Optional functions Tde Macno

User's manual

Safe torque off (STO) TG. S-M-L-XL - case1

Cod. MF00001E00 V_1.6

SUMMARY

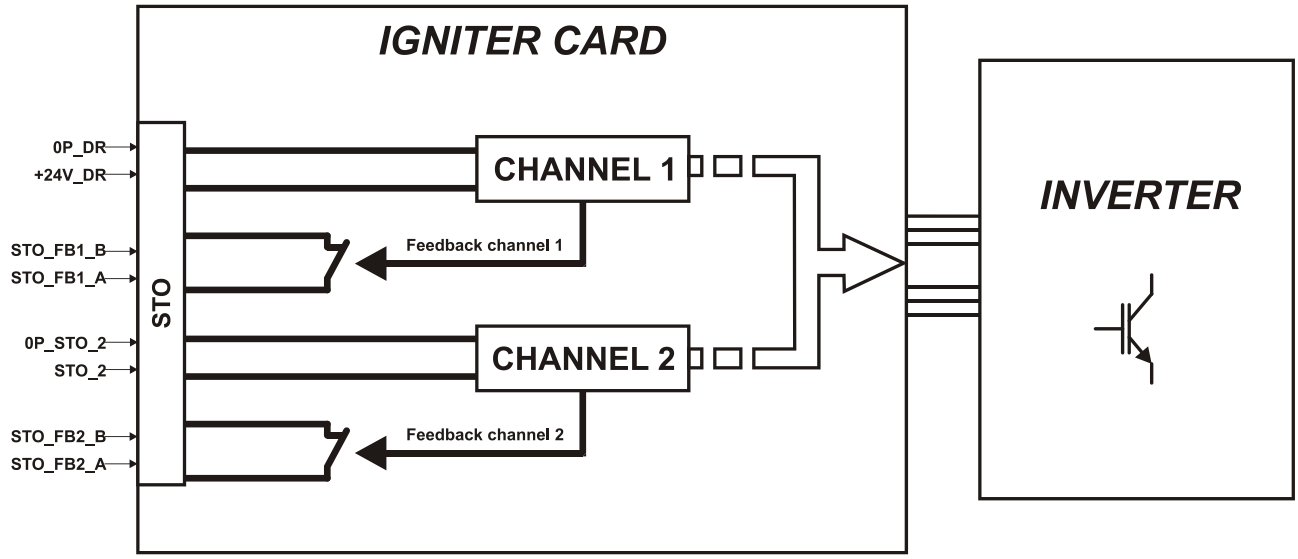
KEY TO SYMBOLS

Caution

Danger

1 GENERAL DESCRIPTION

The OPDE converter implements the Safe Torque Off (STO) system to prevent unexpected starting according to the EN 61800-5-2 standards. This system prevents the creation of a rotating magnetic field by disconnecting the control voltage from the power semiconductors. Thanks to these systems, it will be possible to conduct short operations such as cleaning and/or maintenance work on the non-electrical parts of the machine without disconnecting either the drive power supply or the connection between power and engine. The STO system, therefore, will be managed by components with limited power which means that the cost of the elements used in the switchboards will be reduced.
The STO system is implemented using two redundant channels, each of which has its own feedback signal accessible from the outside. The operating diagram is as follows:



The input to channel 1 is +24VDR and its feedback signal is STO_FB1. The input to channel 2 is STO_2 and its feedback is STO_FB2. Each of the feedbacks refers to a clean N.C. contact which can be read by an external logic managing the STO system at machine level.

2 USE LIMITATIONS

The environmental constraints of the OPDE converter are listed in a section of the installation manual and refer to its normal operation. The following paragraphs serve to clarify the use limitations of the converter with a view to making sure that its correct operation continues also when the STO system has been activated.

2.1 CLIMATE CLASS

Class 3K3 according to EN 60721-3-3

Environmental parameter	Limits	Unit of measurement
working temperature (1)	0÷40	°C
humidity	5÷85	%
atmospheric pressure	70÷106 (2)	kPa
maximum surrounding air movement	1	m/s
maximum temperature gradient	0.5	°C/min
maximum thermal irradiation	700	W/m^2
condensation	NO	
precipitation with wind	NO (3)	
water other than rain	NO	
ice formation	NO	

(1) The climate class 3K3 includes a 5÷40°C use limitation, but the converter can work also if the environmental temperature is 0°C. The maximum operating temperature of the converter reaches 45°C. In this case, declass the rated power to 88%.
(2) The atmospheric pressure limitations correspond to a 0÷3000m a.s.l. operating range. In actual fact, above 1000m it will be necessary to declass the rated power of the converter by 1% every 100m.
(3) The converter must be installed in a switchboard and not outside.

2.2 RESISTANCE TO CHEMICALLY ACTIVE SUBSTANCES

Class 3C1R according to EN 60721-3-3

Environmental parameter	Maximum value	Unit of measurement
sea salts	NO	-
sulphur dioxide	0,01 0,0037	mg/m^3 cm^3/m^3
hydrogen sulphide	0,0015 0,001	mg/m^3 cm^3/m^3
chlorine	0,001 0,00034	mg/m^3 cm^3/m^3
hydrochloric acid	0,001 0,00066	mg/m^3 cm^3/m^3
hydrofluoric acid	0,001 0,0012	mg/m^3 cm^3/m^3
ammonia	0,03 0,042	mg/m^3 cm^3/m^3
ozone	0,004 0,002	mg/m^3 cm^3/m^3
nitrogen oxide	0,01 0,005	mg/m^3 cm^3/m^3

2.3 RESISTANCE TO VIBRATIONS

As regards vibrations, the OPDE has the following use limitations:

10Hz ≤ frequency ≤ 57Hz	0.075	mm (width)
57Hz ≤ frequency ≤ 150Hz	1	g

In the event of vibrations exceeding the limits indicated above, suitable reduction measures will have to be adopted.

2.4 PROTECTION AND POLLUTION DEGREE

Protection degree	IP20
Pollution degree	2 (1)

(1) Non-conductive pollution and – occasionally and temporarily – conductive pollution generated by condensation.

2.5 STORAGE

2.5.1 Environmental Storage Conditions

temperature	-10÷60	°C
humidity	5÷95	%
condensation	NO	

2.5.2 Recovery Procedure After Storage

The converter cannot be used immediately after a storage period. To avoid converter failures, use the following recovery procedure.
PHASE 1:

Non-powered converter		
temperature	15÷35	°C
humidity	5÷75	%
condensation	NO	
Atmospheric pressure	86÷106	kPa
Recovery time (1)	1	h

(1) After this recovery time, there must be no trace of condensation inside or outside the operation (well—aired environment).

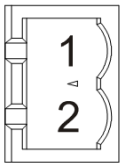
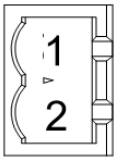
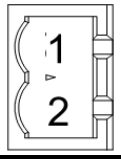
PHASE 2:
For long storage periods (one or more months) regenerate the electrolytic condensers of the power bus. Feed the converter from the terminal boards L1, L2 and L3 for 30min-1 hour without letting it run.

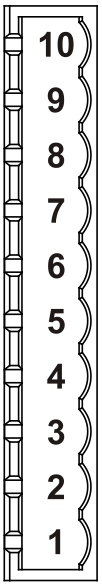
Once the regeneration process has been completed, the converter can work normally.

3 ADJUSTMENT AND DRIVERS SUPPLY

3.1 TERMINAL BOARD DESCRIPTION

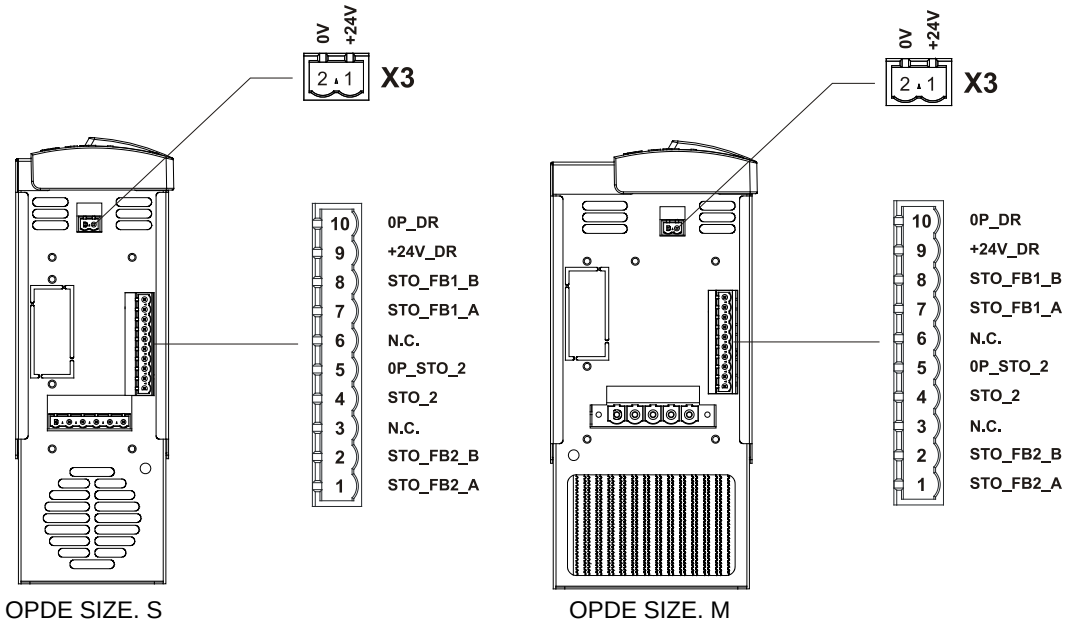
The following tables list the terminal boards used to feed the OPDE cards and to perform the diagnostic work on the STO system.

Adjustment card feeding			
X3	**Pin**	**Name**	**Description**
OPDE 03÷60A  	1 2	+24V_IN 0P	In OPDE drives X3 the connector is used to supply the regulation board (+24Vdc). The drives OPDE 03A÷60A, no autofeed, always need the +24Vdc, while, in the ODPE 03A÷60A autofeed, the connector X3 is a +24Vdc (Imax=150mA) output (can be used for the STO function if present) and so there is no possibility , in this version, to supply the only regulation board. The currents required from + 24V_IN in OPDE from 03A to 60A are as follows: OPDE 3A÷15A min. 600mA OPDE 22A min. 800mA OPDE 32÷60A min. 1A
OPDE 70÷150A  			The OPDE in sizes CASE1 (OPDE from 70A to 150A) generates internally an auxiliary supply of +24V from the main power supply. The control board of OPDE can be fed through X3 with an external +24V: there aren't conflict between the voltage generated internally and auxiliary supply provided externally. In fact is used the source with higher voltage level. This allows you to: a) configure the drive without main power supply b) keep alight the control part even if it lacks the main power supply. The currents required from + 24V_IN in the size CASE 1 is as follows: OPDE CASE1 (70A, 90A, 110A, 150A) max. 500mA **N.B.** the pinout of X3 change in function of the drive size
X6 **(only on OPDE 70÷150A)**  	1 2	+24V_OUT 0P	The voltage + 24V_OUT (22V÷23V) generated within OPDE (from 70A to 460A) is available on terminal X6. The output current is internally limited to a 500mA (protection against external over-current and short-circuit). This voltage can be used by the customer **only** for: a) give digital I/O to the OPDE. b) give an auxiliary supply for its two channels of the STO function (the auxiliary supply must be interrupted by suitable safety contacts).

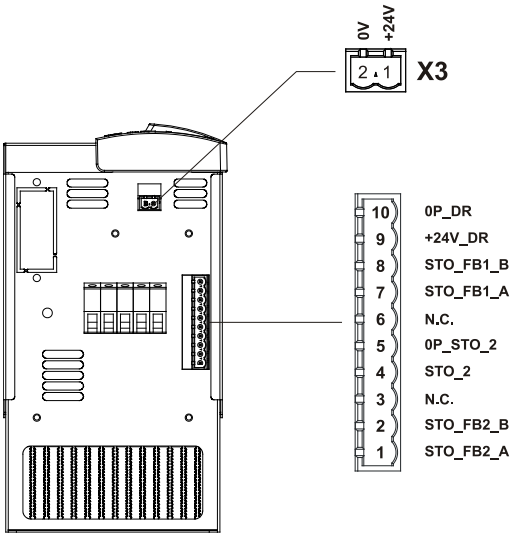
S1	Pin	Name	Description
	10	0P_DR	+24V (22V÷26V) min. 200mA Powering voltage for the first of the two STO safety system channels. This channel powers the IGBT power drivers. When the drive is working normally, the +24V_DR driver must be provided. On the other hand, to enable the STO system, it is necessary to disconnect +24V_DR.
	9	+24V_DR	
	8	STO_FB1_B	Clean N.C. contact max. 60Vdc max. 0.5A Monitor of the first STO system channel which indicates whether the IGBT drivers are powered or not. When the terminal board1 is powered, the contact is open..
	7	STO_FB1_A	
	6	N.C.	No connect
	5	0P_STO_2	+24V (22V÷26V) min. 40mA Power voltage for the second of the two STO safety system channels. This channel powers the relay which disconnects the IGBT driver controls. When the drive is working normally the STO_2 must be powered. On the contrary, to enable to STO system, it is necessary to disconnect STO_2.
	4	STO_2	
	3	N.C.	No connect
	2	STO_FB2_B	Clean N.C. contact max. 60Vdc max. 0.5A Monitor of the second STO system channel which indicates whether the relay which disconnect the IGBT drivers are powered or not. When the terminal board is powered, the contact is open
	1	STO_FB2_A	

3.2 TERMINAL BOARD POSITIONS

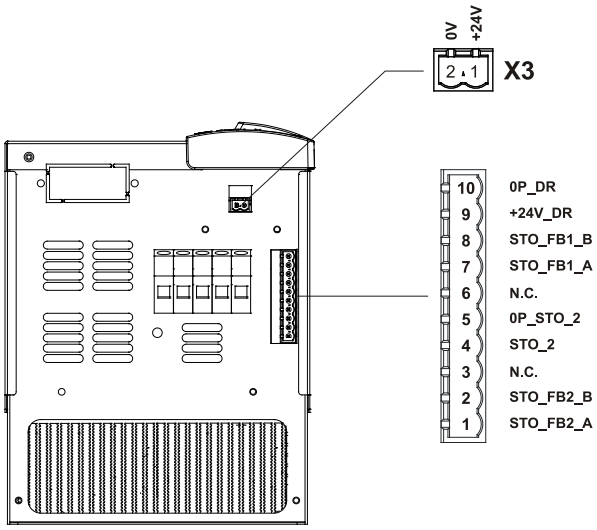
The X3 and S1 terminal boards are placed on the same side as the converter as shown in the figures below



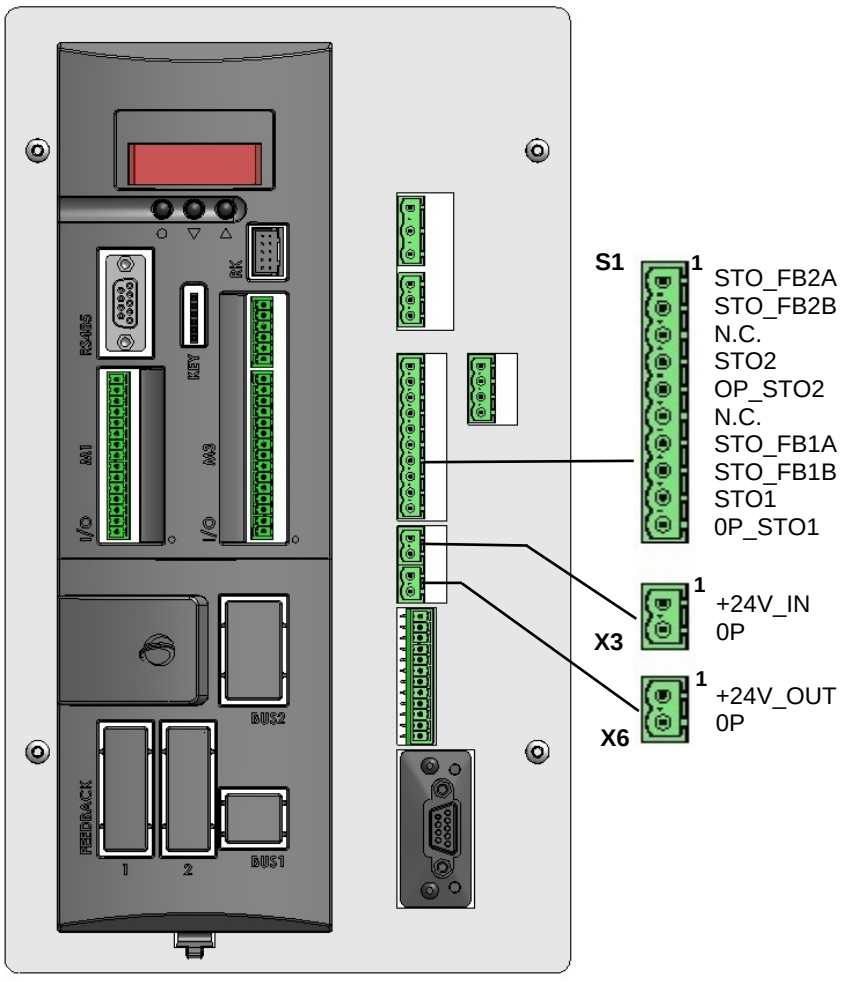
OPDE SIZE. S OPDE SIZE. M



OPDE SIZE. L



OPDE TG. X



OPDE CASE 1

4 EXTERNAL CONNECTIONS

The following paragraphs provide indications about the OPDE connection only as regards the feeding of the adjustment card and STO safety system. For the remaining connections, please refer to the OPDE installation handbook.
As indicated in par. 3.1, in the autofeed OPDE from 3A to 60A , a +24V output is present in the terminal board X3. In all OPDE from 70A to 150A this +24V output is present on terminal board X6. On the other hand, the terminal board S1, supplies the drivers of the power IGBT and the relay which carries the PWM signals from the regulation card to the drivers.
The signals +24V_DR (referring to 0P_DR) and STO_2 (referring to 0P_STO_2) each relate to one channel of the STO safety system. For this reason it is particularly important to pay great attention when cabling these signals from the OPDE to the safety module used on the switchboard.

a) For the X3 and X6 connection use a screened two-way cable whose strap must be connected to the 0P signal. Normally a screened cable is not required for adjustment powering. A screened cable is chosen to make sure that, in the event of failure of the powering cables, the safety system is disconnected. The reason is that:
   - the terminals board X3 and X6 are close to the terminal board S1;
   - the powering cables for X3, X6 and those for S1 will reach the converter inside the same conduit.

b) For the first channel connection (+24V_DR e 0P_DR) use a screened two-way cable whose strap must be connected to the 0P_DR signal. A screened cable with the strap connected to 0P_DR serves to avoid disconnecting the safety system in the event of failure of the cables outside the converter. An example of this is the loss of insulation and subsequent accidental contact between one of the cables connected to 24V on the switchboard and +24V_DR.

c) For the second channel connection (STO_2 e 0P_STO_2) use a screened two-way cable whose strap must be connected to the 0P_STO_2 signal. A screened cable with the strap connected to the 0P_STO_2 serves to avoid disconnecting the safety system in the event of failure of the cables outside the converter. An example of this is the loss of insulation and subsequent accidental contact between one of the cables connected to 24V on the switchboard and the STO_2 signal.

d) For the two monitor connections, the type of cable to be used depends on how the diagnostic test on the safety chain is conducted. Some safety modules do not specify the type of cable to connect the signals used by the diagnostic system. The reason for this is that they are able to determine themselves whether there is a failure in these connections. If the diagnostic test on the safety channels is conducted directly by the manufacturer of the switchboard, it is necessary to determine whether this test is able to detect a failure in the connection cables. In the diagnostic test, failure of the monitor signal cables causes the test itself to fail. It is not possible to determine where the failure is: on the safety chain or on the monitor. The use of screened two-way cable for each of the two monitor, therefore, makes it at least possible to rule out a failure of the monitor signal connections

5 DESCRIPTION OF STO OPERATION ON OPDE

5.1 ENABLING THE STO SYSTEM

If the converter is working normally, that is to say the STO system is disabled, it is necessary to power the +24V of the adjustment (X3), as well as +24VDR and STO_2. In this situation the clean monitor contacts (STO_FB1 and STO_FB2) will both have to be open.
To enable the safety system follow this procedure:

a) stop the motor
b) disconnect operation (1) (2)
c) disconnect +24V_DR (3)
d) disconnect STO_2 (3)

(1) it is possible to carry out operations a) and b) only by disconnecting operation if the converter settings include “stop at minimum speed” (C28=1). In this case the converter brings the motor to the minimum speed (set to zero through the parameter P50) then disconnects operation.
(2) in the presence of external influences (for example falling suspended loads), it might be necessary to take extra precautions (for example mechanical brakes) to prevent any risk.
(3) the sequence followed for items c) and d) is not relevant: for example the signals STO_2 and +24V_DR can also be temporarily disconnected.

CAUTION: enabling the STO system while the machine is running causes total loss of motor control. Enable the STO system only after its operation has been stopped following the procedure described above.

DANGER: the terminal boards +, -, U, V, W, F remain live. No maintenance work must be conducted and electrical component must not be touched.

CAUTION: after power has been disconnected, both channels take time to return to a safe condition. The times are indicated below.

CHANNEL 1	Maximum time after +24V_DR has been disconnected	1s
CHANNEL 2	Maximum time after STO_2 has been disconnected	20ms

DANGER: on brushless motors with permanent magnets, in the event of simultaneous failure of the two power switches, motor movement is possible up to 180° electrical equal to [180/n° polar motor couples] mechanical degrees.

In this situation the feedback contacts (STO_FB1 and STO_FB2) will both have to be closed.
Any discrepancy in only one of the monitor contacts compared to the converter status indicate a failure. In this case the safety system might not work correctly and needs to be immediately repaired.
Apart from the feedback contacts available outside, inside the OPDE there is a feedback signal (only for channel 1) used by the adjustment card to manage this situation.
When the connection “enable safety stop only as signal” is disabled (C73=0 which is the default configuration), the converter indicates this status with the alarm presence A13 with d49=1. In this situation the logic output o17 “power electronic card not supplied” switches to high, the logic output o0 to low (the drive ready is disconnected) and the power insertion control is disconnected.
With the C73=1 connection, the converter still brings to a high level the logic output o17 “power electronic card not powered”, the power insertion control is disconnected but no specific alarm is generated and the logic output o0 “Drive ready” remains on high, that is to say the drive ready remains active (if no other alarms are present).

5.2 DISABLING THE STO SYSTEM

To disable the STO system it is sufficient to power again +24V_DR and STO_2. Also in this case the sequence followed is not relevant.

CAUTION: From the moment the machine is powered, it takes time to disable the safety systems on both channels. The times are indicated below

CHANNEL 1	Maximum time after the enabling of +24V_DR	100ms
CHANNEL 2	Maximum time after the enabling of STO_2	20ms OPDE 03÷60A 1.1s OPDE 70÷150A(4)

(4) In the case of OPDE 70÷150A drivers with supply of the AC power side, for which the customer has required a precharge time of the power side higher than that standard, the maximum out time of safe function passes to:

Out STO_maximum_time= 600ms+Required_precharge_time

In the standard configuration the precharge time is 500ms.
In this situation the feedback contacts (STO_FB1 ed STO_FB2) will both need to be open.
Any discrepancy in only one of the monitor contacts with respect to the converter status means that there is a failure. In this case the safety system might not be working properly and it needs to be repaired immediately.
In the case of the adjustment card, to return to the normal operation conditions it is necessary to do the following.

C73=0
Wait at least 100ms after introducing +24V_DR, then enable the alarm reset. In this condition the o17 logic output “power electronic card not powered” reaches a low level. The o0 logic output “Drive ready” is on high which means that the converter is ready to work.

C73=1
The converter behaves in the same way as with C73=0 except that it is not necessary to enable the alarm reset.

ATTENTION: If the run command is given before the maximum time of out by STO function indicated in Tab. 2, the driver shows the alarm A12 with d49=1 “run without precharge”.

6 DIAGNOSTIC SYSTEM

When the safe function is active, the feedback signals indicate if the safe function has been executed correctly . it is necessary to control these feedback signals, with the aim to distinguish between:

- Basic diagnostic (compulsory);
- Intelligent diagnostic (optional).

6.1 BASIC DIAGNOSTIC

The basic diagnostic is compulsory, then it has to be always executed, because it represents a basic control for the correct working of STO function. To satisfy the basic diagnostic is necessary that:

a) The feedback signals and the digital output o23-“Not Dangerous Failure” are monitored at every machine start, on which is mounted the drive. The machine start will be executed if the feedback contacts STO_FB1 are STO_FB2 are both **closed** (feedback signals both “active”) and if the output o23-“Not Dangerous Failure” is **high**;

b) The reset command, which brings out the machine from the state of “emergency stop”, is enabled if during the state of emergency stop, the feedback contacts are both **closed** and the digital output o23-“Not Dangerous Failure” is **high**.

See paragraph 7, for some examples of connections that satisfy these prescriptions.

6.2 INTELLIGENT DIAGNOSTIC

The intelligent diagnostic is optional and can be used if the STO function is controlled by a PLC or by another intelligent system. It consists to perform periodically:

a) Two test sequences, one for each of the two channels, which allow to detect any failure of the safety function before it is turned on (will be discussed later in **FB1 and FB2 control**);

b) A control of the logic output state o23- “Not Dangerous Failure (will be discussed later in “**Not Dangerous Failure” output logic control**).

Below are described in detail the two controls.

6.2.1 FB1 AND FB2 CONTROL

Looking at the congruence between the feedback signals and the presence or absence of the control voltage in input to the two channels of the STO, it’s possible run the control sequences that allow you to detect some faults on safety channels.

CAUTION: The control sequences of the two safety channels must be performed one at a time and not simultaneously.

The maximum time of entry and exit safe condition are shown in the following table.
These figures refer to the maximum time between the change in status, channel switching and security of its monitor

CHANNEL 1	
Maximum time between the +24V_DR interruption and STO_FB1 commutation	1s
Maximum time between the +24V_DR insertion and the STO_FB1 commutation	100ms

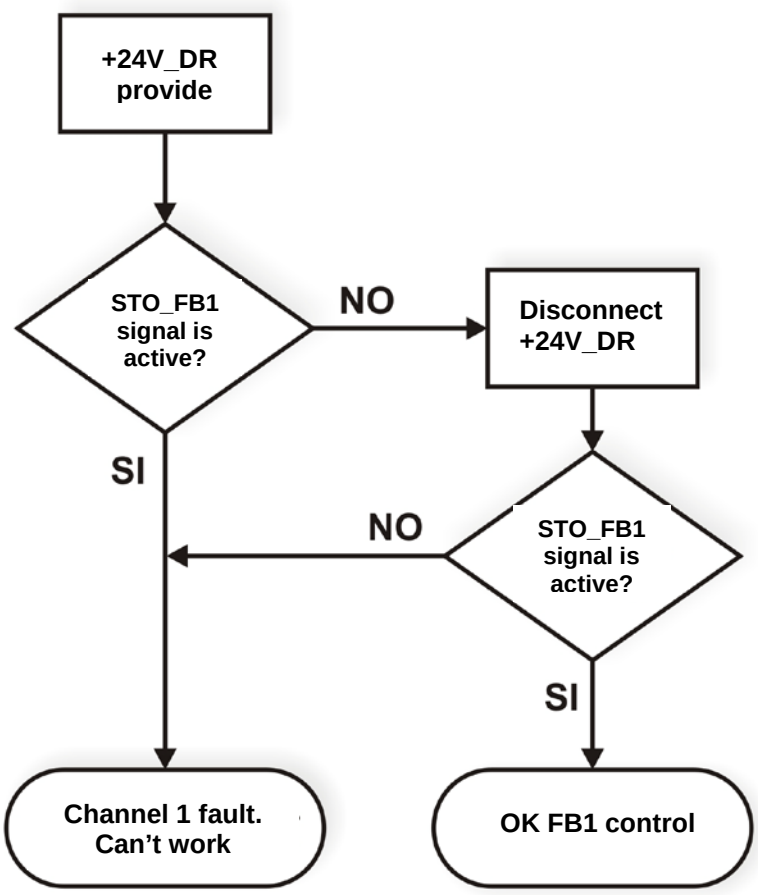
Tab.3

CHANNEL 2	
Maximum time between the STO_2 interruption and STO_FB2 commutation	100ms
Maximum time between STO_2 insertion and STO_FB2 commutation	20ms OPDE 03÷60A 100ms OPDE 70÷150A

Tab.4

The sequence to be performed for channel 1 is represented by the following flow chart:

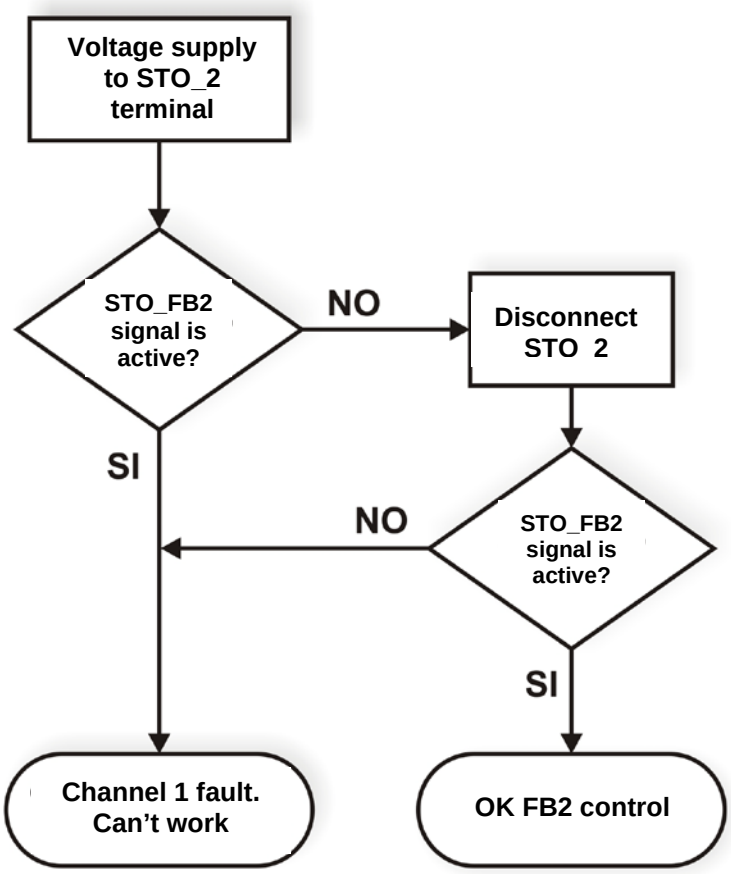
ATTENTION: For the OPDE 70÷150A sizes, the diagnostic function of channel 1 must be done with the second safety channel in OFF (+24V present on input STO_2). For OPDE 03÷60A sizes, instead, the state of the second channel of the safety function is not relevant.



FB1 control Flow-chart

The sequence to be performed for channel 2 is represented by the following flow chart:

ATTENTION: The state of the first channel of the safety function is irrelevant to the diagnostic test of the second channel STO.



Flow-chart FB2 control

If the diagnostic test detects a fault, the converter must be subjected to immediate repair, worth a possible malfunction of the safety function in the subsequent request for intervention. We recommend running these tests periodically in situations standstill. In any case it is required that you also meet at least the basic requirements of diagnostics, namely a) and b) previously described in section 6.1.

6.2.2 "NOT DANGEROUS FAILURE" LOGICAL OUTPUT CONTROL

The output control logic o23-"Not Dangerous Failure" allows to verify the presence of some dangerous faults. To make the control is necessary to check that the logical output o23 is to a high logical level keep ungenergized the channels 1 and 2.
See paragraph 7 for some examples that show how to connect the control output of this logic.

7 APPLICATION EXAMPLES

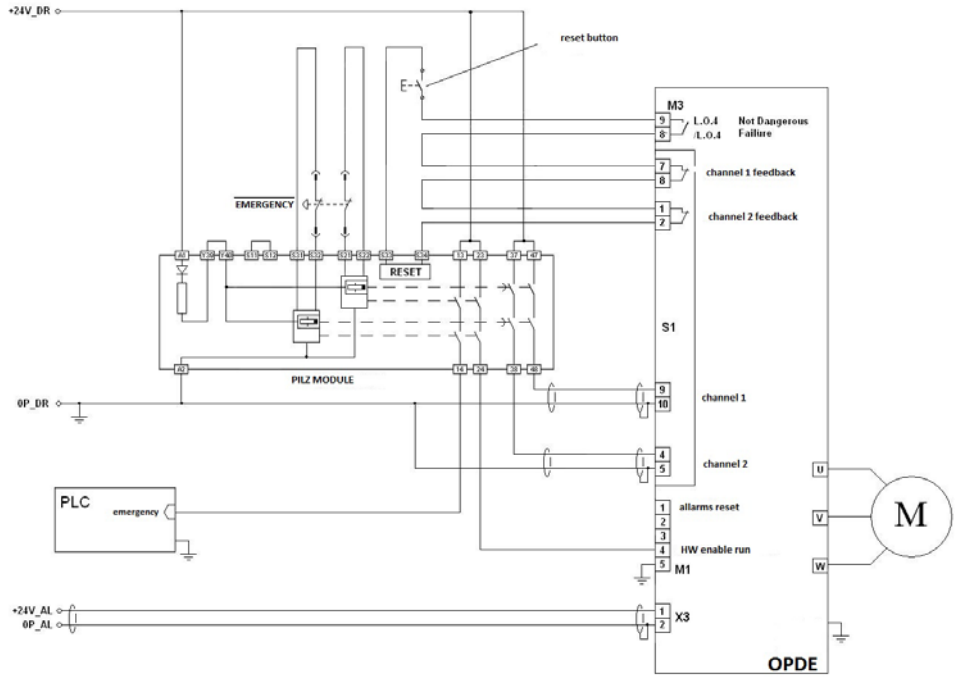
The following are some application examples of the STO system. In the various examples the OPDE connector is linked to a safety module; regardless of the type of connection used, the safety module must be set in order to have a controlled manual start and not an automatic start. Moreover the feedback contacts must be connected in series to the reset button.
In this way the machine is started, and therefore operated, with the safety module on and it will be mandatory to press the reset button to enable its starting. This is necessary in order to conduct, when the machine is started, a test on the feedback signals.

For the proper use of feedback related to the digital-o23 “Not Dangerous Failure” o23 must be configurated as an output physical logic associated with one of four logic outputs available. In order it’s possible use the direct contact present in the clean logic output LO2 and LO4. In this case it’s necessary configure the physical digital output with the **direct** logical output o23.

Alternatively, you can connect to each of the digital output, an external relay, with its contact placed in series with the reset button. In this case, if the contact of the relay is **n.c.** then it’s necessary configure the physical digital output with the **denied** logical output o23; But if the relay contact is **n.o.** it’s necessary configure the digital output with **direct** logical output o23.

Example 1 illustrates the use of a Pilz PNOZ XV2 safety module which includes two relays each of which has two immediate contacts and two timed contacts that are triggered after an adjustable delay. One of the activated systems in the converter is “stop with minimum speed” (the connection C28=1 needs to be set). If the emergency button is pressed, the start consent control is immediately disconnected from the converter causing its controlled stop. The PLC is informed that the emergency button has been pressed through the connection to its digital input. After a given delay, also the timed contacts of the Pilz module are opened which enable the two channels of the STO system, only when the motor has already been stopped. The delay time must be longer than the controlled stop time.
The feedback contacts of the STO systems are connected in series to the reset button which makes it possible to leave the emergency stop condition. Therefore, resetting is enabled only if the feedback contacts are closed at the same time as the STO system is enabled. If this does not happen, it means that there a failure has occurred in the converter and the feedback contact will remain open. This makes it possible to check the feedbacks of the STO system every time the machine is reset.

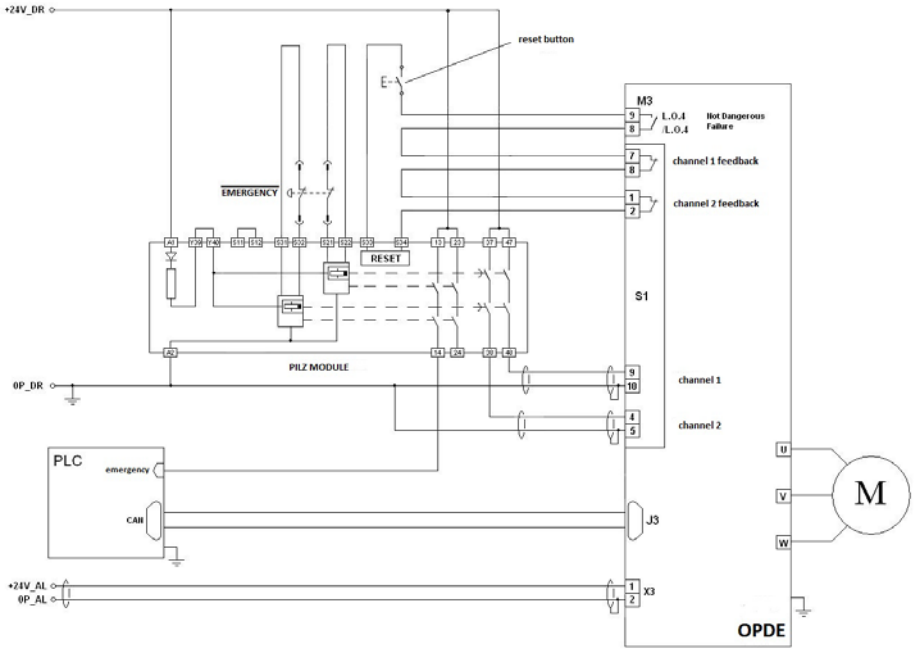
Warning: this example works correctly with the connection C73=0. To be able to go running, it’s necessary provide a reset pulse alarm on terminal M1 on pin 1 (e.g. PLC). To exit by safe condition, once you restore the security module, it’s necessary wait for the time indicated in Table 2 and then provide the pulse for alarm reset.



Example 1

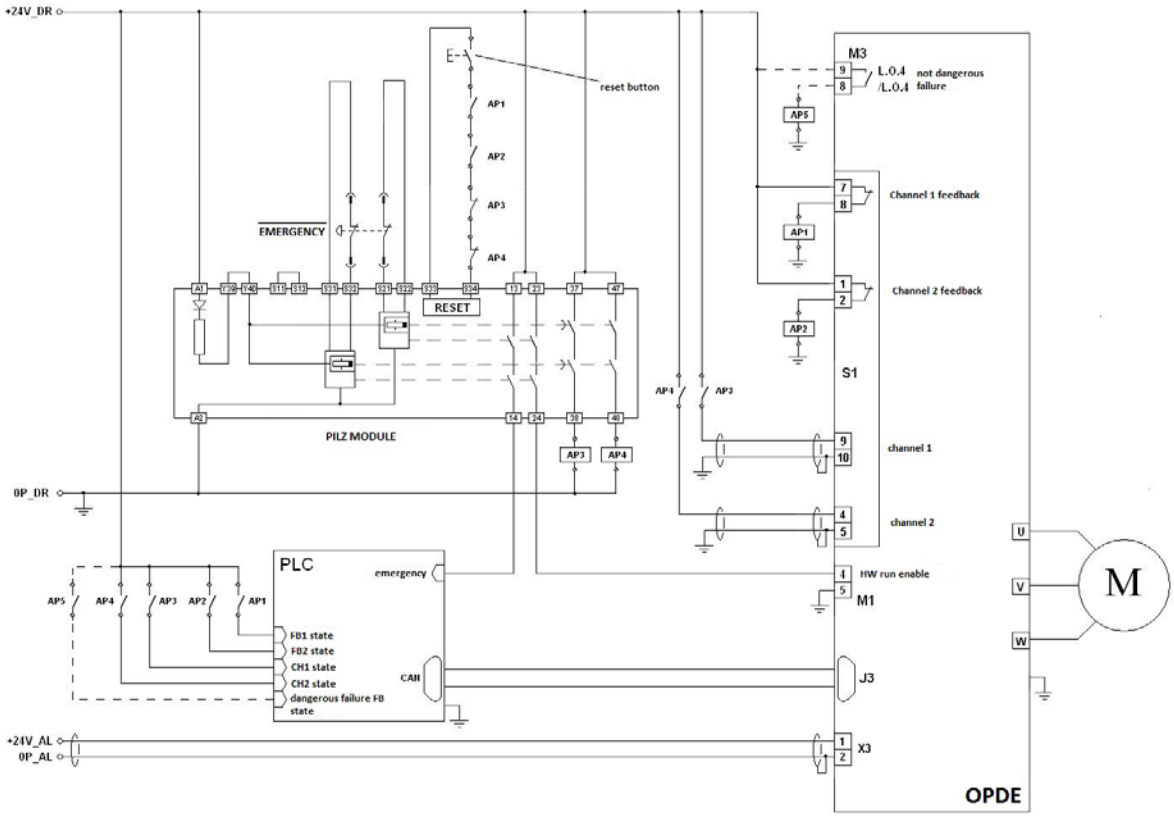
Example 2 is a diagram where the operation is started by a field bus and therefore it is the PLC itself which, having read the “emergency” signal, controls the converter to activate the motor stop procedure. As is example 1, also in this case, the STO system is activated by the timed contacts of the Pilz module.

WARNING: If the connection C73 = 0, to be able to go on run is necessary that the PLC provides a command to reset alarms. To exit safe condition, once you restore the security module, you must wait for the time indicated in Tab. 2, reset the alarm and then provide the run command SW (C21 = 1).
In case C73 = 1, the sequence to follow is the same as that for C73 = 0, but it is not necessary for the PLC provides a command of reset alarms.



Example 2

Example 3 shows an application where the PLC is able to read both the status of the incoming STO signals and the feedback signals. This means that it is possible to conduct a regular check on the PLC which compares the incoming status with the feedback status. If the PLC notices a discrepancy, it means there is a failure which will be reported.



Example 3

8 TECHNICAL DATA

The technical data change with the power sizes, because the used components change in the safety channel.

EN 61800-5-2		
	OPDE 03÷60 A	OPDE 70÷150 A
SIL	2	2
PFH	$1{,}15 \cdot 10^{-7}\ h^{-1}$	$4{,}34 \cdot 10^{-8}\ h^{-1}$
Hardware Fault Tolerance	1	1
Lifetime	20 years	20 years

EN ISO 13849-1		
	OPDE 03÷60 A	OPDE 70÷150 A
PL	d	d
Category	3	3
$MTTF_d$	39,6 years	342,7 years

CERTIFICATE
of Conformity

TÜVRheinland®

Registration No.: AK 60041891 0001

Report No.: 28104685 001

Holder:
TDE MACNO S.p.A.
via dell'Oreficeria, 41
36100 Vicenza VI
Italia

Product:
Machinery Accessory
Adjustable speed electrical power drive system

Identification:
OPD 03A OPD 07A OPD 12A OPD 15A OPD 22A OPD 32A
OPD 40A OPD 48A OPD 60A OPDE 03A OPDE 07A
OPDE 12A OPDE 15A OPDE 22A OPDE 32A OPDE 40A
OPDE 48A OPDE 60A OPD 05A-310Vdc OPD 20A-310Vdc
OPD 35A-310Vdc OPD 50A-310Vdc OPDE 05A-310Vdc
OPDE 20A-310Vdc OPDE 35A-310Vdc OPDE 50A-310Vdc
Only the "safe torque off" (STO) safety function has been evaluated and found to comply with PL=d and SIL=2
Replaces certificate n. 60026361 0001

Tested acc. to:
EN ISO 13849-1:2008
EN 61800-5-2:2007

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen is in conformity with the assessment requirement mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a TÜV Rheinland mark of conformity.

Certification Body

Date 02.11.2011

Dipl.-Ing. M. Leone

TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg

TÜVRheinland®
Precisely Right.

STATEMENT of MODIFICATIONS EVALUATION

Ordered and assessed by:

TÜV Rheinland Italia S.r.l.
Via E. Mattei, 3 20010
Pogliano Milanese (MI), Italy

Giorgio Puglia

Tel. +39 02 939 687 82
Fax +39 02 939 687 23
Mail giorgio.puglia@it.tuv.com
Web www.tuv.com
www.tuvasi.com

Reviewed by:

TÜV Rheinland Industrie Service GmbH
Automation - Functional Safety (A-FS)
Am Grauen Stein
51105 Köln / Germany

Issued to: TDE MACNO S.p.A.
Via Oreficeria, 41
36100 Vicenza (VI)
Italy

on **February 23th, 2017**

Report No.: 968/FSP 1404.00/17

Products Evaluated: BDMs (Basic Drive Modules) within STO function: OPD 03A, OPD 07A, OPD 12A, OPD 15A, OPD 22A, OPD 32A, OPD40A, OPD48A, OPD 60A, OPDE 03A, OPDE 07A, OPDE 12A, OPDE 15A, OPDE 22A, OPDE 32A, OPDE 40A, OPDE 48A, OPDE 60A, OPD 05A-310Vdc, OPD 20A-310Vdc, OPD 35A-310Vdc OPD 50A-310Vdc, OPDE 05A-310Vdc, OPDE 20A-310Vdc, OPDE 35A-310Vdc OPDE 50A-310Vdc
(the models may be followed by additional alphanumeric character not safety related).

Evaluation Standards: (*The following Standards Editions are the currently harmonized standards under the Union harmonization legislation*)

- EN 61800-5-2:2007
  Adjustable speed electrical power drive systems –
  Part 5-2: Safety requirements – Functional
- EN ISO 13849-1:2015
  Safety of machinery –
  Safety-related parts of control systems –
  Part 1: General principles for design
- EN/IEC 62061:2015
  Safety of machinery –
  Functional safety of safety-related electrical, electronic and programmable electronic control systems
- IEC 61508-1 to -7:2010
  Functional safety of electrical/electronic/programmable electronic safety-related systems
- EN ISO 13849-2:2014
  Safety of machinery – Safety-related parts of control systems –
  Part 2: Validation

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Precisely Right.

Modifications Assessed:
- Use of two alternative revised driver boards
- Extension to the "Mission Time" up to 20 years (with direct consequence of changing of PFH with identical STO function circuitry)

Evaluation Results:

The Hardware modifications do not change the integrity of the STO function.
The modification of the "Mission Time" to 20 years modify the PFH, now:
PFH (20 years mission time – EN/IEC 62061): 8,8-08 (h^-1)

But not modify the STO architectural performance:
HFT=1, SIL 2 (in accordance with EN/IEC 62061:2015)
Category 3, PL d (in accordance with EN ISO 13849)

The products must be: installed, operated and maintained, in accordance with revised instructions for use.

Please note that this statement is not a Certificate of Conformity. In addition, this statement does not imply assessment of the production of these products and does not permit the use if a TÜV Rheinland mark of conformity.

Date: 23/02/2017,

The Assessor:

Eng. Giorgio Puglia
TÜV Rheinland Italia S.r.l.

The Reviewer:

Dipl.-Ing. Stephan Häb
TÜV Rheinland Industrie Service GmbH

CERTIFICATE
of Conformity

TÜVRheinland®

Registration No.: AK 60039789 0001

Report No.: 28104272 003

Holder:
TDE MACNO S.p.A.
via dell'Oreficeria, 41
36100 Vicenza VI
Italia

Product:
Machinery Accessory
Adjustable speed electrical power drive system

Identification:
OPD 70A , OPD 90A , OPD 110A , OPD 150A , OPDE 70A
OPDE 90A , OPDE 110A , OPDE 150A

Only the "safe torque off" (STO) safety function has been evaluated and found to comply with:
* PL=d, according to EN 13849-1:2008
* SIL 2, according to EN 61800-5-2:2007

Tested acc. to:
EN ISO 13849-1:2008
EN 61800-5-2:2007

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen is in conformity with the assessment requirement mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a TÜV Rheinland mark of conformity.

Certification Body

Date 01.07.2011

Dipl.-Ing. M. Leone

TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg

TÜVRheinland®
Precisely Right.

STATEMENT of MODIFICATIONS EVALUATION

Ordered and assessed by:

TÜV Rheinland Italia S.r.l.
Via E. Mattei, 3 20010
Pogliano Milanese (MI), Italy

Reviewed by:

TÜV Rheinland Industrie Service GmbH
Automation - Functional Safety (A-FS)
Am Grauen Stein
51105 Köln / Germany

Giorgio Puglia

Tel. +39 02 939 687 82
Fax +39 02 939 687 23
Mail giorgio.puglia@it.tuv.com
Web www.tuv.com
www.tuvasi.com

Issued to: TDE MACNO S.p.A.
Via Oreficeria, 41
36100 Vicenza (VI)
Italy

on **February 23th, 2017**

Report No.: 968/FSP 1405.00/17

Products Evaluated: BDMs (Basic Drive Modules) within STO function: OPD 70A, OPD 90A, OPD 110A, OPD 150A, OPDE 70A, OPDE 90A, OPDE 110A, OPDE 150A (the models may be followed by additional alphanumeric character not safety related) called: "CASE1 Series"

Evaluation Standards: (*The following Standards Editions are the currently harmonized standards under the Union harmonization legislation*)

- EN 61800-5-2:2007
  Adjustable speed electrical power drive systems –
  Part 5-2: Safety requirements – Functional
- EN ISO 13849-1:2015
  Safety of machinery –
  Safety-related parts of control systems –
  Part 1: General principles for design
- EN/IEC 62061:2015
  Safety of machinery –
  Functional safety of safety-related electrical, electronic and programmable electronic control systems
- IEC 61508-1 to -7:2010
  Functional safety of electrical/electronic/programmable electronic safety-related systems
- EN ISO 13849-2:2014
  Safety of machinery – Safety-related parts of control systems –
  Part 2: Validation

TÜVRheinland®
Precisely Right.

Modifications Assessed:
- Use of a revised power board (at the same nominal ratings)
- Use a revised interface board
- Extension to the "Mission Time" up to 20 years (with direct consequence of changing of PFH with identical STO function circuitry)

Evaluation Results:

The Hardware modifications do not change the integrity of the STO function.
The modification of the "Mission Time" to 20 years modify the PFH, now:
PFH (20 years mission time – EN/IEC 62061): 4,34 E-08 (h^-1)

But not modify the STO architectural performance:
HFT=1, SIL 2 (in accordance with EN/IEC 62061:2015)
Category 3, PL d (in accordance with EN ISO 13849)

The products must be: installed, operated and maintained, in accordance with revised instructions for use.

Please note that this statement is not a Certificate of Conformity. In addition, this statement does not imply assessment of the production of these products and does not permit the use if a TÜV Rheinland mark of conformity.

Date: 23/02/2017,

The Assessor:

Dipl.-Ing. Giorgio Puglia
TÜV Rheinland Italia S.r.l.

The Reviewer:

Dipl.-Ing. Stephan Häb
TÜV Rheinland Industrie Service GmbH

Via dell'Oreficeria, 41
36100 Vicenza - Italy
Tel +39 0444 343555
Fax +39 0444 343509
www.bdfdigital.com