

Smart Safety Net™

The smarter way to do safety

Connection and Instruction Manual



Type: SSN-2001, 24V DC

Type number: 42010202

Construction year: 2007

Registration still outstanding

UL & cUL: Underwriters Laboratories Inc., USA / Canada

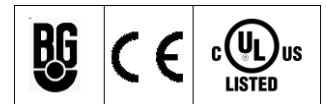
BG: Employers' Liability Insurance Association, Germany

EG-Model Inspection Document

CE Symbol in agreement with MD, EMC and LVD

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Safety Advice

For your safety

The **Smart Safety Net** (SSN for short) was designed as a communication monitoring system of safety relays, as a switch-off function of protective devices to secure hazardous areas in the machine controlled industry.

Before use please read the instruction manual and carefully store it in a safe place. Install and operate the device only after reading and comprehending the instruction manual, and after you are familiar with the valid rules on work safety and accident prevention.

Please use the device only as specified. For this purpose please also note the values in section "Technical data".

During transport, storage and operation please adhere to the conditions listed in "Technical data".

For all capacitive and inductive consumers please make sure that an adequate protective circuit is available.

Please observe all warning signs listed in other sections of this manual. These signs are clearly highlighted!

IMPORTANT

Only qualified personnel may assemble start-up and maintain the unit when it is in a zero voltage state. Only qualified electricians may work on electrical installations.

IMPORTANT

The connection and instruction manual contains information that enables the proper and efficient use of the SSN monitoring module. Duelco is not liable for damage caused by improper use of this device. This manual is an integral part of the basic knowledge necessary for proper use of the system.

Safety observations

The comments about safety in this document will not discuss safety observations of individual machine parts where safety devices (usually safety relays) are applied. Here the respective instruction manuals will be referenced! This document merely describes how to establish a SSN network and how to start it up.

WARNING

The safety function during machine operation can not be guaranteed if the system is connected incorrectly or not used as specified. This may lead to fatal injuries. Interventions and changes to the SSN modules are not permitted, unless they are explicitly described in this instruction manual.

The regional legal regulations and conditions of the liability insurance of the employer must be maintained.

Safety standards

The SSN module was developed, produced and tested for a prototype test in concordance with the safety standards valid during the testing period. The devices comply with the requirements of Category 4, PL e cf. DIN EN ISO 13849-1:2007 and SIL CL 3 where $PFM_d \geq 10^{-8}$ cf. DIN EN 62061:2005 respectively.

IMPORTANT

The above specifications concerning the category, PL, SIL CL respectively are only valid by serial connection of ≤ 3 pieces SSN-Modules (s. DIN EN ISO 13849-1:2007 paragraph 6.3).

In a risk analysis, the SSN module may, based on its safety category 4, be used as a deactivation protective unit to secure hazardous areas.

Conformity statement

The *Smart Safety Net* was developed according to valid European standards and guidelines. The respective conformity statement is found at the end of this connection and instruction manual.

Remaining risks (EN ISO 12100-1)

The wiring examples shown in this instruction manual were tested with the highest degree of care. The valid standards and regulations were strictly adhered to when applying the shown components and wiring. There are residual risks, if:

- The suggested wiring design is not applied and consequently the safety relevant components are not or not properly integrated in the safety circuit.
- The user does not comply with the respective safety regulations for operation, the defined setting and maintenance intervals of the system. The inspection and maintenance intervals of the device must be strictly adhered to.

Area of application

The SSN system is usually used in machines and systems where the SSN network functions as a local bus.

The advantage of this safety system is the simple "programming" (with DIP switch) and less elaborate wiring of the systems. Additionally, far more diagnoses functions and error detections are available, which provide clarity in visualizing and for error searches.

There is no product / brand limitation for the safety relays that may enter into the SSN system. Here is a list of the primary areas of application:

- Machine tools
- Expanded processing machines with several control elements
- Wood and metal processing machines
- Print and paper processing machines, cutting machines
- Packaging machines, individual devices and as part of a system
- Grocery processing systems
- Machines in the rubber and plastics industry
- Assembly machines and robots

Safety features

The SSN module meets the following safety requirements:

- The switch is constructed redundant with self monitoring.
- The safety device continues to work even if a component breaks down.
- Secure communication between the SSN modules. Missing or faulty messages are recognized.
- The safety outputs are checked with each switch process, by using test impulse signals.

The device is predominantly constructed electronically. Thus, the core of the SSN module consists of two cooperating micro processors that by standard form two independent channels. With the respective hardware, the connected safety relay is now monitored continuously.

The two micro processors evaluate the input (feedback loop of the safety relay) and the arriving messages from the SSN network. A Solid-State machine in the SSN module defines the behavior of the 3 outputs (internal potential free C/O relay). During every switch process, test impulse signals will further check if the internal relays have switched correctly and will make sure no shorts exist.

WARNING

You must observe the different response times of the system (Chapter "Data Connection") if you conduct safety observations of the entire system.

WARNING

The potential free relay contacts on the SSN-2001 are NOT safety relay outputs (E11/E12), (E21/E22), (R33/R34). The relay contacts may NOT be connected to the load circuit!

Function

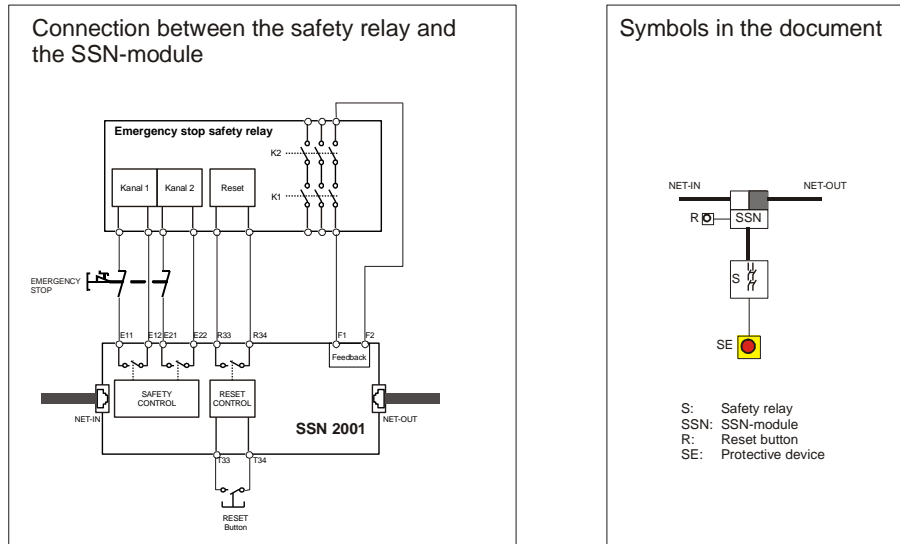
Short description of the function

Duelco has developed a permanent safety concept with the new safety communication unit SSN. SSN is a data bus used for safety systems. The fundamental idea of SSN is to easily and safely connect safety systems (safety relays) with each other. The data bus technology significantly reduces elaborate wiring not only at the installation location but also in the switch cabinet.

Therefore, it is no longer necessary to replace the safety devices (mostly safety relays) installed in various machine parts, but the individual safety devices are now connected via the SSN network. The user achieves the highest possible safety level while saving costs – however only as far as the safety relays applied in the network.

WARNING

The SSN-2001 module may only be used as a safety system together with a safety relay that monitors the safety application. The SSN-2001 module may thus not be operated as an individual device! The potential free relay contacts on the SSN-2001 are NOT safety relay outputs (E11/E12), (E21/E22), (R33/R34). The relay contacts may NOT be connected to the load circuit!



The SSN-2001 modules are now connected with the safety relays in a manner that the SSN-2001 module can also interrupt the safety circuit (channel 1 and 2 of the safety relays). Furthermore the SSN module takes over the control of the RESET input of the safety relays. The safety relays may now be interrupted by the connected protective device (e.g. an EMERGENCY Switch) and by the SSN module. However, the SSN module entirely takes over the resetting of the safety relays.

WARNING

The SSN module may be connected with almost any safety relays. The maximum stop time specified by standards may not exceed 200 mS. For this reason the stop time of a connected safety relay may not exceed 60 mS.

The SSN modules are connected with each other using RJ45 cable and thus form a closed ring. Within the ring a token is sent around which will specify the behavior of the connected SSN modules and ultimately also that of the connected safety relays.

With the SSN system, safety groups can also be formed. The SSN network can be divided in up to 4 zones (regions). It is now possible to only turn off the portion of a system where for example maintenance and set-up work is to be performed. The function of all remaining system parts remains unchanged. One or more SSN modules can be connected in every group. Thus, every group can be evaluated separately.

Stop - Behavior

A correctly connected safety relay can now be controlled as follows:

Case A:

The safety circuit is interrupted by the protective device (e.g. EMERGENCY switch) and transfers the connected machine into a safe state. The connected SSN module detects this STOP and sends a STOP message along with the next TOKEN (to the zones that were configured in the SSN module).

Case B:

The SSN module connected to the safety relay receives a STOP message for the zone in which the SSN module is located. Now the SSN module interrupts the safety circuit by opening the internal relays and transfers the connected safety relay (and ultimately the machine) into a safe state.

Start – Behavior (reset)

Case A:

The SSN module detects if the RESET button connected to the SSN module is activated. The SSN module initiates the respective RESET impulse (manual RESET, monitored RESET, etc.) on the safety relay by closing an internal relay. The SSN module monitors that the safety relay was able to start the machine successfully (the return coupling loop was closed again). If this has been diagnosed then the SSN module sends a START message along with the next TOKEN (to the zones configured in the SSN module).

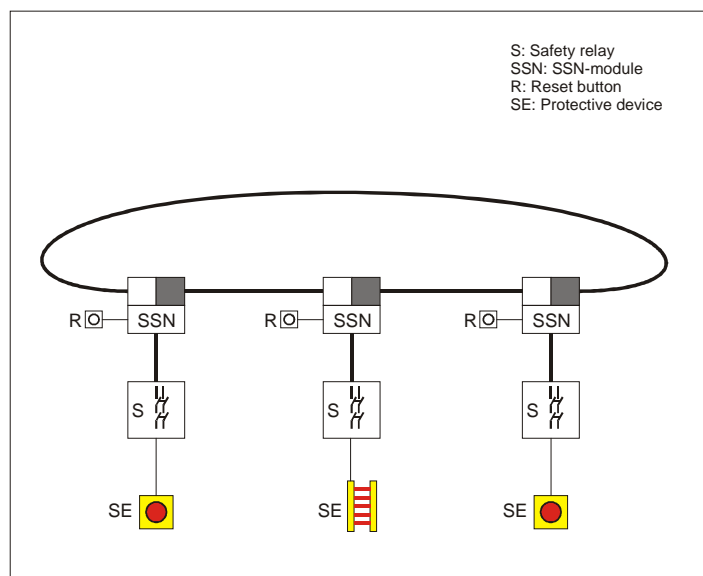
Case B:

The SSN module connected to the safety relay receives a START message for the zone in which the SSN module is located. The SSN module initiates the respective RESET impulse on the safety relay by closing an internal relay. The SSN module monitors that the safety relay was able to start the machine successfully (the return coupling loop was closed again).

HAZARD

If this has not been diagnosed then the SSN module sends a STOP message along with the next TOKEN (to the zones configured in the SSN module). This means that a system can be turned on for a brief moment! This must be taken into consideration in the system blueprint.

In the event that this can lead to a hazardous situation, the SSN module must be configured in a manner that it can only be restarted via the local reset button (see chapter about configuration using the DIP switch).



Features of the SSN system

- Connection to safety relays for EMERGENCY switch, limit switch, non-contact switch, light grid above individually insulated switches (E11/E12), (E21/E22), (R33/R34).
- Safety relays with NO/NC inputs can not be used
- Cyclical self-test. The SSN device has two micro-processors used for monitoring the safety functions
- Return feedback loop used for monitoring the safety relay (F1/F2)
- The SSN module can be operated with 4 different reset types:
 - Monitored reset
 - Manual monitored reset
 - Automatic reset
 - Manual monitored reset with automatic start at power-up
- Setting/configuration via DIP switches
- LEDs for diagnosis
- Removable terminal block
- Connector for RESET button (T33/T34)
- PL e * category 4 * respectively cf. EN ISO 13849-1:2007
- SIL CL 3 with $PFM_d \geq 10^{-8}$ * cf. DIN EN 62061:2005
- Up to 25 units can be connected to the safe ring network
- Compact enclosure (22.5 mm)

IMPORTANT

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- * The above specifications concerning the category, PL, SIL CL respectively are only valid by serial connection of ≤ 3 pieces SSN-Modules (s. DIN EN ISO 13849-1:2007 paragraph 6.3).

Configuration

Comments

The SSN modules must be attached at a suitable operating location such as a switch cabinet, enclosure, etc. (min. protective class IP54) – preferably in direct proximity to the connected safety relay. The device is set to contamination level 2.

After the device has been configured, the SSN module must be placed on the DIN-standardized track (35mm - according to EN 50022). Thereafter, the SSN module must be wired electrically (refer to chapter Connection).

It is possible to work with the network cables without separating the SSN modules from the supply voltage.

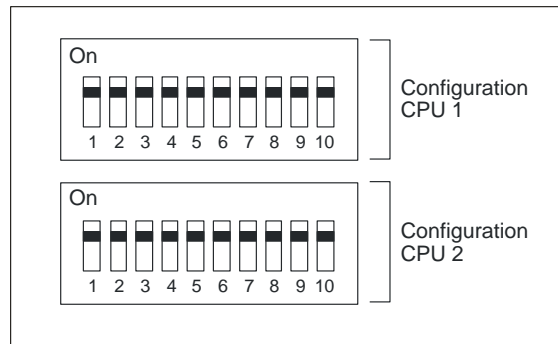
WARNING

The potential free relay contacts on the SSN-2001 are NOT safety relay outputs (E11/E12), (E21/E22), (R33/R34). The relay contacts may NOT be connected to the load circuit!

Configuration with DIP switches

Via the DIP switches found on a circuit board the various configurations are parameterized. The DIP-switches are found on the side of the housing.

There are 2 rows with DIP switches, since the parameterization is doubled. Both rows must therefore be set equally for the device to work.



DIP Switch	Significant	DIP Switch	Significant
Key 1	GR Group/Zones PIN 1	Key 6	SS Start/Stop signal PIN for zone 1
Key 2	GR Group/Zones PIN 2	Key 7	SS Start/Stop signal PIN for zone 2
Key 3	LR Local Reset PIN	Key 8	SS Start/Stop signal PIN for zone 3
Key 4	LS Local STOP PIN	Key 9	RM Reset Mode Bit 1
Key 5	SS Start/Stop signal PIN for zone 0	Key 10	RM Reset Mode Bit 2

IMPORTANT

The SSN module can only be configured when the device is turned off. Changes made during operation without turning the power off will not affect the unit!

Zone / Group (GR)

The 2 switches (GR), assigns the SSN module to a specific zone. In a SSN-2001 module up to 4 zones may be set: Zone 0, 1, 2 and zone 3.

DIP Switch Key 1	DIP Switch Key 2	Behavior
0	0	The module belongs to zone 0
1	0	The module belongs to zone 1
0	1	The module belongs to zone 2
1	1	The module belongs to zone 3

Local / global reset behavior (LR)

This configures whether the SSN module should or should not react to the START signals of the SSN network.

HAZARD

If one or more of the protective devices are not reset, then the system may activate for a brief moment, when activating a RESET button (about 400ms). This is explained in more detail in the chapter "Start-up of the system" in the start-up scenario 3! In the event that this presents a hazard for this machine part, then this SSN module should ONLY react to a local RESET (that is: Key 3 = "1"). In this configuration the SSN module (as well as the connected safety relay) will only start if you press the local RESET button, OR if it was configured with an automatic reset if the local protective device is reset.

DIP Switch Key 3	Behavior
0	The module reacts to the START messages from the network
1	The module does not react to the START messages from the network

Local / global Stop behavior (LS)

This configures whether the SSN module should or should not react to the STOP signals of the SSN network. If this switch is set to "1", the machine will only stop if the protective device connected to the safety relay triggers a STOP function.

DIP Switch Key 4	Behavior
0	The module reacts to the STOP messages from the network
1	The module does not react to the STOP messages from the network

Stop / Start signals (SS)

These 4 DIP switches define which zones should be triggered by this SSN module. The START signal is sent by the SSN module if the RESET button of the respective unit was activated. The start signal provides information on which groups will start, unless they are already running.

The STOP signal works the same way as the START signal. The respective SSN module sends a STOP signal if the connected safety relay is turned off (by activating the EMERGENCY switch). The STOP signal provides information about which groups should be stopped if they are not already standing still.

IMPORTANT

If LR and LS are set to "1" and SS to "0000" then the SSN module will react like a stand-alone device. This means the SSN module does not react to messages from the SSN network and it also does not generate any messages in the network. Only if the communication in the SSN network shows an error or is interrupted, will this SSN module turn off the safety relay.

DIP Switch Key 5	DIP Switch Key 6	DIP Switch Key 7	DIP Switch Key 8	Behavior
0	0	0	0	The module does not generate any STOP/START messages. Stand-alone mode.
1	0	0	0	The modules should generate START/STOP messages for zone 0.
0	1	0	0	The modules should generate START/STOP messages for zone 1.
1	1	0	0	The modules should generate START/STOP messages for zones 0 + 1.
0	0	1	0	The modules should generate START/STOP messages for zone 2.
1	0	1	0	The modules should generate START/STOP messages for zones 0 + 2.
0	1	1	0	The modules should generate START/STOP messages for zones 1 + 2.
1	1	1	0	The modules should generate START/STOP messages for zones 0 + 1 + 2.
0	0	0	1	The modules should generate START/STOP messages for zone 3.
1	0	0	1	The modules should generate START/STOP messages for zones 0 + 3.
0	1	0	1	The modules should generate START/STOP messages for zones 1 + 3.
1	1	0	1	The modules should generate START/STOP messages for zones 0 + 1 + 3.
0	0	1	1	The modules should generate START/STOP messages for zones 2 + 3.
1	0	1	1	The modules should generate START/STOP messages for zones 0 + 2 + 3.
0	1	1	1	The modules should generate START/STOP messages for zones 1 + 2 + 3.
1	1	1	1	The modules should generate START/STOP messages for zones 0 + 1 + 2 + 3.

INFORMATION

You must choose your own zone. Only when choosing the combination “0000” for stand-alone operation, it is permitted to omit choosing your own zone.

RESET mode (RM)

With these 2 DIP switches it is possible to set the different RESET types. The SSN module initiates the respective reset impulse with the safety relay. You can choose the following RESET types: manually monitored RESET, automatic RESET, monitored RESET and manually monitored RESET with automatic RESET at power up.

DIP Switch Key 10	DIP Switch Key 9	Behavior
0	0	Manual monitored reset
1	0	Automatic reset
0	1	Monitored reset
1	1	Manually monitored reset with automatic reset at power up

Operating types

The reset button must be installed in a manner that the hazardous area can be overseen.

In accordance with IEC/EN 60-204-1, Section 9.2.5.4.2 and 10.8.3, an automatic start must not occur after an Emergency shut off. Therefore, in operating types with automatic start a superior control must prevent the automatic start after an EMERGENCY shut off. An automatic start is only permitted if the machine is not able to cause a hazardous situation after starting.

Start up can occur using a start-up button (manual start and manually monitored start), where the function is monitored by the SSN module or automatically by the supply voltage (auto-start).

Manual monitored reset

If the SSN module was deactivated by operating the protective device, for example by pressing the Emergency button, then the safety module can only be restarted via the start button or via a start command from the SNN network. Also during a network failure, the device must always be activated via the start button or using a start command. When operating using a manually monitored start, the start button is checked with each turn-on process. If the push button is closed before unlocking the EMERGENCY switch or applying the supply voltage, then a start is not possible.

Automatic reset

WARNING

When operating using the auto-start function, the device will automatically turn on when the supply voltage is applied, provided the Emergency circuits are closed. In the case that the monitoring channels are cut off during operation, because of activation of the EMERGENCY switch, the machine connected to the safety relay will stop. When the EMERGENCY switch is returning to the previous position (the Emergency circuits are closed), the SSN generates an automatic start of the machine.

Please observe the note in the EN ISO 13849-1: 2007 paragraph 5.2.3 that a restart of the machine can only occur automatically, if it is made sure that there is not a hazardous state present.

HAZARD

Before start-up of the system it must be certain that the external connections of the SSN module is done correctly. If the SSN module is activated with an open feedback loop, the safety relay connected to the SSN module is activated, which leads to startup of the machine. A indication of missing or incorrect wiring of the feedback loop is shown through the internal state of the SSN module (Standby). In this case the LEDs R1 and R2 illuminate amber.

Monitored reset

When operating with monitored start, the start is only executed once the RESET button is released.

Manually monitored reset with automatic reset at power up

If the EMERGENCY switch is not activated, after applying the supply voltage, the unit behaves like automatic RESET. Hereafter the unit behaves like manually monitored reset.

WARNING

Another difference between automatic RESET and manually monitored RESET with automatic RESET at power up is that the SSN units connected to the SSN module and configured to the same group as the SSN module, also will receive a start command when applying the supply voltage and therefore will start together with the SSN module! Please observe the note in the EN ISO 13849-1: 2007 paragraph 5.2.3.

Features

Generation of start / reset command only for its own zone/group

The SSN-2001 can be acquired with a special function for use in special applications.

The product is named SSN-2001.2.

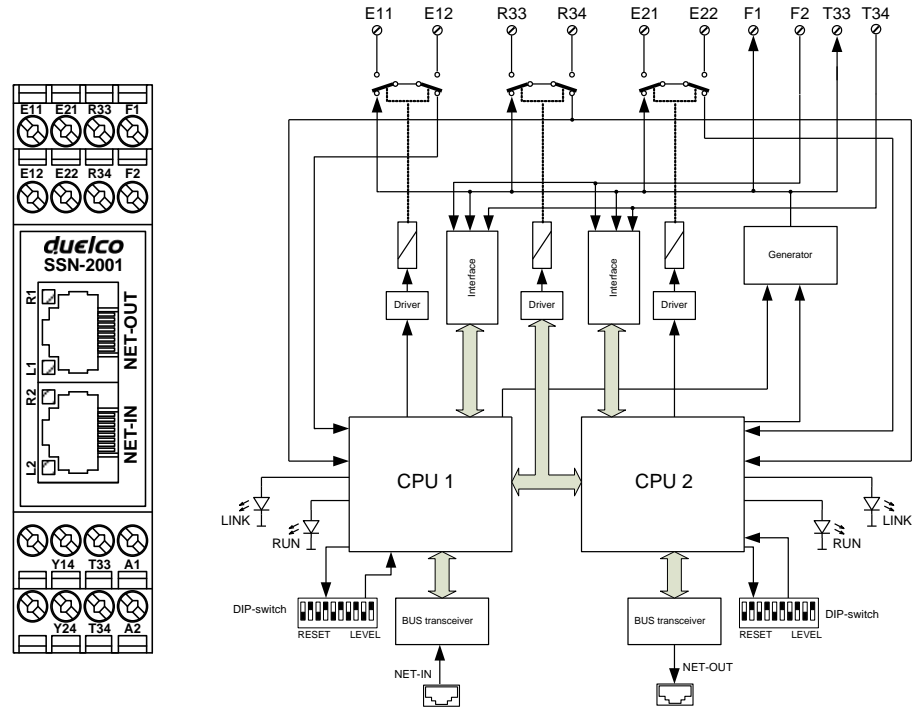
By pressing the manual reset device (reset button) of the SSN-unit, it is possible to start only the groups, which are configured with the first two DIP switches 1 & 2 (see Chapter: "Configuration" Key 1 & 2) (i.e. reset for only own zone / group).

In opposition to the reset case, when activating the safety protective device (e.g. emergency stop button) the stop command is generated for the groups, which are configured with the DIP switches 5-8 (see Chapter: "Configuration") in the configuration field „Start-/Stop signals“.

Connection

Wiring diagram

Front view and interior wiring diagram of the SSN device



Description of the terminal clips

Terminal clips	Description
E11 / E12 :	Potential-free contact to check the Emergency signal input for the connected safety relay T11/T12 (channel 1).
E21 / E22 :	Potential-free contact to check the Emergency signal input for the connected safety relay T21/T22 (channel 2).
R33 / R34:	Potential-free contact to control the reset button (T33/T34) for the connected safety relay.
F1 / F2:	Test impulse generator and receiver for monitoring operating state for the connected safety relay.
T33 / T34:	Test impulse generator and receiver for monitoring operating state for the connected reset function.
Y14 / Y24 :	The outputs are meant for functions that do not require a redundancy check such as display instruments, status signals, etc.
A1 / A2:	Power supply (+/-). 24VDC.

Description of the LEDs

Terminal clips	Description
R1	Operating state (μ P 1)
R2	Operating state (μ P 2)
L1	Operating state of the incoming signal (μ P 1) (NETIN).
L2	Operating state of the outgoing signal (μ P 2) (NETOUT).

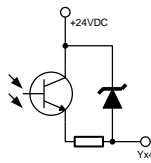
Description of the semi-conductor outputs

SSN possesses two semi-conductor signaling outputs, Y14 and Y24 that are used to report different operating conditions for example on a PLC.

Semi-conductor output Y14	Semi-conductor output Y24	Description
0	0	No power supply
0	1	Ready
1	0	Activated (RUN)
1	1	Internal system error

IMPORTANT

The semi-conductor signaling outputs do not have a short-circuit protection. At “1”, 24 VDC is at the semi-conductor output. The current load may not be more than 20 mA.



Electrical connection

WARNING

Only qualified experts may perform the electrical installation. During installation please note that the supply and signal wires and the RJ45 cables are wired separately from the power supply cables.

The electrical inlets must be separated from the network with an insulating transformer (safety class III according to EN 60742) or using a similar method.

The SSN module possesses a surge protector (multi fuse); however, a protection via an external protector is necessary.

The terminal blocks are removable which facilitates the re-inserting. While working on connections, the device may not be connected to the supply voltage.

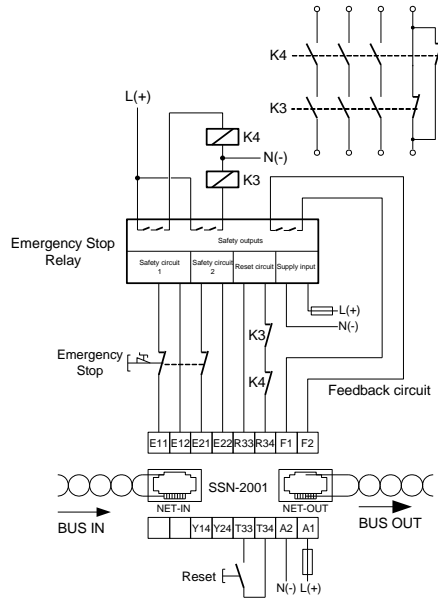
It must be noted that the maximum length of the RJ45 cable is 300 m. Longer cables require using a RS485 repeater.

The SSN modules are only suitable for use in terminal boxes/ switch cabinets with a minimum protective class of IP54.

From the following illustration it can be seen how the SSN module is wired with a safety relay. The figure is only an example not meant for any particular area of application.

WARNING

The potential free relay contacts on the SSN-2001 are NOT safety relay outputs (E11/E12), (E21/E22), (R33/R34). The relay contacts may NOT be connected to the load circuit!



IMPORTANT

If the emergency shut-off functions are not activated for a longer period then they are not monitored during this period. Monitoring of the emergency shut-off functions are only tested when switching the EMERGENCY switch. It is therefore highly recommended to test this function regularly and to include it in the maintenance instructions for the system!


Data connection

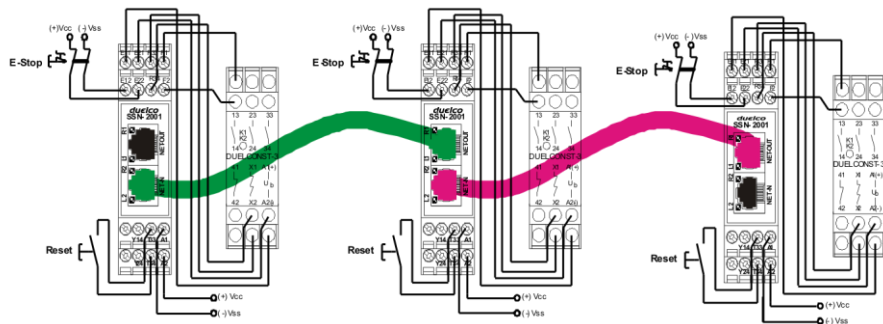
Even though the SSN network from an electrical point of view is a ring network, the wiring is completed using RJ45 cables. With 8 internal conductors, the data flow can thus be attained using one cable in both directions. To close the circuit, a terminating plug RJ45 must be plugged into the first SSN module (NET-OUT) and the last SSN module (NET-IN) of the data string. Between the SSN modules one cable each is plugged into the output of one SSN module (NET-OUT) and into the input of the next SSN module (NET-IN).

The length of the cable (RJ45) between the devices may not exceed 300 m and no more than 25 SSN modules may be connected.

IMPORTANT

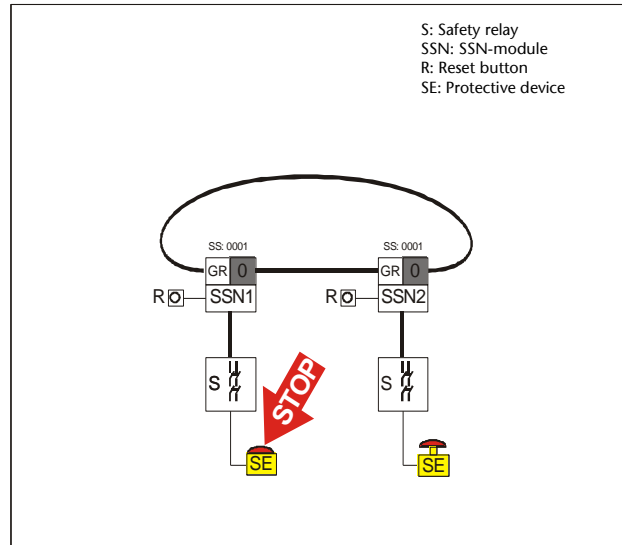
Before plugging cables or terminating plugs into the SSN device, ESD remedial measures must be taken.

 A terminal plug is mounted in Net-In and Net-Out on the first and last SSN-module, respectively

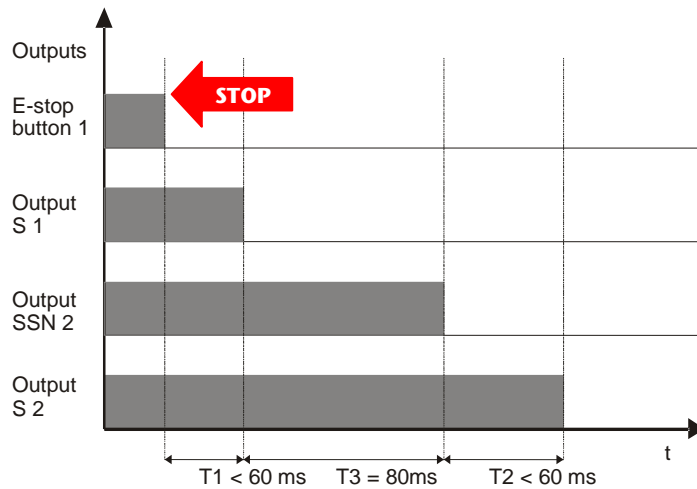


Requirements of the safety relay

The following example details the timeframes when turning off the system. In the example 2 SSN modules are located in the same zone.



The time behavior when pressing the Emergency switch on SSN1 looks as follows:



WARNING

The maximum turn-off delay of the system may not exceed 200 ms and thus the maximum turn-off time ($T1 / T2$) of the connected safety relay may not be longer than 60 ms! The SSN network has a maximum response time ($T3$) of 80ms.

The switch-off time must be chosen during the standard supply voltage.

The response time of the connected safety relay may not exceed 250 ms.

Network timing

To close the bus (token ring), a terminating plug RJ45 must be plugged into the first SSN module (NET-OUT) and the last SSN module (NET-IN) of the data string – you will need the corresponding terminating plugs which are contained in the delivery scope of the module.

System Start-Up

WARNING

The device may only be started by authorized technical personnel who are familiar with the proper start-up of safety components.

WARNING

If the SSN module does not start, based on a protective device not being reset – it must be noted that the remaining units can for a brief moment quickly (up to about 400 ms) be switched on until a STOP message is received. Only after receiving the STOP message, the connected devices are turned off again. This must be taken into account in the risk analysis! (See start-up scenario 3)

Switching the system on

1. Make sure that during start-up no individuals are at risk.
2. Before start-up, please check if all connections and the configuration of the individual SSN modules are correct.
3. Switch on the supply voltage of the individual SSN modules and applicable safety relays.

⇒ If there is no error, both LEDs R1 and R2, showing the operating state, will light up orange and both LEDs L1 and L2, showing the communication state, will be blinking red continuously.

⇒ Once the last SSN module has been switched on and no errors are apparent then each SSN module will show that communication is in operation (both LEDs L1 and L2 light up in green). Once all units have run through a self test without any errors and the network is active, then all units are in a “ready” state.

The SSN modules conduct various tests regularly (self test, network test, response test for safety relays). If one test run is unsuccessful, the unit will switch to the “error” state and is turned off. This is shown by the LEDs R1 and R2 are no longer orange (or green), but show an error code in red.

IMPORTANT

A faulty SSN unit switches only to the “ready” status once all errors have been corrected AND the supply voltage has been removed (system reboot).

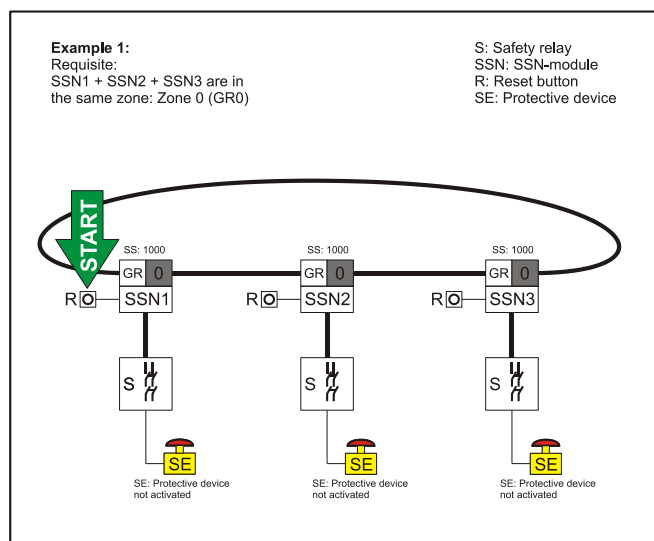
Start behavior of the system

Now the system is ready for actual operation. Press the start button (necessary only for manual start).

Start-up scenario 1

In the event, that all protective devices are set to the standard position in the zones to be started (that means all safety relays are ready to start), then the following start process is generated:

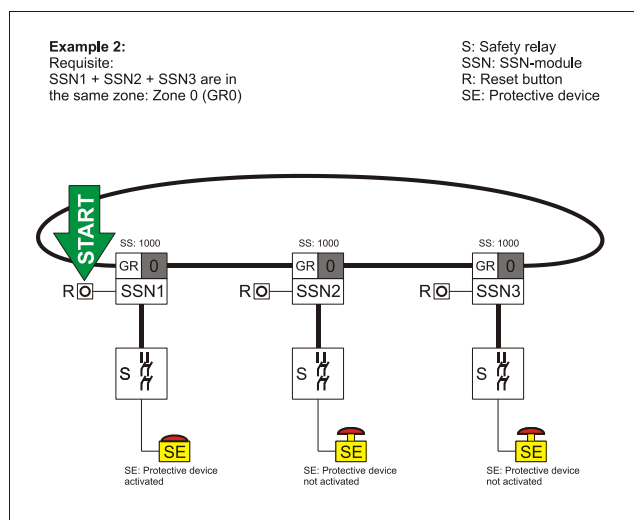
- After pressing the start button, the safety relay will attempt to start the machine partial system.
- If this can be completed successfully within 300ms, the SSN module (SSN1) will send a start signal to the zone specified in the module (here SS= "1000").
- Once SSN2 and SSN3 receive the message also these machine parts are started.



Start-up scenario 2:

In the event, that the protective device of the SSN module is not in the normal position (that the safety relay is not ready to be started), then you will receive the following start process:

- After pressing the start button, the safety relay will attempt to start the machine partial system.
- Since this is not possible, nothing happens. Therefore, no start signals are sent to other participants.



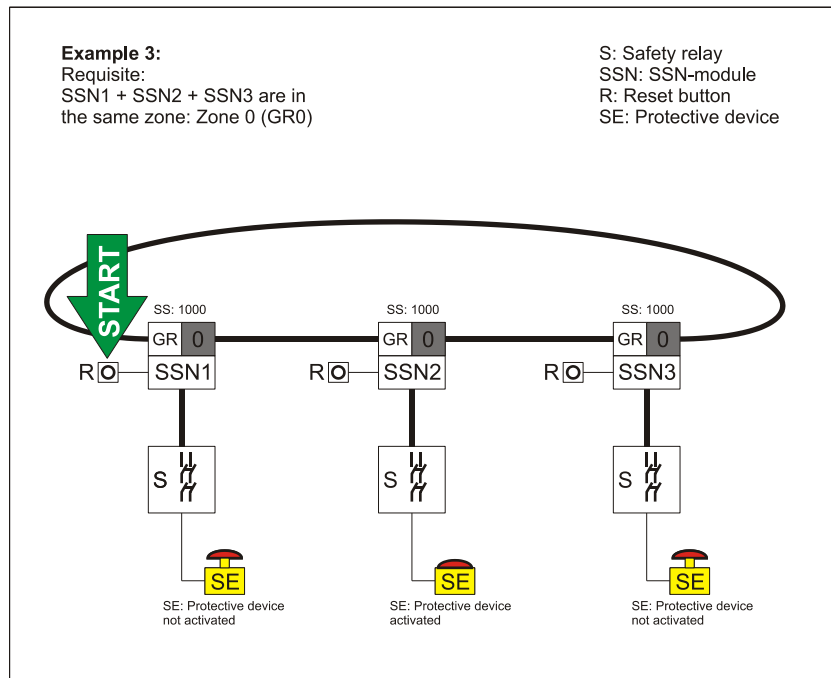
Start-up scenario 3:

In the event, that the protective device of one of the other SSN modules (e.g. SSN2) in the zone is not in the normal position (that is the safety relay is not ready to be started), then you will receive the following start process:

- After pressing the start button, the safety relay will attempt to start the machine partial system.
- If this can be completed successfully within 300ms, the SSN module (SSN1) will send a start signal to the zones specified in the module (here SS= "1000").
- If SSN2 and SSN3 receive the message then here too it is attempted to start the machine parts.

WARNING

- Since it is not possible to start SSN2, SSN2 will send a STOP message after 300ms with the next Token, whereas SSN1 and SSN3 will stop again. For the machine parts SSN1 and SSN3 it is thus possible to run for a brief moment (about 400ms) in order to stop again later. In the event this is not wanted, then SSN1 and SSN3 can be set in a manner that it does not respond to start signals (LR=1) or that SSN1 does not allow to start or stop other participants (SS = "0000").



Network and Operating Displays (LEDs)

In operation, 4 LEDs (R1, R2, L1 and L2) show the operating state and possible system errors. The LEDs R1 and L1 obtain their impulse form the micro-processor 1. The LEDs R2 and L2 obtain their impulse from micro-processor 2. The LEDs can display the following three colors: Red, green and orange.

The LEDs R1 and R2 (RUN1 & RUN2) are assigned to the SSN module and the connected safety relay as a status display.

The LEDs Link1 and Link2 (L1 & L2) are assigned to the network as a status display.

Errors are displayed by way of a blinking LED signal. The following table explains the significance of the LEDs.

LEDs R1 and R2 (operating display)

Color	Type	Description
Off	-	The device is not turned on.
Orange	Continuous light	The outputs for the safety relay are not active (=open). The SSN module is ready for a reset (operating status "ready") There are no internal system errors.
Red	Continuous light or blinking	There is an error. The error code is displayed by a number of red blinking signals.
Green	Continuous light	The connected safety relay is in a "RUN" condition (feedback loop is thus closed). There are no internal system errors.

Error overview

If an error is detected in the SSN device, then the LED R1 and R2 show an error code by blinking. The error code is equal to the number of red blinking signals between two green blinking signals. For example green-red-red-red-red-green equals the error code 4.

Error code	Description
Continuous light	CRC test error / software error
1	The impulse generator is not working properly, therefore no test impulse can be generated.
2	The safety relay (output) is closed, even though it should be opened.
3	The reset relay (output) is closed, even though it should be opened.
4	The safety relay (output) is opened, even though it should be closed.
5	The reset relay (output) is opened, even though it should be closed.
6	Network error. This error is due to wrong wiring or a defect network cable.
7	Error in the external contact monitor for the feedback path.
8	Error in the external contact monitor for the reset button.
9	Communication between the CPUs is interrupted. May originate from a software function defect in one of the CPUs.
10	Faulty setting of the DIP switch. Either the two DIP switch rows do not match or in the START/STOP group setting the group of the unit is not included (unless, all switches are deactivated = "0000").
11	The two micro processors are not in the same operating status! The cause may be a hardware or software problem. Note: If an error is registered by a μ P it will switch to the "device error" condition. The other μ P remains in the operating condition (e.g. "ready" or „running“). After a short time this μ P registers which one did not recognize the problem that the operating conditions are different. Thereafter through this μ P the error message „11“ is displayed (derived error). If a μ P shows this error notice, however, the other one deviating from this, then the error cause will be found in the latter.
12	The feedback path is blocked, even though the safety relay (output) is open.
13	Faulty master initialization. This error is due to a disconnected wire, bad wiring or a defect RJ45 plug on the network-output socket.
14	Batch overload. This indicates a software problem.

LEDs L1 and L2 (communication display)

Color	Type	Description
Off	-	The device is not turned on.
Green	Continuous light	Network ready. Data packages are transferred.
Red	Continuous light	Network crash. Network error – however data packages are being received.
Red	Blinking	Network crash. Network error – data packages are NOT being received.

IMPORTANT

During a cable failure or cable error, all communication LEDs (L1 and L2) will blink red of those SSN devices that are rear-mounted to the error source, while the remaining LEDs will light continuously!

Replacing defect SSN modules

The SSN module may be replaced in case of an error. The configuration of the defect SSN module must be noted. The same configuration is completed in the new device so that it can be connected.

WARNING

When removing safety modules during operation, there will be a loss of the safety function. Individuals may be put at risk and cause damage to the device or system. Separate the system from the power supply and protect the system for switching back on before you begin the work.

Disposal

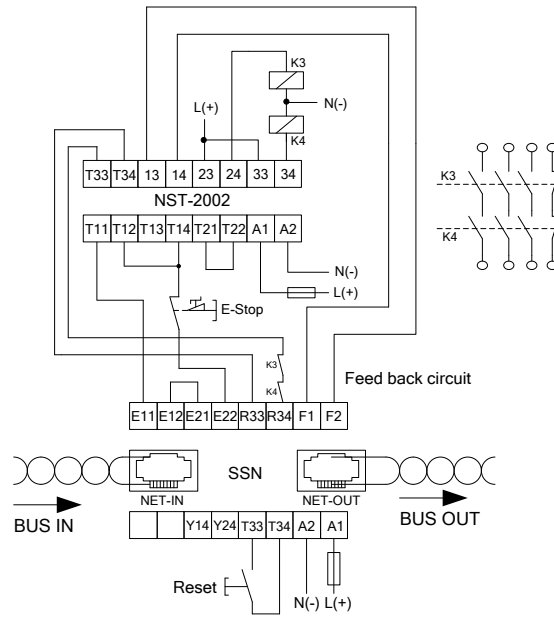
Electronic waste is hazardous waste! Please observe the local rules for disposing these products.

The SSN unit does not contain any batteries that need to be removed before disposing of the product. The SSN unit meets the requirements of the RoHS guideline!

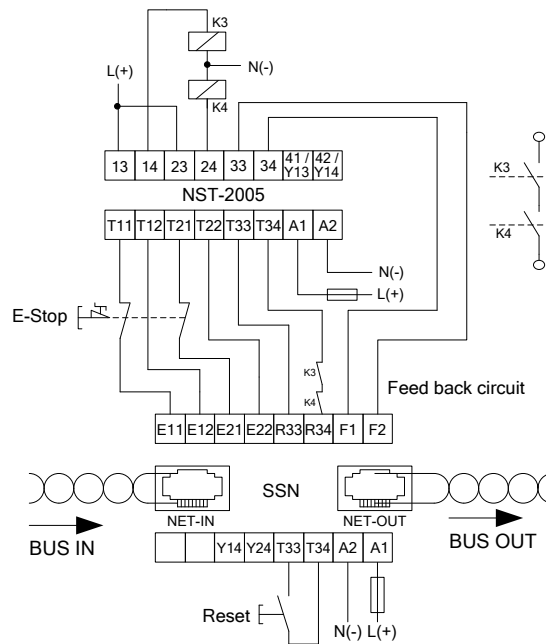
Duelco is a member of the Danish WEEE Disposal Organization “el-retur” – Duelco’s products are developed and manufactured according to the health, safety and environmental aspects including compliance with the WEEE guidelines.

Connection Examples

Emergency Stop 1 channel

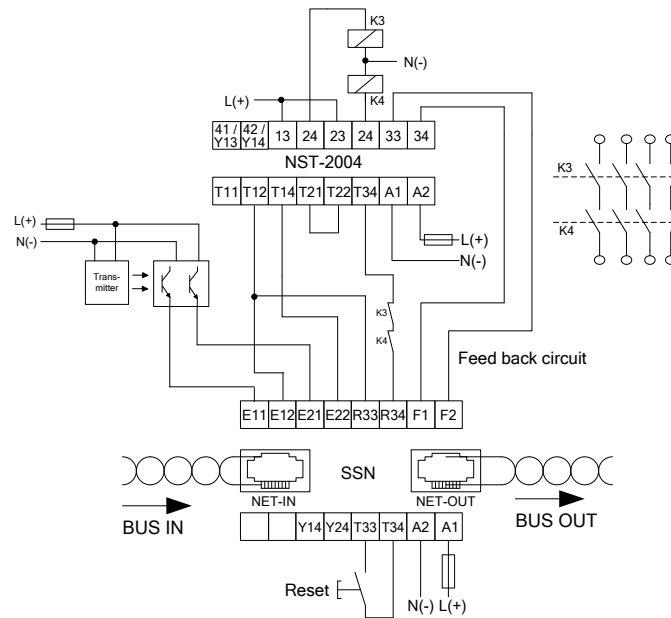


Emergency Stop 2 channel



Safety light barrier

The outputs (output signal switching devices – OSSD for short) of the non-contact protective device must be guided via the SSN control contacts E11/E12 and E21/E22 to the safety relay. Only OSSDs with “high side switch” may be used (i.e: Outputs are switched to +24VDC).



Specifications

Technical data

Input	
Nominal tension UN	24V DC \pm 10%
Tension range at max. 5% residual ripple	0,85 ... 1.15 UN
Nominal use	< 100 mA (semi-conductor outputs no load)
Power input	< 2.4 VA for UN
Control voltage above T33/T34 & F1/F2	DC 23 V for UN
Control circuit above T33/T34 & F1/F2	Each 12mA for UN
Peak switch-on power	< 2.2A within 4 ms
Static current	< 100 mA for UN
Minimum voltage on clips A1 (+)/A2(-) Minimum necessary holding level of the activated status	> 12.0 VDC
Protecting the device	T 500 mA
Max. cable resistance	F1-F2 : < 150 Ω T33-T34 : < 150 Ω
Output (*)	
Contact assembly	3 x NO
Breaking capacity according to EN 60947-5-1, R33-R34, E11-E12, E21-E22	AC1: 250 V / 2 Amp / 500 VA (0,4 x 105 switching cycle) DC1: 2 Amp / 24 VDC / 48 W
Mechanical life (number of activations)	> 10 million
Semi-conductor outputs	
Transistor outputs: Y14 , Y24	2 NPN (24 V DC Aus. Max. 20 mA) not short-circuit resistant.
Network	
Number of units per network	Max. 25 units
Cable length between units	< 300 m
Network connection	RJ45 cable with category 5e UTP
Communication bus	RS 485 baud rate at 0.5 MB/s
SSN system response time	> 85 mS
Response times	
Min. response time at nominal load	> 50 mS
Delay of start-up (configuration time)	< 1.5 s
Switch-off delay during Emergency (Ub = 24 VDC)	< 80 mS
Switch-off delay during network failure (Ub)	< 130 mS
Restart time	> 150 mS
Requirement for monitored relay	
Max. response time	< 250 mS
Max. switch-off time	< 60 mS
Miscellaneous	
Insulation level according to UL 840	2
Contamination level	2
Temperature, running / storage	0 - 50°C / -30 - 70 °C
Relative humidity for running and storage	10% to 95%, no condensation
Insulation class	4kV/2, VDE 0110-1 / -2
EMC requirements	EN 61000-6-3 and EN 61000-6-2

***) WARNING**

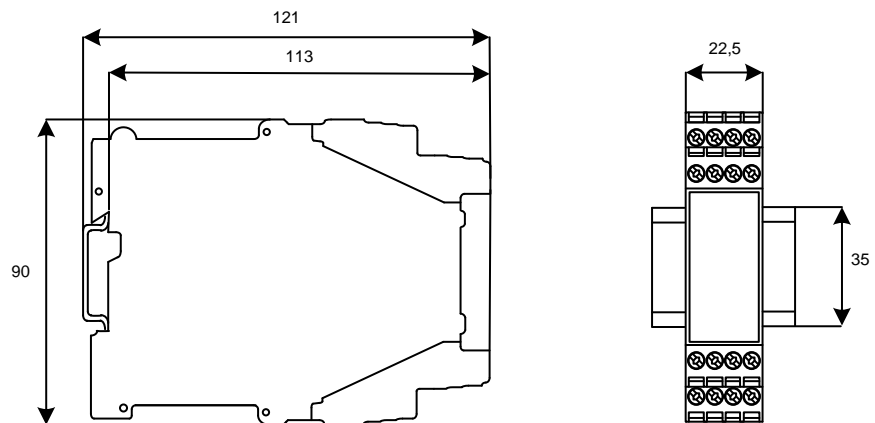
The potential free relays contacts on SSN-2001 are NOT safety relay outputs (E11/E12), (E21/E22), (R33/R34). The relay contacts may NOT be connected to the load circuit!

Enclosure

Mechanical	
Dimensions, WxHxD (mm)	22.5 x 90 x 118
Weight:	~ 170 g
Protective type, enclosure / clamps	IP40 / IP20
Enclosure material	Polyamide PA 6.6
Installation	Switch cabinet installation: Min. IP54
Installation, DIN standard track / screw fastening	DIN EN 50022-35 / M4 (2 pieces)
Min. / max. connection diameter	0.5 mm ² / 1 x 4 mm ² massive or 1 x 2,5 mm ² strand with sleeve and plastic flange.
Conductor type	Copper conductor. Temperature classification 60 / 75°C
Torque for terminal clips (screws)	< 1 Nm

Scale drawing

Enclosure with pluggable screw clamps



Recommended minimum empty air clearance around the SSN module:

Top: 15 mm

Below: 15 mm

Between the devices: 2-3 mm distance. Recommendation for surrounding temperatures greater than + 40° C / +104°F.

Installation

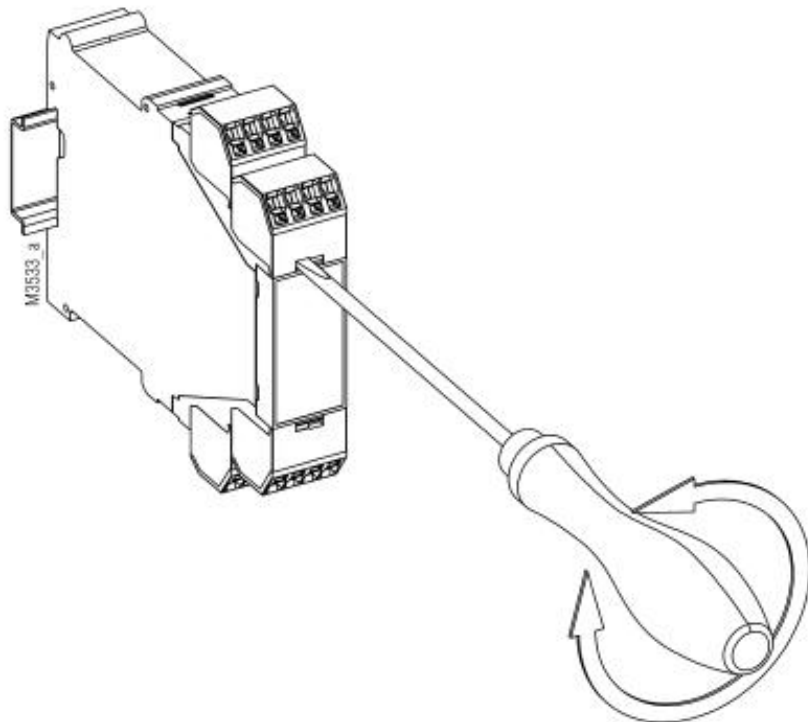
IMPORTANT

Install the SSN device in a switch cabinet equipped with a protective type of at least IP54.




- Make sure that the device is dead when you are working on the device.
- Attach the device, with help from the snap element, to the back of a standard rail (DIN 35 mm).
- Secure the device on a vertical standard rail (35 mm) using a holding element (e.g. terminal holder of final angle)
- For disassembly of the SSN module, loosen the snap element using a screwdriver and tilt the SSN module up as of the DIN rail.

Disassembly of the plug-in terminal blocks (plugs)**CAUTION**

- Power off the device.
- Push the screwdriver into the front side opening between the plug and front plate.
- Turn the screwdriver around its axis.
- Please note that the terminal blocks can only be installed on the respective slot.



Conformity Declaration

 EG-Konformitätserklärung EC-Declaration of Conformity		
Wir We	Duelco A/S, Mommarkvej 5, DK-6400 Sønderborg, Denmark	
erklären in alleiniger Verantwortung, dass das Produkt declare under our sole responsibility that the product		
SSN-Einheit	SSN	Kommunikationsmodul Communication module
Sicherheitsbauteil nach EG-Richtlinie 98/37/EG, Artikel 1 Abs. 2 Safety component according to EC guideline 98/37 EC, article 1 par 2		
auf das sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder normativen Dokument(en) übereinstimmt. to which this declaration relates is in conformity with the following standard(s) or other normative document(s).		
EN 60204-1:12.2006; EN 61000-6-2:2005; EN 61000-6-4:2002; EN ISO 13849-1:2006; EN ISO 13849-2:2003; EN 62061:2005		
Das bezeichnete Produkt entspricht den folgenden europäischen Richtlinien: The described product corresponds to the following European Directives:		
2006/95/EG Niederspannungsrichtlinie /EEC Low voltage directive 2004/108/EG EWG EMV-Richtlinie /EEC EMC directive 98/37 EG-Maschinenrichtlinie /EC EMD directive		
Die Übereinstimmung eines Baumusters des bezeichneten Produkts mit der Richtlinien Nr.: Consistency of a production sample with the marked product in accordance with the Directives No:		
98/37/EG-Maschinenrichtlinie /EC MD directive wurde bescheinigt durch:		
Notifizierte Stelle/ Anschrift:		
Notified agency/Address:	FACHAUSSCHUSS "ELEKTROTECHNIK" PRÜF-UND ZERTIFIZIERUNGSSTELLE IM BG-PRÜFZERT Gustav-Heinemann-Ufer 130 D-50968 Köln Notified Body Number : 0340	
Nummer der Bescheinigung: XXXXX Certification number:	Ausstelldatum: 10.01.2007 Date of issue:	
Das bezeichnete Produkt stimmt mit dem geprüften Baumuster überein. The marked product is consistent with the examined production sample.		
Sønderborg		
24. Januar 2007 (Ort und Datum der Ausstellung/Place and date of issue)	Teidt Due Geschäftsführer/Managing Director (Name und Unterschrift /name and signature)	

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