POSICON positioning function

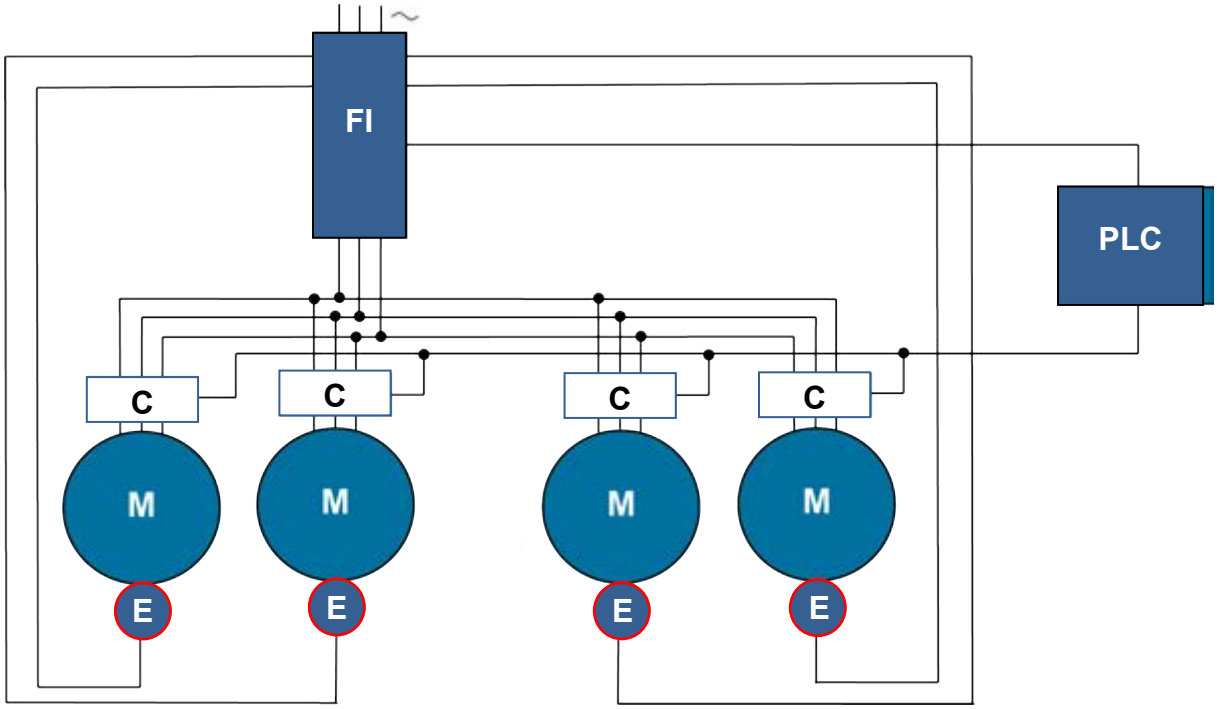
All NORDAC *PRO*, SK 500P inverters are equipped with the POSICON functionality. Position control of the drive can be implemented with a directly connected position measurement system (e.g. incremental encoders, absolute encoders).

Depending on the configuration, up to five different encoders can be connected. By switching the parameter sets, these can sequentially control four motors via the frequency inverter.

The following must be noted:

- The frequency inverter must be equipped with connection terminals for each motor.
- Parallel operation of different types of motor is not permissible.
- Parallel operation of several identical motors is only possible without control and without position control. The connected powers are added together and must not exceed the rated power of the frequency inverter.
- Sequential operation of up to four controlled motors (including position control) is possible. This is subject to the following conditions:
  - Each motor is connected to the frequency inverter via a separate circuit breaker.
  - Only one circuit breaker is closed at a given time, i.e. only one motor is controlled.
  - Switching from one motor to another (opening and closing of the circuit breaker) may only be carried out when there is no voltage present at the motor connection terminals of the frequency inverter, i.e. the frequency inverter runs down or is in the state "ready for switch-on".
  - A higher level control system controls the frequency inverter and the circuit breakers, and evaluates the feedback.
  - Optionally the PLC can evaluate the signals from all connected encoders in order to implement monitoring of the motors which have been shut down.

FI= Frequency inverter, PLC = Higher level control system, M = Motor, E = Encoder, C = Motor circuit breaker



1 Validity of document

The following information applies to NORDAC *PRO*, SK 500P series frequency inverters. Basic and further information about frequency inverters can be found in the following documents:

- BU 0600, Issue 2319 (Part No.: 6076001): NORDAC *PRO* SK 500P series
- BU 0510, Issue 4816 (Part. No.: 6075101): POSICON position control, supplementary instructions for the SK 500E series

2 Installation

Each frequency inverter is equipped with a CANopen interface and an interface to which an HTL encoder can be connected. For position control, both interfaces can be independently selected in the various parameter sets of the frequency inverter, and can therefore be assigned to two different drive axes.

With SK 530P and higher, an interface is available for connection of a TTL encoder. This can be assigned to a third, independent drive axis and can also be selected by switching the parameter set.

An optional SK CU5-ENC or SK CU5-MLT module extends the frequency inverter (SK 530P and higher) with a fourth and fifth encoder interface (SIN/COS, EnDat, Hiperface, SSI or BISS). By switching the parameter set, position control of up to four independent drive axes can be implemented with a single frequency inverter.

2.1 Installation of an SK CU5-... customer unit

DANGER

Danger of electric shock

The frequency inverter has a hazardous voltage for up to 5 minutes after it has been switched off.

- Only carry out work when the frequency inverter has been disconnected and at least 5 minutes have elapsed since the mains was switched off!

Installation must be carried out as follows:

1. Switch off the mains voltage, observe the waiting period.
2. Push the control terminal cover down or remove.
3. Remove the blank cover by activating the release mechanism at the lower edge and removing it with an upward rotating movement.
4. Hook the customer unit onto the upper edge and press in lightly until it engages. Take care that the connector strip makes proper contact.
5. Close the control terminal cover.

Remove the control terminals and blank cover.

Install the SK CU5-... customer unit.

Install the control terminals and blank cover.

2.2 Electrical connection

Electrical connection of the position measurement system is made via connection terminals.

On the frequency inverter

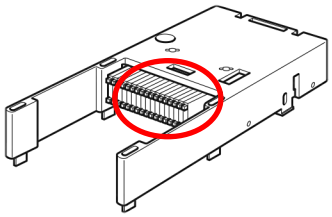
X15 – CANopen

X13 – TTL
(SK 530P and higher)

X11 – HTL
(via digital inputs)

Note: The illustrations show special configurations.

On the option module SK CU5-ENC or SK CU5-MLT



X22: Universal encoder interface (SIN/COS, Hiperface, EnDat, SSI, BISS)

2.2.1 Connection terminal details

TTL encoder interface (on board) (SK 530P and higher)

Connection X13	Designation	No.	Description
	24V	43	24 V power supply
	GND	40	Reference potential for digital signals, 0 V
	A+	51	Track A
	A-	52	Track A inverse
	B+	53	Track B
	B-	54	Track B inverse
Connection X11	**Designation**	**No.**	**Description**
	DI5	25	Digital input 5

HTL encoder interface (on board)

Connection X11	Designation	No.	Description
	DI1	21	Digital input 1
	DI2	22	Digital input 2
	DI3	23	Digital input 3, Track A/ B
	DI4	24	Digital input 4, Track A/ B
	DI5	25	Digital input 5
	24V	43	24 V power supply
	GND	40	Reference potential for digital signals, 0 V digital
	5V	41	5 V power supply
Connection X12	**Designation**	**No.**	**Description**
	DI6	26	Digital input 6

CANopen encoder interface (on board)

Connection X15	Designation	No.	Description
	SHD	90	Shielding
	GND	40	Reference potential for digital signals, 0 V
	CAN-	76	CAN_L
	CAN+	75	CAN_H

Universal encoder interface (SK CU5-ENC plug-in customer unit)

This option module can only be used in combination with an SK 530P or higher frequency inverter.

The appropriate contacts must be used depending on the position measurement system which is used.

Connection X21	Designation	No.	Description
	CLK+	63	CLK signal for BISS-/SSI-/EnDat encoder
	CLK-	64	CLK signal for BISS-/SSI-/EnDat encoder
	DAT+/RS485+	65	Data signal DAT+ for BISS-/SSI-/EnDat encoder, RS485+ Hiperface
	DAT-/ RS485-	66	Data signal DAT- for BISS-/SSI-/EnDat encoder, RS485- Hiperface
	A+ / SIN+	57	Track A+ incremental encoder SIN+ from Hiperface or SIN/COS encoder
	A- / SIN-	58	Track A incremental encoder SIN+ from Hiperface or SIN/COS encoder
	B+ / COS+	59	Track B+ incremental encoder COS+ from Hiperface or SIN/COS encoder
	B- / COS-	60	Track B- incremental encoder COS- from Hiperface or SIN/COS encoder
	Z+	61	Zero track Z+ incremental encoder
	Z-	62	Zero track Z- incremental encoder
	VO_12V	49	Encoder supply max. 80 mA
	VO_0V	40	Reference potential for encoder

Universal encoder interface (SK CU5-MLT plug-in customer unit)

SK CU5-MLT contains all connections from X21 including the following digital inputs and outputs:

Connection X22	Designation	No.	Description
	VO_24V	43	Initiator supply (maximum 200 mA)
	VO_0V	40	Reference potential for I/O
	DIO1	30	Digital input 7 or digital output 3
	DIO2	31	Digital input 8 or digital output 4
	DIO3	32	Digital input 9 or digital output 5
	DIO4	33	Digital input 10 or digital output 6

3 Colours and contact assignment

Incremental encoders

Function	Wire colours	Signal type TTL			Signal type HTL	
		Encoder 1	Encoder 2			
10 … 30 V supply	Brown / Green	**X13: 43**	**X21: 49**	24V	**X11: 43**	24V
0 V supply	White / Green	**X13: 40**	**X21: 40**	GND/0V	**X11: 40**	GND/0V
Track A	Brown	**X13: 51**	**X21: 57**	ENC A+	**X11: 23**	DI3
Track A inverse	Green	**X13: 52**	**X21: 58**	ENC A-	–	–
Track B	Grey	**X13: 53**	**X22: 59**	ENC B+	**X11: 24**	DI4
Track B inverse	Pink	**X13: 54**	**X21: 60**	ENC B-	–	–
Track 0	Red	**X11: 25**	**X21: 61**	DI5/Z+	**X11: 21/22/25** **X12: 26**	DI1, DI2, DI5 DI6
Cable shield	Connect to a large area of the frequency inverter housing or shielding bracket					

Sin-/Cos encoders

Function	Wire colours	Sin-/Cos	
10 … 30 V supply	Brown	**X21: 49**	VO_12V
0 V supply	White	**X21: 40**	VO_0V
Track A	Green	**X21: 57**	A+/SIN+
Track A inverse	Yellow	**X21: 58**	A-/SIN-
Track B	Grey	**X21: 59**	B+/COS+
Track B inverse	Pink	**X21: 60**	B-/COS-
Track 0	Red	**X21: 61**	Z+/RES+
Track 0 inverse	Black	**X21: 62**	Z-/RES-
Cable shield	Connect to a large area of the frequency inverter housing or shielding bracket		

Hiperface encoder

Function	Wire colours	Hiperface	
7 … 12 V supply	Red	**X21: 49**	VO_12V
0 V supply	Blue	**X21: 40**	VO_0V
+ SIN	White	**X21: 57**	A+/SIN+
REFSIN	Brown	**X21: 58**	A-/SIN-
+ COS	Pink	**X21: 59**	B+/COS+
REFCOS	Black	**X21: 60**	B-/COS-
Data + (RS485)	Grey or Yellow	**X21: 65**	DAT+/RS485+
Data - (RS485)	Green or Violet	**X21: 66**	DAT-/RS485-
Cable shield	Connect to a large area of the frequency inverter housing or shielding bracket		

EnDat encoders

Function	Wire colours [1]	EnDat	
Supply (3.6 … 14 V) [2]	Brown / Green	**X21: 49**	VO_12V
Sensor U_B	Blue	**X21: 49**	VO_12V
0 V supply	White / Green	**X21: 40**	VO_0V
Sensor 0 V	White	**X21: 40**	VO_0V
Track A [3]	Green / Black	**X21: 57**	A+/SIN+
Track A inverse [3]	Yellow / Black	**X21: 58**	A-/SIN-
Track 3 [3]	Blue / Black	**X21: 59**	B+/COS+
Track B inverse [3]	Red / Black	**X21: 60**	B-/COS-
Takt +	Violet	**X21: 63**	CLK+
Takt -	Yellow	**X21: 64**	CLK-
Data + (RS485)	Grey	**X21: 65**	DAT+/RS485+
Data - (RS485)	Pink	**X21: 66**	DAT-/RS485-
Cable shield	Connect to a large area of the frequency inverter housing or shielding bracket		

[1] Colour example depending on manufacturer. Other colours are possible.

[2] Voltage range depending on the type of encoder.

[3] Optionally available depending on the type of encoder.

SSI encoders

Function	Wire colours [1]	SSI	
Supply (10 … 30 V)	Brown	**X21: 49**	VO_12V
Sensor U_B	Red	**X21: 49**	VO_12V
0 V supply	White	**X21: 40**	VO_0V
Sensor 0 V	Blue	**X21: 40**	VO_0V
Takt +	Green	**X21: 63**	CLK+
Takt -	Yellow	**X21: 64**	CLK-
Data + (RS485)	Grey	**X21: 65**	DAT+/RS485+
Data - (RS485)	Pink	**X21: 66**	DAT-/RS485-
Cable shield	Connect to a large area of the frequency inverter housing or shielding bracket		

[1] Colour example depending on manufacturer. Other colours are possible.

BISS encoders

Function	Wire colours [1]	BISS	
Supply (10 … 30 V)	Brown	**X21: 49**	VO_12V
0 V supply	White	**X21: 40**	VO_0V
Track A [2]	Black	**X21: 57**	A+/SIN+
Track A inverse [2]	Violet	**X21: 58**	A-/SIN-
Track 2 [3]	Grey / Pink	**X21: 59**	B+/COS+
Track B inverse [2]	Red / Blue	**X21: 60**	B-/COS-
Takt +	Green	**X21: 63**	CLK+
Takt -	Yellow	**X21: 64**	CLK-
Data + (RS485)	Grey	**X21: 65**	DAT+/RS485+
Data - (RS485)	Pink	**X21: 66**	DAT-/RS485-
Cable shield	Connect to a large area of the frequency inverter housing or shielding bracket		

[1] Colour example depending on manufacturer. Other colours are possible.

[2] Optionally available depending on the type of encoder.

4 Commissioning

1. Connect the encoder
2. Commission the encoder by changing the parameters. For this, make the necessary settings for each axis in the relevant parameter set.

Step		Interface / position measurement system (encoder)					
		Incremental		Absolute	Universal		
		HTL	TTL	CANopen	SIN/COS	SSI/ BISS	Endat/ Hiperface
1	Contact assignment	P420 [-01] … [-06]	P420 [-05] DIN5 TTL Zero track	–	–		
2	Selection of the position measurement system	P604					
3	Resolution	P301 [-02]	P301 [-01]	P605 [-01, -02]	P301 [-03]	P605 [-03, -04]	
4	Position detection Linear / Modulo	P619 [-02]	P619 [-01]	P621 [-01]	P619 [-03]	P621 [-02]	
5	Additional settings	–	–	P514, P515 [-1]	–	P617, (P622)	–
6	Speed ratio Speed ratio	P607 [-02]	P607 [-01]	P607 [-04]	P607 [-03]	P607 [-05]	
	Speed reduction ratio	P608 [-02]	P608 [-01]	P608 [-04]	P608 [-03]	P608 [-05]	
8	Check the direction of rotation, resolution and speed ratio	P660 [-02], P583	P660 [-01], P583	P660 [-04], P583	P660 [-03], P583	P660 [-05], P583	
8	Setpoint processing (source and type)	P610					
9	Overflow point (only for modulo)	P620 [-02]	P620 [-01]	P620 [-04]	P620 [-03]	-	-
10	Reference the encoder	see BU0510					
11	Define the offset	P609 [-02]	P609 [-01]	P609 [-04]	P609 [-03]	P609 [-05]	
12	Define the limits	P612 / P615 / P616					
13	Define the target position	P613					
14	Define the reference point run	P623 / P624					
15	Monitoring etc.	P625, P626, P630 et seq.					

5 Parameters

P001	Selection of display value		
Description	Selection of the operating display of a ControlBox / SimpleBox with 7-segment display.		
Setting values	**Value**	**Meaning**	
	0	Actual frequency	Present supplied output frequency
	16	Position setpoint	Setpoint position
	17	Actual position	Present actual position (actual position)
	50	TTL actual position	Actual position from TTL incremental encoder
	51	CANopen actual position	Actual position from CANopen absolute encoder
	52	Act. pos. diff.	Actual position difference between setpoint and actual position
	53	Act. pos. diff. Abs/Inc	Actual position difference between absolute and incremental encoder (see also **P631**)
	54	Act. pos. diff. Cal./Meas.	Actual position difference between the calculated and measured value of an encoder (see also **P630**)
	55	Pos. act. Univ. encoder	Actual position from universal encoder
	56	HTL actual position	Actual position from HTL incremental encoder
	57	Actual position Sin/Cos	Actual position from Sin/Cos encoder
	58	Actual position Resolver	Actual position from resolver

P301	Encoder resolution		
Setting range	0 … 27		
Arrays	[-01] = TTL	[-02] = HTL	[-03] = Sin/Cos
Factory setting	{ 6 }	{ 3 }	{ 5 }
Description	"*Encoder resolution*". Input of the pulse-count per rotation of the connected encoder. If the direction of rotation of the encoder is not the same as the FI, (depending on installation and wiring), this can be compensated by selecting the corresponding negative pulse numbers.		
Note	P301 is also significant for position control via incremental encoders. If an incremental encoder is used for positioning (P604=1), the setting of the pulse number is made here (see supplementary POSICON manual).		
Setting values	**Value**	**Value**	

0	500 pulses	8	-500 pulses
1	512 pulses	9	-512 pulses
2	1000 pulses	10	-1000 pulses
3	1024 pulses	11	-1024 pulses
4	2000 pulses	12	-2000 pulses
5	2048 pulses	13	-2048 pulses
6	4096 pulses	14	-4096 pulses
7	5000 pulses	15	-5000 pulses
		16	-8192 pulses
17	8192 pulses		
18	16 pulses	23	-16 pulses
19	32 pulses	24	-32 pulses
20	64 pulses	25	-64 pulses
21	128 pulses	26	-128 pulses
22	256 pulses	27	-256 pulses

P400	Function Analogue input		P
Setting range	0 … 58		
Arrays	[-01] = Analogue input 1	Analogue input 1 (AI1) integrated into the FI	
	[-02] = Analogue input 2	Analogue input 2 (AI2) integrated into the FI	
	[-03] = Ext. analogue input 1	*"External analogue input 1".* Analogue input 1 of the first IO extension	
	[-04] = Ext. analogue input 2	*"External analogue input 2".* Analogue input 2 of the first IO extension	
	[-05] = Ext. A. in.1 2.IOE	*"External analogue input 1 of the 2nd IOE".* Analogue input 1 of the second I/O extension	
	[-06] = Ext. A. in.1 2.IOE	*"External analogue input 2 of the 2nd IOE".* Analogue input 2 of the second I/O extension	
	[-07] = Reserved		
	[-08] = Reserved		
	[-09] = Clock input 1		
Scope of Application	**[-01] … [-02] SK 500P and higher**		
	[-03] … [-09] SK 530P and higher		
Factory setting	[-01] = { 1 } all other { 0 }		
Description	"*Analogue input function*". Assignment of analogue functions to internal analogue inputs or the analogue inputs of optional modules.		
Note	The analogue inputs of the frequency inverter (analogue inputs 1 and 2) can alternatively be parameterised to digital functions (see P420 [-13] or [-14]). To avoid misinterpretation of the signals, the analogue functions can then be connected to the relevant inputs (P400 [-01] or [-02])		

Setting values

Value	Function	Description
0	Off	The input is not used.
47	Gear ratio factor	Gearing ratio. Setting of the gearing ratio between the master and the slave
58	Set position	Within the limits of **P615** and **P616**, the set position can be specified via the analogue input. **P610** must be set to "Aux. setpoint source". In this case, monitoring of the position for minimum and maximum position is not performed.

P418	Function Analogue output		P
Setting range	0 ... 60		
Arrays	[-01] = Analogue output 1	Analogue output (AO) integrated into the FI	
	[-02] = Reserved		
	[-03] = First IOE	*"External analogue output of first IOE".* Analogue input of the first IO extension	
	[-04] = Second IOE	*"External analogue output of second IOE":* Analogue output of the first IO extension	
Scope of Application	**[-01] SK 500P and higher**		
	[-02] … [-04] SK 530P and higher		
Factory setting	all { 0 }		
Description	"*Analogue output function*".(max. load: 5 mA analogue, 20 mA digital): An analogue voltage (0 ... +10 Volt) can be obtained at the control terminals (max. 5 mA). Various functions are available, whereby: 0 Volt analogue voltage always corresponds to 0 % of the selected value. 10 V analogue voltage always corresponds to the nominal values for the motor (unless otherwise stated) multiplied by the P419 standardisation factor, e.g.: $\Rightarrow 10\ V = \frac{\text{Nominal motor speed} \cdot P419}{100\ \%}$		

Setting values

Value	Function	Description
0	Off	The output is not used.
29	Actual position	Within the limits of **P615** and **P616** the analogue output indicates the actual position.
34	Reference	Digital functions, for explanation see parameter **P434**
35	Position reached	
36	Comparative position	
37	Comparative position value	
38	Position array value	
39	Comparative position reached	
40	Comparative position value reached	

P420	Digital inputs				
Setting range	0 … 84				
Arrays	[-01] = Digital input 1	Digital input 1 (DI1) integrated into the FI			
	[-02] = Digital input 2	Digital input 2 (DI2) integrated into the FI			
	[-03] = Digital input 3	Digital input 3 (DI3) integrated into the FI			
	[-04] = Digital input 4	Digital input 4 (DI4) integrated into the FI			
	[-05] = Digital input 5	Digital input 5 (DI5) integrated into the FI			
	[-06] = Digital input 6	Digital input 6 (DI6) integrated into the FI			
	[-07] = Digital input 7	Digital input 7 (DI7) integrated into SK CU5			
	[-08] = Digital input 8	Digital input 8 (DI8) integrated into SK CU5			
	[-09] = Digital input 9	Digital input 9 (DI9) integrated into SK CU5			
	[-10] = Digital input 10	Digital input 10 (DI10) integrated into SK CU5			
	[-11] = Reserved				
	[-12] = Reserved				
	[-13] = Digital function Analogue1	Analogue input 1 (AI1) (digital function) integrated into the FI			
	[-14] = Digital function Analogue2	Analogue input 2 (AI2) (digital function) integrated into the FI			
Scope of Application	**[-01] … [-05] SK 500P and higher**				
	[-06] … [-12] SK 530P and higher				
	[-13] … [-14] SK 500P and higher				
Factory setting	[-01] = { 1 }	[-02] = { 2 }	[-03] = { 8 }	[-04] = { 4 }	all other { 0 }
Description	"*Digital input functions*". Up to 14 inputs which can be freely programmed with digital functions are available.				
Note	Analogue inputs 1 and 2 of the Fi do not comply with EN61131-2 (Type 1 digital inputs).				
	Alternatively, digital inputs 7 – 10 can also be used as digital outputs 3 - 6 (see P434). For these IOs it is advisable to parameterise either an input function or an output function. However, if an input function and an output function are parameterised, a High signal from the output function will result in activation of the input function. This IO connection is hence used as a kind of "flag".				

Setting values	Value	Function	Description	Signal

0	Off	The input is not used.	
22	Reference point run	Start of reference point run	High
23	Reference point	Reference point reached	High
24	Teach-in	Start of Teach-in function	High
25	Quit – Teach-in	Saving of the actual position	Flank 0→1
55	Bit 0 PosArr / Inc	Bit 0 Position array / Position increment array	High
56	Bit 1 PosArr / Inc	Bit 1 Position array / Position increment array	High
57	Bit 2 PosArr / Inc	Bit 2 Position array / Position increment array	High
58	Bit 3 PosArr / Inc	Bit 3 Position array / Position increment array	High
59	Bit 4 PosArr / Inc	Bit 4 Position array / Position increment array	High
60	Bit 5 PosArr / Inc	Bit 5 Position array / Position increment array	High
61	Reset position	Reset of the actual position	Flank 0→1
62	Sync. Position array	Adoption of a preset position	Flank 0→1
63	Synchronous operation OFF	With function **P610** = 2 "Synchronous operation", synchronous operation is interrupted, however the drive unit remains in position control mode. The position setpoint (**P602**) of the master drive is reset with the 0→1 flank. The drive moves back to position "0" or to the position which is saved in the position offset (**P609**) and remains in this position.	High
		With function **P610** = 5 "Flying Saw", the slave returns to its starting position and remains there until the next "Start Flying Saw" command. A new start command is only accepted if the slave has reached its starting position. The position setpoint (**P602**) of the master drive is reset with the 0→1 flank.	Flank 0→1
64	Start Flying Saw	Start command for synchronisation of the slave drive with the master.	Flank 0→1
77	Stop Flying Saw	The "Flying Saw" function is interrupted.	Flank 0→1
78	Trig. remaining path	With function **P610** = 10 "Remaining path positioning" the drive unit switches to position control and moves for the parameterised "Remaining path".	Flank 0→1

P434	Digital output function		P
Setting range	0 … 59		
Arrays	[-01] = Binary output 1 / MFR1	Multi-function relay 1 (K1) integrated into the FI	
	[-02] = Binary output 2 / MFR2	Multi-function relay 2 (K2) integrated into the FI	
	[-03] = Digital output 1	Digital output 1 (DO1) integrated into the FI	
	[-04] = Digital output 2	Digital output 2 (DO2) integrated into the FI	
	[-05] = Digital output 3	Digital output 3 (DO3) integrated into SK CU5	
	[-06] = Digital output 4	Digital output 4 (DO4) integrated into SK CU5	
	[-07] = Digital output 5	Digital output 5 (DO5) integrated into SK CU5	
	[-08] = Digital output 6	Digital output 6 (DO6) integrated into SK CU5	
	[-09] = Digital function Analogue1	Digital output 1 (AO1) (digital function) integrated into the FI	
	[-10] = Reserved		
Scope of Application	**[-01] … [-02] SK 500P and higher**		
	[-03] … [-08] SK 530P and higher		
	[-09] … [-10] SK 500P and higher		
Factory setting	[-01] = { 1 } [-02] = { 7 } all other { 0 }		
Description	"*Digital output function*". Up to 10 outputs (2 of which are relays) are available. These can be freely programmed with digital functions. These can be seen in the following table.		
Note	With settings 3 to 5 and 11 the two relays (K1, K2) work with 10 % hysteresis, i.e. the relay contact closes (setting 11: opens) on reaching the limiting value and opens (setting 11: closes) if a 10 % lower value is undershot. This behaviour can be inverted with a negative value in P435.		
	Alternatively, digital outputs 3 – 6 can also be used as digital inputs 7 - 10 (see P420). For these IOs it is advisable to parameterise either an input function or an output function. However, if an input function and an output function are parameterised, a High signal from the output function will result in activation of the input function. This IO connection is hence used as a kind of "flag".		

Setting values

Value	Function	Description	Signal
0	Off	The output is not used.	
20	Reference	Reference point is available / has been saved	
21	Position reached	Set position has been reached	
22	Comparative position	Position value in **P626** has been reached	
23	Comparative position value	Position value in **P626** (without consideration of sign) has been reached.	
24	Position array value	A value set in **P613** has been reached or exceeded.	
25	Comparative position reached	Comparative position has been reached, as for 22, however with consideration of **P625**	
26	Comparative position value reached	Comparative position value has been reached, as for 23, however with consideration of **P625**	
27	Flying Saw Synchronisation	The slave drive has completed the start phase of the "Flying Saw" function and is now synchronised with the master axis.	

P543	Bus actual value				S	P
Setting range	0 … 57					
Arrays	[-01] = Actual bus value 1	[-02] = Actual bus value 2	[-03] = Actual bus value 3			
	[-04] = Actual bus value 4	[-05] = Actual bus value 5				
Factory setting	[-01] = { 1 }	[-02] = { 4 }	[-03] = { 9 }	[-04] = { 0 }	[-05] = { 0 }	
Description	Setting of the return values for bus control.					
Setting values	**Value / Meaning**					

0	Off	The guide value is not used.
6	Actual position Low word	Lower 16-bit value of the set position (absolute position) of the frequency inverter
7	Set position Low word	Lower 16-bit value of the set position (absolute position) of the frequency inverter
10	Actual position Inc.Low word	Lower 16-bit value of the actual position (relative position) of the frequency inverter
11	Set pos. Inc.Low word	Lower 16-bit value of the set position (relative position) of the frequency inverter
13	Actual position High word	Upper 16-bit value of the actual position (absolute position) of the frequency inverter
14	Set position High word	Upper 16-bit value of the set position (absolute position) of the frequency inverter
15	Actual position inc. High word	Upper 16-bit value of the actual position (relative position) of the frequency inverter
16	Setpoint pos. inc. High word	Upper 16-bit value of the set position (relative position) of the frequency inverter

P546	Function Bus setpoint				S	P
Setting range	0 … 57					
Arrays	[-01] = Bus setpoint 1	[-02] = Bus setpoint 2	[-03] = Bus setpoint 3			
	[-04] = Bus setpoint 4	[-05] = Bus setpoint 5				
Factory setting	[-01] = { 1 }	all other { 0 }				
Description	Assignment of a function to a bus setpoint value.					
Setting values	**Value**	**Meaning**	**Value**	**Meaning**		

58	Analog setpoint (%)

P583	Motor phase sequence	S	P
Setting range	0 … 2		
Factory setting	{ 0 }		
Description	The sequence for controlling the motor phases (U – V – W) can be changed with this parameter. This enables the direction of rotation of the motor to be changed without having to change the motor connections.		
Note	If there is a voltage on the output terminals (U – V – W) (e.g. on enabling) the parameter setting or the parameter set may be changed by setting parameter P583. Otherwise the frequency inverter switches off with error message E016.2.		
Setting values	**Value**	**Meaning**	

0	Normal	No change
1	Inverted	*"Invert motor phase sequence"* The direction of rotation of the motor is changed. The counting direction of the encoder for speed detection (if present) remains unchanged.
2	Inverted by encoder	As for setting 1, however in addition the counting direction of the encoder is also changed.

P600	Position control		S	P
Setting range	0 … 4			
Factory setting	{ 0 }			
Description	Enabling the position control.			
Note	Details 🕮 Section			
Setting values	Value	Meaning		
	0	Off	Positioning control is disabled	
	1	Lin. Ramp (max. freq.)	Position control is active with a linear ramp and maximum frequency	
	2	Lin.ramp(setp.freq.)	Position control is active with a linear ramp and setpoint frequency	
	3	S-ramp (max. freq.)	Position control is active with an S ramp and maximum frequency	
	4	S-ramp (set freq.)	Position control is active with an S ramp and setpoint frequency	

P601	Actual position
Display range	- 50000,000 … 50000,000 rev.
Description	Display of the actual position.

P602	Actual setpoint position
Display range	- 50000,000 … 50000,000 rev.
Description	Display of the actual setpoint position.

P603	Act. position diff.	S
Display range	- 50000,000 … 50000,000 rev.	
Description	Display of the actual difference between the set position and the actual position.	

P604	Position measurement system		S	P
Setting range	0 … 8			
Factory setting	SK 500P / SK 510P	= { 0 }		
	SK 530P / SK 550P	= { 1 }		
Description	Selection of the encoder used to detect the position (actual position).			
Note	Only one multiturn encoder (setting 4 – 7) may be parameterised simultaneously in one of the 4 parameter sets. Otherwise the frequency inverter goes into fault state (**E25.5**).			
	Before activating an absolute encoder via parameter **P604** it is essential to set the resolution of the absolute encoder in parameter **P605**. Also refer to the information in **P605**.			

Setting values

Value		Meaning
0	TTL incremental [1]	Position detection with incremental encoder (TTL)
1	HTL incremental	Position detection with incremental encoder (HTL)
2	Sin/Cos incremental [2]	Position detection with incremental encoder (Sin/Cos)
3	CANopen	Position detection with absolute encoder (CANopen)
4	SSI [2]	Position detection with absolute encoder (SSI)
5	BISS [2]	Position detection with absolute encoder (BISS)
6	Hiperface [2]	Position detection with absolute encoder (Hiperface)
7	Endat [2]	Position detection with absolute encoder (Endat)
5	Resolver [3]	Absolute encoder (Resolver)

1) SK 530P and higher
2) Only with option SK CU5-ENC, SK CU5-MLT, SK CU5-RES
3) Only with option SK CU5-RES

P605	Absolute encoder		S
Setting range	0 … 24 Bit		
Arrays	[-01] = CANopen Multiturn	Number of possible encoder rotations of a CANopen absolute encoder.	
	[-02] = CANopen Singleturn	Resolution per rotation of the CANopen absolute encoder.	
	[-03] = Universal Multiturn	Number of possible encoder rotations of an absolute encoder which is connected to the universal encoder interface.	
	[-04] = Universal Singleturn	Number of possible encoder rotations of an absolute encoder which is connected to the universal encoder interface.	
Factory setting	[-01], [-02] = { 10 }	[-03] = { 12 }	[-04] = { 13 }
Description	Setting the resolution of the absolute encoder.		
Note	If a singleturn encoder is used, the value "0" must be parameterised accordingly in Array [-01] or [-03].		
	Before activating the absolute encoder (**P604**) the resolution of the absolute encoder must be correctly set in **P605**. Otherwise, the values entered in parameter **P605** may be transferred to the absolute encoder.		

Setting values

Conversion of encoder resolution (Bit value → decimal value):

Setting [Bit]	0	1	2	3	4	5	6	7	8	9	10	11	12	…
Resolution	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	…

Example

– Absolute encoder with 12-bit single-turn resolution:
  P605 [-01] = 0
  P605 [-02] = 12

– Absolute encoder with 24-bit resolution, of which 12-bit single-turn resolution:
  P605 [-01] = 12
  P605 [-02] = 12

P607	Speed ratio	S
Setting range	- 2 000 000 … 2 000 000	
Arrays	[-01] = TTL encoder [-02] = HTL encoder [-03] = Sin/Cos encoder [-04] = CANopen encoder [-05] = Universal encoder, (SSI, BISS, EnDat and Hiperface) [-06] = Resolver [-07] = Setpoints and actual values [-08] = Synchronous running	
Factory setting	{ all 1 }	
Description	Speed ratio set-up. (📖 Section)	
Note	If the encoder is not mounted on the motor shaft, the speed ratio (i) between the motor shaft and the drive shaft on which the encoder is mounted must be stated. Only integer values can be entered. Because of the speed ratio must be divided into a positive speed ratio (P607) and a negative speed ratio (P608). E.g. i=3.5 = 35 /10 → P607 = 35, P608 = 10	

P608	Reduction ratio	S
Setting range	1 … 2 000 000	
Arrays	[-01] = TTL encoder [-02] = HTL encoder [-03] = Sin/Cos encoder [-04] = CANopen encoder [-05] = Universal encoder, (SSI, BISS, EnDat and Hiperface) [-06] = Resolver [-07] = Setpoints and actual values [-08] = Synchronous running	
Factory setting	{ all 1 }	
Description	Speed reduction ratio set-up. (📖 Section)	
Note	If the encoder is not mounted on the motor shaft, the speed ratio (i) between the motor shaft and the drive shaft on which the encoder is mounted must be stated. Only integer values can be entered. Because of the speed ratio must be divided into a positive speed ratio (P607) and a negative speed ratio (P608). E.g. i=3.5 = 35 /10 → P607 = 35, P608 = 10	

P609	Offset Position	S
Setting range	- 50000.000 … 50000.000 rev.	
Arrays	[-01] = TTL encoder [-02] = HTL encoder [-03] = Sin/Cos encoder [-04] = CANopen encoder [-05] = Universal encoder, (SSI, BISS, EnDat and Hiperface) [-06] = Resolver	
Factory setting	{ all 0 }	
Description	Set-up of an offset for defining an absolute and a relative position setpoint.	

P610	Setpoint Mode	S
Setting range	0 … 10	
Factory setting	{ 0 }	
Description	Specification of setpoint position (type and source)	
Note	For detailed information see 📖 Section , .	
Setting values	**Value**	**Meaning**

0	Position Array	Specification of absolute position [1]
1	Pos. Inc. Array	Specification of relative position [1]
2	Synchronous operation	Position specification from master drive unit (note **P509**) [2]
3	Bus	… as for 0, via bus (note **P509**)
4	Bus Increment	… as for 1, via bus (note **P509**)
5	Flying saw	… as for 2, however extended with the "Flying Saw" function [2]
6	Auxiliary setpoint source	… as for 0, within the limits of P615 and P616 via analogue signal (P400 set to "Setpoint position" function)
7	Relative position increment	… as for 1, in this case the movement increment relates to the current actual position – accordingly, the setpoint position is extended by the required increment relative to the current actual position.
8	Relative bus increment	… as for 7, via bus (note **P509**)
9	*Reserved*	
10	Remaining path position	Position specification for "Residual path positioning" mode (📖 Section)

1) Any setpoint from the bus (note**P509**, **P546**…) is added!

2) Any programmed position increment via the digital inputs or Bus IO Bits is added!

P611	Position controller P	S	P
Setting range	0.1 … 100.0 %		
Factory setting	{ 5 }		
Description	Adjustment of the proportional amplification P (P amplification) of the position control. The rigidity of the axis when at a standstill increases with increasing values of P.		
Note	• Values which are too large cause overshooting. • Values which are too low cause imprecise positioning.		

P612	Pos. window	S	P
Setting range	0.0...100.0 rev		
Factory setting	{ 0 }		
Description	Slow travel at the end of the positioning process can be enabled by the size of the positioning window. The positioning window corresponds to the starting point for slow travel.		
Note	In the positioning window or with slow travel, the speed of movement is determined by parameter **P104** (minimum frequency) and not by the maximum or setpoint frequency.		

P613	Position	S	P
Setting range	- 50000,000 … 50000,000 rev.		
Arrays	[-01] = Position 1, position array element 1 or position increment array element 1 [-02] = Position 2, position array element 2 or position increment array element 2 … … [-06] = Position 6, position array element 6 or position increment array element 6 [-07] = Position 7, position array element 7 … … [-63] = Position 63, position array element 63		
Factory setting	{ all 0 }		
Description	Setting of various position setpoints which can be selected via digital inputs or a field bus.		
Note	• All arrays (position array Element 1 … 63) are available for positioning with absolute setpoint positions) (see **P610**). • The first 6 arrays (position array Element 1 … 6) are available for positioning with relative setpoint positions) (see **P610**). With each change of signal from "0" to "1" at the relevant digital input, the value allocated to the digital input is added to the position setpoint value. This also applies to control via the bus.		

	This parameter *depends on the parameter set*. Therefore *4 times the number* of relative (24) or absolute positions (252) are available.

P615	Maximum position	S	P
Setting range	- 50000.000 … 50000.000 rev.		
Factory setting	{ 0 }		
Description	Setting of the upper setpoint limit for a permissible positioning range. If the setpoint limit is exceeded error message **E14.7** is activated.		
Note	• Rotary axes ("Turntable applications") Parameter **P619**: With the setting **P619 = 2** "*Modulo Pos*" or **P619 = 3** "*Save Modulo Pos*" parameter **P615** has no function.		
	• Positioning with incremental encoder Parameter **P619**: With the setting **P619 = 0** "*Normal*" or **P619 = 1** "*Save position*" the monitoring function is only active for referenced incremental encoders i.e. referencing of the incremental encoder is necessary every time the frequency encoder is switched on. In contrast, with setting **619 = 1** "*Save position"* the initial referencing on commissioning is sufficient to be able to use the function when the frequency inverter is switched on again. • With the setting **P610 = 6** "*Auxiliary setpoint source*" monitoring is always deactivated.		
Setting values	0 = Monitoring is disabled		

P616	Minimum position	S	P
Setting range	- 50000.000 … 50000.000 rev.		
Factory setting	{ 0 }		
Description	Setting of the lower setpoint limit for a permissible positioning range. If the setpoint limit is undershot error message **E14.8** is activated.		
Note	• Rotary axes ("Turntable applications") Parameter **P619**: if one of the functions "*Modulo Pos*" { 2 } or "*Save Modulo Pos*" { 3 } has been set, parameter **P616** has no function.		
	• Positioning with incremental encoder Parameter **P619**: With the setting **P619 = 0** "*Normal*" or **P619 = 1** "*Save position*" the monitoring function is only active for referenced incremental encoders i.e. referencing of the incremental encoder is necessary every time the frequency encoder is switched on. In contrast, with setting **619 = 1** "*Save position"* the initial referencing on commissioning is sufficient to be able to use the function when the frequency inverter is switched on again. • With the setting **P610 = 6** "*Auxiliary setpoint source*" monitoring is always deactivated.		
Setting values	0 = Monitoring is disabled		

P617	SSI type encoders	S	
Setting range	000 … 111 (binary)		
Factory setting	{ 010 }		
Description	Protocol settings for SSI encoders		
Setting values	**Bit**	**Meaning**	

0	Power Fail Bit.	This bit is activated if the transfer protocol contains a Power Fail Bit (PFB). If the PFB changes to the value 1, error message **E 25.4** is triggered.
1	Gray=1/Binary=0	Data format for position communication
2	Multiply-Transmit	The encoder supports the communication variant "*Multiple Transmit*", which is used to increase the reliability of communication by transmitting the data 2x in mirrored form.

P619	Incremental mode	S
Setting range	0 … 3	
Arrays	[-01] = TTL encoder [-02] = HTL encoder [-03] = Sin/Cos encoder	
Factory setting	{ all 0 }	
Description	Selection of the mode for detection of position (actual position) with an incremental encoder.	
Setting values		

Value		Meaning
0	Normal	Position detection with the selected incremental encoder
1	Save position	… as for 0, with saving of the position
2	Modulo Pos	... as for 0 with emulation of a singleturn absolute encoder for optimum path positioning
3	Save Modulo Pos	… as for 2, with saving of the position

P620	Absolute encoder range	S
Setting range	0 … 50000.000 rev.	
Arrays	[-01] = TTL encoder [-02] = HTL encoder [-03] = Sin/Cos encoder [-04] = CANopen encoder	
Factory setting	{ all 0 }	
Description	*"Absolute encoder range"*, Definition of the overflow point for the rotary axis / turntable positioning function (number of rotations until encoder overflow).	
Note	Only relevant if **P619** in setting (2) or (3).	
Setting values	0 = A value range of ± 0,5 rev. (0.5 rotations) is assumed.	

P621	Absolute encoder mode	S
Setting range	0 … 1	
Arrays	[-01] = CANopen encoder [-02] = Universal encoder [-03] = Resolver	
Factory setting	{ all 0 }	
Description	*"Absolute encoder mode"*Selection of the mode for detection of position (actual position) with an incremental encoder.	
Setting values		

Value		Meaning
0	Normal	Linear position detection with selected absolute encoder
1	Modulo Pos	Position detection for path optimised positioning (rotary axes / turntable applications)

P622	Shift SSI Position		S	
Setting range	0 … 7			
Factory setting	{ 0 }			
Description	With SSI encoders the position is typically transmitted with the first bit. However, there are some SSI encoders where transmission of the position is made with other bits. This parameter defines an offset in order to conceal the surplus bits.			
Setting values	**Value**	**Meaning**		
	0	No offset		
	1 ... 7	Telegram offset of 1 (… 7) Bit		

P623	Reference run type		S	P
Setting range	0 … 34			
Factory setting	{ 15 }			
Description	*"Reference run type"*, selection of a variant for the reference run.			
Setting values	**Value**	**Meaning**		
	0	No reference run		
	1	DS402 Method 17	Reference run according to CANopen Drive Profile DS402 "homing method 17 … 30"	
	2	DS402 Method 18		
	…	…		
	14	DS402 Method 30		
	15	Nord Method 1	Once the reference point has been reached, the drive reverses. When the reference point switch is left (negative flank), this is adopted as the reference point. The reference point is therefore typically in the side of the reference point switch on which the reference point run started. Note: If the reference point switch is passed over (switch too narrow, speed too high), this is also taken as the reference point when leaving the reference point switch (negative flank). The reference point is therefore not on the side of the reference point switch from which the reference point run was started.	
	16	Nord Method 2	As for 15, however passing over the reference point switch does not result in adoption as the reference point. A negative flank only results in adoption as the reference point after reversal has been completed. The reference point is therefore definitely on the side of the reference point switch from which the reference point run was started.	
	17	Nord Method 3	If the reference point switch is passed over during the reference point run (positive flank → negative flank) the drive adopts the average value of both positions and sets this as the reference point. The drive reverses and therefore stops at the reference point which has been thus determined.	
	18	DS402 Method 1	Reference run according to CANopen Drive Profile DS402 "homing method 1 … 16"	
	…	…		
	31	DS402 Method 16		
	32	Nord Zero track 1	As for 15, however with synchronisation with the zero track.	
	33	Nord Zero track 2	As for 16, however with synchronisation with the zero track.	
	34	Nord Zero track 3	As for 17, however with synchronisation with the zero track.	

P624	Reference run frequency	S	P
Setting range	0 … 399.0 Hz		
Arrays	[-01] = Search for switch [-02] = Search for reference point		
Factory setting	{ all 0 }		
Description	*"Reference run frequency"*, Specification of the speed for the reference run.		
Setting values	**Value** / **Meaning**		
	0 / The value from the setpoint source is used		
	1… 399.0 / Frequency value for the reference run		

P625	Hysteresis output	S	P
Setting range	0.00...99.99 rev		
Factory setting	{ 1 }		
Description	Difference between switch-on and switch-off point to prevent oscillation of the output signal.		
Note	Relevant for POSICON output messages. Parameter **P436** … or **P483** … accordingly have no effect. (🕮 Section)		

P626	Comparative position output	S	P
Setting range	- 50000.000 … 50000.000 rev.		
Factory setting	{ 0 }		
Description	Comparative position for digital output messages.		
Note	Relevant for POSICON output messages. (🕮 Section)		

P630	Position slip error	S	P
Setting range	0.00...99.99 rev		
Factory setting	{ 0 }		
Description	Permissible deviation between the estimated and actual position. The error message **E14.5** becomes active if the permissible deviation is exceeded. As soon as a target position is reached, the estimated position is set to the current actual position.		
Note	The estimated position is determined from the calculated position, which results on the basis of the actual speed.		
Setting values	0 = Monitoring is disabled		

P631	2nd encoder slip error	S	P
Setting range	0.00 … 99.99 rev.		
Factory setting	{ 0 }		
Description	*"2nd encoder slip error"*, Permissible deviation of the measured position between the two encoders which are selected in parameter P632. If the permissible deviation is exceeded error message **E14.6** is activated.		
Setting values	0 = Monitoring is disabled		

P632	Slip error source		S	P
Setting range	0 … 5			
Arrays	[-01] = Encoder 1 [-02] = Encoder 2			
Factory setting	SK 500P / SK 510P	[-01] = { 1 }, [-02] = { 3 }		
	SK 530P / SK 550P	[-01] = { 0 }, [-02] = { 3 }		
Description	Selection of the encoder to be compared according to **P631**.			
Setting values	**Value**	**Meaning**		

0	TTL incremental [1]	Incremental encoder (TTL)
1	HTL incremental	Incremental encoder (HTL)
2	Sin/Cos incremental [2]	Incremental encoder (Sin/Cos)
3	CANopen	Absolute encoder (CANopen)
4	Universal [2]	Absolute encoder via universal encoder interface (SSI, BISS, Hiperface or Endat)
5	Resolver [3]	Absolute encoder (Resolver)

1) SK 530P and higher
2) Only with option SK CU5-ENC, SK CU5-MLT, SK CU5-RES
3) Only with option SK CU5-RES

P633	Slip error delay		S	P
Setting range	0 ... 99.99 s			
Arrays	[-01] = Slip error position (P630) [-02] = Slip error 2nd Encoder (**P631**)			
Factory setting	{ all 0 }			
Description	"*Slip error delay*", delay of slip error monitoring after enabling.			

P640	Unit of pos. value		S	
Setting range	0 … 9			
Factory setting	{ 0 }			
Description	Assignment of a measurement unit for the position values.			
Note	For details see 🕮 Section			
Setting values	**Value**	**Meaning**		

0	rev	Rotations
1	°	Degrees
2	rad	Radians
3	mm	Millimetres
4	cm	Centimetres
5	dm	Decimetres
6	m	Metres
7	in	Inch
8	ft	Feet
9	(no unit)	No unit

P650	Univ. encoder status	S
Display range	-32768 … 32767	
Arrays	[-01] = Actual error, encoder error code [-02] = Actual warning, encoder warning code [-03] = Signal quality, the number of communication errors which have occurred since the last initialisation.	
Description	Status of a connected universal encoder	
Note	In case of error, **Hiperface-** and **EnDat-** encoders issue a specific code which can be displayed in the arrays [-01] or [-02]. The cause of the message can be found in the documentation for the encoder.	
	In case of error, **BISS** encoders only issue the value 1 which can be displayed in the arrays [-01] or [-02].	

P651	SinCos voltage	S
Display range	-5.00 … 5.00 V	
Arrays	[-01] = Track A (SIN) [-02] = Track B (COS)	
Description	Display of signal voltage (SIN/COS encoder or resolver).	

P660	Position encoder	S
Display range	- 50000.000 … 50000.000 rev.	
Arrays	[-01] = TTL encoder [-02] = HTL encoder [-03] = Sin/Cos encoder [-04] = CANopen encoder [-05] = Universal encoder [-06] = Resolver	
Description	Displays the current position measured by the respective rotary encoder.	
Note	The function of parameter **P660** is comparable with the function of parameter **P601.** However the actual positions of all connected encoders can be read out from the arrays of parameter **P660**.	

P700	Actual operating status	
Display range	0.0 … 99.9	
Arrays	[-01] = Actual error	Indicates the presently active (unacknowledged) fault.
	[-02] = Actual warning	Indicates a present warning message.
	[-03] = Reason for switch-on block	Indicates the reason for an active switch-on block.
	[-04] = Extended error	Indicates the presently active error with use of drive profile DS402.
Description	Display of present messages (coded) for the actual operating status of the frequency inverter such as faults, warnings or the cause of a switch-on block (🕮 Section).	
Note	Display of bus-level error messages is in decimal integer format. The displayed value must be divided by 10 in order to correspond with the correct format. Example: Display: 20 → Error number: 2.0	
	The error number range from 50.0 to 99.9 displays messages from any extension modules. The meaning of these numbers is explained in the relevant documentation for the extension module.	

P701	Last fault
Display range	0.0 … 99.9
Arrays	[-01] … [-10]
Description	„*Last fault 1 … 10*“. This parameter stores the last 10 faults (🕮 Section).

6 Operating status messages

The majority of frequency inverter functions and operating data are continuously monitored and simultaneously compared with limiting values. If a deviation is detected, the inverter reacts with a warning or an error message.

Basic information on this topic is contained in the manual for the device.

All faults or reasons which may result in a switch-on block of the frequency inverter and which are associated with the POSICON function are listed below.

Error messages

Display in the SimpleBox / ControlBox		**Fault** **Text in the ParameterBox**	**Cause** • **Remedy**
Group	**Details in P700 [-01] / P701**		
E013	**13.0**	**Encoder error**	No signal from encoder • Check 5 V sensor if present. • Check supply voltage of encoder.
	13.1	**Speed slip error** "Speed slip error"	The slip speed error limit was reached. • Increase value in P327
	13.2	**Shut-down monitoring**	The slip error shut down monitoring was triggered; the motor could not follow the setpoint. • Check motor data P201-P209! (important for current controllers) • Check motor circuit • Check encoder settings P300 and following • Increase value for torque limit in P112 • Increase value for current limit in P536 • Check deceleration time P103 and extend if necessary
	13.3	**"Rotation direction" slip error** "Rotation direction slip error"	• Unexpected direction of rotation of the encoder.
	13.5	**Flying saw acceleration** "Flying Saw acceleration"	The acceleration value set in P613 [-63] is too low.
	13.6	**Incorrect Flying Saw value** “Flying saw value incorrect”	The prefix of the acceleration path (P613 [-63]) does not match the prefix of the master drive.
	13.8	**Right end position**	The right limit switch was reached during the reference run although this is not permitted,
	13.9	**Left end position**	The left limit switch was reached during the reference run although this is not permitted,

E014	**14.2**	**Reference point Error**	The reference point run was cancelled without a reference point being found. • Check the reference point switch and the control unit
	14.4	**Absolute encoder error**	Absolute encoder defective or connection faulty (Error message is only possible with positioning enabled) • Check absolute encoder and wiring • Check the parameterisation in the frequency inverter • Five seconds after switching on the frequency inverter there is no contact with the encoder • The encoder does not respond to an SDO command from the frequency inverter • The parameters set in the frequency inverter do not correspond to the possibilities for the encoder (e.g. resolution in parameter P605) • The frequency inverter does not receive a position value over a period of 50ms
	14.5	**Pos. diff. Speed**	Change of position and speed do not match • Check the position detection and the setting in P630
	14.6	**Diff.betw.Abs. & Inc.**	Difference between absolute and incremental encoders • Check the position detection and the setting in P631 • Position change for the absolute and incremental encoders do not match • Check the speed ratio or reduction ratio and offset of both encoders in P607 … P609.
	14.7	**Max. Pos. Exceeded**	Maximum position has been exceeded • Check the specified setpoint and the control setting in P615
	14.8	**Min. Pos. Undershot**	Minimum position undershot • Check the setpoint setting in P616

E025	**25.0**	**Hiperface Abs./Inc. error**	Hiperface encoder monitoring detects an error during comparison of data between the incremental and absolute signals. (absolute position deviates from that which is calculated incrementally) • Poor cable shielding • The Sin/Cos signals are not connected or are defective. Check with P709 [-09] and [-10]
	25.1	**Universal encoder communication**	Communication error for the universal encoder interface (CRC checksum error) • Poor cable shielding • Encoder triggering incorrectly set. (BISS, SSI) • SSI does not support Multiply Transmit
	25.2	**No corresp. universal encoder**	No connection to selected universal encoder • Encoder not connected or data cable not connected correctly • No voltage supply to encoder • Incorrect encoder type set
	25.3	**Universal encoder resolution**	The set universal encoder resolution does not match that which is transmitted by the encoder.
	25.4	**Universal encoder error**	The universal encoder reports an internal error to the frequency inverter • Restart encoder
	25.5	**Uni. encoder parameter**	Two different multiturn encoder types have been parameterised. • Only identical multiturn encoders may be used. Use and parameterisation of two different multiturn encoders (P604 [-04] to [-07]) in the 4 parameter sets results in an error.

7 Technical Data

The POSICON function essentially has the following technical data.

Encoder type		
	Incremental	SK 5xxP: HTL; ab SK 53xP: TTL; SK CU5- ENC, -MLT: SIN/COS
	Absolute	SK 5xxP: CANopen; SK CU5- ENC, -MLT: SSI, BISS, EnDat, Hiperface
Number of positions		
	Absolute	252
	Relative	24
Measurement detection resolution		1/1000 position
Functionalities		• Absolute positioning • Relative positioning • Residual path positioning • Rotary table positioning / module axes (path optimised) • Reference point run • Reset position • Position synchronisation (Master - Slave) – Flying Saw – Diagonal Saw
Setpoint specification		• Digital inputs • Bus IO In Bits • Analogue inputs • Bus setpoints
Status messages		• Setpoint / Actual position and position deviations • Operating status – Position reached – Reference point available – …
Types of acceleration		• With maximum speed • With fixed or variable speed setpoint .... each optionally with "S ramp" (ramp smoothing)
Monitoring		• Communication – To encoder – Between Master and Slave • Operating characteristics – Target window / permissible positioning range (min/ max. position) – Slip error ~ Calculated value in comparison with the actual encoder value ~ Measured value between two encoders

Note:	Only the encoder for the active parameter set is monitored.
Position detection	• Sequential position detection for up to 4 axes with different encoders is possible. • With correct parameterisation the position of all connected encoders is detected. Via the integrated PLC of the frequency inverter the positions can be transmitted to a higher level PLC and used for monitoring (e.g. standstill monitoring of inactive drive axes).