

# Instruction Sets

## Sequential instructions

Instruction	Operand	Ladder symbol	Function
ORG	X,Y,M, S,T,C		Network starts by an A contact
ORG NOT			Network starts by a B contact
ORGTU			Network starts by a TU contact
ORGTD			Network starts by a TD contact
ORG OPEN			Network starts by an open contact
ORG SHORT			Network starts by a short contact
LD	X,Y,M, S,T,C		Branch line starts by an A contact
LD NOT			Branch line starts by a B contact
LDTU			Branch line starts by a TU contact
LDTD			Branch line starts by a TD contact
LD OPEN			Branch line starts by an open contact
LD SHORT			Branch line starts by a short contact
AND	X,Y,M, S,T,C		Serial connect with an A contact
AND NOT			Serial connect with a B contact
ANDTU			Serial connect with a TU contact
ANDTD			Serial connect with a TD contact
AND OPEN			Serial connect with an open contact
AND SHORT			Serial connect with a short contact

Instruction	Operand	Ladder symbol	Function
OR	X,Y,M, S,T,C		Parallel connect with an A contact
OR NOT			Parallel connect with a B contact
ORTU			Parallel connect with a TU contact
ORTD			Parallel connect with a TD contact
OR OPEN			Parallel connect with an open contact
OR SHORT			Parallel connect with a short contact
ANDLD			Concatenate two blocks in series
ORLD			Merge two blocks in parallel
OUT	Y,M,S		Output result to coil
OUT NOT			Output the inverse of result to a coil
OUT L	Y		Output result to a retentive coil
OUT	TR		Store node status in temporary relay
LD			Retrieve node status from temporary relay
TU			Take differential up of node status to node status
TD			Take differential down of node status to node status
NOT			Inverse node status
SET			Set a coil
RST			Reset a coil

## Step ladder instructions (SFC)

Instruction	Operand	Ladder symbol	Function
STP	Snnn		Define STEP program
STPEND			STEP program end

Instruction	Operand	Ladder symbol	Function
TO	Snnn		STEP divergence
FROM			STEP convergence

## Function instructions

Category	NO.	Instruction	Derivative	Function
Timer		Tnnn		General timer instruction (T0 ~ T255)
	Counter		Cnnn	
		UDCTR	D	16 or 32-bit up/down counter
Setting / Resetting		SET	DP	Set all bits of register or a discrete point to 1
		RST	DP	Clear all bits of register or a discrete point to 0
	114	Z-WR	P	Zone set or clear
Digital operation	4	DIFU		Take differential up of the node status to operand
	5	DIFD		Take differential down of the node status to operand
	10	TOGG		Toggle the coil status
Mathematical operation	11	(+)	DP	Sa+Sb → D
	12	(-)	DP	Sa-Sb → D
	13	(×)	DP	Sa × Sb → D
	14	(/)	DP	Sa / Sb → D
	15	(+1)	DP	Add 1 to D
	16	(-1)	DP	Subtract 1 from D
	23	DIV48	P	48 bits integer division Sa / Sb → D
	24	SUM	DP	Sum of N consecutive values
	25	MEAN	DP	Average of N consecutive values
	26	SQRT	DP	Square root of S
	27	NEG	DP	Two's complement of D (Negative number)
	28	ABS	DP	Absolute value of D
29	EXT	P	Extend 16 bits into 32 bits	

Category	NO.	Instruction	Derivative	Function
Mathematical operation	30	PID	P	PID calculation
	31	CRC16	P	CRC16 calculation
	32	ADCNV		Offset and full scale conversion for analog I/O
	33	LCNV	P	Linear conversion
	200	I→F	DP	Integer to floating point number conversion
	201	F→I	DP	Floating point number to integer conversion
	202	FADD	P	Addition of floating point number
	203	FSUB	P	Subtraction of floating point number
	204	FMUL	P	Multiplication of floating point number
	205	FDIV	P	Division of floating point number
	206	FCMP	P	Comparison of floating point number
	207	FZCP	P	Zone comparison of floating point number
	208	FSQR	P	Square root of floating point number
	209	FSIN	P	SIN trigonometric function
	210	FCOS	P	COS trigonometric function
211	FTAN	P	TAN trigonometric function	
212	FNEG	P	Change sign of floating point number	
213	FABS	P	Absolute value of floating point number	
Logic operation	18	AND	DP	Sa AND Sb
	19	OR	DP	Sa OR Sb
	35	XOR	DP	Sa XOR Sb
	36	XNR	DP	Sa XNR Sb
Comparison	17	CMP	DP	Value Compare
	37	ZNCMP	DP	Zone Compare

(Continues)

Category	NO.	Instruction	Derivative	Function
Move operation	8	MOV	DP	Move S to D
	9	MOV/	DP	Inverse S and move to D
	40	BITRD	DP	Move the Bit-N of S to FO
	41	BITWR	DP	Write INB input to the Bit-N of D
	42	BITMV	DP	Move the Bit-Ns of S to the Bit -Nd of D
	43	NBMV	DP	Move the Nibble-Ns of S to the Nibble-Nd of D
	44	BYMV	DP	Move the Byte-Ns of S to the Byte-Nd of D
	45	XCHG	DP	Exchange Da and Db
	46	SWAP	P	Swap the High-Byte of D with the Low-Byte of D
	47	UNIT	P	Take Nb0 of N words to form a Word
	48	DIST	P	Distribute N Nb of S to Nb0 of N Words
	49	BUNIT	P	Low byte of words re-unit
	50	BDIST	P	Words split into multi-byte
	160	RW-FR	DP	File register access
	161	WR-MP		Write memory pack
	162	RD-MP	P	Read memory pack
Shift / Rotation	6	BSHF	DP	Shift D right 1 bit or left 1 bit
	51	SHFL	DP	Shift D left N bits
	52	SHFR	DP	Shift D right N bits
	53	ROTL	DP	Rotate D left N bits
	54	ROTR	DP	Rotate D right N bits
Code conversion	20	→BCD	DP	Convert S into BCD
	21	→BIN	DP	Convert S into Binary
	55	B→G	DP	Binary to Gray code conversion
	56	G→B	DP	Gray code to Binary conversion
	57	DECOD	P	Decode the Ns ~ Nl of S
	58	ENCOD	P	Encode the Ns ~ Nl of S
	59	→7SG	P	Convert N+1'Nb of S into 7-segment code
	60	→ASC	P	Convert character/number into ASCII code
	61	→SEC	P	Convert hour, minute, second by seconds
	62	→HMS	P	Convert second by hour, minute and second
63	→HEX	P	Convert ASCII code into hexadecimal	
64	→ASCII	P	Convert hexadecimal into ASCII code	
Flow control	0	MC		Master control loop start
	1	MCE		Master control loop end
	2	SKP		The start of the skip loop
	3	SKPE		The end of the skip loop
		END		Terminate the execution of program (for debugging)
	22	BREAK	P	Exit from FOR-NEXT loop
	65	LBL		Define the string as label
	66	JMP	P	Jump instruction
	67	CALL	P	Call instruction
	68	RTS		Subroutine return instruction
	69	RTI		Interrupt return instruction
	70	FOR		The start of the FOR loop
71	NEXT		Return point of FOR loop	
I/O instruction	74	IMDIO	P	Refresh I/O immediately
	76	TKEY	D	10 keys input convenient instruction
	77	HKEY	D	16 keys input convenient instruction
	78	DSW	D	Thumbwheel switch input convenient instruction
	79	7SGDL	D	7-segment multiplexing display convenient Instruction

Category	NO.	Instruction	Derivative	Function
I/O instruction	80	MUXI		Multiplexing input convenient instruction
	81	PLSO	D	Pulse output(PSO) instruction
	82	PWM		Pulse Width Modulation (PWM) output instruction
	83	SPD		Pulse speed detection instruction
	84	TDSP		7/16-segment LED display control
	86	TPCTL		PID temperature control
	139	HSPWM		Hardware PWM pulse output
Accumulative Timer	87	T.01S		0.01S time base accumulative timer
	88	T.1S		0.1S time base accumulative timer
	89	T1S		1S time base accumulative timer
Monitor and control	90	WDT	P	Set watchdog timer
	91	RSWDT	P	Reset watchdog timer
HSC/ HST	92	HSCTR		Read CV of hardware high speed counter/timer
	93	HSCTW		Write CV or PV of hardware high speed counter/timer
Text	94	ASCWR		Output ASCII message
Ascend/ Descend	95	RAMP		Ascending/Descending convenient instruction
Communication	150	M-BUS		Modbus protocol communication
	151	CLINK		Fatek CPU link/Generic protocol communication
	100	R→T	DP	Move register Rs to the table Td
Table operation	101	T→R	DP	Move the Rp of table Ts to register Rd
	102	T→T	DP	Move the Rp of table Ts to the Rp of table Td
	103	BT_M	DP	Move table Ts to table Td
	104	T_SWP	DP	Swap Ta and Tb
	105	R-T_S	DP	Search Rs from table Ts
	106	T-T_C	DP	Compare table Ta and table Tb
	107	T_FIL	DP	Fill Rs into Td table
	108	T_SHF	DP	Shift table left or right
	109	T_ROT	DP	Rotate table left or right
	110	QUEUE	DP	First in first out (Queue) instruction
	111	STACK	DP	First in last out (Stack) instruction
	112	BKCOMP	DP	Compare Rs with zone defined by two tables
	113	SORT	DP	Sort the table
Matrix operation	120	MAND	P	AND two matrixes
	121	MOR	P	OR two matrixes
	122	MXOR	P	Exclusive OR (XOR) two matrixes
	123	MXNR	P	Exclusive NOR (XNR) two matrixes
	124	MINV	P	Inverse matrix
	125	MCMP	P	Compare two matrixes and find out the differences between two matrixes
	126	MBRD	P	Read the bit of a matrix pointed by pointer
	127	MBWR	P	Write the bit of a matrix pointed by pointer
	128	MBSHF	P	Shift matrix left 1 bit or right 1 bit
129	MBROT	P	Rotate matrix left 1 bit or right 1 bit	
NC position control	130	MBCNT	P	Count the number of bit whose value is 1 or 0 in the matrix
	140	HSPSO		Hardware NC high-speed pulse output
	141	MPARA		Set NC position parameters
	142	PSOFF	P	Force to stop HSPSO
	143	PSCNV	P	Convert pulse count into mechanical value for display
Interrupt control	147	MHSPO		Multi-Axis high speed pulse output
	145	EN	P	Enable external input or peripheral interrupt
	146	DIS	P	Disable external input or peripheral interrupt