

Equipment for Special Machines

WF 721/WF 723 A/WF 723 B/WF 723 C

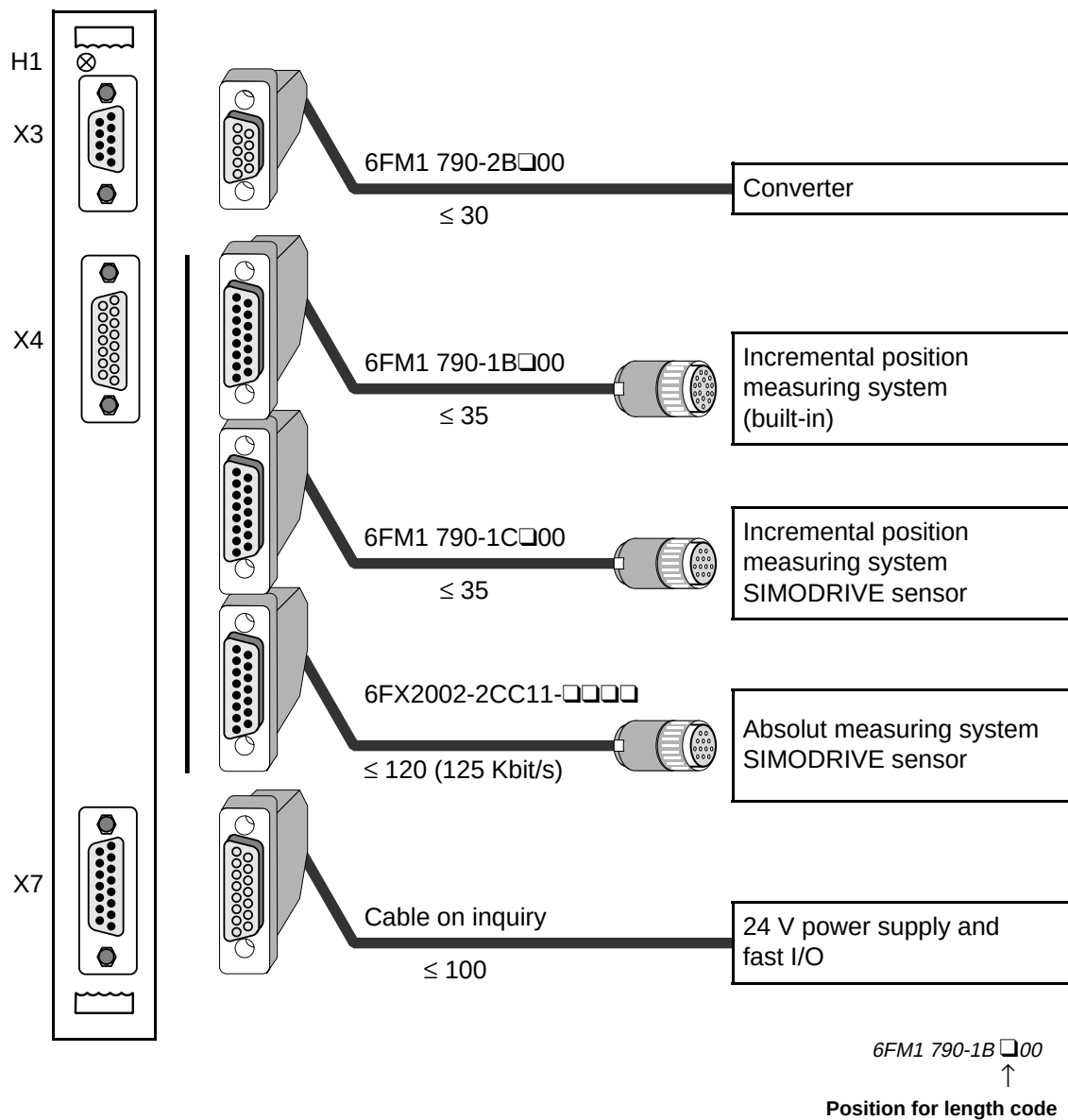
Positioning Modules

Planning Instructions

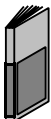
Edition 06.98

Hardware Description

2.3 Overview: WF 721



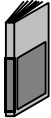
The LED H1 will be selected if a WF traversing error message which has to be acknowledged by reset is pending in the axis.



For connector and cable details refer to section 8.

3 Module Locations in the SIMATIC Rack and Current Consumption

The positioning modules WF 721/WF 723 A/WF 723 B/WF 723 C run with the SIMATIC racks listed below. For the module racks of the SIMATIC S5-115U and the SIMATIC S7-400, adaptor casings are an indispensable condition for the pluggability of the WF modules. The module width with adaptor casing is represented by a dotted line, the bus connector of the WF module, by a small grey rectangle. A WF module has to be inserted into a SIMATIC rack so that the grey rectangle faces a module location marked in grey. WF modules can operated without fan.



For the module locations of WF 470 and GRACIS-S5 in a SIMATIC S5, refer to catalog AR 10.



WF-data is buffered by the SIMATIC buffer battery.

3.1 SIMATIC S5

3.1.1 Admitted CPU Types

Automation unit	CPU type	Order No.
S5-115U	941B	6ES5 941-7UB11
	942B	6ES5 942-7UB11
	943B	6ES5 943-7UB11
	943B	6ES5 943-7UB21
	944B	6ES5 944-7UB11
	944B	6ES5 944-7UB21
	945	6ES5 945-7UA13
	945	6ES5 945-7UA23
S5-135U	928A	6ES5 928-3UA21
	928B	6ES5 928-3UB21
S5-155U	928A	6ES5 928-3UA21
	928B	6ES5 928-3UB21
	948	6ES5 948-3UA12
	948	6ES5 948-3UA22

3.2 SIMATIC S7-400

The positioning modules WF 721/WF 723 A/WF 723 B/WF 723 C can be used in the SIMATIC S7-400 in different ways:

- in the SIMATIC S7-400 central controller in the SIMATIC S7 adaptor casing,
- in a SIMATIC S5 expansion unit coupled with the central controller of the SIMATIC S7-400 via the interfaces IM463-2 (S7) and IM314.



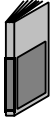
For the module racks of the SIMATIC S7-400, adaptor casings are an indispensable condition for the pluggability of the WF modules. The module width with SIMATIC S7 adaptor casing is two slots.

3.2.1 Admitted CPU types

Automation unit	CPU type	Order No.
S7-400	412-1	6ES7 412-1XF02-0AB0
	413-1	6ES7 413-1XG02-0AB0
	413-2DP	6ES7 413-2XG02-0AB0
	414-1	6ES7 414-1XG02-0AB0
	414-2DP	6ES7 414-2XG02-0AB0
		6ES7 414-2XJ01-0AB0
	416-1	6ES7 416-1XJ02-0AB0
	416-2DP	6ES7 416-2XK01-0AB0
		6ES7 416-2XL01-0AB0

4 Connection Conditions and Installation Directions

Die SIMATIC S5 und die SIMATIC S7 unterscheiden sich in ihren allgemeinen technischen Daten, insbesondere in den Umgebungsbedingungen. Wenn Sie eine WF-Baugruppe in einer S7-400 einsetzen, sind für den Gesamtaufbau die jeweils strengeren Umgebungsbedingungen einzuhalten.



For connection and installation, the EMC recommendations for WF modules (refer to documentation summary on the inner cover), and the installation directions for SIMATIC S5/S7 are of particular relevance.

4.1 Installation Directions

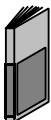
4.1.1 Potential Equalization Lines and Earthing

General Principle

For an interference free operating, all controlling units (PLC, EU, drive controller, etc.) connected by signaling cables must be connected by potential equalization lines as well.

Exception: Components connected via optical waveguide are excepted from the above direction.

Huge network systems using potential equalization lines must conform to the EMC recommendations.



Please refer to section 4.3.1

Earthing



ATTENTION

For correct operation careful earthing is needed to avoid external interference. Be sure of earthing without loops. Only use cables with required diameter.

4.3 Examples for SIMATIC - WF - Drive - Encoder - Connection

4.3.1 Potential Equalization Concept

In order to guarantee fault-free operation, all components of the system connected via signaling cables must be connected by potential equalization lines as well. Potential equalization lines prevent from exceeding potential differences between system components. High potential differences cause a compensating current running through the signaling cable that may lead to faulty data transmission.

For satisfying results make sure that the cable cross section is not less than 10 mm² for the potential equalization line and the resulting surface area for interference distruction. For maximum conductor surface area, only flexible conductors should be used. Solid conductors must be avoided.

Potential equalization lines have to be arranged radially. The potential equalization busbar must be mounted as close as possible to the WF module. Therefore, several WF modules should be concentrated in one rack (central controller, expansion unit) at a central system location and not be spread over several expansion units.

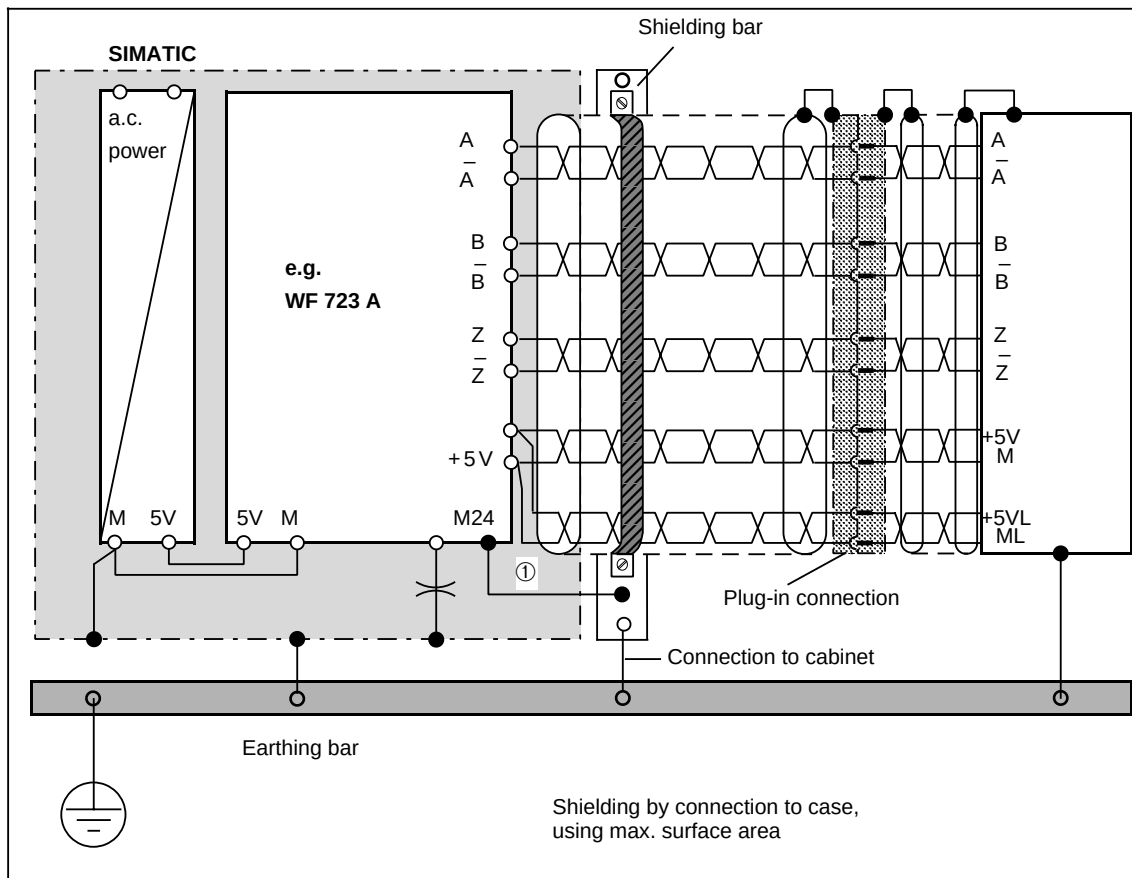
Today's modern analog controller components, such as converters and transistorized controllers, work with very high clock frequencies. In connection with the high intermediate-circuit voltages, the drive represents a very high interference potential that must be prevented by an appropriate earthing concept.

Drive and WF module have to be connected with a separate potential equalization line (minimum cross section 10 mm², Cu). The distance between the rack containing the WF module and the potential equalization busbar must not be bigger than 0.5 meters. The cross section of the cable used between the potential equalization busbar and the earthing bar must be min. 10 mm², Cu. The cable used should be as short as possible.



Do not use equalization busbars made of cadmium-plated steel. Do not use protective conductors as potential equalization lines.

4.3.2.2 Connection of Incremental Position Encoders



Connect the position encoders very carefully. This signaling line carries the information about the position of the corresponding WF axis, so that the WF axis is able to position with a maximum accuracy of $1\mu\text{m}$ and to traverse the axis with closed-loop control at a speed of 500 m/min (with a resolution of $10\mu\text{m}$). The transmission frequencies in the measuring circuit cable amount to up to 250 kHz. Therefore, measuring circuit wires must be shielded. Make sure to use exclusively twisted pair wires. Avoid excessive wire pairs by careful cable selection. If this is impossible for certain reasons, connect the unused pairs to a signal potential (e.g. +5 V and M), making sure that the signals are reciprocal. Do not carry A and B in the same pair, but use A and $\bar{A}$ or +5 V and M or only M.

Lead the shield of the line through the encoder plug (connect it to case or plug). If there is a potential difference between position encoder case and shielding bar of the WF-axis, connect a separate potential equalization line to the position encoder.

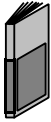
Avoid interruptions of the encoder line, e.g. through intermediate plugs or flat connectors.

4.3.2.3 Input Circuit Connection

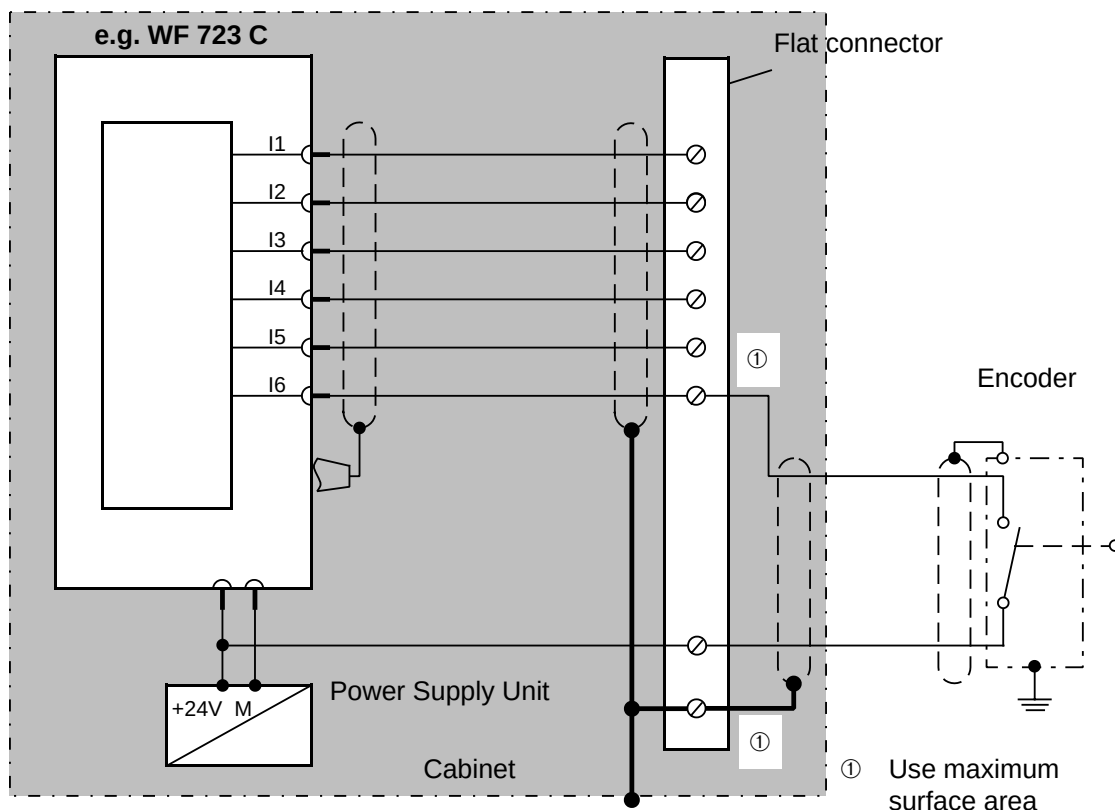
The WF 723 A/WF 723 B/WF 723 C uses 9 inputs, respectively the WF 721 uses 7 inputs. 3 controller feedback signals ("ready") from the drive can be plugged on connector X3, respectively at the WF 721 one feedback signal and 6 further input circuits on connector X7.

The function of the inputs can be selected by machine data setting (MD 15).

Some connection conditions must be fulfilled.



The voltage and current limits mentioned in section 5 must be observed.

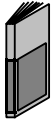


As the WF-module inputs are interrupt inputs, the encoders must be connected by shielded cable. The shield conductor must be connected to the cabinet shielding bar using maximum surface area.

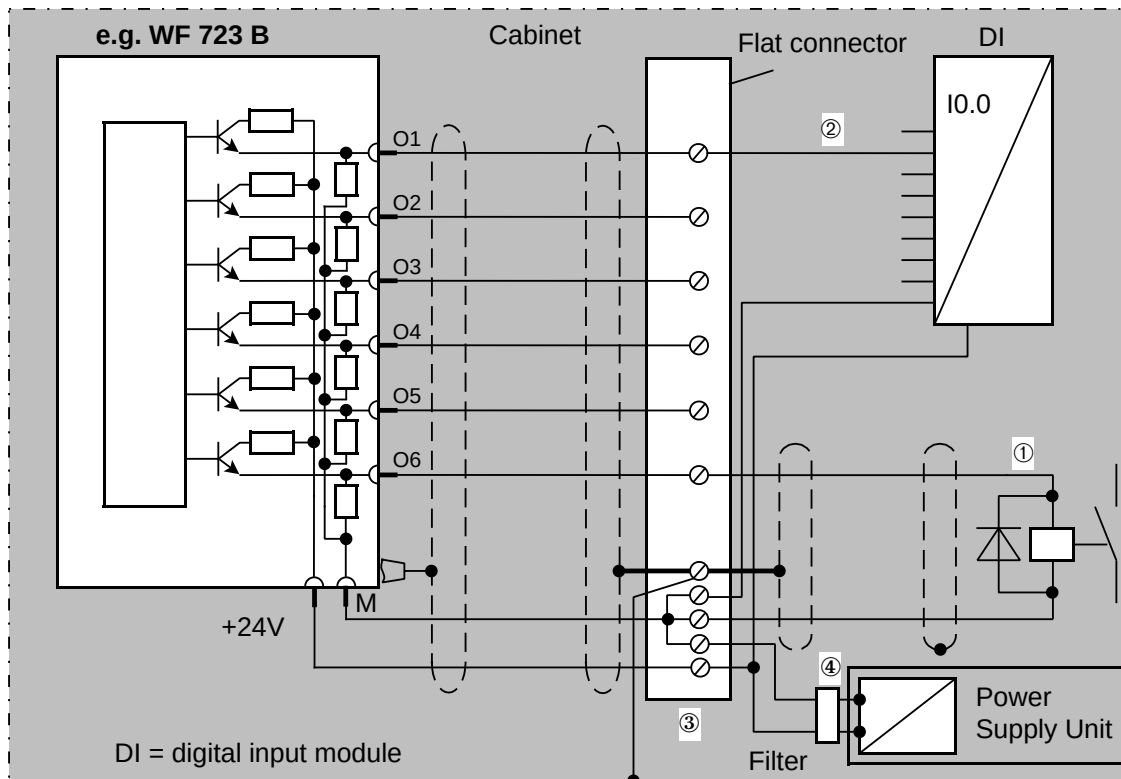
Make sure that the switching contact is bounce-free. Unused inputs must remain unconnected. Therefore, avoid superfluous wires when selecting the cables. Signals processed as an interrupt (e.g. flying actual-value setting) have to be pending for at least 50 μ s. Signals not processed as an interrupt (e.g. external block change) have to be pending for at least one WF cycle.

4.3.2.4 Output Circuit Connection

The 9 outputs of the WF 723 A/WF 723 B/WF 723 C, respectively the 7 outputs of the WF 721, are located similar to the inputs on the connectors. 3 outputs used for control enable, respectively one output at the WF721. This outputs must be plugged on connector X3 and 6 further outputs are plugged on connector X7. The function of the outputs (X7) can be selected by machine data setting (MD 16).



The voltage and current limits mentioned in section 5 must be observed.



- ① The cables used for relays or electromagnetic valves must be shielded. The unshielded part of the cable must be kept as short as possible. Coils must be de-jammed.
- ② When connecting an output to a digital input of the PLC make sure that the relevant return circuit is laid very close to the hot wire. At distances > 3 m or when laying wires parallel to other signaling lines use shielded cable.
- ③ The shield conductors must be connected to the shielding bar or the cabinet by maximum surface area. Wires or clamps must not be used.
- ④ If the power supply unit is mounted externally to the module cabinet, the supply voltage has to be filtered when entering the cabinet (the same applies to mains voltages).

When re-energizing the WF-modules, a hardware circuit provides that the outputs are in low state.

5 Technical Data

In addition to national and international recommendations, various Siemens standards (SN) are valid. The applicable standards are indicated in the corresponding sub-sections.

5.1 Electrical Data

Internal Power Supply	
The modules are powered via the corresponding SIMATIC bus. Regulated d.c. power supply SN 26555 part 9.	
Nominal voltage	+5 V
Voltage limits/static	+4.85 V to +5.25 V
Current consumption (without encoder) – WF 721 – WF 723 A – WF 723 B – WF 723 C	1.0 A 1.3 A 1.4 A 1.4 A
Admissible current consumption per encoder	max. 0.3 A

External Power Supply	
For digital outputs of the module, +24 V and M is needed for connector X7. Regulated d.c. power supply SN 26555 part 9.	
Nominal voltage	+24 V
Voltage limits/static	+20 V to +30 V
Voltage limits/dynamic – lower limit voltage duration recovery time – upper limit voltage duration recovery time	+14.25 V 5 ms 10 s +35 V 500 ms 50 s

Signal Voltages	
Analog d.c. signal voltages SN 26555 part 1 or DIN IEC 381, part 2	
Nominal analog output voltage range	– 10 V to +10 V
Permitted load current	0 mA to 2 mA

Signal Voltages	
Binary d.c. signal voltages SN 26555 part 3	
High level – nominal voltage range – permitted voltage range for inputs outputs – permitted current range for inputs outputs Permitted inductive load	+24 V +13 V to +33 V +15 V to +33 V 0 mA to 5 mA 0 mA to 500 mA damping necessary with recovery diode or RC-circuit
Low level – nominal voltage – permitted voltage range for inputs outputs	+0 V – 2 V to +4.5 V 0 V to +2.5 V
Frequency limits/ baud rate for encoder input – incremental – serial	250 kHz 125 kBit/s
Required input current Encoder signals – incremental – serial	10 mA 7 mA

5.2 Reliability

Temperature	MTBF (mean time between failure)
25 °C – WF 721 – WF 723 A – WF 723 B – WF 723 C	6.65 years 5.7 years 6.18 years 6.18 years
55 °C – WF 721 – WF 723 A – WF 723 B – WF 723 C	2.47 years 1.8 years 2.34 years 2.34 years

5.3 Mechanical Data

Vibrating stress during operation (DIN IEC 68-2-6; SN29010-1, class 12)	10 Hz to 58 Hz: 0.075 mm excursion 58 Hz to 500 Hz: 9.81 m/s ² (=1g)
Vibrating stress when module packed ready for dispatch (DIN IEC 68-2-6; SN29010-2, class 22)	5 Hz to 9 Hz: 3.5 mm excursion 9 Hz to 500 Hz: 9.81 m/s ² (=1g)
Toppling over of unpacked module (DIN IEC 68-2-31)	Height of fall 50 mm
Rolling test of packed module (DIN IEC 68-2-31)	
Weight – WF 721 – WF 723 A, WF 723 B, WF 723 C	approx. 0.6 kg approx. 0.7 kg

5.4 Climatic Environmental Conditions

Ambient temperature (DIN IEC 68-2-1 cold; DIN IEC 68-2-2 dry heat; DIN IEC 68-2-3 humid heat) – operating temperature (SN26551-1, assignment B) – storage temperature (SN26556-2, assignment C)	0 °C to +55 °C $\Delta T \leq 10$ K/h – 40 °C to +70 °C $\Delta T \leq 20$ K/h
Air pressure – during operation – storage	min. 860 hPa (below, restricted refrigerating capacity) max. 1060 hPa min. 660 hPa max. 1060 hPa

5.5 Chemical Stress

Protect the system against influence of chemically aggressive gas by corresponding measures during system installation.

Operation-Endangering Dust or Gas	
Type of ventilization	Self-ventilated
Class of protection	VDE0106-1(IEC536) class III
Protection against water and foreign substances (DIN40050; IEC529) – module plugged into the SIMATIC S5 rack – module withdrawn	IP20 IP10

6 Hardware Description

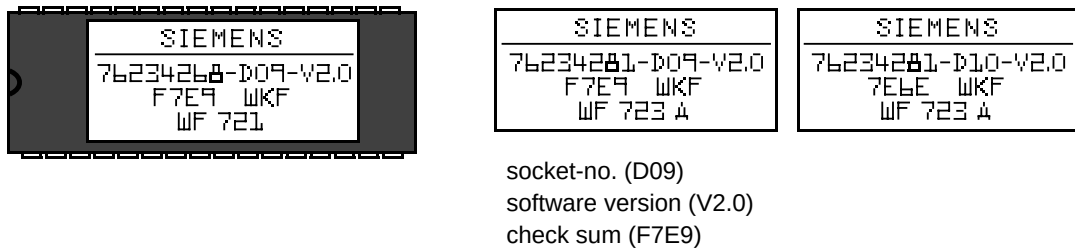
6.1 Labels

- The following label is attached to the front panel of the module:



The current object version is made known by means of revision notes. Please contact your Siemens branch office.

- EPROM label (WF 721/WF 723 A only)



- FEPROM label (WF 723 B/WF 723 C only)
The labels mark the version of the loadable firmware on delivery of the module and have therefore no special meaning.



The WF 723 B, order number 6FM1 723-3BA10, has FEPROM label (order number 6FM1 723-3BA00 has EPROM label).

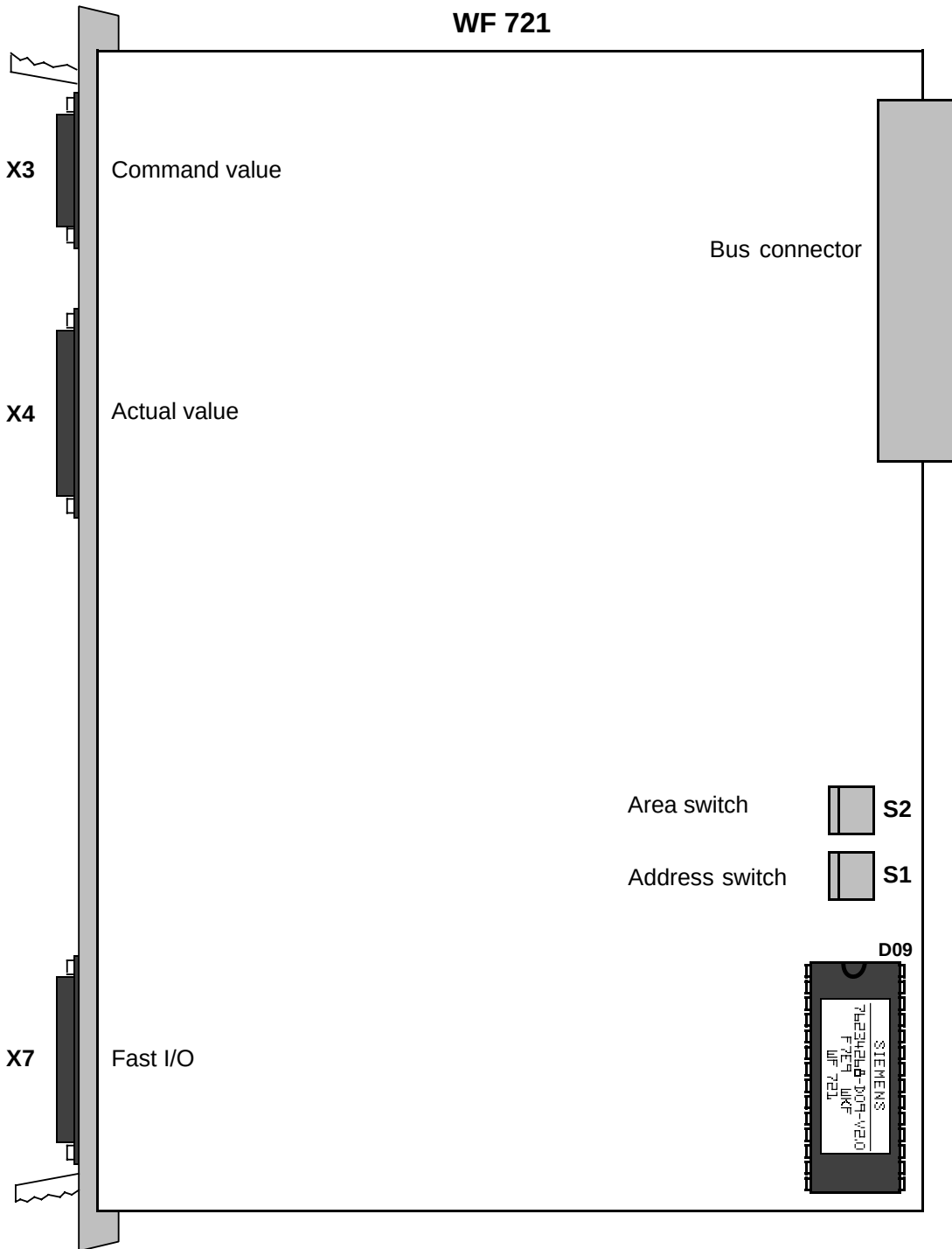


Fig. 6.1 WF 721 – socket location of the EPROM