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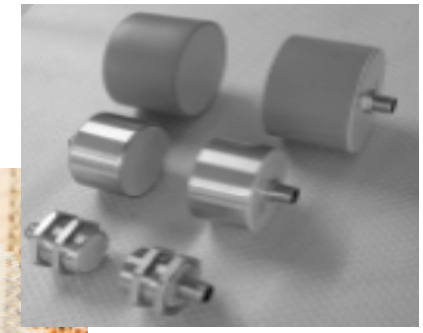

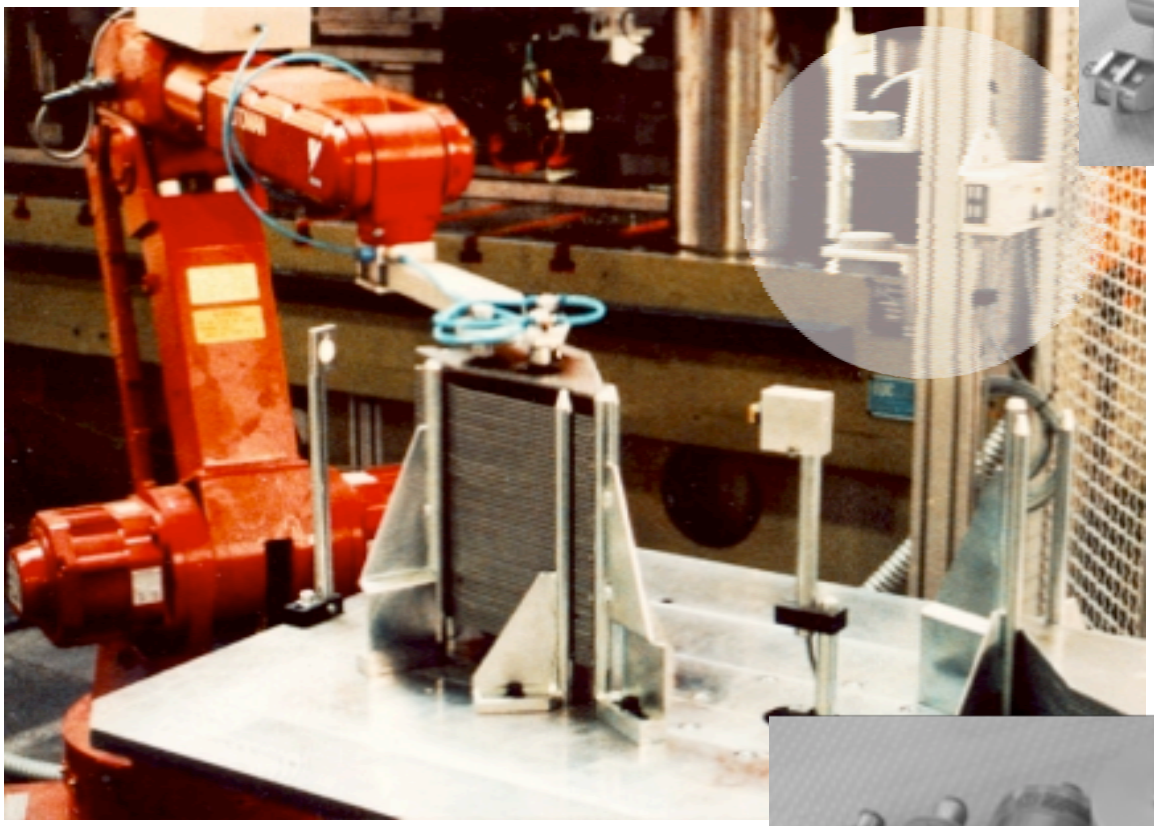

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Double Sheet Sensors monitor the sheet separation on automatic metal sheet- destackers, - robots, -feeders, -handling equipment etc.

Abb.1

These sensors are useful for low price and simply double sheet monitoring as all functions are integrated in the sensors. No additional, external amplifiers controllers or switching boxes are necessary. The sensors are for 24 VDC supply designed. We deliver digital sensors with 2 transistor switchess with teach -in programmable sheet thickness limits and also analog sensors with sheet thickness relatet analog voltage outputs from 0 - 10 VDC. These analog sensor may be used in connection with PLCs or IPC controllers that have 0- 10 VDC sensor inputs. In this configuration the PLC / IPC many be programmed according the the sheet working machines / process features as simple double sheet detector with one ore more fixed or adjustable local (operator- panel) or remoted thickness limits , as sheet thickness comparator, thickness limit switch and so on.The sensors are connected via a M 12 x 1 male connector for 24 VDC supply , the 2 digital outputs or the 0- 10 VDC analog voltage output. There are single sided, sheet touching sensors for magnetic and non magnetic (stainless-) steel sheets as well as both sided, touch less sensors for magnetic- , non- magnetic-, aluminum and other non-ferrous metal sheets available.

Fig. 1. shows an example for a single side sensor fixed closed to a vacuum gripper of a sheet destacker to watch these stages: Vacuum gripper / sensor on top of stack: Stack present / last sheet on stack / no sheet on stack anymore ? Vacuum gripper / sensor lift off from stack: No sheet -/ single sheet- / double sheet picked up ? During sheet feed: Sheet still present / sheet lost ? Sheet target: Sheet successful placed / released ?

Safety- information: The double sheet detector sensor output contact is often used for stopping sheet transfers or sheet working machines. After removing the (double) sheets from the sensor(s) the sensor output switches back in the no sheet / one sheet position. The control circuit must work so that the transfers / machines do not restart automatically to avoid dangerous situations.

Sensor arrangements:

Fig.2 Sensor position singlesided sensor related to the sheet edges.

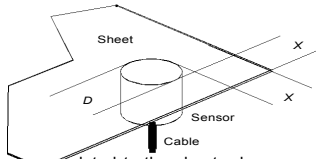
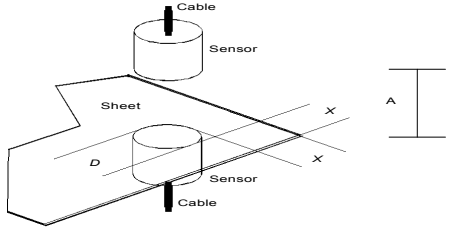


Fig.3 Sensor position bothsided sensors related to the sheet edges.
Keep X constant if X is smaller than the sensors diameter D.



Sensor connection

Fig.4 Connection example for digital sensors with sheet thickness teach-in programming on a PLC

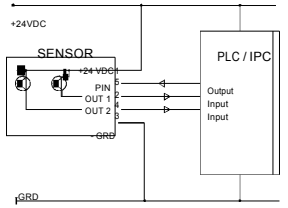
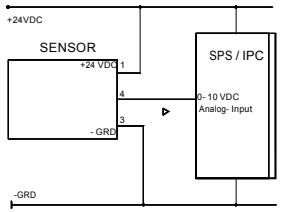


Fig.5 Connection example for analog sensors with 0- 10 VDC output on a PLC with 0- 10 VDC analog input.



1. Digital sensors with transistor switch output

Sheet material *1)	Steel (magnetic, ferritic)						Stainless steel (non- magnetic, austenitic)		
Sheet monitoring	singlesided, sheet touching			bothsided, touchless			singlesided, sheet touching		bothsided, touchless
Single sheet thickness (mm)	1	2	3	0,8	1,5	3	1,5	3	3
Sensor- Type *2)	S 1.0P3S	S 2.0P3S	S 3.0P3S	SIZ 30PSS+ SIZ 30P3SE	SIZ 54PSS+SIZ 54P3S	SIZ 75PSS+SIZ 75P3SE	SIE 1.5P3S	SIE 3.0P3S	SIE 30RSS+SIZ30P3SE
Datas page	4			5			6		7
Sensor- fig.									

2. Analog sensors with 0 - 10 VDC analog voltage output

Sheet material *1)	Steel (magnetic, ferritic)							Stainless steel (non- magnetic, austenitic)		
Sheet monitoring	singlesided, sheet touching				bothsided, touchless			singlesided, sheet touching		bothsided, touchless
Einfach- Blechdicke max.(mm)	0,5	1	2	3	0,8	2	3,0	1,5	3	3
Sensor- Type *2)	S 0.5AS	S 1.0AS	S 2.0AS	S 3.0AS	SIZ 30PPS+ SIZ 30AS	SIZ 54PSS+SIZ 54AS	SIZ 75PSS+SIZ 75AS	SIE 2.0AS	SIE 4.0AS	SIE 30RSS+SIZ30AS
Datas page	8				9			10		11
Sensor- fig.										

*1) Please inquire for other sheet materials. *2) Many other sensors- types avialable, please ask.

Types S 1.0P3S, S 2.0P3S, S 3.0P3S,

Fig. 1

Application These double sheet sensors are for monitoring automatic sheet de stacking processes for double or multiple magnetic steel sheets. The sensor is mounted so that the monitored sheets passes the magnetic front side of the sensor by touching the sheet from one side (Fig. 1). Sheet monitoring is possible both, on moving and also on not moving sheets. There is no distance (air gap) allowed between sheet and sensor and also not between double/ multiple sheets . Small distances / air gaps (in the order of a few 1/10 mm) may be tolerated if they remain constant and if they are also present during the single sheet thickness programming. These distances / air gaps however reduces the max. sheet thickness the sensor can monitor. The sensors have 2 short circuit protected complementary transistor output that switches according to Fig. 2. This both outputs OUT 1 and OUT 2 allow no sheet / one sheet and also one sheet / double/ multiple sheet discrimination with the advantage of sensor checking with each sheet loading cycle and also need no additional proximity switch to check the presence/ absence of a monitored sheet. The sensors output conditions are also indicated on a 2 color duo- LED on the sensors connector output side according to fig. 2. The sensor has to be programmed once with a single sheet .(Teach-in system) after installation and wiring. For this a single sheet must set flat and closed to the active front side of the sensor and a single short (min. 50 msec.) High- pulse (= + 24 VDC) have to be connected to the sensors program input PIN (connector pin no. 5). After programming the PIN input must go to and held on Low signal . The programmed single - sheet value is permanently stored in a nonvolatile store (EEPROM) and remains valid also after sensor di- connection or power off. Programming (teach-in) with a single sheet can be made after installation once, if only one and the same sheet thickness is used or again and again with different sheet thick nesses , also during machine operation whenever the sheet thickness changes (EEPROM programming live time min. 100 000 cycles). The short circuit protected switch outputs OUT 1 and OUT 2 are PNP transistor (high side switches).

Mounting

The sensors are polyurethane capsulated in a flat, cylindrical stainless steel tube and may fixed by clamps or in mounting holes with blocking screws. It is important that the sensors are fixed so in the sheet feed way that every sheet passes the sensor touching the active side of the sensor flat, close and so that the active area of the sensor is full covered. The sensor can be fixed in any kind of material, also in steel. The sensor cable length should not be longer than 20 m (also dependent on the PLC / IPC input specifications).

Important: If the machine is stopped from the double sheet sensor in the case of double sheets , the sensors outputs will switch back in no sheet / single sheet conditions as soon as the double sheets are removed from the sensor. Make sure that this behavior do not restart the machine /- motors/ -movements etc. to avoid dangerous situations / risks of injuries or damages. **I**

Fig.2 Output relations

Sensor conditions	Out 1(Stift2)	Out 2 (Stift4)	LED
No sheet	H	H	Green (flash)
One sheet	H	L	Green
Doubble sheet	L	H	Red

Fig. 3 Sensor / sheet arrangement

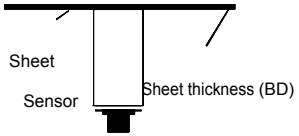


Fig. 4 Sensor dimensions

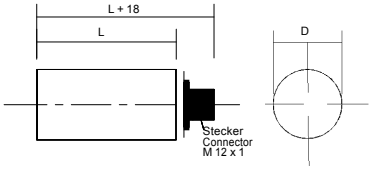


Fig. 5 Sensor connection

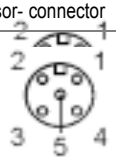
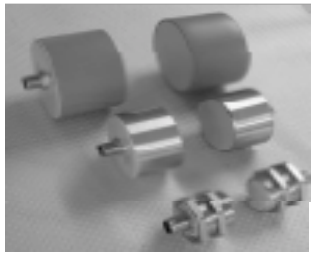
Sensor- connector	Name	Pin- no.:	Wire colour
	+ 24VDC	1	Brown
	Output OUT 1	2	White
	GRD -	3	Blue
	Output OUT 2	4	Black
	Programming PIN	5	Grey

Fig. 6 Techn. spezifications

Sensor type	S 1.0P3S	S 2.0P3S	S 3.0P3S
Max. sheet thickness	1 mm	2 mm	3 mm
Sensor diameter D (mm)	28	43	54
Sensor length L (mm)	55	70	75
Adhes. force max. (N)*)1	80	200	350
Power supply	24 VDC +/-10% app. 30 mA		
Switch outputs	24 VDC, max. 200 mA, overload protected, PNP transistors, High Side Switch		
Switch time (msec.)	100		
Temperature	0 - 50 grd. C		
Protection	IP 63		
Programminpt PIN:	H- Level = 24 VDC +/-10% min. 50 msec. Ri: app. 20 kOhm		

*)1 Adhesive force (N) = max. force that is necessary to pull the sheet in axial direction away from the Sensors magnetic surface. Max. Value for full sensor magnetfield saturation with a sheet with max. Sheet thickness. For thinner sheet the force is lower.

	Transmitter sensor	SIZ 30PSS	SIZ 54PSS	SIZ 75PSS
Fig. 1	Receiver sensor	SIZ 30P3SE	SIZ 54P3SE	SIZ 75P3SE



Application

These Double Sheet Sensors are designed for detection layers of thin gauge steel- and/ or aluminum other non- ferrous sheets up to high transportation speeds. They consists of two sensors, the transmitter-sensor and the receiver sensor that are fitted to oppose each other in perfect alignment. The sheet to be checked is passed through the gap A (see fig .1) between the sensors without touching the sensors. The recommended distance is shown in Fig. 6. Also other sensor-distances A are possible: Higher distances of A allow lower sheet thick nesses and vice versa. Sheet monitoring is possible both, on moving and also on not moving sheets. The receiver sensor has 2 short circuit protected comple-mentary transistor outputs that switches according to Fig .2. These both outputs OUT 1 and OUT 2 allow no sheet / one sheet and also one sheet / double / multiple discrimination with the advan-tage of automatic sensor checking with each detected sheet. The sensors output conditions are also indicated on a two color duo- LED on the receiver sensors connector output side. The receiver sensor have to be programmed once with a single sheet (teach-in system) between the sensors after installation and wiring. For this a single sheet must put between both sensors and a single high- pulse of at least 50 msec. have to connected on input PIN (pin no .5) of the receiver sensor connector. After programming the PIN input must go to low and also remain on low signal till new teach-in calibration. The programmed single sheet thickness value is permanently stored in the non-volatile EEPROM of the sensor and remains valid also after sensor disconnection or power- off. Programming (teach-in) with a single sheet can be made after installation once, if only one and the same sheet thickness is used, or again and again when sheet thickness changes during machine operation. (EEPROM life time min. 100 000 cycles). The short circuit protected NPN transistor- out-puts are high switches. The transmitter sensor has a 4 pin male M12 connector where only 2 pins are used for the 24 VDC supply voltage; the receiver sensor has a 5 pin mal M12 connector for wiring according to fig. 4. The receiver- and the transmitter- sensors have the same dimensions. Sensors SIZ 30PSS and SIZ 30P3SE are made from nickel plated bras thread tubes M 30 x 1,5 that can be fixed M 30 nuts also delivered with the sensors. Sensors SIZ 54PSSE and SIZ 54P3Se are made from stainless steel tube with PVC ends and sensors SIZ 75PSS and SIZ 75P3SE are made from PVC only.

Mounting

Mount the sensors in alignment to each other so that the sheet can pass in the middle of both sen-sors without touching them. Recommended distance A between the sensors is 35 +/- 5mm. Make sure that the sheets do not flutter / wave between the sensors during transportation (if necessary, please use guide roller, guiding pulley or similar).

Sheet thickness programming (Teach-in)

Connect the sensors according fig .4 , switch on power supply. Put / drive a single sheet between both sensors in the same position as during production conditions. Switch for at least 50 msec. H-level (= +24 VDC) on the receiver sensor input PIN pin 5 . The green LED on the receiver sensor comes on . If the green LED comes not on during programming , reduce distance A between the sensors and try programming again. Simulate double sheets with 2 sheets close to each other and watch the receivers LED for proper function according to table on fig .2. If different sheet thick nesses and / or sheet materials shall be monitored , please check proper function of the sensors.

Fig.2 Output relations

Sensor conditions	Out 1(Stift2)	Out 2 (Stift4)	LED
No sheet	H	H	Green (flash)
One sheet	H	L	Green
Doubble sheet	L	H	Red

Fig. 3 Sensor / sheet arrangement

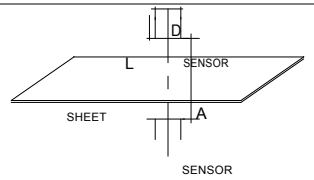


Fig. 4 Sensor dimensions

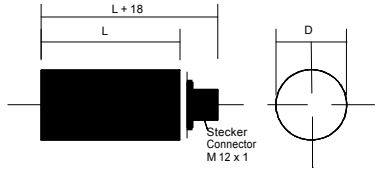


Fig. 5 Sensor connection

Transmitter sensor				Receiver sensor			
Connector	Name	Pin-no.	Wire color	Connector	Name	Pin-no.	Wire color
	+ 24VDC	1	Brown		+ 24VDC	1	Brown
	N.C.	2			OUT 1	2	White
	GRD -	3	Blue		GRD -	3	Blue
	N.C.	4			OUT 2	4	Black
N.C. = Not connected					PIN	5	Grey

Abb. 6 Techn. specifications

Sensors - type:	Transmitter	Receiver	Transmitter	Receiver	Transmitter	Receiver
	SIZ 30PSS	SIZ 30P3SE	SIZ 54PSS	SIZ 54P3SE	SIZ 75PSS	SIZ 75P3SE
Max. Sheet thick-	0,6 (A= 35 mm)		1,5 (A= 40 mm)		3 (A= 50 mm)	
Sensor diameter D	M 30 mm		54 mm		75 mm	
Sensor length L mm)	25 mm		36 mm		50 mm	
Power supply	24 VDC +/-10% app. 100 mA				24 VDC +/-10%	
Trans. outputs	24 VDC, max. 200 mA short circuit protected, PNP transistors, High Side Switch					
Switching time	20 msec.		100 msec.		500 msec.	
Temperature	0 - 50 grd. C					
Protection	IP 63					
Programm input PIN	H- Level = 24 VDC +/- 10% min. 50 msec. Ri: app. 20 kOhm					

Fig. 1 Types SIE 1.50P3S, SIE 3.0P3S

Application

These double sheet sensors are for monitoring automatic sheet de stacking processes for double or multiple non- magnetic (stainless-) steel sheets. The sensor is mounted so that the monitored sheets passes the active front side of the sensor by touching the sheet from one side (Fig. 1). Sheet monitoring is possible both, on moving and also on not moving sheets. There is no distance (air gap) allowed between sheet and sensor and also not between double/ multiple sheets . Small distances / air gaps (in the order of a few 1/10 mm) may be tolerated if they remain constant and if they are also present during the single sheet thickness programming. These distances / air gaps however reduces the max. sheet thickness the sensor can monitor. The sensors have 2 short circuit protected complementary transistor output that switches according to Fig. 2. This both outputs OUT 1 and OUT 2 allow no sheet / one sheet and also one sheet / double/ multiple sheet discrimination with the advantage of sensor checking with each sheet loading cycle and also need no additional proximity switch to check the presence/ absence of a monitored sheet. The sensors output conditions are also indicated on a 2 color duo- LED on the sensors connector output side according to fig. 2. The sensor has to be programmed once with a single sheet .(Teach-in system) after installation and wiring. For this a single sheet must set flat and closed to the active front side of the sensor and a single short (min. 50 msec.) High- pulse (= + 24 VDC) have to be connected to the sensors program input PIN (connector pin no. 5). After programming the PIN input must go to and held on Low signal . The programmed single - sheet value is permanently stored in a nonvolatile store (EEPROM) and remains valid also after sensor di- connection or power off. Programming (teach-in) with a single sheet can be made after installation once, if only one and the same sheet thickness is used or again and again with different sheet thick nesses , also during machine operation whenever the sheet thickness changes (EEPROM programming live time min. 100 000 cycles). The short circuit protected switch outputs OUT 1 and OUT 2 are NPN transistor - outputs (high side switches).

Mounting

The sensors are polyurethane capsulated in a flat, cylindrical stainless steel tube and may fixed by clamps or in mounting holes with blocking screws. It is important that the sensors are fixed so in the sheet feed way that every sheet passes the sensor touching the active side of the sensor flat, close and so that the active area of the sensor is full covered. The sensor can be fixed in any kind of material, also in steel. The sensor cable length should not be longer than 20 m (also dependent on the PLC / IPC input specifications).

Important: If the machine is stopped from the double sheet sensor in the case of double sheets , the sensors outputs will switch back in no sheet / single sheet conditions as soon as the double sheets are removed from the sensor. Make sure that this behavior do not restart the machine /- motors/ -movements etc. to avoid dangerous situations / risks of injuries or damages.

Fig.2 Output relations

Sensor conditions	Out 1(Stift2)	Out 2 (Stift4)	LED
No sheet	H	H	Green (flash)
One sheet	H	L	Green
Doubble sheet	L	H	Red

Fig. 3 Sensor / sheet arrangement

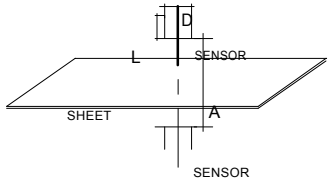


Fig. 4 Sensor dimensions

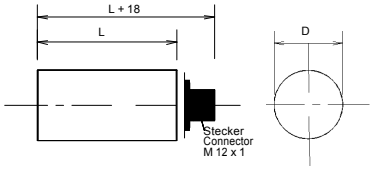


Fig. 5 Sensor connection

Sensor- connector	Name	Pin- no.:	Wire colour
	+ 24VDC	1	Brown
	Output OUT 1	2	White
	GRD -	3	Blue
	Output OUT 2	4	Black
	Programming PIN	5	Grey

Transmitter- Sensor: SIE 30RSS, Receiver- Sensor: SIZ 30P3SE

Fig. 1

Application

These Double Sheet Sensors are designed for detection layers of non- magnetic (stainless-) steel ferrous sheets up to high transportation speeds. They consists of two sensors, the transmitter- sensor and the receiver- sensor that are fitted to oppose each other in perfect alignment. The sheet to be checked is passed through the gap A (see fig .1) between the sensors without touching the sensors. The recommended distance is 35 +/. 5 mm for single sheets up to 3 mm thickness. Also other sensor- distances A are possible: Higher distances of A allow lower sheet thick nesses and vice versa. Sheet monitoring is possible both, on moving and also on not moving sheets. The receiver sensor has 2 short circuit protected complementary transistor outputs that switches according to Fig .2. These both outputs OUT 1 and OUT 2 allow no sheet / one sheet and also one sheet / double / multiple discrimination with the advantage of automatic sensor checking with each detected sheet. The sensors output conditions are also indicated on a two color duo- LED on the receiver sensors connector output side. The receiver sensor have to be programmed once with a single sheet (teach-in system) between the sensors after installation and wiring. For this a single sheet must put between both sensors and a single high- pulse of at least 50 msec. have to connected on input PIN (pin no .5) of the receiver sensor connector. After programming the PIN input must go to low and also remain on low signal till new teach-in calibration. The programmed single sheet thickness value is permanently stored in the nonvolatile EEPROM of the sensor and remains valid also after sensor disconnection or power- off. Programming (teach-in) with a single sheet can be made after installation once, if only one and the same sheet thickness is used, or again and again when sheet thickness changes during machine operation. (EEPROM life time min. 100 000 cycles). The short circuit protected complementary NPN transistor- outputs are high side switches. The transmitter sensor has a 4 pin male M12 connector where only 2 pins are used for the 24 VDC supply voltage; the receiver sensor has a 5 pin mal M12 connector for wiring according to fig. 4. The receiver- and the transmitter- sensors have the same dimensions. The sensors are made from nickel plated bras thread tubes M 30 x 1,5 that can be fixed M 30 nuts also delivered with the sensors.

Mounting

Mount the sensors in alignment to each other so that the sheet can pass in the middle of both sensors without touching them. Recommended distance A between the sensors is 35 +/- 5 mm. Make sure that the sheets do not flutter / wave between the sensors during transportation (if necessary, please use guide roller, guiding pulley or similar).

Sheet thickness programming (Teach-in)

Connect the sensors according fig .4 , switch on power supply. Put / drive a single sheet between both sensors in the same position as during production conditions. Switch for at least 50 msec. H- level (= +24 VDC) on the receiver sensor input PIN pin 5 . The green LED on the receiver sensor comes on . If the green LED comes not on during programming , reduce distance A between the sensors and try programming again. Simulate double sheets with 2 sheets close to each other and watch the receivers LED for proper function according to table on fig .2. If different sheet thick nesses and / or sheet materials shall be monitored , please check proper function of the sensors with min. and max. sheet thick nesses that are used after installation.

Fig.2 Output relations

Sensor conditions	Out 1(Stift2)	Out 2 (Stift4)	LED
No sheet	H	H	Green (flash)
One sheet	H	L	Green
Doubble sheet	L	H	Red

Fig. 3 Sensor / sheet arrangement

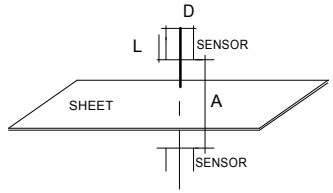


Fig. 4 Sensor dimensions (Transmitter- and receiver- sensor have the same dimensions)

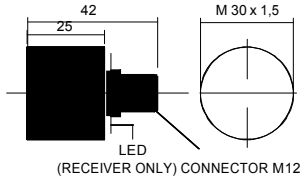


Fig. 5 Sensor connection

Transmitter sensor SIE 30RSS				Receiver sensor SIZ 30P3SE			
Connector	Name	Pin-no.	Wire color	Connector	Name	Pin-no.	Wire color
	+ 24VDC	1	Brown		+ 24VDC	1	Brown
	N.C.	2			OUT 1	2	White
	GRD -	3	Blue		GRD -	3	Blue
	N.C.	4			OUT 2	4	Black
N.C. = Not connected					PIN	5	Grey

Fig. 6 Techn. specifications

Power supply	24 VDC +/- 10% ca. 50 mA
Trans. ts	24VDC, max. 200mA, short circuit protected,PNP Transist., High Side Switch
Switching time	50 msec.
Temperature	0- 50 grd.C
Protection	IP 65
Programm input PIN	H-Level = 24V +/- 10% min. 50 msec. Ri: app. 20 kOhm

Type S 0.5AS, S 1.0AS ,S 2.0AS, S 3.0AS

Fig. 1

Application

These double sheet/ sheet thickness sensors supply a sheet thickness co- related output voltage from 0(1) to 10 VDC. The measuring amplifier is integrated into the sensor therefore no external amplifier or switching box is necessary. The 24 V DC power supply and the output voltage are connected to a 3 pin M12 x 1 connector and may used for many double/ sheet thickness monitoring applications. The analog voltage output of 0 (1) - 10 VDC from the sensors in connection with a PLC / IPC or other controllers that have 0 - 10 VDC inputs, allow a lot of high flexible, sophisticated and low price sheet thickness/ double sheet monitoring applications by programming these controllers. For example double sheet monitoring with one or more local or remoted thickness limits, sheet thickness comparators, sheet thickness limit calibration by teach- in and more. The sensors are built into rugged stainless- steel tubes. The monitored sheet has to touch the active front side of the sensor flat without any air gap. The sensors calculate the sheet thickness from the magnetic conductivity of the sheet for this a permanent magnet in the sensor is used. That magnet attracts the monitored sheet automatically to the sensors active front side. Fig. 2 shows the characteristic of the sensors. On low sheet thicknesses the characteristics are nearly linear and tend to saturation on higher sheet thicknesses. If the sheet thickness of the monitored sheet is near the upper limit of the characteristic using the next higher sensor type is recommended. The outputvolatge is app. 1 V without a sheet on the active side of the sensor. These 1V output may be used to monitor the sensor connection cable against cable interrupts or cable short circuits. (fail save monitoring).

Mounting

The sensors are polyurethane capsulated in a flat, cylindrical stainles steel tube and may fixed by clamps or in mounting holes with blocking screws. It is important that the sensors are fixed so in the sheet feed way that every sheet passes the sensor touching the active side of the sensor flat, closed and so that the active area of the sensor is full covered. The sensor can be fixed in any kind of material also in steel. The sensor must be connected over the 3 - pin M12 x1 connector. On request we also delivery sensor- cables with singlesided connector and open wires on the other cable side. Type SKS305 = 5m long, Type SKS310 = 10m long. The sensor- cabel should be not longer than 20 m (also depended on the PLC / IPC input specifications).

sheets from the sensor(s) the output contact switches back in the no sheet / 1 sheet position. The control circuit must work so that the transfers / machines do not restart automatically to avoid dangerous situations

Important: If the machine is stopped from the double sheet sensor in the case of double sheets , the sensors outputs will switch back in no sheet / single sheet conditions as soon as the double sheets are removed from the sensor. Make sure that this behavior do not restart the machine /- motors/ -movements

Fig. . 2 Sensor connection

Connector	Name	Pin- no.	Wire colour
	+ 24VDC	1	Brown
	N.C.	2	
	GRD -	3	Blue
	Output-	4	Black

Fig. 3 Sensor- characterristics Ua = f (BD) , Ua= Output voltage (V) , BD = Sheet thickness (mm)

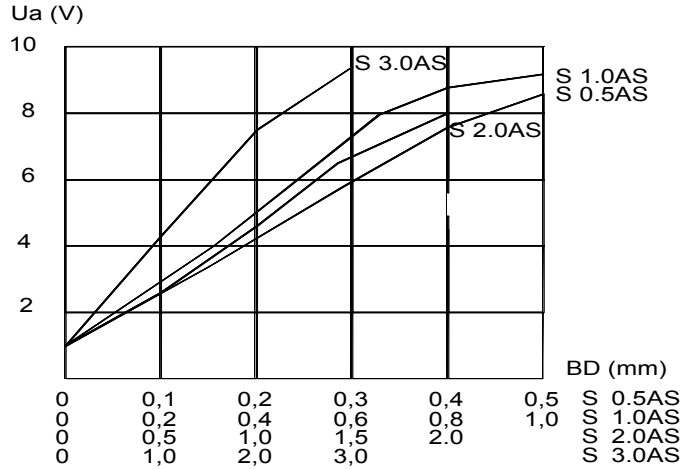


Fig. 4 Sensor / sheet arrangement

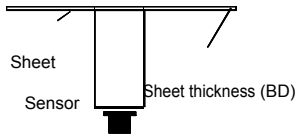


Fig. 5 Sensor dimensions

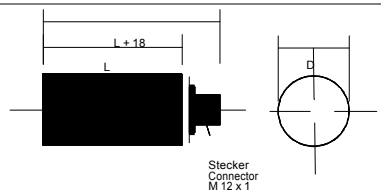
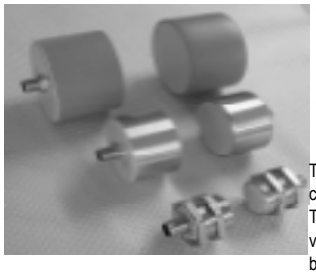


Fig. 6 Techn. spezifications

Sensor- Type	S 0.5AS	S 1.0AS	S 2.0AS	S 3.0AS
Max. Sheet thickness BD	0,5mm	1,0mm	2,0mm	3,0mm
Diameter D (mm)	18	28	43	54
Length L (mm)	45	55	70	75
Adhesiv. force max (N) *)1	15	80	250	300
Output voltage Ua (V)	0(1) - 10 V short circuit protected			
Power supply	24 VDC +/- 10% app. 30 mA			
Impedance Ri. (Ohm)	200			
Rise time Ua (msec)	> 0,5			
Temperature	0 - 50 grd.C			
Protection	IP 63			

*)1 Adhesive force (N) = max. force that is necessary to pull the sheet in axial direction away from the Sensors magnetic surface. Max. Value for full sensor magnetfield saturation with a sheet with max. sheet thickness. For thinner sheet the force is lower.

	Transmitter sensor	SIZ 30PSS	SIZ 54PSS	SIZ 75PSS
Fig. 1	Receiver sensor	SIZ 30AS	SIZ 54AS	SIZ 75AS



Application.

These transmitter and receiver sensor pairs supply a sheet thickness related output voltage from 0(1) to 10VDC. All electronic parts are integrated in the sensors therefore no external amplifier is necessary. The output voltage Ua is connected to a 4 pin M12 x 1 connector and may used for many double - / sheet thickness monitoring application on magnetic steel sheets and also other metal sheet materials. The sensor pair have to be fixed opposite each other. In this alignment the sensors form an eddy current barrier in which one sensor transmits an AC field that is received from the opposite sensor. The sheet between both sensors reduce the received field strength. The received signal then is transformed into a DC voltage between 1 and 10 volts. The output connector of the receiver sensor delivers an amount of output voltage Ua that depends on sheet thickness, sheet material and distance A between both sensors. Diagram Fig. 2 shows the output voltage Ua in relation to the sheet thickness BD (mm), for magnetic steel sheets (thin lines) and for aluminum sheets (thick lines, „AL" surfix) for the different sensor typs at a given sensor fixing distance. The output voltage Ua is factory calibrated to 1 VDC with indicated distance with no sheet between the sensors. This 1 VDC Ua ("Living Zero") may be used to watch the sensors connection and the sensors cables to detect short circuits and/ or short cuts from the PLC / IPC controller (fail safe). To get again this 1 VDC Ua after sensor installation, adjust the distance between the sensors (greater distance means also higher output voltage Ua) either/ and / or adjust the screwdriver adjust with a 2 mm screwdriver (total 15 turns, with slide clutches on every end position) on the connector side of the receiver sensor . Adjusting the output voltage to an other value than 1 volt is also possible but changes the sensors output characteristic, too. The sensors enclosures are made from nickel plated brass thread tubes M 30 x 1,5 on sensors SIZ 30 that can be fixed in holes with the delivered M 30 nuts, from stainless steel on sensors SIZ 54 and from PVC on Sensors SIZ 75. The sensors dimensions are shown on fig. 3.

Mounting.

The sensors SIZ 30 are fitted into M 30 threat tubes so they can easy mounted into through holes by using the enclosed M 30 nuts. The other sensor typs may be fixed with clamps or blocking screws in fixing holes. The sensors must be mounted opposite each other in perfect alignment so that the sheet can pass between both sensors without touching them. The sensors can be mounted flush in any kind of material. Make sure that the sheet passes in the middle between both sensors and that the sheet do not touch the sensors.

Adjust.

Fix sensors final position. Wire sensors connectors according Fig. 2 and switch on power supply. Connect a voltmeter on the receiver sensors output (Ua, Pin 4) and ground (GRD, Pin 3) and turn the zero- adjust on the receiver sensors with a 2 mm screwdriver so that the voltmeter 1,0 VDC shows. After this adjust please do not change the distance A between both sensors anymore. Important: When double sheets are detected and the double sheets are pulled away from the sensor the output changes back in the no sheet / 1 sheet voltage level. The control circuit of the machine must work so that the transfers / machines do not restart automatically when the sheet(s) are removed to avoid dangerous situations.

Fig. 2 Sensor connection

Transmitter- Sensor				Receiver- Sensor		
Connector	Name	Pin- no.:	Wire colour	Name	Pin- no.:	Wire colour
	+ 24VDC	1	Brown	+ 24VDC	1	Brown
	N.C.	2	N.C.	N.C.	2	N.C.
	GRD -	3	Blue	GRD -	3	Blue
	N.C.	4	N.C.	UA 0- 10V	4	Black
N.C. = Not connected						

Fig. 3 Sensor characteristics Ua = f (BD) , Ua= Output voltage (V) , BD = Sheet thickness (mm)

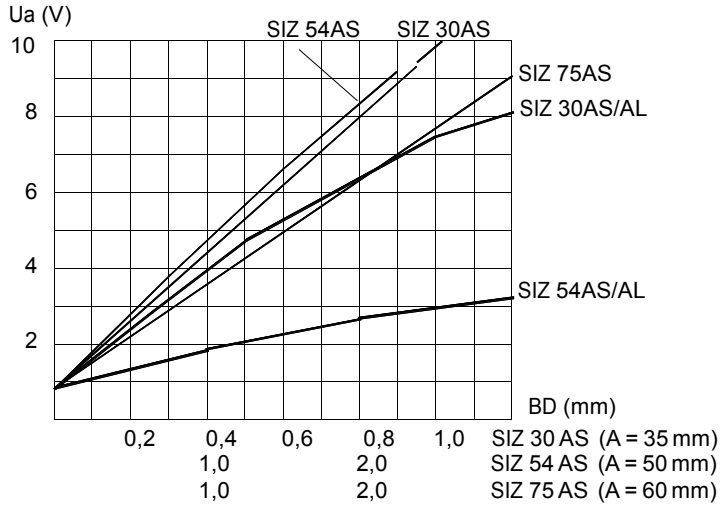


Fig. 4 Sensor / sheet arrangement

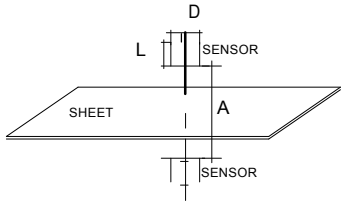


Fig. 5 Sensor dimensions

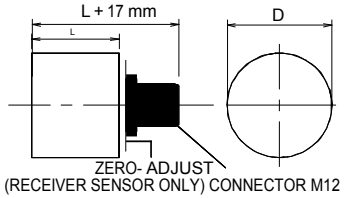


Fig. 6 Techn. spezifications

Sensor type:	Transmitter	Receiver	Transmitter	Receiver	Transmitter	Receiver
	SIZ 30PSS	SIZ 30AS	SIZ 54PSS	SIZ 54AS	SIZ 75PSS	SIZ 75AS
Max. Sheet thickness	0,8 mm (A= 35 mm)		2,0 mm (A= 50 mm)		3,0 mm (A= 60 mm)	
Sensor diameter D	M 30 mm		54 mm		75 mm	
Sensor length L	25 mm		36 mm		50 mm	
Output voltage	0(1) - 10 V short circuit protected					
Power supply	24 VDC +/- 10% ca.100 mA					
Impedance Ri (Ohm)	200					
Rise time Ua	20 msec.		100 msec.		500 msec.	
Temperature	0 - 50 grd. C					
Protection	IP 63					

Type SIE 2.0AS, SIE 4.0AS

Fig. 1

Application

These double sheet/ sheet thickness sensors supply a sheet thickness co- related output voltage from 0(1) to 10 VDC. The measuring amplifier is integrated into the sensor therefore no external amplifier or switching box are necessary. The 24 V DC power supply and the output voltage are connected via a 4 pin M12 x 1 connector and may used for many double/ sheet thickness monitoring applications. The analog voltage output of 0 (1) - 10 VDC from the sensors in connection with a PLC / IPC or other controllers that have 0 - 10 VDC inputs, allow a lot of high flexible, sophisticated and low price sheet thickness/ double sheet monitoring applications by programming these controllers. For example double sheet monitoring with one or more local or remoted thickness limits, sheet thickness comparators, sheet thickness limit calibration by teach- in and more. The sensors are built into rugged stainless-steel tubes. The monitored sheet has to touch the active front side of the sensor flat without any air gap. This sensor use the inductive system without any force that affected the monitored sheet. Bassically there should be no air gap between the active surface of the sensor and the sheet. Small airgaps are allowed if the remain allways constant. Airgaps however reduce the max. sheet thickness that can be monitored usually with the same sensor type and also changes the sensors charactaristic . Fig. 3 shows the sensors characteristic. In the range of lower sheet thicknesses the transfere characteristi is nearly linear and goes into saturation on higher sheet thicknesses. Using the next bigger sensor is recommende if the monitored sheet thickness is on the upper end of the characteristic.The output volatge is app. 1 V without a sheet on the active side of the sensor. These 1V output may be used to monitor the sensor connection cable against cable interrupts or cable short circuits. (fail save monitoring).

Mounting

The sensors are polyurethane capsulated in a flat, cylindrical stainles steel tube and may fixed by clamps or in mounting holes with blocking screws. It is important that the sensors are fixed so in the sheet feed way that every sheet passes the sensor touching the active side of the sensor flat, closed and so that the active area is full covered. The sensor can be fixed in any kind of material also in steel. The sensor must be connected via the 3 - pin M12 x1 connector. On request we also delivery sensor- cables with singlesided connector and open wires on the other cable side. Type SKS305 = 5m long, Type SKS310 = 10m long. The sensor- cabel should be not longer than 20 m (also depended on the PLC / IPC input specifications).

Fig. . 2 Sensor connection

Connector	Name	Pin- no.	Wire colour
	+ 24VDC	1	Brown
	N.C.	2	
	GRD -	3	Blue
	Output-	4	Black

Fig. 3 Sensor characteristics Ua = f (BD) , Ua= Output voltage (V) , BD = Sheet thickness (mm)

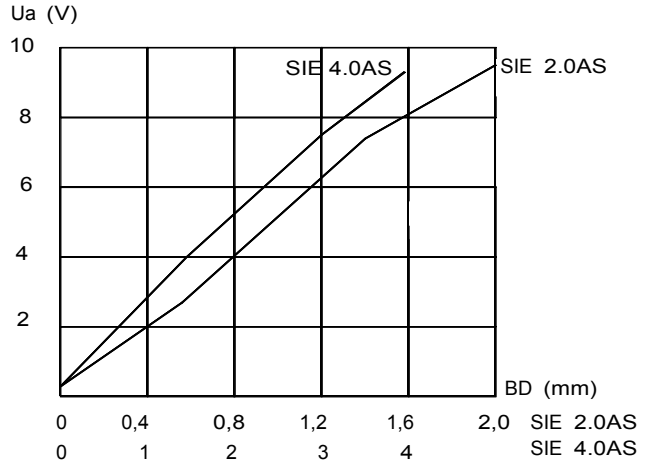


Fig. 4 Sensor / sheet arrangement

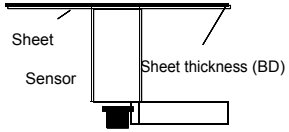


Fig. 5 Sensor dimensions

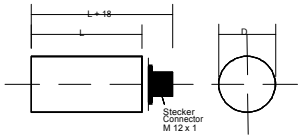


Fig. 6 Techn. Spezifications

Type	SIE 2.0AS	SIE 4.0AS
Max. Sheet thickness BD	2 mm	4 mm
Diameter D (mm)	28	54
Length L (mm)	55	36
Output voltage	0(1) - 10 short circuit protected	
Power supply	24 VDC +/- 10% ca. 30 mA	
Impedance Ri (Ohm)	200	
Rise time Ua	2	
Temperature	0- 50 grd. C	
Protection	IP 63	

Abb. 1 Transmitter- Sensor: SIE 30RSS, Receiver- Sensor: SIZ 30AS

Application.

This transmitter and receiver sensor pair supply a sheet thickness related output voltage form 0(1)) to 10VDC. All electronic parts are integrated in the sensors therefore no external / separate amplifier is necessary. The output voltage Ua is connected to a 4 pin M12 x 1 connector and may used for many double - / sheet thickness monitoring application on non-magnetic steel sheets (stainless steel sheets). The both sensors have to be fixed opposite each other . In this alignment the sensors form an eddy current barrier in which one sensor transmits an AC field that is received from the opposite sensor. The sheet between both sensors reduces the received field strength. The amount of decreased field depends on the sheet thickness and the sheet material. The received signal then is trans-formed into an DC voltage between 1 and 10 volts. The output connector of the receiver sensor delivers an amount of output voltage Ua that de-pends on sheet thickness, sheet material and distance A between both sensors. Diagram Fig. 3 shows the output voltage Ua in relation to the sheet thickness BD (mm), for non- magnetic (austenitic) steel sheets for the sensors recommented fixing distance A of 35 +/- 5mm. The output voltage Ua is factory calibrated to 1 VDC with a distance A of 35 mm with no sheet between the sensors. This 1 VDC Ua ("Living Zero") may be used to watch the sensor connection and the sensors cables to detect short cir- cuits and/ or short cuts from the PLC / IPC controller (fail safe) . To get again this 1 VDC Ua after sen- sor installation, adjust the distance between the sensors (greater distance means also higher output voltage Ua) either/ and / or adjust the poti with a 2 mm screwdriver (total 15 turns with slide clutches on every end position) on the connector side of the receiver sensor SIZ 30AS. Adjusting the output voltage to an other value than 1 volt is also possible but changes the sensors output characteristic, too. The sensors enclosures are made from nickel plated brass thread tubes M 30 x 1,5 that can be fixed in holes with the delivered M 30 nuts. The sensors dimensions are shown on fig. 3.

Mounting.

The sensors are fitted into M 30 threat tubes so they can easy mounted into through holes by using the enclosed M 30 nuts. The sensors must be mounted opposite each other in perfect alignment so that the sheet can pass between both sensors without touching them. The sensors can be mounted flush in any kind of material. Make sure that the sheet passes in the middle between both sensors and that the sheet do not touch the sensors.

Adjust.

Fix sensors in the final position. Wire sensors connectors according Fig. 2 and switch on power supply. Connect a voltmeter on the receiver sensor SIZ 30AS output (Ua, Pin 4) and ground (GRD, Pin 3) and turn the zero- adjust on the sensors with a 2 mm screwdriver so that the voltmeter 1,0 VDC shows. After this adjust please do not change the distance A between both sensors anymore. Important: When double sheets are detected and the double sheets are pulled away from the sensor the output changes back in the no sheet / 1 sheet voltage level. The control circuit of the machine must work so that the transfers / machines do not restart automatically when the sheet(s) are removed to avoid dangerous situations.

Fig. 2 Sensor connection

Transmitter- Sensor SIE 30RSS				Receiver- Sensor SIZ 30AS		
Connector	Name	Pin- no.:	Wire colour	Name	Pin- no.:	Wire colour
	+ 24VDC	1	Brown	+ 24VDC	1	Brown
	N.C.	2	N.C.	N.C.	2	N.C.
	GRD -	3	Blue	GRD -	3	Blue
	N.C.	4	N.C.	UA 0- 10V	4	Black
N.C. = Not connected						

Fig. 3 Sensor characteristics Ua = f (BD) , Ua= Output voltage (V) , BD = Sheet thickness (mm)

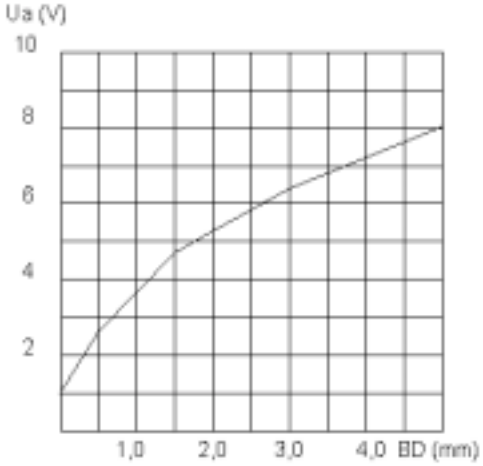


Fig. 4 Sensor / sheet arrangement

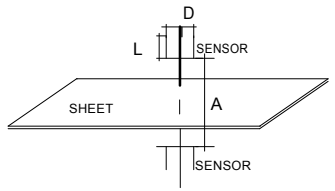


Fig. 5 Sensor dimensions

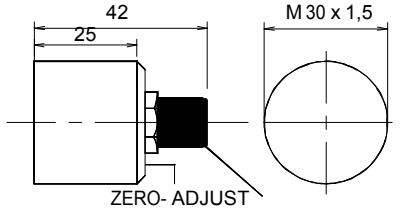
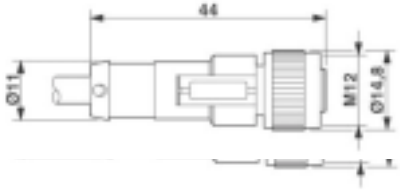


Fig. 6 Techn. spezifications	
Power supply	24 VDC +/- 10% app. 30 mA
Output voltage Ua (V)	(0) 1 - 10 V
Output impedance	Ri app. 200 Ohm
Rise time app.	10 msec.
Temperature	0- 50 grd.C
Protection	IP 63

Fig. 1

Application

The sensor cables have on the sensor- side a femal connector M 12 with fixing nut. The other side of the cables have open wires. There are cables with 5 m and with 10 m length available. According to the sensor type, not all wires are used.

Fig. 2 Connector connection		
Connector	Pin- no.	Wire colour
	1	Brown
	2	White
	3	Blue
	4	Black
	5	Grey
Fig 3. Techn. Spezifications		
Type	SKS 505	SKS 510
Cable length	5 m	10 m
Plug - in cycles	>100	
Cable material	PUR	
Cable wire	5 x 0,34 qmm	
Cable diameter	5 mm +/- 0,15 mm	
Temperature	0-50 Grd C	
Protection	IP 63	
Fig. 4 Connector dimensions		
		

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