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## 1. GENERAL PRECAUTIONS

The system must be used only in accordance with the required protection level.

The sensor must be protected against accidental knocks and used in accordance with the instrument's ambient characteristics and performance levels.

Sensors must be powered with non distributed networks.

## 2. TECHNICAL SPECIFICATIONS

Output signal	IO-Link
Non Linearity (BFSL)	± 0.15% FS (typ) ± 0.25% FS (max)
Hysteresis	+ 0.1% FS (typ) + 0.15% FS (max)
Repeatability	± 0.025% FS (typ) ± 0.05% FS (max)
Zero offset tolerance	± 0.15% FS (typ) ± 0.25% FS (max)
Span offset tolerance	± 0.15% FS (typ) ± 0.25% FS (max)
Accuracy at room temperature	< ± 0.5% FS
Pressure ranges	From 4 bar to 1000 bar (See table)
Overpressure (without degrading performance)	See table
Pressure containment (burst test)	See table
Pressure Media	Fluids compatible with Stainless Steel AISI 430F and 17-4 PH
Housing	Stainless Steel AISI 304
Power supply	18-30Vdc
Maximum current absorption	1 W
Zero adjustment	"Autozero" function
Communication interface	IO-Link
Cycle time	1 msec
IO-Link version	1.1
Transmission type	COM3 (230.4 kBaud)
Profile	Smart sensor generic profile
SIO Mode	Yes
Required class for Master port	A
Pressure data resolution	14 bit
Temperature data resolution	12 bit
Power supply polarity reverse protection	YES
Integral temperature	Sensor on electronic board
Operating temperature range (process)	-40...+125°C (-40...+257°F)
Operating temperature range (ambient)	-40...+105°C (-40...+221°F)
Compensated temperature range	-20...+85°C (-4...+185°F)
Storage temperature range	-40...+125°C (-40...+257°F)
Temperature effects over compensated range (zero)	± 0.01% FS/°C typ. (± 0.02% FS/°C max.)

Temperature effects over compensated range (span)	± 0.01% FS/°C typ. (± 0.02% FS/°C max.)
Warm-up time	< 30 sec.
Mounting position effects	Negligible
Humidity	Until 100%RH non-condensing
Weight	80-120 gr. nominal
Mechanical shock	100g/11msec according to IEC 60068-2-27
Vibrations	20g max at 10...2000 Hz according to IEC 60068-2-6
Ingress protection	IP65/IP67 (M12 version) with female homologated connector mounted, tightening torque 0.6Nm + low strength threadlocker
Output short circuit and reverse polarity protection	YES
EC Conformity	According to Directive 2014/30/EU

RANGE (Bar)	4	6	10	16	20	25	40	60	100	160	200	250	400	600	1000
Overpressure (Bar)	8	12	20	32	40	50	80	120	200	320	400	500	800	1200	1200
Burst pressure (Bar)	16	24	40	64	80	100	160	240	400	640	800	1000	1500	1500	1500

### 3. INSTALLATION AND ELECTRICAL CONNECTIONS

#### 3.1. General precautions

The system must be used only in accordance with the required protection level.

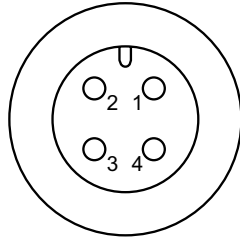
The sensor must be protected against accidental knocks and used in accordance with the instrument's ambient characteristics and performance levels.

The sensors must be powered with non-distributed networks and always at lengths of less than 30 mt.

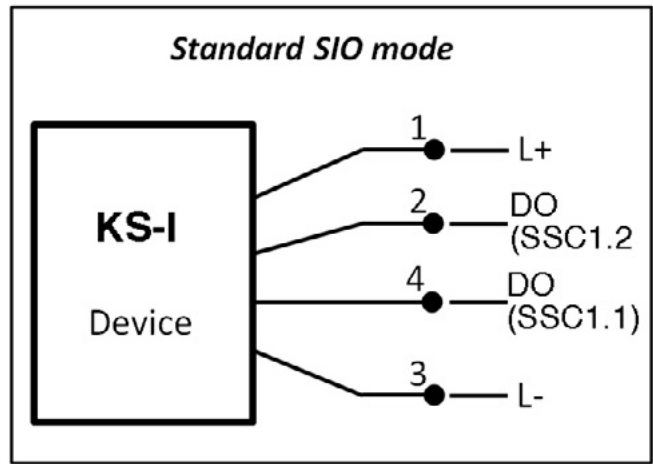
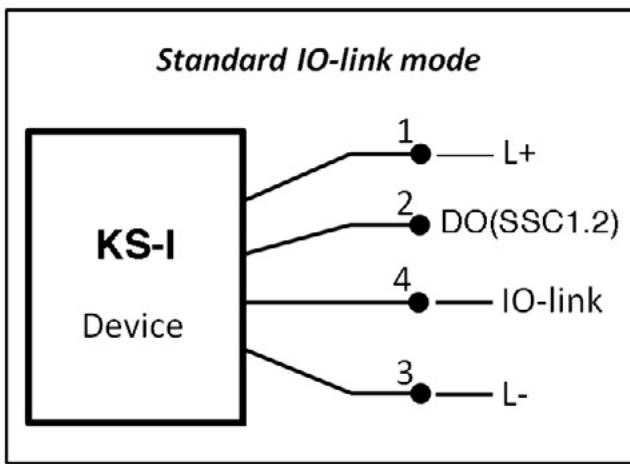
#### 3.2. Electrical installation

The transducer must be grounded (normally through the machine body or equipment it is installed on). To prevent interference, separate the power cables from signal cables

The transducer has a male M12 4 pole connector for power supply and output signal.

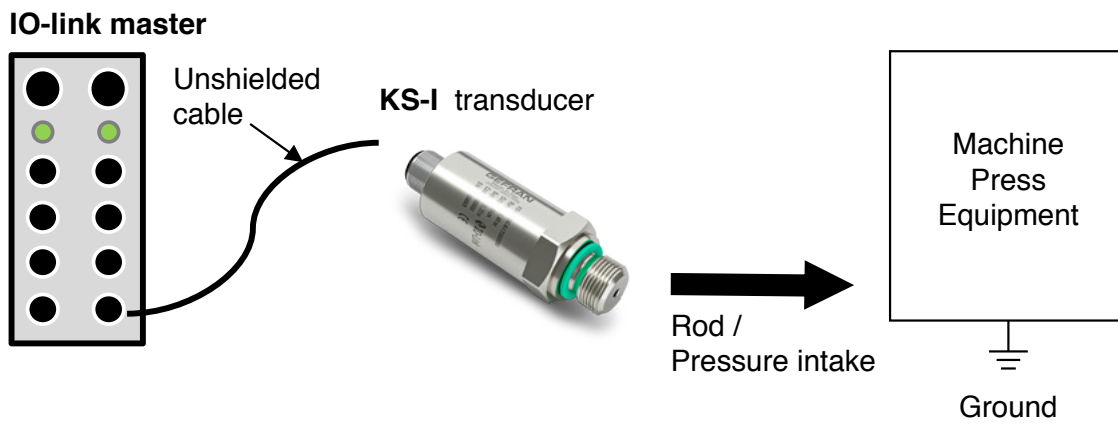
Z - 4 pin male connector M12 x 1	PIN	SIGNAL	FUNCTION
	1	L+	Power Supply (+), (nominal 24Vdc)
	2	I/Q	Digital Output (DO* - SSC 1.2)
	3	L-	Power Supply (-), GND
	4	C/Q	IO Link / Digital Output (DO* - SSC 1.1)

\*Output current limit = 200mA



**Notes:**

- For IO-Link only version connect the transducer to a standard IO-Link master through a standard unshielded M12 cable (max length 20m according to IO-Link specification)



**3.3. Standard reference**

Gefran products, described in this manual, are compliant to the European Directive 2014/30/EU.

They are tested according to the standard EN 61326-1 “Electrical equipment for measurement, control and laboratory use - EMC requirements”, Part 1 “general requirements and EN 61326-2-3 “Electrical equipment for measurement, control and laboratory use

- EMC requirements”, Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning.

**Note**

In accordance with IEC/EN 62061, IEC/EN 61508 and ISO/EN 13849, KS-I series transducers also comply with EN 61326- 3-1 “Electrical equipment for measurement, control, and laboratory use - immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications”.

**3.4. EMC and RoHS Requisites**

Gefran Pressure transducers are built in conformity with the following EMC directives: EMC 2014/30/EU and RoHS 2011/65/EU.

## 4. COMMAND MODES

### 4.1. IO-Link Information

**Table 1** IO-Link information

Port Class	A
Baud rate	COM3 (230.4 kB)
IO-Link version (1)	1.1
Profile	Smart Sensor – Digital Measuring and Switching Sensor (DMSS)
Process data input length	4 Bytes (Pressure + Scale + SSCs)
Process output data length	0
Min Cycle Time	1,0 ms
SIO mode	Supported
ISDU	Supported
Data storage	Supported

Compliant to the following IO-Link specifications:

- IO-Link Interface and System Specification v1.1.3 (June 2019)
- IODD - IO Device Description Specification v1.1.3 (January 2021)
- IO-Link Common Profile Specification v1.1 (December 2021)
- IO-Link Smart Sensors 2nd Edition Specification v1.1 (September 2021)

For more details about IO-Link specifications please visit the Downloads area at this address: <https://io-link.com>

### 4.2. SIO mode and IO-Link mode

The KS-I transducer supports both SIO mode and IO-Link mode:

- In SIO mode the transducer behaves like a digital sensor: on pin 4 and 2 of M12 connector two digital thresholds are available and programmable (replicating the same behavior configured for SSCs, see par 4.5)
- In IO-Link mode the transducer communicates with a standard IO-Link master on pin 4 of M12 connector

### 4.3. Process Data mapping (IO-Link)

The KS-I transducer sends the measure of a single channel (pressure) inside process data.

The pressure data in a 16-bit value, compliant to the FunctionClass 0x800A (Measurement Data Channel, standard resolution).

The mapping of the Input Data is compliant to the standard layout, specified by the Smart Sensor Profile, defined as MSDC32 (Measurement and Switching Data Channel 32 bit).

31...16 (16 bit Signed Integer)	15...8 (8 bit Signed Integer)	7..2 (6 bit)	1 (Bool)	0 (Bool)
Pressione measurement	Scale	Unused	SSC1.2	SSC1.1

Where:

- The pressure data is set in the selected unit depending on the ordering code
- The measure unit can be obtained also reading the value of UnitCode in parameter MDC1 Descriptor (index 4080, subindex 3).

Allowed values are specified in the following table:

Unit Code	Measure unit
1137	bar
1141	psi
1132	MPa

The number of decimal digits used for the pressure data is determined by the Scale factor send in the Process Data.

The number of decimal digits depends on the full scale of the transducer as specified in the following table:

	Measuring Unit [bar]	Measuring Unit [psi]	Measuring Unit [MPa]
<b>Measuring range</b>	<b>Decimal Digits</b>		
Less or equal to 100 bar (or equivalent)	2	1	3
Greater than 100 bar (o equivalent)	1	0	2

- The Scale factor determines the scaling factor (multiplicative factor, calculated as  $10^{\text{scale}}$ ) to be applied to the pressure

data in order to obtain the value in the specified measure unit.

Possible values for the Scale factor and its equivalent gradient are specified in the following table:

Scale	Number of decimal digits	Scaling factor (gradient)
0	0	1
-1	1	0.1
-2	2	0.01
-3	3	0.001

The Scale factor can be obtained also reading the value of Scale in parameter MDC1 Descriptor (index 4080, subindex 4).

- SSC1.1: switching signal 1.1 is a on/off bit changing its value according to the overtaking of a pressure threshold that can be programmed by the user; several configurations are available (see par.4.5)
- SSC1.2: switching signal 1.2 is a on/off bit changing its value according to the overtaking of a pressure threshold that can be programmed by the user; several configurations are available (see par.4.5)

NOTE: IO-Link transmits according to the “Big Endian” ordering, so the bit 31 of the Process Data is the first to be send/received

NOTE: as by Smart Sensor 2nd Edition specifications, the 16-bit pressure data is limited to the range -32000..32000.

If the pressure value overrides this range, it is replaced by a fixed value (substitute value) as specified in the following table.

	Substitute value
Measure out of range (+)	32760
Measure out of range (-)	-32760

#### 4.4. Parameterization data

This paragraph includes list and explanation of relevant available parameters for IL transducer, listed according to IO-Link specification

##### • *Predefined parameters - System*

Index	Subindex	Object name	Access			Length	Data Type	Value (example)	Description
			U	M	S				
0x0002	0x00	System Command	W	W	W	1	UInt8	See Table 2	

U=User, M=Maintenance, S=Specialist

**Table 2** System command values

Value	Access			Command	Data Type	Description
	U	M	S			
0x01	W	W	W	ParamUploadStart	UInt8	
0x02	W	W	W	ParamUploadEnd	UInt8	
0x03	W	W	W	ParamDownloadStart	UInt8	
0x04	W	W	W	ParamDownloadEnd	UInt8	
0x05	W	W	W	ParamDownloadStore	UInt8	
0x06	W	W	W	ParamBreak	UInt8	
0x41	-	W	W	TeachSP1	UInt8	It allows to teach "Setpoint 1" (SP1) for the selected Switching Signal Channel(s). SP1 is defined by one "TeachPoint" ("Single value teach-in" mode)
0x42	-	W	W	TeachSP2	UInt8	It allows to teach "Setpoint 2" (SP2) for the selected Switching Signal Channel(s). SP2 is defined by one "TeachPoint" ("Single value teach-in" mode)
0x81	-	W	W	ApplicationReset	UInt8	Resets application parameters to its default values, without communication interruption or power cycle. Identification parameters remain unchanged.
0x83	-	W	W	Back-to-Box	UInt8	Resets parameters to the original factory values. NOTE: after the command, the device stops and disable the communication until the next power cycle
0xA0	-	W	W	Autozero	UInt8	Set to zero the offset of transducer (see limits in Table 3)
0xA1	-	W	W	ResetAutozero	UInt8	Reset the Autozero effect command
0xA4	-	W	W	ResetPressureMaxValue	UInt8	Reset the maximum value of pressure measured (PressureMaxValue) – stored in EEPROM
0xA6	-	W	W	ResetPressurePeaksCounter	UInt8	Reset the counter of peak of pressure (PressurePeaksCounter) – stored in EEPROM
0xA7	-	W	W	ResetTemperatureMaxValue	UInt8	Reset the maximum value of temperature measured (TemperatureMaxValue) – stored in EEPROM
0xA8	-	W	W	ResetTemperatureMinValue	UInt8	Reset the minimum value of temperature measured (TemperatureMinValue) – stored in EEPROM
0xAB	-	W	W	ResetOperatingTimeCounter	UInt8	Reset the Time counter
0xAC	-	W	W	ResetOperatingTimeInPressureCounter	UInt8	Reset the Time in pressure counter
0xAD	-	W	W	ResetOperatingTimeOverPressureCounter	UInt8	Reset the Time in overpressure counter
0xFA	-	W	W	StoreOperatingData	UInt8	Save current statistics data NOTE: automatically saved every 6 minutes
0xFB	-	W	W	TestEventErrorAppear	UInt8	Generates an event Error Appear for testing purpose
0xFC	-	W	W	TestEventErrorDisappear	UInt8	Generates an event Error Disappear for testing purpose
0xFD	-	W	W	TestEventWarningAppear	UInt8	Generates an event Warning Appear for testing purpose
0xFE	-	W	W	TestEventWarningDisappear	UInt8	Generates an event Warning Disappear for testing purpose
0xFF	-	W	W	TestEventNotification	UInt8	Generates an event Notification for testing purpose

U=User, M=Maintenance, S=Specialist, - : command not available

**Table 3** Autozero command application limits

Transducer FS	Percentage limit for autozero application [%FS]
FS ≤ 35 bar (or equivalent)	100%
36 bar ≤ FS ≤ 199 bar (or equivalent)	40%
200 bar ≤ FS ≤ 349 bar (or equivalent)	20%
FS ≥ 350 bar (or equivalent)	10%

According to the different FS, the Autozero command can be applied only if the offset is within the percentage allowed by Table 3.

• **Predefined parameters – Identification**

Index	Subindex	Object name	Access			Length	Data Type	Value (example)	Description
			U	M	S				
0x0010	0x00	VendorName	RO	RO	RO	10	String	GEFRAN spa	
0x0011	0x00	VendorText	RO	RO	RO	14	String	www.gefran.com	
0x0012	0x00	ProductName	RO	RO	RO	Max 64	String	KS-I-E-Z-B35D-M-0-530 2130X000X00	Full description of product (ordering code)
0x0013	0x00	ProductID	RO	RO	RO	7	String	F075123	Model (F code)
0x0014	0x00	ProductText	RO	RO	RO	Max 64	String	KS IO-Link	Description of the family model
0x0015	0x00	SerialNumber	RO	RO	RO	8	String	22260001	Unique serial number for product (yywwnnnn)
0x0016	0x00	HardwareRevision	RO	RO	RO	3	String	1.0	
0x0017	0x00	FirmwareRevision	RO	RO	RO	3	String	1.0	
0x0018	0x00	ApplicationSpecificTag	RO	R/W	R/W	Min16 Max32	String	*** (Default)	User specifies a tag which defines functionality, position of the transducer in the system
0x0019	0x00	FunctionTag	RO	R/W	R/W	Min16 Max32	String	*** (Default)	User specifies a tag which defines functionality, position of the transducer in the system
0x001A	0x00	LocationTag	RO	R/W	R/W	Min16 Max32	String	*** (Default)	User specifies a tag which defines functionality, position of the transducer in the system

U=User, M=Maintenance, S=Specialist

• **Predefined parameters – Diagnosis**

Index	Subindex	Object name	Access			Length	Data Type	Value (example)	Description
			U	M	S				
0x0020	0x00	ErrorCount	RO	RO	RO	2	Uin16	0	Incremental counter of errors since power-on
0x0024	0x00	DeviceStatus	RO	RO	RO	1	Uint8	See Table 4	Defines the status of Device
0x0025	0x01 0x02 0x03 0x04	DetailedDeviceStatus	RO	RO	RO	Variabile	(Array di 3 bytes Record)	See Table 5	Specifies detailed status of the Device Octet 1=EventQualifier Octet 2,3=EventCode
0x0028	0x00	ProcessDataInput	RO	RO	RO	PD length	PD	0	Read last valid Process Data from PDin channel

**Table 4** Device Status Values

Value	Description
0	Device is operating properly (no errors/warnings)
1	Maintenance required
2	Out of specification

**Table 5** Warnings in Detailed Device Status

Event Code	Event Type	Device Status	Description	Note
0x8C10	Warning	Out of specification	Pressure above 200% of Span respect to factory zero at room temperature	
0x8C30	Warning	Out of specification	Pressure below -50% of Span respect to factory zero at room temperature	
0x8CA1	Warning	Maintenance required	Zero drift excessive	

**Table 6** Other Events

Event Code	Event Type	Device Status	Description	Note
0x8DFD	Error	OK	Test event type "Error"	
0x8DFE	Warning	OK	Test event type "Warning"	
0x8DFF	Notification	OK	Test event type "Notification"	
0x189C	Notification	OK	event for Autozero command successfully completed	
0x189D	Notification	OK	event for Autozero command failed due to value (autozero) out of range	
0x189E	Notification	OK	event for Autozero command failed due to function temporarily not available	
0x189F	Notification	OK	event for Autozero command reset	



**Table 7** Error codes

Error Code	Description
0x8000	Device application error – no details
0x8011	Index not available
0x8012	Subindex not available
0x8022	Service not available – Device control
0x8023	Access denied
0x8030	Parameter value out of range
0x8031	Parameter value above limit
0x8032	Parameter value below limit
0x8033	Parameter length overrun
0x8034	Parameter length underrun
0x8035	Function not available
0x8036	Function temporarily unavailable
0x8040	Invalid parameter set
0x8041	Inconsistent parameter set

**• Predefined parameters – Profile specific parameters**

Index	Sub Index	Object Name	Access			Length	Data Type	VALUE (exam- ple)	Value Range	Gradient	Offset	Unit	Description
			U	M	S								
0x003A	0x00	TeachIn Channel	-	R/W	R/W	1	UInt8	0x00: SSC1 (default) 0x01: SSC1 0x02: SSC2	0...2	-	-	-	Defines the channel to which address teach-in
0x003B	0x00	TeachIn Result	-	RO	RO	1	Boolean	0: non OK 1...255: OK	0...255	-	-	-	Show the result of teach-in procedure
	0x01	State	-	RO	RO	4 bit	UInt4	0 Vedere Table 8	0...15	-	-	-	
	0x02	FlagSP1TP1	-	RO	RO	1 bit	Boolean	0: SP1TP1 non taught 1...255: SP1TP1 taught	0...255	-	-	-	
	0x03	FlagSP1TP2	-	RO	RO	1 bit	Boolean	0: SP1TP2 non taught 1...255: SP1TP2 taught	0...255	-	-	-	
	0x04	FlagSP2TP1	-	RO	RO	1 bit	Boolean	0: SP2TP1 non taught 1...255: SP2TP1 taught	0...255	-	-	-	
	0x05	FlagSP2TP2	-	RO	RO	1 bit	Boolean	0: SP2TP2 non taught 1...255: SP2TP2 taught	0...255	-	-	-	
0x003C	0x00	SSC1.1Param	RO	R/W	R/W	4	Record						Defines the Switch- points for Channel 1 (see par.4.5)
	0x01	SP1	RO	R/W	R/W	2	Int16	FS	-32000..32000	According to MU See Table 9	0	MU	From Specification: SP1=SP
	0x02	SP2	RO	R/W	R/W	2	Int16	0	-32000..32000	According to MU See Table 9	0	MU	"High" SP2=SP "Low"
0x003D	0x00	SSC1.1Config	RO	R/W	R/W	4	Record						Defines the config- uration of Channel 1.1 (see par. 4.5)
	0x01	Logic	RO	R/W	R/W	1	UInt8	0x00: High active 0x01: Low active	0...1	-	-	-	
	0x02	Mode	RO	R/W	R/W	1	UInt8	0x00: Deactivated 0x01: single point 0x02: window 0x03: two point	0...3	-	-	-	
	0x03	Hyst	RO	R/W	R/W	2	Int16	0x0000: no hysteresis Other values: hysteresis in pressure unit	0...10%FS	According to MU See Table 9	0	MU	
0x003E	0	SSC1.2Param	RO	R/W	R/W	4	Record						Defines the Switch- points for Channel 1.2 (See par. 4.5)

Index	Sub Index	Object Name	Access			Length	Data Type	VALUE (exam- ple)	Value Range	Gradient	Offset	Unit	Description
			U	M	S								
	0x01	SP1	RO	R/W	R/W	2	Int16	FS	-32000..32000	According to MU See Table 9	0	MU	From Specification: SP1=SP
	0x02	SP2	RO	R/W	R/W	2	Int16	0	-32000..32000	According to MU See Table 9	0	MU	"High" SP2=SP "Low"
0x003F	0x00	SSC1.2Config	RO	R/W	R/W	4	Record						Defines the configuration of Channel1.2 (See par. 4.5)
	0x01	Logic	RO	R/W	R/W	1	UInt8	0x00: High active 0x01: Low active	0...1	-	-	-	
	0x02	Mode	RO	R/W	R/W	1	UInt8	0x00: Deacti- vated 0x01: single point 0x02: window 0x03: two point	0...3	-	-	-	
	0x03	Hyst	RO	R/W	R/W	2	Int16	0x0000: no hysteresis Other values: hysteresis in pressure unit	0...10%FS	According to MU See Table 9	0	MU	

U=User, M=Maintenance, S=Specialist

MU = measure unit

**Table 8** Teach-in state

Value	Description
0	IDLE
1	Set point 1 OK
2	Set point 2 OK
3	Set point 1 and 2 OK
4	WAIT
5	BUSY
7	ERROR

**Table 9** Gradient and Display format for data in pressure unit

Sensor ordered in BAR unit		
1 decimal digit*	gradient	0.1
	Display format	Dec.1
2 decimal digits*	gradient	0.01
	Display format	Dec.2
Sensore ordered in PSI unit		
0 decimal digits*	gradient	1
	Display format	Dec.0
1 decimal digit *	gradient	0.1
	Display format	Dec.1
Sensor ordered in MPa unit		
2 decimal digits*	gradient	0.01
	Display format	Dec.2
3 decimal digits*	gradient	0.001
	Display format	Dec.3

\*See paragraph "4.3. Process Data mapping (IO-Link)"

• Device parameters – Extended Index

Index	Sub Index	Object Name	Access			Length	Data Type	VALUE (example)	Value Range	Gradient	Offset	Unit	Description
			U	M	S								
0x0100	0x00	Calibration Date	RO	RO	RO	8	String	20190825	-	-	-	Calibration date (yyyymm- mdd)	
0x0103	0x00	Lin error (%FS)	RO	RO	RO	1	Int8	25	1...100	0,01	0	%	Linearity error at factory in %FS
0x0104	0x00	Zero calibration	RO	RO	RO	1	Int16	0	-32768..32767	According to MU See Table 9	0	MU	Zero calibration value at factory in MU
0x0105	0x00	Span calibration	RO	RO	RO	1	UInt16	FS	0...65535	According to MU See Table 9	0	MU	Span calibration value at factory in MU
0x0107	0x00	PressurePeaksCounterTh	RO	R/W	R/W	1	Int16	1000	-32000..32000	1	0	MU	Pressure peaks counter threshold in MU
0x0108	0x00	UseAutozeroCorrection	RO	R/W	R/W	1	Boolean	0: off 1...255: on (default)	0...255	-	-	-	Enable/disable autozero correction
0x010B	0x00	FullScaleValue	RO	RO	RO	2	UInt16	FS	0...FS	According to MU See Table 9	0	MU	Factory full scale value, expresses in MU
0x010C	0x00	OperatingTimeCounter	RO	RO	RO	4	UInt32	0	0...4294967295	0,1	0	h	Operating hours, stored in non volatile memory
0x010D	0x00	OperatingTimeInPressureCounter	RO	RO	RO	4	UInt32	0	0...4294967295	0,1	0	h	Operating hours since Pressure > 2%FS, stored in non volatile memory
0x010E	0x00	PressurePeaksCounter	RO	RO	RO	4	UInt32	0	0...4294967295	1	0	-	Count of times pressure goes above PeakPressureThreshold
0x010F	0x00	PressureMaxValue	RO	RO	RO	2	Int16	0	-32768..32767	According to MU See Table 9	0	MU	Max value registered, stored in non volatile memory
0x0112	0x00	TemperatureMaxValue***	RO	RO	RO	2	Int16	1000	-32768...32767	0,1	0	°C	Temperature max value registered, stored in non volatile memory
0x0115	0x00	Special Execution Tag	RO	RO	RO		String	1AA	-	-	-	-	String for special execution versions
0x0116	0x00	AutozeroCorrection	RO	RO	RO	2	Int16	0	-32768...32767	According to MU See Table 9	0	MU	Actual zero Offset value. Useful to monitor the “zero drifting” in time.
0x0119	0x00	SSC1.1 Set Delay	RO	R/W	R/W	2	UInt16	0	0...500	0,1	0	s	SSC1.1 Delay time set (See par. 4.5)
0x011A	0x00	SSC1.1 Reset Delay	RO	R/W	R/W	2	UInt16	0	0...500	0,1	0	s	SSC1.1 Delay time reset (See par. 4.5)
0x011B	0x00	SSC1.2 Set Delay	RO	R/W	R/W	2	UInt16	0	0...500	0,1	0	s	SSC1.2 Delay time set (See par. 4.5)
0x011C	0x00	SSC1.2 Reset Delay	RO	R/W	R/W	2	UInt16	0	0...500	0,1	0	s	SSC1.2 Delay time reset (See par. 4.5)
0x011D	0x00	Temperature	RO	RO	RO	2	Int16	0	-32768...32767	1	0	°C	Temperature of electronics
0x0120	0x00	Damping filter	RO	R/W	R/W	2	UInt16	0	0...1000	0,001	0	s	Process data (pressure) filter. Limited to 1s. 0 = disabled 1 ms = not accepted
0x0129	0x00	TemperatureMinValue	RO	RO	RO	2	Int16	1000	-32768...32767	0,1	0	°C	Temperature min value registered, stored in non volatile memory
0x012B	0x00	OperatingTimeOverPressureCounter	RO	RO	RO	4	UInt32	0	0...4294967295	0,1	0	h	Operating hours since Pressure > PressurePeaksCounterTh, stored in non volatile memory
0x4080	0x00	MDC1Descr	RO	RO	RO	11	Record			-	-	-	Describes the configuration of the measuring channel (Measuring Digital Channel 1) for thel Process Data

Index	Sub Index	Object Name	Access			Length	Data Type	VALUE (example)	Value Range	Gradient	Offset	Unit	Description
			U	M	S								
	0x01	LowerValue	RO	RO	RO	4	Int32	-32000	-2147483648..2147483647	-	-	-	Minimum value of data in the Process Data
	0x02	UpperValue	RO	RO	RO	4	Int32	32000	-2147483648..2147483647	-	-	-	Maximum value of data in the Process Data
	0x03	UnitCode	RO	RO	RO	2	UInt16	1137:bar 1141:psi 1132:MPa	1137 1141 1132	-	-	-	Measure Unit Code of pressure data inside Process Data
	0x04	Scale	RO	RO	RO	1	Int8	0: coeff=1 -1: coeff=0.1 -2: coeff=0.01 -3: coeff=0.001	-3..0	-	-	-	Scale of pressure data inside Process Data

U=User, M=Maintenance, S=Specialist

MU= Measure Unit

#### 4.5. Switching signal channels (SSCm.n) configuration

The definition SSCm.n indicates the SSC 1 or SSC 2 (n) of the channel m. Since the KS-I transducer has a single channel (m=1), because the sensor data sent in the process data is the only pressure, the first SSC is defined as SSC1.1, and the second SSC is defined as SSC1.2.

The KS-I transducer offers two digital outputs (SSCs):

- Logical, inside process data (bit0 for SSC1.1 and bit1 for SSC1.2), during IO-Link mode communication
- Physical, on pin 4 of M12 connector for SSC1.2
- Physical, on pin 2 of M12 connector for SSC1.1, only in SIO mode

SSCs commute according to the overtaking (high or low) of threshold value(s) based on the main process data, that is pressure.

Logical and physical SSCs behave in the same way, according to different configuration possibilities.

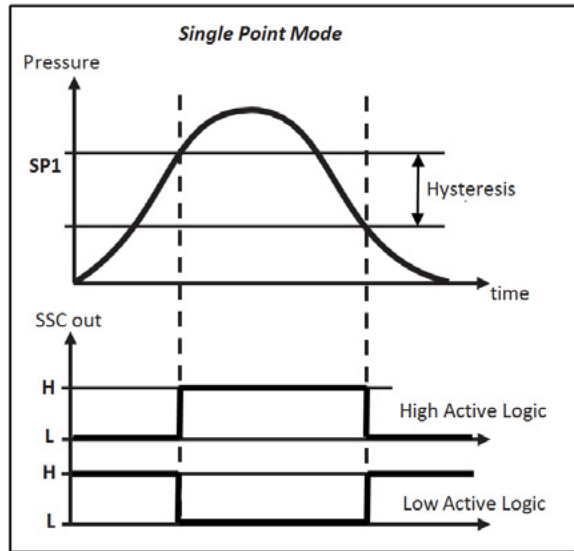
Each channel has its own sets of parameters:

- SP1: point of switch HIGH, defined in MU (it must be higher than SP2)
- SP2: point of switch LOW, defined in MU (it must be lower than SP1)
- LOGIC:
  - High Active
  - Low Active

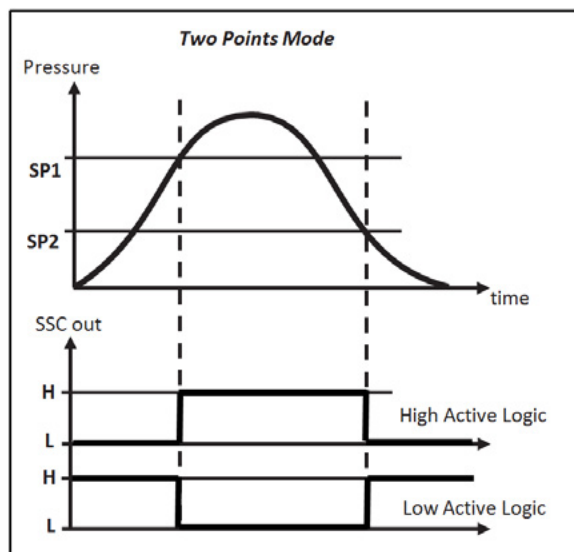
MODE:

- Deactivated: SSC is not enabled
- Single Point: only SP1 is used to determine the commutation of SSC (it's important to set Hysteresis)
- Two Point: SP1 and SP2 are used to determine commutation and contemporarily the hysteresis (no need to set parameter Hyst)
- Window: SSC commutes both during ramp up and ramp down, when pressure overtakes SP2 and SP1 threshold in both directions.
- HYST: the hysteresis, always expressed in MU, is useful for:
  - Single Point Mode: hysteresis value is all below SP
  - Window Mode: hysteresis value is half above SP, half below SP
- SET\_DELAY: filter on SSC activation; if the pressure spike/movement is faster than the time interval defined in set\_delay parameter (0,1s resolution) the SSC does not activate
- RESET\_DELAY: filter on SSC deactivation; if the pressure spike/movement is faster than the time interval defined in reset\_delay parameter (0,1s resolution) the SSC does not deactivate

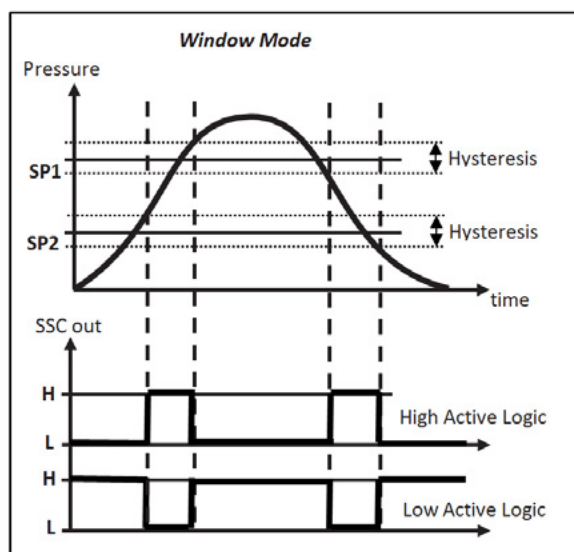
For better understanding of SSCs configurations, see following figures:



**Figure 1** Single Point Mode



**Figure 2** Two Points Mode



**Figure 3** Window Mode

SP1 and SP2 points can be set in two ways:

- through direct setting of the value of objects:
  - SSC1.1Param.SP1 (Index 0x003C, sub-index 1)
  - SSC1.1Param.SP2 (Index 0x003C, sub-index 2)

- SSC1.2Param.SP1 (Index 0x003E, sub-index 1)
- SSC1.2Param.SP2 (Index 0x003E, sub-index 2)

- through Teach-in procedure applied to SSC1.1, to SSC1.2 or both SSC1.1 and SSC1.2, using system commands 0x41 (TeachSP1) and 0x42 (Teach SP2). SSC1.1 is the default channel set for the Teach-in procedure.
- Teach-in procedure
  - 1) Connect input pressure to the transducer
  - 2) Select the SSC number (1.1/1.2/all) to which address SPs through TeachInChannel (Index 0x003A)
  - 3) Bring (Higher)the input pressure to the SP1 desired value
  - 4) Launch System command 0x41 for setting SP1 value
  - 5) Bring (Lower) the input pressure to the SP2 desired value
  - 6) Launch System command 0x42 for setting SP2 value
  - 7) Repeat procedure for the remaining channel, if needed

#### 4.6. Damping filter parameter

The Process Value, can be filtered by a digital filter with the aim of smoothing the output value in front of noise and peaks on input value.

The time duration of this filter is driven by the Damping Filter parameter (see par. 7.4 – Device parameters - index 0x0120); its value is expressed in seconds and represents the step response time from 10% to 90% of step value.

This filter applies both to analog output and IO-Link digital value.

The value of Damping Filter can be changed under these constraints:

- It can be modified only by Specialist and Maintenance users
- It is limited in the range 2 ms ... 1s

Writing of this parameter has immediate effect on output.

Action on this parameter must be done by skilled and trained personnel.

#### 4.7. Autozero command

The Autozero command (see par 4.4, Table 2 - System command values – value 0xA0) allows the user to put to zero the offset of pressure reading of transducer due to thermal drift at working temperature.

Action on this command must be done by skilled and trained personnel, under these constraints and procedure:

- It can be acted only by Specialist and Maintenance users
- It is limited in range according to Table 3
- It must be acted at 0 barg pressure in the plant
- It cannot be acted at a time interval shorter than 20 s
- After the application of command the user shall verify the output, in order to confirm that the pressure offset has gone to zero.

Application of command has immediate effect on output.

The value of offset measured and stored by the device is visible at parameter AutozeroCorrection (see par. par. 4.4, Device parameters – Extended index – index 0x0116).

With Specialist and Maintenance credentials the Autozero effect can be cancelled (reset) through the Autozero Reset command (see par. 4.4, Table 2 - System command values – value 0xA1).

With Specialist and Maintenance credentials The Autozero effect can also be disabled through the UseAutozeroCorrection parameter (see par. 4.4, - Device parameters – Extended index – index 0x0108).



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