LamaPLC: Simatic S7 SCL commands with examples

- The chapter is not finished yet. I am still working on the (black) Instructions without links. - *Vamos 06.06.2023*

SCL is the most effective programming language for Simatic systems. It is high-level, suitable for cycle organization, the use of CASE structures, its code can be edited with an external editing program or created with external generators.

Instruction / Command	Type of op	Usage	Properties	Note
positive / negative edge monitoring	bit-logic	summary of edge monitoring	-	-
R_TRIG	bit-logic	detect positive signal edge	Detect positive signal edge	-
F_TRIG	bit-logic	detect negative signal edge	Detect negative signal edge	-
ABS	math	absolute value	Value of the “ABS” (absolute value) math function	-
COS/ACOS	math	cosine	value of the “COS” (cosie) trigonometric function	-
ACOS	math	arccosine	value of the “ACOS” (arccosine) trigonometric function	-
EXP	math	exponential	Value of the “EXP” (exponent from the base e (e = 2.718282)) math function	-

Instruction / Command	Type of op	Usage	Properties	Note
FRAC	math	fractal	Value of the “FRAC” (fraction) math function	-
LIMIT	math	set limit	Limits the value of the parameter	-
LN	math	natural logarithm	Value of the “LN” (natural logarithm to the base e (e = 2.718282)) math function	-
MAX	math	get maximum	Get maximum of maximum 32 inputs	-
MIN	math	get minimum	Get minimum of maximum 32 inputs	-
SIN	math	sinus	Value of the “SIN” (sinus) trigonometric function	-
ASIN	math	arcsine	Value of the “ASIN” (arcsine) trigonometric function	-
SQR	math	square	Value of the “SQR” (square) math function	-
SQRT	math	square root	Value of the “SQRT” (square root) math function	-
TAN	math	tangent	value of the “TAN” (tangent) trigonometric function	-
ATAN	math	arctangent	value of the “ATAN” (arctangent) trigonometric function	-
IEC timers	timer/counter	Summary IEC timer FBs	-	
TON	timer/counter	Generate on-delay)	The TON “switch-on delay” function	-
TOF	timer/counter	Generate off-delay)	The TOF “switch-off delay” function	-
TP	timer/counter	Generate pulse)	The TP “pulse generator” function	-
TONR	timer/counter	Time accumulator)	The TONR “time accumulator” function	-
CTU	timer/counter	count up	The function that only counts upwards	-
CTD	timer/counter	count down	The function that only counts downwards	-
CTUD	timer/counter	count up and down	The function that counts up- and downwards	-
ROUND	conversion	Rounding	Round numerical value	-
CEIL	conversion	round up	Generate next higher integer from floating-point number	-
FLOOR	conversion	round down	Generate next lower integer from floating-point number	-
TRUNC	conversion	Truncate	Truncate numerical value	-
SCALE_X	conversion	Scale	-	-
NORM_X	conversion	Normalize	-	-
SCALE	conversion	Scale	-	-

Instruction / Command	Type of op	Usage	Properties	Note
RUNTIME	runtime	measures the runtime	The “RUNTIME” instruction measures the runtime of the entire program, individual blocks or command sequences	only S7-1500
MOVE	move	Copy value	- Copies the content of the parameter on the input IN to the parameter of the output OUT. - The parameters on the input and output must be of the same data type. - Parameters can also be structured tags (PLC data types). - Copies complete arrays and structures.	-
BLKMOV	move	move pointer block	- Move the content of a memory area (source area) to another memory area (destination area)	-
MOVE_BLK	move	move array block	- Copies the content of an array to another array. - Source and target array must be of the same data type. - Copies complete arrays and structures. - Copies several array elements with structures as well. In addition, start and number of elements can be specified.	-
UMOVE_BLK	move	Copies array without interruption	- Copies the content of an array consistently without the risk of the OB interrupting the copying process. - Source and target array must be of the same data type.	-
MOVE_BLK_VARIANT	move	Copy array	Copies one or several structured tag(s) (PLC data types) - Recognizes data types at runtime - Supplies detailed error information - Apart from the elementary and structured data types, PLC data types, arrays, and array DBs are also supported.	-

Instruction / Command	Type of op	Usage	Properties	Note
Serialize	move	converts structured data into a byte array	- Several data records can be combined into a single byte array and, for example, be sent to other devices as a message frame. - Input and output parameters can be transferred as data type Variant.	S7-1500 or S7-1200 > FW4.1
Deserialize	move	converts one byte array into one or several structure/s	- Application case I-Device: The I device receives several data records in the input area which are copied to different structures. - Several data records can be combined into a single byte array. Deserialize enables copying these to different structures.	S7-1500 or S7-1200 > FW4.1
FILL_BLK	move	Fill a memory area	- The instruction can only be executed if the source range and the target range have the same data type - The maximum number of elements changed is the number of elements in the ARRAY or structure	S7-1500 or S7-1200 > FW4.1
UFILL_BLK	move	Fill block uninterruptible	- The instruction can only be executed if the source range and the target range have the same data type - The maximum number of elements changed is the number of elements in the ARRAY or structure - The instruction cannot be interrupted	S7-1500 or S7-1200 > FW4.1
SCATTER	move	Parse the bit sequence into individual bits	- BYTE, WORD, DWORD or LWORD data type into individual bits and saves them in an ARRAY of BOOL, an anonymous STRUCT or a PLC data type exclusively with Boolean elements	S7-1500 or S7-1200 > FW4.1
SCATTER	move	Parse the bit sequence into individual bits	- BYTE, WORD, DWORD or LWORD data type into individual bits and saves them in an ARRAY of BOOL, an anonymous STRUCT or a PLC data type exclusively with Boolean elements	S7-1500 or S7-1200 > FW4.1

Instruction / Command	Type of op	Usage	Properties	Note
SCATTER_BLK	move	Parse elements of an ARRAY of bit sequence into individual bits	- parses one or more elements of an ARRAY of BYTE, WORD, DWORD or LWORD into individual bits and saves them in an ARRAY of BOOL, an anonymous STRUCT or a PLC data type exclusively with Boolean elements	S7-1500 or S7-1200 > FW4.1
GATHER	move	Merge individual bits into a bit sequence	Merges the bits from an ARRAY of BOOL, an anonymous STRUCT or a PLC data type exclusively with Boolean elements into a bit sequence. The bit sequence is saved in a tag of the data type BYTE, WORD, DWORD or LWORD	S7-1500 or S7-1200 > FW4.1
GATHER_BLK	move	Merge individual bits into multiple elements of an ARRAY of bit sequence	Merges the bits from an ARRAY of BOOL, an anonymous STRUCT or a PLC data type exclusively with Boolean elements into one or multiple elements of an ARRAY of <bit sequence>	S7-1500 or S7-1200 > FW4.1
SWAP	move	Swap; change the arrangement	Change the arrangement of the bytes of an input value and save the result in the specified operand	S7-1500 or S7-1200 > FW4.1
ReadFromArrayDB	move	Read from array data block	Read the element from a data block of the ARRAY DB block type to which the index references, and write the value of the element to the target range	S7-1500 or S7-1200 > FW4.1
WriteToArrayDB	move	Write to array data block	Write the element to which the index references to a data block of the ARRAY DB block type	S7-1500 or S7-1200 > FW4.1
ReadFromArrayDBL	move	Read from array data block in load memory	Read the element ti which the index references from a data block of the ARRAY DB block type in the load memory and write it to the target range	S7-1500 or S7-1200 > FW4.1
WriteToArrayDBL	move	Write to array data block in load memory	Write the element to which the index references to a data block of the ARRAY DB block type in load memory	S7-1500 or S7-1200 > FW4.1
PEEK	move	Read memory address	Read a memory address from a standard memory area without specifying a data type	S7-1500 or S7-1200 > FW4.1

Instruction / Command	Type of op	Usage	Properties	Note
PEEK_BOOL	move	Read memory bit	Read a memory bit from a standard memory area without specifying a data type	S7-1500 or S7-1200 > FW4.1
POKE	move	Write memory address	Write a memory address to a standard memory area without specifying a data type	S7-1500 or S7-1200 > FW4.1
POKE_BOOL	move	Write memory bit	Write a memory bit to a standard memory area without specifying a data type	S7-1500 or S7-1200 > FW4.1
POKE_BLK	move	Write memory area	Write a memory area to a different standard memory area without specifying a data type	S7-1500 or S7-1200 > FW4.1
READ_LITTLE	move	Read data in little endian format	Read data from a memory area and to write this to a single tag in the little endian byte sequence	S7-1500 or S7-1200 > FW4.1
WRITE_LITTLE	move	Write data in little endian format	Write the data of a single tag in the little endian byte sequence to a memory area	S7-1500 or S7-1200 > FW4.1
READ_BIG	move	Read data in big endian format	Read data from a memory area and to write this to a single tag in the big endian byte sequence	S7-1500 or S7-1200 > FW4.1
WRITE_BIG	move	Write data in big endian format	Write the data of a single tag in the big endian byte sequence to a memory area	S7-1500 or S7-1200 > FW4.1
VariantGet	variant	Read value	This instruction enables you to read the value of a tag pointing to a VARIANT.	S7-1500 or S7-1200 > FW4.1
VariantPut	variant	Write value	This instruction enables you to write the value of a tag pointing to a VARIANT.	S7-1500 or S7-1200 > FW4.1
CountOfElements	variant	Counting elements	With this instruction you poll the number of ARRAY elements of a tag pointing to a VARIANT	S7-1500 or S7-1200 > FW4.1
TypeOf()	variant	Determining the data type	Use this instruction to poll the data type of a tag pointing to a VARIANT	only SCL S7-1500 or S7-1200 > FW4.1

Instruction / Command	Type of op	Usage	Properties	Note
TypeOfElements()	variant	Determining the array data type	Use this instruction to poll the data type of the ARRAY elements of a tag pointing to a VARIANT.	only SCL S7-1500 or S7-1200 > FW4.1
VARIANT_TO_DB_ANY	variant	Determining the data block number	This instruction queries the data block number of an instance data block of a PLC data type, system data type or array DB.	only SCL S7-1500 or S7-1200 > FW4.1
DB_ANY_TO_VARIANT	variant	Created from a data block of a variant tag.	This instruction creates the variant tag of an instance data block of a PLC data type, system data type or array DB	only SCL S7-1500 or S7-1200 > FW4.1

Simatic, S7, SCL, TIA, commands, reference, main menu