SEW EURODRIVE

Product Manual

Safety-Related Subsystem
MOVISAFE® prog. FSSS-HC/HW-POS-DCS

Edition 09/2017

23567252/EN

Table of contents

23567252/EN – 09/2017

23567252/EN – 09/2017

1 System description

1.1 Other applicable documentation

Observe the following other applicable documentation:

- "Decentralized Safety Controller MOVISAFE® HM31 (Version PFF-HM31B..)" operating instructions
- "Data matrix positioning system PXV..A-F200-R4-V19-SEW" manual

Always use the latest edition of the documentation and software. The current version of the product manual is the original.

Our documentation is available in various languages for download from the SEW website (www.sew-eurodrive.com). If you are unclear about any of the information in this documentation, or if you require further information, consult SEW-EURODRIVE.

If required, you can order printed copies of the documentation from SEW-EURODRIVE.

1.2 General description

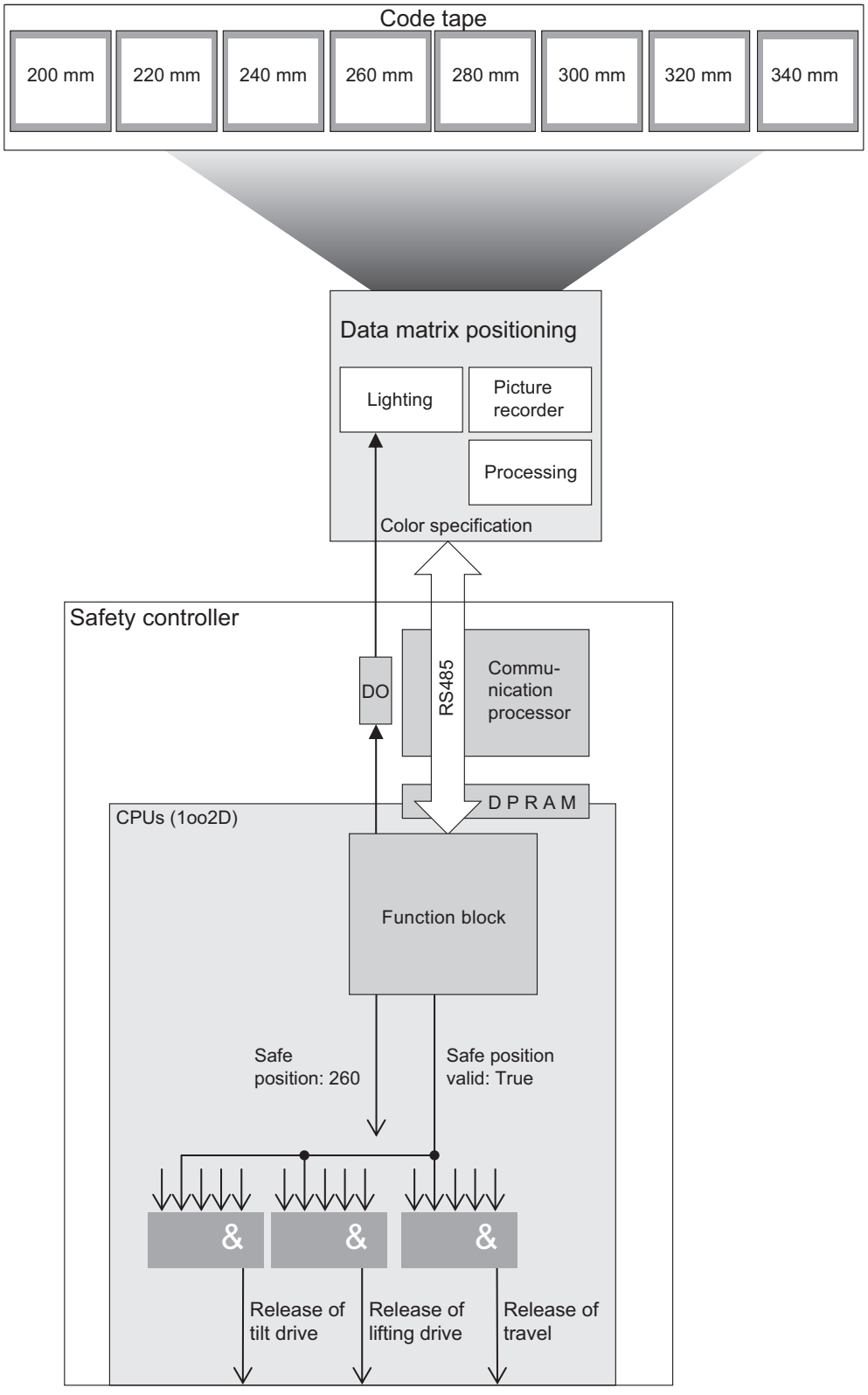
The following subsections define the designated use of the safety-related subsystem. They contain information that must be specified for a safety-related subsystem in accordance with EN 62061:2005 + Cor.:2010 + A1:2013 + A2:2015 Section 6.7.2.2.

1.3 System overview of the safety-related subsystem

The safety-related subsystem consists of the following components:

- MOVISAFE® HM31B/OGD/BSI safety controller
- PXV100A-F200-R4-V19-SEW data matrix positioning system
- *SEW303-PXV* function block for connecting the PXV100A-F200-R4-V19_SEW data matrix positioning system to the MOVISAFE® HM31B/OGD/BSI safety controller
- Connection cable (electrical interface) between the PXV100A data matrix positioning system and the MOVISAFE® HM31B/OGD/BSI safety controller

23567252/EN – 09/2017



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1.3.1 Designated use

The safety-related subsystem of several safety functions performs the following tasks:

- Determination of the absolute position of the PXV100A-F200-R4-V19-SEW data matrix positioning system in relation to a fixed code tape.

23567252/EN – 09/2017

- Calculation of the information as to whether the determined absolute position is valid.
- Encapsulation of all monitoring and plausibility checks that are required in order to achieve the characteristic safety values of the safety-related subsystem.

1.3.2 Predictable misuse

⚠ DANGER

Ineffectiveness of the safety function.

Severe or fatal injuries.

- Use the safety-related subsystem only in an industrial environment.
- Only operate the safety-related subsystem as described in this product manual and in the user documentation of the components used.
- The users of this safety-related subsystem must be trained specialists in accordance with the user documentation of the hardware components that are used, and they must be familiar with the valid safety regulations, standards, directives and laws for the respective application.

The safety-related subsystem is intended for use in an industrial environment and within closed buildings in accordance with this product manual. The safety-related subsystem is not suitable for the following usage conditions, among other things:

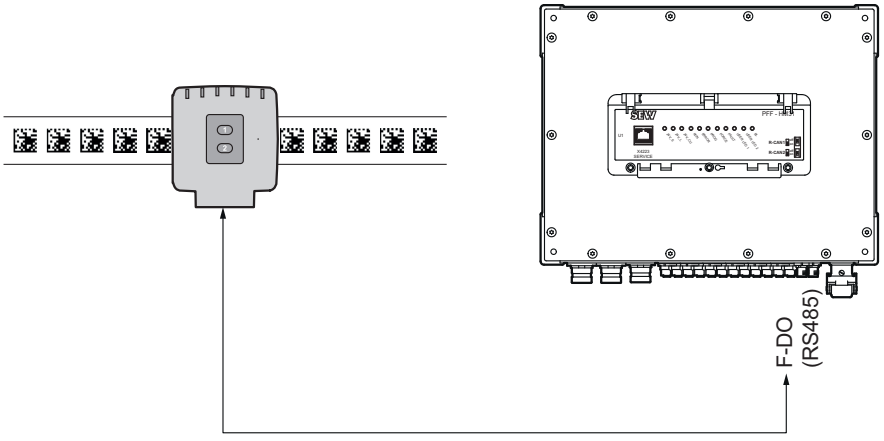
- Outdoors
- Under water
- Outside the designated use of the hardware components that are used
- Use by unauthorized persons
- Failure to heed the warnings pointed out by the signal words "DANGER" and "CAUTION".

23567252/EN – 09/2017

1.3.3 Electrical interface (connection cable)

The PXV100A data matrix positioning system must have a connection cable (part number: 18191525) directly attached to the MOVISAFE® HM31/OGD/BSI safety controller. The PXV100A data matrix positioning system is supplied with additional energy via this connection cable.

No Y cables or the like to other components (such as non-safe controllers or other identical data matrix positioning systems) are permitted. The safety controller, the data matrix positioning system and the connection cable form a closed subsystem.



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1.4 Scope of delivery

1.4.1 Without hardware components

The following components are included in the scope of delivery of the safety-related subsystem MOVISAFE® prog. FSSS-HW-POS-DCS without hardware components (part number: 18267483):

- HM31 application software FSSS-HS-POS-DCS, part number: 18267491
- Nameplate (self-adhesive) FSSS-HT-POS-DCS, part number: 28103343

1.4.2 With hardware components

The following components are included in the scope of delivery of the safety-related subsystem MOVISAFE® prog. FSSS-HC-POS-DCS with hardware components (part number: 18267475):

- HM31 application software FSSS-HS-POS-DCS, part number: 18267491
- Nameplate (self-adhesive) FSSS-HT-POS-DCS, part number: 28103343
- MOVISAFE® HM31B safety controller (version PFF-HM31B/OGD/BSI), part number: 18265529
- PXV100A-F200-R4-V19-SEW data matrix positioning system, part number: 19500394
- Connection cable 0x02-F8AS-Sw-M5BA, variable length 0.5 – 30 m, part number: 18191525

23567252/EN – 09/2017

1.5 Declaration of conformity

INFORMATION

This product has been developed and produced in accordance with applicable European standards and directives (see chapter "Applied standards and directives"). The declaration of conformity is available for download from the SEW website (www.sew-eurodrive.com) under "Documentation".

23567252/EN – 09/2017

2 Technical data

2.1 Applied standards and directives

Directives	
2006/42/EC	Machinery Directive
2014/30/EU	EMC Directive
2011/65/EU	RoHS Directive

Harmonized standards
EN ISO 13849-1:2015
EN ISO 13849-2:2012
EN 62061:2005/AC:2010/A1:2013/A2:2015
EN 61326-01:2013
EN 61800-3:2004/A1:2012
EN 61800-5-2:2007 (extracts)
EN 50581:2012

Other applicable standards
EN 61000-6-7:2015
EN 61326-3-1:2008

23567252/EN – 09/2017

2.2 Characteristic safety values of the safety-related subsystem

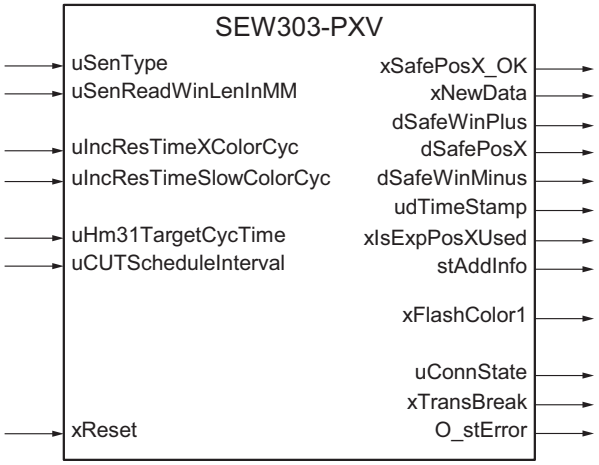
The safety-related subsystem may only be used in safety functions that require the following maximum characteristic safety values for the safety-related subsystem.

	Characteristic values according to	
	EN IEC 62061/ IEC 61508	**EN ISO 13849-1:20 15-12**
Safety class/underlying standards	SIL 3 according to IEC 61508. SIL CL3 according to EN IEC 62061.	PL e
System structure	Black channel with HFT 0 between code tape and safety controller (2-channel) with diagnostics (1oo2D).	Category 4
Operating mode selection	"High demand" or continuous.	
Probability of dangerous failure per hour (PFH_d value)	PFH_d value of MOVISAFE® HM31B safety controller that is used.	
Mission time/service life	20 years	
Proof test interval	20 years	-
Safe state	Function block of the safety-related subsystem in the 1oo2D processor system of the safety controller marks the position value as invalid. The output of the position value is frozen and no longer updated if the position value is invalid.	
Safety technology maximum fault response time	See chapter "Maximum response time of the safety-related subsystem".	
Safety technology accuracy	See chapter "Safety-related positioning accuracy".	

23567252/EN – 09/2017

3 Software

3.1 Structure of function block SEW303-PXV



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3.1.1 Inputs and outputs

The individual inputs and outputs are defined in accordance with the following table. Position values are triggered in 1 mm steps, and speed values in 1 mm/s steps.

Name	Data type	Range of values	Definition
uSenType	UINT	1: PXV100A	Type of connected data matrix positioning system.
uSenReadWinLenInMM	UINT	0 – 1000 mm	Length of read window with nominal distance of data matrix positioning system.
uIncResTimeXColorSync	UINT	0, 2, 4, 6. 8, 10	Increases the response time of the subsystem by X color cycles. The X picture recording cycles are used to tolerate erroneous picture recordings, RS485 telegrams, etc. This increases the availability of the subsystem.
uIncResTimeSlowColor-Sync	BOOL	True: fast color change False: slow color change (< 3 Hz)	Increases the response time of the subsystem by reducing the color change frequency to values < 3 Hz.
uHm31TargetCycTime	UINT	8 – 23 ms	Target cycle time of HM31 safety controller (identical to the characteristic values of the controller).
uCutScheduleInterval	UINT	2, 5 or 10 ms	Target cycle time of the Com user task.
xReset	BOOL	Rising edge: Acknowledgment	The rising edge acknowledges the internally detected error.
xSafePosX_OK	BOOL	True: Position value is valid False: Position value is invalid	Signals that the safe position value *dSafePosX* is valid.

23567252/EN – 09/2017

Name	Data type	Range of values	Definition
xNewData	BOOL	True: New position value received False: Otherwise	Signals that the safe position value *dSafePosX* has been updated.
dSafePosX	DINT	0 – 100000000 mm	Safe position value X.
dSafeWinPlus	DINT	0 mm to half window length	Tolerance window around safe position value X, in which the actual position value is located.
dSafeWinMinus	DINT	Minus half window length up to 0 mm	
udTimeStamp	UDINT	µs	Timestamp of safe position value X during picture recording. Reset to "0" when the status changes to "Safe connection established".
xIsExpPosXUsed	BOOL	True: Extrapolated position False: Position from code tape	Signals which of the two values is output as a safe position for position X.
stAddInfo	STRUCT	See section "Additional information".	
xFlashColor1	BOOL	1: Color 1 (blue) 0: Color 2 (red)	Lighting color selection.
uConnState	UINT	10: Connection establishment step 1 11: Connection establishment step 2 12: Connection establishment step 3 20: Connection establishment step 4 21: Continuous red connection test 22: Color change connection test 1: Secure connection has been established	Connection establishment status.
xTransBreak	BOOL	1: Connection interrupted 0: Connection not interrupted	Connection status.
O_Error	STRUCT	See section "Error messages".	

23567252/EN – 09/2017

3.1.2 Additional information

The non-safe additional information is defined as follows.

Name	Data type	Range of values	Definition
dNonSafeCodePosX	DINT	20 – 99999980 mm	Safe position value X, which has been read out of the code tape without pre-processing.
dNonSafeExpPosX	DINT	0 – 100000000 mm	Non-safe extrapolated position value X of the data matrix positioning system which has been corrected by the relative position of the sensor for the data matrix code.
dNonSafeExpPosY	DINT	-4096 – 4096 mm	Non-safe extrapolated position value Y of the data matrix positioning system.
dNonSafeExpPosZ	DINT	0 – 8182 mm	Non-safe extrapolated position value Z of the data matrix positioning system.
dNonSafeSpeedX	DINT	0 – 8182 mm/s	Non-safe extrapolated speed value of the data matrix positioning system.
dAngle	DINT	-179° – 180°	Orientation of sensor in relation to code tape.
uIlluminationColor	UINT	1: Blue 2: Red	Received lighting color.
stSenStatus	STRUCT	See section "Sensor status".	
stSenWarn	STRUCT	See section "Sensor warning".	
wSenDiag	WORD	0	Reserve word for later condition monitoring.
xRs485ToSen_PK	BOOL	True: Connection established False: Connection interrupted	Status of RS485 communication with data matrix positioning system.
tMaxReacTime	TIME	ms	Maximum response time of subsystem. When the connection is being established and tested, the position is marked as invalid. For this reason, a maximum response time of 0 ms is output.

23567252/EN – 09/2017

3.1.3 Sensor status

The status of the data matrix positioning system is defined as follows.

Name	Data type	Range of values	Definition
xVAL	BOOL	True: Data matrix code is valid False: Data matrix code is invalid	The sensor detects the data matrix code as valid.
xRS	BOOL	True: Reed-Solomon correction has taken place False: No correction	The sensor used the Reed-Solomon algorithm to correct the data when reading out the data matrix code.
xEV	BOOL	True: Event marker detected False: Otherwise	Sensor detects an event marker.
xNP	BOOL	True: Sensor does not detect a position False: Otherwise	Sensor does not detect a position.
xERR	BOOL	True: Sensor has detected an error False: Otherwise	Sensor detects an error.
xWRN	BOOL	True: Sensor has detected a warning False: Otherwise	Sensor detects a warning.
usA1A0	BOOL	0	Address of sensor.

3.1.4 Sensor warning

The non-safe additional information is defined as follows.

Name	Data type	Range of values	Definition
xW00_No_Warning	BOOL	True: Error detected False: Otherwise	Sensor detects an error and not a warning.
xW01_WrongCodeContent	BOOL	True: Wrong code content detected False: Otherwise	Sensor detects erroneous code content.
xW02_PosZTooShort	BOOL	True: Position Z too close False: Otherwise	Sensor detects that sensor is too close to code tape.
xW03_PosZTooLong	BOOL	True: Position Z too far False: Otherwise	Sensor detects that sensor is too far from code tape.
xW02_PosYTooHigh	BOOL	True: Position Y too high False: Otherwise	Sensor detects that sensor is too high.
xW02_PosYTooLow	BOOL	True: Position Y too low False: Otherwise	Sensor detects that sensor is too low.
xW06_HeadIsRotated	BOOL	True: Sensor is twisted False: Otherwise	Sensor detects that sensor is twisted.

23567252/EN – 09/2017

Name	Data type	Range of values	Definition
xW07_ContrastTooLow	BOOL	True: Contrast too low False: Otherwise	Picture recording has insufficient contrast.
wAll	WORD	Bit vector LSB: Warning 0 MSB: Warning 13	Summary of all warnings as word.

3.1.5 Error messages

Function block *SEW303-PXV* must always output the first error to be detected. Subsequent errors are not output. The error codes must be used as follows.

INFORMATION

The entries in the "Level" column have the following meanings:

- "0x10" = self-acknowledging warning
- "0x20" = acknowledgeable error
- "0x30" = non-acknowledgeable error

Error code	Level	Info 1	Info 2	Info 3	Info 4	Description
1	0x10	Duration of connection interruption.	-	-	-	Connection interruption has been detected.
2	0x20	Duration of connection interruption.	-	-	-	Connection interruption longer than 120 s detected.
100	0x10	Self-calculated checksum.	Received XOR checksum.	-	-	Difference between received and self-calculated telegram XOR checksum.
101	0x10	Telegram bytes 0 – 3.	Telegram bytes 4 – 7.	Telegram bytes 8 – 11.	Telegram bytes 12 – 15.	Expected zero locations in received telegram are not zero.
102	0x10	Telegram bytes 16 – 19.	Telegram bytes 20 – 23.	Telegram bytes 24 – 27.	Telegram bytes 28 – 31.	
103	0x10	Telegram bytes 32 – 35.	Telegram bytes 36 – 39.	-	-	
104	0x10	Self-calculated CRC32 checksum.	Received CRC32 checksum.	-	-	Difference between received and self-calculated telegram CRC32 checksum across the safety data.
105	0x10	Digits 0 – 3 in telegram.	Digits 4 – 7 in telegram.	Calculated code position X.	VAL status.	A received digit of the code position value is not within the expected range of values, or the received VAL status is invalid.

23567252/EN – 09/2017

Error code	Level	Info 1	Info 2	Info 3	Info 4	Description
106	0x10	Time difference	Timestamp	Received timestamp.	Previously received timestamp.	Time difference of timestamp between the received telegram and the previously received telegram deviates from the expected value by more than 1 ms.
107	0x10	Time difference	Received code position X.	Previously received code position X.	-	The code position X has changed, although the received timestamp has not changed.
108	0x10	Received color.	Received CRC7 checksum.	Digit 0.	Detected color in digit 0.	The received CRC7 checksum, the received color in code position X and the received color are contradictory or have unexpected values.
109	0x10	Received extrapolated position.	-	-	-	The received extrapolated position X is outside the expected range of values from 0 to 100000000 mm.
111	0x10	Self-calculated DMC checkbyte.	Received DMC checkbyte.	-	-	Difference between received and self-calculated DMC checkbyte.
200	0x10	Received color.	Number of received red pictures.	Number of expected red pictures.	-	Blue picture received during continuous red connection test.
201	0x10	Number of CPU cycles since last update.	Maximum permitted number of CPU cycles.	-	-	Timeout during continuous red connection test. No new valid security messages/pictures received in expected number of HM31 CPU cycles.
202	0x10	Expected next color.	Number of HM31 cycles until expected color change.	Bit array of transmitted color sequence in HM31 cycles. • 0: Color 2 • 1: Color 1 • LSB: last transmitted color	Bit array of received color sequence in HM31 cycles. • 0: Color 2 • 1: Color 1 • LSB: last transmitted color	Expected color change was detected too soon.
203	0x10					Expected color change was not detected until the last expected step.

Error code	Level	Info 1	Info 2	Info 3	Info 4	Description
204	0x10	Number of CPU cycles since last update.	Maximum permitted number of CPU cycles.	Current step number.	-	Timeout during color change connection test or with established connection. No new valid security messages/pictures received in expected number of HM31 CPU cycles.
205	0x10	CPU cycle time.	Expected CPU cycle time.	Current step number.	-	CPU cycle time differs by more than (-50 µs, +1050 µs) from the target cycle time.
206	0x10	Number of received pictures.	Number of expected pictures.	-	-	Timeout when connection establishment starts. No or too few valid security messages/pictures received within 60 s.
1001	0x20	Actual value *uSenReadWinLenInMM*.	Maximum permitted value.	-	-	The length of the sensor read window exceeds the maximum permitted length.
1002	0x30	Actual value *uSenType*.	-	-	-	Unsupported sensor type.
1003	0x20	Actual value *uHm31TargetCycTime*.	Maximum permitted value.	Minimum permitted value.	-	The target cycle time of the MOVISAFE® HM31 safety controller is outside the expected window.
1005	0x30	Actual value *uCUTScheduleIntervall*.	Permitted value.	Permitted value.	Permitted value.	The cycle time of the Com user task is outside the expected range.
1200	0x20	Actual value *ulncResTimeXColorCyc*.	Maximum permitted value.	-	-	The number of color cycles around the maximum response time should be extended. The length of the sensor read window exceeds the maximum permitted number.

23567252/EN – 09/2017

3.1.6 Global variables

Function block *SEW303-PXV* exchanges all information about local variables with the exception of the following global variables.

Name	Data type	Range of values	Definition
g_stCUT_RS485_Cfg	STRUCT	-	Exchange of information between Com user task and this function block.
g_stCUT_RS485_In			
g_stCUT_RS485_Out			
g_udCPU_DataTime_Sec	UDINT	See "Decentralized Safety Controller MOVISAFE® HM31" operating instructions.	Handover of current date and time to function block.
g_udCPU_DataTime_MS			

23567252/EN – 09/2017

4 Configuration

⚠ DANGER

Ineffectiveness of the safety function in the event of failure to observe the following sub-chapters and the user documentation of the components used.

Severe or fatal injuries.

✓ The following is essential:

- Read this product manual and the user documentation of the components used with care. Familiarize yourself with the device before installing, mounting, and operating it.
- Only operate the safety-related subsystem in the way that is described in this product manual and in the user documentation of the components that are used. This will ensure that the device and the connected systems operate safely. Protection of operating personnel and the system is only guaranteed if this safety-related subsystem is operated according to its designated use.
- During startup, check whether the safety-related subsystem is being used in accordance with the requirements of the following sub-chapters.

4.1 Nameplate

The following figure shows an example of the nameplate of the safety-related subsystem.

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D-76646 Bruchsal
Made in Germany

MOVISAFE® prog. FSSS-HC-POS-DCS

2017

Type: MOVISAFE® prog. FSSS-HC-POS-DCS
Konfiguration: 1.1.0
Part#: 18267475

Safety related sub system: Data Matrix Positioning System consisting of:
• Data Matrix Positioning Sensor
• Code strips
• MOVISAFE® PFF-HM31B
• Connecting cable
• HM31 application software

Designated use according to manual and according to the manuals of the used components

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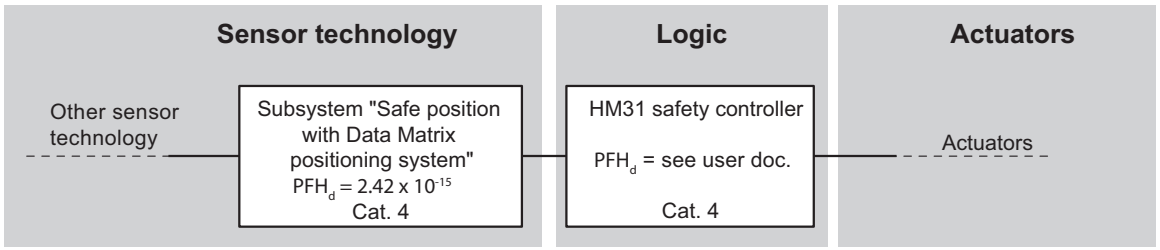
Affix the nameplate to the MOVISAFE® HM31B safety controller or the PXV..A data matrix positioning system. Nameplates must not be affixed over existing hardware component nameplates.

23567252/EN – 09/2017

4.2 Reliability diagram

The safety-related system must be used in the reliability diagrams of the safety functions as follows.



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4.3 Ambient conditions of the safety-related subsystem

The safety-related subsystem may only be used in environments which are supported by all three components that are used.

- PXV data matrix positioning system

⚠ CAUTION

Potentially hazardous red light flashes in accordance with section 5.2.3 of EN ISO 9241-391:2016-10

These can trigger epileptic fits in photosensitive persons at a frequency of between 3 Hz and 65 Hz

- During the risk assessment of the machine, this hazard must be assessed and evaluated in accordance with the situation as per EN 12100:2011+ ACC:2013 and the necessary risk minimization measures defined.
- Possible risk minimization: Inherently safe design. Use of continuous color change with a maximum frequency of 3 Hz.
- Possible risk minimization: Opaque enclosure of the data matrix positioning system and its illuminated surfaces.
- Further information can be found in EN ISO 9241-391:2016-10 and in the DGUV information 250-001 "Professional assessment of epilepsy and post-epileptic seizures".

For this reason, the user can choose between a fast and a slow color change via software signal *uIncResTimeSlowColorCyc*. The fast color change is carried out at a frequency of 20 Hz, and the slow color change is carried out at a frequency of < 3 Hz. The slow color change frequency results in a longer response time.

- MOVISAFE® HM31B/OGD/BSI safety controller
- Connection cable between the PXV data matrix positioning system and the safety controller

23567252/EN – 09/2017

4.3.1 Electromagnetic compatibility

The safety-related subsystem, consisting of the above-mentioned 3 components, also fulfills the following EMC standards:

- EN 61000-6-7:2015
- EN 61326-1:2013
- EN 61326-3-1:2008
- EN 61800-3:2004 + A1:2012 + AC:2014
- IEC 61800-5-2:2016

4.4 Maximum response time of the safety-related subsystem

⚠ DANGER

Ineffectiveness of the safety function by extending the maximum response time.

Severe or fatal injuries.

- Please note that the response time increases with every increase at the *uIncRes-TimeXColorCyc* input.
- Please note that the maximum response time increases if the slow color change is activated (input *uIncResTimeSlowColorSync* = True).
- Particularly with subsequent modification of the two mentioned parameters, analyze the influence on your safety functions and take appropriate measures.

The safety-related subsystem may only be used in safety functions that do not require a smaller maximum response time than the calculated maximum response time.

The following table shows the maximum response time, depending on the CPU cycle time, the color change frequency and the setting at the *uIncResTimeXColorCyc* input.

CPU cycle time	Maximum response time in ms for fast color change						Maximum response time in ms for slow color change					
	Range of values *uIncResTimeXColorCyc*						Range of values *uIncResTimeXColorCyc*					
ms	0	2	4	6	8	10	0	2	4	6	8	10
8	200	360	520	680	840	1000	504	1272	2040	2808	3576	4344
9	198	342	486	630	774	918	513	1287	2061	2835	3609	4383
10	210	370	530	690	850	1010	520	1300	2080	2860	3640	4420
11	220	396	572	748	924	1100	528	1320	2112	2904	3696	4488
12	228	420	612	804	996	1188	528	1320	2112	2904	3696	4488
13	221	377	533	689	845	1001	533	1313	2093	2873	3653	4433
14	224	392	560	728	896	1064	532	1316	2100	2884	2668	4452
15	240	420	600	780	960	1140	555	1365	2175	2985	3795	4605
16	240	432	624	816	1008	1200	544	1344	2144	2944	3744	4544
17	255	459	663	867	1071	1275	561	1377	2193	3009	3825	4641
18	288	504	720	936	1152	1368	594	1422	2250	3078	3906	4734
19	304	532	760	988	1216	1444	608	1444	2280	3116	3952	4788

23567252/EN – 09/2017

CPU cycle time	Maximum response time in ms for fast color change						Maximum response time in ms for slow color change					
	Range of values *uIncResTimeXColorCyc*						Range of values *uIncResTimeXColorCyc*					
ms	0	2	4	6	8	10	0	2	4	6	8	10
20	300	540	780	1020	1260	1500	600	1440	2280	3120	3960	4800
21	315	567	819	1071	1323	1575	609	1449	2289	3129	3969	4809
22	330	594	858	1122	1386	1650	638	1518	2398	3278	4158	5038
23	322	598	874	1150	1426	1702	621	1495	2369	3243	4117	4991

4.5 Error response functions

⚠ DANGER

Ineffectiveness of the safety function due to invalid position values.

Severe or fatal injuries.

- Please note that position values marked as invalid (*dSafePosX_OK* = False) may contain values that are erroneous or no longer updated.
- Please note that position value 0 mm (with *dSafePosX_OK* = True) is also a valid position value.
- When drafting, implementing and qualifying your safety function, use the valid flag *dSafePosX_OK* in all of the following safety-related subsystems which use the position value.

4.5.1 Application software

If this safety-related subsystem detects an error, function block SEW303-PXV of the safety-related subsystem in the 1oo2D processor system notifies all downstream safety-related subsystems that use the position value that the position value is invalid.

The error response function of the higher-order safety functions which use this subsystem depends on the respective safety function. The invalidity notification of the position value normally leads to a stoppage of the drives.

4.5.2 Firmware

If the firmware of the 1oo2D processor system detects an internal error in the 1oo2D processor system, the firmware executes the error response function that has been defined for this purpose.

23567252/EN – 09/2017

4.6 Safety-related positioning accuracy

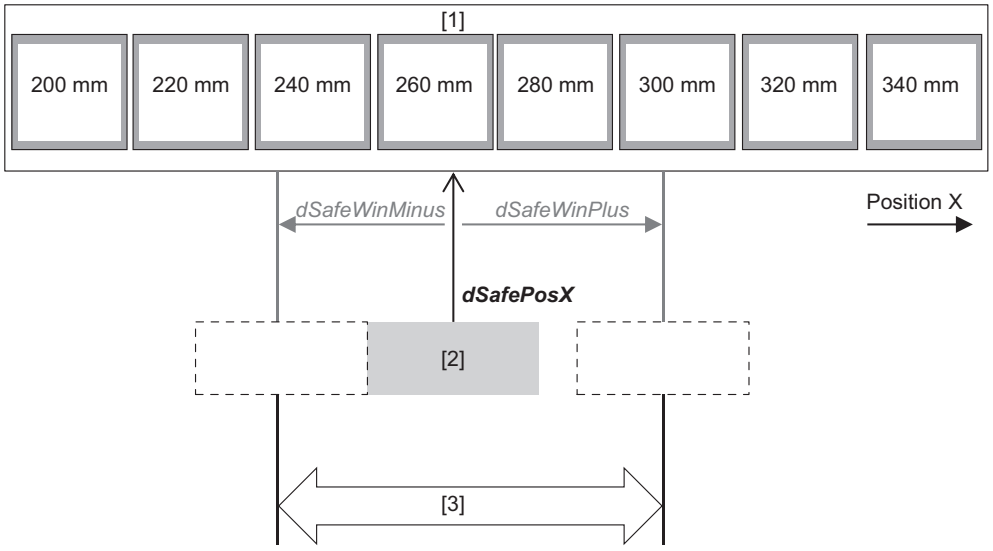
⚠ DANGER

Ineffectiveness of the safety function due to failure to observe the tolerance window around the safe position value.

Severe or fatal injuries.

- Please note that the safety-related positioning accuracy differs considerably from the positioning accuracy described in the user documentation of the positioning system that is used.
- When drafting, implementing and qualifying your safety function, always use the safety-related positioning accuracy
- Analyze the influence of the safety-related positioning accuracy and the tolerance window on your safety function. If necessary, use the *dSafeWinMinus* and *dSafeWinPlus* outputs in downstream subsystems.
- Check the correspondence of the *uSenReadWinLenInMM* parameter with the read window length of the data matrix positioning system that is used.

The PXV..A data matrix positioning system may actually be in the following tolerance window around the safe positioning value *dSafePosX*.



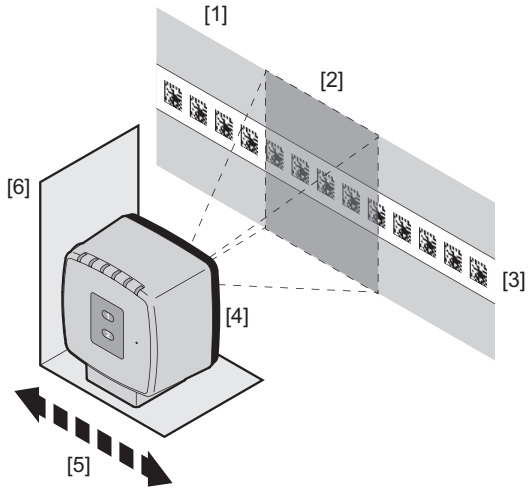
[1] Code tape
[2] PXV..A data matrix positioning system
[3] Tolerance window

23567252/EN – 09/2017

4.7 Limits of the PXV..A data matrix positioning system

4.7.1 Usage limits

The PXV..A data matrix positioning system has the following usage limits.



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[1] Painted background
[2] Read window
[3] Code tape
[4] PXV..A data matrix positioning system
[5] Direction of movement
[6] Holding fixture and guide

4.7.2 Reading distance and alignment

The mechanical holding fixture and guide of the data matrix positioning system must move the sensor in a central position above the code tape. It is particularly important not to exceed the permitted tolerances. More information concerning this can be found in the "Data Matrix Positioning System PXV..A-F200-R4-V19-SEW" manual.

4.7.3 Painted background

Exactly one code tape that is suitable for the data matrix positioning system that is used must be routed in the background filled by the read window. It is particularly important for no other code tape to be attached in this background.

4.7.4 External light limits

The external light limits of the data matrix positioning system that is used may not be exceeded.

4.7.5 Fatigue strength of mechanical holding fixture and guide

There are no additional safety-related requirements for the fatigue strength of the mechanical holding fixture and guide of the data matrix positioning system and the code tape. In order to achieve the availability, these components must be designed in accordance with the prevailing marginal conditions in the application. For example, the elimination of errors by overloading by 20 times in accordance with EN 61800-5-2:2007 table D.16 was not used in the safety examination of the subsystem.

23567252/EN – 09/2017

4.7.6 Connection lead

Only the tested and approved connection leads with shield are permitted as the connection lead (electrical interface).

Further information can be found in the "Data Matrix Positioning System PXV..A-F200-R4-V19-SEW" manual.

4.7.7 No second identical lighting unit

No other lighting unit with comparable red/blue flashing behavior may cast light into the read window.

4.7.8 No code tape gaps

The entire travel section may not contain code tape gaps which are bigger than the code tape gaps that are needed for the position sensor that is used. More information concerning this can be found in the "Data Matrix Positioning System PXV..A-F200-R4-V19-SEW" manual.

4.7.9 Component assembly

The installation of the respective components must take place in accordance with the respective user documentation for the components.

4.7.10 Testing during startup

⚠ DANGER

Ineffectiveness of the safety function due to faulty installation of the positioning system or by affixing code tapes with the wrong position ranges.

Severe or fatal injuries.

- Please note that the requirements in accordance with chapter "Limits of the data matrix positioning system PXV..A" must be adhered to.
- Only use the hardware that has been specially validated for this safety-related subsystem, and check the CRC checksums of the function blocks after every user software code generation (see chapter "Configuration management").
- Perform this check during initial startup and after every modification or repair (e.g. after attaching repair tapes).

- During the startup of the safety-related subsystem, the entire travel section must be traveled and the respective expected position compared with the reliable position readout.
- After attaching a repair tape over a defective or damaged area of an existing code tape, this area must be re-checked.

23567252/EN – 09/2017

4.7.11 Configuration management

- **Supported hardware**

  Only the specially validated hardware listed in the following table (e.g. safety controller, data matrix position sensors and code tapes with two-color lighting, connection cable) may be used for this safety-related subsystem.

Hardware	SEW part number
Data matrix positioning system PXV100A-F200-R4-V19-SEW	19500394
Code tape PXV-AA25	SEW Configurator
MOVISAFE® HM31B/OGD/BSI safety controller	18265529
Connection cable 0x02-F8AS-Sw-M5BA (Variable length 0.5 – 30 m)	18191525

- **Function blocks of the application software**

  Only the function blocks which were developed and verified for this purpose with the relevant CRC checksums as per the following table may be used for this safety-related subsystem.

Name	Type	CRC checksum
PSEW001-ChgErrMonitor	Function block	16#9e7eff93
PSEW001-Timestamp_s_in_ms	Function block	16#0cdf744d
PSEW303_Fct1	Function block	16#70b12f32
PSEW303_Fct2	Function block	16#c6b5e528
PSEW303_Fct4	Function block	16#130dd4f6
PSEW303_getGlbVar	Function block	16#c3adb7cb
PSEW303_setCUT_RS485_Cfg	Function block	16#74cf2571
PSEW303_setRS485_OUT	Function block	16#fde4fc29
SEW001_ResetError	Function block	16#9600bd78
SEW001_SetError	Function block	16#95180a6f
SEW303-PXV	Function block	16#06726a90
TSEW000_aBYTE_0_15	Type definition (Array)	16#be1b00d7
TSEW000_aINT_0_15	Type definition (Array)	16#854e2a1c
TSEW001_aErrMonitor	Type definition (Array)	16#237a920e
TSEW001_stError	Type definition (Structure)	16#26f09385
TSEW303_aRS485_Data	Type definition (Array)	16#c32c79a5
TSEW303_aRS485_Data_0_4	Type definition (Array)	16#a2bc8114
TSEW303_atRS485_In_0_1	Type definition (Array)	16#84c2069c
TSEW303_stAddInfo	Type definition (Structure)	16#248b2293
TSEW303_stRS485_In	Type definition (Structure)	16#8e59e69c
TSEW303_stRS485_Out	Type definition (Structure)	16#58d2bcf7
TSEW303_stStatus	Type definition (Structure)	16#78434537
TSEW303_stWarnings	Type definition (Structure)	16#0989403d

23567252/EN – 09/2017

Name	Type	CRC checksum
TSEW901_stErrorCUT	Type definition (Structure)	16#2e6e4daf
TSEW902_aRS485_Buffer	Type definition (Array)	16#f8afcff7
TSEW902_aRS485_Data	Type definition (Array)	16#62b2bf81
TSEW902_stRS485_Buffer	Type definition (Structure)	16#41ffbd71
TSEW902_stRS485_Cfg	Type definition (Structure)	16#348e92f2
TSEW902_stRS485_In	Type definition (Structure)	16#2f6fcda2
TSEW902_stRS485_Out	Type definition (Structure)	16#e9141062

4.7.12 Probability of dangerous transmission error

The residual error rate per hour for reliable communication between the code tape and the 1oo2D processor system is:

$\Lambda = 2.42 \times 10^{-15}$

4.8 SEW303-PXV function block

4.8.1 Parameterizing the inputs

The user must set the following inputs for their application within the valid range of values:

- *uSenType*
- *uSenReadWinLenInMM*
- *ulncResTimeXColorSync*
- *ulncResTimeSlowColorCyc*
- *uHM31TargetCycTime*
- *uCutScheduleInterval*

4.8.2 CRC of the function blocks

The user must compare the CRCs of the function blocks of the PVX100A library component that are calculated during code compilation (see chapter "Configuration management") with the expected CRCs.

4.8.3 Valid flag

If downstream subsystems of a safety function use the safe position *xSafePosX*, the user must check whether the valid flag *xSafePosX_OK* is to be used in order to trigger an error response.

The user must cancel the release of all drives that use the safe position *xSafePosX* within a safety function. In order to do this, the release output is usually AND-ed with the valid flag *xSafePosX_OK*. These drives are thereby stopped with invalid position X.

23567252/EN – 09/2017

4.8.4 Tolerance window

In all downstream subsystems of a safety function that use the safe position *xSafePosX*, the user must check whether the tolerance window of outputs *dSafeWinMinus* to *dSafeWinPlus* has an influence on the execution of the safety function.

4.8.5 Additional information

⚠ DANGER

Ineffectiveness of the safety function due to use of non-safety-related additional information.

Severe or fatal injuries.

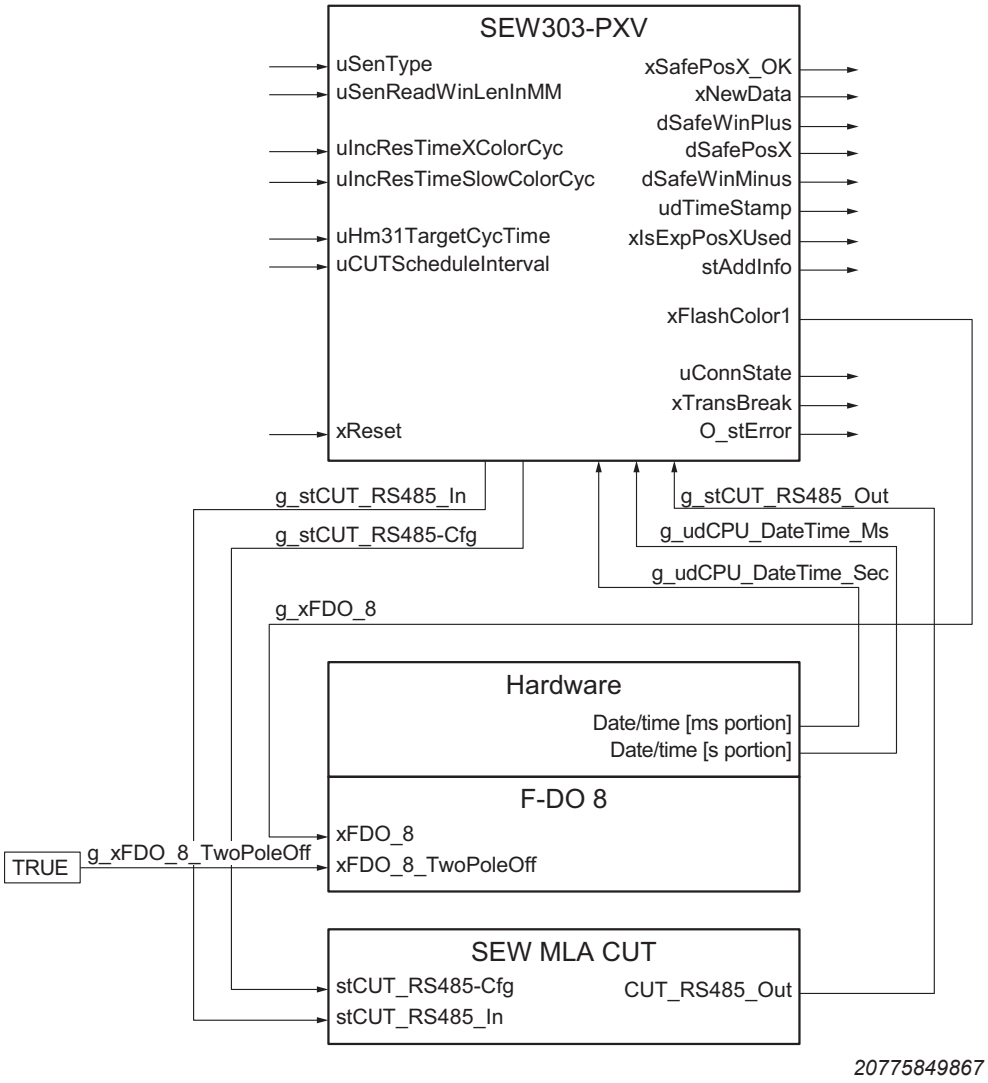
- Please note that many values in the additional information are read directly from the data matrix positioning system without further verification within the safety controller.
- The additional information must only be used in a non-safety-related way, e.g. for diagnostic purposes.

The user may use the additional information in a non-safety-related way at output *stAddInfo* (e.g. as part of a safety function).

23567252/EN – 09/2017

4.8.6 Connection to the PXV..A data matrix positioning system

The user must connect the *SEW303-PXV* function block with the PXV100A data matrix positioning system as follows. The user must use digital output F-DO08 at the MOVISAFE® HM31B/OGD/BSI safety controller when doing this, to which the PXV100A is connected.



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5 Service

5.1 Regular inspections, maintenance, service, repair

Regular inspections, service, maintenance and repairs to the components must be performed according to the respective user documentation (see chapter "Other applicable documentation"). No additional inspections, maintenance, service or repairs are required for the subsystem.

Defective components are replaced at the usage location in accordance with the respective user documentation (see chapter "Other applicable documentation").

23567252/EN – 09/2017

Index

23567252/EN – 09/17

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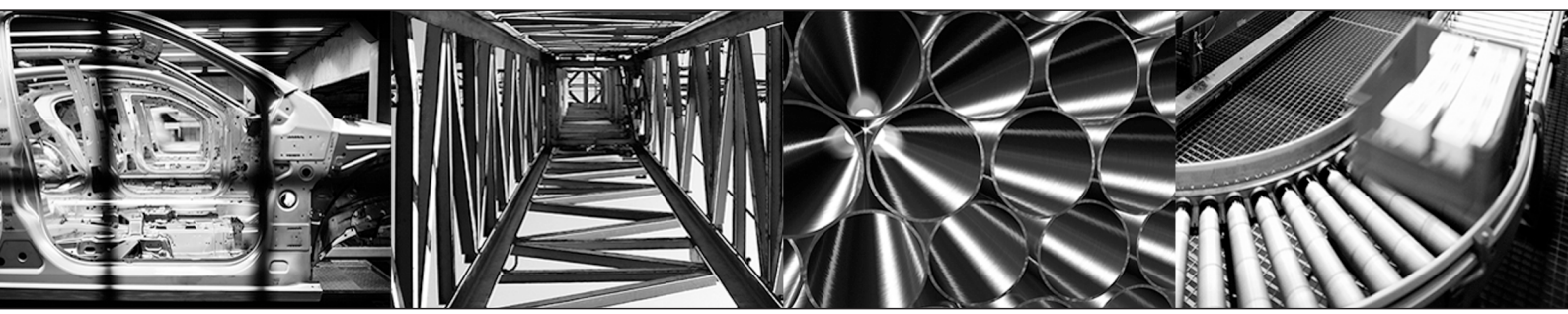
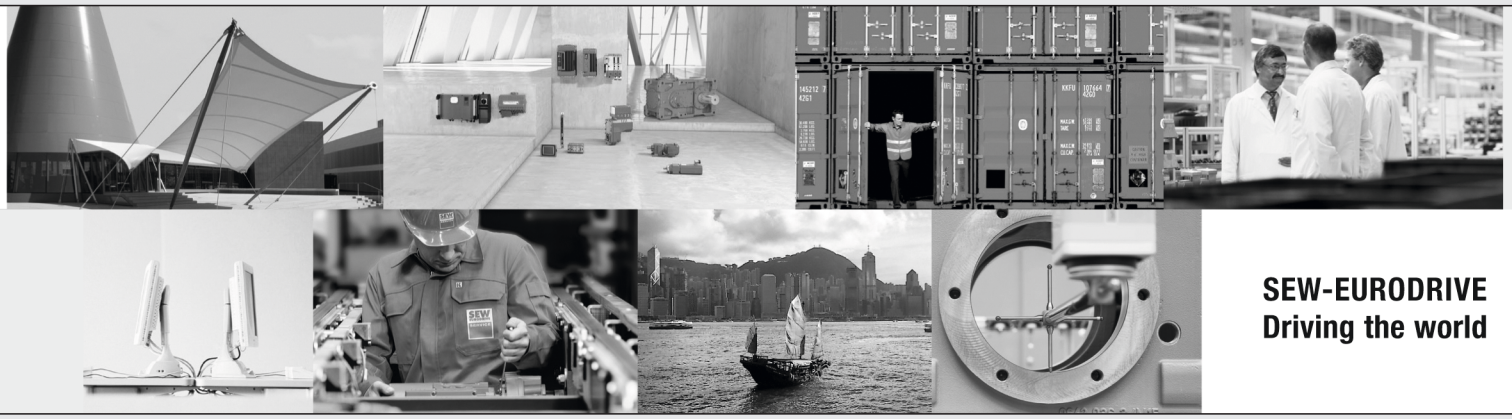
23567252/EN – 09/17





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