be visible as this will occur internally.

**6.6.5 Acknowledging a fault when ESM/Fire Mode is first enabled**

If a fault is active prior to ESM/Fire Mode being enabled, when ESM is enabled the SED2 will acknowledge, restart and ignore all 'soft faults' and attempt to acknowledge and restart any 'hard faults'. If a hard fault is still present, then the SED2 will trip and attempt again indefinitely or until the SED2 is destroyed.

**6.7 Advanced settings**

**6.7.1 ESM/Fire Mode Control Words for the SED2**

P1271 has introduced two new control words that will take priority once ESM has been enabled. These control words have no effect on standard<sup>1a</sup> operation of the SED2.

**P1271 in 000**

- Bit00 ON/OFF1
- Bit01 OFF2: Electrical stop
- Bit02 OFF3: Fast stop
- Bit03 Pulse enabled
- Bit04 RFG enabled
- Bit05 RFG start
- Bit06 Setpoint enabled
- Bit07 Fault acknowledge
- Bit08 JOG right
- Bit09 JOG left
- Bit10 Not used
- Bit11 Reverse (setpoint inversion)
- Bit13 Motor potentiometer MOP up
- Bit14 Motor potentiometer MOP down
- Bit15 CDS Bit 0 (Hand/Auto)

**ESM Control Word 1**

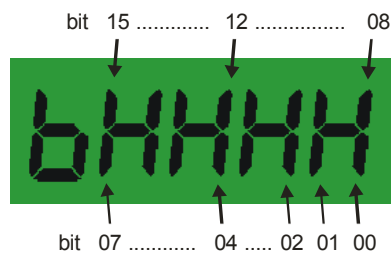
- Ignored (drive always runs)
- Always set (cannot be changed)
- Always set (cannot be changed)
- Always set (cannot be changed)
- Always set (cannot be changed)
- Always set (cannot be changed)
- Always set (cannot be changed)
- Always set (cannot be changed)
- Selectable
- Selectable
- Ignored
- Selectable
- Selectable
- Selectable
- Forces Auto Mode (cannot be changed)

**P1271 in 001**

- Bit00 Fixed frequency Bit 0
- Bit01 Fixed frequency Bit 1
- Bit02 Fixed frequency Bit 2
- Bit03 Fixed frequency Bit 3
- Bit04 Not Used
- Bit05 Not Used
- Bit08 PID enabled
- Bit09 DC brake enabled
- Bit11 Droop enabled
- Bit12 PID disabled
- Bit13 External fault 1
- Bit15 Not Used

**ESM Control Word 2**

- Selectable
- Selectable
- Selectable
- Selectable
- Ignored
- Ignored
- Selectable
- Selectable (not generally used in HVAC functions)
- Selectable (not generally used in HVAC functions)
- Selectable
- Ignored
- Ignored



## 6.7.2 Starting the SED2 in ESM/Fire Mode

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Enabling ESM will ALWAYS RUN the SED2, even if there is no RUN command activated in the standard<sup>1a</sup> settings.

Once ESM/Fire Mode has been enabled, the display on the BOP will flash ES  
Example: within a building the Air Handling Units may be stopped at night-time or weekend. If a fire is detected, the standard control from the Building Management System is overridden by the Fire Control Panel (FCP) if required. However, the activation of ESM/Fire Mode within the SED2 from the FCP will ensure the smoke exhaust fans operate.

## 6.7.3 Stopping the SED2 in ESM/Fire Mode

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The only method of stopping the SED2 once ESM has been activated is by opening the ESM circuit (deactivate the DIN assigned as ESM) or remove power to the SED2.

The (red) stop button on the BOP, any other DIN assigned in for OFF1, OFF2 or OFF3 or command designated by P0700 (e.g. 1,2,4,5 or 6) will have **no effect**.

### Example

*from AS/NZS 1668.1: 1998 "It cannot be inadvertently deactivated, programmed or otherwise left in a non-functional condition by operating or maintenance personnel, thus rendering it incapable of operating correctly in fire mode."*

Site personnel need to be aware that once the SED2 has been activated in ESM/Fire Mode it will NOT STOP until the DIN assigned to ESM is opened. This should be documented and or signs placed where they are visible.



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