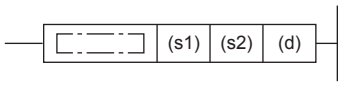
Dividing 16-bit binary data

/(P)(_U) instruction and DIV(P)(_U) instruction can be used for division of 16-bit binary data.

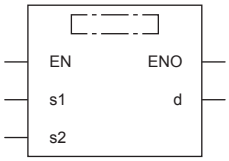
/(P)(_U)

FX5S FX5UJ FX5U FX5UC

These instructions divide the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the result in the device specified by (d).

Ladder diagram	Structured text*1	
	ENO:=DIVISION(EN,s1,s2,d); ENO:=DIVISIONP(EN,s1,s2,d);	ENO:=DIVISION_U(EN,s1,s2,d); ENO:=DIVISIONP_U(EN,s1,s2,d);

FBD/LD



("DIVISON", "DIVISIONP", "DIVISION_U", "DIVISIONP_U" enters □.)

*1 Supported by engineering tool version "1.035M" and later.

Setting data

■Descriptions, ranges, and data types

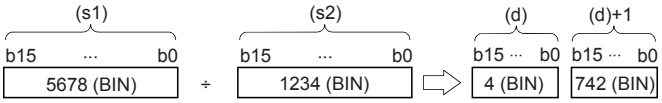
Operand		Description	Range	Data type	Data type (label)
(s1)	/(P)	Dividend data or the device where the data to be divided by another is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	/(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(s2)	/(P)	Divisor data or the device where the data by which another is to be divided is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	/(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(d)	/(P)	Head device for storing the operation result	—	32-bit signed binary	ANY16_S_ARRAY (Number of elements: 2)
	/(P)_U			32-bit unsigned binary	ANY16_U_ARRAY (Number of elements: 2)
EN		Execution condition	—	Bit	BOOL
ENO		Execution result	—	Bit	BOOL

■Applicable devices

Operand	Bit	Word			Double word		Indirect specification	Constant			Others
	X, Y, M, L, SM, F, B, SB, S	T, ST, C, D, W, SD, SW, R	U□\G□	Z	LC	LZ		K, H	E	$	
(s1)	○	○	○	○	—	—	○	○	—	—	—
(s2)	○	○	○	○	—	—	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

Processing details

- These instructions divide the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the division result in the device specified by (d).



(d): Quotient
(d)+1: Remainder

- For the division result, 32-bit is used for word device to store the quotient and remainder and 16-bit is used for bit device to store quotient only.
  - Quotient…… Stored in the lower 16 bits.
  - Remainder…… Stored in the upper 16 bits. (This data can be stored for word device only.)

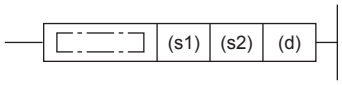
Operation error

Error code (SD0/SD8067)	Description
2820H	The device range specified by (d) exceeds the corresponding device range.
3400H	0 is specified for (s2) value.

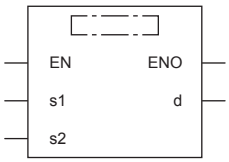
DIV(P)(_U)

FX5S FX5UJ FX5U FX5UC

These instructions divide the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the result in the device specified by (d).

Ladder diagram	Structured text*1	
	ENO:=DIVP(EN,s1,s2,d);	ENO:=DIV_U(EN,s1,s2,d); ENO:=DIVP_U(EN,s1,s2,d);

FBD/LD*1



("DIVP", "DIV_U", "DIVP_U" enters □.)

*1 The DIV instruction is not supported by the ST language and the FBD/LD language. Use DIV of the standard function.
☞ Page 1306 DIV(_E)

Setting data

■Descriptions, ranges, and data types

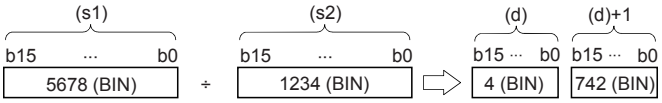
Operand		Description	Range	Data type	Data type (label)
(s1)	DIV(P)	Dividend data or the device where the data to be divided by another is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	DIV(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(s2)	DIV(P)	Divisor data or the device where the data by which another is to be divided is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	DIV(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(d)	DIV(P)	Head device for storing the operation result (quotient, remainder)	—	32-bit signed binary	ANY16_S_ARRAY (Number of elements: 2)
	DIV(P)_U			32-bit unsigned binary	ANY16_U_ARRAY (Number of elements: 2)
EN		Execution condition	—	Bit	BOOL
ENO		Execution result	—	Bit	BOOL

■Applicable devices

Operand	Bit	Word			Double word		Indirect specification	Constant			Others
	X, Y, M, L, SM, F, B, SB, S	T, ST, C, D, W, SD, SW, R	U□\G□	Z	LC	LZ		K, H	E	$	
(s1)	○	○	○	○	—	—	○	○	—	—	—
(s2)	○	○	○	○	—	—	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

Processing details

- These instructions divide the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the division result in the device specified by (d).



(d): Quotient
(d)+1: Remainder

- Two devices in total starting from the one specified by (d) are used to store the division result. Make sure that these two devices are not used for another control.
  - Quotient…… Stored in the lower 16 bits.
  - Remainder…… Stored in the upper 16 bits.

■Related flag

Device	Name	Description
SM700	Carry	When the operation result of the signed operation exceeds 32767, the carry flag is turned ON.
SM8304	Zero	When the operation result is 0, the zero flag is turned ON.
SM8306	Carry	When the operation result of the signed operation exceeds 32767, the carry flag is turned ON.

Precautions

■Operation result

- The most significant bit of the quotient and remainder indicates the sign (positive: 0, negative: 1), respectively.
- The quotient is negative when either (s1) or (s2) is negative. The remainder is negative when the (s1) is negative.

■Device specified by (d)

- The remainder is not obtained when a bit device is specified with digit specification.

Program example

Operation error

Error code (SD0/SD8067)	Description
2820H	The device range specified by (d) exceeds the corresponding device range.
3400H	0 is specified for (s2) value.
3403H	The data type of the data setting is signed data and the operation result exceeds 32767.