Cables, Connectors & System Components

for SINUMERIK, SIMODRIVE, SIMOVERT MASTERDRIVES & SIMOTION

Catalog NC Z · 2002/2003

Supersedes:
Catalog NC Z· 2000/2001

The products and systems described in this catalog are sold under application of a management system certified by DQS in accordance with DIN EN ISO 9001 (Zertifikat-Registrier-Nr. 125805).
The DQS Certificate is recognized in all IQ Net countries.

SIEMENS

Introduction

Overview

We supply connection equipment and system components for this automation equipment which can be ideally adapted to the Motion Control applications.

Just plug and play
Whether you require the perfect connection for servo motors or main spindles, we supply power and signal cables for the entire performance range.

Our strength – your safety
Electromagnetic compatibility, insulation and production processes in accordance with VDE (Association of German Electricians) as well as extremely resistant cables with a long service life ensure fault-free operation.

Tailored to your machine – YOUR BENEFIT
We make sure that you find the ideal solution for your application.
In addition to catalog products, we configure the ideal machine for you and supply suitable products for special applications such as mounting cables vertically or vibration-resistant connections.

Our logistics – YOUR BENEFIT
We make sure that your machine gets the right connection. Our production center produces order-related, in any length required, and we deliver around the world.
If you have any questions, you will always find a Siemens contact person close by.

In case you assemble your own cable sets, we offer many fully developed accessories.

Connection technology for Motion Control is easy to use and economically priced.

Pre-assembled cable sets 6FX■ 002-...

Pre-assembled cable sets have many advantages over self-made cables.

Apart from guaranteed faultless functioning and high quality, they also offer many cost advantages.

By using pre-assembled cable sets you will save money on logistics, design, assembly and purchasing.

Pre-assembled power and signal cable sets 6FX can be supplied cut to the meter from 1 m to 299 m (other lengths upon request).

Notes:
Please observe the technically maximum permissible cable lengths (e.g. ≤ 50 m) in the overview of connection diagrams. Malfunctions can occur if longer cable lengths are used.

The letters OEM are printed on the outer sheath of cables ordered in excess of the maximum permissible length. In such cases, however, Siemens AG will not provide warranty for signal transferability or performance.

The MOTION-CONNECT family consists of the following versions:

- MOTION-CONNECT 500 (6FX5...)
  The economical solution for primarily fixed installation.UL
  - UL
  - VDE
  - EMV
  - DESINA color
  - Can be trailed conditionally
  - Free of CFCs
  - Oil resistant (hydraulic oil only)
- MOTION-CONNECT 700 (6FX7...)
  For extreme acceleration and traversing velocity when using linear motors.
  - UL/CSA
  - VDE
  - EMV
  - DESINA color
  - Can be trailed
  - Oil resistant
  - Flame-retarding
  - Free of CFCs
  - Free of halogen
  - Free of silicone
- MOTION-CONNECT 800 (6FX8...)
  Meets all requirements for use in machine tools and production machines.
  - UL/CSA
  - VDE
  - EMV
  - DESINA color
  - Can be trailed
  - Oil resistant
  - Flame-retarding
  - Free of CFCs
  - Free of halogen
  - Free of silicone

1 In order to achieve the longest possible service life of the trailing arrangement and cables, cables with different materials and without separators must not be used in the trailing arrangement. The sections should be filled uniformly to ensure that the cables do not change their positions during operation. The cables should be distributed as symmetrically as possible, according to weight and dimensions. Cables with greatly differing outer diameters should be segregated by separators.

When routing cables with integral connectors in a trailing arrangement, **do not pull** at the connector as this may damage the strain relief or cable clamp.

2 The cables must not be secured in the trailing arrangement and must have freedom of movement.

3 It must be possible to move the cables without force, particularly in the radii of curvature of the arrangement. The bending radii must not be less than the minimum values specified.

Mounting points of the cables should be located in dead zones at both ends at a suitable distance from the end points of the moving parts.

Note:
If, for example, pre-assembled cables are laid in a trailing chain and the connector obstructs installation, the pre-assembled cables can also be ordered and supplied without connector (signal and power cables).

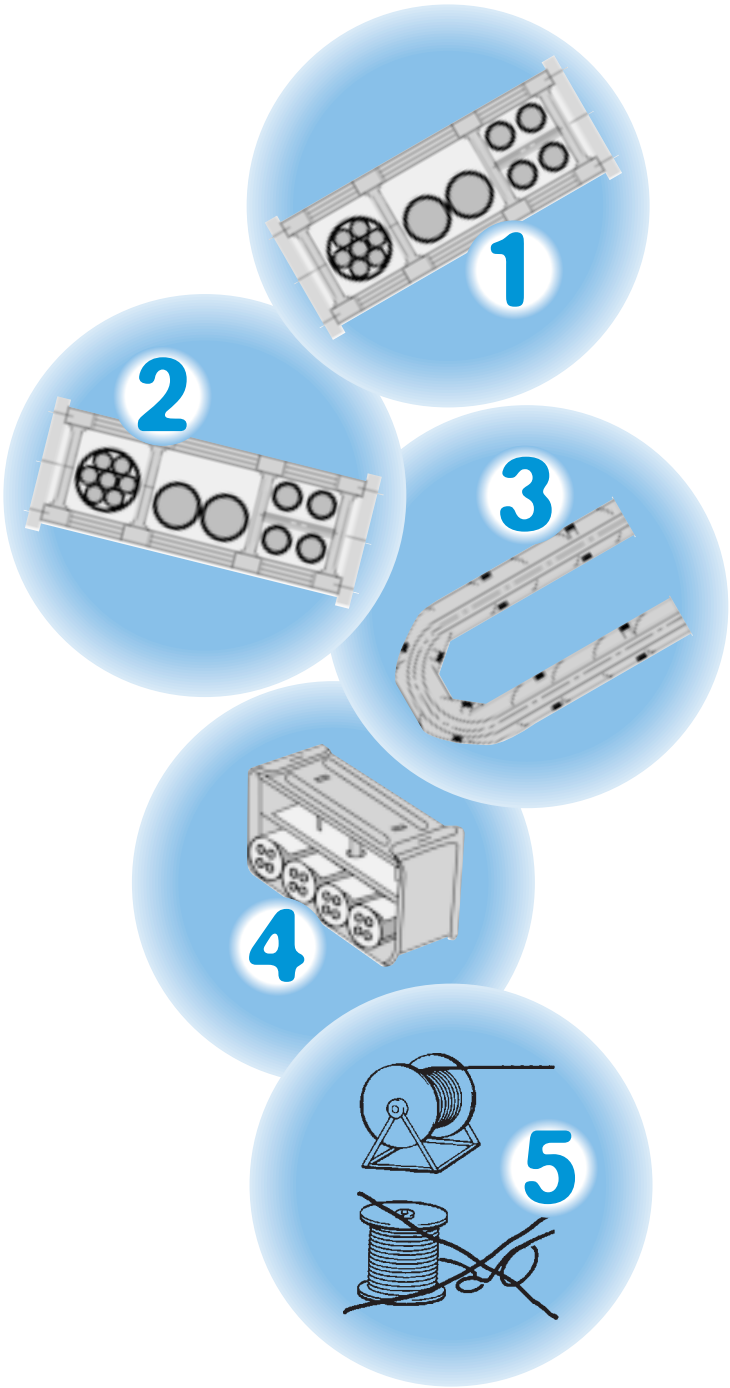
In the case of this cables, the contacts are crimped; here, the connector housing is not mounted, but enclosed as part of the delivery. After installing the cable, the customer mounts the connector housing himself (see 2/4 and 2/5 for ordering).

4 The cables must be fitted with a strain relief, at least at the moving ends of the trailing arrangement; this should be achieved over a large area of the sheath's surface without crushing the cable construction.

5 Twisting must be avoided when removing the cables from the cable drum, i.e. the cables must be rolled off and must never be lifted in loops over the drum flange.

When routing the cables, the instructions given by the trailing arrangement manufacturer must be strictly observed.
Our cables are approved for a lifting height of max. 5 m.

In the case of vibration load and horizontal or vertical cable entries we always recommend additional fixing of the cable, if part of the cable is freely suspended or is not ducted between the strain relief on the trailing arrangement and the connection to the motor. To avoid machine vibrations being transferred onto the connectors, the cable should be connected to the part in motion, where the motor is connected, too. The distance should be approx. 10 x D_{max} of the cable.



Current carrying capacity (I_z) of PVC-insulated copper wires according to IEC 60204-1: 1997 ++ Corrigendum 1998

Cross section	Current carrying capacity (I_z) [A] with installation type (see C 1.2)			
[mm^2]	B1	B2	C	E
0.75	7.6	–	–	–
1.0	10.4	9,6	1.7	1.5
1.5	13.5	12,2	1.2	16.1
2.5	18.3	16,5	21	22
4	25	23	28	30
6	32	29	36	37
10	44	40	50	52
16	60	53	66	70
25	77	67	84	88
35	97	83	104	114
50	–	–	123	123
70	–	–	155	155
95	–	–	192	192
120	–	–	221	221
150	–	–	234	262
185	–	–	267	300
Electronics (pairs)				
0.2	–	–	4.0	4.0
0.3	–	–	5.0	5.0
0.5	–	–	7.1	7.1
0.75	–	–	9.1	9.1

The current carrying capacity (I_z) of PVC-insulated cables is given in the table above in relation to an ambient air temperature of +40 °C. For other ambient temperatures, calculate values using the Corretion factors table above.

PUR cables are also subject to this standard.

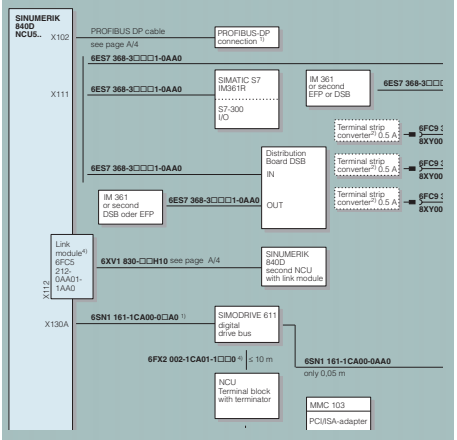
Correction factors

Ambient temperature of air	Corection factor
°C	
30	1.15
35	1.08
40	1.00
45	0.91
50	0.82
55	0.71
60	0.58

Note: Correction factors according to IRC 60364-5-523, Table 52-D1.

Cables

2



2

Cables	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800
	Typ 6FX5 00. -	Typ 6FX7 00.- ...	Typ 6FX8 00. - ....
Approvals			
Power-/signal cables			
• VDE[1]	yes	yes	yes
• c/UL oder UL/CSA	758/C22.2 N.210.2-M9C	758/C22.2 N.210.2-M9C	758/C22.2 N.210.2-M9C
• UL-CSA File No. [2]	yes	yes	yes
Electrical data			
DIN VDE 0472			
Rated voltage			
• Power cables U_0/U			
- Supply cores	600 V/1000 V	600 V/1000 V	600 V/1000 V
- Signal cores	24 V (VDE) 1000 V (UL)	24 V (VDE) 1000 V (UL/CSA)	24 V (VDE) 1000 V (UL/CSA)
• Signal cables	30 V	–	30 V
Test voltage			
• Power cables			
- Supply cores	4 kV_{eff}	4 kV_{eff}	4 kV_{eff}
- Signal cores	2 kV_{eff}	2 kV_{eff}	2 kV_{eff}
• Signal cables	500 V_{eff}	–	500 V_{eff}
Operating temperature			
on the surface			
• fixed installation	-20 °C ... +80 °C	-50 °C ... +80 °C	-50 °C ... +80 °C
• in motion	0 °C ... +60 °C	-20 °C ... +60 °C	-20 °C ... +60 °C
Mechanical data			
Maximum tensile stress			
Power-/signal cables:			
• fixed installation	50 N/mm²	50 N/mm²	50 N/mm²
• in motion	–	20 N/mm²	20 N/mm²
Minimum perm. bending radius			
• fixed installation power cable	5 x D_{max}	4 x D_{max}	6 x D_{max}
• fixed installation signal cable	see table page A/1	–	see table page A/1
• in motion power cable	see table page 2/6	see table page 2/7	see table page 2/6
• in motion signal cable	see table page A/1	–	see table page A/1
Torsional stress	absolute 30°/m	absolute 30°/m	absolute 30°/m
Number of bends power cable			
• 1.5 to 6 mm²	100,000	10 Mio.	10 Mio.
• 10 to 50 mm²	100,000	10 Mio.	3 Mio.
Number of bends signal cable	2 Mio.	10 Mio.	10 Mio.
Process speed power cable			
• 1.5 to 6 mm²	30 m/min.	200 m/min.	180 m/min.
• 10 to 50 mm²	30 m/min.	200 m/min.	100 m/min.
Signal cable	180 m/min. (5 m); 100 m/min (15 m)	200 m/min.	180 m/min
Acceleration power cable	2 m/s²	30 m/s²	5 m/s² (5 m); 10 m/s² (2,5 m)
Acceleration signal cable	5 m/s²	30 m/s²	5 m/s² (5 m); 10 m/s² (2,5 m)
Chemical data			
Insulation material	Free of CFCs, silicone	Free of halogen, silicone, CFCs DIN 472 815/IEC 60754-1	Free of halogen, silicone, CFCs DIN 472 815/IEC 60754-1
Oil resistance	VDE 0472, Part 803 Test type B (hydraulik oil only)	VDE 0472, Part 803 Test type B	VDE 0472, Part 803 Test type B
Outer sheath			
• Power cable	PVC Color: DESINA orange RAL2003	PUR DIN VDE 0282, Part 10 Color: DESINA orange RAL2003	PUR DIN VDE 0282, Part 10 Color: DESINA orange RAL2003
• Signal cable	PVC Color: DESINA green RAL6018		PUR DIN VDE 0282, Part 10 Color: DESINA green RAL6018
Flame-retarding	IEC 60 332-3	IEC 60 332-3	IEC 60 332-3

The cables are not intended for use outdoors.
The technical specifications of these cables are only valid for simple bends with horizontal traverse paths up to 5 m.
Degree of protection for precut power and signal cables and their extension cables
in closed and plugged in state: IP 67

1) the number of registration is printed on the outer sheath.
2) the file number of the specific manufacturer is printed on the outer sheat.

Splitting Options

Signal Cables

Extension cables

Cable basic type

Extension cables	Cable basic type
6FX■ 002-2AD04-1 ■■ 0	6FX■ 002-2AD00-1 ■■ 0
6FX■ 002-2AH04-1 ■■ 0	6FX■ 002-2AH00-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CA11-1 ■■ 0
6FX■ 002-2CA54-1 ■■ 0	6FX■ 002-2CA15-1 ■■ 0
6FX■ 002-2CA34-1 ■■ 0	6FX■ 002-2CA31-1 ■■ 0
6FX■ 002-2CA54-1 ■■ 0	6FX■ 002-2CA51-1 ■■ 0
6FX■ 002-2CA54-1 ■■ 0	6FX■ 002-2CA61-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CA72-1 ■■ 0
6FX8 002-2CB34-1 ■■ 0	6FX8 002-2CB31-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CB51-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CC11-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CC71-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CD01-1 ■■ 0
6FX■ 002-2CF04-1 ■■ 0	6FX■ 002-2CF02-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CG00-1 ■■ 0
6FX■ 002-2AD04-1 ■■ 0	6FX■ 002-2CH00-1 ■■ 0
6FX■ 002-2EQ14-1 ■■ 0	6FX■ 002-2EQ10-1 ■■ 0
6FX8 002-2CA41-1 ■■ 0	6FX8 002-2CA21-1 ■■ 0
6FX■ 002-2CB44-1 ■■ 0	6FX■ 002-2CB42-1 ■■ 0
6FX■ 002-2CB44-1 ■■ 0	6FX■ 002-2CE02-1 ■■ 0
6FX■ 002-2CM04-1 ■■ 0	6FX■ 002-2CM00-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CB47-1 ■■ 0
6FX■ 002-2CB54-1 ■■ 0	6FX■ 002-2CE07-1 ■■ 0
6FX■ 002-2CA54-1 ■■ 0	6FX■ 002-2CA51-1 ■■ 0

5 8 ▲ 5 8 ▲ 5 8 ▲ 5 8 ▲

The illustrated combinations are just one example of how you can extended cables or install them between interfaces.

Note

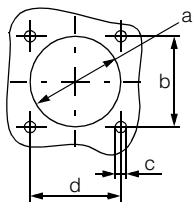
The maximum length of cables (basic and extension) must be observed. Each interruption point reduces the overall length by 2 meters. All signal cables are also available with crimped contacts and separately enclosed connector housing (see also page 1/3):
Ordering data:
Separately enclosed connector housing motor end: Order No.: 6FX■ 042–2...–1...
Separately enclosed connector housing module end: Order No.: 6FX■ 012–2...–1...

Flange mounting

A flange can be mounted on the connector with union nut or with an external thread (not for angled connectors) and must be seperately ordered under Order No.: 6FX2 003-7DX00.
HF-clamp (high-frequency) see page A/1

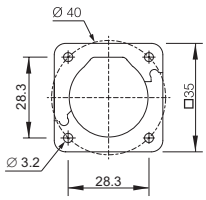
▲ length code see page A/1

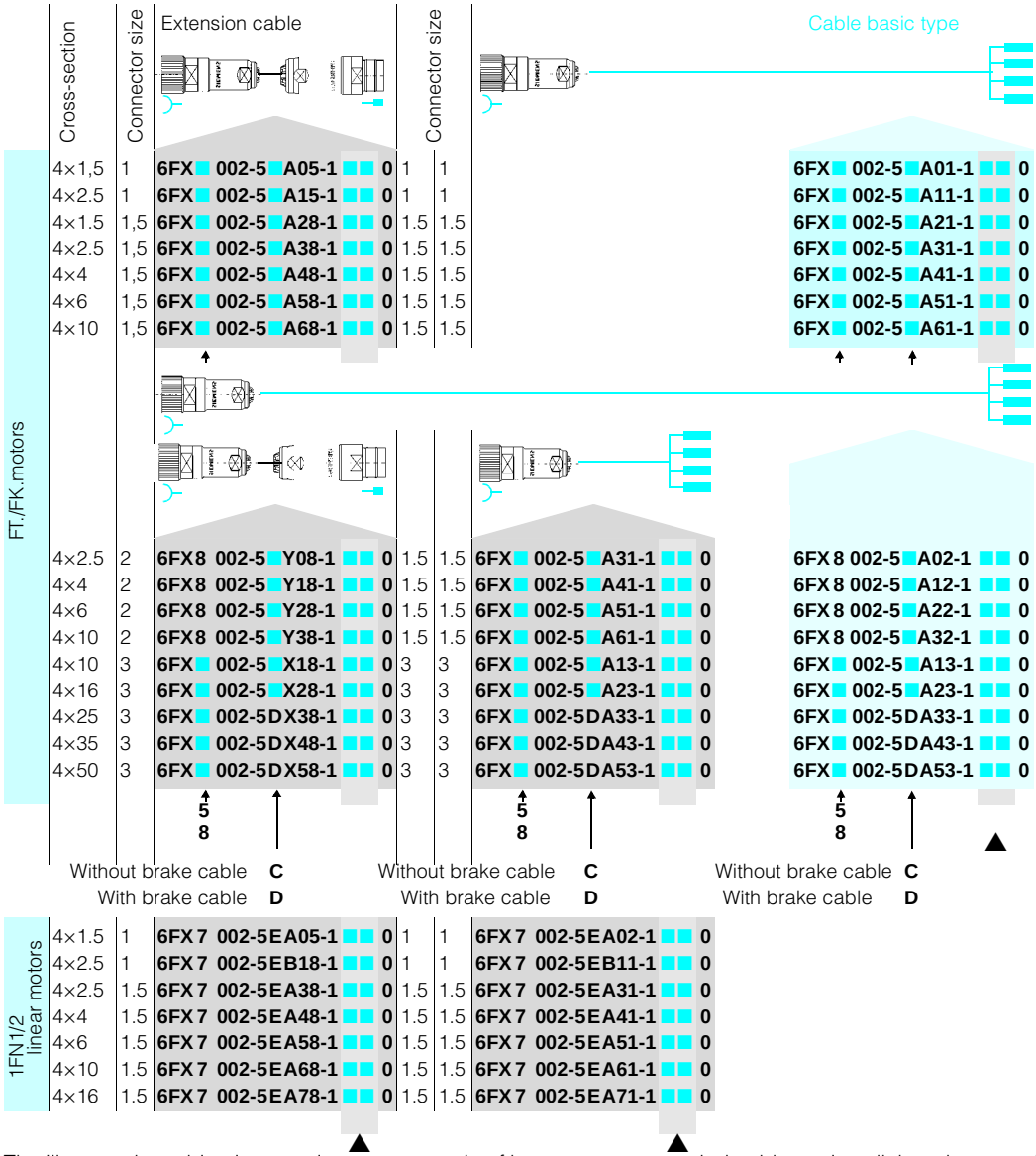
Mounting wholes for flange



Dimensions [mm]
a = Ø 27
b = 28.3
c = M3 (4x)
d = 28.3

Flange dimensions [mm]





The illustrated combinations are just one example of how you can extended cables or install them between interfaces.
Connector size 2 power cables which require safe clearance (e.g. cabinet wall) cannot be extended directly. in such cases, use the Splitting Options above right from the start..

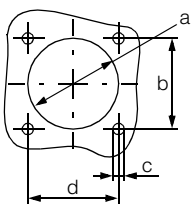
Note
The maximum length of cables (basic and extension) must be observed. Each interruption point reduces the overall length by 2 meters. All signal cables are also available with crimped contacts and separately enclosed connector housing (see also page 1/3):
Ordering data:
Separately enclosed connector housing motor end: Order No.:: 6FX■ 042–5...–1...
Separately enclosed connector housing module end: Order No.: 6FX■ 012–5...–1...

Flange mounting

A flange can be mounted on the connector with union nut or with an external thread (not for angled connectors) and must be seperately ordered under Order No.:
6FX2 003-7BX00
for connector size 1
6FX2 003-7CX00
for connector size 1,5
6FX2 003-7AX10
for connector size 3

HF-clamp (high-frequency)
see page A/1

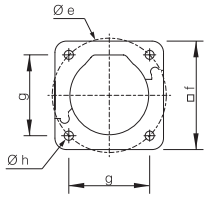
Mounting wholes for Flange



Dimensions [mm]

Size 1	Size 1.5	Size 3
a = Ø 27.8	a = Ø 46	a = Ø 65
b = 28.3	b = 42.4	b = 75
c = M3(4x)	c = M4(4x)	c = M4(4x)
d = 28.3	d = 42.4	d = 75
e= Ø 40	e = Ø 60	e = Ø 63
f = 35	f = 55	f = 85
g = 28.3	g = 42.4	g = 75
h = Ø 3.2	h = Ø 4.4	h = Ø 4.5

Flange dimensions



▲ length code see page A/1

Power cables

For 1FT/1FK servomotors aswell cable sold by meter for 1PH/1FE1 mainspindle motors

6FX■ 002 - 5....

without brake cables with overall shield

[mm²]	Connec-tor size	Pre-assembled cable Order-No.	Dmax 6FX5.. [mm]	Dmax 6FX8.. [mm]	Cable supplied by meter Order-No.	Weight[1] 6FX5.. [kg/m]	Weight[1] 6FX8.. [kg/m]	Minimum perm. bending radius 6FX5.. [mm]	Minimum perm. bending radius 6FX8.. [mm]
4x1.5	1 1.5	**6FX■ 002 - 5CA01 - ■■■0** **6FX■ 002 - 5CA21 - ■■■0**	10.1	10.4	**6FX■ 008 - 1BB11 - ■■A0**	0.18	0.16	185	100
4x2.5	1 2 1.5	**6FX■ 002 - 5CA11 - ■■■0** **6FX8 002 - 5CA02 - ■■■0** **6FX■ 002 - 5CA31 - ■■■0**	11.5	12.1	**6FX■ 008 - 1BB21 - ■■A0**	0.24	0.24	210	120
4x4	2 1.5	**6FX8 002 - 5CA12 - ■■■0** **6FX■ 002 - 5CA41 - ■■■0**	13.3	13.2	**6FX■ 008 - 1BB31 - ■■A0**	0.32	0.31	240	130
4x6	2 1.5	**6FX8 002 - 5CA22 - ■■■0** **6FX■ 002 - 5CA51 - ■■■0**	15.6	16	**6FX■ 008 - 1BB41 - ■■A0**	0.46	0.43	285	170
4x10	2 3 1.5	**6FX8 002 - 5CA32 - ■■■0** **6FX■ 002 - 5CA13 - ■■■0** **6FX■ 002 - 5CA61 - ■■■0**	20	19.4	**6FX■ 008 - 1BB51 - ■■A0**	0.73	0.63	360	210
4x16 4x25 4x35	3	**6FX■ 002 - 5CA23 - ■■■0** ▲	24.2 28 31.5	23.6	**6FX■ 008 - 1BB61 - ■■A0** **6FX5 008 - 1BB25 - ■■A0** **6FX5 008 - 1BB35 - ■■A0**	1.1 1.42 1.87	0.95	440 505 570	260
4x50 4x70 4x95			38 42.6 51.7		**6FX5 008 - 1BB50 - ■■A0** **6FX5 008 - 1BB70 - ■■A0** **6FX5 008 - 1BB05 - ■■A0**	3.42 4.12 4.48		685 770 935	
4x120 4x150 4x185			56 63 66.2		**6FX5 008 - 1BB12 - ■■A0** **6FX5 008 - 1BB15 - ■■A0** **6FX5 008 - 1BB18 - ■■A0**	6.11 7.75 9.45		1010 1135 1195	

with brake cables with overall shield

[mm²]	Connec-tor size	Pre-assembled cable Order-No.	Dmax 6FX5.. [mm]	Dmax 6FX8.. [mm]	Cable supplied by meter Order-No.	Weight[1] 6FX5.. [kg/m]	Weight[1] 6FX8.. [kg/m]	Minimum perm. bending radius 6FX5.. [mm]	Minimum perm. bending radius 6FX8.. [mm]
4x1.5+2x1.5	1 1.5	**6FX■ 002 - 5DA01 - ■■■0** **6FX■ 002 - 5DA21 - ■■■0**	13.1	12.9	**6FX■ 008 - 1BA11 - ■■A0**	0.22	0.25	240	125
4x2.5+2x1.5	1 2 1.5	**6FX■ 002 - 5DA11 - ■■■0** **6FX8 002 - 5DA02 - ■■■0** **6FX■ 002 - 5DA31 - ■■■0**	14.2	14.2	**6FX■ 008 - 1BA21 - ■■A0**	0.28	0.31	260	140
4x4+2x1.5	2 1.5	**6FX8 002 - 5DA12 - ■■■0** **6FX■ 002 - 5DA41 - ■■■0**	15.9	15.3	**6FX■ 008 - 1BA31 - ■■A0**	0.36	0.40	290	150
4x6+2x1.5	2 1.5	**6FX8 002 - 5DA22 - ■■■0** **6FX■ 002 - 5DA51 - ■■■0**	16.9	17.8	**6FX■ 008 - 1BA41 - ■■A0**	0.54	0.53	305	195
4x10+2x1.5	2 3 1.5	**6FX8 002 - 5DA32 - ■■■0** **6FX■ 002 - 5DA13 - ■■■0** **6FX■ 002 - 5DA61 - ■■■0**	21.7	20.8	**6FX■ 008 - 1BA51 - ■■A0**	0.75	0.74	395	230
4x16+2x1.5 4x25+2x1.5 4x35+2x1.5 4x50+2x1.5	3 3 3 3	**6FX■ 002 - 5DA23 - ■■■0** **6FX■ 002 - 5DA33 - ■■■0** **6FX■ 002 - 5DA43 - ■■■0** **6FX■ 002 - 5DA53 - ■■■0**	24.2 29.4 32.6 38	24.7 27.9 32 35.8	**6FX■ 008 - 1BA61 - ■■A0** **6FX■ 008 - 1BA25 - ■■A0** **6FX■ 008 - 1BA35 - ■■A0** **6FX■ 008 - 1BA50 - ■■A0**	1.1 1.56 2.01 3.3	1.10 1.46 2.10 2.75	440 530 590 685	275 325 380 420
		5 **8** ▲			**5** **8**				

Other packing drum length

6FX■ 008-	50 m (-1FA0)	100 m (-2AA0)
-1BA25	No return drum	No return drum
-1BA35	No return drum	No return drum
-1BA50	No return drum	No return drum
-1BA51 /-1BB51		No return drum
-1BA61 /-1BB61	No return drum	No return drum

Packing drum lenght:

10 m	**Packing drum**	**1 B**	(only for 25, 35, 50 mm²)
50 m	**Packing drum**	**1 F**	(for other length see Table)
100 m	**Packing drum**	**2 A**	(for other length see Table)
200 m	**No return drum**	**3 A**	(not for cables > 10 mm²)
500 m	**No return drum**	**6 A**	(not for cables > 10 mm²)

▲ Length code see page A/1

(25, 35 and 50 mm² cross-sections can be ordered and delivered by meter in lengths of 10 m to 49 m according to the integral connector-cables and in 10 m packing drum length).

1) Weight of the cables by meter without connector.

For linear motors

6FX7 002 - 5EA..

6FX7 008 - 1BC..[2]

[mm²]	Connector size	Pre-assembled cable for 1FN1 motors Order-No.	$D_{max.}$ [mm]	Minimum perm. bending radius [mm]	Cable supplied by meter for 1FN3 motors Order-No.	Weight[1] [kg/m]
4x1.5+4x0.5	1	**6FX7 002 - 5EA02 - ■■■0**	14	100	**6FX7 008 - 1BC11 - ■■A0**	0.26
4x2.5+4x0.5	1.5	**6FX7 002 - 5EA31 - ■■■0**	15.2	110	**6FX7 008 - 1BC21 - ■■A0**	0.33
4x4 +4x0.5	1.5	**6FX7 002 - 5EA41 - ■■■0**	16.6	120	**6FX7 008 - 1BC31 - ■■A0**	0.43
4x6 +4x0.5	1.5	**6FX7 002 - 5EA51 - ■■■0**	18.3	130	**6FX7 008 - 1BC41 - ■■A0**	0.52
4x10 +4x0.5	1.5	**6FX7 002 - 5EA61 - ■■■0**	23.5	165	**6FX7 008 - 1BC51 - ■■A0**	0.79
4x16 +4x0.5	1.5	**6FX7 002 - 5EA71 - ■■■0**	26.1	185	**6FX7 008 - 1BC61 - ■■A0**	1.06
4x25 +4x0.5	–	–	30.5	215	**6FX7 008 - 1BC25 - ■■A0**	1.52

▲

Packing drum lenght:

50 m	Packing drums (for 1BC25/1BC61, no return drum)	1F
100 m	Packing drums (for 1BC25//1BC51//1BC61, no return drum)	2A
200 m	no return drum (not for cables >10 mm²)	3A

For POSMO CD/CA and SI (MOTION-CONNECT 700/800 supplied by

6FX1 002 - 5....

[mm²]	Connector design	Pre-assembled cable Order-No.	$D_{max.}$ [mm]	Weight[1] [kg/m]	Minimum perm. bending radius [mm]
4x1.5+2x1.5		**6FX1 002 - 5DA01 - 1■■■**	12.9	0.25	125
4x2.5+2x1.5		**6FX1 002 - 5DA02 - 1■■■**	14.2	0.31	140
4x4 +2x1.5		**6FX1 002 - 5DA03 - 1■■■**	15.3	0.40	150
4x6 +2x1.5		**6FX1 002 - 5DA05 - 1■■■**	17.8	0.53	195
4x6 +2x1.5		**6FX1 002 - 5DA15 - 1■■■**	17.8	0.53	195
4x6		**6FX1 002 - 5CA16 - 1■■■**	16	0.43	170
4x4		**6FX1 002 - 5CA23 - 1■■■**	13.2	0.31	130
4x6 +2x1.5		**6FX1 002 - 5DA25 - 1■■■**	17.8	0,53	195
4x1.5		**6FX1 002 - 5CA31 - 1■■■**	10.4	0.16	100
4x2.5		**6FX1 002 - 5CA32 - 1■■■**	12.1	0.24	120
4x6 +2x1.5		**6FX1 002 - 5DA35 - 1■■■**	17.8	0,53	195
4x6 +2x1.5		**6FX1 002 - 5DA45 - 1■■■**	17,8	0.53	195
4x6 +2x1.5		**6FX1 002 - 5DA55 - 1■■■**	17.8	0.53	195
4x6 +2x1.5		**6FX1 002 - 5DA65 - 1■■■**	17.8	0.53	195
4x6 +2x1.5		**6FX1 002 - 5DA75 - 1■■■**	17.8	0.53	195
4x6 +2x1.5		**6FX1 002 - 5DA85 - 1■■■**	17.8	0.53	195

▲

Legend:

Module end / Motor end

- Connector angled with pin contacts / Connector straight with socked contacts
- Connector straight with pin contacts / Connector straight with socked contacts
- Connector angled with pin contacts / Connector angled with socket contacts
- Connector angled with pin contacts / Open wire ends

For SIMOSTEP motors 1FL3

6FX5 008 - 5A…
PUR-PVC (not DESINA)

[mm²]	$D_{max.}$ [mm]	Weight[1] [kg/m]	Order-No.
3×1.5	11.4	0.2	**6FX5 008 - 5AA00 - 1■A0**

Packing drum lenght:

10 m	Packing drums	B
20 m	Packing drums	C

For POSMO A motors

6FX5 008 - 5F…
*UL STYLE No. 2570 80 °C 600 V; CSA AWM A*B II FT1*

[mm²]	D_{max} [mm]	Weight[1] [kg/m]	Order-No.
2x4	10.7	0.176	**6FX5 008 - 5FA00 - 1FA0**

Packing drum lenght:

50 m	Packing drums

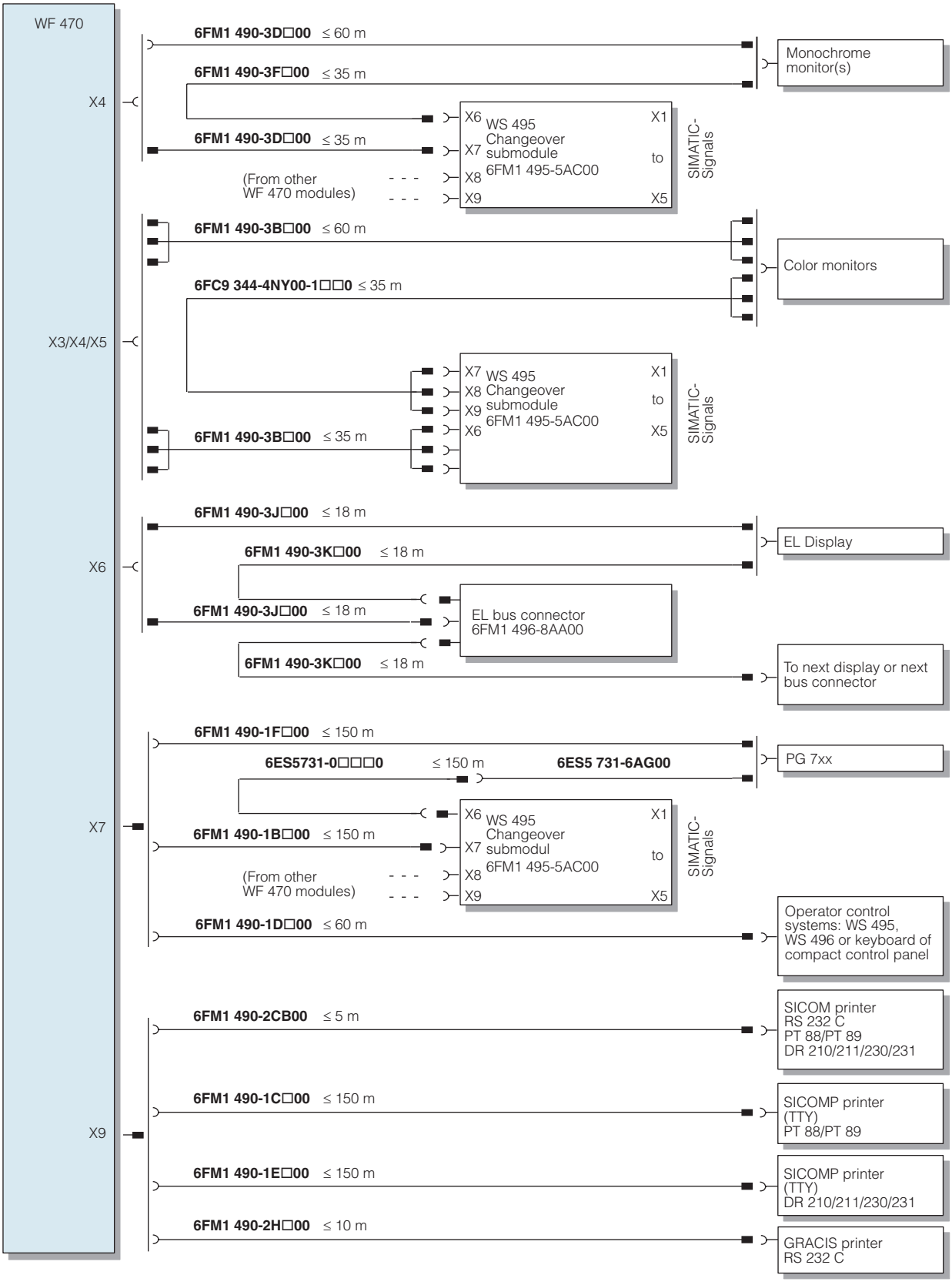
1) Weight of the cables by meter without connector.
2) All cables supplied by meter can also be supplied and delivered with exact lenght from 1 to 49 meters.

▲ Length code see page A/1

Overview of Connection Diagrams

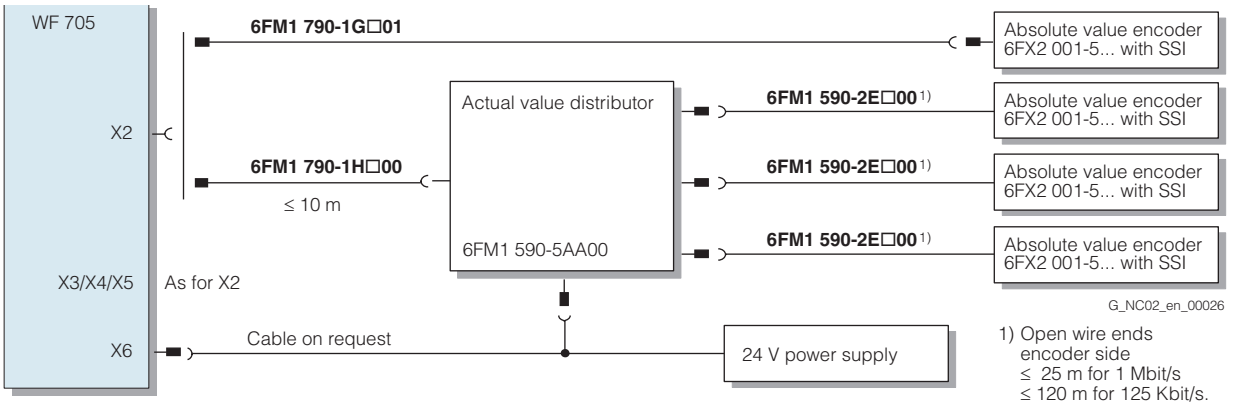
WF modules

WF 470 screen display module and WS 495 changeover module



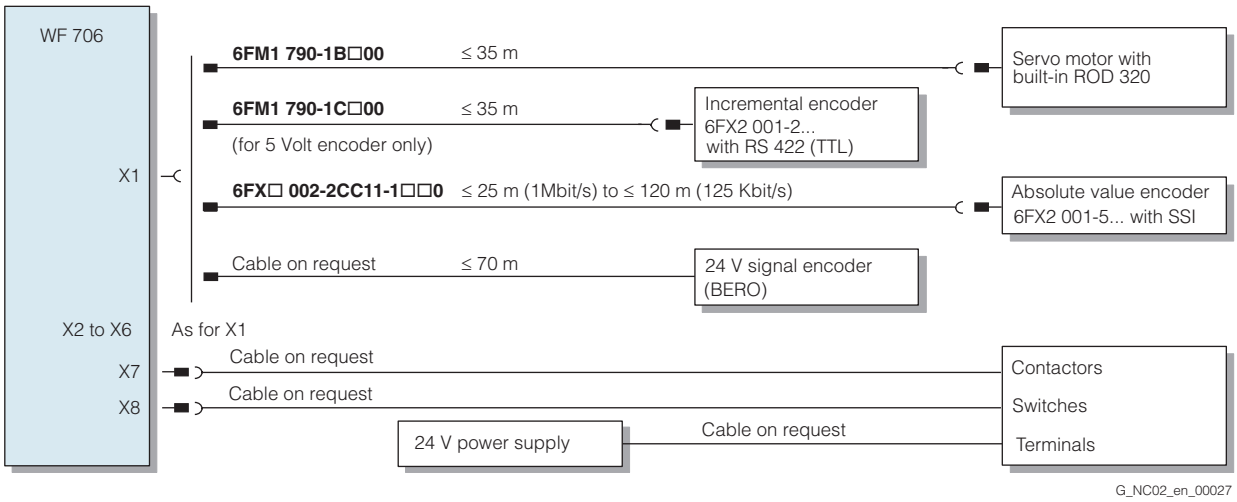
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

WF 705 position decoder module

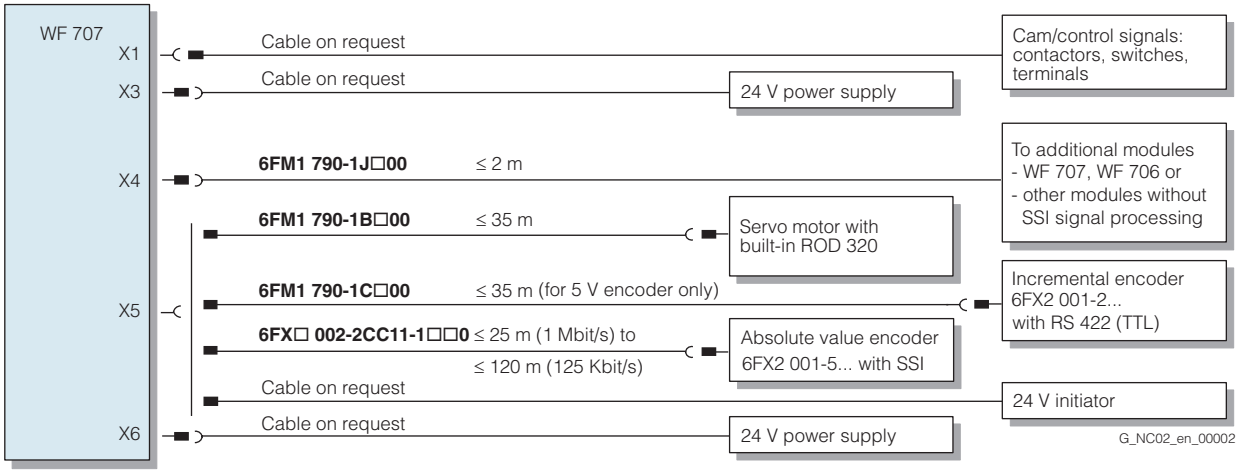


1) Open wire ends encoder side
≤ 25 m for 1 Mbit/s
≤ 120 m for 125 Kbit/s.

WF 706 positioning and counter module



WF 707 cam controller

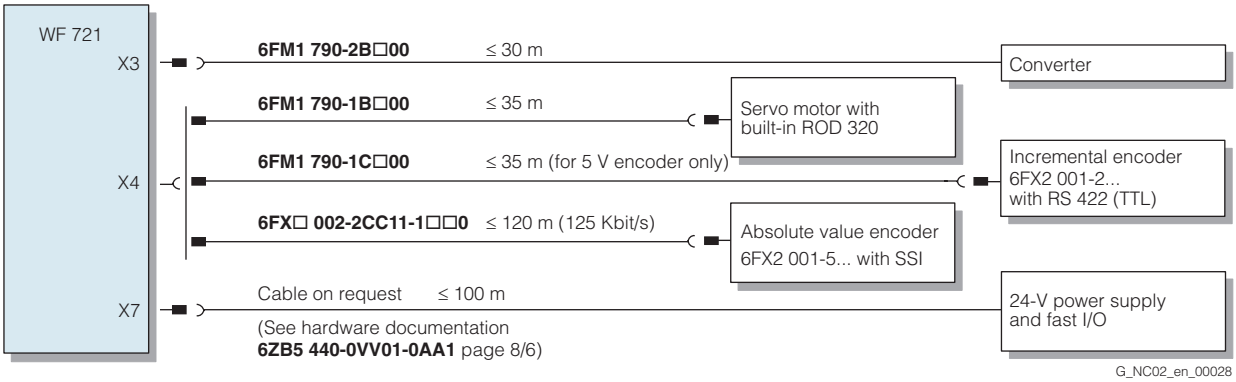


Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

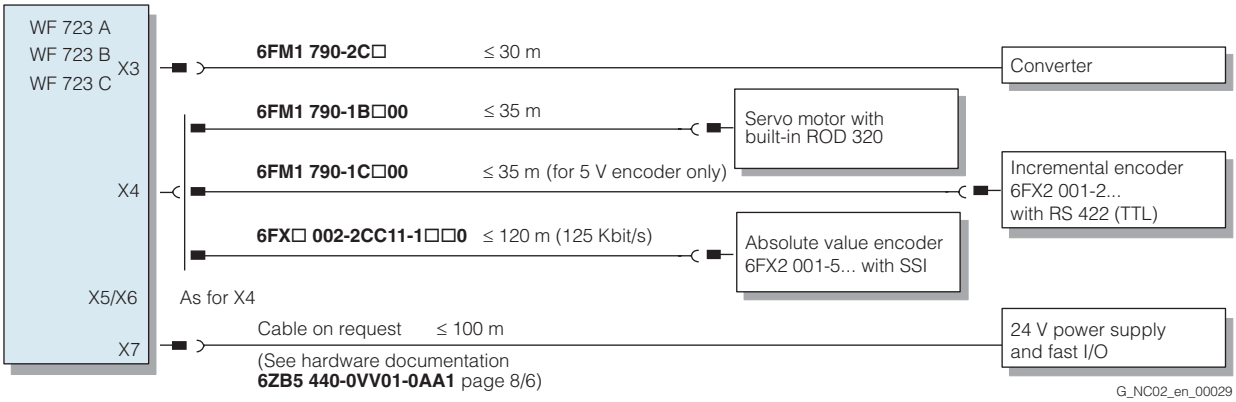
Overview of Connection Diagrams

WF modules

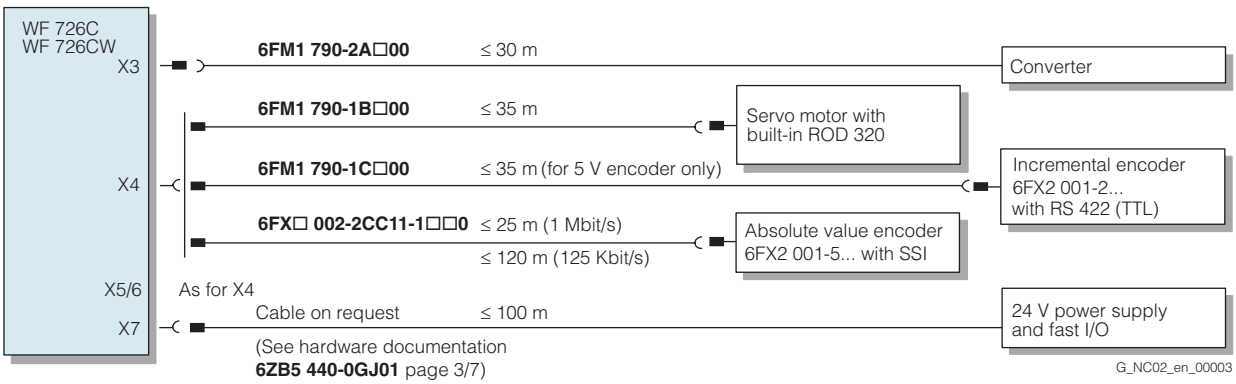
WF 721 positioning module



WF 723 A/WF 723 B/WF 723 C positioning modules

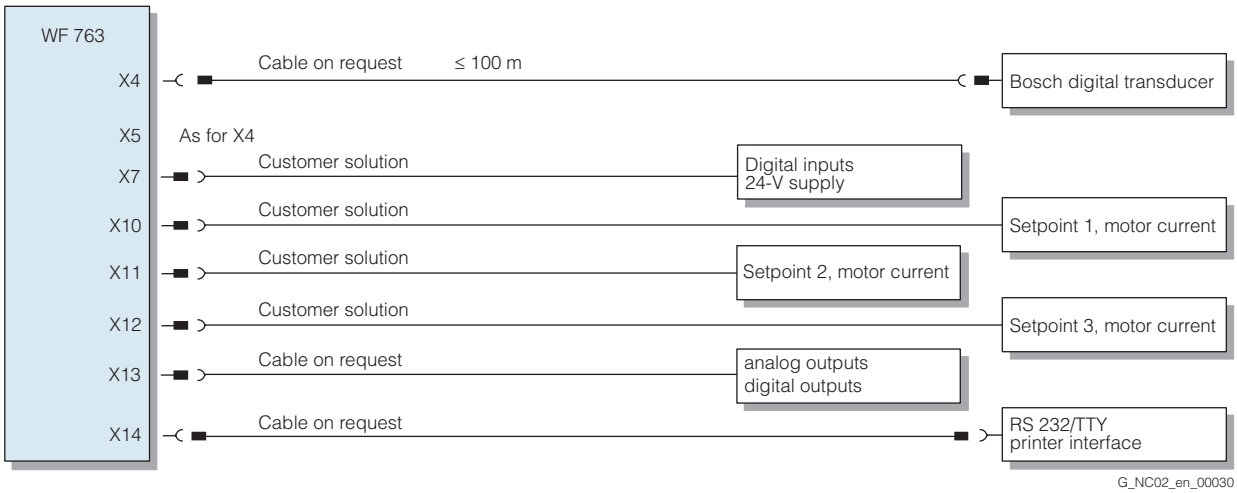


WF 726 C/WF 726 CW positioning modules

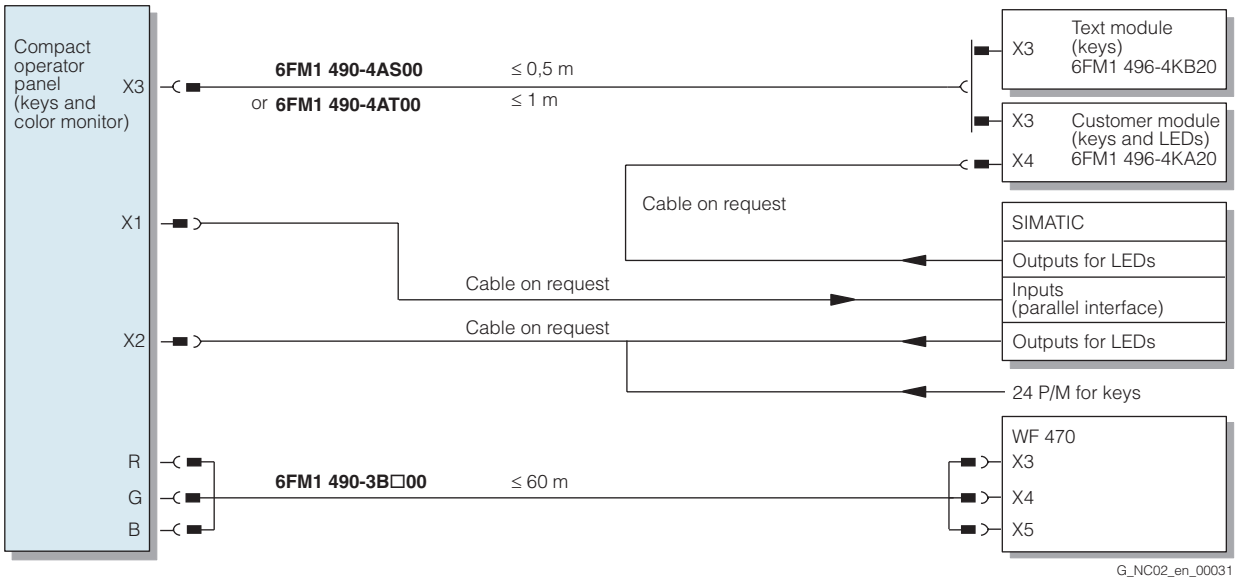


Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

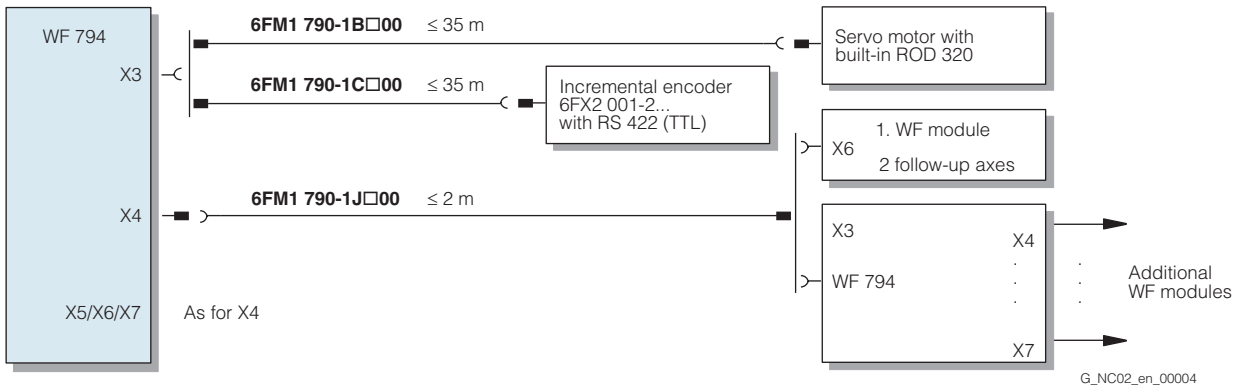
WF 763 screw controller



WF 496 compact operator panel



WF 794 fan-out unit

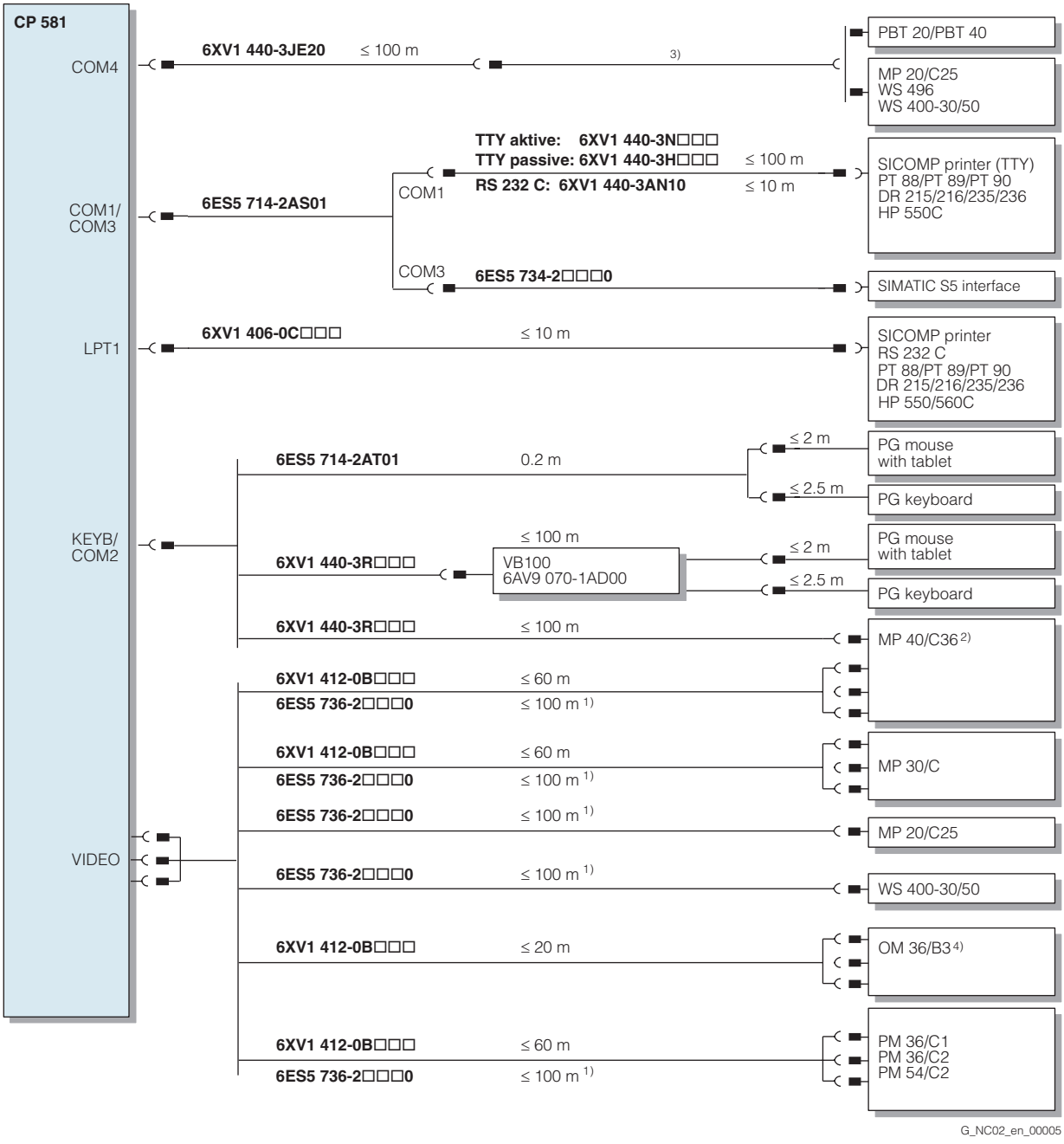


Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

GRACIS

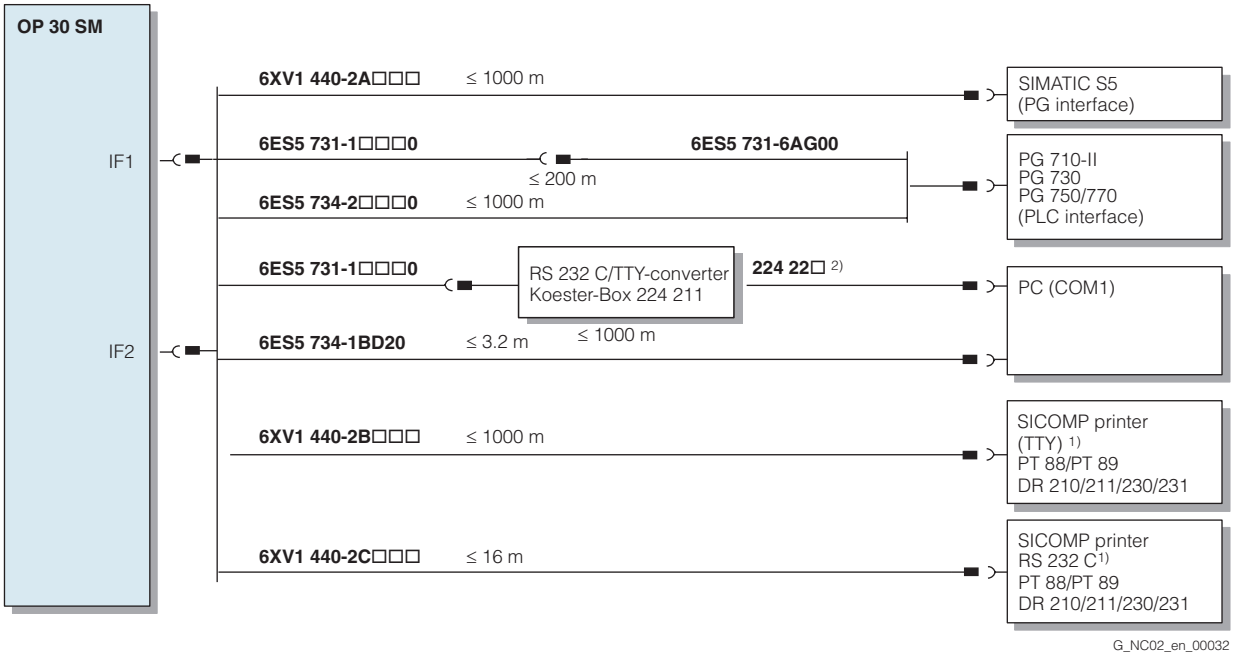
GRACIS CP 581



1) 3 cables required; active cable matching recommended for 100 m.
2) Connection to PBT20, PG keyboard and PG mouse is possible.
3) Cable diagram + driver available via GRACIS hotline.
4) In addition, a BNC adapter 6AV1 908-0BA00 is required.

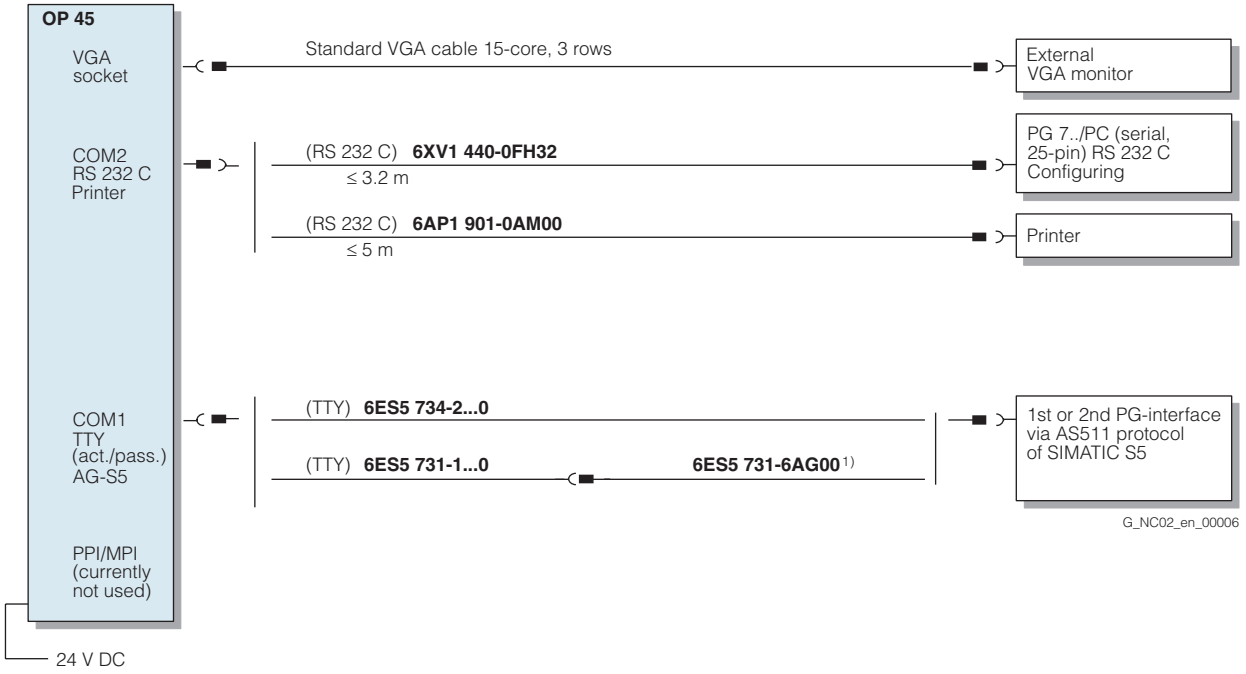
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

GRACIS OP 30SM operator panel



1) When a printer is connected to the integrated interface, the additional interface module 6AV3 970-1XB00-0AA0 is needed for communication with a SIMATIC S5.
2) Koester connecting cable.

GRACIS Operator panel OP 45/Pro Tool

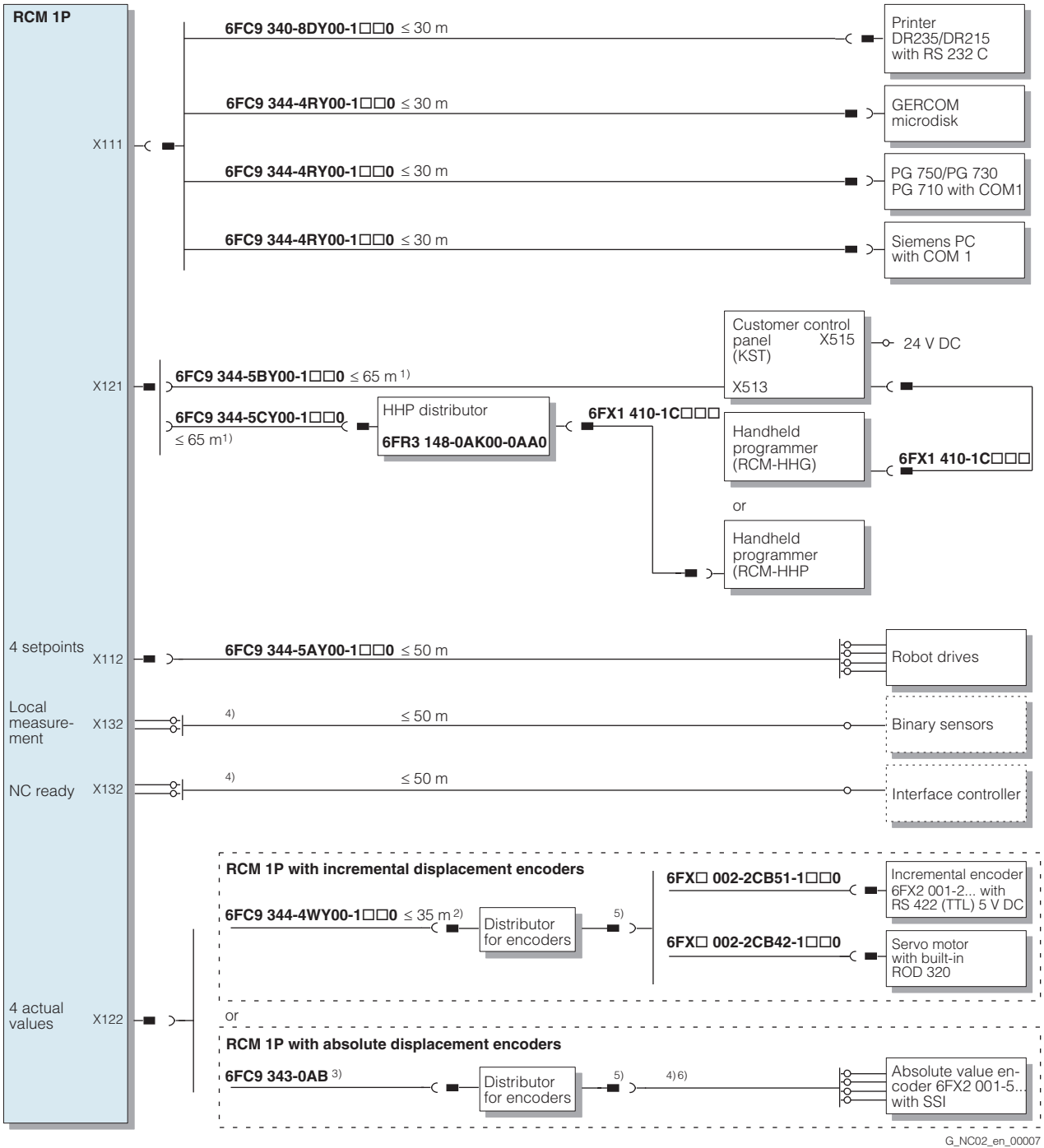


1) See Catalog ST 70.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

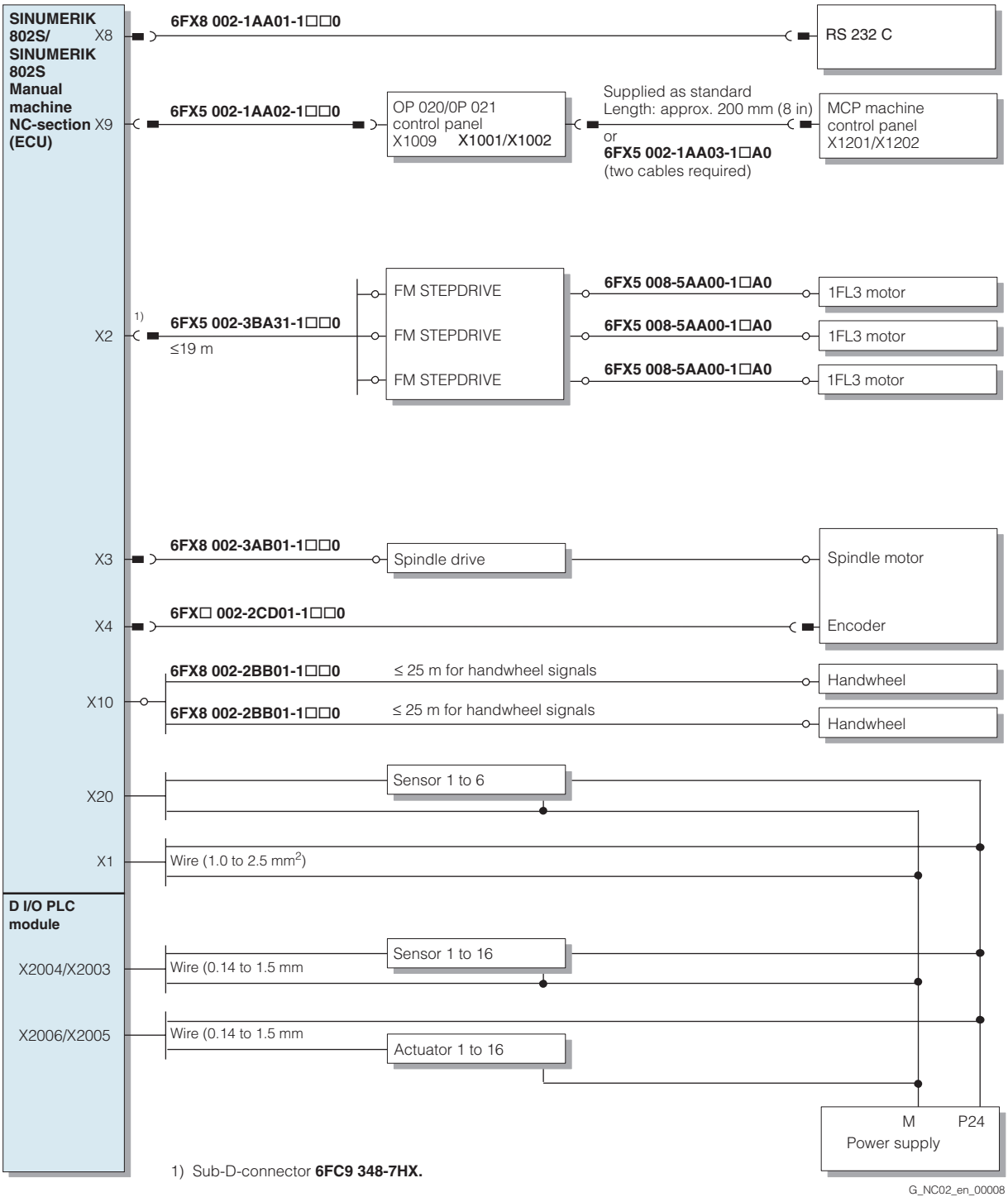
SIROTEC RCM 1P



HHP: Handheld programmer

1) The total cable length, comprising cables **6FC9 344-5BY00-1□□0** (**-5CY00-1□□0**) and **6FX1 410-1C□□□** must not exceed 65 meters.
2) The total cable length, comprising cables **6FC9 344-4WY00-1□□0** and **6FX□ 002-2CB51-1□□0** (or **6FX□ 002-2CB42-1□□0**) must not exceed 35 meters.
3) Cable supplied by the meter, 2 x Sub-D-connectors **6FX2 003-0AA37** required.
The total cable length from terminal X122 to the absolute encoder must not exceed 100 m.
4) Cable to the provided by the customer (see planning guide).
5) 4 connectors provided.
6) ≤ 25 m for 1 Mbit/s
≤ 120 m for 125 Kbit/s.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.



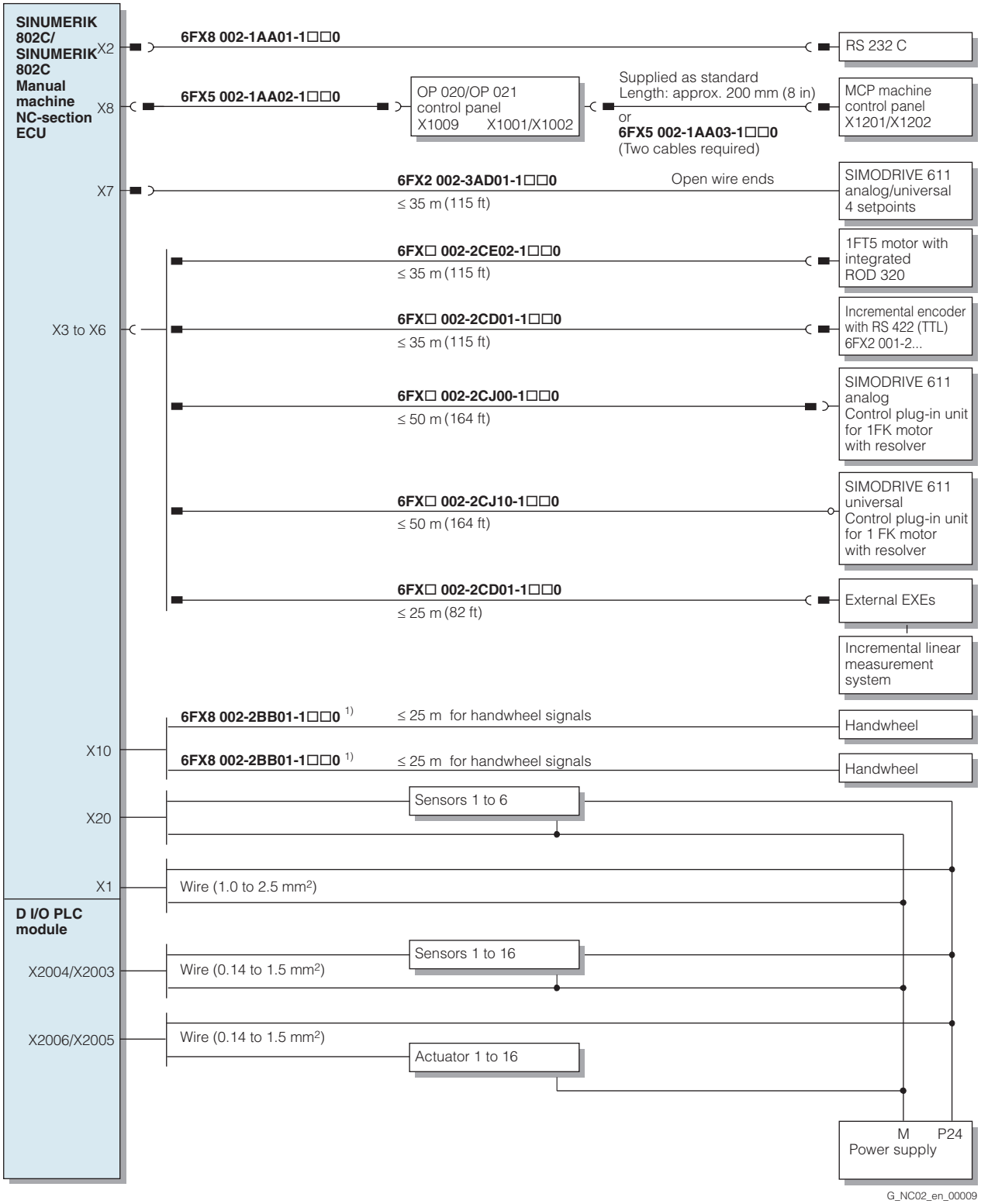
1) Sub-D-connector **6FC9 348-7HX.**

G_NC02_en_00008

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

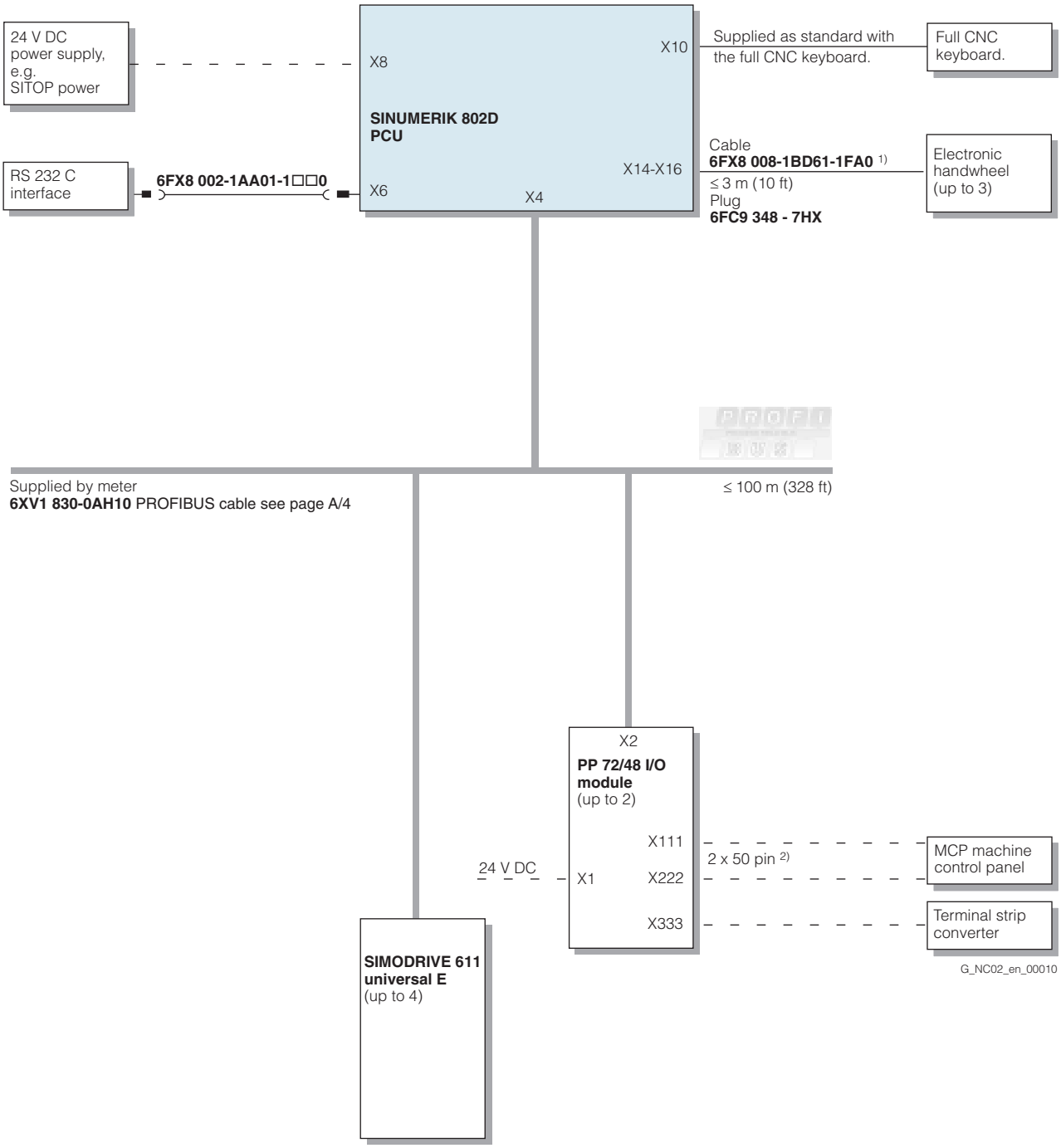
Overview of Connection Diagrams

SINUMERIK 802C



1) With open wire ends on both sides.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

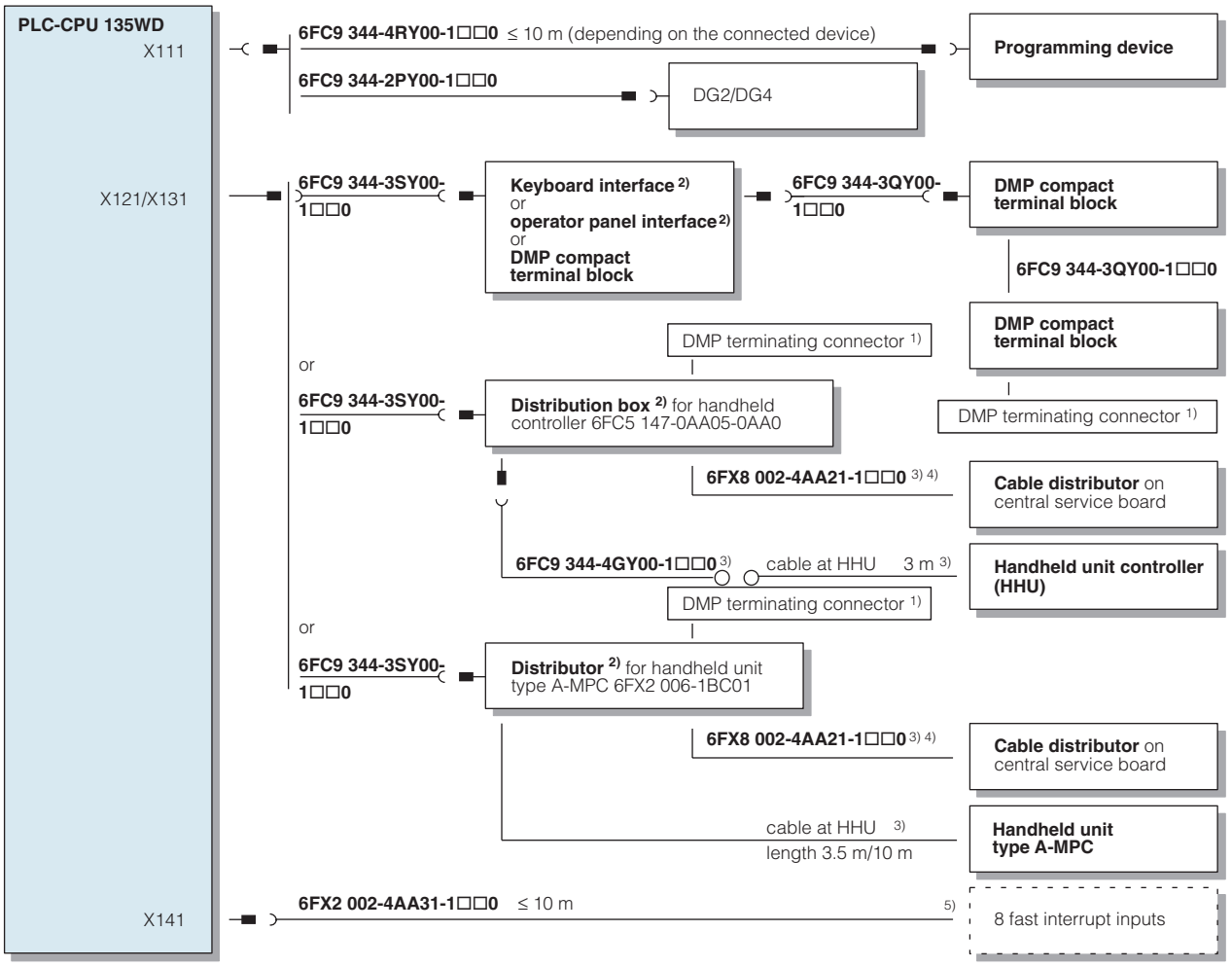


1) Length supplied only in: 50 m (164 ft) packing drum.
2) Conventional product, ordered by meter.

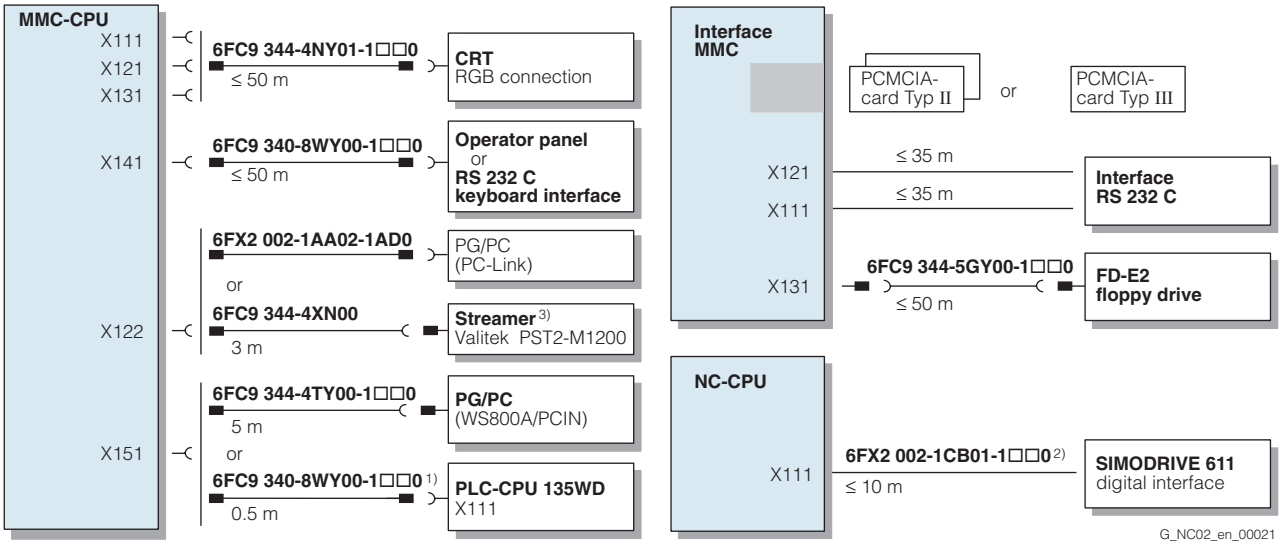
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

SINUMERIK 840C



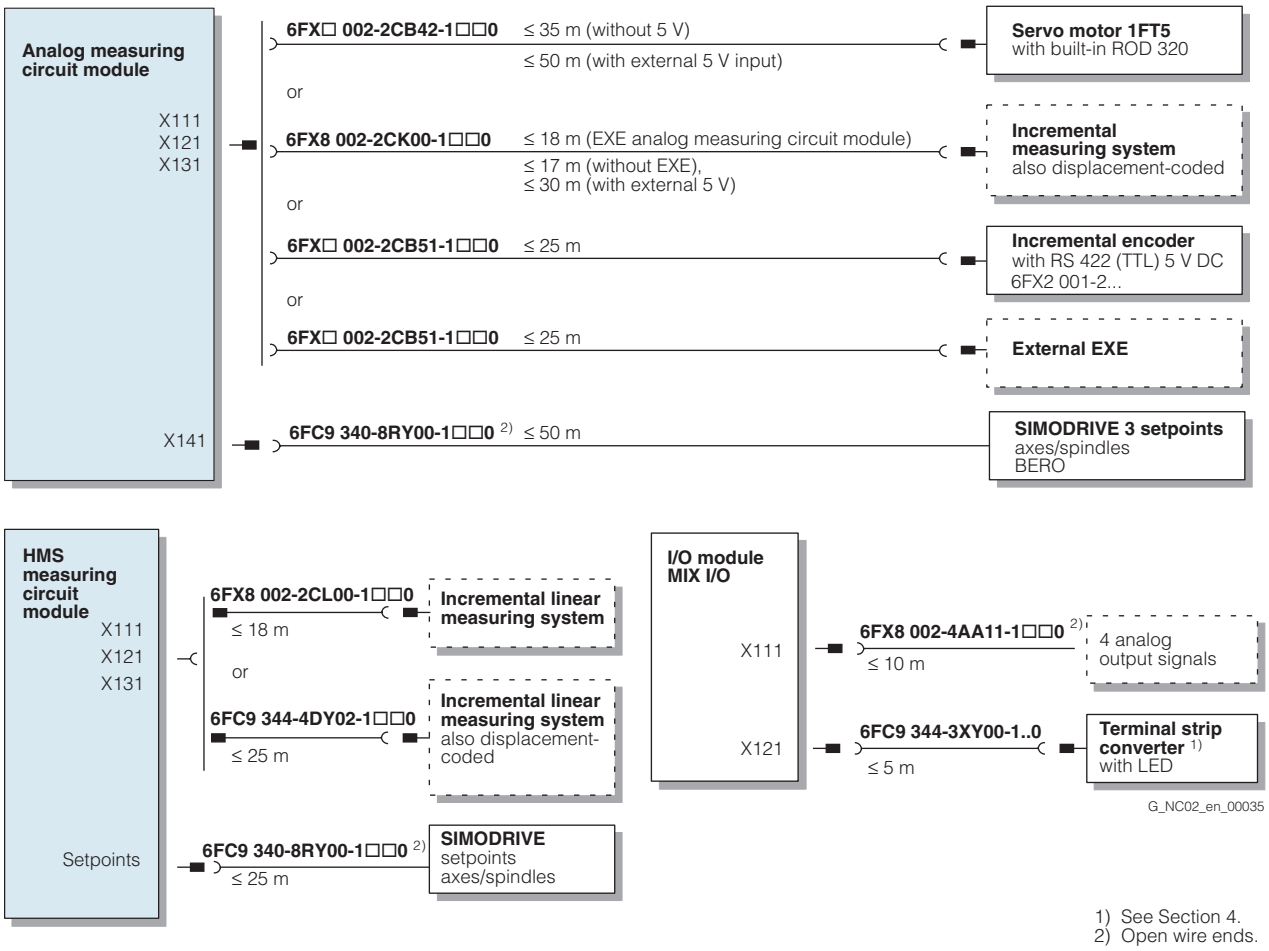
1) Up to 15 DMP terminal blocks can be connected to the RS 485 interfaces (X121/X131).
2) The operator panel and keyboard interface or the distribution box are treated like a DMP terminal block and can be connected to the DMP block.
The maximum cable length to the RS 485 interfaces is 50 m per interface (X121, X131).
3) The distance between hand-held unit and cable distributor on CSB must not exceed 25 m.
4) DU box connector, open wire end.
5) Open wire ends.



1) Connecting cable is only required with the "STEP 5 package" option (Order number for 0.5 m length: 6FC9 340-8WY00-1AA5).
2) With terminating connector 6FX2 003-0DA00.
3) Not for new applications.

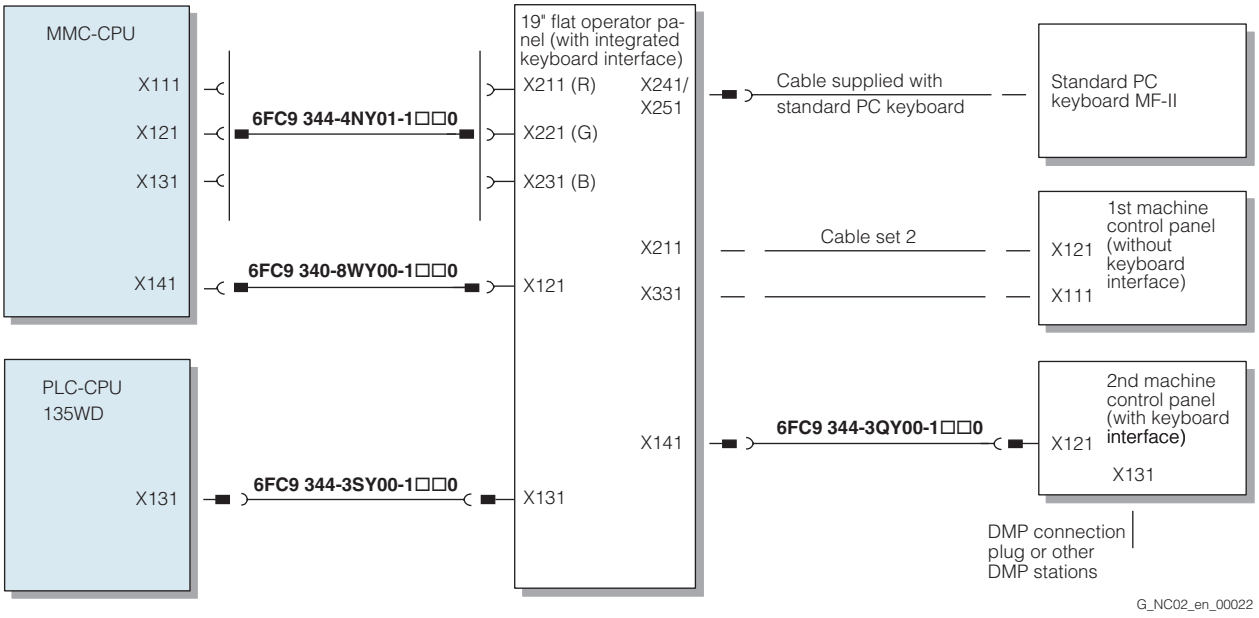
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Analog measuring circuit module and HMS, I/O module MIX I/O



1) See Section 4.
2) Open wire ends.

19" flat operator panel

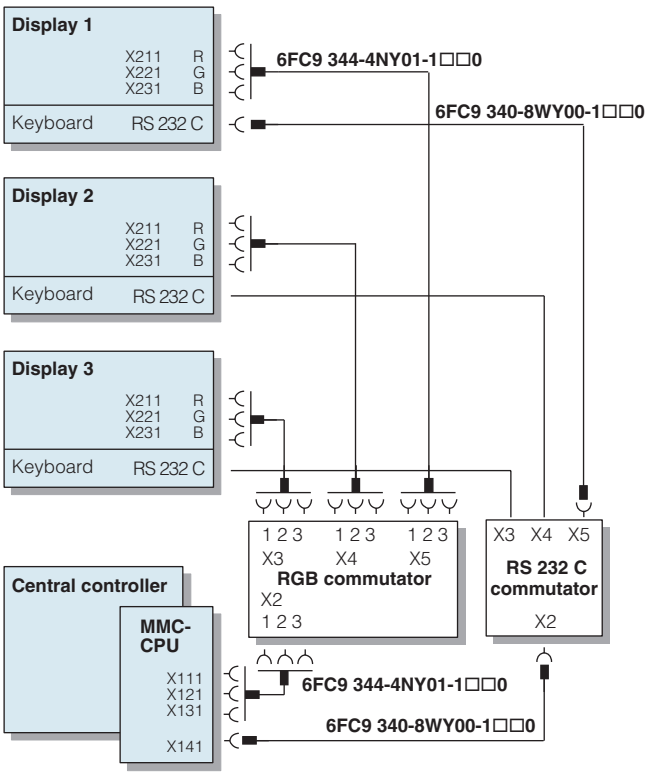


Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

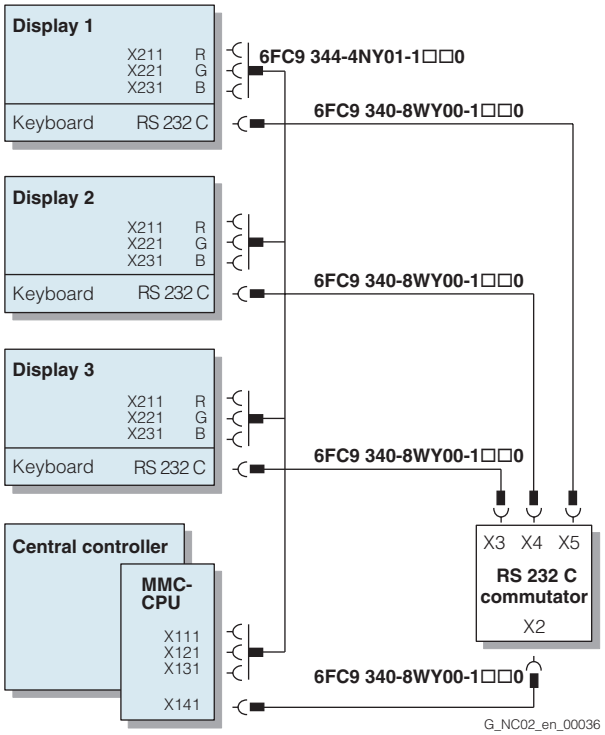
Overview of Connection Diagrams

SINUMERIK 840C operator panels

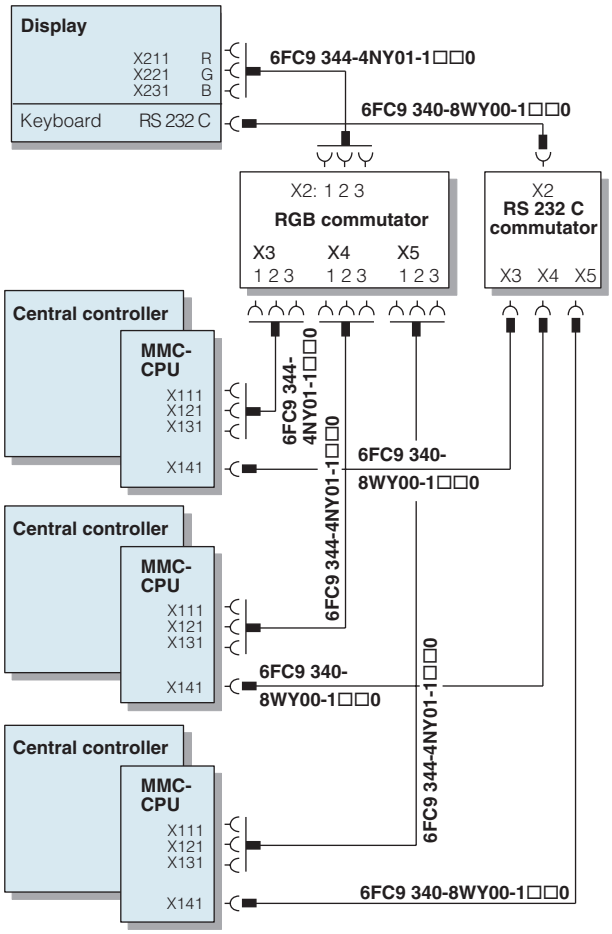
3 slimline operator panels on a central controller: RGB and RS 232 C connected



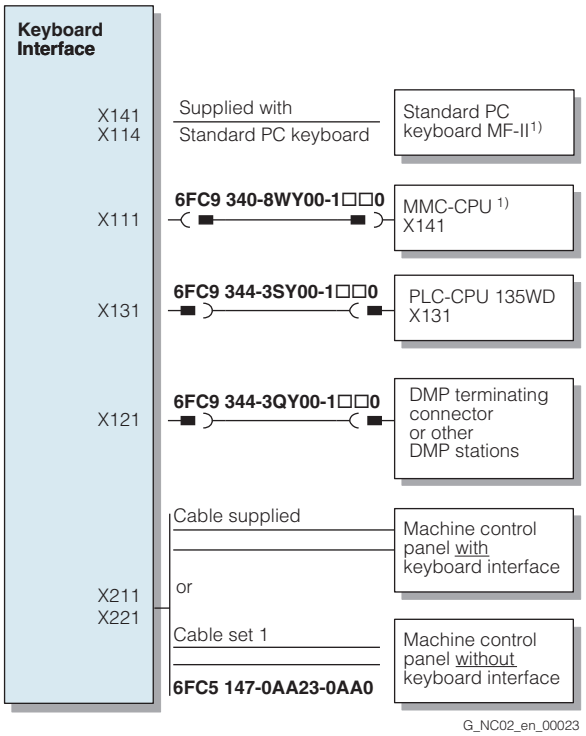
3 slimline operator panels on a central controller: RGB continued and RS 232 C connected



1 slimline operator panel for 3 central controllers

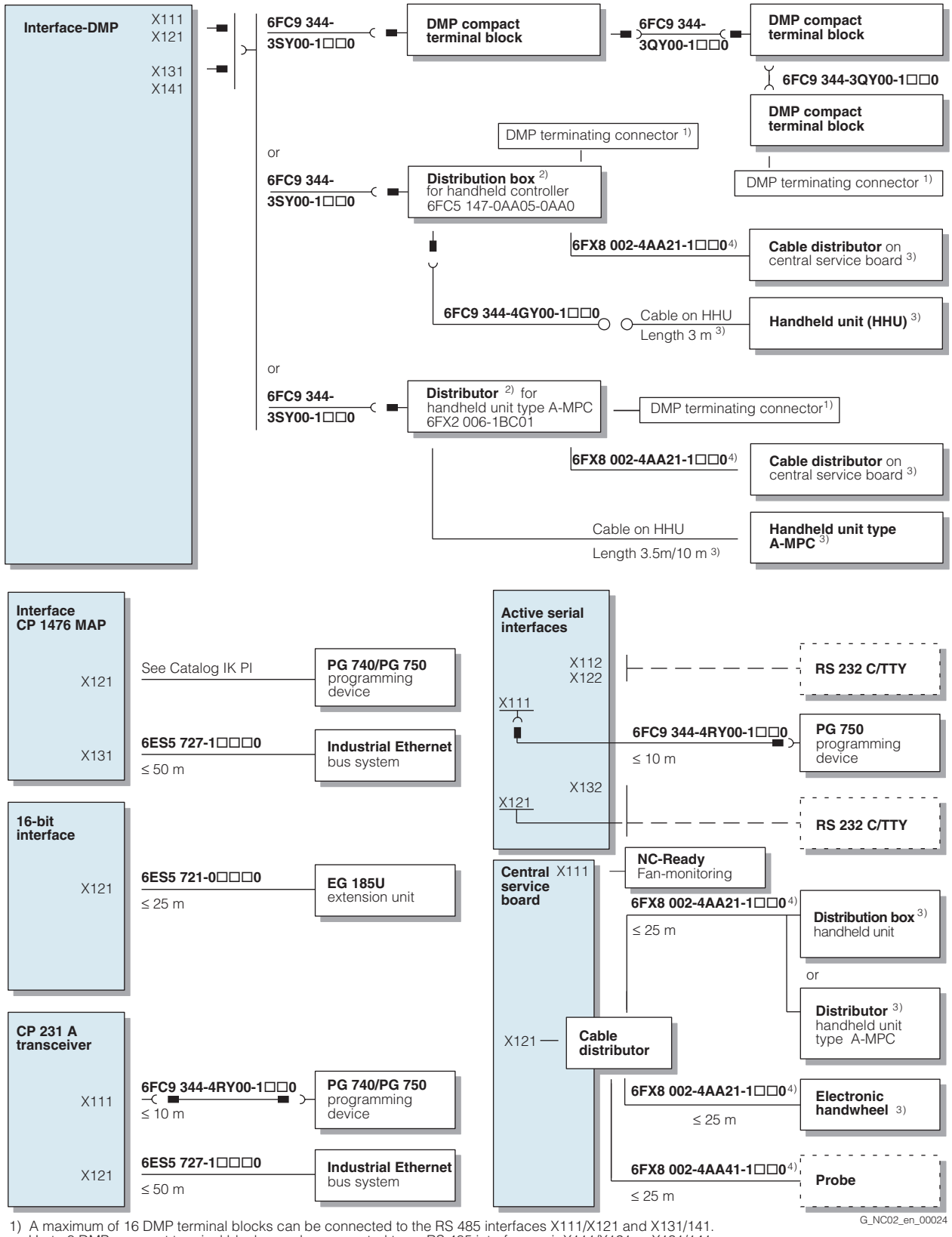


Connection overview of keyboard interface



1) Does not apply to the 2nd machine control panel.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). I greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general lengt key (-1□□□), and recommended lengths can be found on the foldout pages.

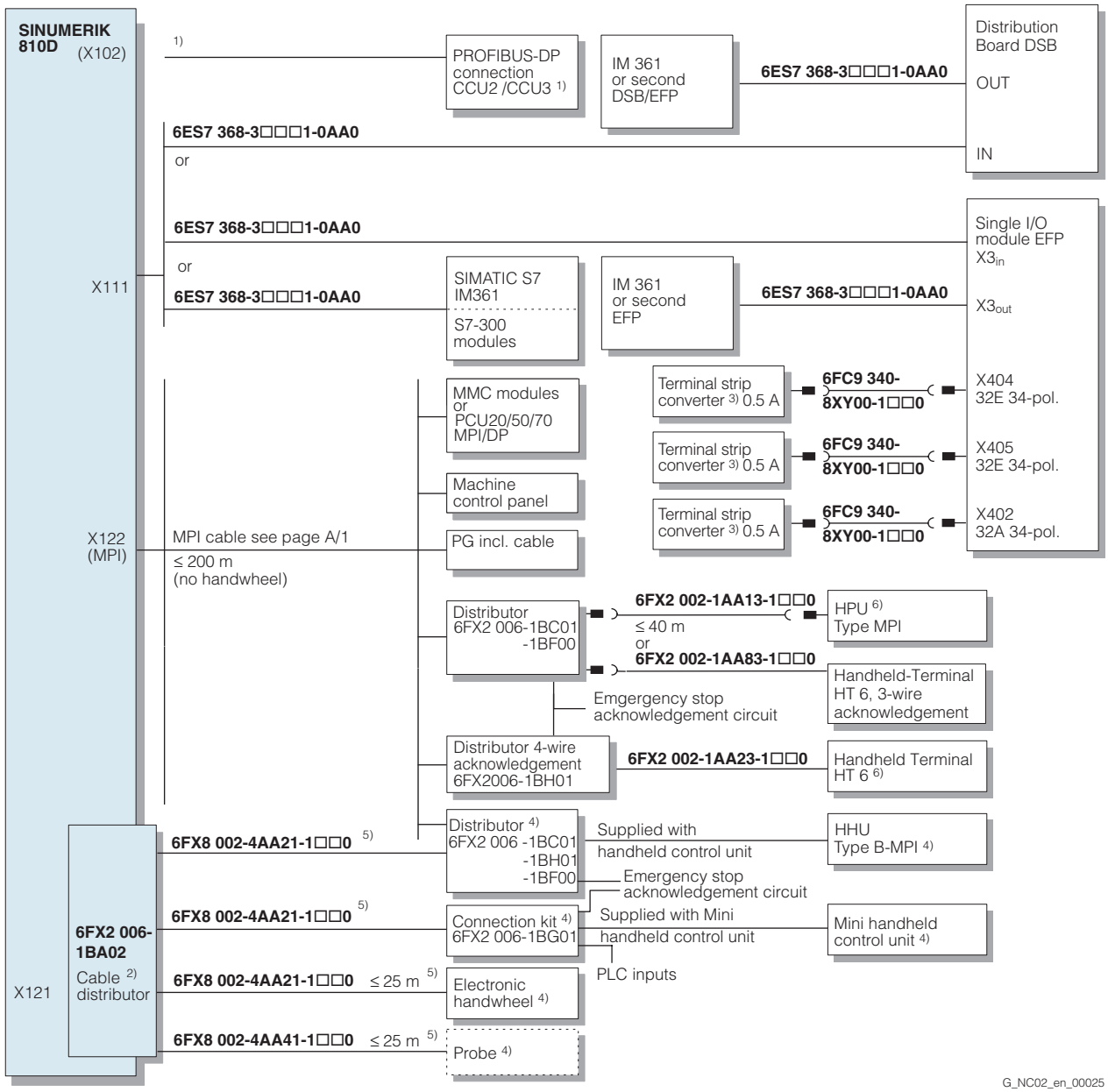


G_NC02_en_00024

1) A maximum of 16 DMP terminal blocks can be connected to the RS 485 interfaces X111/X121 and X131/141. Up to 8 DMP compact terminal blocks can be connected to an RS 485 interface pair X111/X121 or X131/141.
2) The maximum cable length at the RS 485 interfaces is 50 m per interface (X111; X121).
3) Maximum permissible length between handwheel and NC = 25 m.
4) NC side: DU box, I/O: open wire ends.

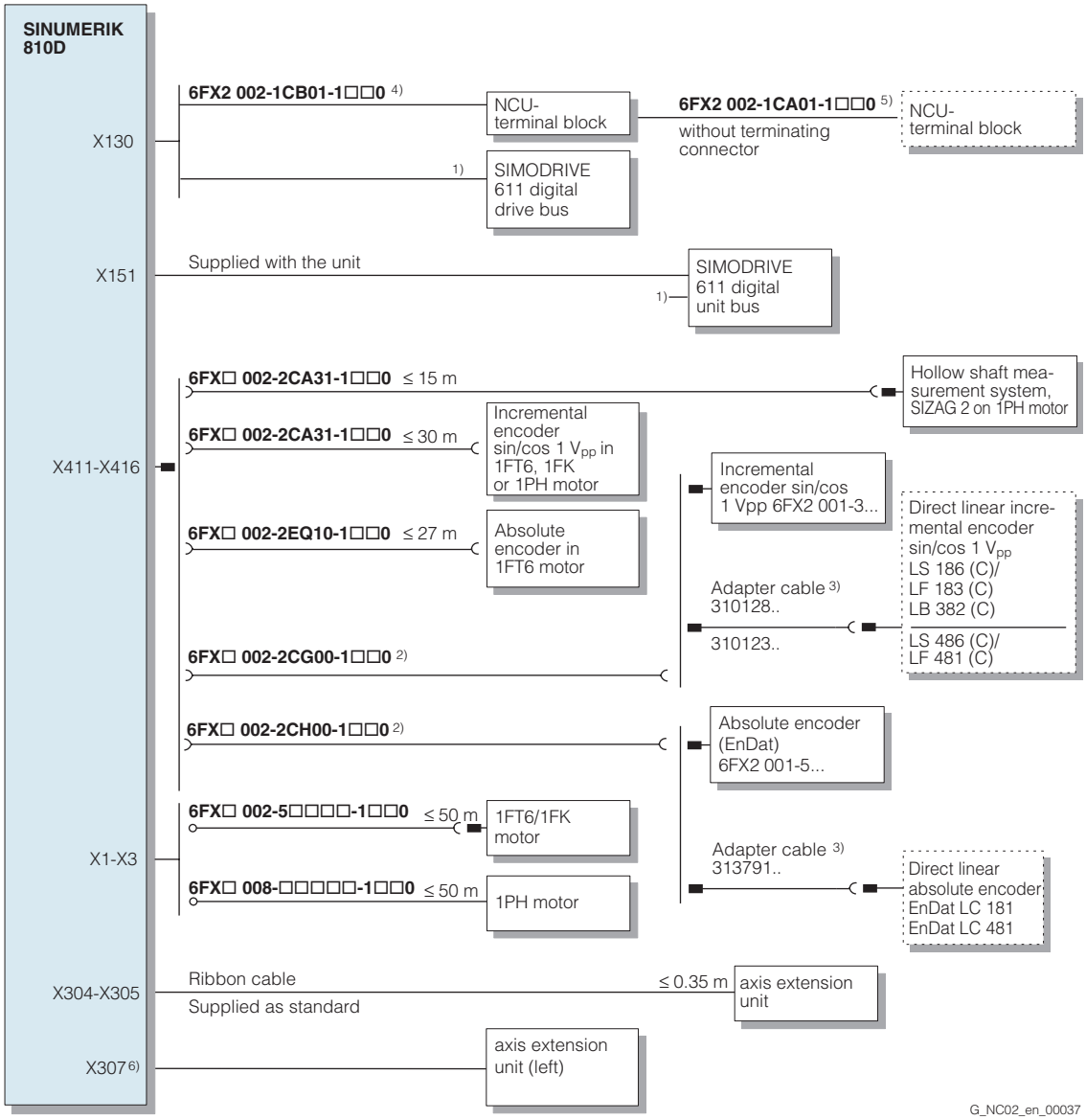
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

2



1) For PROFIBUS-DP components see Catalog IK PI.
2) A maximum of 2 handwheels and 2 probes can be connected. A third handwheel can be connected via a probe connection using ManualTurn.
3) See Catalog Section 4.
4) Maximum distance between handwheel and terminal X121 ≤ 25 m (82 ft).
5) NC side: DU box, I/O: open wire ends.
6) • HT 6 /HPU always connected: max. 200 m (650 ft) from X122 connector to HT 6/HPU.
• HT 6/HPU not always connected: max. 200 m from X122 connector to HT 6/PG only with RS 485 repeater (6ES7972-0AA01-1XA0. Otherwise total length MPI from X122 connector to distribution cabinet ≤ 5 m (16.4 ft).
The HT 6/HPU must always be connected at one end of the MPI connector (integrated bus termination).
• Not with 6FX2 002-4EA04-... (termination resistor cannot be disconnected).

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

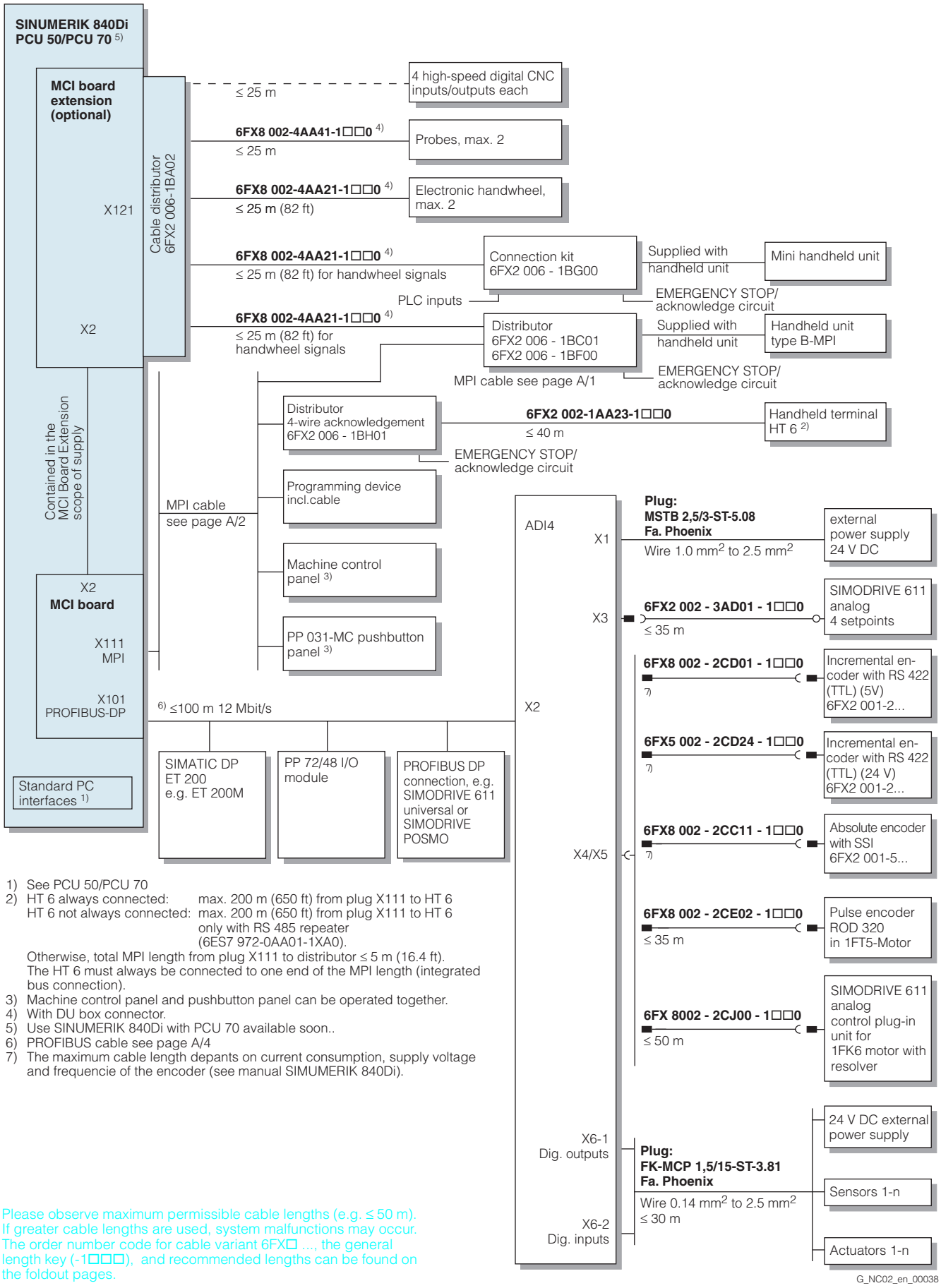


1) Cable set for external SIMODRIVE 611 closed-loop control mut be ordered separetley.
2) Maximum cable length for power consumption of 300 mA is 15 m (49 ft 3 in) (longer cable lengths can be used for lower consumption rates but should never exceed 50 m (164 ft)).
3) Cables can be ordered from the linear-scale manufacturer.
4) With terminating connector (6FX2 003-0DA00)
5) The max. connecting length at the drive bus is 10 m (32-8 ft).
6) With CCU 3.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

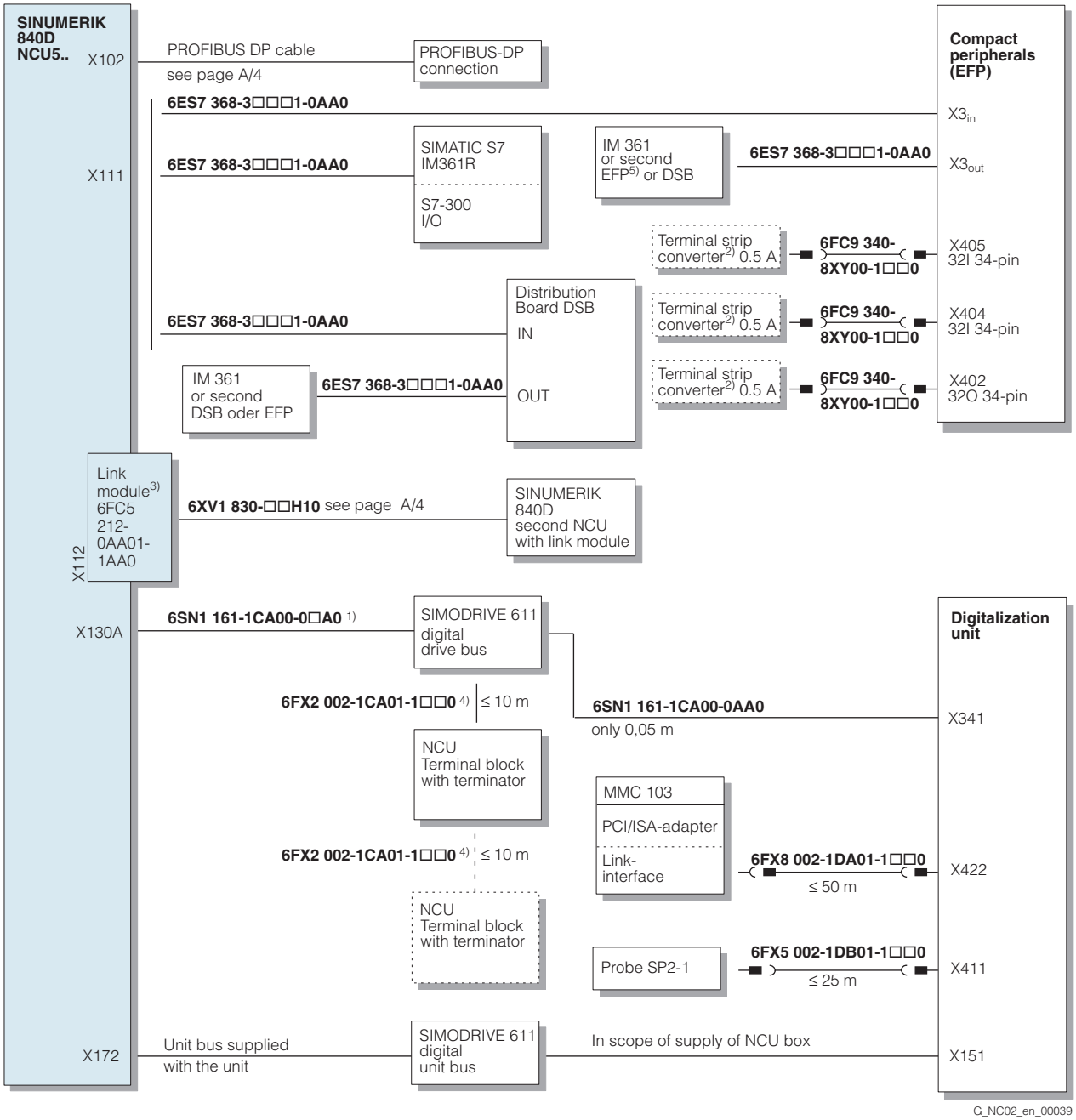
Overview of Connection Diagrams

SINUMERIK 840Di



1) See PCU 50/PCU 70
2) HT 6 always connected: max. 200 m (650 ft) from plug X111 to HT 6
HT 6 not always connected: max. 200 m (650 ft) from plug X111 to HT 6 only with RS 485 repeater (6ES7 972-0AA01-1XA0).
Otherwise, total MPI length from plug X111 to distributor ≤ 5 m (16.4 ft).
The HT 6 must always be connected to one end of the MPI length (integrated bus connection).
3) Machine control panel and pushbutton panel can be operated together.
4) With DU box connector.
5) Use SINUMERIK 840Di with PCU 70 available soon..
6) PROFIBUS cable see page A/4
7) The maximum cable length depants on current consumption, supply voltage and frequencie of the encoder (see manual SIMUMERIK 840Di).

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

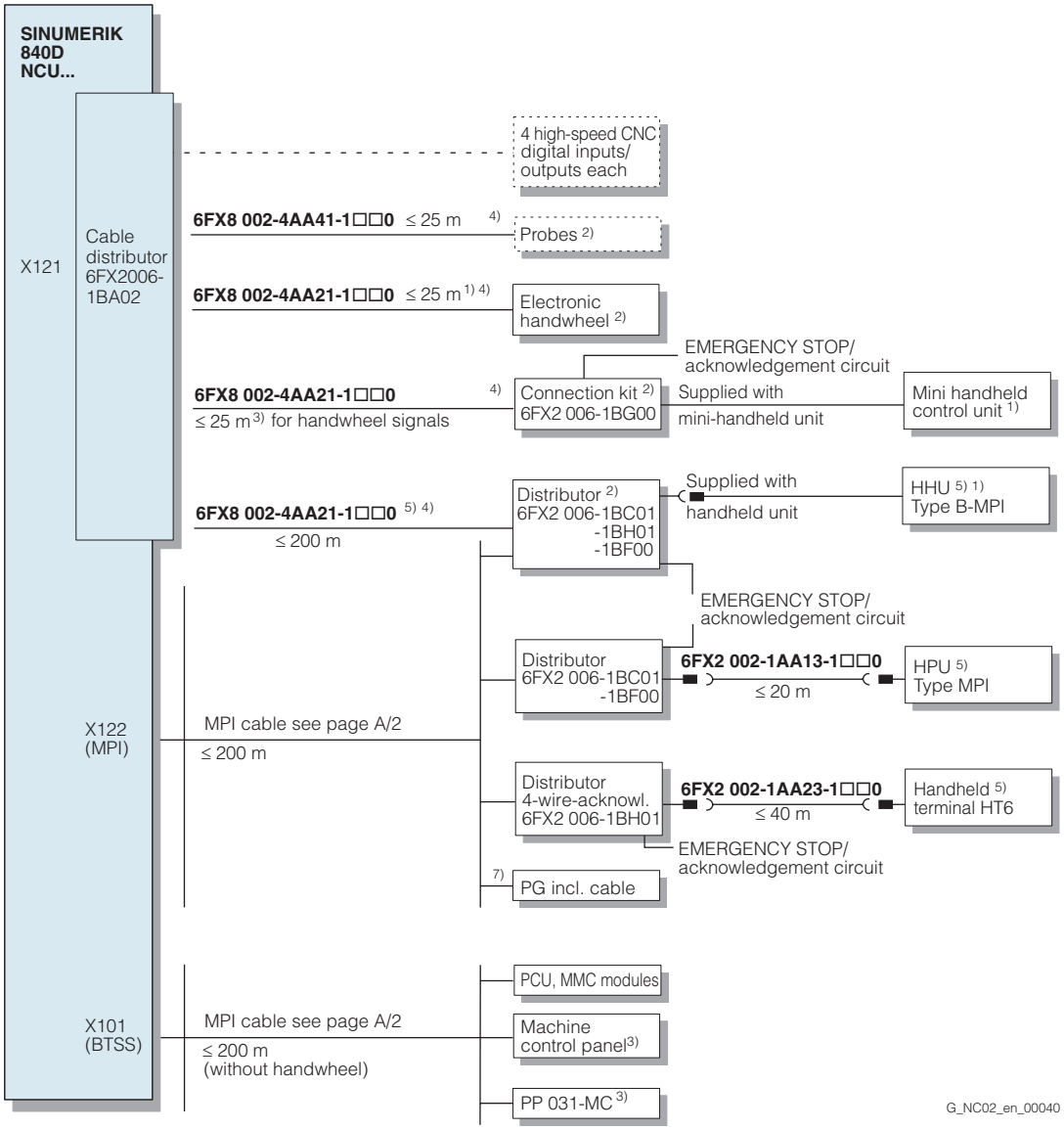


1) For lengths see Catalog NC 60 section 9 »Power modules«.
2) see Catalog part 4.
3) Only for NCU 573.2/573.3 and NCU 573.4.
4) The maximum connection length on the drive bus is 10 m (32 ft. 10 in.).
5) The cable 6FC5411-0AA80-0AA0 is aviable with a single-tier design with EFP.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

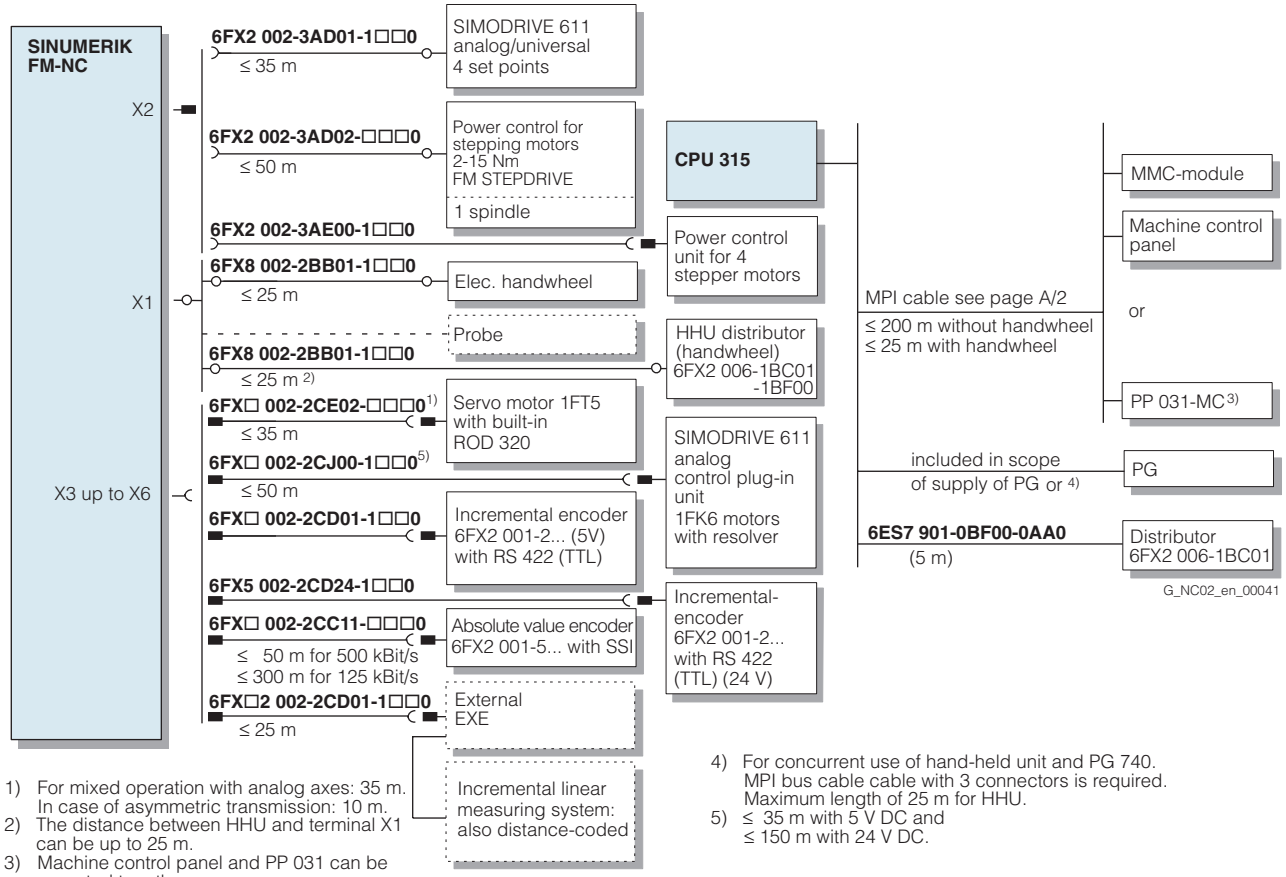
SINUMERIK 840D (continued)



1) The distance between HHU and terminal X121 can be up to 25 m.
2) A maximum of 2 handwheels and 2 probes can be connected.
With ManualTurn is a third handwheel can be connected via the probe connector.
3) MCP and PP 031-MC can be operated together.
4) NC side: DU box, I/O: open wire ends.
5) • HPU (HHU)/HT 6 always connected: Max. 200 m from MCP/MMC or plug X122 to HPU (HHU)/HT 6.
• HPU (HHU)/HT 6 not always connected: Max. 200 m from MCP/MMC or plug X122 to HPU (HHU)/HT 6 only with repeater RS 485 (6ES7972-0AA01-1XA0) otherwise MPI total length from MCP/MMC or plug X122 to distributor ≤ 5 m.
The HPU (HHU)/HT 6 must always be integrated at one end of the MPI line (integrated bus connection)
• Cable -4EA04 is not permitted.
6) Not with -4EA04 (terminating register cannot be disconnected.
7) If handheld unit and PG are to be used at the same time: MPI bus cable (6FX2002-4EA01-... or ...-4EA02-..) with plug 3 required.

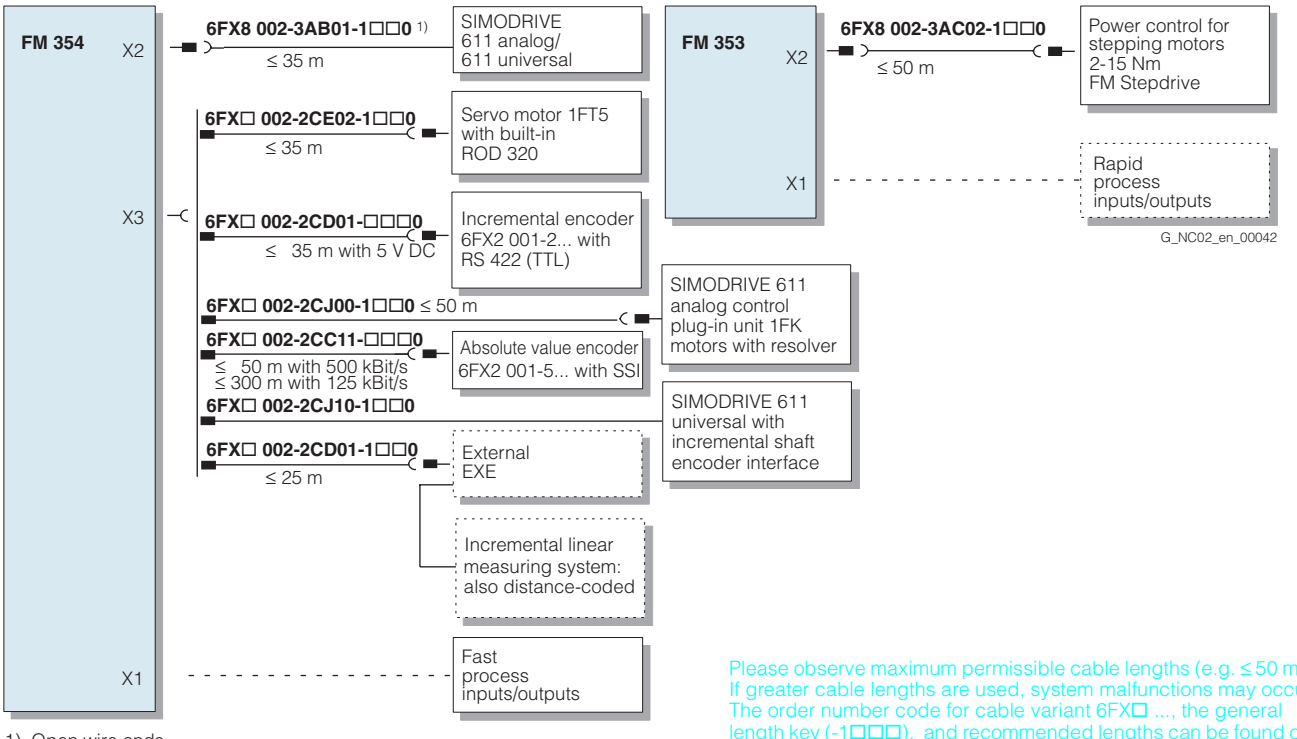
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

SINUMERIK FM-NC



1) For mixed operation with analog axes: 35 m. In case of asymmetric transmission: 10 m.
2) The distance between HHU and terminal X1 can be up to 25 m.
3) Machine control panel and PP 031 can be operated together.
4) For concurrent use of hand-held unit and PG 740. MPI bus cable cable with 3 connectors is required. Maximum length of 25 m for HHU.
5) ≤ 35 m with 5 V DC and ≤ 150 m with 24 V DC.

FM 353/FM 354



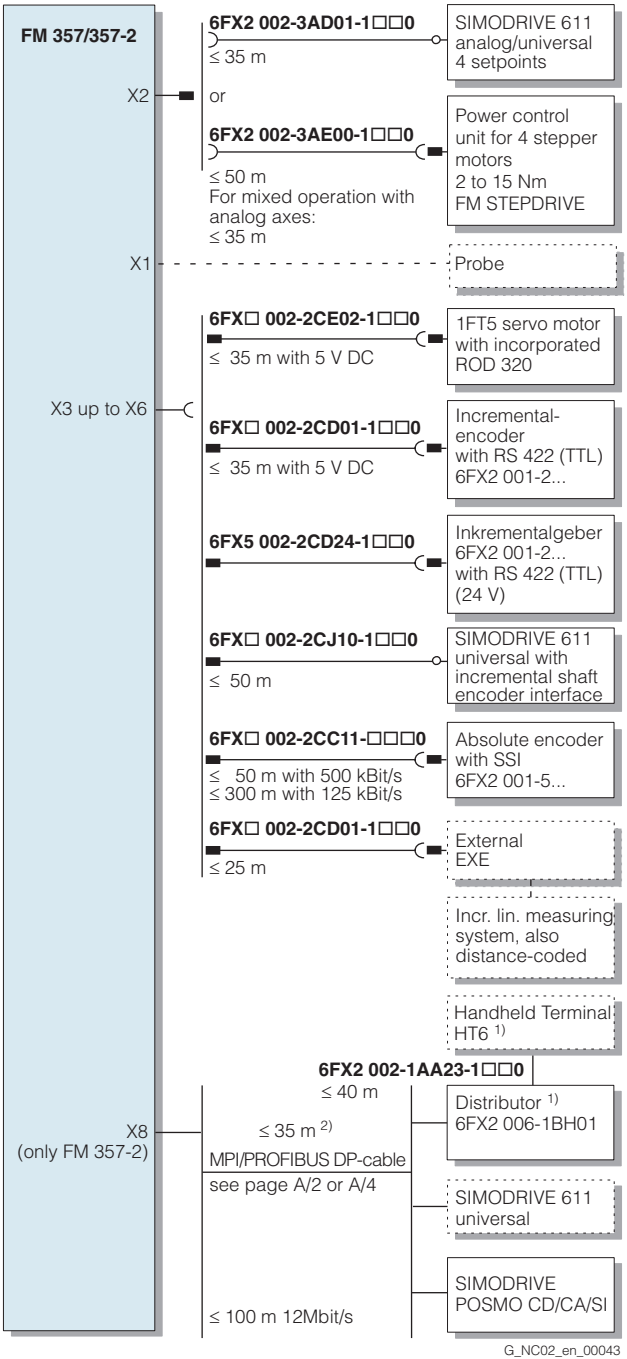
1) Open wire ends SIMODRIVE side.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

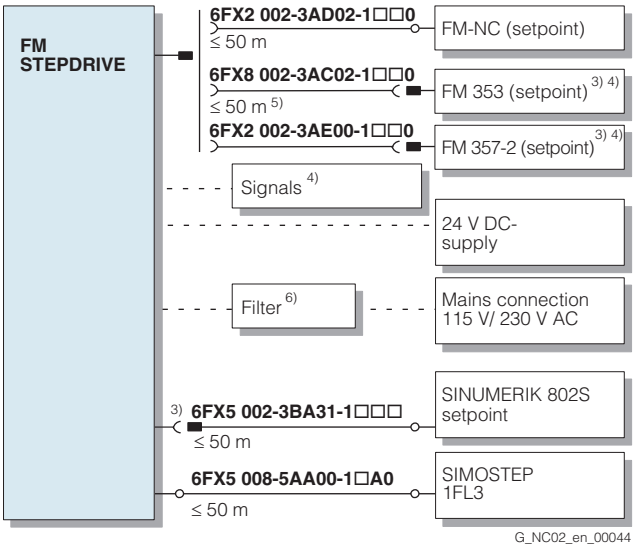
Overview of Connection Diagrams

FM

FM 357/357-2



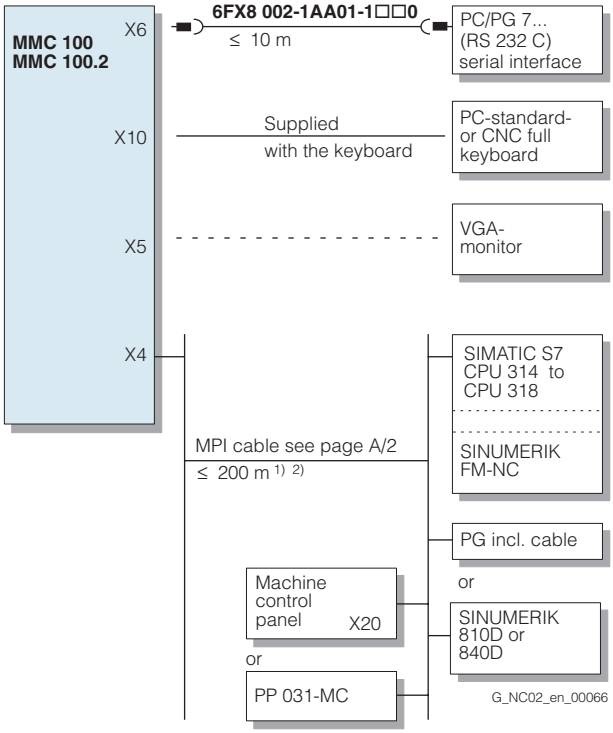
FM STEPDRIVE



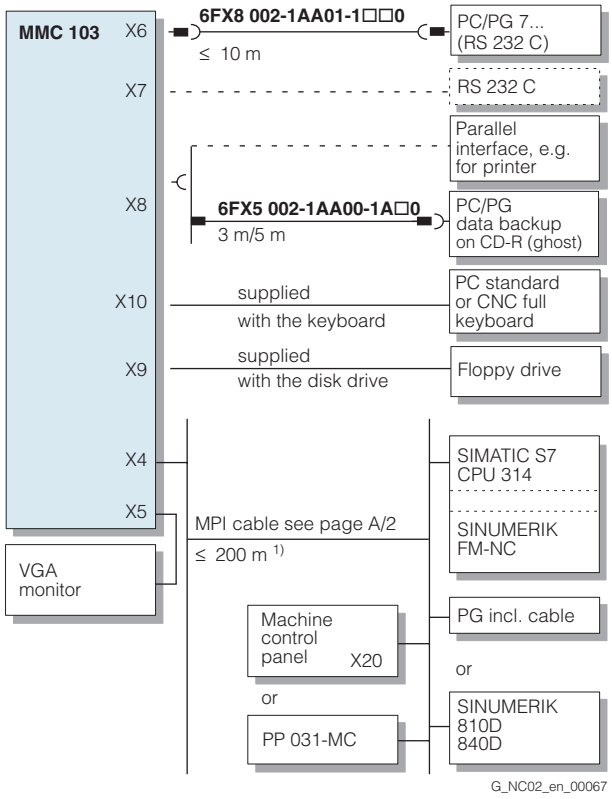
1) Only for FM 357-2 H.
2) Not with -4EA04-1...0 (termination resistor cannot be disconnected).
3) Sub-D-connector 6FC9 348 - 7HX
4) Enable signal (enabling of power module) choiseable 5 V via pulse interface or 24 V via signal interface.
5) Mixed operation with analog axis: ≤ 35 m.
6) Filters must be ordered from:
Fa. RS Components GmbH, Hessenring 13b
64546 Mörfelden-Walldorf, Phone: +49 (0) 61 05-401-444

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

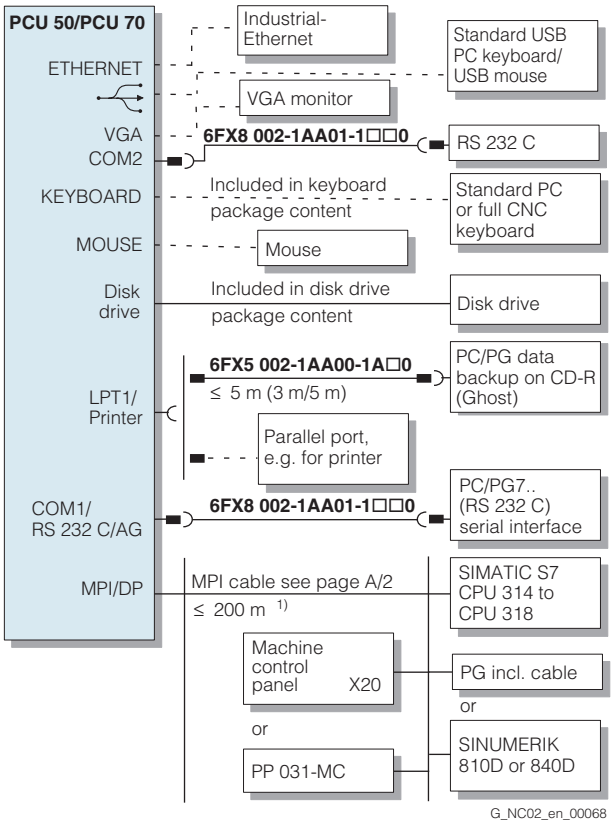
MMC 100/100.2



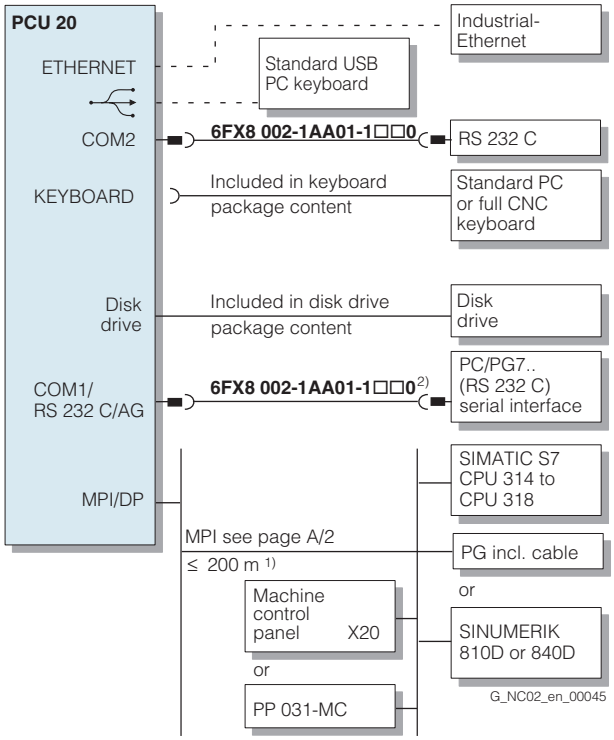
MMC 103



PCU 50/PCU 70



PCU 20

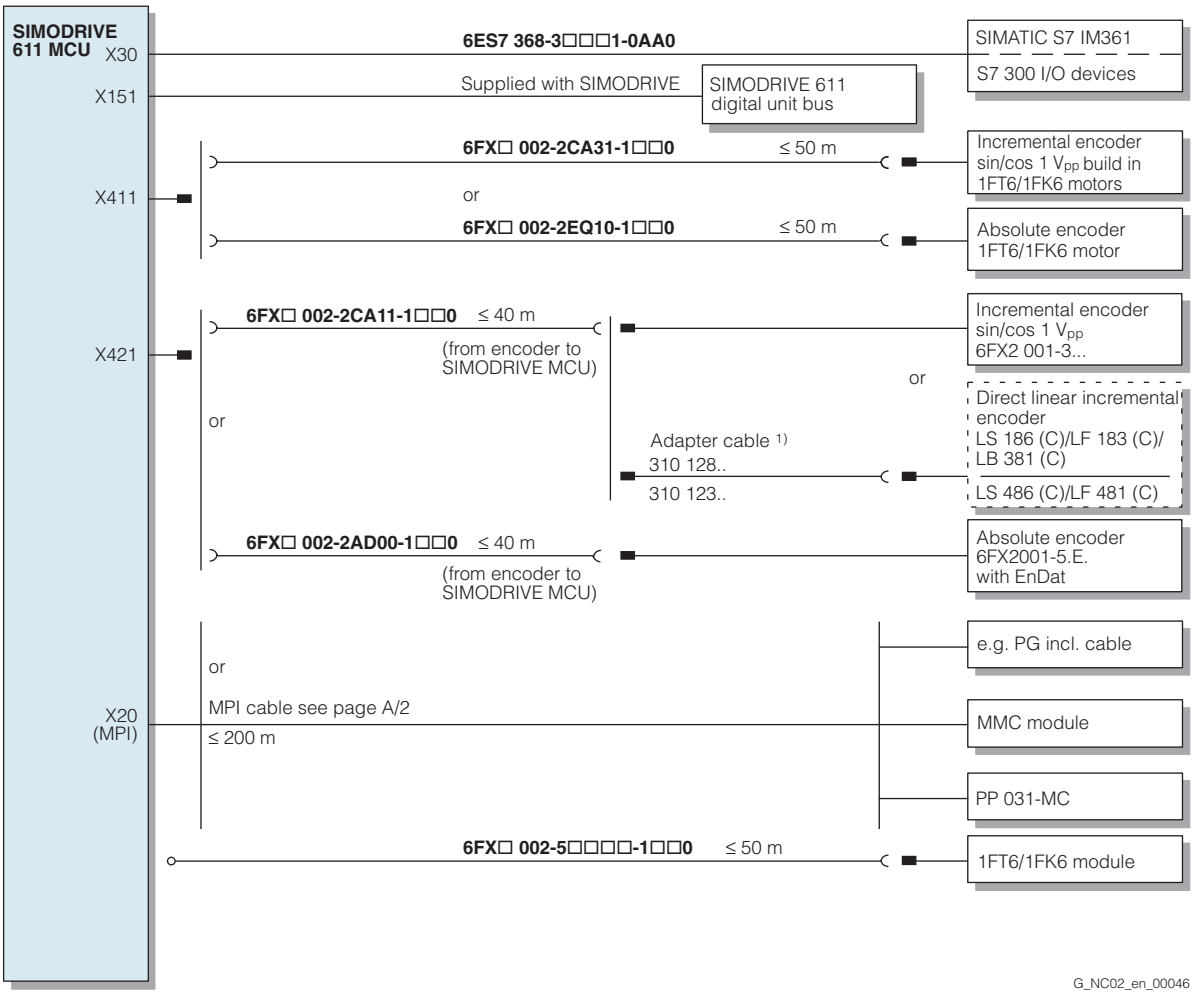


1) Not with -4EA04-1...0 (termination resistor cannot be disconnected).
2) design with two connectors

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

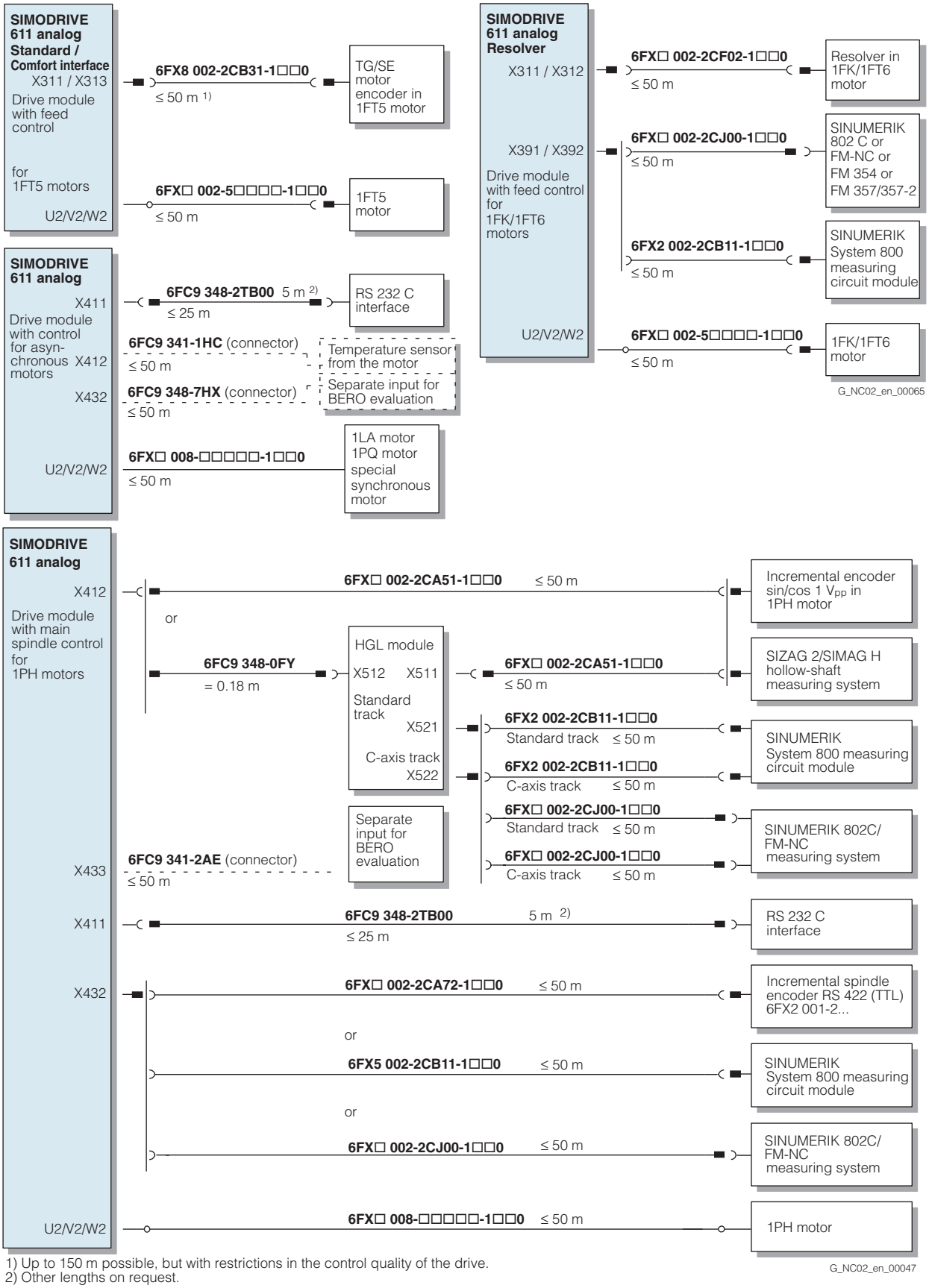
SIMODRIVE 611 MCU



1) Cables can be ordered from the linear scale manufacture.

1) Cables can be ordered from the linear scale manufacture.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

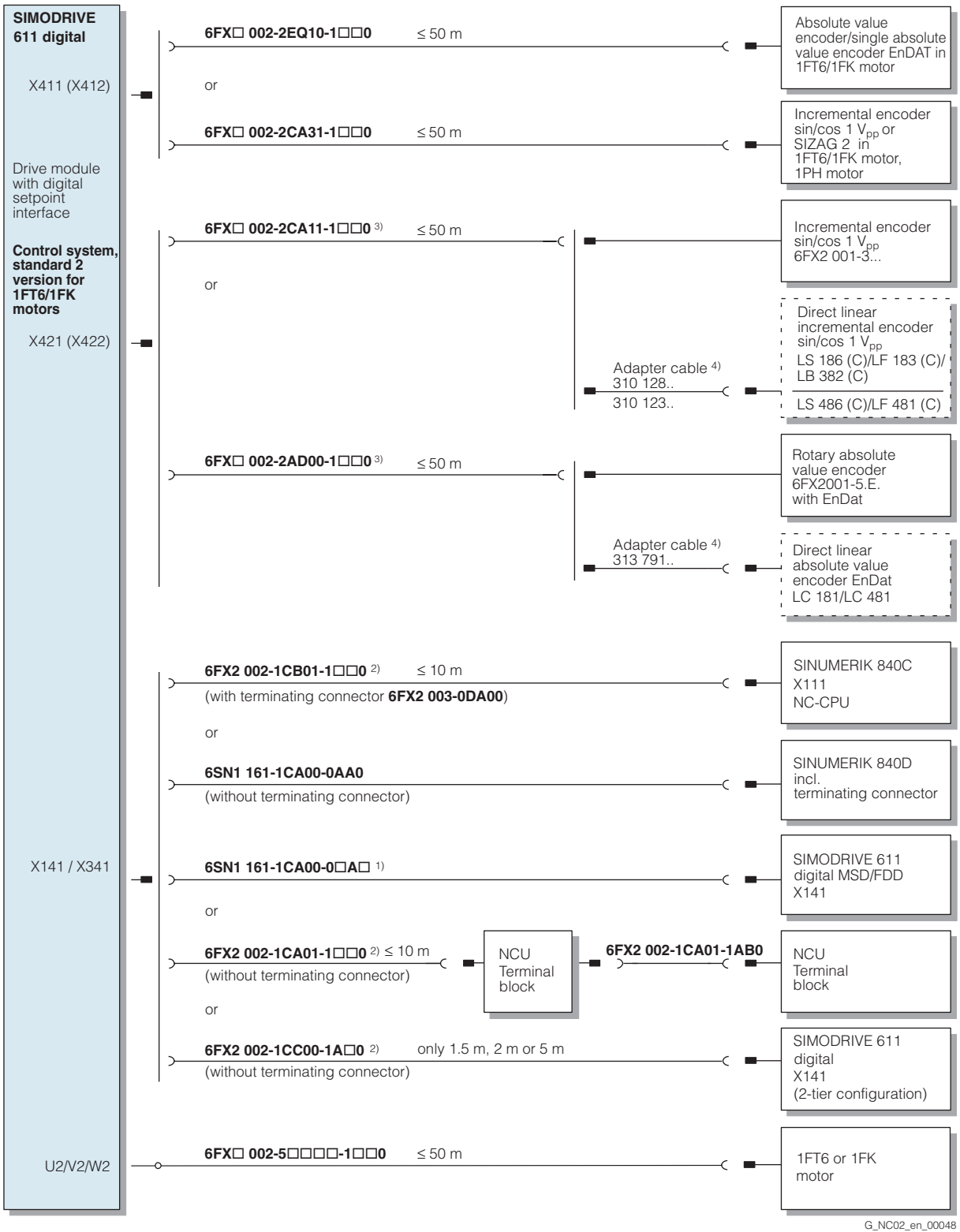


1) Up to 150 m possible, but with restrictions in the control quality of the drive.
2) Other lengths on request.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

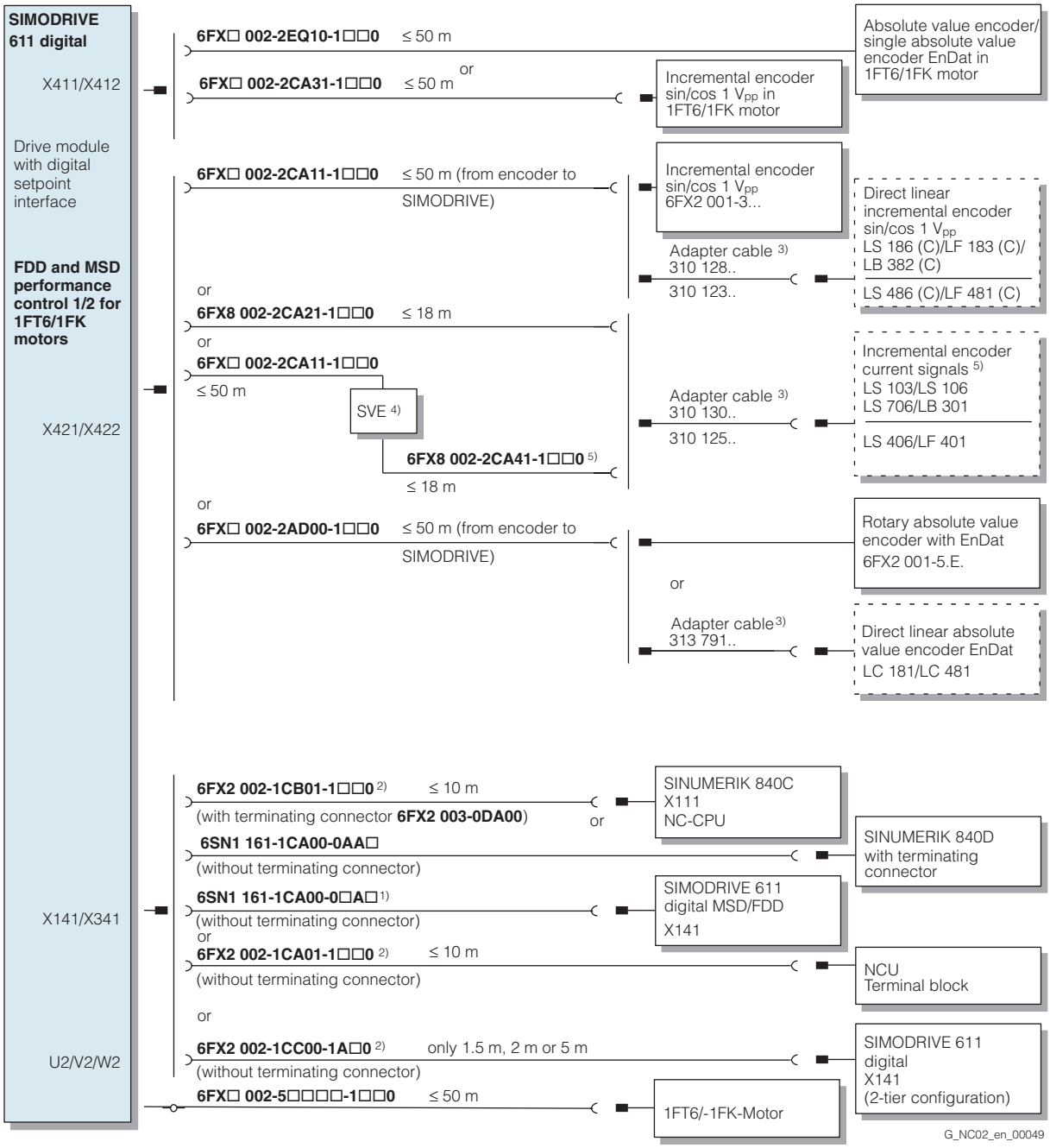
Overview of Connection Diagrams

SIMODRIVE 611 digital



1) Separate order for supply of components.
2) Connect once only to the first module that follows the I/RF module (round cable).
With two-tier configurations, use cable 6FX2 002-1CC00-1□□□.
3) Maximum cable lenth for 300 mA power consumptions is 15 m
(with lower power consumption, greater cable lengths are possible,
up to a maximum of 25 m).
4) Cables can be ordered from the linear scale manufacturer.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.



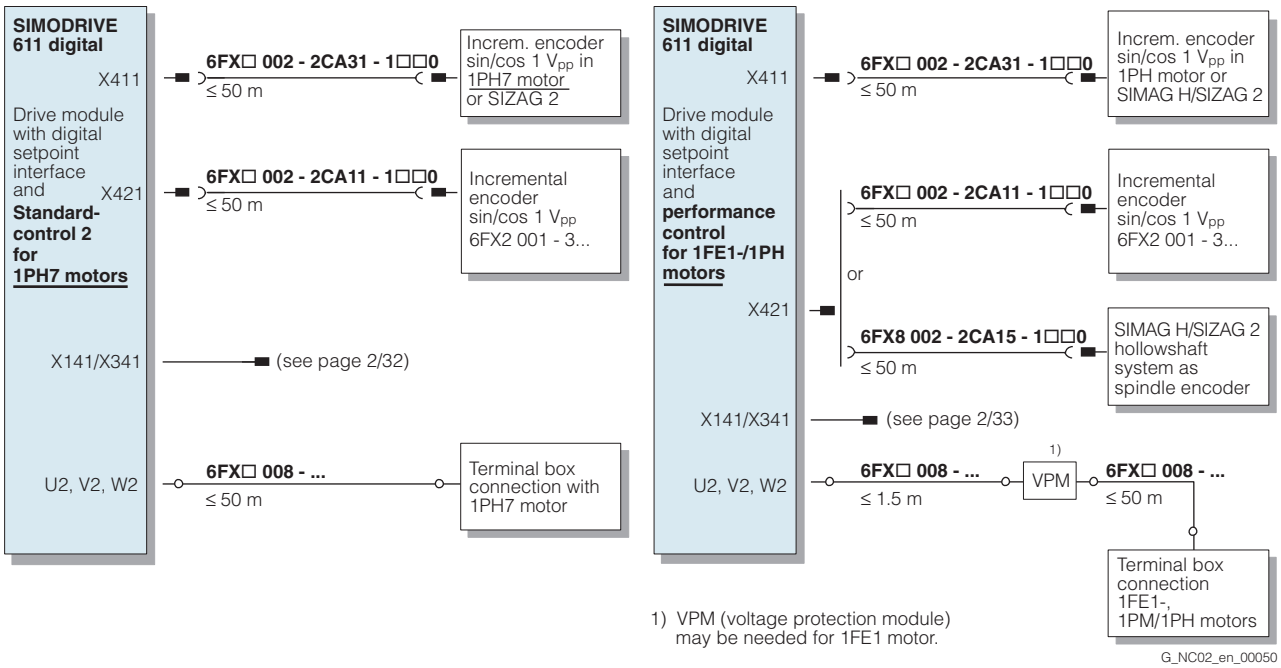
1) Separate order for supply of components.
2) Connect once only to the first module that follows the I/RF module (round cable).
3) Cables can be ordered from the linear scale manufacturer.
4) Order No. 6SN1 115-0AA12-0AA0.
5) No longer use measuring systems with current signals for new applications.
Voltage signals provide improved noise immunity and will replace the current signals in medium-team.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

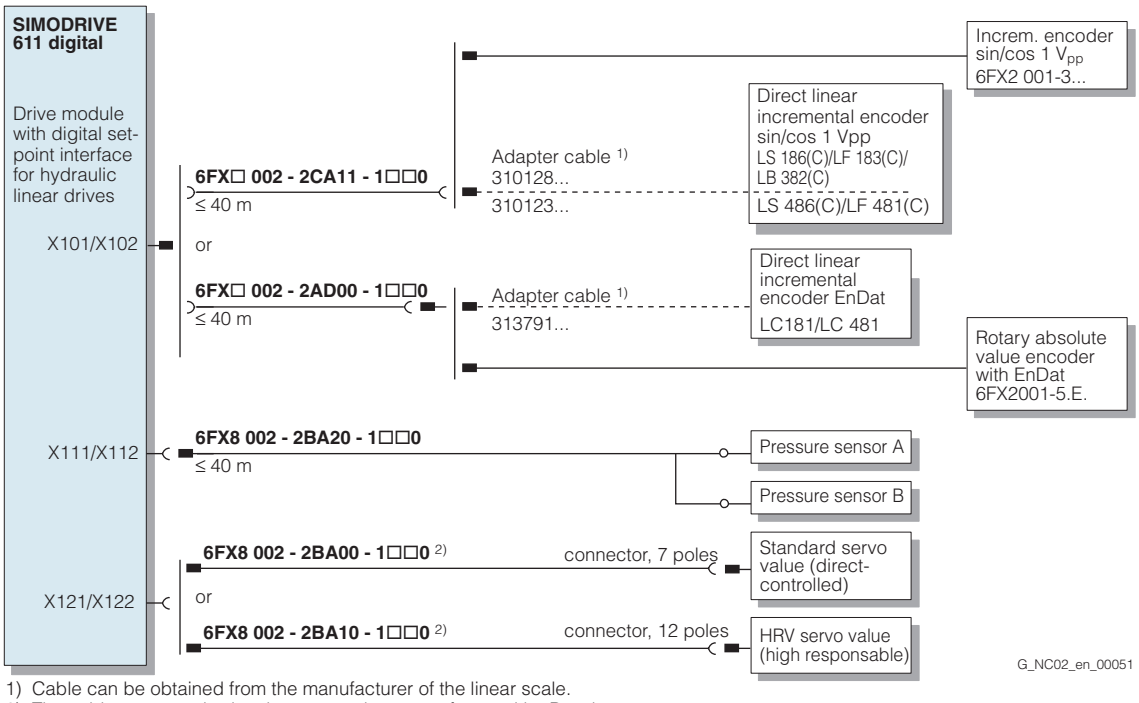
SIMODRIVE 611 digital

Digital closed loop control plug-in for FDD and MSD



1) VPM (voltage protection module) may be needed for 1FE1 motor.

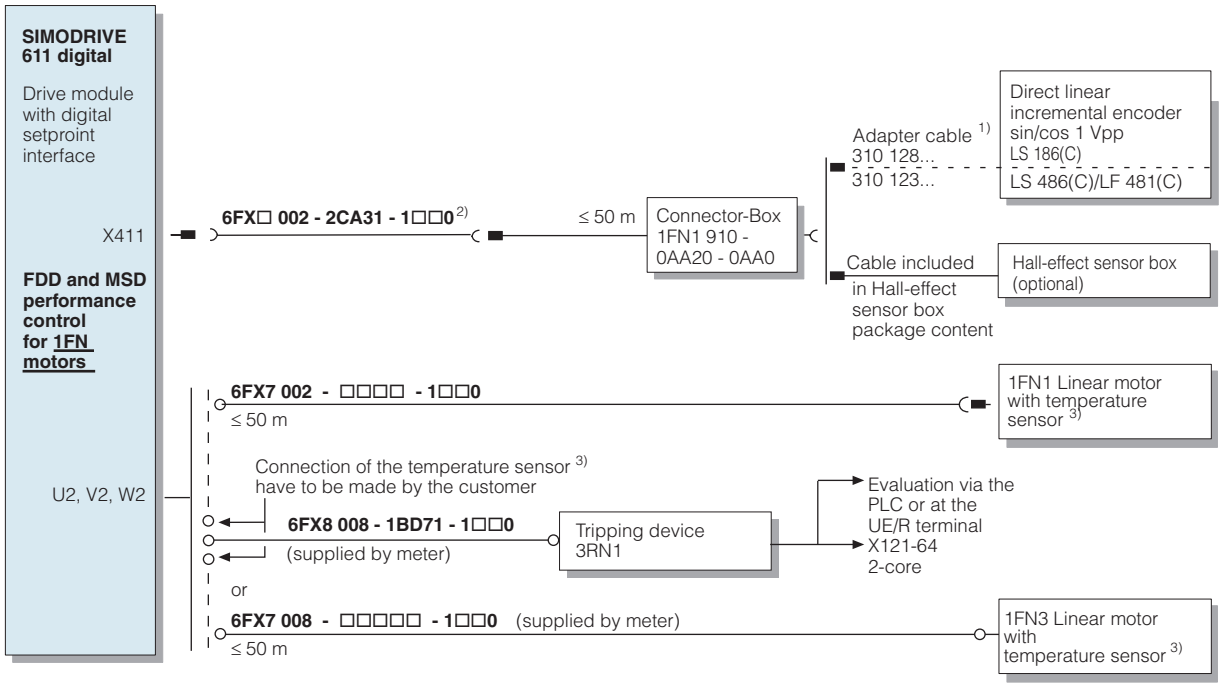
Closed loop control plug-in for hydraulic/analog linear drives HLA/ANA



1) Cable can be obtained from the manufacturer of the linear scale.
2) The cables are matched to the servo-valves manufactured by Bosch. For valves from other manufacturers, a universal cable is available on request.

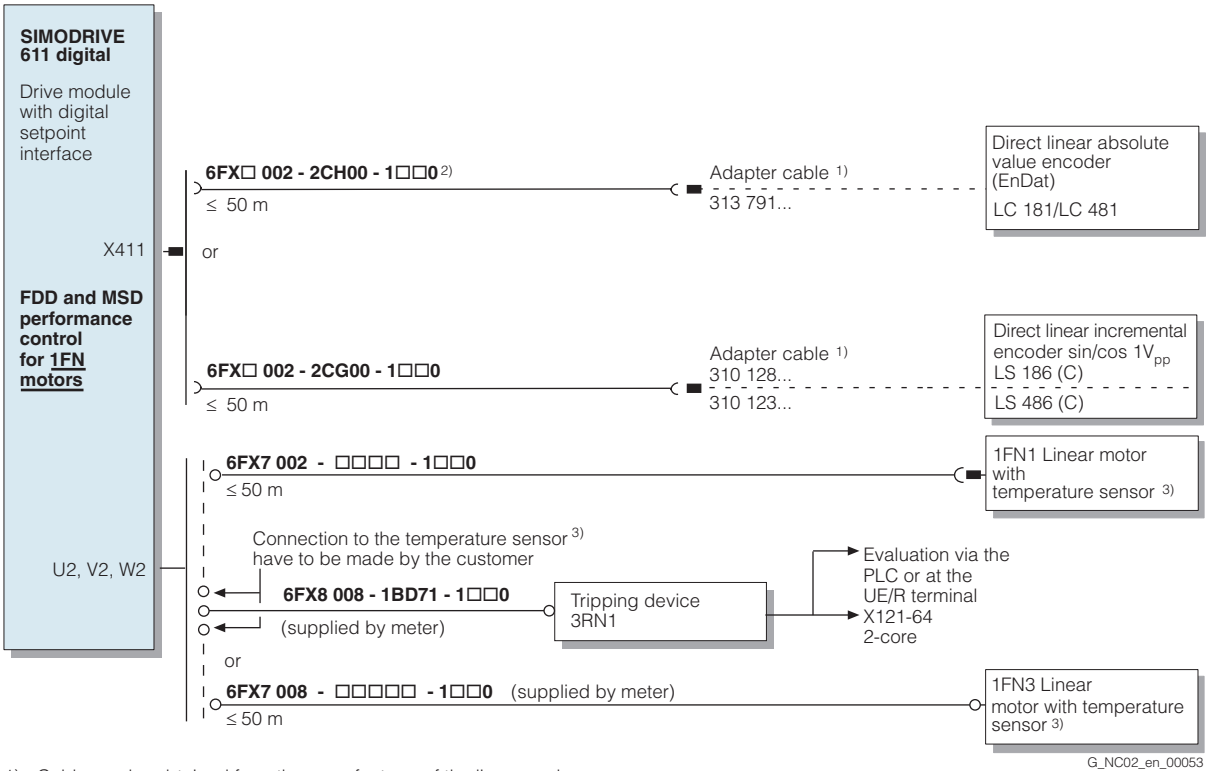
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

With connector box



1) Cable can be obtained from the manufacturer of the linear scale.
2) For 6FX8 ... ≤ 25 m
3) The cables for the temperature sensor are run in the power cable 6FX700.-... and must be coupled out before the converter.

Alternative connection without connector box

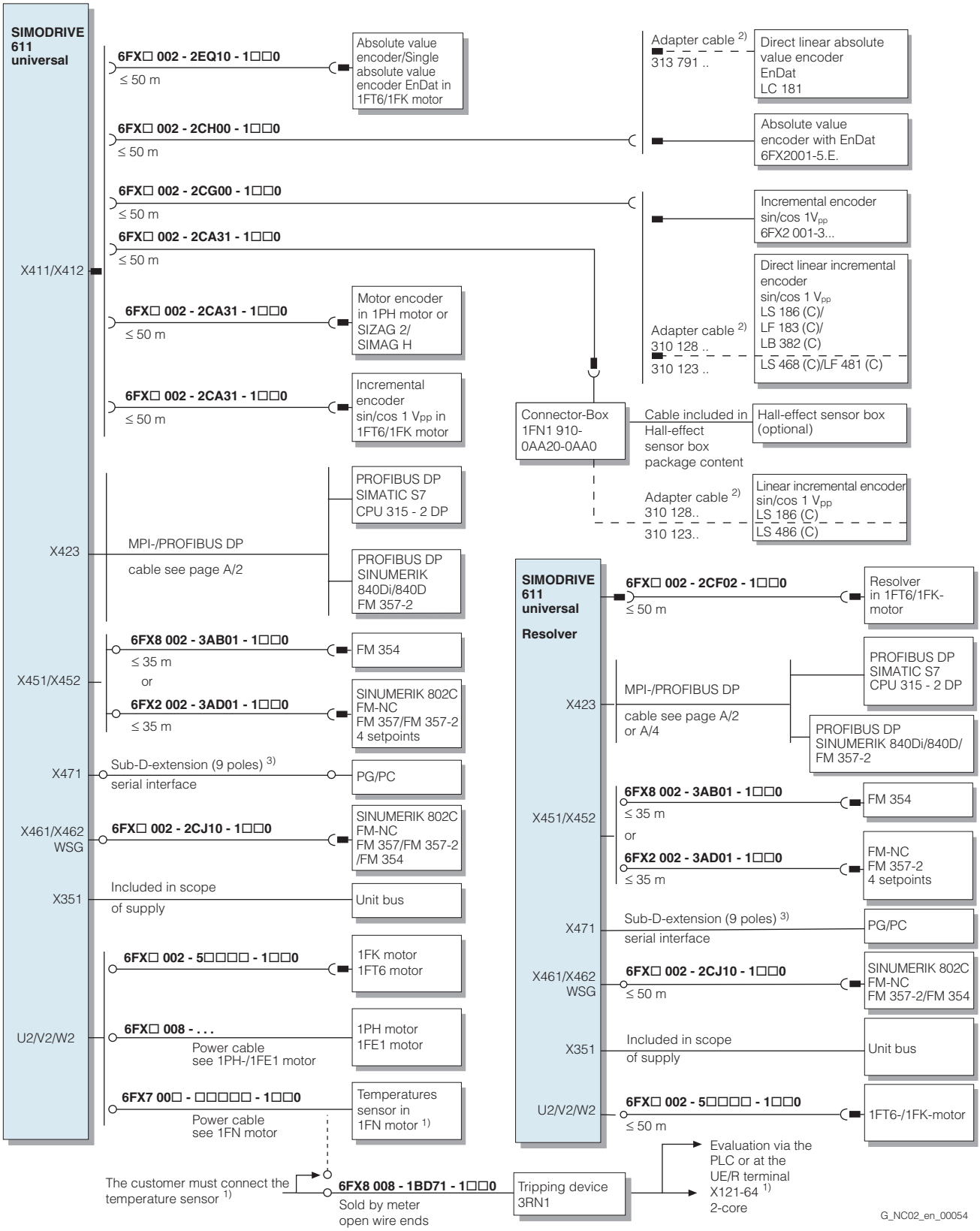


1) Cable can be obtained from the manufacturer of the linear scale.
2) For 6FX8 ... ≤ 25 m.
3) The cables for the temperature sensor are run in the power cable 6FX700.-... and must be coupled out before the converter.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Overview of Connection Diagrams

SIMODRIVE 611 universal

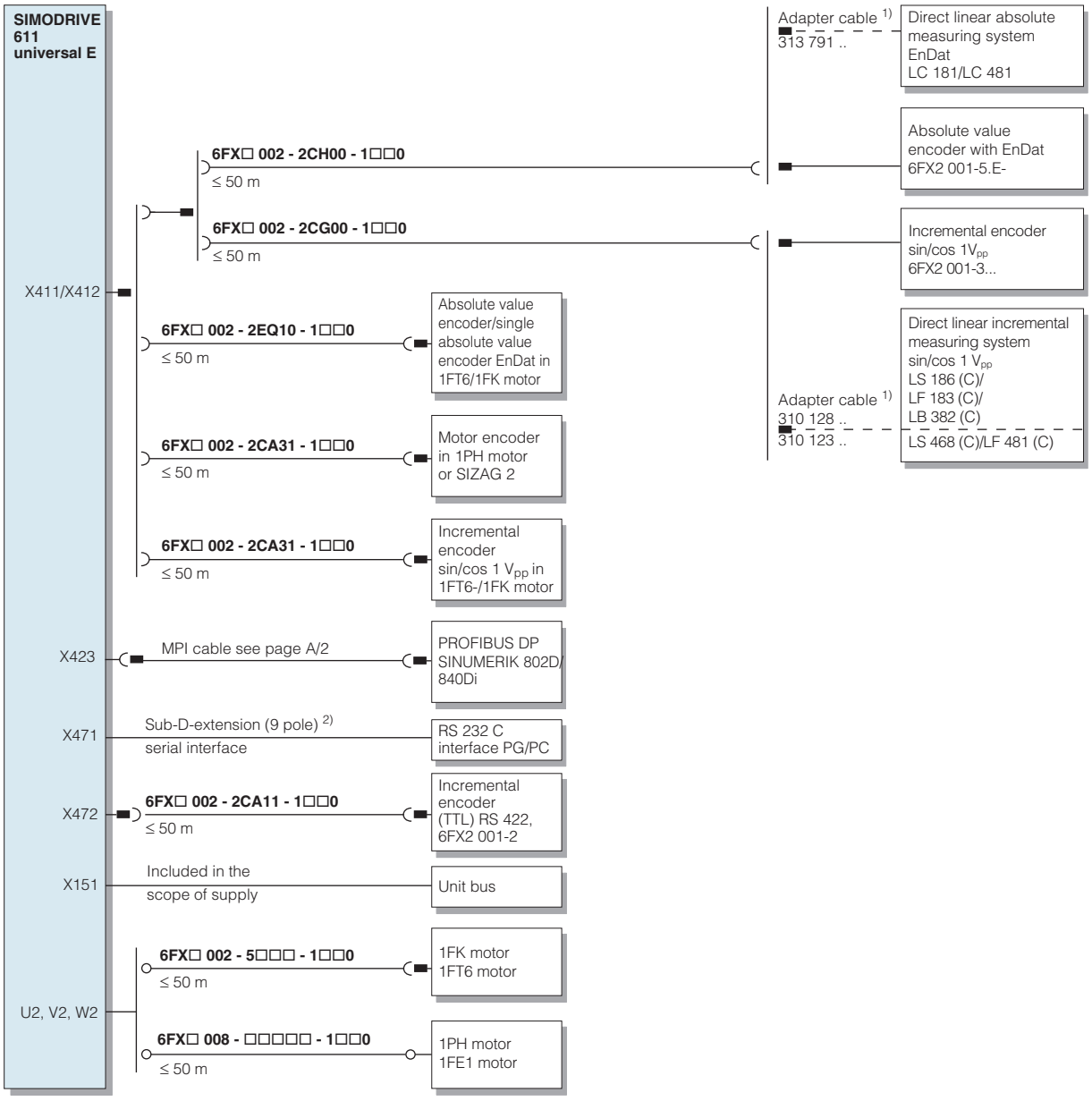


1) Connection of temperature sensor must be provided by the customer.
Cables for the temperature sensor are contained in the power cable 6FX7 00.-... for the 1FN motor.

2) Cables can be ordered from linear scale manufacturer.

3) PC accessory.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.



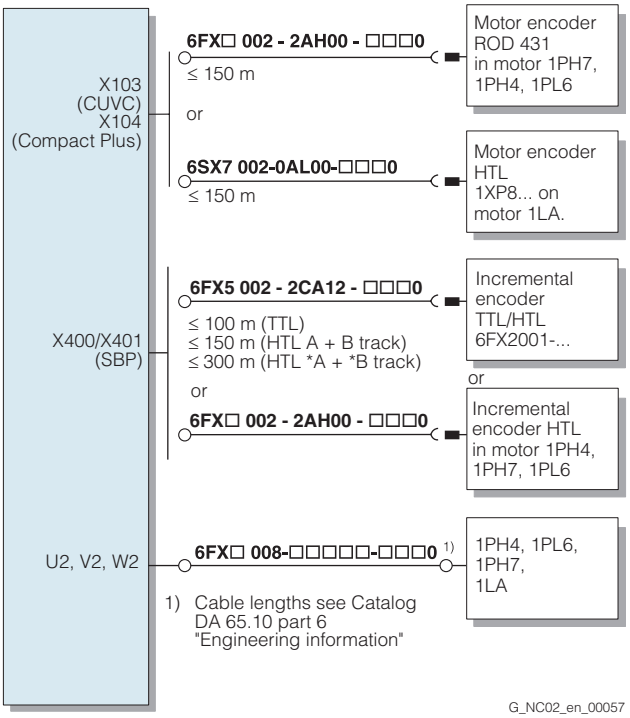
G_NC02_en_00055

1) Cables can be ordered from linear scale manufacturer.
2) PC accessory.
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

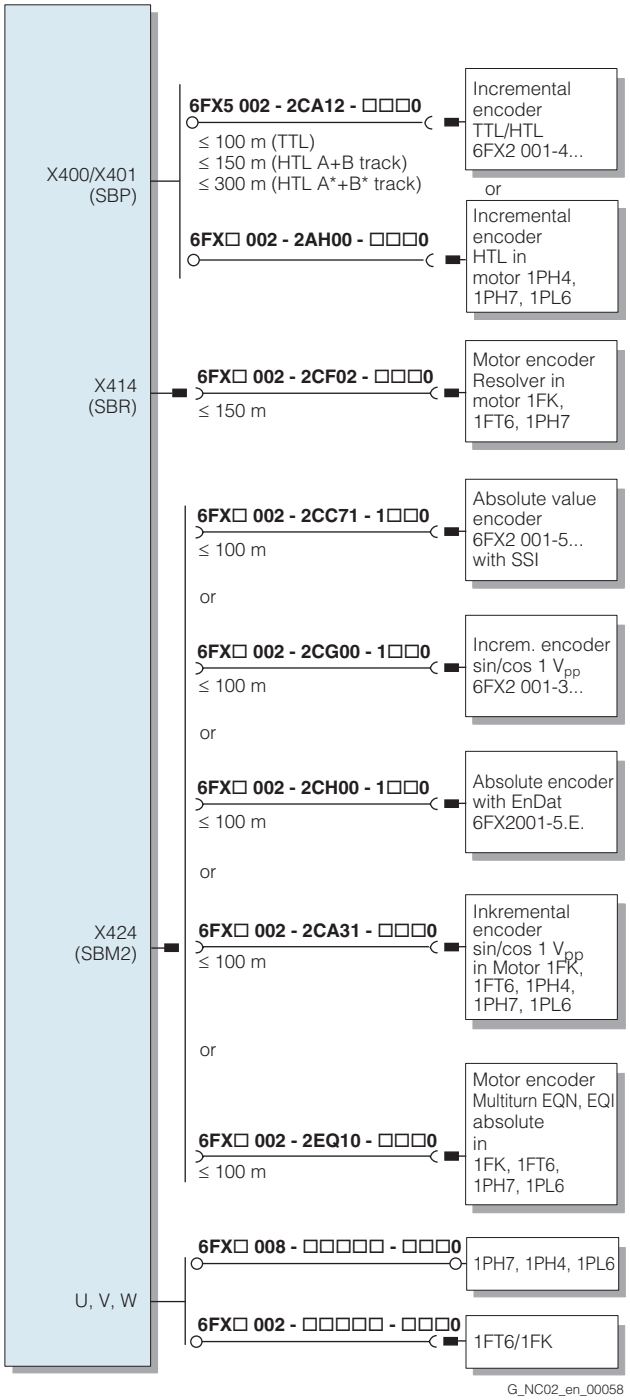
Pre-assembled Cables
Overview of Connection Diagrams

SIMOVERT MASTERDRIVES

SIMOVERT MASTERDRIVES VC

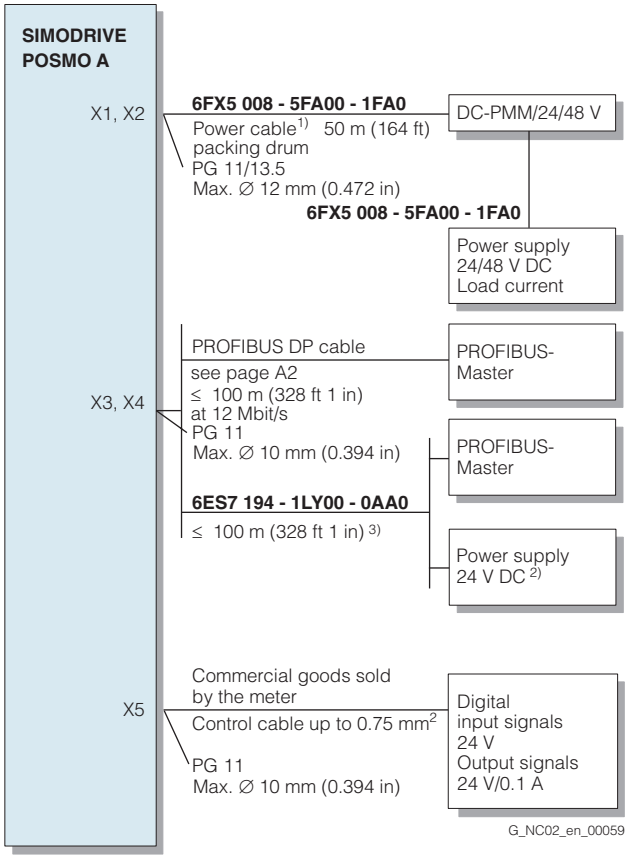


SIMOVERT MASTERDRIVES MC



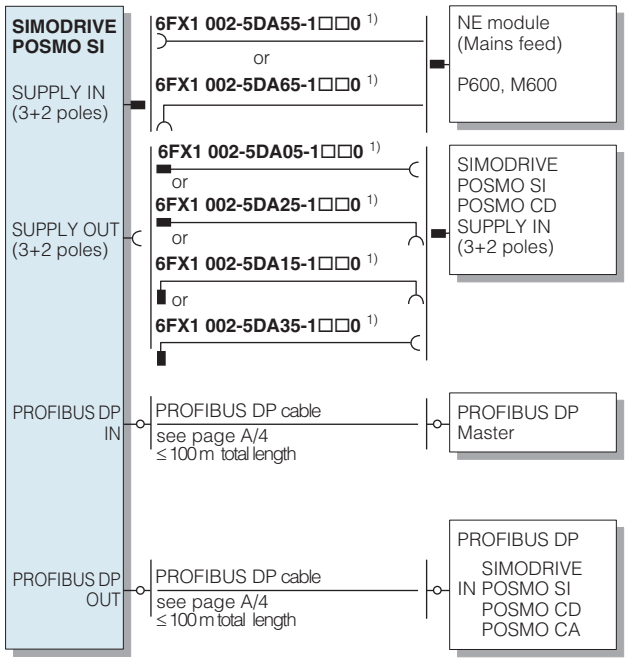
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

SIMODRIVE POSMO A



1) Length depends on permissible voltage drop at max. operating current.
2) Required when electronics have separate power supply.
3) Length specification applies for one bus segment at 12 Mbit/s.

SIMODRIVE POSMO SI



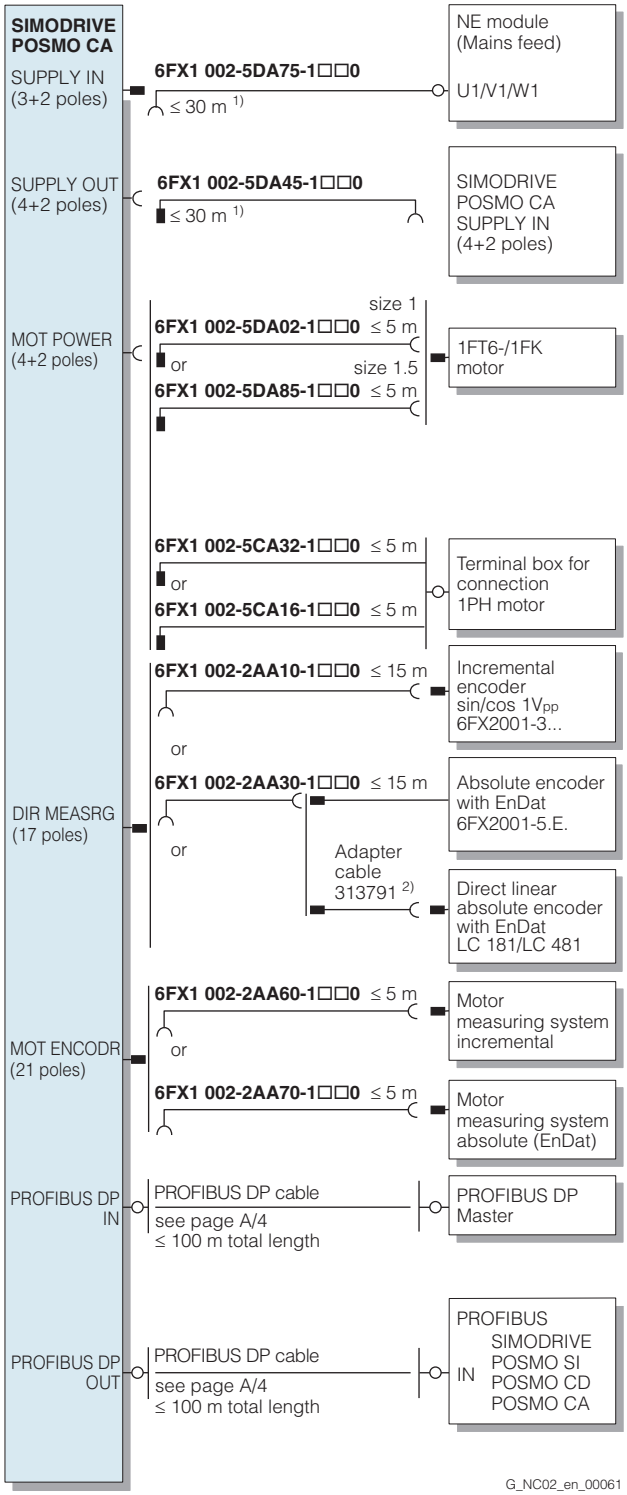
1) The total cable length in the DC link of all units connected to a supply must not exceeded 100 m.

Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

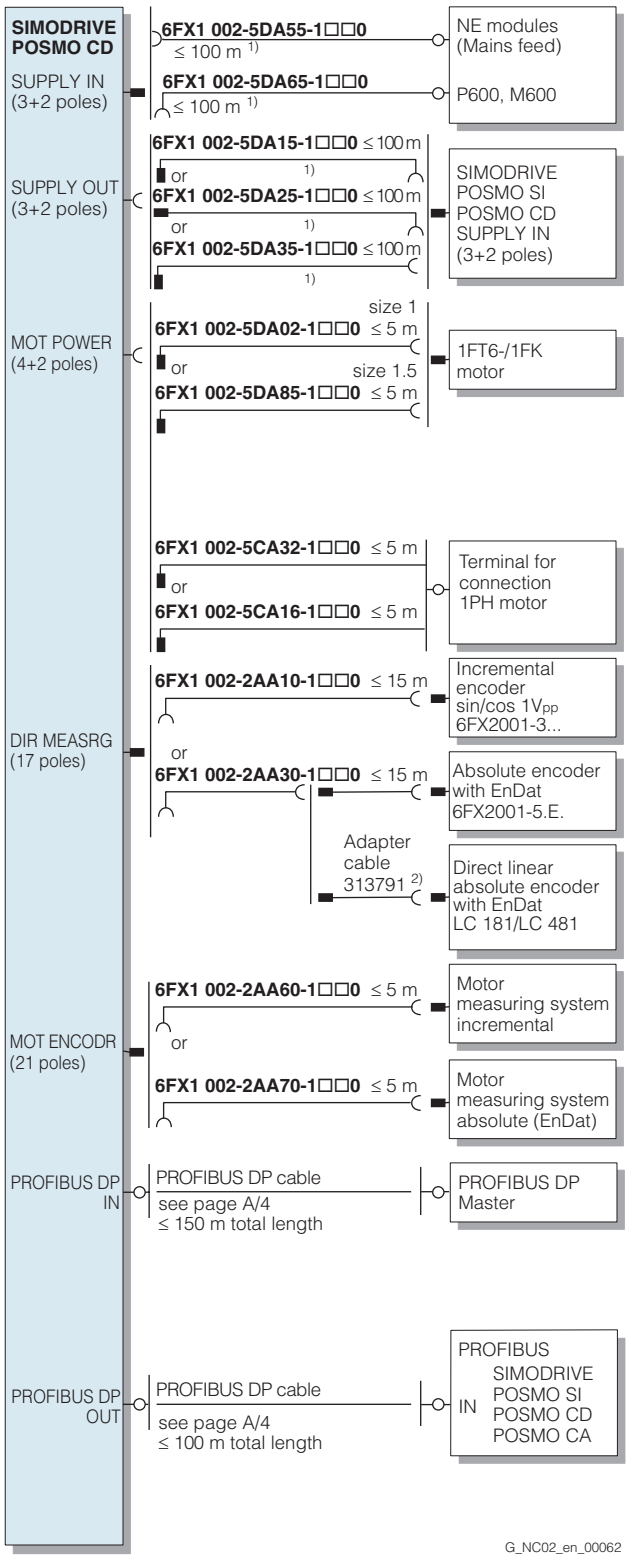
Overview of Connection Diagrams

SIMODRIVE POSMO CA, POSMO CD

SIMODRIVE POSMO CA



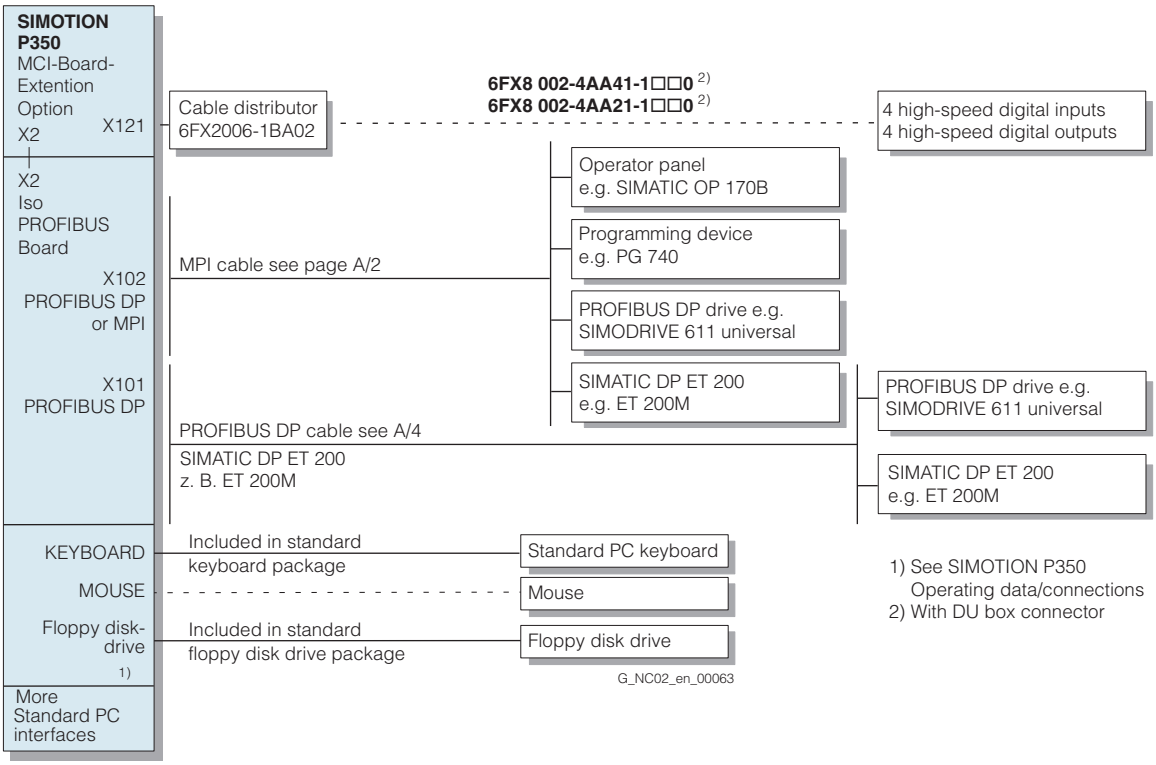
SIMODRIVE POSMO CD



1) The total cable length in the DC link of all units connected to a supply must not exceed 100 m.
2) Cables can be ordered from the linear scale manufacturer.

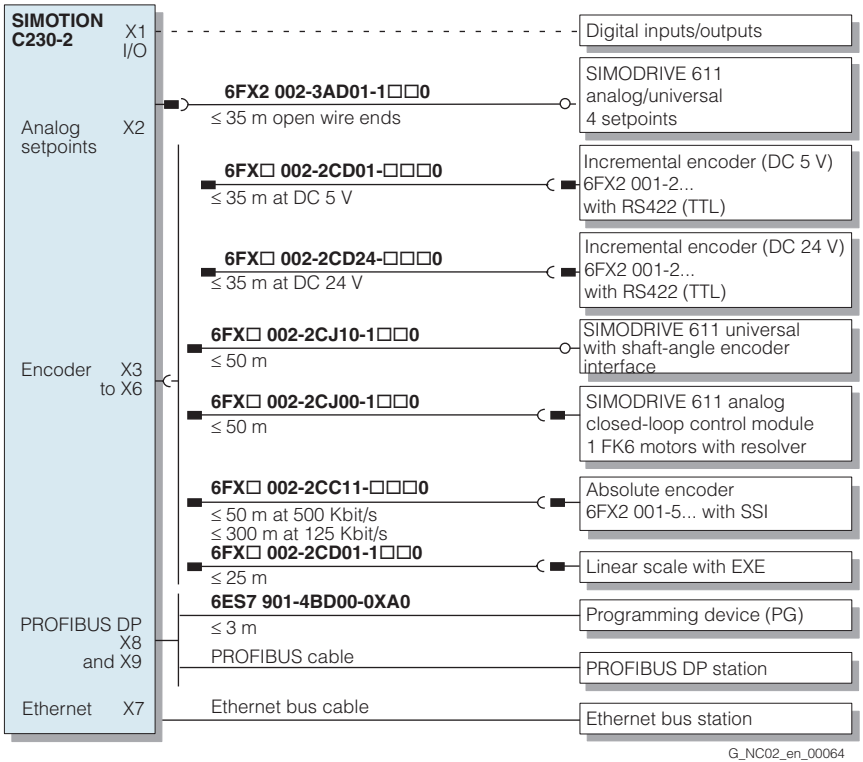
Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

SIMOTION P350



1) See SIMOTION P350 Operating data/connections
2) With DU box connector

SIMOTION C230-2



Please observe maximum permissible cable lengths (e.g. ≤ 50 m). If greater cable lengths are used, system malfunctions may occur. The order number code for cable variant 6FX□ ..., the general length key (-1□□□), and recommended lengths can be found on the foldout pages.

Notes

Measuring Systems
SIMODRIVE sensor

3

Built-on optoelectronic rotary encoders

Built-on optoelectronic rotary encoders

Application range, design

SIMODRIVE sensors are optoelectrical built-on rotary encoders for measuring displacement, angles of rotation or speeds on machines. They can be used in conjunction with numerical controls, programmable logic controllers, drives and position displays, such as

- SIMOTION; motion control systems
- SINUMERIK; CNC controls
- SIMATIC; programmable controllers
- SIMODRIVE and SIMOVERT MASTERDRIVES MC; drive systems

A basic differentiation is made between incremental and absolute measurement techniques. Because the position of the control is not normally stored and movements of the machine are not recorded during an emergency off, the use of incremental encoders requires that the machine carries out a reference-point approach after every emergency off.

As opposed to this, absolute value encoders also record these movements and supply the current position after emergency off. There is no need for a reference-point approach.

All encoders can be supplied in the synchro-flange and clamp flange versions. Encoders with synchro-flange can be attached with 3 clamps to the machine. A mounting with axial screws is also possible. The encoder is driven by a push-on coupling or spring disk coupling. Belt pulleys are also a possible alternative.

The power supply for the encoder is 5 V DC or optionally 10 V to 30 V DC. The 10 V to 30 V version permits longer cable lengths. Most control systems provide the supply voltage directly from the measuring circuit.

Mode of operation

Incremental encoder

These encoders supply a defined number of electrical pulses for each revolution that is the measurement of the traveled path or angle.
Incremental encoders operate by scanning code disks photoelectrically using the backlighting method. A light-emitting diode (LED) is used as the source. Photoelectric elements record the light-dark modulation caused by the turning encoder shaft. The suitable arrangement of the bar pattern on the coded disk attached to the shaft and the fixed aperture permit the photoelectric elements to supply A and B track signals that are displaced at 90° to each other and also a reference signal R. The encoder electronics amplifies these signals and converts them into various output levels.

The following output levels are available:

- RS 422 difference signals (TTL)
- Sine/cosine analog signals with level 1 V_{pp}
- HTL (High Voltage Transistor Logic)

The edge evaluation can increase the resolution unit for RS 422 encoders (TTL).

To achieve an even finer resolution, the supervisory control interpolates the signals from encoders with sinusoidal signals. Encoders with HTL interface are well suited for use in applications with digital inputs with 24-V-level.

Mode of operation for absolute value encoders (Singleturn / Multiturn)

Although absolute shaft encoders (angular encoders) have the same design as incremental encoders with regard to the sampling principle, they possess a larger number of tracks. For example, Singleturn encoders code 2^{13} = 8192 steps for 13 tracks. A single step code (Gray Code) is used. This avoids the occurrence of sampling errors.
After the machine has been switched on, the position value is transferred immediately to the control. A reference-point approach is not necessary. The data transmission between encoder and control is performed via the synchronous serial interface (SSI) or via PROFIBUS DP.[1)]
SSI and EnDat have advantages for time-critical applications. Because of the reduced cabling effort required by PROFIBUS DP, it is more suitable for installations with a large number of encoders.
The encoders for PROFIBUS DP can be parameterized.

Singleturn encoders convert a revolution (360° mechanical) into a specific number of steps, e.g. 8192. A unique code word is assigned to every position. The position values repeat themselves after 360°.

In addition to the absolute position within a revolution, Multiturn encoders also record the number of revolutions. Here samples are taken of the additional code disks coupled with the encoder shaft using gearboxes. The evaluation of a further 12 tracks permits 2^{12} = 4096 revolutions to be coded.

1) For references on the subject PROFIBUS, see Section 12 »Documentation« in Catalog NC 60 · 2002.

Ordering data

Incremental encoder

Order No.

Incremental encoder with RS 422 interface (TTL)
Synchro flange and 5 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 2G** ■■■
- Flange-connector radial — **6FX2 001 - 2E** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 2C** ■■■

Synchro flange and 10 V - 30 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 2H** ■■■
- Flange-connector radial — **6FX2 001 - 2F** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 2D** ■■■

Clamping flange and 5 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 2R** ■■■
- Flange-connector radial — **6FX2 001 - 2P** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 2M** ■■■

Clamping flange and 10 V - 30 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 2S** ■■■
- Flange-connector radial — **6FX2 001 - 2Q** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 2N** ■■■

Resolution [2]

500 p/r	**A 5 0**
1000 p/r	**B 0 0**
1024 p/r	**B 0 2**
1250 p/r	**B 2 5**
1500 p/r	**B 5 0**
2000 p/r	**C 0 0**
2048 p/r	**C 0 4**
2500 p/r	**C 5 0**
3600 p/r	**D 6 0**
5000 p/r	**F 0 0**

Incremental encoder with analog sin/cos 1 V_{pp} signals
Synchro flange and 5 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 3G** ■■■
- Flange-connector radial — **6FX2 001 - 3E** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 3C** ■■■

Resolution [2]

1000 p/r	**B 0 0**
1024 p/r	**B 0 2**
2500 p/r	**C 5 0**

Incremental encoder with HTL interface
Synchro flange and 10 V - 30 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 4H** ■■■
- Flange-connector radial — **6FX2 001 - 4F** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 4D** ■■■

Clamping flange and 10 V - 30 V DC power supply
Connection:
- Flange-connector axial — **6FX2 001 - 4S** ■■■
- Flange-connector radial — **6FX2 001 - 4Q** ■■■
- 1 m cable with connector [1] — **6FX2 001 - 4N** ■■■

Resolution [2]

100 p/r	**A 1 0**
500 p/r	**A 5 0**
1000 p/r	**B 0 0**
2500 p/r	**C 5 0**

Double-track encoder

Order No.

Double-track encoder with RS 422 interface (TTL)
Synchro flange and 5 V DC power supply
Connection:
- 1 m cable with two connectors axial

Resolution: 9000/1024 p/r [2] — **6FX2 001 - 2UK00**

Absolute value encoder SSI

Synchro flange and 10 V - 30 V DC power supply
Connection:
- SSI with flange-connector axial — **6FX2 001 - 5HS** ■■
- SSI with flange-connector radial — **6FX2 001 - 5FS** ■■

Clamping flange and 10 V - 30 V DC power supply
Connection:
- SSI with flange-connector axial — **6FX2 001 - 5SS** ■■
- SSI with flange-connector radial — **6FX2 001 - 5QS** ■■

Resolution

Singleturn 8192 p/r (13 bit)	**1 2**
Multiturn 8192 p/r, 4096 revolutions (25 bit)	**2 4**

Absolute value encoder EnDat

Synchro flange and 5 V DC power supply
Connection:
- EnDat with flange-connector axial — **6FX2 001 - 5HE** ■■
- EnDat with flange-connect. radial — **6FX2 001 - 5FE** ■■

Clamping flange and 5 V DC power supply
Connection:
- EnDat with flange-connector axial — **6FX2 001 - 5SE** ■■
- EnDat with flange-connect. radial — **6FX2 001 - 5QE** ■■

Resolution

Singleturn 8192 p/r (13 bit)	**1 3**
Multiturn 8192 p/r, 4096 revolutions (25 bit)	**2 5**

Absolute value encoder with PROFIBUS DP

Synchro flange and 10 V - 30 V DC power supply
- Connection radial — **6FX2 001 - 5FP** ■■

Clamping flange and 10 V - 30 V DC power supply
- Connection radial — **6FX2 001 - 5QP** ■■

Resolution

Singleturn 8192 p/r (13 bit)	**1 2**
Multiturn 4096 p/r, 8192 revolutions (25 bit)	**2 4**

Documentation
User manual (German/English) for start-up and parameterization of the PROFIBUS encoders — **6SN1 197- 0AB10 - 0YP1**

1) Universal integral cable outlet for axial and radial directions.
2) p/r = pulse/revolution

Built-on optoelectronic rotary encoders

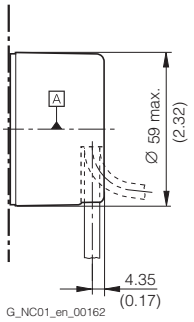
Technical specifications of incremental encoder

Type	Encoder with RS 422 (TTL)	Encoder with sin/cos 1 V_{pp}	Encoder with HTL	Double-track enc. with RS 422 (TTL)
Operating voltage (at encoder)	5 V DC ±10 % or 10 V – 30 V DC	5 V DC ±10 %	10 V – 30 V DC	5 V DC ± 5 %
Cut-off frequency (-3 dB)	–	≥ 180 kHz (typ.)	–	–
(-6 dB)	–	≥ 450 kHz (typ.)	–	–
Sampling frequency (max.)	300 kHz	–	300 kHz	Track 1: 160 kHz Track 2: 1 MHz
No-load current consumption (max.)	150 mA			150 mA per track
Signal level	RS 422 (TTL)	sinusoidal 1 V_{pp}	HTL U_H ≥ 21 V at I_H=20 mA@ 24 V U_L ≤ 2.8 V at I_L=20 mA@ 24 V	RS 422 (TTL)
Outputs protected against short-circuit to 0 V	yes	yes	yes	yes
Switching time (10 % to 90 %) (with 1 m cable and recommended input circuit)	Rise/fall time t_+ /t_- ≤ 50 ns	–	Rise/fall time t_+ /t_- ≤ 200 ns	Rise/fall time t_+ /t_- ≤ 100 ns
Phasing signal A to B min. edge spacing at:	90°	90° ±10° el.	90°	90°
1 MHz	–	–	–	≥ 0.125 µs (track 2)
300 kHz	≥ 0.45 µs	–	≥ 0.45 µs	–
160 kHz	–	–	-	≥ 0.8 µs (track 1)
Cable length to electronic circuitry[1], max.	100 m	150 m	100 m	100 m (to 500 kHz) 50 m (to 1 MHz)
LED failure monitoring	Driver at high resist.	–	Driver at high resist.	–
Resolution, max.	5000 p/r	2500 p/r	2500 p/r	Track 1:1024 p/r Track 2: 9000 p/r
Accuracy (in angular seconds)	±18° mech.x 3600/encoder line z			Track 1: ± 63 Track 2: ±12
Permissible electrical speed	18 x 10^6 rpm / increments	27 x 10^6 rpm / increments (at 6 dB)	18 x 10^6 rpm / increments	Track 1:9000 rpm Track 2:6500 rpm
Maximum mechanical speed	12000 rpm			
Frictional torque	≤ 0.01 Nm (at 20° C) [≤ 0.09 lb-in (at 68° F)]			
Starting torque	≤ 0.01 Nm (at 20° C) [≤ 0.09 lb-in (at 68° F)]			
Shaft loading capacity				
• n > 6000 rpm	axial 10 N/radial 20 N at shaft extension			–
• n ≤ 6000 rpm	axial 40 N/radial 60 N at shaft extension			axial 10 N/ radial 20 N at shaft extension
Angular acceleration, max.	$>10^5$ rad/s^2			
Moment of inertia of rotor	$1.45 \cdot 10^{-6}$ kgm^2			$20 \cdot 10^{-6}$ kgm^2
Vibration (55 Hz to 2000 Hz) to DIN IEC 68-2-6	≤ 100 m/s^2			
Shock (6 ms) to DIN IEC 68-2-27	≤ 1000 m/s^2			
Maximum working temperature	100 °C (212 °F) (U_P=5 V ±10%) 70 °C (158 °F) (U_P=10 V to 30 V)	100 °C (212 °F)	85 °C (185 °F) (100 °C at U_P<15 V)	70 °C (158 °F)
Minimum working temperature	Flange socket or fixed cable: -40 °C (-40 °F) Movable cable: -10 °C (+14 °F)			-10 °C (+14 °F)
Degree of protection to DIN EN 60529 (IEC 60529)	IP 67 at the housing IP 64 at the shaft inlet			
EMC	Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EEC and the regulations of the EMC guidelines (applicable basic standards)			
Weight, approx.	0.25 kg			0.7 kg
CE marking	yes			

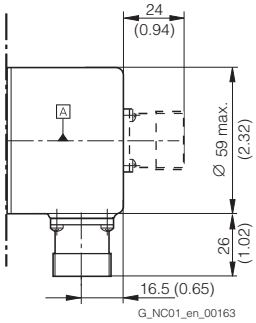
1) With recommended cable and input circuit of the follow-up electronics; observe max. permissible cable length of module to be evaluated.

Connection variants

Cable



Flange-connector



Technical specifications of the absolute value encoder

Type	**Absolute value encoder with synchronous serial interface SSI**	**Absolute value encoder with EnDat**	**Absolute value enc. with PROFIBUS DP** (EN 50170)
Operating voltage (at encoder)	10 V - 30 V DC	5 V DC ±10 %	10 V - 30 V DC
Power consumption, approx.	Multiturn 250 mA, Singleturn 180 mA	Multiturn 250 mA, Singleturn 180 mA	300 mA - 100 mA (3.5 W)
Clock pulse input	Differential cable receiver according to EIA standard RS 485		
Data output	Differential cable driver according to EIA standard RS 485		
Short-circuit proof	yes		
Transmission rate	100 kHz - 1 MHz	100 kHz - 2 MHz	12 Mbit/s
LED for bus diagnostics	–	–	yes (green/red)
Permissible electric speed	5000 rpm with ±1 Bit accuracy 10000 rpm with ±100 Bit accuracy		1500 rpm with ±1 Bit accuracy
Maximum mechanical speed	12000 rpm with Singleturn, 10000 rpm with Multiturn		12000 rpm with Singleturn, 6000 rpm with Multiturn
Cable length to electronic circuitry [1], max.	50 m to 1 MHz cycle 100 m to 300 kHz cycle 400 m to 100 kHz cycle	50 m to 1 MHz cycle 150 m to 300 kHz cycle –	100 m to 12 Mbit/s 200 m to 1.5 Mbit/s 1200 m to 93.75 kbit/s
Node count, max.	–	–	99
Connection	Flange-connector axial/radial		Terminal block with address selector and bus terminator in removable cover with 3 cable glands
Cable diameter	–	–	6.5 mm to 9 mm (0.26 to 0.35 in) Removal of cover possible without interrupting bus
Resolution	13 bit Singleturn (8192 steps) 25 bit Multiturn (8192 × 4096 steps)	13 bit Singleturn (8192 steps) 25 bit Multiturn (4096 x 8192 steps)	13 bit Singleturn (8192 steps) 25 bit Multiturn (8192 x 4096 steps)
Frame length	13 bit Singleturn, without parity 25 bit Multiturn, without parity	According to EnDat specification	–
Inkremental track	–	512 p/r, 1 V_{PP}	–
Type of code			
• Sampling	Gray	Gray	Gray
• Transmission	Gray	Binary	Binary
Parameterization			
• Resolution per revolution	–	–	any 1 to 8192
• Total resolution	–	–	any 1 to 4096
• Preset	–	–	yes
• Counting direction	yes	–	yes
• Speed signal	–	–	yes
• Limit switch	–	–	yes, 2 pcs.
• Clock synchronism and lateral communication	–	–	yes
Online parameterization	–	–	yes
Bus load of encoder, approx.	–	–	20 µs per encoder with 12 Mbit/s
Cycle time	–	–	667 µs
Accuracy	± 60 angular seconds	± 60 angular seconds (incr. track)	± ½ LSB
EMC	tested to DIN EN 50081 and EN 50082		
Frictional torque	≤ 0.01 Nm (with 20 °C) [≤ 0.09 lb-in (at 68° F)]		
Starting torque	< 0.01 Nm (with 20 °C) [≤ 0.09 lb-in (at 68° F)]		
Shaft load rating			
• n > 6000 rpm	axial 10 N/radial 20 N at shaft extension		
• n ≤ 6000 rpm	axial 40 N/radial 60 N at shaft extension		
Angular acceleration, max.	10^5 rad/s^2		
Moment of inertia of rotor	$1.45 \cdot 10^{-6}$ kgm^2		
Vibration (55 Hz to 2000 Hz) to DIN IEC 668-2-6	≤ 100 m/s^2		
Shock (6 ms) to DIN IEC 668-2-27	≤ 1000 m/s^2		
Minimum working temperature	-40 °C (-40 °F)	-40 °C (-40°F)	-30 °C (-22 °F)
Maximum working temperature	85 °C (+185 °F)	100 °C (212 °F)	70 °C (+158 °F)
Degree of protection to DIN EN 60529 (IEC 60529) without/with shaft inlet	IP 67/IP 64		
Weight			
• Singleturn/Multiturn, approx.	0.35 kg/0.35 kg		0.5 kg/0.7 kg
CE marking	yes	yes	yes
PROFIBUS certificate	–	–	yes
Supported profiles	–	–	Class 1, Class 2

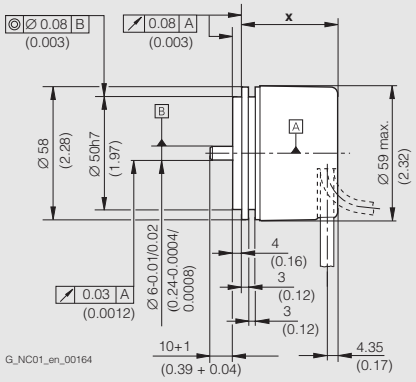
1) Observe the maximum permissible cable length of the connected module.

Built-on optoelectronic rotary encoders

Dimension drawings in mm

Incremental encoder, absolute value encoder

Encoder with synchro flange

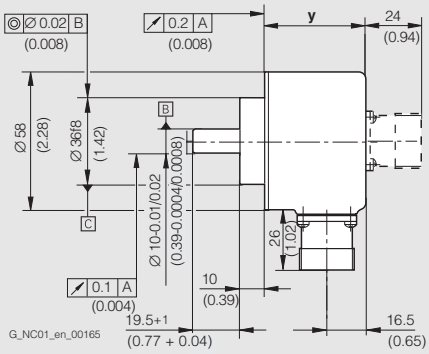


Incremental encoder

Cable axial/radial:	x = 42±1
Flange-connector axial:	x = 48±1
Flange-connector radial:	x = 52±1

Absolute value enc. SSI/EnDat	axial	radial
Singleturn:	x = 48	x = 52
Multiturn:	x = 59	x = 59

Encoder with clamping flange

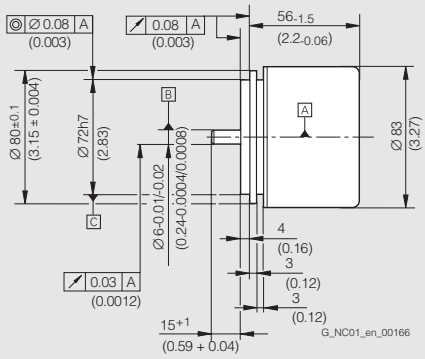


Incremental encoder

Cable axial/radial:	y = 36±1
Flange connector axial:	y = 42±1
Flange connector radial:	y = 46±1

Absolute value enc. SSI/EnDat	axial	radial
Singleturn:	y = 42	y = 46
Multiturn:	y = 53	y = 53

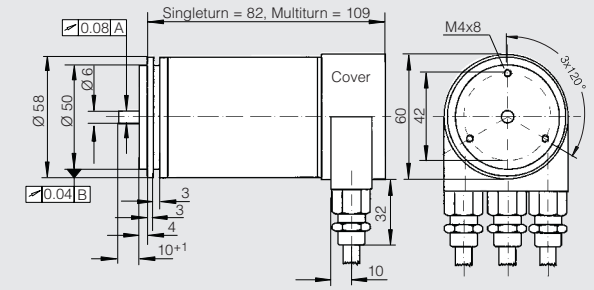
Double-track encoder with synchro flange



Cable axial

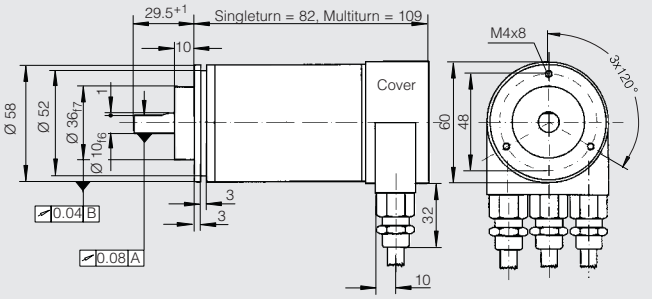
Absolute value encoder with PROFIBUS DP

Synchro flange



Cover detachable

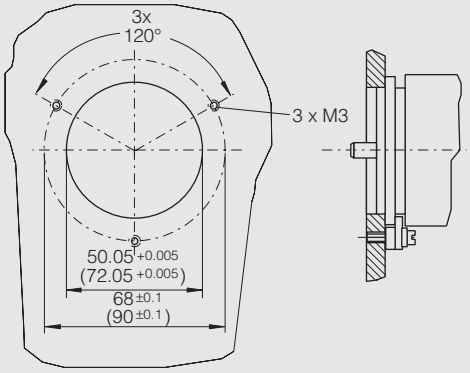
Clamping flange

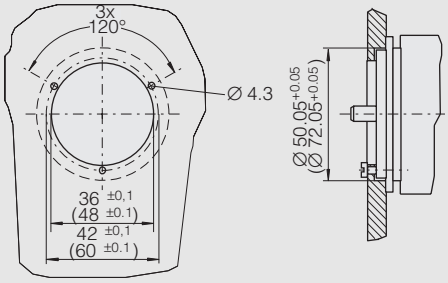


Cover detachable

Installation proposal for encoder (dimensions in mm)

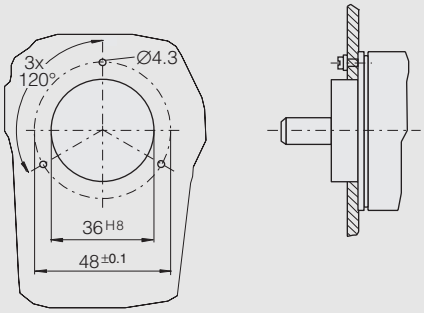
Encoder with synchro flange

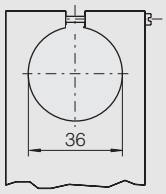




(Values for double-track encoders in brackets)

Encoder with clamping flange

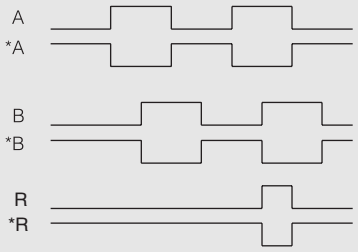




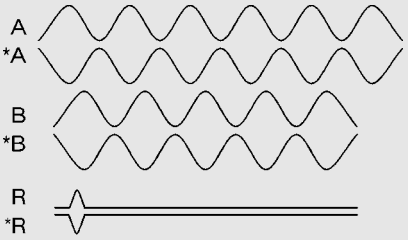
Built-on optoelectronic rotary encoders

Encoder output signals (View on shaft and shaft rotation clockwise)

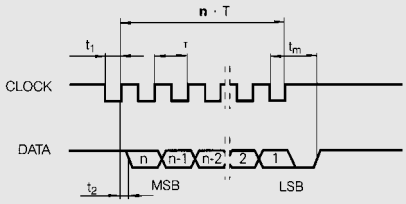
RS 422 interface (TTL)



Sinusoidal 1 V_{PP} signals



SSI

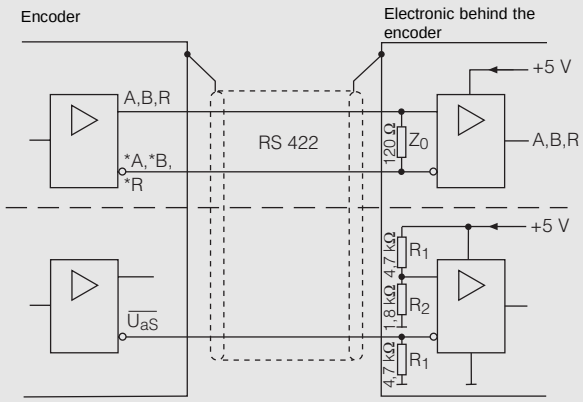


t_m = 12 - 15 µs
T < tm

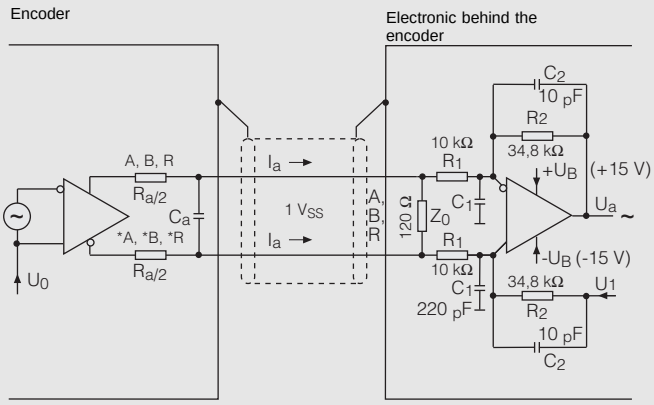
n = 13 with Singleturn
n = 25 with Multiturn

Electronics behind the encoder (recommendation)

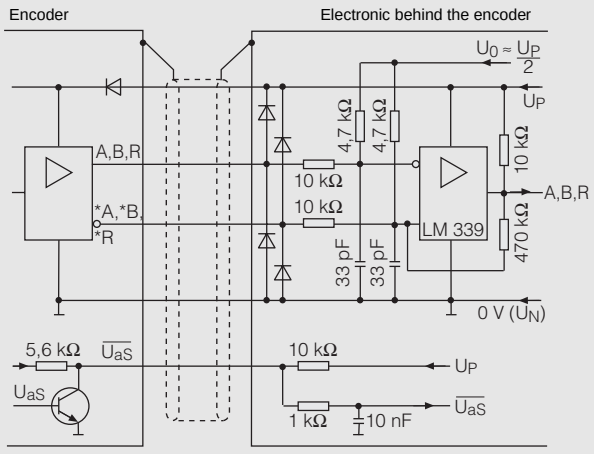
RS 422 interface (TTL)



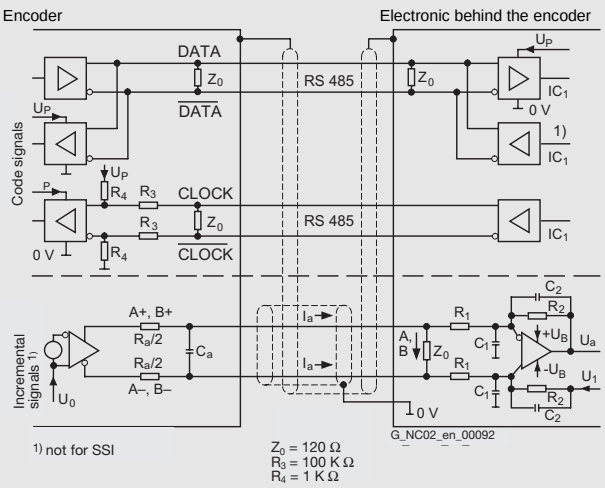
Sinusoidal 1 V_{PP} signals



Highvoltage Transistor Logic (HTL)



SSI/EnDat



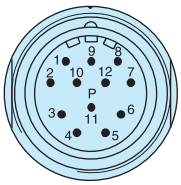
1) not for SSI

Z_0 = 120 Ω
R_3 = 100 K Ω
R_4 = 1 K Ω

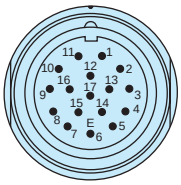
Allocation of encoder connector and flange-connector

Pin	Signal SSI	EnDat	Signal ink.	Color [1]	
				cable sheath green (RAL 6018)	cable sheath petrol
1	*Clock	5 V_{sens}	*B	pink	brown
2	Clock	–	5 V_{sens} or 10 V - 30 V	blue	red/white
3	Data	–	R	red	blue
4	*Data	0 V_{sens}	*R	black	violet
5	–	–	A	brown	yellow
6	–	–	*A	green	green
7	–	5 V	U_{as}	violet	–
8	Counting direction	Clock	B	grey	black
9	–	*Clock	–	–	–
10	–	0 V	0 V	white/green	yellow/white
11	10 V - 30 V	Internal shield	0 V_{sens}	white	blue/white
12	0 V	B	5 V or 10 V - 30 V	brown/green	black/white
13	–	*B	–		
14	–	Data	–		
15	–	A	–		
16	–	*A	–		
17	–	Data	–		
Housing	Housing	Housing	Housing	Shield	

View onto connecting side of encoder connector and flange-connector



12-pole, pin contacts, external thread



17-pole, pin contacts, external thread

On the rotary encoders with cable including connector, the cable length is 1 m.
Please observe the following radii of curvature:
Single bending: ≥ **20 mm**
Permanent bending: ≥ **75 mm**

Note:
On incremental encoders, pin 10 is jumpered with pin 11, and pin 2 with pin 12; with SSI encoders, pin 8 open or on 0V: counting direction adding. Pin 8 on U_B+: counting direction subtracting, in each case for clockwise rotation and viewed onto the shaft.

Spare connectors for encoder

Ordering data	Order No.
12 poles 12 pin contacts; external thread	**6FX2 003-1CF12**
17-poles 17 pin contacts; external thread	**6FX2 003-1CF17**

Note: We recommend the use of pre-assembled cables as shown on page 3/10.

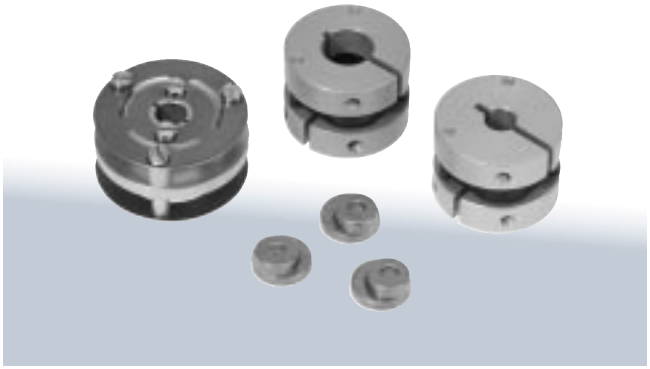
1) Applies to the versions cable connection. The colors of the cores are only valid for the cores of encoder cable.

Built-on optoelectronic rotary encoders connection diagram

Signal cables, preassebled

for device		Encoder version Interface	Power supply U_P	Signal cable, preassembled type
SINUMERIK				
SINUMERIK 805, 810, 840C		TTL (RS 422)	5V	6FX■ 002 - 2CB51 - 1..0
SIROTEC RCM 1P		SSI TTL (RS 422)	10 V - 30 V 5 V	6FX■ 002 - 2CC11 - 1..0 6FX■ 002 - 2CB51 - 1..0
SINUMERIK 802S/C		TTL (RS 422)	5 V	6FX■ 002 - 2CD01 - 1..0
SINUMERIK 810D		sin/cos 1 V_{pp} EnDat	5 V 5 V	6FX■ 002 - 2CG00 - 1..0 6FX■ 002 - 2CH00 - 1..0
SINUMERIK FM-NC ADI 4		TTL (RS 422) TTL (RS 422) SSI	5 V 10 V - 30 V 10 V - 30 V	6FX■ 002 - 2CD01 - 1..0 6FX■ 002 - 2CD24 - 1..0 6FX■ 002 - 2CC11 - 1..0
SIMODRIVE				
SIMODRIVE 611 analog, MSD		TTL (RS 422)	5 V	6FX■ 002 - 2CA72 - 1..0
SIMODRIVE 611 digital, MSD/FDD, MCU		sin/cos 1 V_{pp} EnDat	5 V 5 V	6FX■ 002 - 2CA11 - 1..0 6FX■ 002 - 2AD00 - 1..0
SIMODRIVE 611 universal		sin/cos 1 V_{pp} EnDat	5 V 5 V	6FX■ 002 - 2CG00 - 1..0 6FX■ 002 - 2CH00 - 1..0
SIMODRIVE 611 universal E		sin/cos 1 V_{pp} TTL (RS 422) EnDat	5 V 5 V 5 V	6FX■ 002 - 2CG00 - 1..0 6FX■ 002 - 2CA11 - 1..0 6FX■ 002 - 2CH00 - 1..0
Masterdrives				
SIMOVERT MASTERDRIVES MC/VC		sin/cos 1 V_{pp} HTL in the motor EnDat SSI HTL TTL (RS 422)	5 V 10 V - 30 V 5 V 10 V - 30 V 10 V - 30 V 5 V	6FX■ 002 - 2CG00 - 1..0 6FX■ 002 - 2AH00 - 1..0 6FX■ 002 - 2CH00 - 1..0 6FX■ 002 - 2CC71 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0 ↑ 5 8
POSMO				
		sin/cos 1 V_{pp} EnDat	5 V 5 V	6FX1 002 - 2AA10 - 1..0 6FX1 002 - 2AA30 - 1..0
SIMOTION				
SIMOTION C 230		TTL (RS 422) TTL (RS 422) SSI	5 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CD01 - 1..0 6FX5 002 - 2CD24 - 1..0 6FX5 002 - 2CC11 - 1..0
SIMATIC				
S7-300C	CPU 31 x	HTL	10 V - 30 V	6FX5 002 - 2CA12 - 1..0
ET200S	1POS.INC x 1POS.SSI x; 1SSI 1 Count 24 V 1 Count 5 V	TTL (RS 422) SSI HTL TTL (RS 422)	10 V - 30 V 10 V - 30 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CC12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0
S7 300/400	FM 350-1	TTL (RS 422) TTL (RS 422) HTL	5 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0
	FM 350-2 FM 352-5, FM 452	HTL TTL (RS 422) TTL (RS 422) HTL SSI	10 V - 30 V 5 V 10 V - 30 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CC12 - 1..0
	SM 338 IM 178-4	SSI TTL (RS 422) TTL (RS 422) SSI	10 V - 30 V 5 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CC12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CA12 - 1..0 6FX5 002 - 2CC12 - 1..0
	FM 351, FM 451, FM 352	TTL (RS 422) TTL (RS 422) HTL SSI	5 V 10 V - 30 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CD01 - 1..0 6FX5 002 - 2CD24 - 1..0 6FX5 002 - 2AL00 - 1..0 6FX5 002 - 2CC11 - 1..0
	FM 354, FM 357, FM 453	TTL (RS 422) TTL (RS 422) SSI	5 V 10 V - 30 V 10 V - 30 V	6FX5 002 - 2CD01 - 1..0 6FX5 002 - 2CD24 - 1..0 6FX5 002 - 2CC11 - 1..0

Note: The cables 6FX5 002-2CC12 and -2CA12 are with open wire ends for terminal connection on control end.



Clamps and couplings are available as mounting accessories for the rotary encoders.

Technical specifications

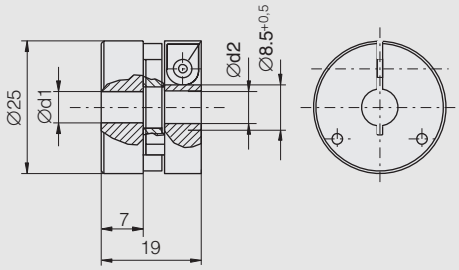
Type		Spring disc coupling	Push-on coupling
Transmission torque	max.	0.8 Nm	0.7 Nm
Shaft diameter		6 mm both ends or d_1 = 6 mm, d_2 = 5 mm	6 mm both ends or 10 mm both ends
Eccentricity of shafts	max.	0.4 mm	0.5 mm
Axial offset		± 0.4 mm	± 0.5 mm
Angular displacement of shafts	max.	3°	1°
Torsional rigidity		150 Nm/rad	31 Nm/rad
Lateral spring stiffness		6 N/mm	10 N/mm
Mass moment of inertia		19 gcm^2	20 gcm^2
Max. permissible speed		12000 rpm	12000 rpm
Minimum operating temperature		-40 °C	-40 °C
Maximum operating temperature		+150 °C	+80 °C
Weight, approx.		16 g	20 g

Ordering data

	Order No.
Clamp (3 clamps are required) for encoder with synchro flange and double-track encoder	**6FX2 001 - 7KP01**
Spring disk coupling Shaft diameter:	
• 6 mm/6 mm	**6FX2 001 - 7KF10**
• 6 mm/5 mm	**6FX2 001 - 7KF06**
Push-on coupling Shaft diameter:	
• 6 mm/6 mm	**6FX2 001 - 7KS06**
• 10 mm/10 mm	**6FX2 001 - 7KS10**

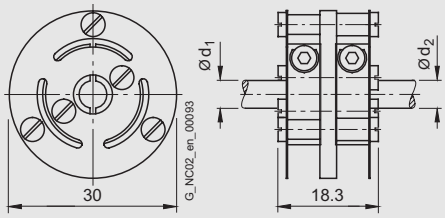
Dimensions in mm

Push-on coupling



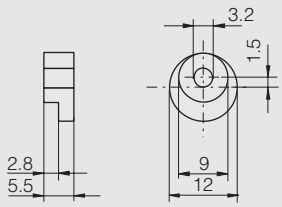
$d_1 = d_2 = 6$ mm
or
$d_1 = d_2 = 10$ mm

Spring disk coupling

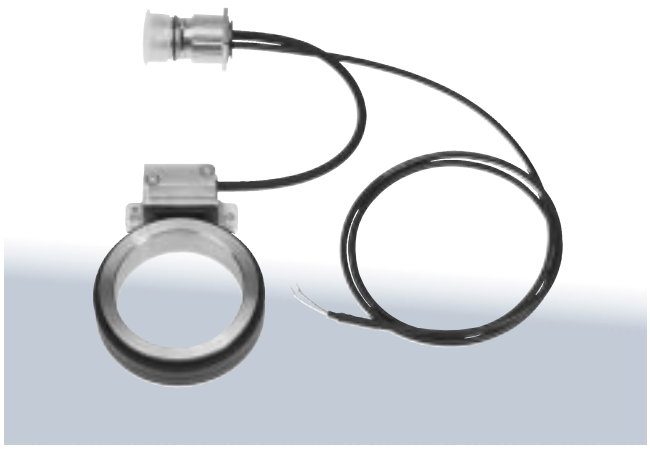


$d_1 = d_2 = 6$ mm
or
$d_1 = 5$ mm; $d_2 = 6$ mm

Clamp



SIMAG H hollow-shaft measuring system



SIMAG H hollow-shaft measuring system

Application range, design

SIMAG H is an incremental measuring system for detecting angles of rotation and speeds of rotation. It is used in hollow-shaft applications with 1FE1 and 1PH2 direct drives and as an independent spindle encoder. SIMAG H is intended for use in new applications in place of the SIZAG 2 hollow-shaft measuring system.

The electrical signals and the flange socket are designed in such a way as to be compatible with existing motor measuring systems. SIMAG H can be used on the SIMODRIVE 611 analog/digital converter systems with all available closed-loop control systems as a motor measuring system or as a direct measuring system.

The SIMAG H measuring system consists of three components:

- Measuring wheel
- Scanning head
- Cable module

The measuring system wheel has a mechanical scale to show measurements. Depending upon the external diameter, various internal diameters are available; it is possible to process the internal diameters at a later stage. The measuring wheel is fixed with the shaft nut; as an alternative (not available with all measuring wheel variants), it can be screwed against a shaft shoulder. The scanning head scans by proximity the incremental and reference track on the measuring wheel and amplifies the signals.

The 6FX. signal lines are connected using the flange socket in the cable module. The cable module is completely pre-assembled and can be plugged into the scanning head. This allows optimum adjustment of the measuring system to relevant mounting conditions.

Technical specifications

Output signals	Two voltage signals, 1 V_{PP} offset by 90° one reference signal per revolution of the encoder
Operational voltage	DC 5 V ± 5 %
Power consumption	40 mA typical
Resolution [2]	256 p/r
Precision of scale on measuring wheel	± 72 angular seconds where increments = 256 p/r
Limited speed	≤ 24000 rpm with 256 p/r
Nominal spacing, measuring wheel – scanning head	200 µm
Operational temperature range	–20 °C to +100 °C
Impact resistance (11 ms)	1000 m/s^2
Vibration (50 Hz to 2000 Hz)	200 m/s^2
Degree of protection to DIN EN 60529 (IEC 60529)	IP 65
Bend radius of the wires in the cable module	Single bending: ≥ 25 mm Several bending: ≥ 60 mm
Cable length to converter	max. 50 m
Scanning head Approximate dimensions	55 mm × 39 mm × 20 mm

Ordering data

	Order No.
Scanning head, incremental 1 mm pole separation, 1 V_{PP}	**6FX2 001 - 6AA11 - 0AA0**
Mesuring wheel	
• Internal diameter 35 mm	**6FX2 001 - 6RB01 - 4DF0**
• Internal diameter 45 mm	**6FX2 001 - 6RB01 - 4EF0**
• Internal diameter 60 mm	**6FX2 001 - 6RB01 - 4GA5**
Cable module with 17-pin flange socket	
Length 0.2 m	**6FX2 001 - 6K■10 - 1CA0**
Length 0.4 m	**6FX2 001 - 6K■10 - 1DA0**
Length 0.6 m	**6FX2 001 - 6K■10 - 1EA0**
Length 0.8 m	**6FX2 001 - 6K■10 - 1FA0**
Length 1.0 m	**6FX2 001 - 6K■10 - 2AA0**
Length 1.5 m	**6FX2 001 - 6K■10 - 2FA0**
Length 2.0 m	**6FX2 001 - 6K■10 - 3AA0**
• Angled flange socket	**A**
• Straight flange socket	**C**
Configuring and Installation guide	
German	**6SN1 197 - 0AB30 - 0AP1**
English	**6SN1 197 - 0AB30 - 0BP1**

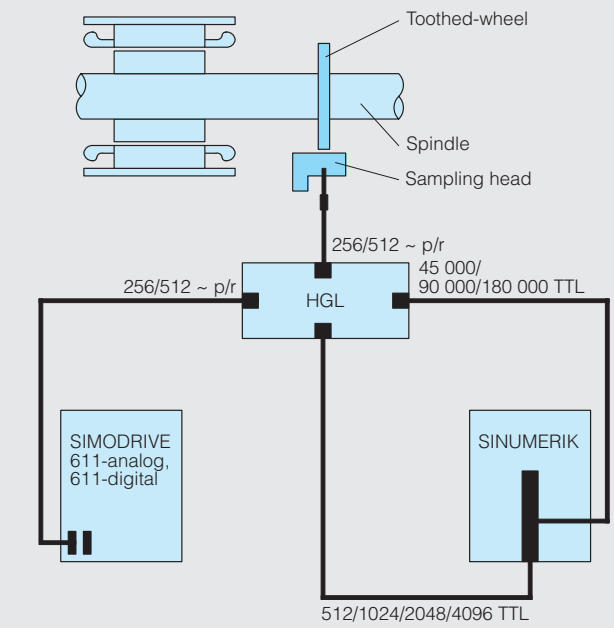
Technical specifications Measuring wheel

Internal diameter [1] mm	External diameter mm	Increments	Moment of inertia approx. 10^{-4} kgm^2	Weight kg
35	81.14	256	5.3	0.5
45	81.14	256	4.6	0.4
60	81.14	256	2.8	0.2

1) The internal diameter can be finished (boring), see configuring/mounting instructions.
2) p/r = pulse/revolution

SIZAG 2 hollow-shaft measuring system for integrated motors

SIZAG 2 as spindle encoder (HGL optional)



A hollow-shaft measuring system, comprising a sampling head and toothed wheel, is available for integrated motors. Toothed-wheels are available with 256 or 512 teeth. The toothed-wheel and sampling head must be ordered individually with the appropriate Order Nos. Toothed-wheel encoders can also be used as independent spindle encoders in conjunction with HGL (high resolution position). Toothed-wheels suitable for the 1PH2 integrated motors are given in the Ordering data table. A different choice can be made, but the assignment of toothed-wheel to sampling head given in the table must be complied with.

The encoder is connected directly on the converter. With analog coupled drives (SIMODRIVE 611 analog) for C-axis operation and/or M19 positioning, the actual position value of the spindle in the NC is required with high resolution. In addition, the „HGL module“ evaluation electronics is needed. The HGL module must be ordered separately.

The SIZAG 2 sampling head contains field plates for proximity sampling and amplifier electronics. The connector connection and encoder signals are compatible with the encoder of the 1PH7 and 1PH4 motors. The sampling head is installed with the help of a spacer gauge.

The SIZAG 2 hollow-shaft measuring system is supplied with:
- Toothed-wheel
- Sampling head with cable and 17-way connector insert
- Right-angled, split flange connector
- Feeler gauge

The connector insert is fitted in the split flange connector which is inserted into the spindle housing. The temperature sensor of the motor should be connected to the free ends of the leads.

Technical specifications

Absolute accuracy	
• 512 teeth	± 36 angular seconds
• 256 teeth	± 72 angular seconds
Operating voltage	5 V DC ± 5 %
Current drawn	250 mA max.
Cut-off frequency (-3 dB)	90 kHz
Signal level	sin/cos 1 V_{pp}
Limit speed	
• for 512 teeth	≤ 12000 rpm
• for 256 teeth	≤ 24000 rpm
Degree of protection DIN EN 60529 (IEC 60529)	IP 65
Permissible bending radius Connceting cable at encoder	
• for permanent bending	> 100 mm
• for single bending	> 52 mm
Permissible ambient temperature	
• in storage	–20 °C to +85 °C
• in operation	–20 °C to +85 °C
Oscillating load according to DIN IEC 68-2-6	200 m/s^2
Impact resistance according to DIN IEC 68-2-29	1000 m/s^2
Weight of sampling head	approx. 300 g
Connection dimension	see Configuring and Installation Guide
Permissible cable length	max. 50 m

Note:
For C-axis+drive a toothed-wheel with 512 teeth is recommended.

HGL module achievable axis tracks resolution at SIMODRIVE 611 analog

Toothed-wheel with 512 teeth	
• C-axis track resolution	90000/180000
• Standard track resolution	512/1024/2048/4096
Toothed-wheel with 256 teeth	
• C-axis track resolution	45000/90000
• Standard track resolution	256/512/1024/2048

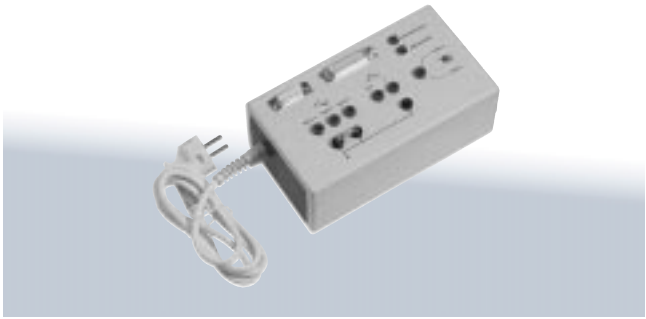
SIZAG 2 hollow-shaft measuring system for integrated motors

Ordering data

Sampling head	Toothed wheel	Outer diamet., toothed wheel	Error per 1 µ eccentri-city	Inner diamet., toothed wheel	Moment of inertion approx.	No. of teeth	Mod-ule	Clear. betw. samp.head a. toothed wheel tip circle	Too-thed wheel size	Suitable toothed wheels for 1PH2 motors
Order No.	Order No.	[mm]	[angular seconds]	[mm]	10^{-4} [kgm^2]		[m]	[mm]	[mm]	Type
6FX2 001 - 8A■05	**6FX2 001 - 8RA05 - 1F**	129	3.2	65	30	256	0.5	0.3	15	1PH2093-6WF41 1PH2095-6WF41
6FX2 001 - 8A■03	**6FX2 001 - 8RA03 - 1D**	154.2	2.7	80	61	512	0.3	0.15	15	1PH2113-6WF41 1PH2115-6WF41 1PH2117-6WF41 1PH2118-6WF41
6FX2 001 - 8A■03	**6FX2 001 - 8RA03 - 1E**	154.2	2.7	110	49	512	0.3	0.15	15	1PH2186-6WB41 1PH2188-6WB41
6FX2 001 - 8A■05	**6FX2 001 - 8RA05 - 1G**	257	1.6	150	449	512	0.5	0.3	15	
6FX2 001 - 8A■03	**6FX2 001 - 8RA03 - 1B**	77.4	5.3	45	4	256	0.3	0.15	15	
6FX2 001 - 8A■03	**6FX2 001 - 8RA03 - 1C**	77.4	5.3	60	3	256	0.3	0.15	15	

■ **K** Connection lead: Length 0.2 m
■ **A** Connection lead: Length 0.5 m
■ **J** Connection lead: Length 2.0 m

Diagnostic unit



Encoder signals with analog level sin/cos 1 V_{pp} can be checked with the diagnostic unit. Signals from built-in encoders can be checked with the above-mentioned analog level. It allows the height of the signal amplitudes, offset values and the relationship between zero signal and incremental track to be measured.

The unit has its own encoder power supply with monitoring circuit. This allows testing of the encoder system without additional external components such as converter, controller, etc.

For connection of the panel mounted encoder to the diagnostic unit, use the following cables with integral connectors: 6FX■ 002-2CA61-0... or -2CA31 or -2CA51-0... .

Technical specification

Supply voltage	230 V AC, 50/60 Hz
Inputs	Encoder signal terminals
Outputs	
• encoder supply	5 V to 8 V DC accord. to enc. type I_{max} = 250 mA
• analog outputs	Encoder signal A Encoder signal B Encoder signal R (= zero pulse) Offset of encoder signal A or B
• square-wave signal	Encoder signal A and B square-wave converted logic ANDed Encoder signal R (= zero pulse) square-wave converted
Indicators	„Measurement valid“ LED „Encoder supply“ LED

Ordering data	Order No.
Diagnostic unit	**6FX2 007 - 1AA00**

System Components

4

Electronic handwheel

Electronic handwheel

This encoder generates signals corresponding to the rotation of the wheel actuated manually. The axis selected via the controller is positioned paraxially. Two handwheels can be connected in each case to the SINUMERIK FM-NC, SINUMERIK 810D and SINUMERIK 840D/840C. Two encoders with front panels in different sizes (front plates can be removed) as well as a portable handwheel in the housing and with spiral cable (see ordering data) are available.

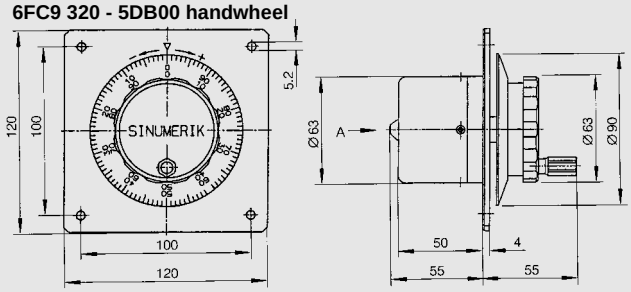
Technical specifications

Rated voltage	5 V DC ± 5 % or 24 V DC ± 20 %
Rated current	max. 160 mA
Interface	RS 422 (TTL) or HTL
Phase shift between pulse trains A and B	75° electrical
Pulses	max. 100 p/r
Cut-off frequency	max. 10 kHz
Max. distance	25 m
Handwheel signals ⇒ NCU	
Degree of protection to DIN EN (IEC) 60529	IP 65 (front side)
Permissible ambient temperature	
• in storage and transportation	–25 °C to +85 °C
• in operation	0 °C to +70 °C
Weight approx.	0.6 kg

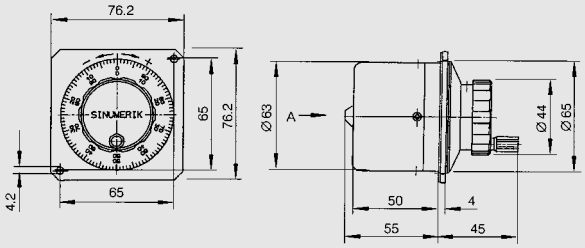
Ordering data

	Order No.
Electronic handwheel 5 V DC, RS 422 (TTL)	
• with front panel 120 mm × 120 mm	**6FC9 320 - 5DB00**
• with front panel 76.2 mm × 76.2 mm	**6FC9 320 - 5DC00**
• without front panel, without wheel, for panel mounting	**6FC9 320 - 5DF00**
• portable housing 75 mm x 85 mm x 95 mm with magnetic clamp and spiral cable including connector (length when extended approx. 2 m) pin contacts, 9 poles	**6FC9 320 - 5DE01**
Electronic handwheel 24 V DC, HTL	
• with front panel 76.2 mm × 76.2 mm	**6FC9 320 - 5DH00**
Mating connector with external thread and socket contacts matching the circular connector (9 poles)	**6FX2 003 - 0CF00**
Mounting box matching the circular connector (9 poles)	**6FC9 341 - 1AQ**

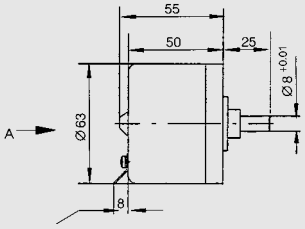
6FC9 320 - 5DB00 handwheel



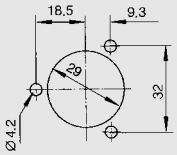
6FC9 320 - 5DC00 handwheel



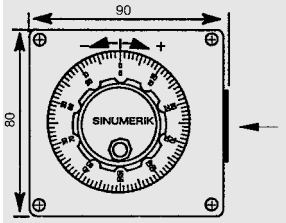
6FC9 320 - 5DF00 handwheel with 6.3 mm flat connector



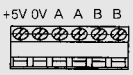
Installation dimensions for fastening without front panel



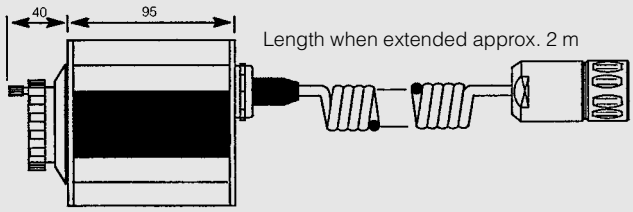
Handrad 6FC9 320 - 5DE01



Magnetic clamp

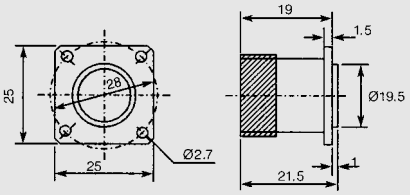


View A



Length when extended approx. 2 m

6FC9 341 - 1AQ mounting box



Pin assigment	
Pin	Signal
1	5 V
2	0 V
3	B
4	A
5	*A
6	*B
9	shield

A-MPC/B-MPI handheld unit type

A-MPC/B-MPI handheld unit type with distributor (left)

The handheld unit (HHU) is suitable for manual operation (e.g. axis feed movements) on machine tools equipped with the SINUMERIK 840C, 840D/810D controls or FM-NC controls. The special shape of the plastic housing makes it easy to operate with either the right or the left hand.

When used in conjunction with a specially designed distribution box a UL version is available for U.S.A. and Canada.

Features

With the HHU, it is permissible (when observing the general conditions of the relevant standards) to move the machine tool axes at machining speed with the guard door open.

The HHU is equipped with
- a membrane keyboard with 20 freely assignable single-stroke keys, which can be labelled with insertable strips,
- 16 LEDs,
- an electronic handwheel with indexing,
- a two-line LC display for 2 x 16 alphanumeric characters,
- an emergency Stop button, with two channels
- two acknowledgement switches, each of two channels
- a rapid traverse/feedrate override switch,
- a single-stage keyswitch,
- a coiled connecting cable which extends to 3.5 m, or a 10 m cable
- a support clip and magnetic clamp.

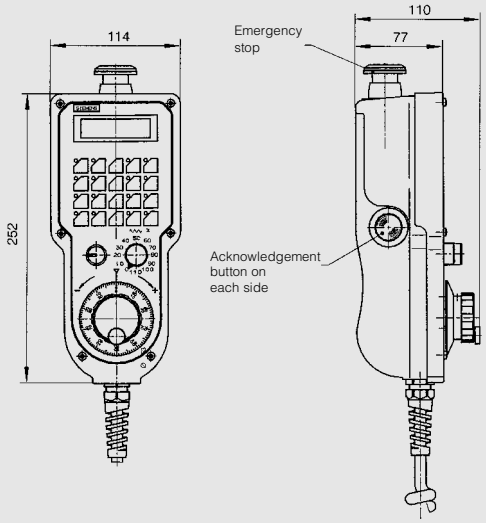
No additional PLC inputs/outputs are needed for the LEDs and all the other functions of the handheld unit. The HHU is connected via a distributor to the DMP line (for 840C) or to the MPI line (for the 810D/840D or FM-NC). The distributor is intended for installation in a switching cabinet or separate housing. The distributor splits up the HHU signals into PLC signals (key signals, keyswitch, feedrate override switch, display) via the RS 485 interface, and into the signals for handwheel, emergency Stop and acknowledgement switches. External power is also supplied to the HHU via the distributor.

Technical specifications

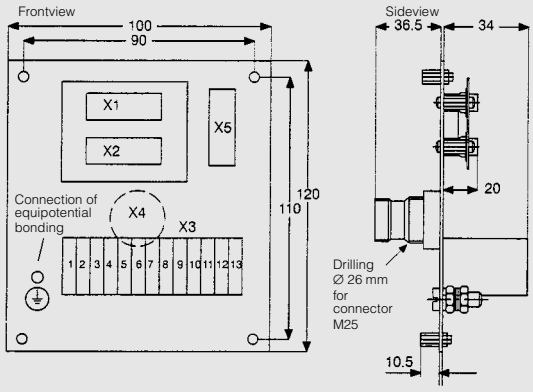
Operating voltage	24 V DC unregulated
Degree of protection DIN EN 60529 (IEC 60529)	IP 65
Humidity rating based on DIN EN 60721-3-3	Cl. 3K5 Condensation and ice formation excluded. Low air temperature 0 °C
Permissible ambient temp. • in storage and transportation • in operation	 –20 °C to +60 °C 0 °C to +45 °C
Weight approx.	1.2 kg (without cable)
Dimensions (L × W × H)	252 mm × 114 mm × 110 mm

Dimensions (in mm)

A-MPC/B-MPI handheld unit



Location of interface and terminal strips



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A-MPC/B-MPI handheld unit (continued)

Ordering data

	Order No.
Handheld unit A-MPC for 840C • Coiled connecting cable 3.5 m • with 10 m cable	**6FX2 007 - 1AB■3** **0** **1**
Handheld unit B-MPI for 840D/810D/FM-NC • 3-wire acknowledgement • 4-wire acknowledgement • Coiled connecting lead 3.5 m • with 10 m straight lead	**6FX2 007 - 1A■■3** **C** **E** **0** **1**
Handheld unit type A-MPC/B-MPI incl. shorting plug • 3-wire acknowledgement • 4-wire acknowledgement	**6FX2 006 - 1B■01** **C** **H**
Distribution box, UL-approved for handheld operator control/ programming unit including shorting plug • 3-wire acknowledgement	**6FX2 006 - 1BF00**
Extension cables Handheld unit distributor box • 3-wire acknowledgement Lengths 5 m (16 ft 5 in) 10 m (32 ft 10 in) 15 m (49 ft 2 in) • 4-wire acknowledgement [1] Lengths 5 m (16 ft 5 in) 10 m (32 ft 10 in) 15 m (49 ft 2 in)	**6FX2 002 - 1AB04 - 1■■0** **A F** **B A** **B F** **Id-Nr. 084 988** **Id-Nr. 084 989** **Id-Nr. 084 990**
Holder The hand-held controller can rest in the holder. The holder is made of black polystyrene.	**6FX2 006 - 1HA00**

1) Order via:
Fa. Euchner
Kohlhammerstr. 16
D-70771 Leinfelden Echterdingen
Phone:+ 49 (0) 711 7597-0
Fax: + 49 (0) 711 7597-903

Mini handheld unit

Mini handheld unit

The ergonomically designed mini handheld unit is suitable for setting up and operating simple machines in JobShop applications and can be connected to the SINUMERIK FM-NC/810D/840D/840C controls.
In addition to the EMERGENCY STOP and enable keys in isolated and 2-channel design, the following control elements are available:

- Rotary switch for selecting up to 5 NC axes
- Electronic handwheel with 100 detent positions per revolution
- „+/-“ keys for moving the selected NC axis in inching mode
- Rapid traverse/factor key for adjusting the inching speed and handwheel resolution
- 3 freely assignable function keys F1, F2 and F3 for custom-specific applications.

The operator control concept permits fast positioning in exact increments thanks to a simple method of coarse, medium and fine infeed adjustment.
The EMERGENCY STOP is in 4-wire design. The enable keys are in 3-wire design. The signals are fed to the NC in parallel (without MPI).
Two laterally integrated magnetic clamps enable the mini handheld unit to be set down safely.
A separetely obtainable connection kit is used for connection.

Technical specifications

Operating voltage	24 V DC
Handwheel	100 p/r; U_B = 5 V; RS 422
Degree of protection to DIN EN 60 529 (IEC 60 529)	IP 65
Humidity rating based on DIN EN 60 721-3-3	Cl. 3K5 Condensation and ice formation excluded. Low air temperature 0 °C.
Permissible ambient temperature • Storage and transportation • Operation	 –20 °C to +60 °C 0 °C to +55 °C
When using the handwheel: Max. handwheel - NCU distance	25 m
Weight, approx.	0.8 kg (without cable)
Dimensions (L × W × H) approx.	250 mm × 110 mm × 90 mm

Ordering data

	Order No.
Mini handheld unit Incl. 2 magnetic clamps and • coiled connecting lead with plug Length: 1.5 m, extends to 3.5 m • 5 m straigth lead	 **6FX2 007 - 1AD00** **6FX2 007 - 1AD10**
Connection kit For mini handheld unit 24-pin flange socket with socket contacts and shorting plug	**6FX2 006 - 1BG00**

Safety switching unit

Safety switching, expansion unit and time delay module

The safety switching unit, its corresponding expansion unit and the time delay modules are main elements of a safety switching system in the switching cabinet; they bear the VGB test mark.

They serve to implement, for example, functions such as
- Emergency Off,
- Drive enable,
- Guard interlock,

to prevent hazards for personnel and machines.

The safety switching unit is self-monitoring and ensures that machinery can only start if there are no faults, or it shuts down in the event of a fault.

In conjunction with the safety switching unit, the time-delay modules allow a defined Off-delay which is preset and individually adjustable.

The safety switching units can be used for all equipment covered by the regulations of DIN EN 60 204 Part 1.

The modules are easily fitted by snap-mounting on a 35 x 15 mm DIN rail to DIN EN 50 022.

Ordering data

	Order No.
Safety switching unit H100 1 channel/3 release circuits	**6FM8 090 - 0AS01**
Safety switching unit H110 Extension for 2 × 4 release circuits	**6FM8 090 - 0AS02**
Time-delay module H120 0.2 to 22.5 s	**6FM8 090 - 0AS03**
Time-delay module H121 0.1 to 6.1 s	**6FM8 090 - 0AS04**
Safety switching unit H100-2K-Z dual-channel redundant with earth and cross-circuit recognition, RC-delayed relay K1	**6FX2 006 - 2AC01**
Reference manual in German	**6FM8 090 - 0AS00**

Technical specifications

Unit type	H100	H110	H120	H121	H100-2K-Z
Cable connection via plug-in terminal strip	2×5 2×14	2×16 2×16	2×10	2×10	2×16
Conductor cross-section	up to 2.5 mm^2 (AWG 12) up to 1.5 mm^2 (AWG 14)				
PE-terminal	tap-connector 4.8 mm or cable lug				
Supply voltage Operating voltage U_e Permissive range	24 V DC 20.4 to 28.8 V DC				
Power consumption [VA]	1.5	2	0.5	0.5	1.5
Switching voltage AC/DC Switching current	230/24 6/6		– –	– –	230/24 6/6
Utilizing categories (DIN VDE 0660, part 200) AC-12 AC-15 AC-13	 230 V, 6A 230 V, 2A 24 V, 6A		 – – –	 – – –	 230 V, 6A 230 V, 2A 24 V, 6A
Permissive ambient temp. • in storage and transportation • in operation	 –25 °C to +70 °C 0 °C to +55 °C				
Mech. ambient condition (DIN EN 60 721-3-3)	Class 3 M3				
Degree of protection (DIN VDE 0470 Part 1)	IP 20				
Degree of protection (DIN VDE 0106 Part 100)	I				
Weight approx. [g]	450	650			450
Dimension (H × D)	110 mm × 210 mm				
Width [mm]	44	44		44	44

Terminal strip converter

The signal link between input/output modules of the controller and the machine is created in a reliable and simple manner with a terminal strip converter. For wiring at the machine end, there are screw terminals for up to 2.5 mm cross-section. At the controller end, the terminal strip converters are designed either for ribbon cable connectors or Siemens Sub D connectors. Most of the terminal strip connectors are equipped with LEDs for signal status indication. The LED lights up for an active high. This simplifies simulation, startup and servicing at the interface between controller and machine.
The terminal strip converters are simply snap-mounted on a standard DIN rail.

Technical specifications

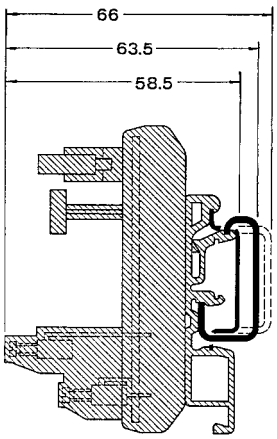
Max. permissible sig. voltage	24 V DC
Current consumption of one LED	approx. 2 mA
Cable connection Conductor cross-section • solid • flexible	by screw terminals up to 4 mm^2 (AWG 12) up to 2.5 mm^2 (AWG 12)
Orientation	any
Permissible ambient temperature	-20 °C to +50 °C
Leakage and creepage distance (VDE 0110, 1/89)	pollution severity 2 overvoltage class 3

Ordering data

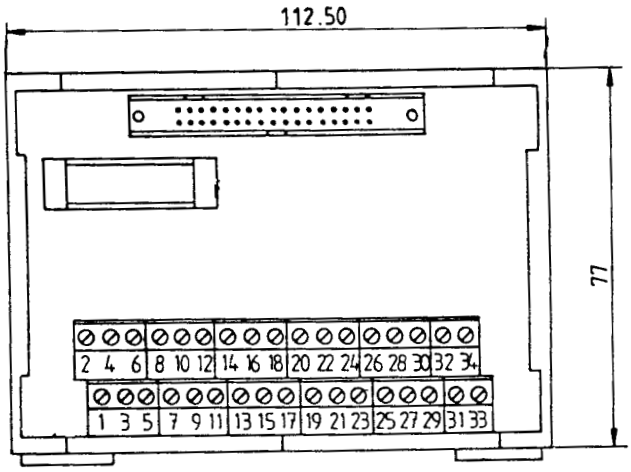
For use with	LED-display	Rated current [A]	Labelling	**Order No. Terminal strip converter**	Cable type with integral connector at NC end	No. of relayed signals	Connection at NC end via
SINUMERIK input/output (M01/M02/M03)	–	0.5	numeric	**6FC9 302 - 2AA**	6FC9 340 - 8LY00 - 1□□0 6FC9 340 - 8XY00 - 1□□0	34	34-core
	red	0.5	numeric	**6FC9 302 - 2AB**	6FC9 340 - 8LY00 - 1□□0 6FC9 340 - 8XY00 - 1□□0	34	
	red	2	in bytes	**6FC9 302 - 2AL**	6FC9 340 - 8LY00 - 1□□0 6FC9 340 - 8XY00 - 1□□0	34	
	green	0.5	in bytes	**6FC9 302 - 2BB01**	6FC9 340 - 8LY00 - 1□□0 6FC9 340 - 8XY00 - 1□□0	34	
SINUMERIK input/output	red	0.5	numeric	**6FC9 302 - 2AD**	6FC9 344 - 1UY00 -1□□0 6FC9 344 - 2TY00 -1□□0 6FC9 344 - 3XY00 -1□□0	37	Sub-D 37-core
SINUMERIK input/output	green	0.5	in bytes	**6FC9 302 - 2BD01**	6FC9 344 - 1UY00 -1□□0 6FC9 344 - 2TY00 -1□□0 6FC9 344 - 3XY00 -1□□0	37	
SINUMERIK input/output SIROTEC input/output	red	2	numeric	**6FC9 302 - 2AK20**	6FC9 344 - 1VY00 - 1□□0	16	Sub-D 37-core
	green	2	in bytes	**6FC9 302 - 2BK21**	6FC9 344 - 1VY00- 1□□0	16	
SIROTEC input/output	red	0.5	numeric	**6FC9 302 - 2AG**	6FC9 340 - 2WY00- 1□□0	49	Sub-D 50-core

Dimension drawing (dimensions in mm)

Basic dimensions for DIN rail mounting
(applies to all terminal strip converters)

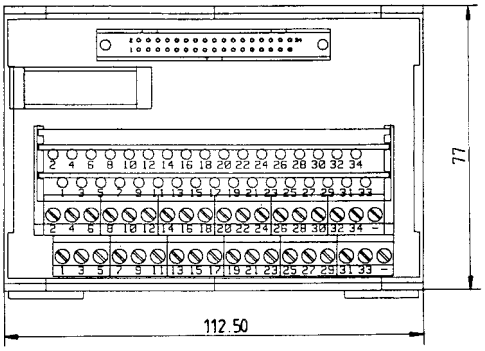


Terminal strip converter Type 6FC9 302 - 2AA

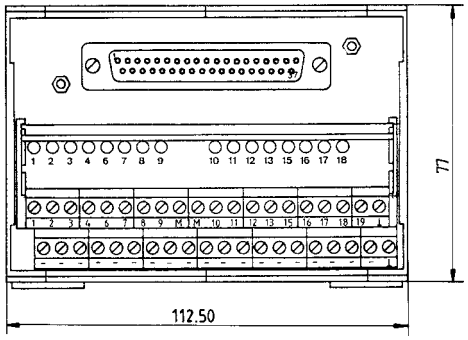


Dimension drawings (continued)

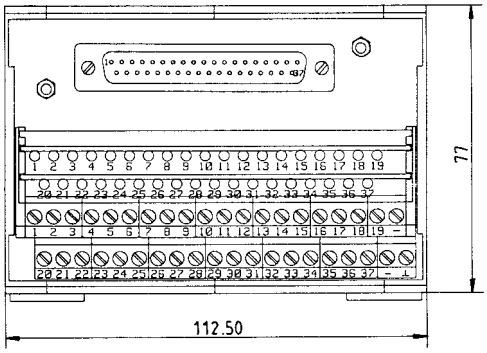
Terminal strip converter Type 6FC9 302 - 2AB



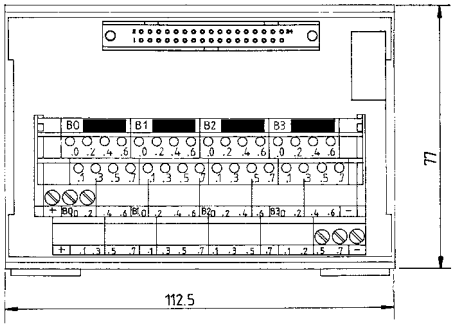
Terminal strip converter Type 6FC9 302 - 2AK20



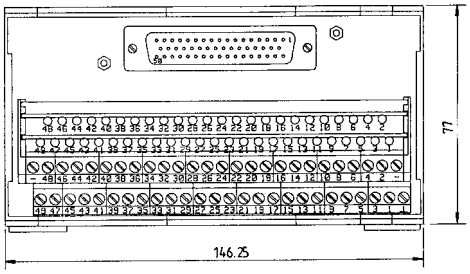
Terminal strip converter Type 6FC9 302 - 2AD



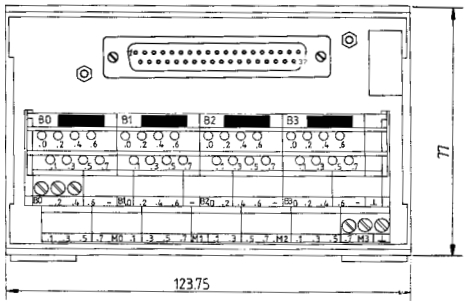
Terminal strip converter Type 6FC9 302 - 2BB01



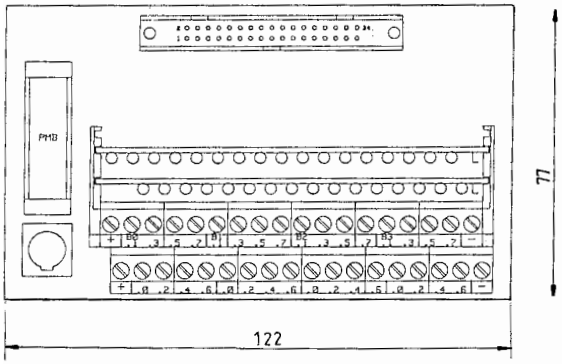
Terminal strip converter Type 6FC9 302 - 2AG



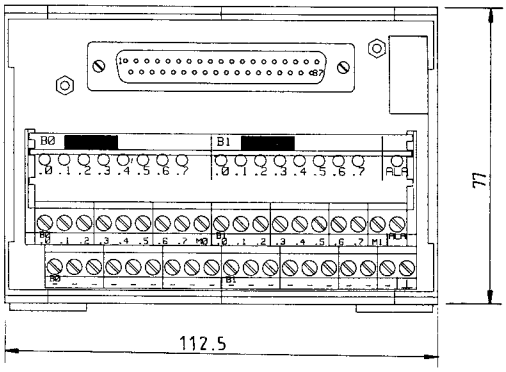
Terminal strip converter Type 6FC9 302 - 2BD01



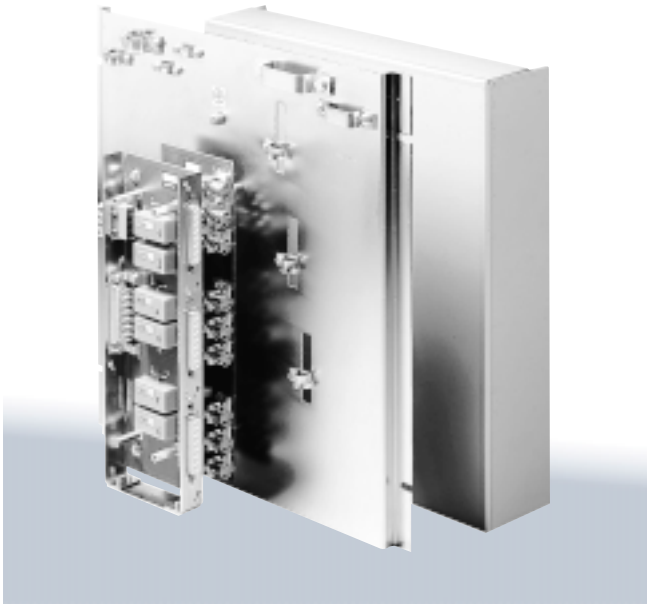
Terminal strip converter Type 6FC9 302 - 2AL



Terminal strip converter Type 6FC9 302 - 2BK21



Keyboard and monitor changeover unit



Mounting plate with keyboard and monitor changeover unit

A keyboard and monitor changeover unit allows one or more keyboards or monitors to be operated with one or more central controllers. For example:

- One monitor with three central controllers
- Three monitors with one central controller
- One keyboard with three central controllers
- Three keyboards with one central controller

The changeover units can be fitted one on top of each other on a mounting plate (see Fig.). Suitable connection examples can be found in Section 2 of this catalog on page 2/31.

Technical specifications

Supply voltage	24 V DC (20 to 33 V)
Current	0.4 A
Degree of protection	IP 00
Connectors • keyboard changeover • monitor changeover	 SUB-D, 25-pole BNC
Permissible ambient temperature • in operation • in storage and transportation	 0 °C to +55 °C –20 °C to +70 °C
Dimensions (W × H × D) • mounting plate • keyboard changeover • monitor changeover	 300 mm × 300 mm × 15 mm 222 mm × 90 mm × 30 mm 212 mm × 90 mm × 30 mm

Ordering data	Order No.
Mounting plate	**6FC9 310 - 1MA01**
Keyboard changeover (V.24/RS 232 C) 3-pin	**6FC9 310 - 1MB01**
Monitor changeover unit (RGB) 3-pin	**6FC9 310 - 1MD01**

Discontinued Products

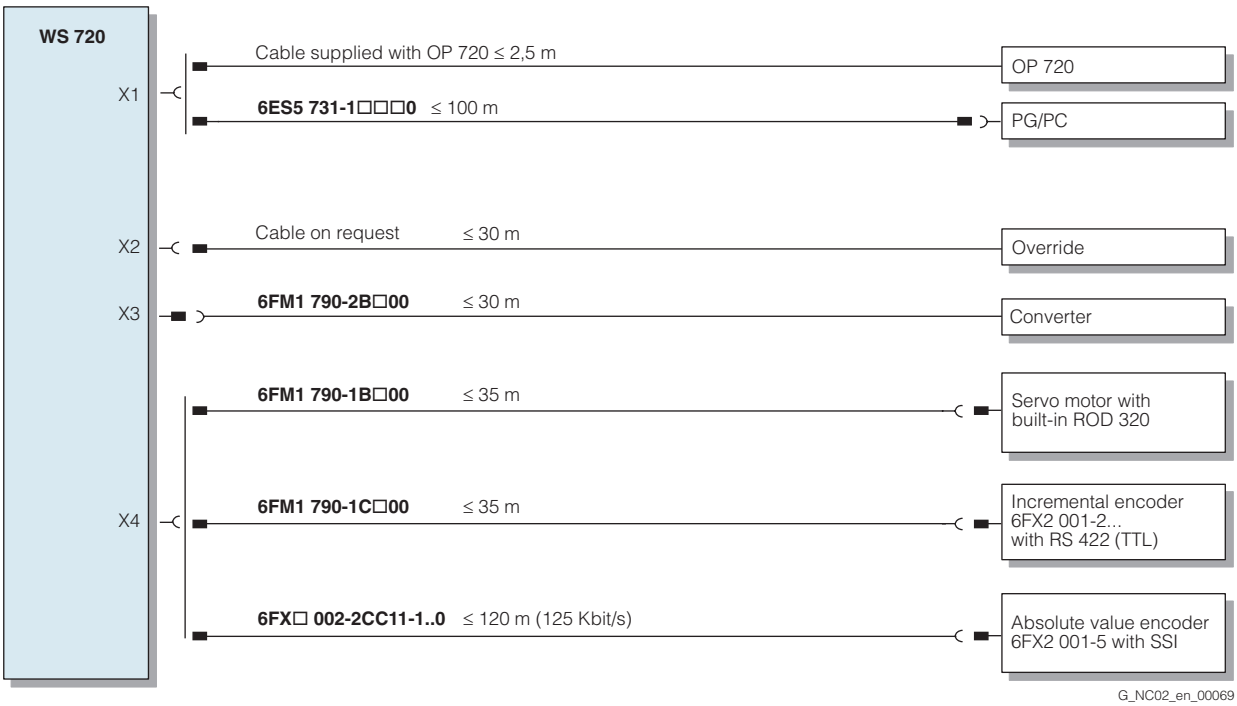
5

The pre-assembled cables listed here can still continue to be ordered as a remake. The length codes can be found on foldout page A1 of this catalog.

Overview of Connection diagrams

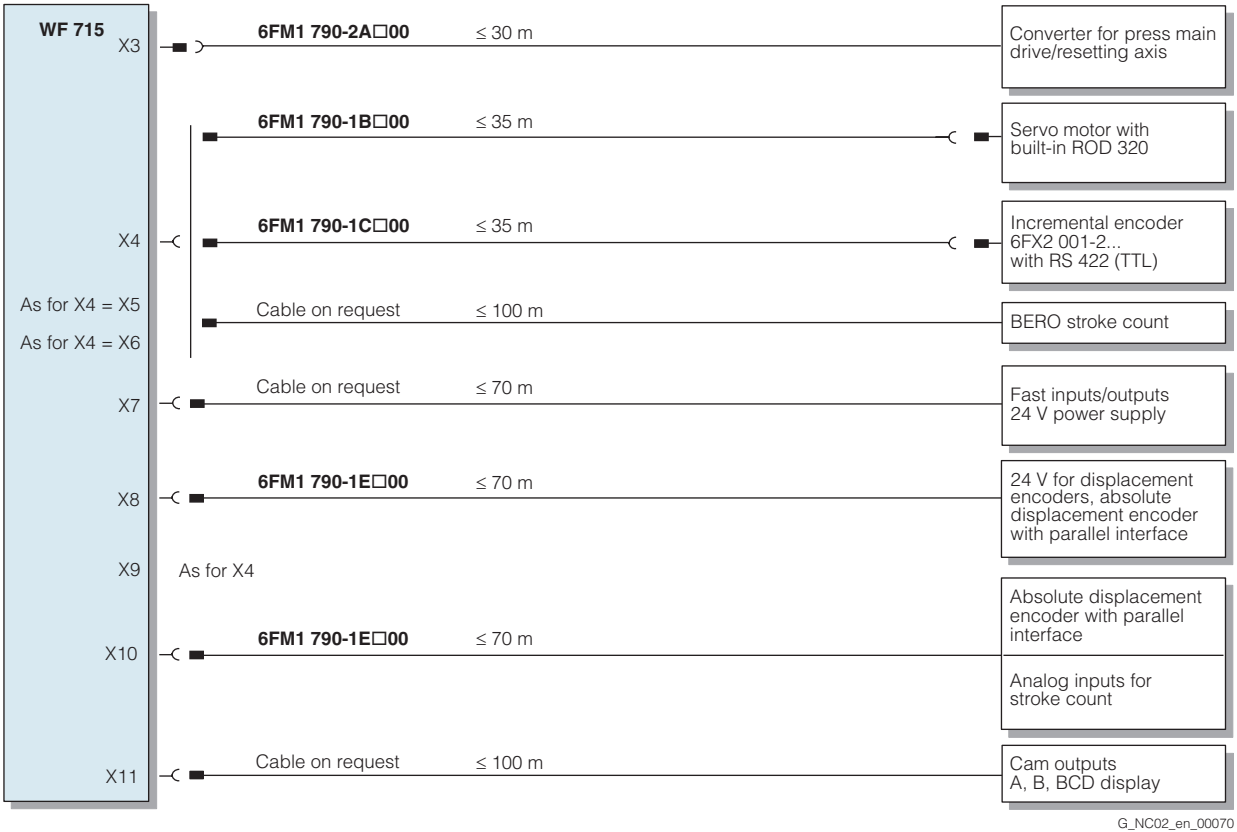
WF-/WS modules

WS 720/WS 720A single-axis controller



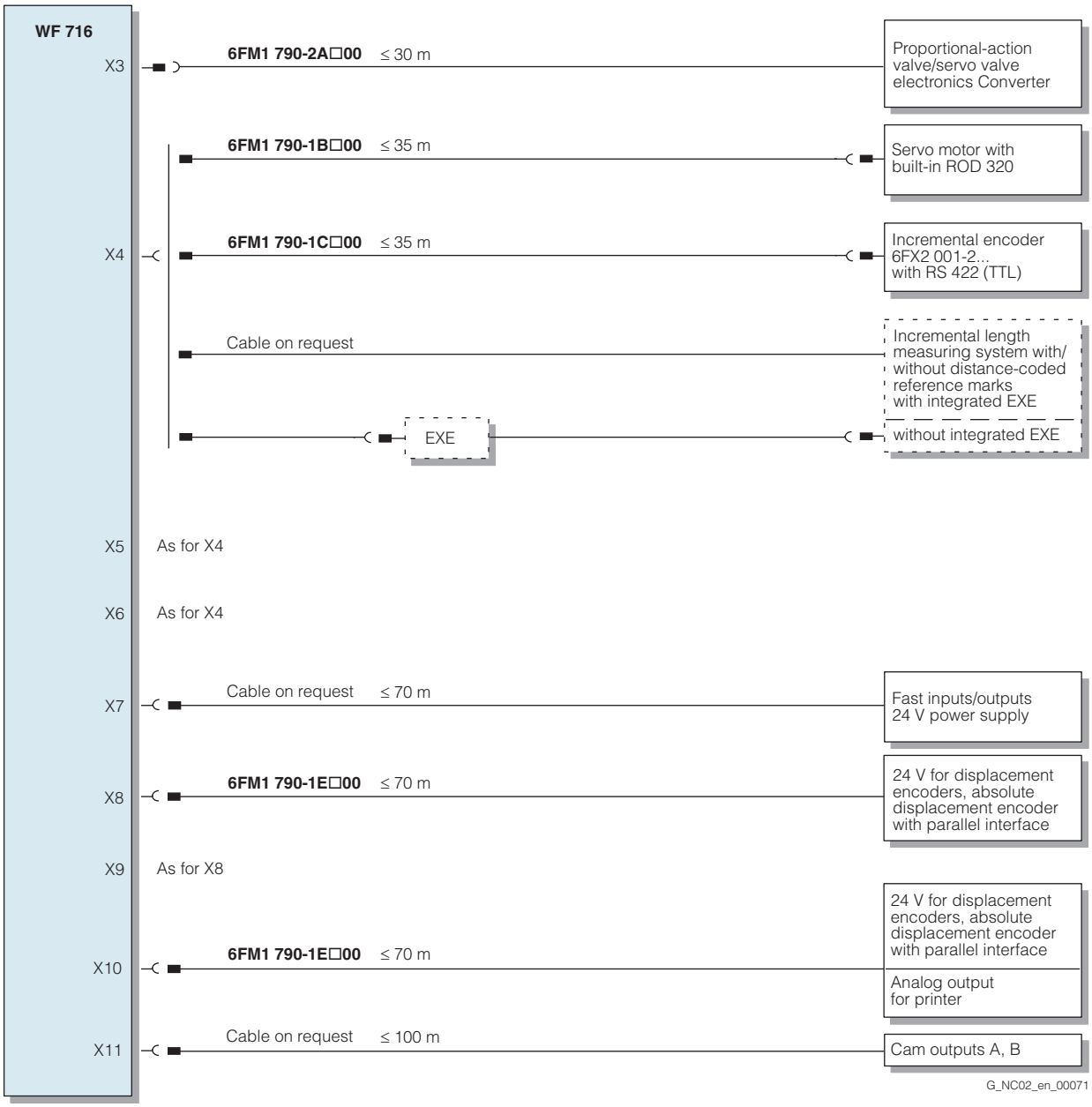
5

WF 715 cam controller



Please observe maximum permissible cable lengths (total length – e.g. ≤ 50 m – from module to peripherial units). If greater cable length ar used, system malfunctions may occur. The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1.

WF 716 control module

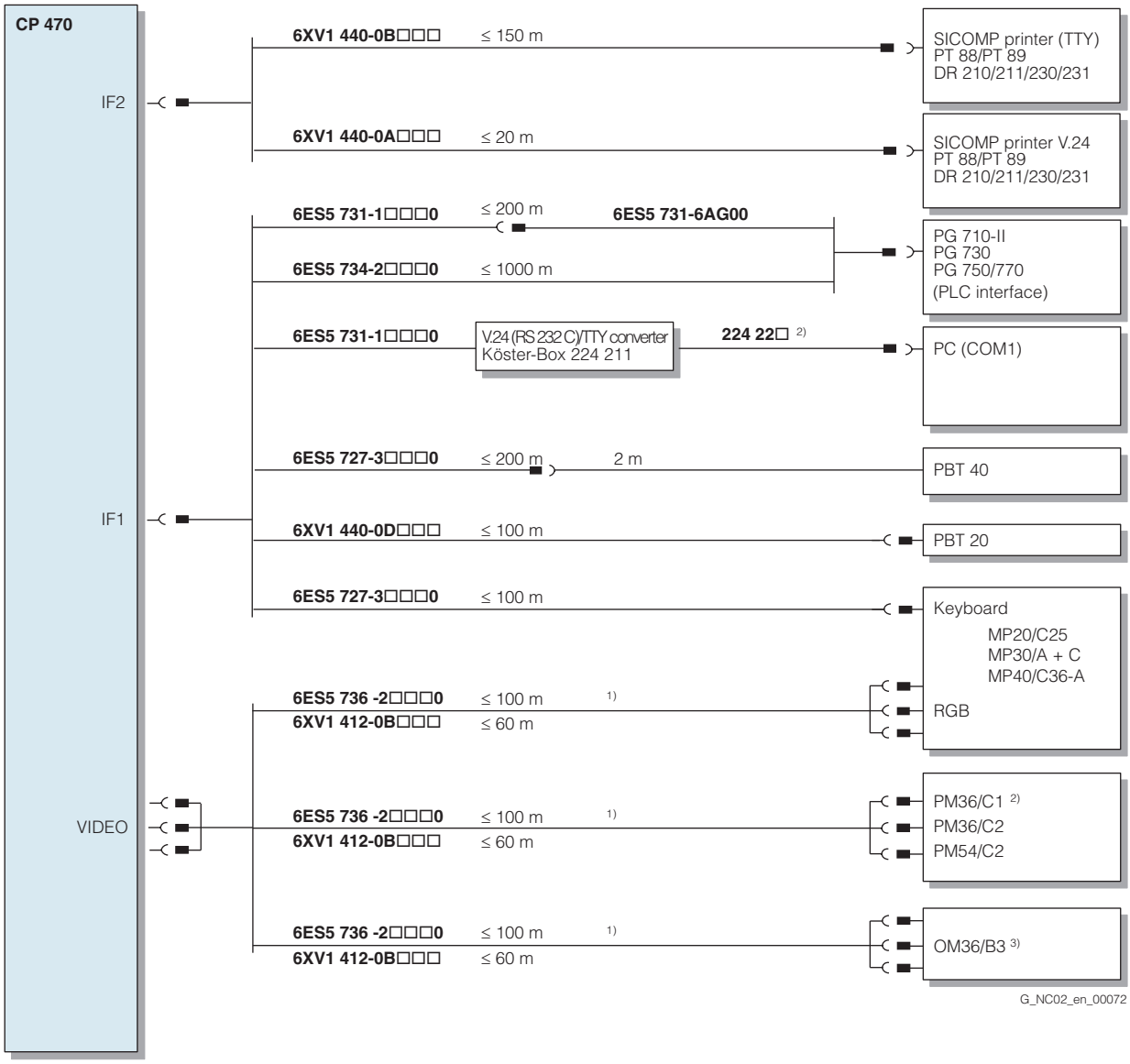


Please observe maximum permissible cable lengths (total length – e.g. ≤ 50 m – from module to peripherial units). If greater cable length ar used, system malfunctions may occur. The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1.

Overview of Connection diagrams

WF-/WS modules

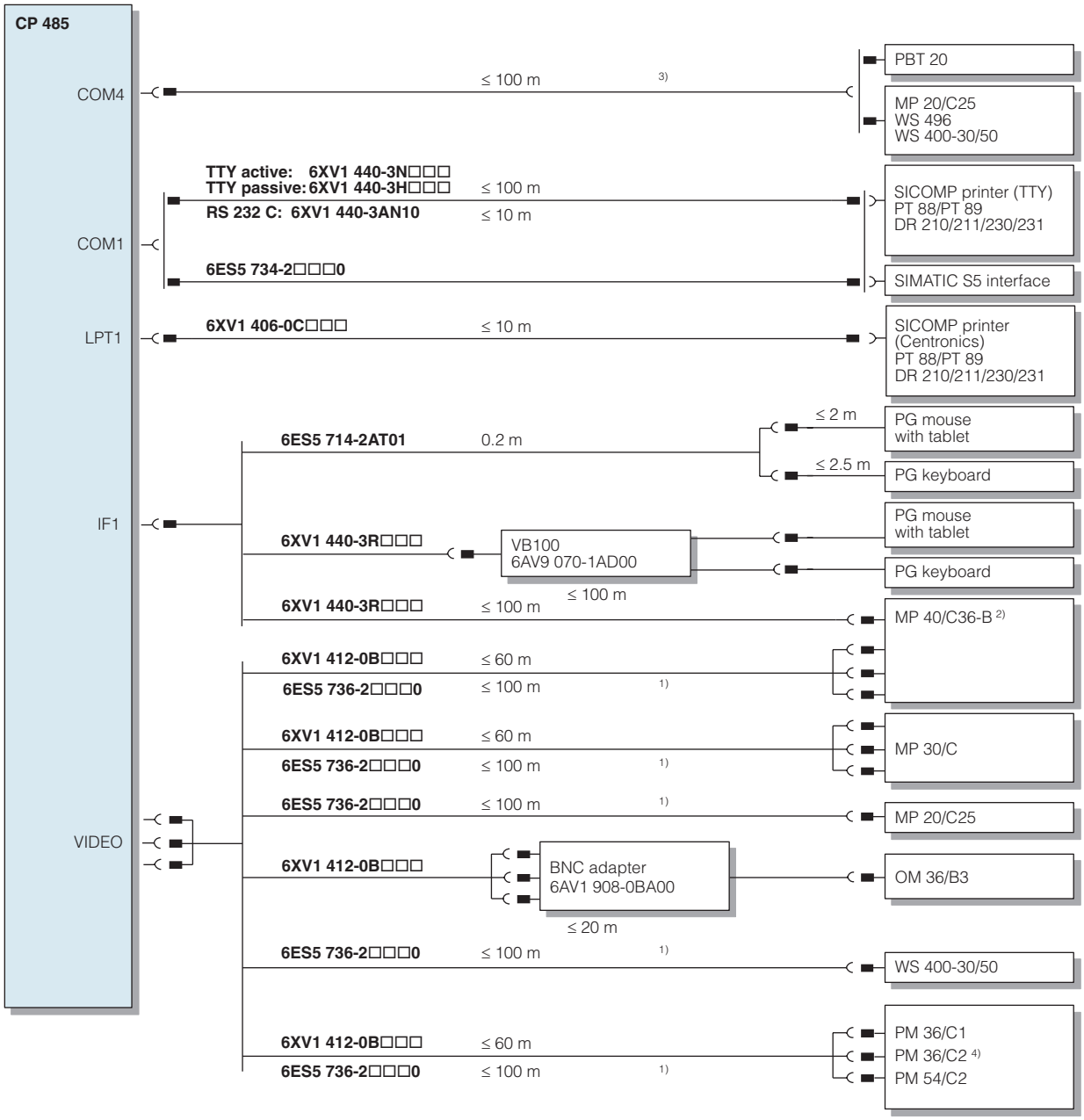
GRACIS CP 470



1) 3 required.
2) Koester connecting cable (recommended from approx. 80 m).
3) 20 m max. because no isolation is provided, the 6AV1 908-0BA00 adapter is additionally required with the OM36/B3.

Please observe maximum permissible cable lengths (total length – e.g. ≤ 50 m – from module to peripherial units). If greater cable length ar used, system malfunctions may occur. The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1.

GRACIS CP 485



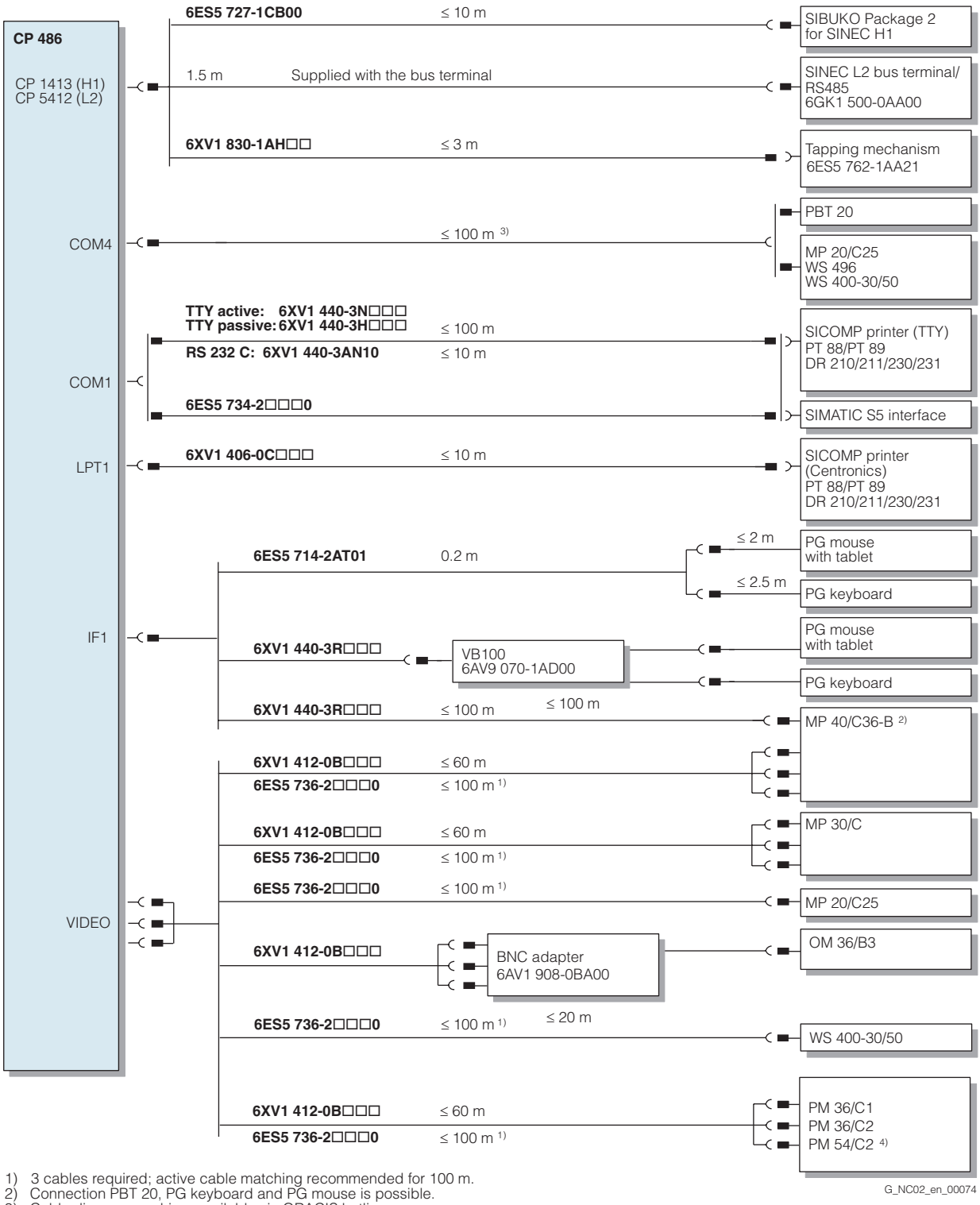
1) 3 cables required; active cable matching recommended for 100 m.
2) Connection to PBT 20, PG keyboard and PG mouse is possible.
3) Cable diagrams + driver available via GRACIS hotline.
4) Koester connecting cable 22422 (recommended from approx. 80 m).

Please observe maximum permissible cable lengths (total length – e.g. ≤ 50 m – from module to peripherial units). If greater cable length ar used, system malfunctions may occur. The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1.

Overview of Connection diagrams

WF-/WS modules

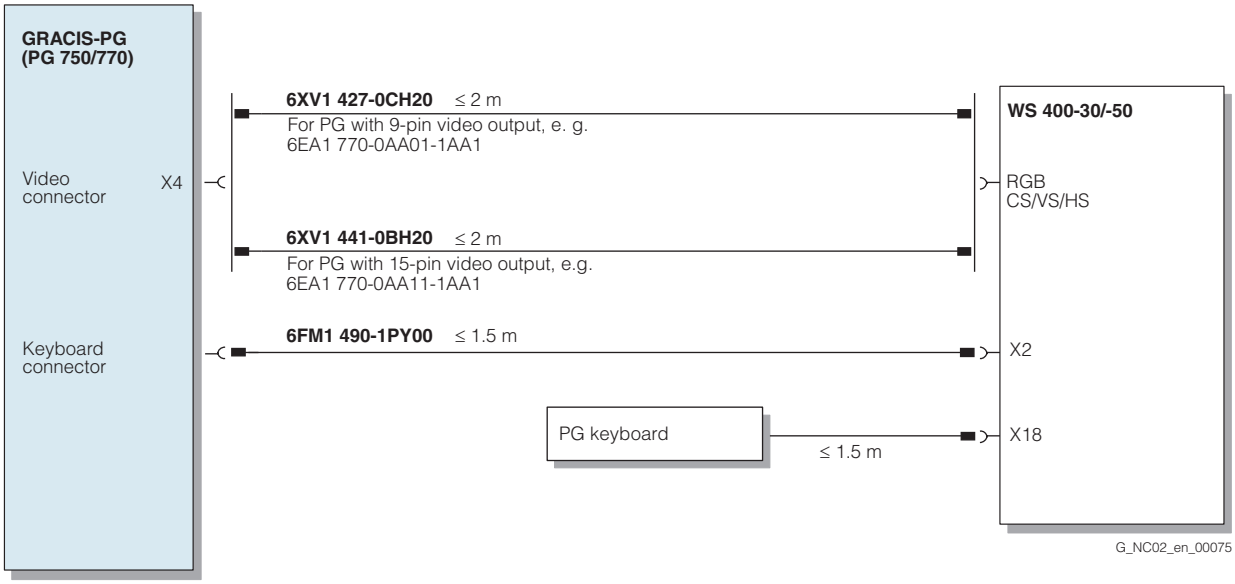
GRACIS CP 486



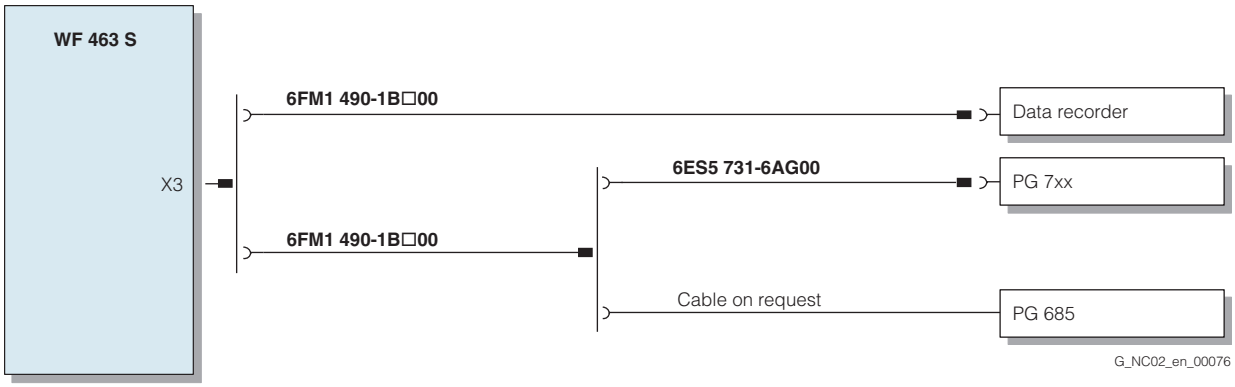
1) 3 cables required; active cable matching recommended for 100 m.
2) Connection PBT 20, PG keyboard and PG mouse is possible.
3) Cable diagrams + driver available via GRACIS hotline.
4) Koester connecting cable 22422 (recommended from approx. 80 m).

Please observe maximum permissible cable lengths (total length – e.g. ≤ 50 m – from module to peripherial units). If greater cable length ar used, system malfunctions may occur. The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1.

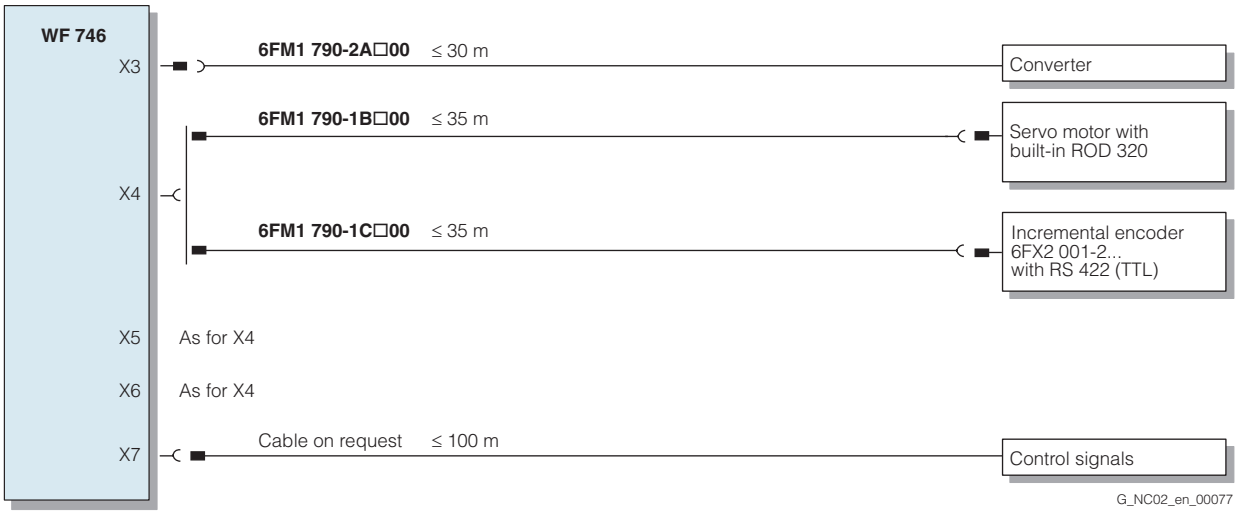
GRACIS-PG and WS 400-30/-50 operator panels



WF 463S operator panels, external storage devices



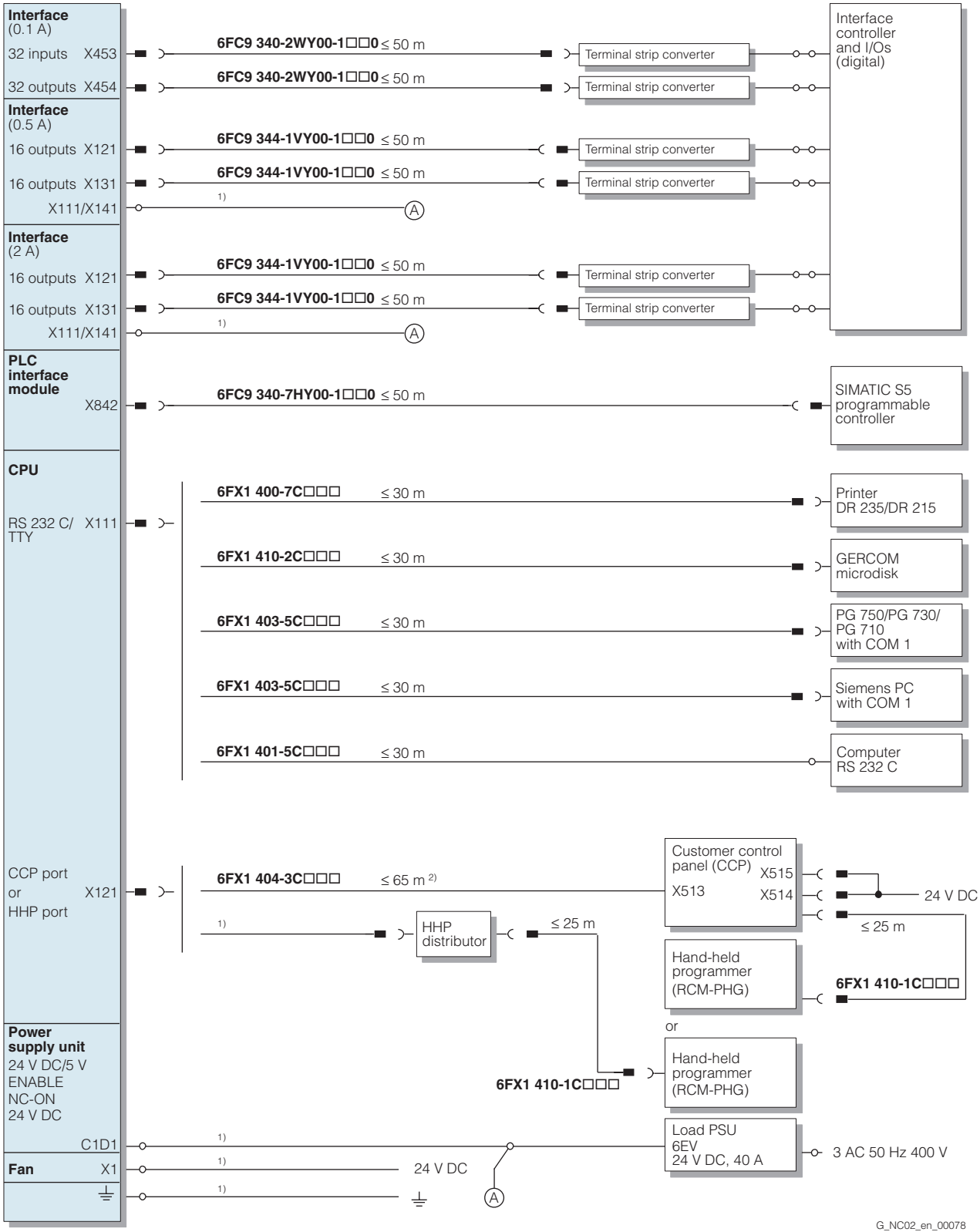
WS 746 synchronous-action module



Please observe maximum permissible cable lengths (total length – e.g. ≤ 50 m – from module to peripherial units). If greater cable length ar used, system malfunctions may occur. The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1.

Overview of Connection diagrams

RCM 1D

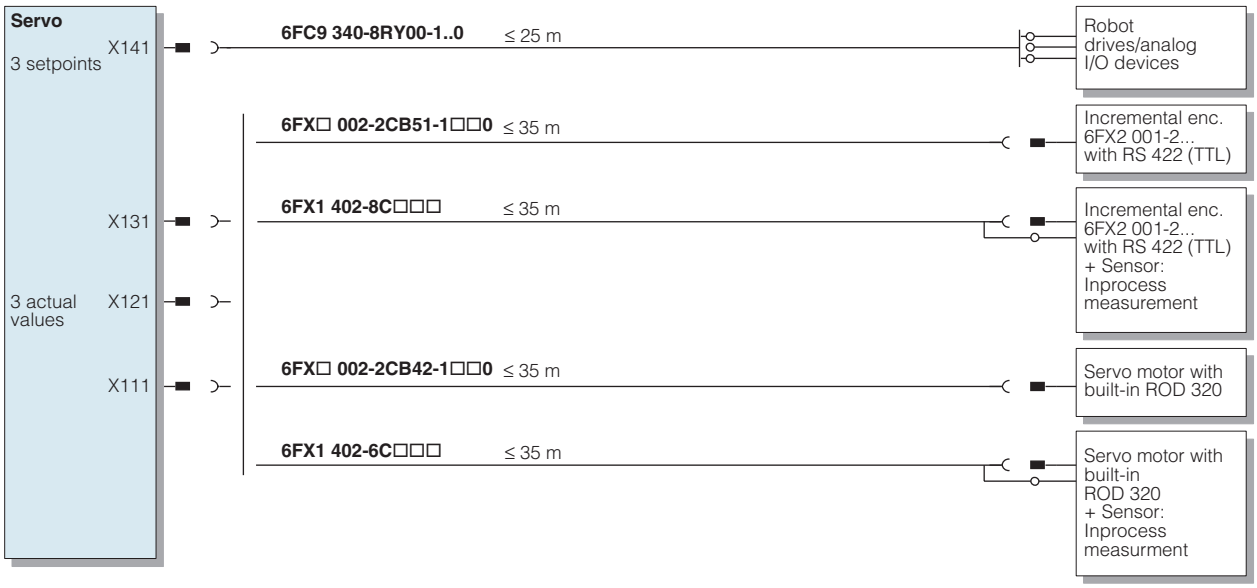


1) Cable to be provided by the customer (see planning guide).
2) The total cable length, comprising cables **6FX1 404-3C□□□** and **6FX1 410-1C□□□** must not exceed 65 meters.

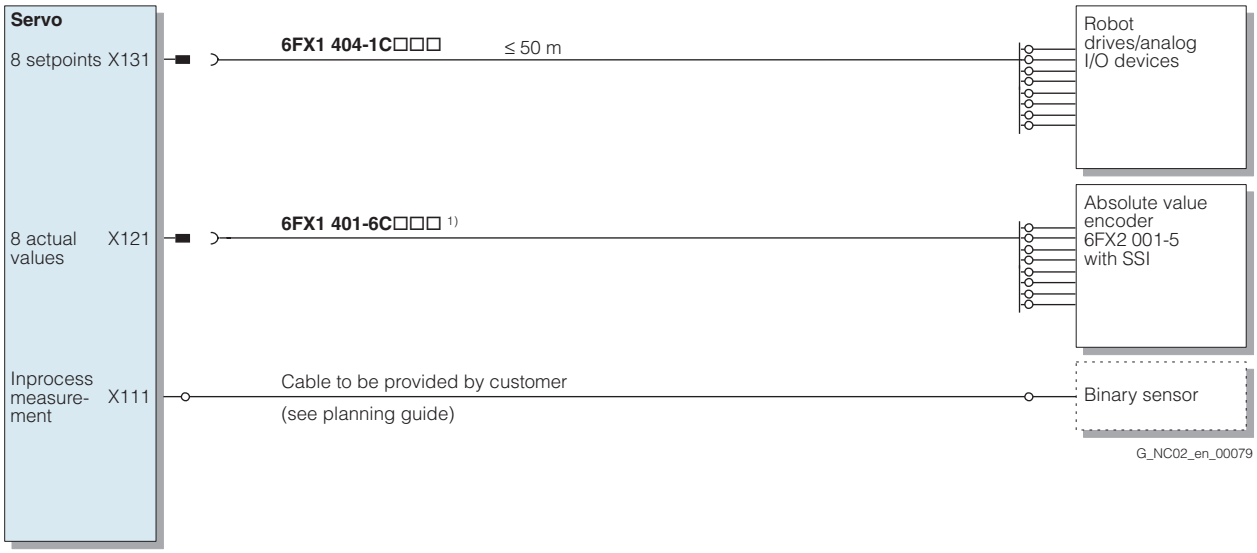
Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

RCM 1D (continued)

RCM 1D with incremental displacement encoders



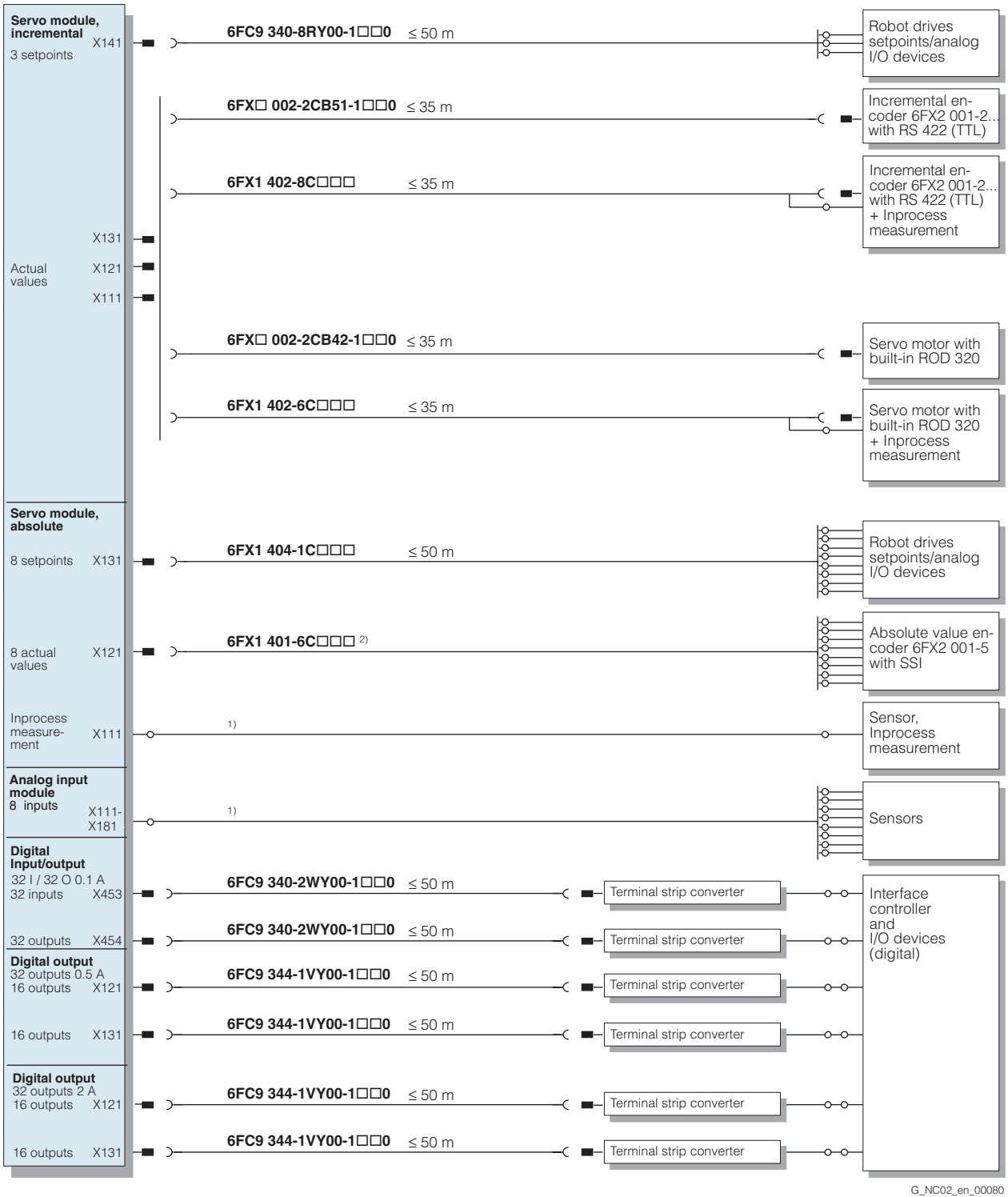
RCM 1D with absolute encoders



1) ≤ 25 m for 1 Mbit/s
≤ 120 m for 125 Kbit/s

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

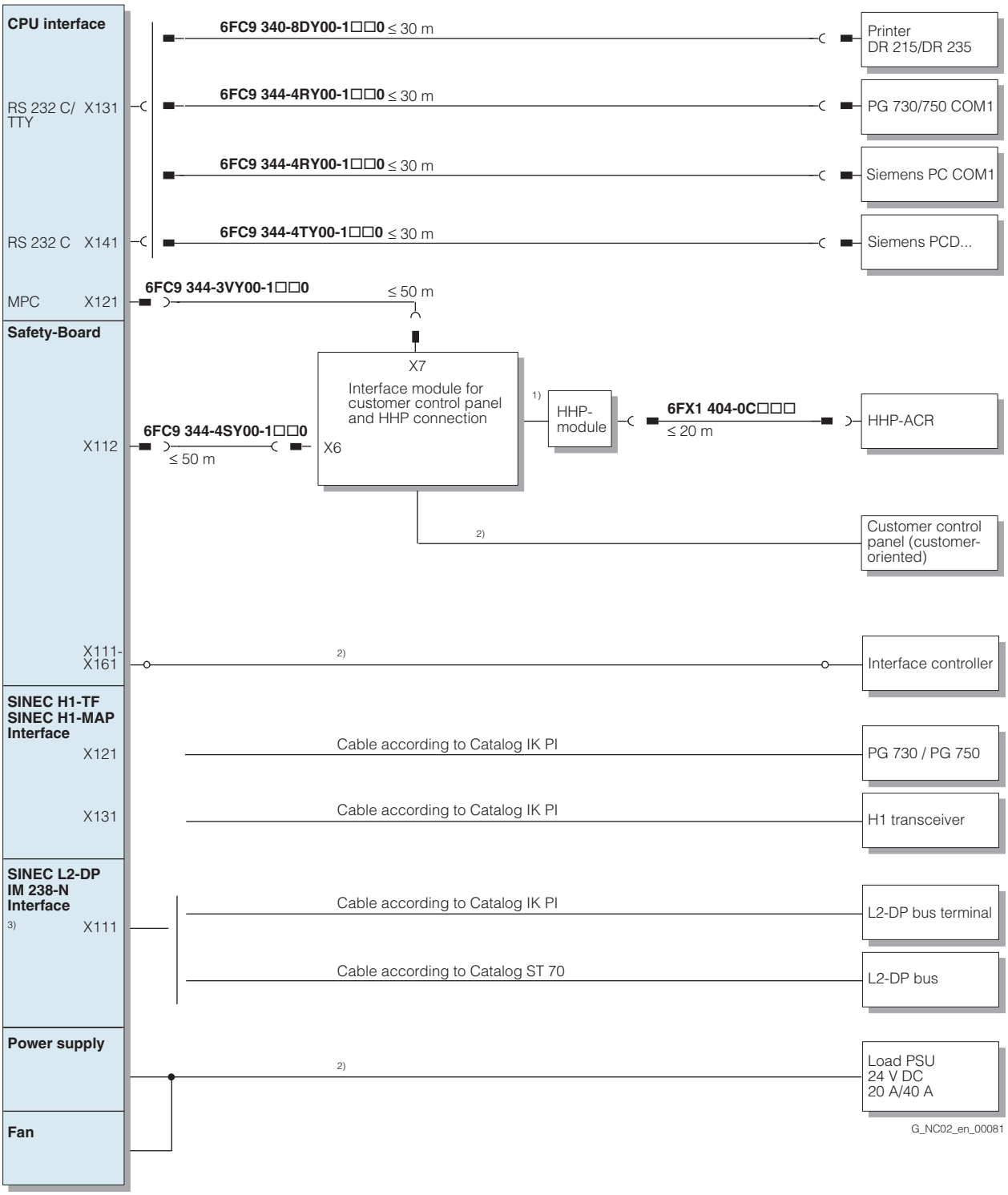
ACR 20



1) Cable to be provided by the customer (see planning guide).
2) ≤ 25 m for 1 Mbit/s
≤ 120 m for 125 Kbit/s

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1...

ACR 20 (continued)

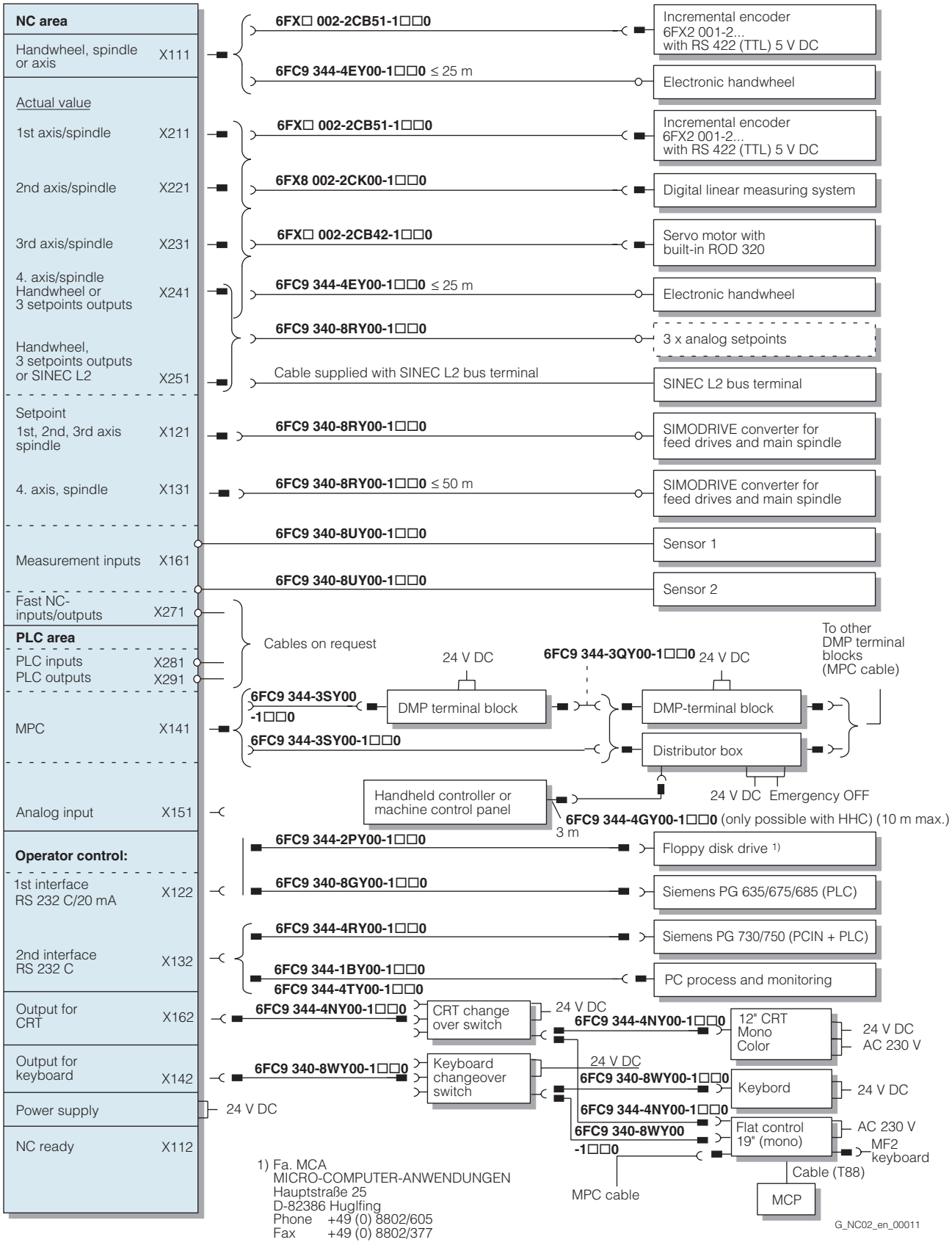


HHP: Handheld programmer

1) Cable supplied with the module.
2) Cable to be supplied by the customer (see planning guide).
3) Cables to be used for the IM 239-N interface can be found in CATALOG IK PI and Catalog ST 70.

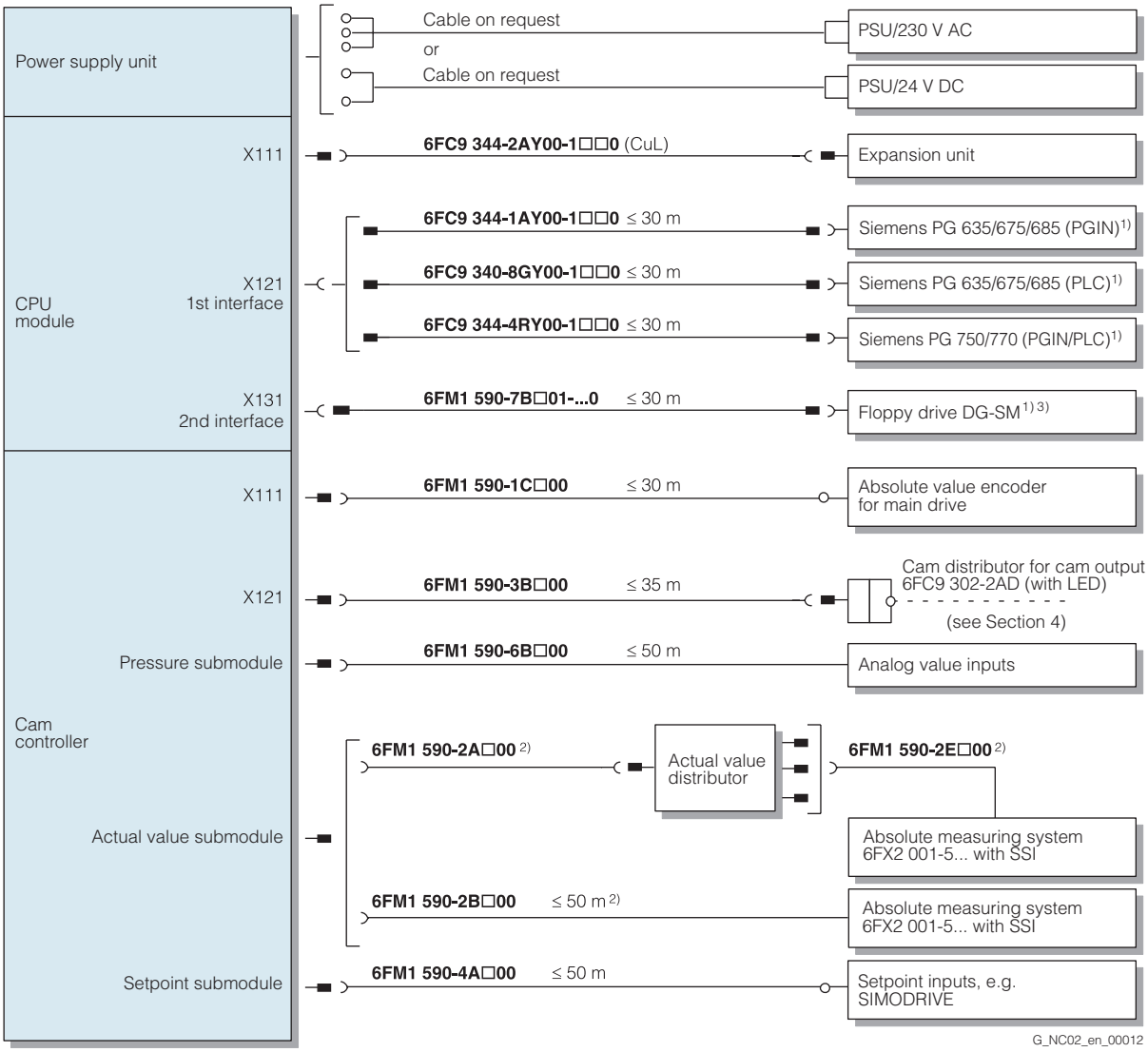
Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

SINUMERIK 805



Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

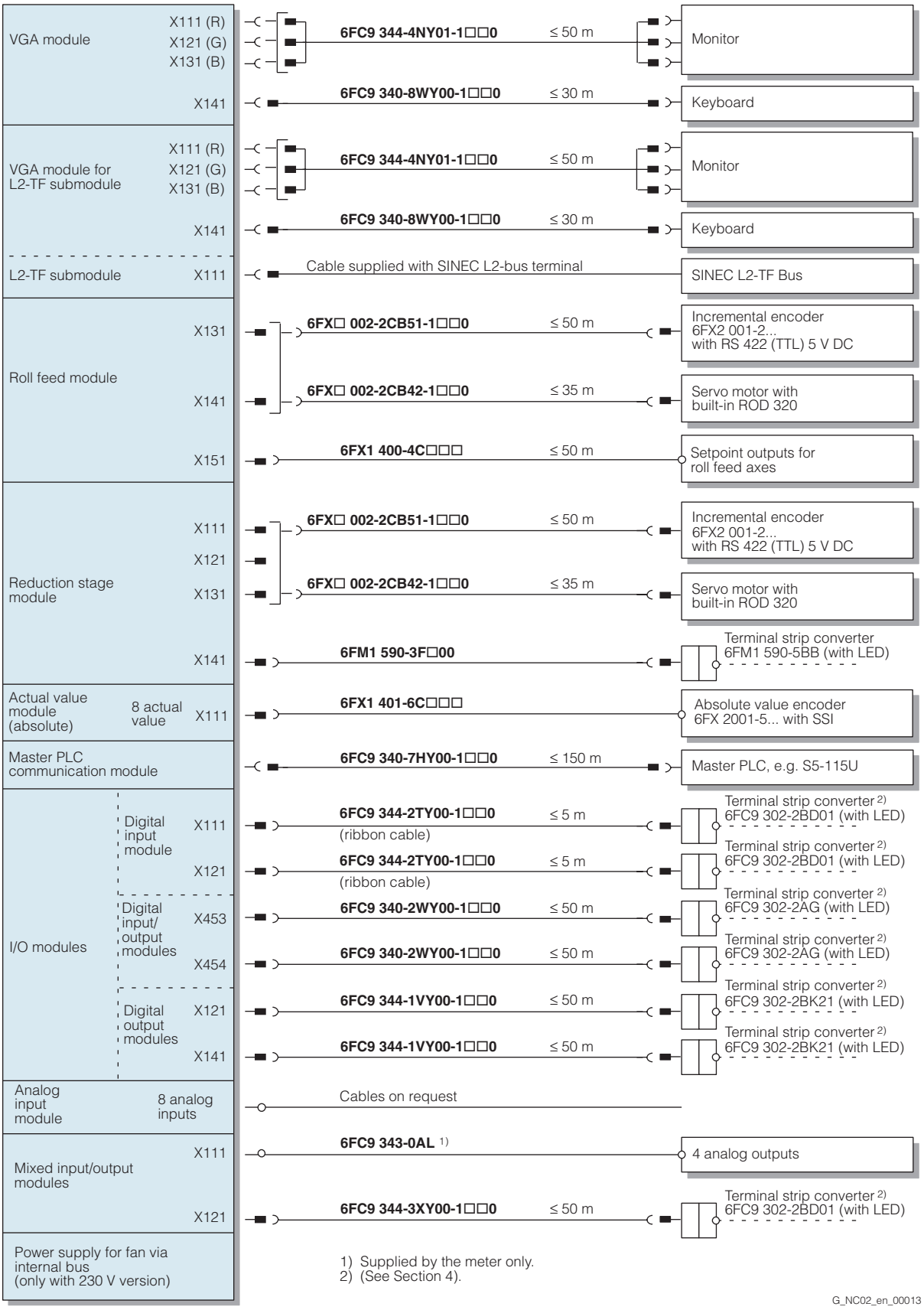
SINUMERIK 805 SM-P central controller



1) Can be connected to the 1st or 2nd interface.
2) ≤ 25 m for 1 Mbit/s
   ≤ 120 m for 125 Kbit/s.
3) Fa. MCA
   MICRO-COMPUTER-ANWENDUNGEN
   Hauptstraße 25
   D-82386 Huglfing

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

SINUMERIK 805 SM-P central controller (continued)

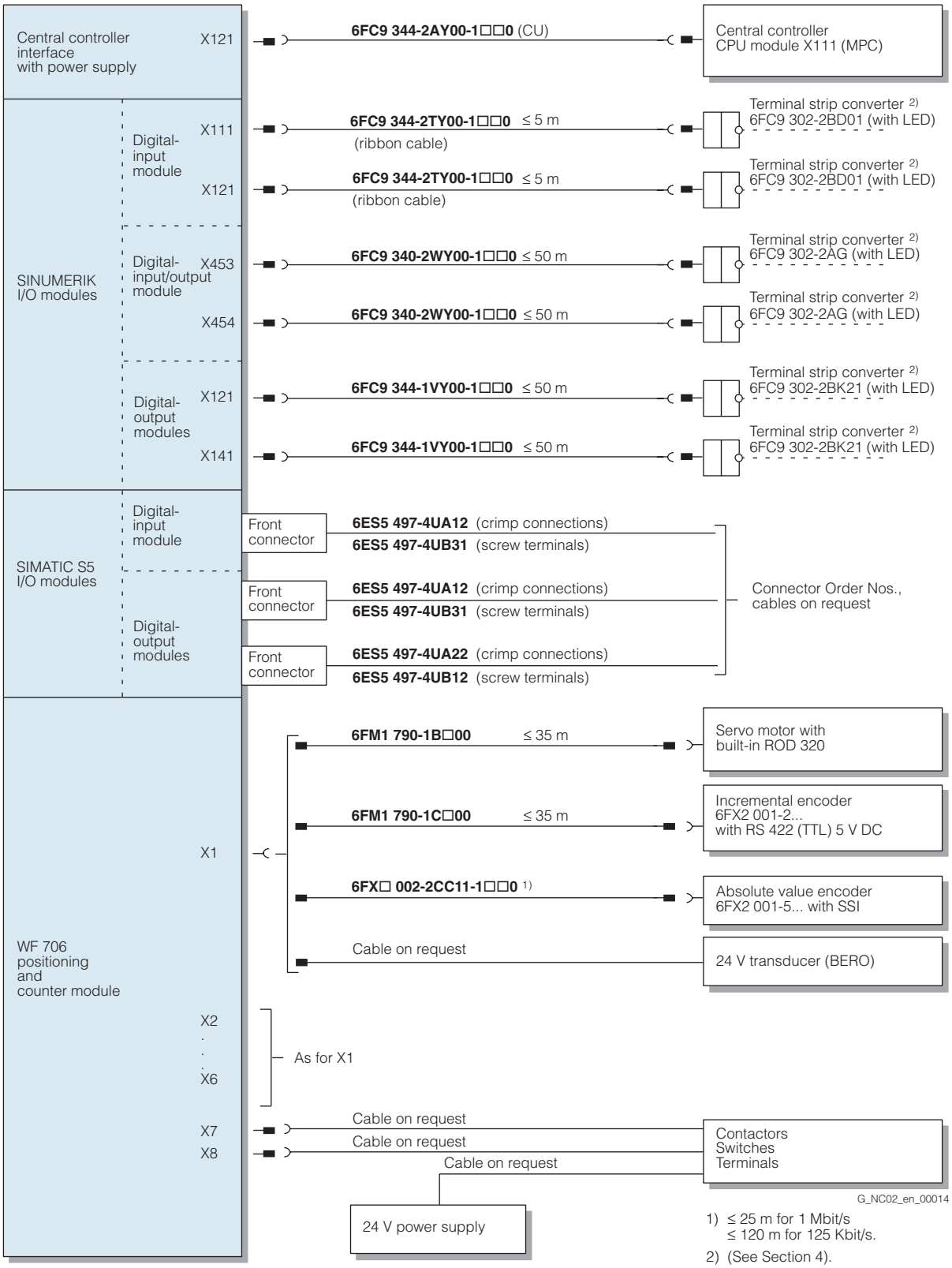


1) Supplied by the meter only.
2) (See Section 4).

G_NC02_en_00013

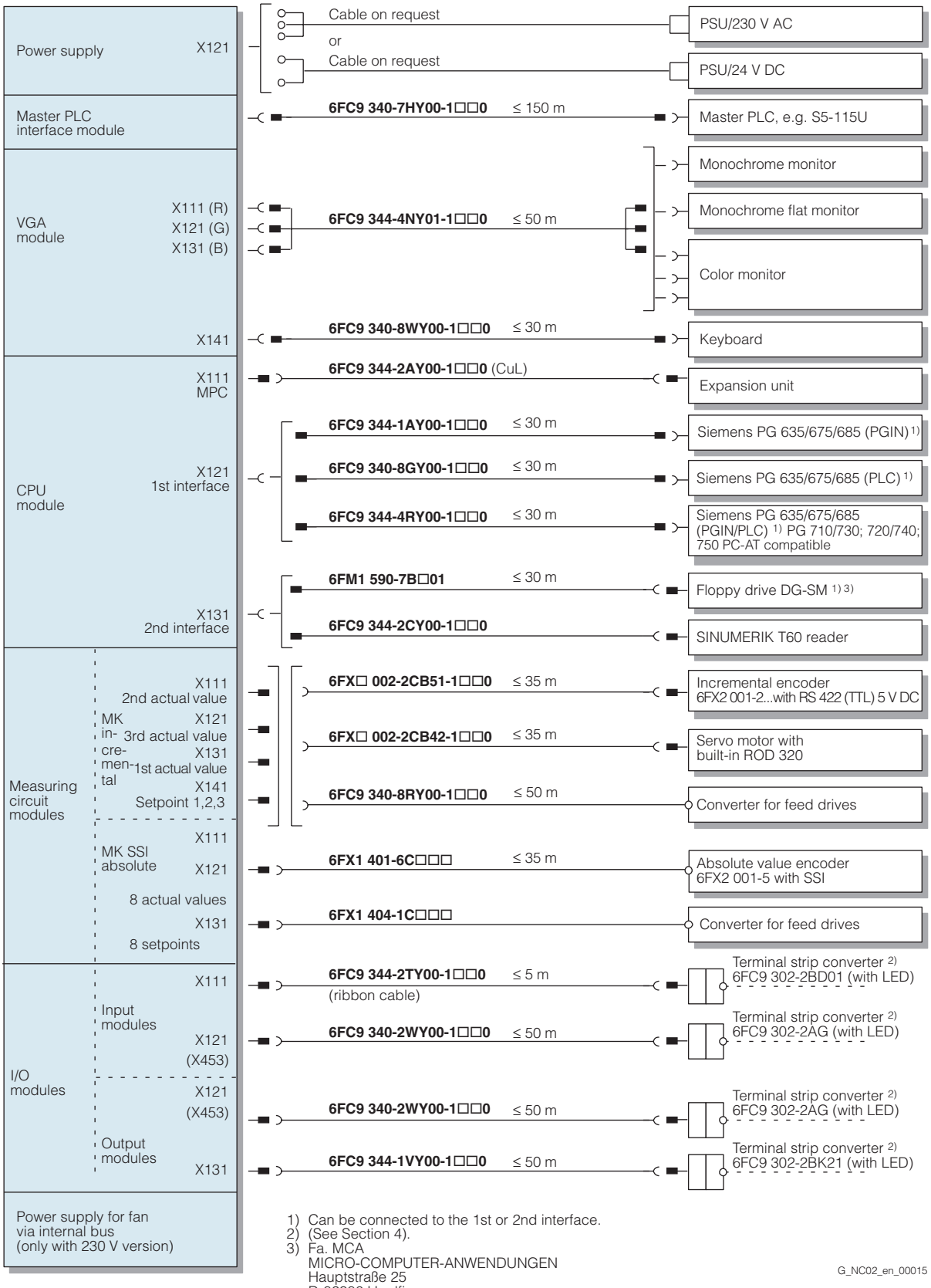
Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

SINUMERIK 805 SM-TW central controller



Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

SINUMERIK 805 SM-TW central controller

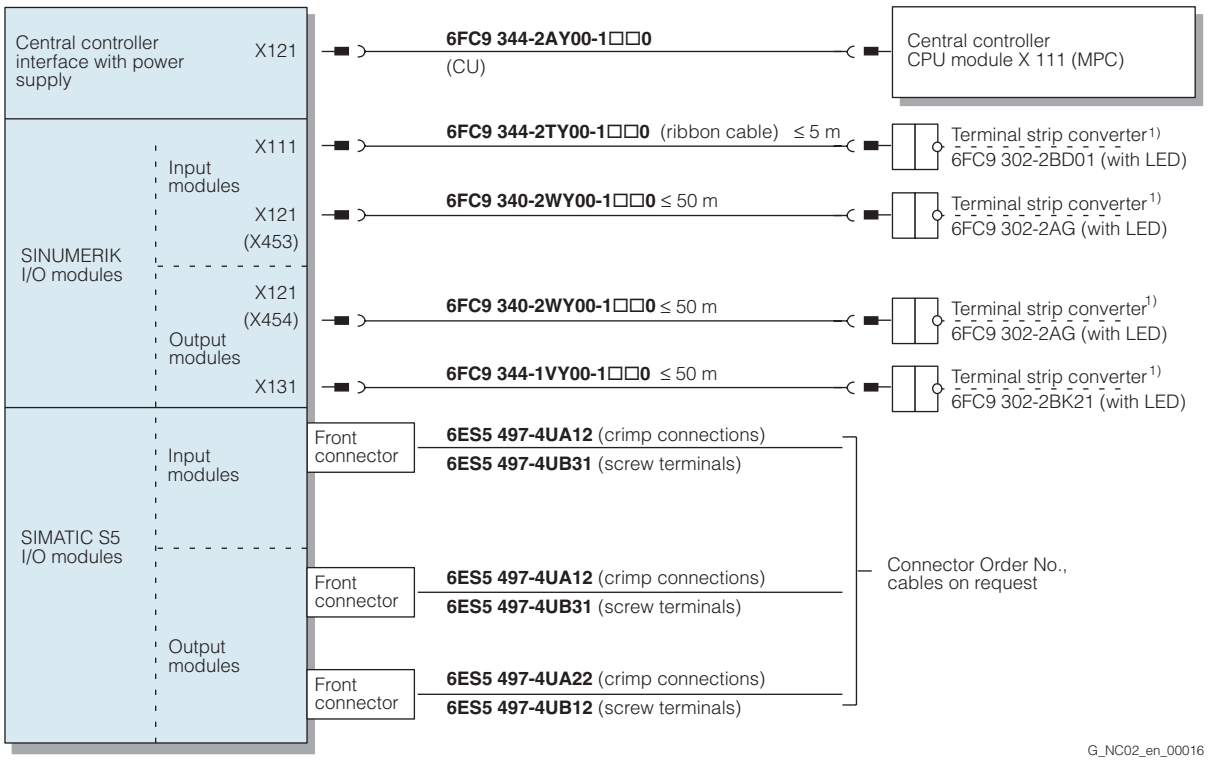


1) Can be connected to the 1st or 2nd interface.
2) (See Section 4).
3) Fa. MCA
MICRO-COMPUTER-ANWENDUNGEN
Hauptstraße 25
D-82386 Huglfing
Phone +49 (0) 8802/605
Fax +49 (0) 9902/377

G_NC02_en_00015

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

SINUMERIK 805 SM-TW central controller (continued)

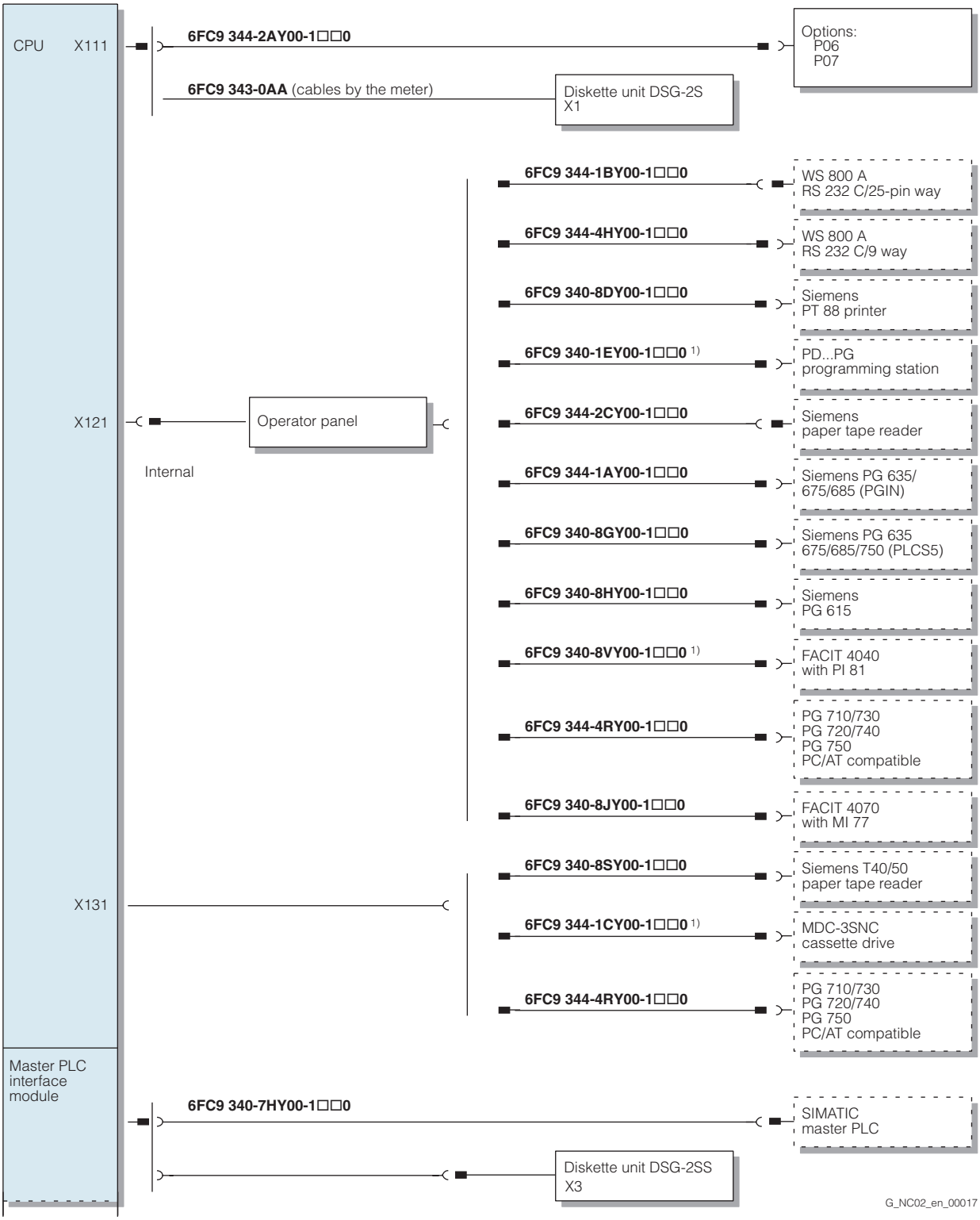


1) See section 4.

5

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

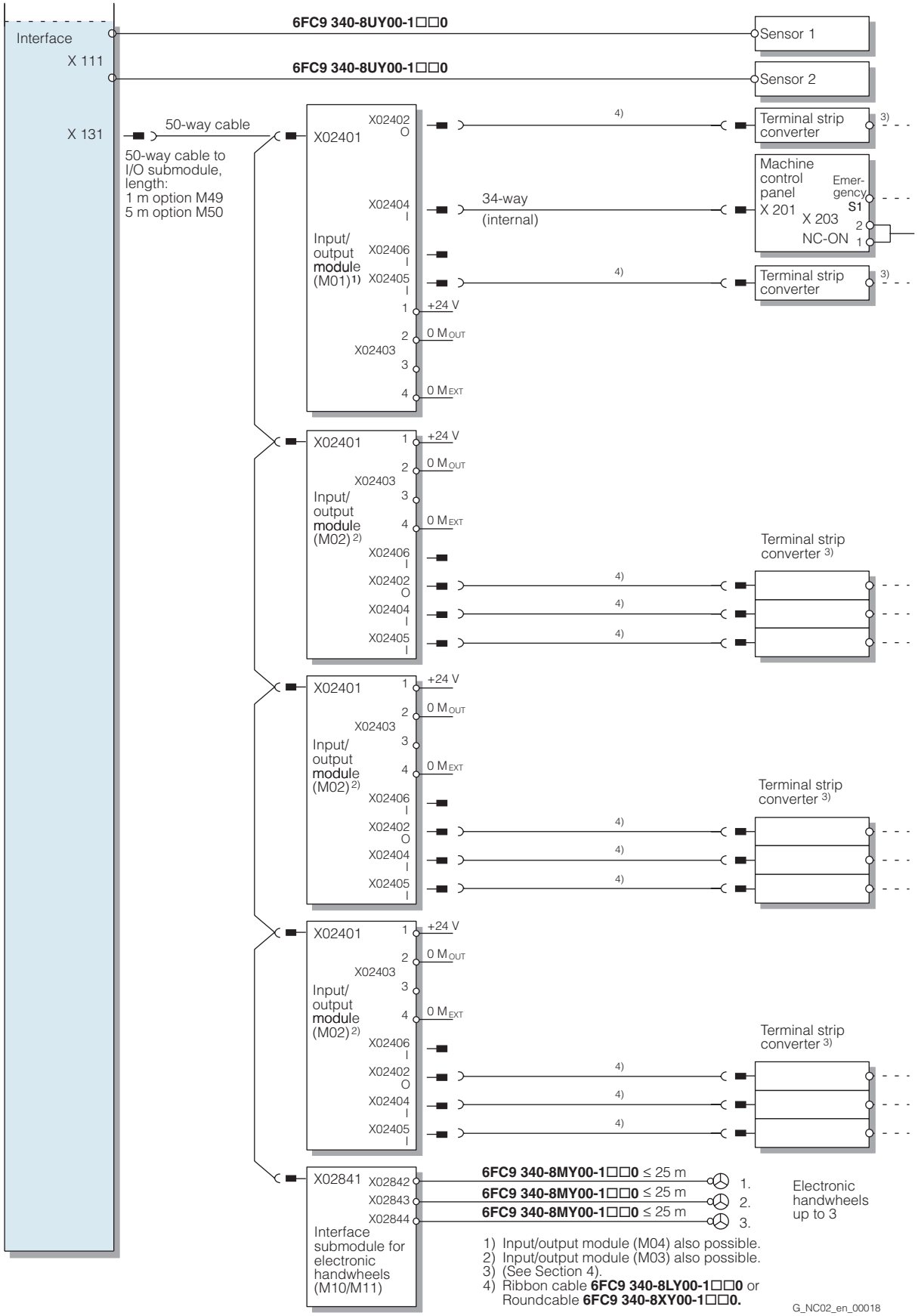
SINUMERIK 810T/820T, 810M/820M, 810G/820G, 810N/820N central controller (continued)



1) Cables available as a remake.
2) Fa. MCA
MICRO-COMPUTER-ANWENDUNGEN
Hauptstraße 25
D-82386 Huglfing
Phone +49 (0) 8802/605
Fax +49 (0) 8802/377

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

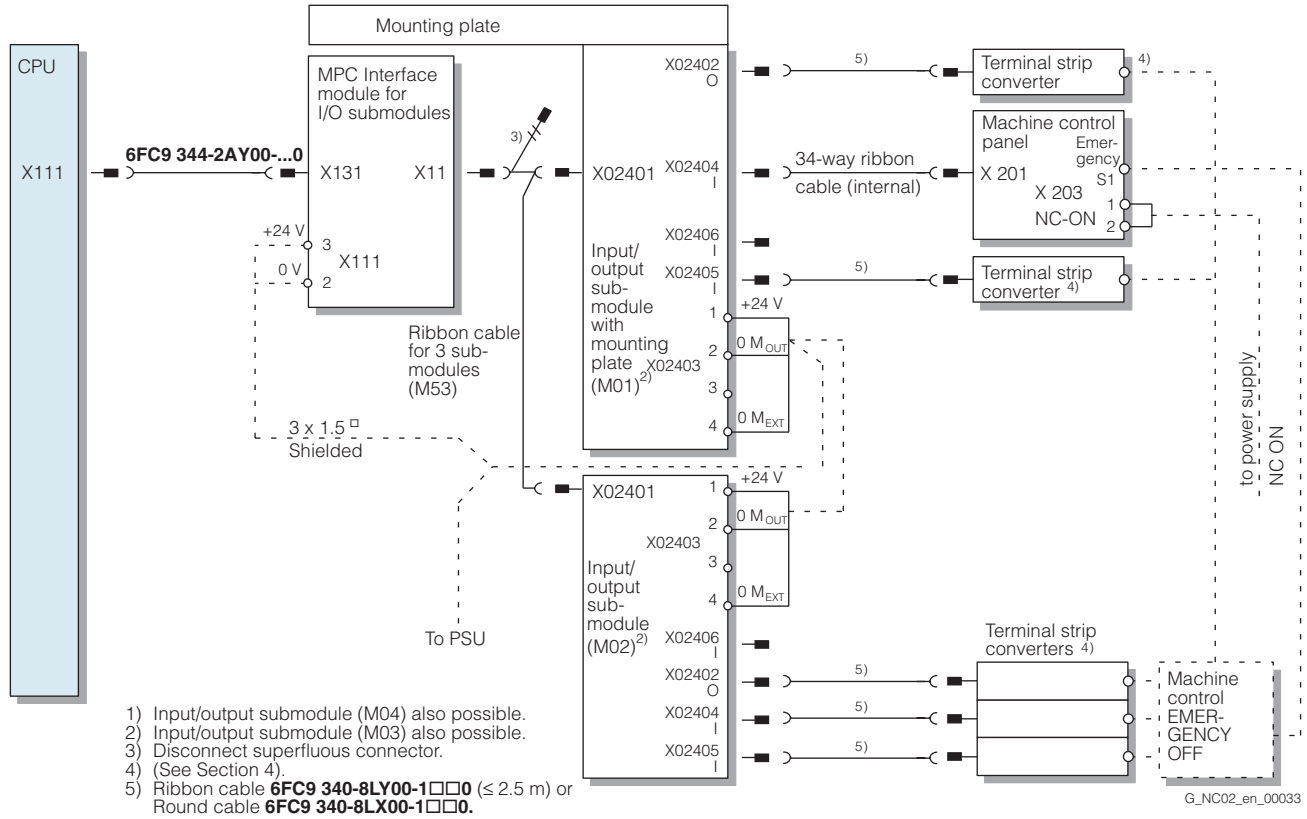
SINUMERIK 810T/820T, 810M/820M, 810G/820G, 810N/820N central controller (continued)



Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

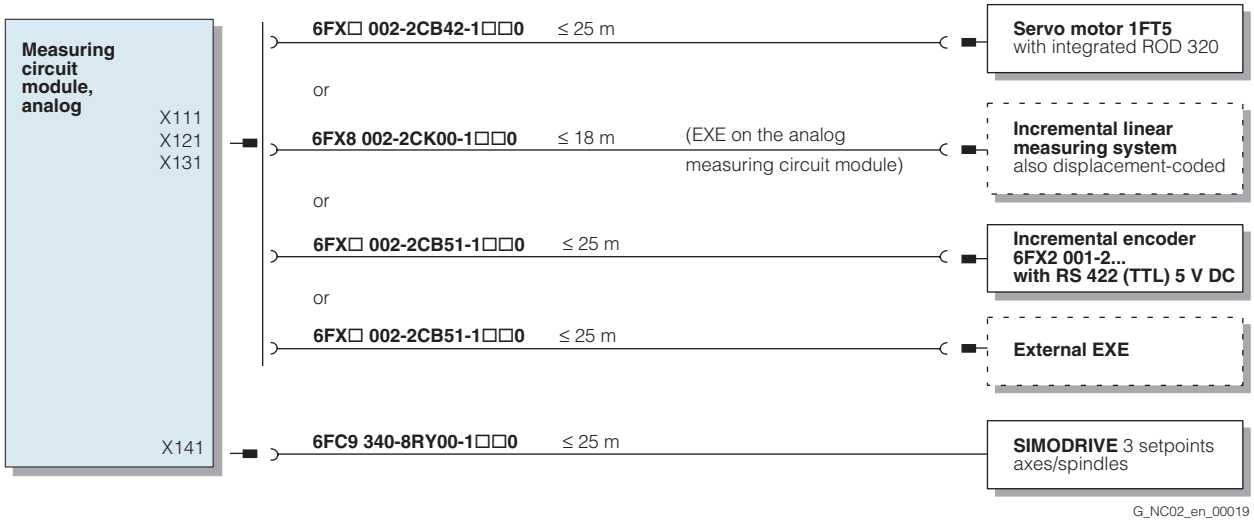
SINUMERIK 810T/820T, 810M/820M, 810G/820G, 810N/820N central controller (continued)

Central unit (continued)



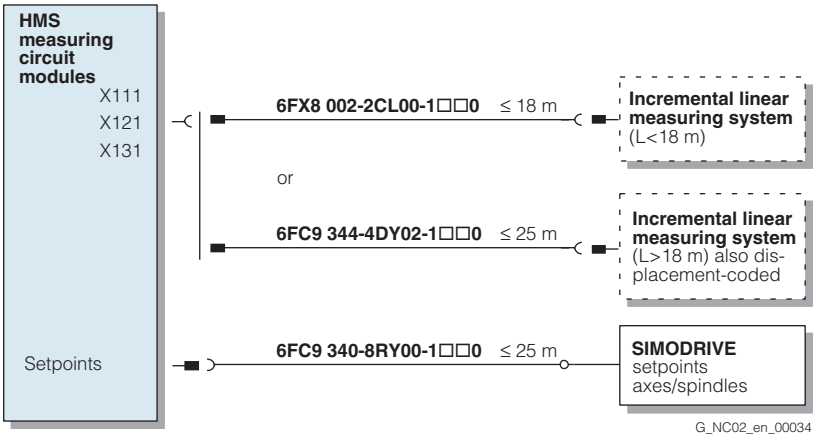
1) Input/output submodule (M04) also possible.
2) Input/output submodule (M03) also possible.
3) Disconnect superfluous connector.
4) (See Section 4).
5) Ribbon cable **6FC9 340-8LY00-1□□0** (≤ 2.5 m) or Round cable **6FC9 340-8LX00-1□□0.**

Measuring circuits, analog



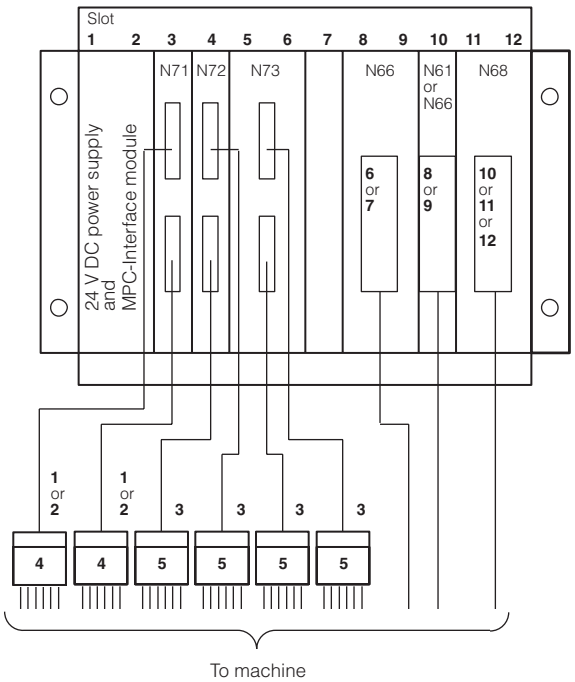
Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

HMS measuring circuit module



Mini-EU expansion unit

PLC expansion unit (mini-EU)



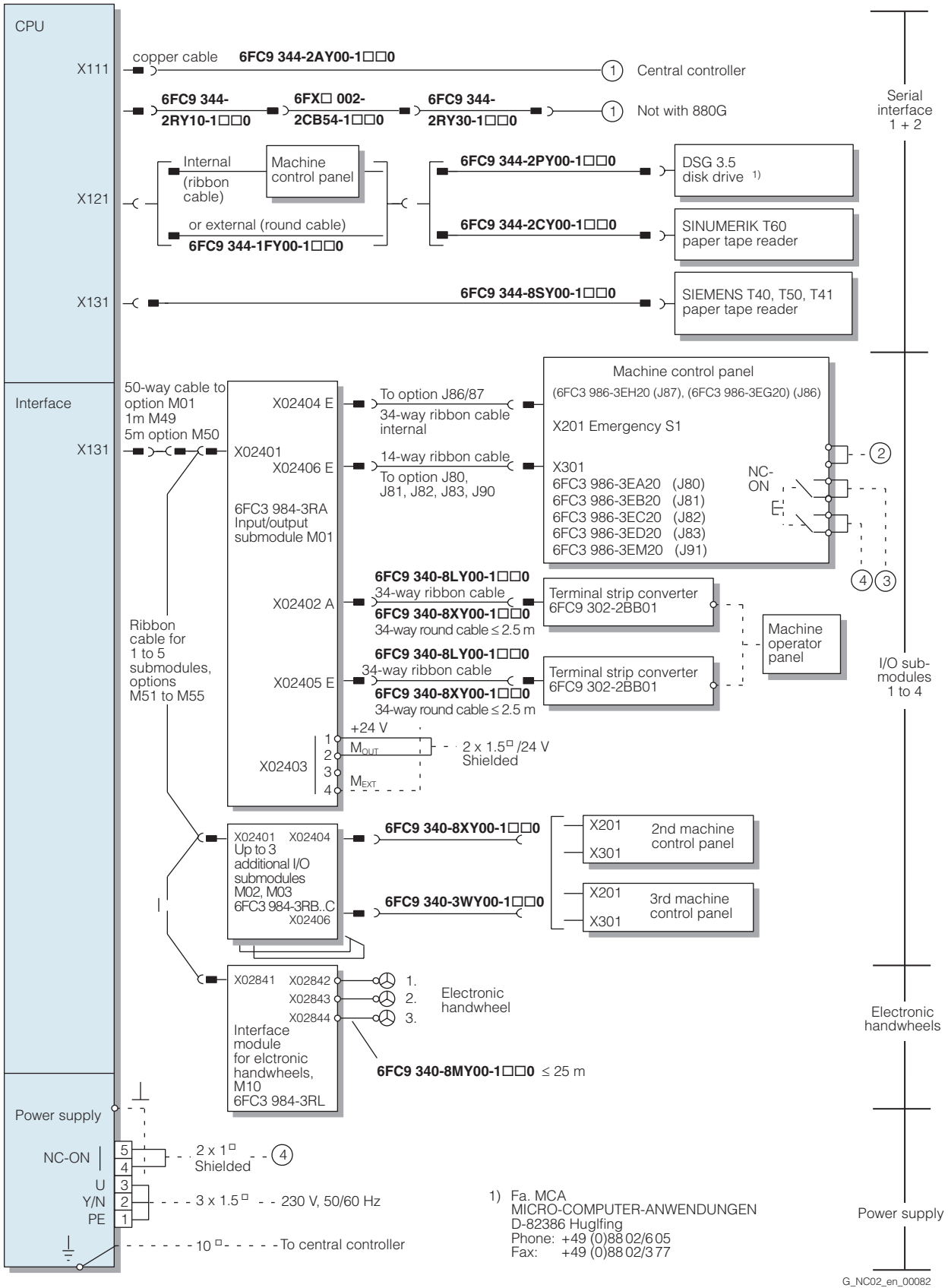
1	37-way cable,	6FC9 344-1UY00-1□□0
2	Ribbon cable,	6FC9 344-2TY00-1□□0
3	37-way cable,	6FC9 344-1VY00-1□□0
4	Terminal strip converter, 37-pin, with LED, (rated at 0.5 A)	6FC9 302-2AD
5	Terminal strip converter, 37-pin, with LED, (rated at 2 A)	6FC9 302-2AK20
6	Front connector for crimp connection, 43-pin,	6XX3 068
7	Front connector for screw terminals, 43-pin,	6XX3 081
8	Front connector for crimp connection, 42-pin,	6ES5 497-4UA12
9	Front connector for srew terminals 42-pin,	6ES5 497-4UB31
10	Front connector for crimp connection, 42-pin,	6ES5 497-4UA22
11	Front connector for screw terminals, 42-pin,	6ES5 497-4UB11
12	Front connector for screw terminals, 25-pin,	6ES5 497-4UB22

G_NC02_en_00020

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

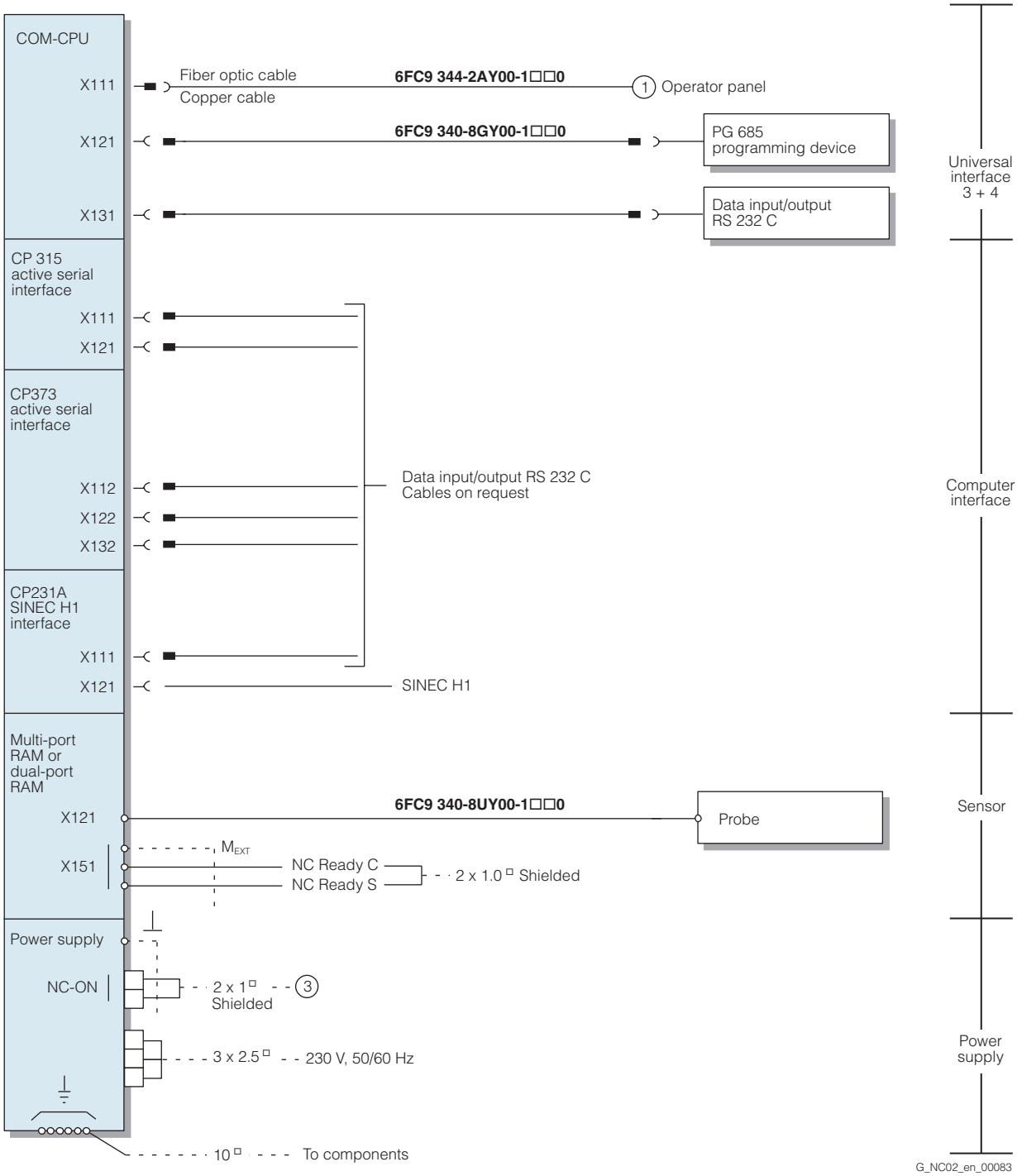
SINUMERIK 880M, 880T, 880G

Operator panel



Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

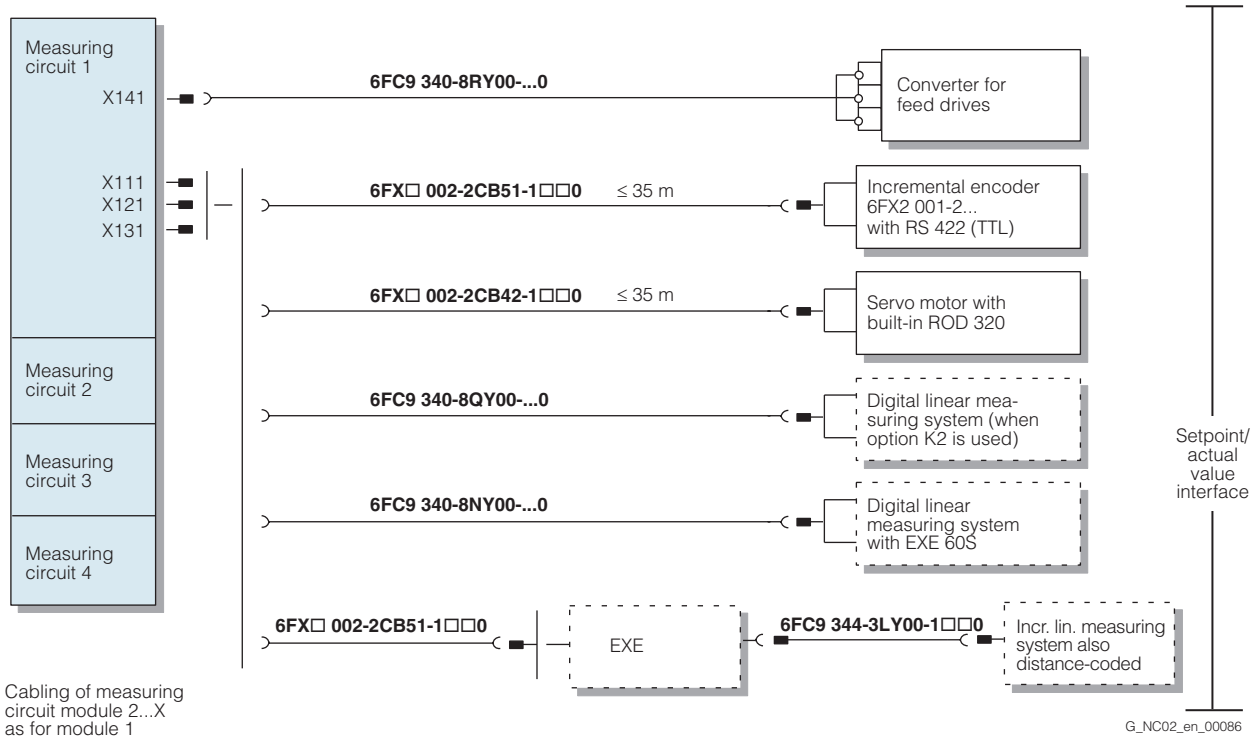
COM-area

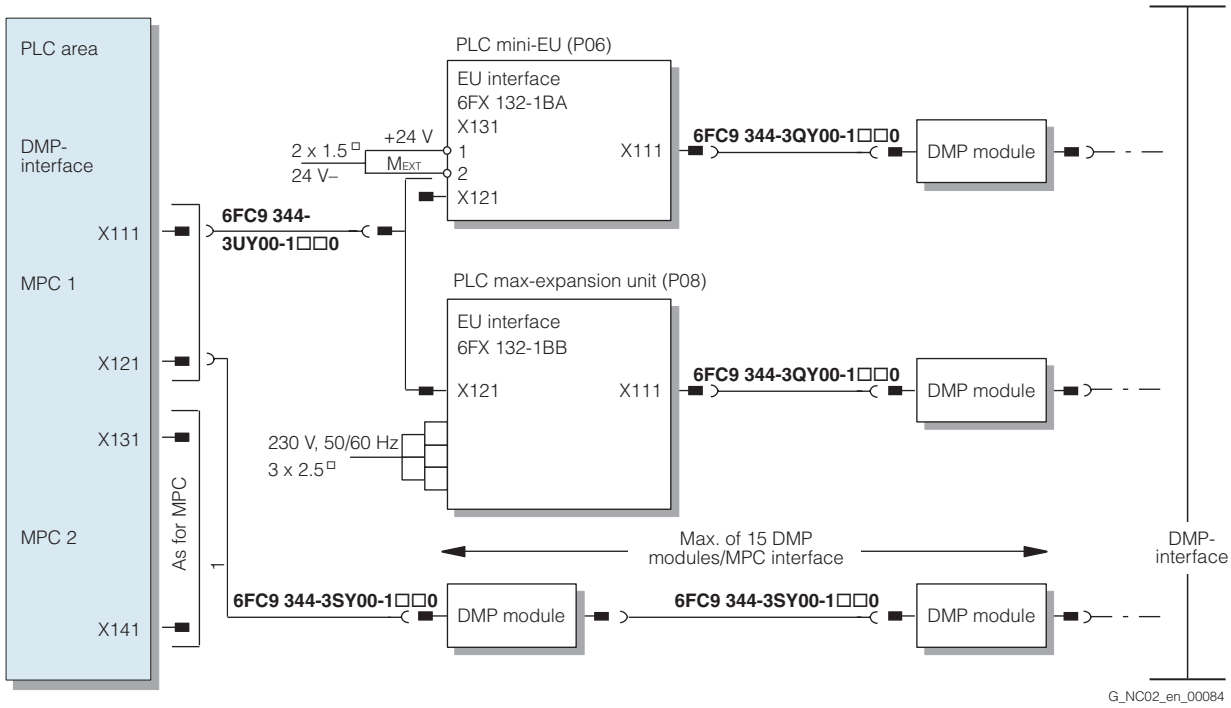


Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

SINUMERIK 880M, 880T, 880G

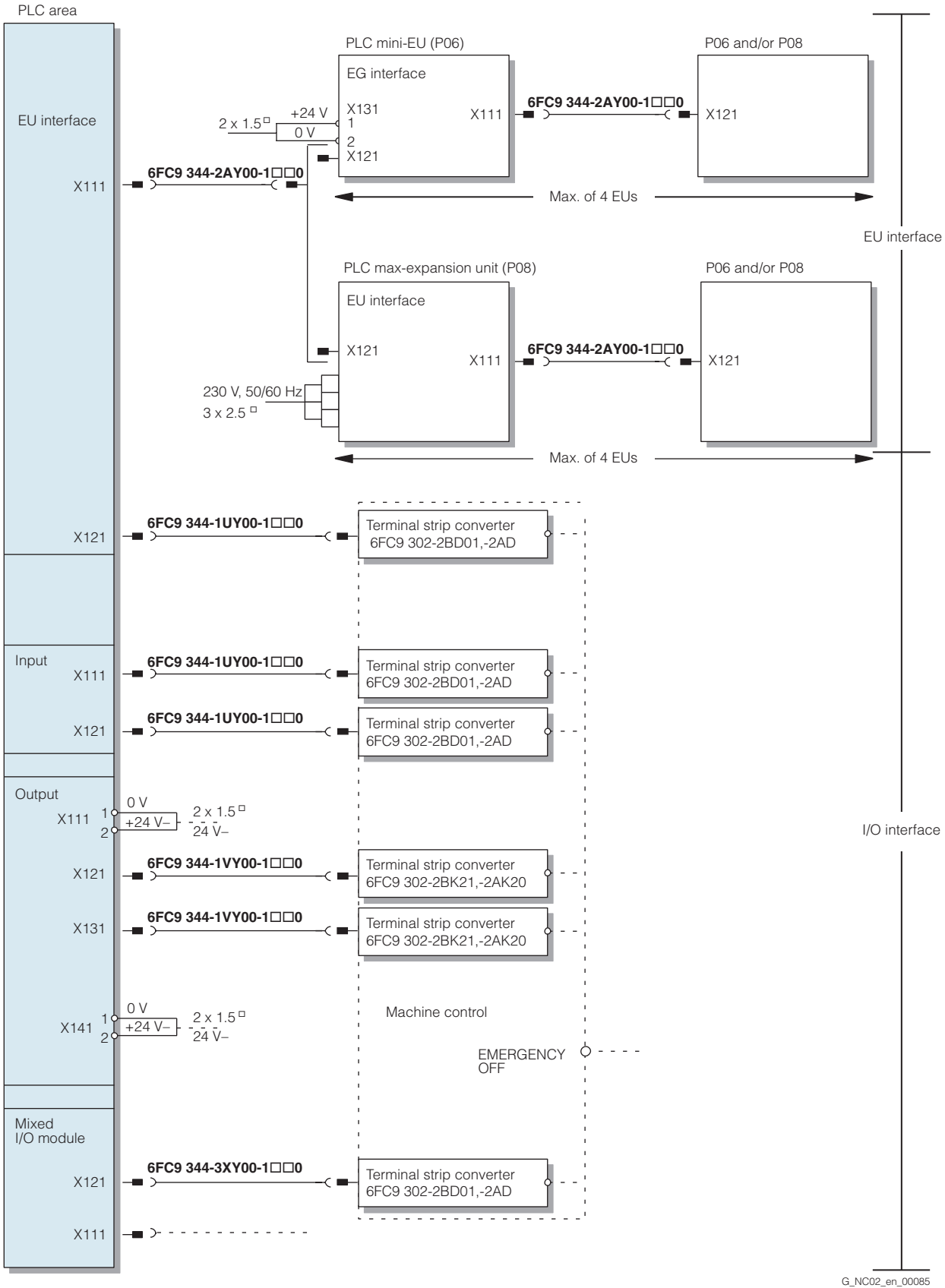
NC area / PLC area





Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

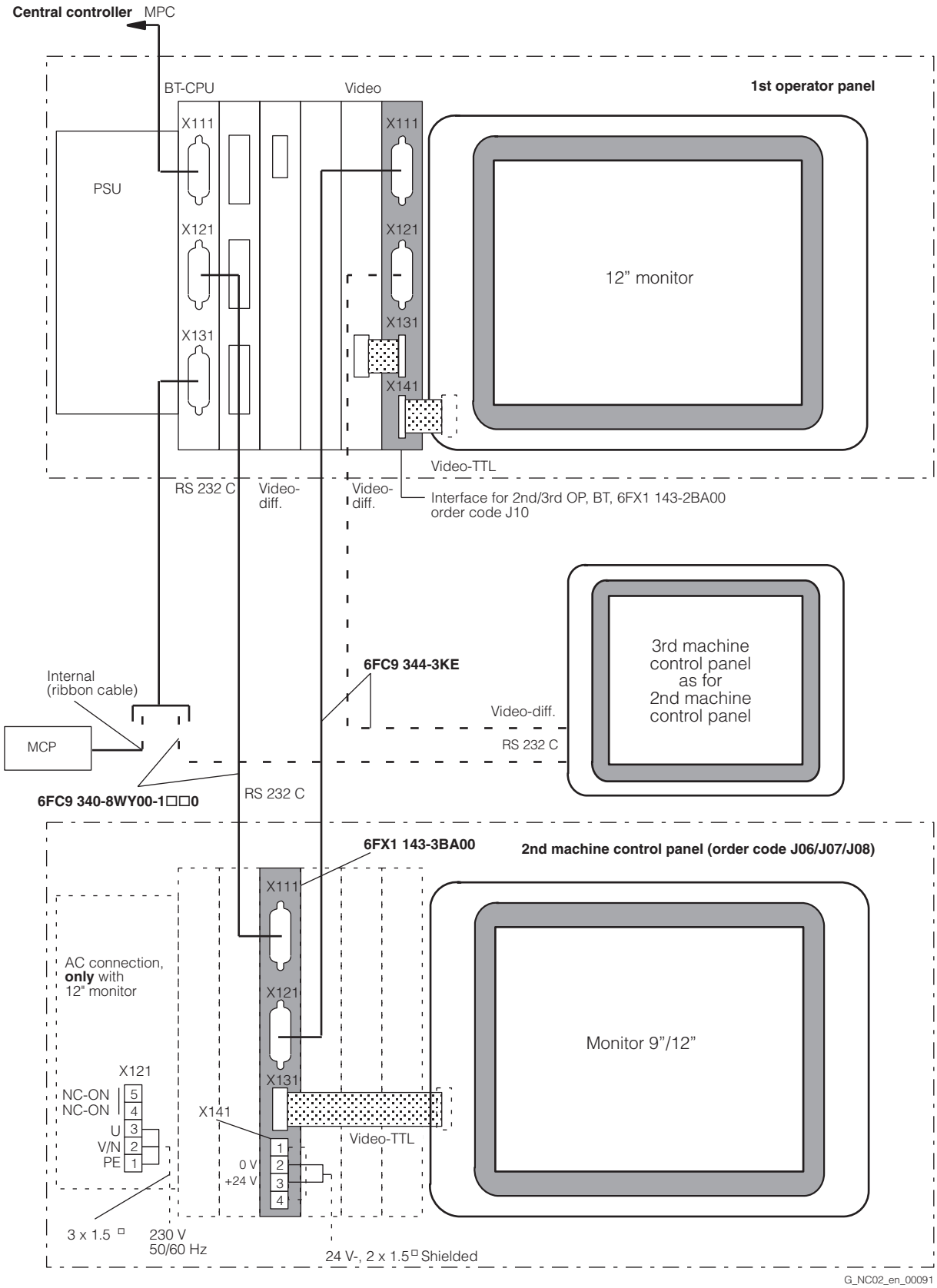
PLC area (continued)



Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

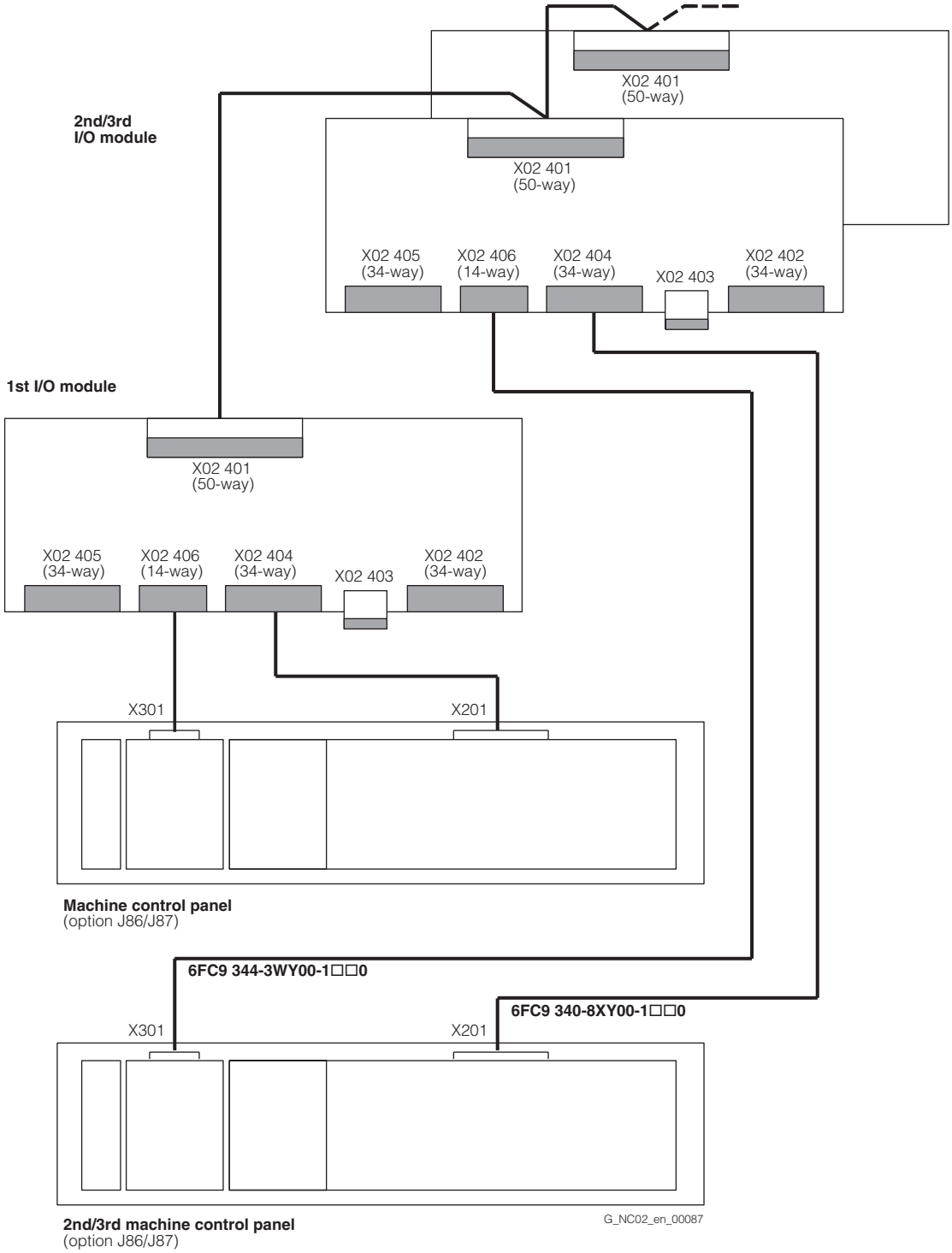
SINUMERIK 880M, 880T, 880G

Interfacing a 2nd/3rd machine control panel



Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

Interfacing a 2nd/3rd machine control panel

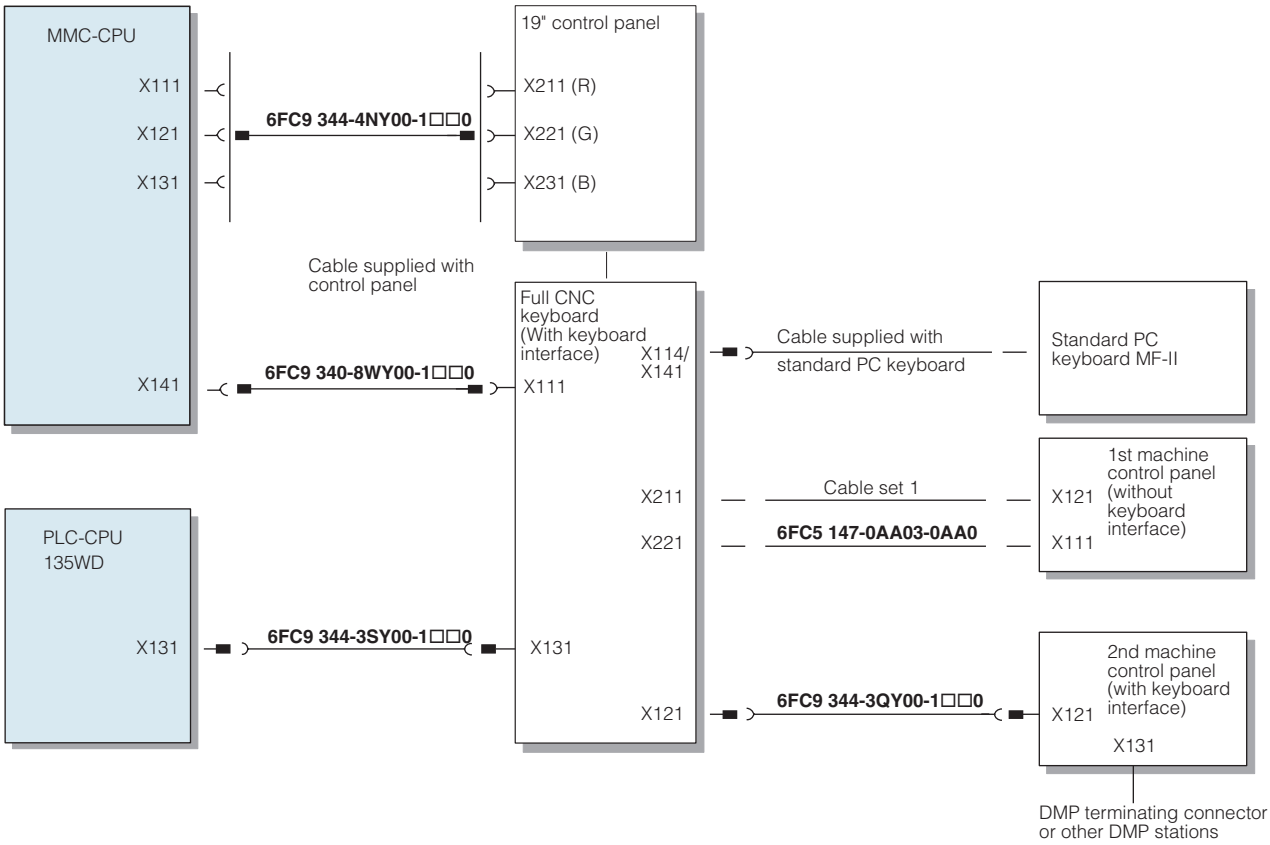


Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

Overview of Connection Diagrams

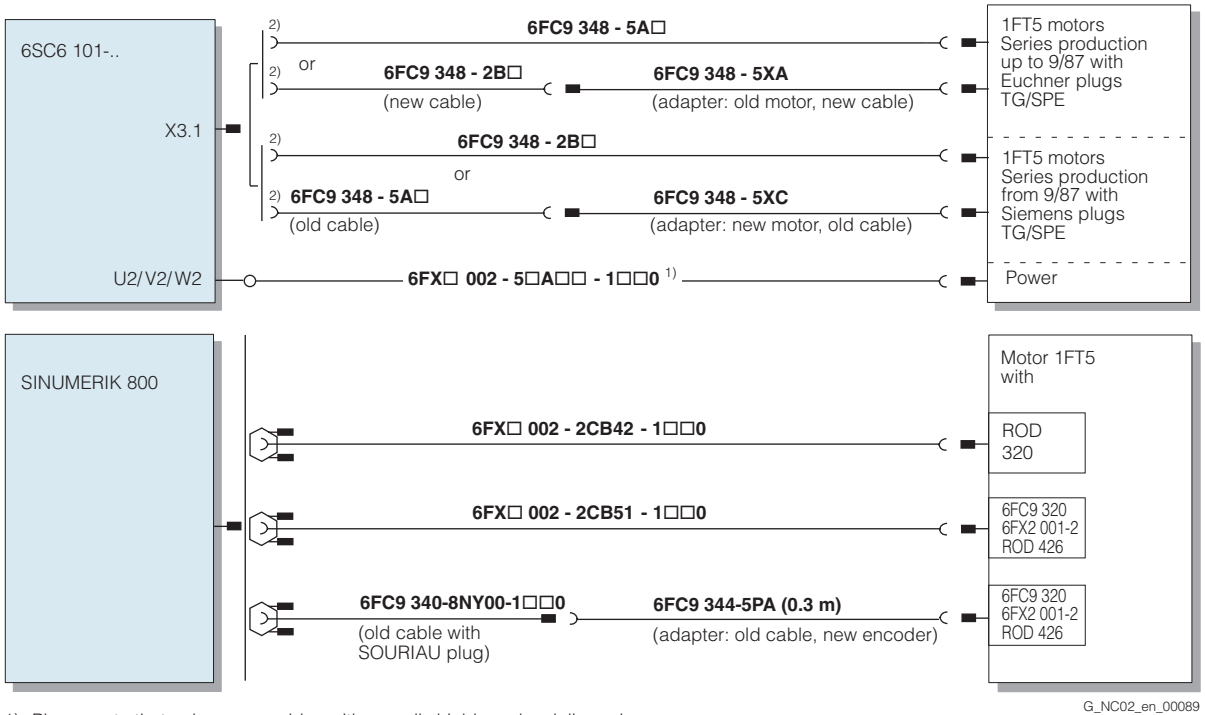
SINUMERIK 840C
SIMODRIVE

SINUMERIK 840C with 19“ operator panel



G_NC02_en_00088

1FT5 motors to SIMODRIVE 610/SINUMERIK 800

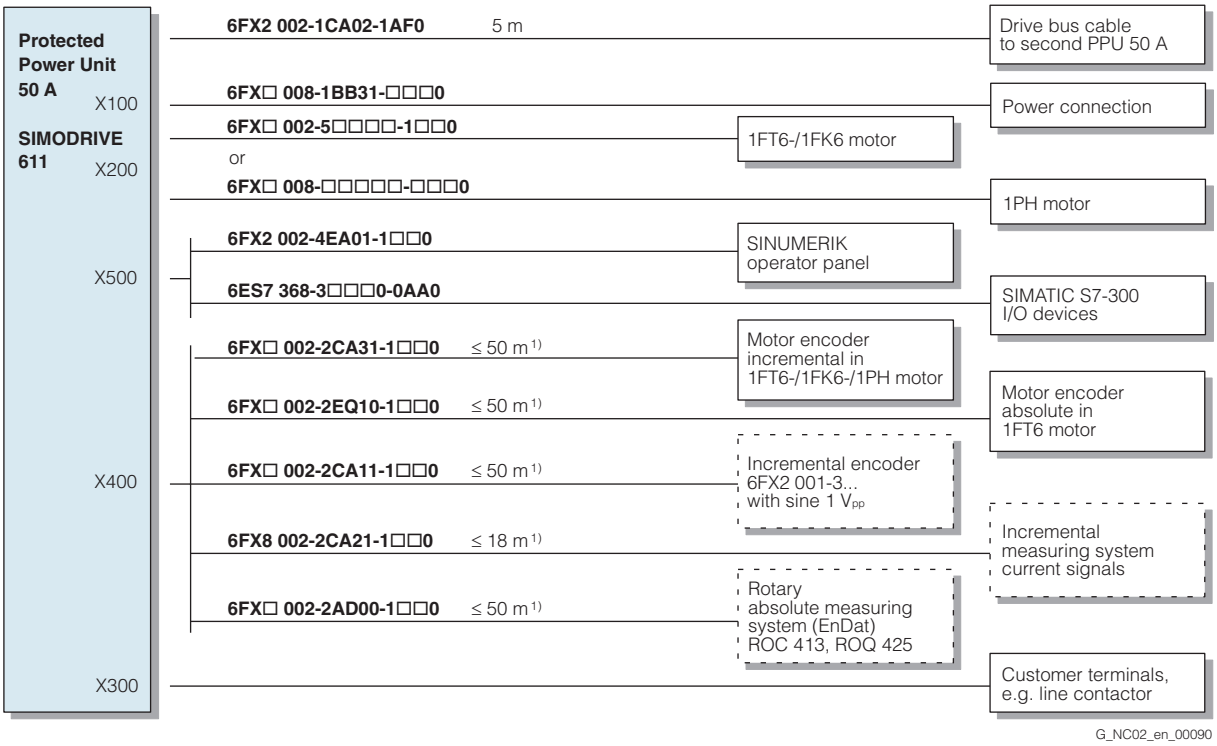


G_NC02_en_00089

1) Please note that only power cables with overall shield can be delivered.
2) DU box connector.

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

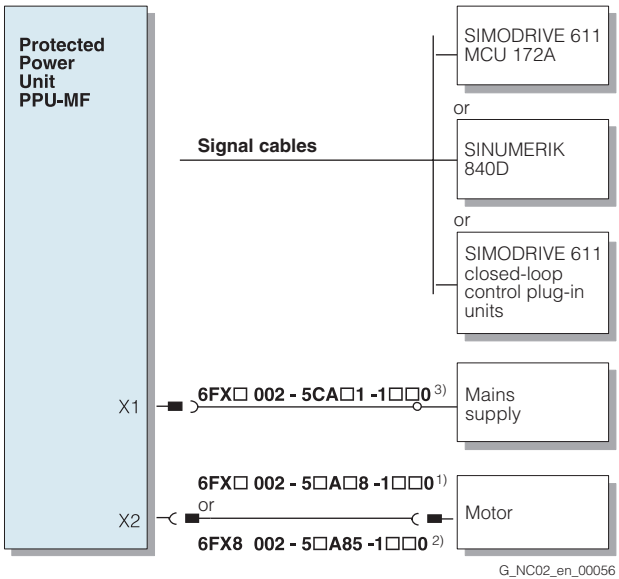
SIMODRIVE 611 Protected Power Unit (PPU) 50 A



G_NC02_en_00090

1) Maximum length depending on use, standard control, performance control or MCU.

SIMODRIVE 611 Protected Power Unit PPU-MF



G_NC02_en_00056

1) See also page 2/5 cables > 4 x 2.5 mm²
PPU-MF side, connector size 1.5 motor 1.5

2) **6FX8 002 - 5□A85** Connector size 1.5 PPU/MF side
Connector size 1 motor side

without brake cable **C**
with brake cable **D**
4 x 2.5 mm²

3) only -5CA51 (4 x 6 mm)²
-5CA61 (4 x 10 mm)².

Please observe maximum permissible cable lengths(total length -e.g.. ≤ 50 m- from module to peripherial units). If greater cable length ar used, system malfunctions may occur.The Order No. code □ for cable variant 6FX□ ... , the general length key (-1□□□), and recommended lengths can be found on foldout page A/1..

Streamer, Measurements adapter, PCIN

Streamer PST2-M 1200

Streamer PST2-M 1200

The connection diagram for the MMC-CPU can be found on page 2/18.

When connecting to the SINUMERIK 840C, always use data cable 6FC9 344 - 4XN00!

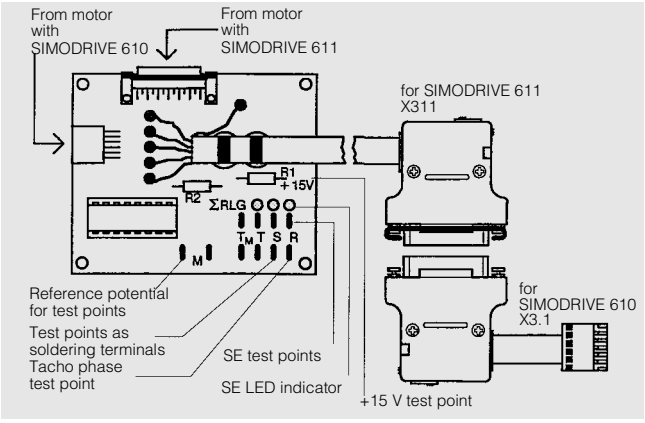
Technical specifications

Control system	SINUMERIK 840C
Magnetic tape drive	TEAC MT-2ST/F50
Interface	Parallel Port (Centronics)
Operating voltage	115/230 V AC 50/60 Hz
Power consumption	25 W
Degree of protection to DIN 40 050	IP 00
Dimension of housing W × H × D	152 mm × 89 mm × 292 mm
Weight approx.	3,6 kg
Memory capacity	Up to 600 MByte
Transmission rate	12 MByte/min

Ordering data

	Order No.
Streamer (including 2 data cables)	**6FX2 007 - 2AA00**
Data cables (replacement 3 m)	**6FC9 344 - 4XN00-1□□0**
Magnetic tape cassette	**6FX2 007 - 2AB00**

Measurement adapter



Connecting the SIMODRIVE 610/611 measurement adapter

The measurement adapter is a testing device for feed drives with SIMODRIVE 610/611 for startup and servicing. It is inserted in the actual-value cable between converter and motor.
The signals from the shaft encoder (SE) and tacho can be measured without affecting the functioning of the drive.

The following can be measured:

- SE signal at SE test points R, S, T, visually indicated by LEDs. Lighting sequence at jogging speeds or when turned manually:
  Clockwise: R, S, T
  Counter-clockwise: R, T, S
- SE aggregate signal (Σ SE) for rapid verification of the three SE signals, duty factor 1:1 in the error-free state. If the IC on the module fails, there will be no Σ SE signal; this will not affect functioning of the drive.
- Tacho signal at tacho phase test points R, S, T. The test points are directly brought out on leads. The signals may only be measured with high-impedance measuring instruments such as an oscilloscope.
- 15 V DC supply at resistor R1

Ordering data

	Order No.
Measurment adapter for SIMODRIVE 610/611 (A cable to connect the SIMODRIVE 610 is supplied but detached).	**6FC9 338 - 1AB**

PCIN

PCIN is a program for transfering SINUMERIK user data via COM 1 and COM 2 serial interfaces. PCIN runs under MS-DOS at AT-compatible PCs

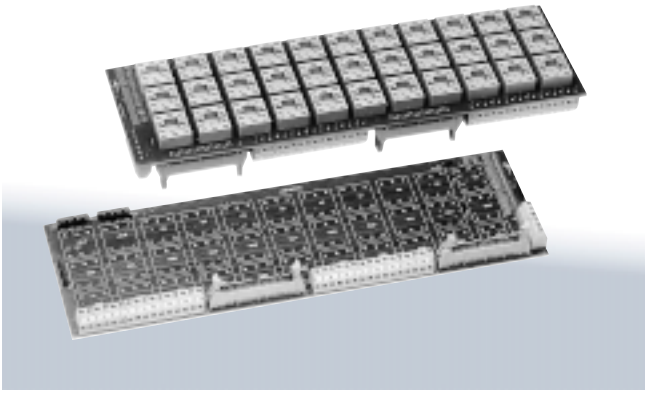
Features

- Standard transfer and parameter assignment functions.
- Integrated text editor for editing programs.
- Additional functions for revising and editing files in the PC format.
- Functions for editing SINUMERIK 840C and 840D/FM-NC archive files.
- Interface setting can be stored permanently on the data medium.
- Choice of English, French or German languages, even during operation.
- All functions are selectable via pull-down menus and the cursor keys.
- Context-sensitive integrated help function.

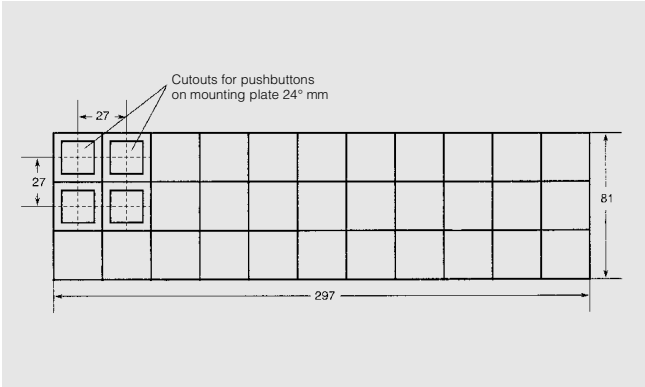
Ordering data

	Order No.
PCIN Languages: English, French, German MS-DOS on 3.5" floppy License • Single license (current software) • Copy license	**6FX2 060 - 0AA00 - 0XB■** 0 1

Pushbotton module



Pushbutton module



Mounting dimensions

Features

This pushbutton module allows the simple and low-cost implementation of customized operator panels for SINUMERIK 820/880/840C systems.

- Compact unit with 33 sockets (S 1 to S 33) for arbitrary fitting with pushbuttons, illuminated pushbuttons and indicator lights.
- No need for wiring, unlike individually assembled operator control and indicating elements.
- Facility for connecting an LED display for actual current value of the axes and spindles.
- Connection via two ribbon cables with integral connectors to the input/output module (M01) or via the interface and UTS module (840C) of the SINUMERIK controller.
- Free inputs and outputs at terminals for other (external)
- control devices.
- Special function of pushbutton S1 as a double normally open pushbutton (e.g. for emergency OFF circuit).

For connection to the SINUMERIK 840C, the voltage converter module (UTS) is additionally required (see next page).

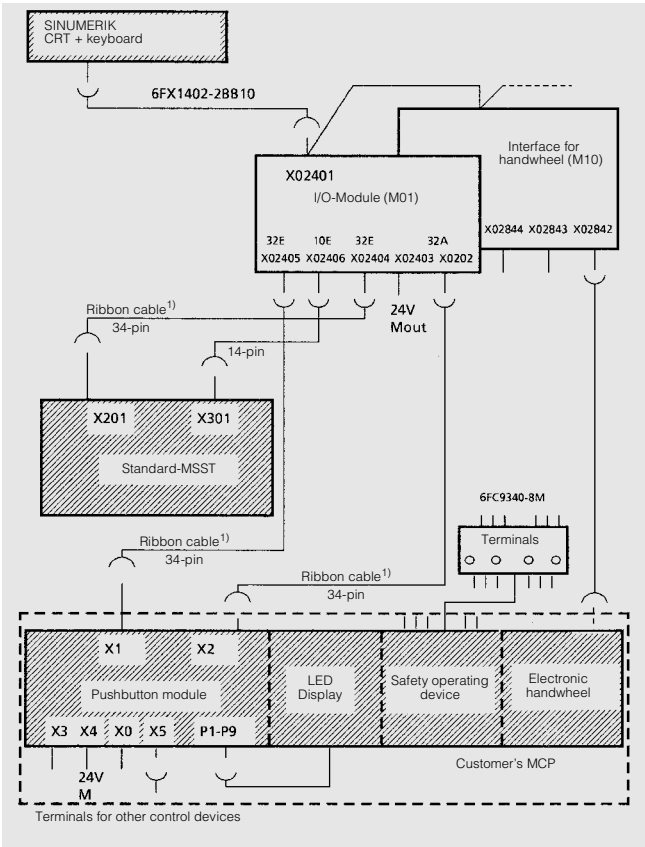
Technical specifications

External supply voltage	24 V DC
Power consumption	40 W
Permissible ambient temperature • in operation • in storage and transportation	 0 °C to +55 °C –40 °C to +70 °C
Degree of protection	IP 00
Dimensions (W × H × D)	279 mm × 81 mm × 100 mm

Ordering data

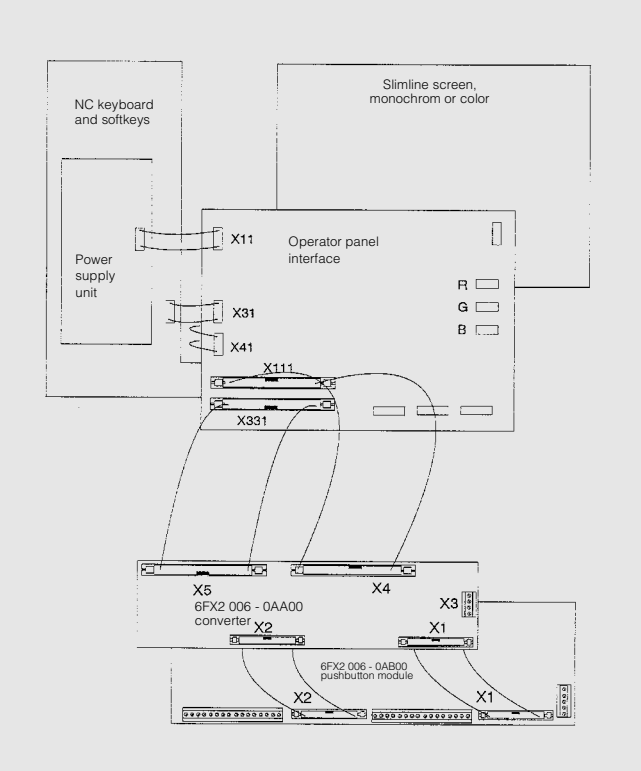
	Order No.
Pushbutton module	**6FX2 006 - 0AB00**
Indicator lights: (for S 2 to S 33)[1)] • Lamp socket • Light insert	 **AL5** **QXJN**
Pushbuttons or illuminated pushbuttons:[1)] • Momentary-contact switch 1 NC + 1 NO (always needed for S 2 to S 33) • Momentary-contact switch 2 NC + 2 NO (for S 1) • Pushbutton • Illuminated pushbutton	 **ATL** **ATL2** **QXJT** **QXJTLL**
Contact jumper for free sockets[1)]	**A0**
Cap for free sockets[1)]	**QX24**
Incandescent lamps 24 V, 1.2 W[1)] (for all light combinations)	**T5, 5K/24**
Ribbon cable (0.5 m) (ordering not required for SINUMERIK 840C)	**6FC9 340 - 8LY00 - 1AA5**

1) Order address: Fa. Georg Schlegel GmbH Elektronische Fabrik 88525 Dürmentingen/Federal Republic of Germany.
The pushbutton caps, light inserts and illuminated pushbuttons are available in colors: white, green, yellow, red and blue.
The color should be specified in plaintext on the order

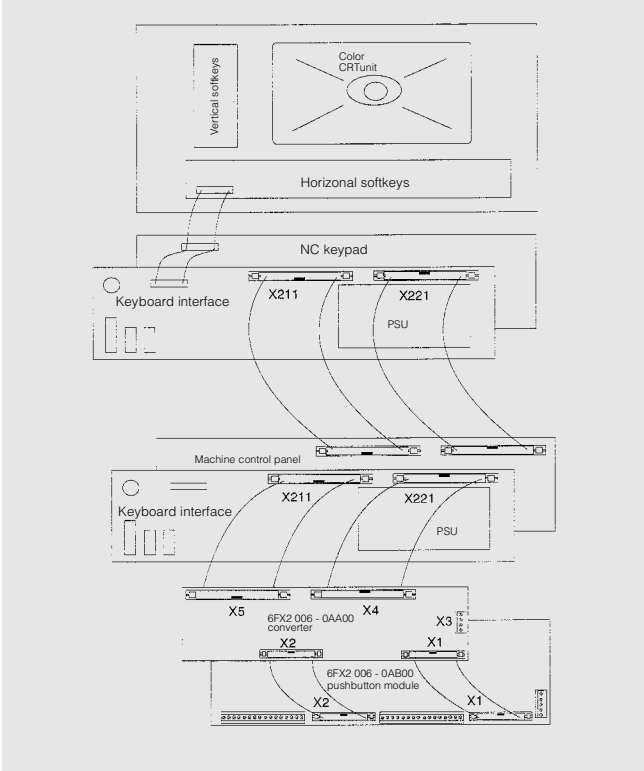


Block diagram of operator panel

Voltage converter module for SINUMERIK 840C



Connecting the pushbutton module via the operator panel interface



Connecting the pushbutton module via the keyboard interface

5

A voltage converter module UTS is required for connecting the pushbutton module (see page 5/31) to the SINUMERIK 840C controller. The voltage converter module is fitted to the rear of the pushbutton module with six spacer pins. The hardware is supplied with the module. This add-on assembly increases the overall height of the pushbutton module by 50 mm.

Technical specifications

External supply	24 V DC (-23 % +25 %)
Power dissipation	15 VA
Permissible ambient temperature • in operation • in storage and transportation	 0 °C to +55 °C –40 °C to +70 °C
Degree of protection	IP 00
Dimensions (W × H × D)	315 mm × 85 mm × 50 mm

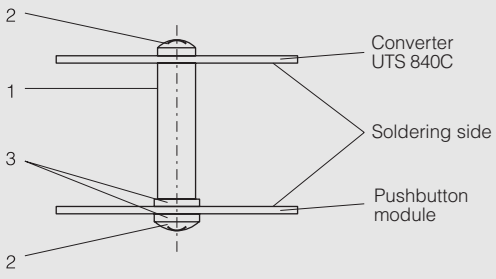
Ordering data

	Order No.
Voltage converter module	**6FX2 006 - 0AA00**

Features

- Matching of input/output signals of the keyboard interface to the signal level of the pushbutton module
- Signal decoupling and isolation via optocouplers.

The voltage converter module is connected to the pushbutton module and the keyboard interface via ribbon cable sets supplied with the module. When the slimline screen is used, the voltage converter module can be directly connected to the operator panel interface by means of the cable set provided. For connection to the keyboard interface, standard cable set 1 or 2 is needed.



1 6 spacer pins, metal M2.5 x 15
2 6 cylindrical cross-head screws M2.5 x 6
3 12 plastic U washers M2.5

Suggested assembly

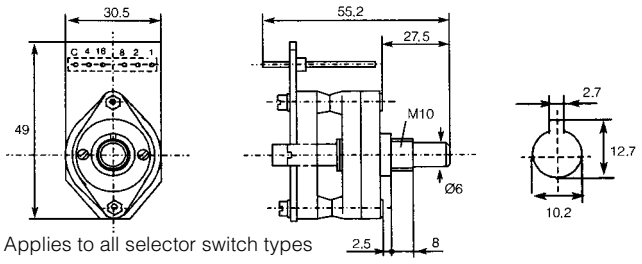
Application, design

The selector switches are of the same design as those of the Siemens SINUMERIK machine control panels and can be used in external customer control panels for the SINUMERIK 800 series. The signal complies with the Gray code and is evaluated in the controller according to the switch function. When the 6FC9 301-0CC20 rapid traverse override is used, a code conversion for the NC/PLC user interface is required in the PLC user program.
The switches are anthracite in color and are supplied with a suitable symbol disk (adhesive) and the necessary mounting hardware.

Technical specifications

Switching current	100 mA
Continuous current	1 A
Test voltage	200 V AC
Contact resistance	≤ 0.11 Ω
Contact material	Nickel, hard gold-plated contact surface
Contact base	Epoxy laminated paper
Contact life	≥ 25 × 10^3 Switching operations
Torque	≥ 0.09 Nm
Permissible ambient temperature	–40 °C to +85 °C

Dimensions (in mm)



Applies to all selector switch types

Ordering data

Type of selector switch	Angle of indexing mechanism	Switching stages	Max. indexing angle	Order No.
Axis selector switch	30°	8	210°	**6FC9 301 - 0DC20**
	15°	16	225°	**6FC9 301 - 0DD20**
Mode selector switch	15°	16	225°	**6FC9 301 - 0AE20**
Auxiliary axis selector switch	30°	8	210°	**6FC9 301 - 0CC20**
	15°	16	225°	**6FC9 301 - 0CD20**
Spindle speed override switch	15°	16	225°	**6FC9 301 - 0EC20**
Feedrate override switch	11.25°	23	247.5°	**6FC9 301 - 0BC20**

The selector switches can not be used in SINUMERIK 810D/840D and 802S; they can however be used for customized machine control panels.

5

Notes

Appendix

6

Information and Ordering in the Internet and on CD-ROM

A&D in the WWW

A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

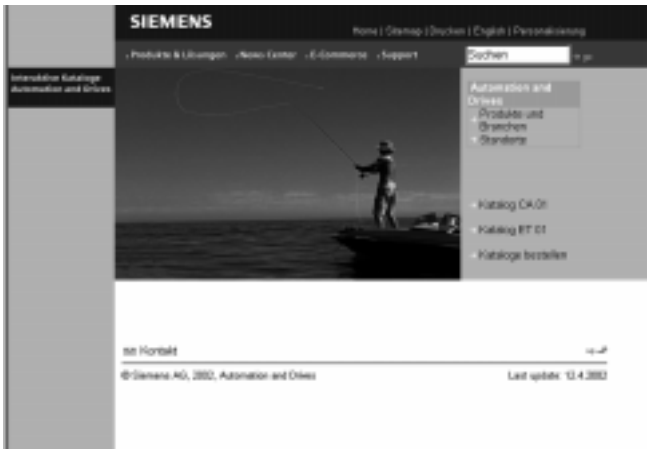
The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

http://www.siemens.com/automation

you will find everything you need to know about products, systems and services.

Product Selection Using the Interactive Catalogs



Detailed information together with convenient interactive functions:
The interactive catalogs CA 01 and ET 01 cover more than 80,000 products and thus provide a full summary of the Siemens Automation and Drives product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives.
All information is linked into a user interface which is easy to work with and intuitive.

After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the interactive catalogs can be found in the Internet under

http://www.siemens.com/automation/ca01

or on CD-ROM.

Automation and Drives, CA 01
Order No.:
E86060-D4001-A110-B7-7600

Electrical installation technology, ET 01
Order No.:
E86060-D8200-A107-A2-7600

Easy Shopping with the A&D Mall

The A&D Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the A&D Mall on the Internet under:

http://www.siemens.com/automation/mall

Who to contact

The follwing is a list of regional contact persons and their telephone numbers. Those contact persons not listed below continue to be responsible for their respective projects.

Germany

Aachen	Mr. Mengis	+49 (0) 241 451-216
Augsburg	Mr.Mr. Bunz	+49 (0) 821 2595-445
Bayreuth	Mr. Fleischer	+49 (0) 921 281-230
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Düsseldorf	Mr. Frank	+49 (0) 211 399-2496
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Kassel	Mr. Schäffer	+49 (0) 561 7886-325
Kempten	Mr. Hindelang	+49 (0) 831 5818-258
München	Mr. Geßwein	+49 (0) 89 9221-2531
Nürnberg	Mr. Ernst	+49 (0) 911 654-3896
Regensburg	Mr. Igl	+49 (0) 941 4007-277
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Stuttgart	Mr. Wissert	+49 (0) 711 137-2426
Ulm	Mr. Riek	+49 (0) 731 9450-336
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B	Brussels	Mr. Reckinger	+32 (2) 536 2434
CH	Zurich	Leitstelle	+41 (848) 822 844
CZ	Prague	Mr. Skop	+420 (2) 33 03 2450
	Brno	Mr. Urban	+420 (5) 4119 1733
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E	Tres Cantos	Mr. Wegmann	+34 (91) 514 7138
	Bilbao	Mr. Ugena Gallastegui	+34 (94) 439 5302
F	Caluire-et-Cuire	Mr. Franchino	+33 (4) 78 98 60 55
		Mr. Boyer	+33 (4) 78 98 60 89
	Lesquin	Mr. Etcheberry	+33 (3) 20 95 71 92
	Nantes	Mr. Foulgoc	+33 (2) 40 18 68 45
	Saint Denis	Mr. Burguière	+33 (1) 49 22 35 21
		Mr. Olivier	+33 (1) 49 22 35 49
	Strasbourg	Mr. Jung	+33 (3) 88 45 98 30
	Toulouse	Mr. Kutchukian	+33 (5) 34 50 55 24
		Mr. Malbert	+33 (5) 34 50 55 22
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H	Budapest	Mr. Joó	+36 (1) 471 1598
HR	Zagreb	Mr. Boscic	+385 (1) 6105 536
I	Milan	Mr. Moroni	+39 (02) 6676 2839
N	Oslo	Mr. Søvik	+47 (22) 63 4418
NL	AL The Hague	Mr. van der Kwaak	+31 (70) 333 35 36
P	Amadora	Mr. Mira	+351 (21) 417 8214
PL	Warsaw	Mr. Kurczewski	+48 (22) 870 9162
RO	Bucarest	Mr. Molcuti	+40 (1) 2027 467
RUS	Moscow	Mr. Hofmann	+7 (095) 737 2474
S	Upplands Vaesby	Mr. Fernstrøm	+46 (8) 728 1310
SR	Bratislava	Mr. Cizmazia	+421 (7) 5968 2411
SL	Ljubljana	Mr. Mlinsek	+386 (1) 4746 152
TR	Kartal-Istanbul	Mr. Aydan	+90 (216) 459-3459
YU	Belgrade	Mr. Milisavljevic	+381 (11) 630489

Overseas

AUS	Abbotsford	Mr. Eicher	+61 (3) 9417 2820
BR	Lapa -São Paulo	Mr. Prats Filho	+55 (11) 833 4906
CHN	Beijing	Mr. Peltz	+86 (10) 6472 1888
IDS	Jakarta	Mr. Aziz	+62 (21) 7919 7461
IND	Bangalore	Mr. Sharma	+91 (80) 852-1187
IRN	Tehran	Mr. Zohidi	+98 (21) 614 2221
ISR	Petah-Tiqva	Mr. Yitzhaki	+972 (3) 92 43344
JPN	Irumashi, Saitama	Mr. Nakao	+81 (42) 962 5466
KOR	Kyungnam	Mr. Park	+82 (55) 261 4872
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NSL	Auckland	Mr. Marwick	+64 (9) 274 1280
PAK	Karachi	Mr. Siddiqui	+92 (21) 257 3979
PHI	Makati City	Mr. Amando	+63 (2) 814 9679
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RSA	Halfway House	Mr. Barry	+27 (11) 652-3640
SIN	Singapore	Mr. Lee	+65 (7) 40 7764
TAI	Taichung	Mr. Wu	+886 (4) 261 9225
THA	Pathumathani	Mr. Laximinarayana	+66 (2) 993 7485
USA	Elk Grove Village	Mr. Tarr	+1 (847) 952 4114

Conditions of sale and delivery

For Export

Subject to the General Conditions of Supply and Delivery for products and services of the Electrical and Electronis Industry as well as to any other conditions agreed upon with the recipients of catalogs/price lists.

Export regulations

The products listed in this catalog/price list may be subject to European/German and /or U.S: export regulations.

Any export requiring approval must therefore be approved by the responsible authorities. The relevant information can be obtained from our order acknowledgements, delivery notes and invoices.
Export approval may also be required due to the purpose of use and final destination of the products.

Price data for cables by the meter:

Cables will be charged at the prices applicable on the day of delivery plus value-added tax. The prices for copper cables include a copper basis of € 153,39 for 100 kg copper.

The basis of calculation for the copper surcharge is the DEL stock exchange quotation for copper on the day before delivery, plus 1 % metal purchasing costs.
The selling price increases or decrease by the difference between the copper basis and the DEL quotation.

Pricing data for preassembled cables:

For preassembled cables, the copper prices is included in the overall price.

For Germany

Subject to the General Conditions of Sale and the General Conditions of Supply and Delivery for Products and Services of the Electrical and Electronics Industry as well as the Supply and Service Conditions for SINUMERIK.

Prices are quoted in € (euros) ex-works, excluding packaging.

Prices do not include sales tax (VAT), which is calculated separately at the appropriate rate according to the legal requirements.

■

The contents of the catalog, especially the technical data, dimensions and weights, are subject to change unless otherwise stated on the individual pages of the catalog.

The illustrations are for reference only.

We reserve the right to adjust prices and will charge the prices valid at the time of delivery.

General Notes:

The letters OEM are printed on the outer sheath of cable lengths ordered in excess of the maximum permissible length.
In such cases, however, Siemens AG will not provide warranty for signal transferability or performance.

Attention:
Technical specifications are for general informative purposes only. During installation, operation and maintenance, the Instruction Manuals and the information appearing on the products are to be adhered to at all times.

Fax form

Survey

If you have any suggestions for improvement, special wishes or points of criticism, please fill out this fax form or send us your comments per e-mail at the address given below.

We also appreciate positive feedback, i.e. if you find the catalog very good or good.

To

Siemens AG
A&D MC BMS
Postfach 3180
D-91050 Erlangen

Fax:

+49 (0) 91 31 98-11 45

E-Mail:

motioncontrol.docu@
siemens.com

Your address

Name

Function

Company/Department

Street/No.

Zip code/Town

Tel./Fax no.

We want to know what you think!

We would like you to view the NC Z Catalog as an important tool which you enjoy using. For this reason we are constantly striving to improve the catalog. That's why we would ask to take the time to fill out this mini-questionnaire and fax it to us.

Please indicate your personal evaluation of the following points: please mark with a cross

What is your overall impression of the new combined catalog for Cables, Connectors & System Components?

Do the contents correspond to your requirements?
If you have any suggestions for improvement, please enter them under "Comments".

Is it easy to find the information you require?

Are the contents written in a way which is easy to understand?

Are the Technical Specifications and dimension drawings suitable for your requirements?

Comments

Printing errors?

Type reference and Order No. index

Type reference and Order No. index

Type reference and Order No. index

Type reference and Order No. index

Appendix

Type reference and Order No. index

Preferred lenghts and general lenght codes

6FX_002 - ..... - ■ ■ ■0 and 6FC9 ... - ..... - ■ ■ ■0

cable, pre-assembled	**6FC 9 340 - ...Y00 - ■ ■ ■0**
cable, pre-assembled	**6FC 9 344 - ...Y00 - ■ ■ ■0**
cable, pre-assembled	**6FX■ 002 - . . . . . - ■ ■ ■0**

Length code:	
	1
	5
	7
	8
0 m	**1**
100 m	**2**
200 m	**3**
0 m	**A**
10 m	**B**
20 m	**C**
30 m	**D**
40 m	**E**
50 m	**F**
60 m	**G**
70 m	**H**
80 m	**J**
90 m	**K**
0 m	**A**
1 m	**B**
2 m	**C**
3 m	**D**
4 m	**E**
5 m	**F**
6 m	**G**
7 m	**H**
8 m	**J**
9 m	**K**

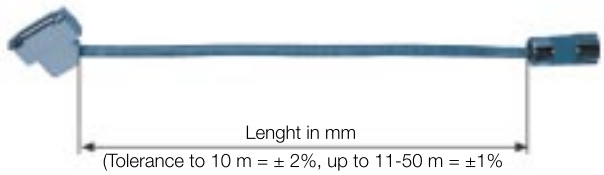
Example:	
1 m: ...	- 1AB0
8 m:	- 1AJ0
17 m:	- 1BH0
59 m:	- 1FK0
111 m:	- 2BB0
262 m:	- 3GC0

Fixed length for 6FX_002-....-1■■0

Order No. — **Length in m**

	1	2	5	7	10						
6FX2 002 - 1CA01 - 1■■0 ←	**AB**	**AC**	**AF**	**AH**							
6FX2 002 - 1CB01 - 1■■0	**AB**	**AC**	**AF**	**AH**							
6FX2 002 - 1CC00 - 1■■0		**AC**	**AF**								
6FX2 002 - 4EA04 - 1■■0			**AF**		**BA**						
6FX5 002 - 2CB11 - 1■■0			**AF**		**BA**						
6FX5 002 - 4AA11 - 1■■0			**AF**		**BA**						
6FX5 002 - 4AA31 - 1■■0			**AF**		**BA**						
6FX8 002 - 2CA41 - 1■■0			**AF**		**BA**						
6FX8 002 - 4AA21 - 1■■0			**AF**		**BA**						
6FX8 002 - 4AA41 - 1■■0			**AF**		**BA**						

Length definition for pre-assembled cables



(Tolerance to 10 m = ± 2%, up to 11-50 m = ±1%
Standard VG96927-4)

When determining the cable lengths for systems described in this catalog, please strictly observe the maximum technically permissible cable lengths listed in the connection diagrams, otherwise interferences may occur.

HF (high-frequency) clamp

To guarantee correct grounding, a ground clamp is optionally available together with the flanges for large-area discharging of high-frequency interferences.

Ordering data	**Order No.**
HF clamp for:	
• any signal connector	**6FX2 003 - 7FX00**
• power connector size 1	**6FX2 003 - 7FX00**
• power connector size 1.5	**6FX2 003 - 7GX00**
• power connector size 3	not required

Bending radii for MOTION-CONNECT signal cable

Minimum permissible bending radius, supplied by meter

cable fixed				cable moving			
	mm		mm		mm		mm
6FX5 008-		**6FX8 008-**		**6FX5 008-**		**6FX8 008-**	
		-1BD11	50			-1BD11	85
-1BD21	55	-1BD21	55	-1BD21	170	-1BD21	95
		-1BD31	60			-1BD31	95
-1BD41	55	-1BD41	55	-1BD41	170	-1BD41	90
-1BD51	60	-1BD51	60	-1BD51	180	-1BD51	100
		-1BD61	40			-1BD61	70
		-1BD71	35			-1BD71	55
		-1BD81	45			-1BD81	75

Conversion factors

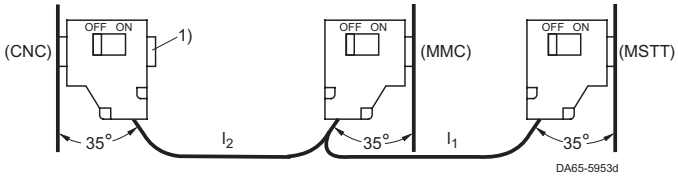
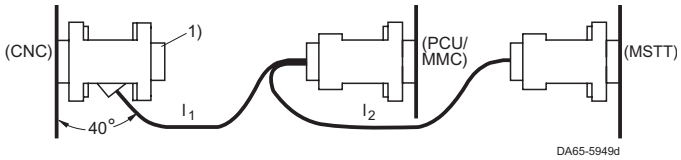
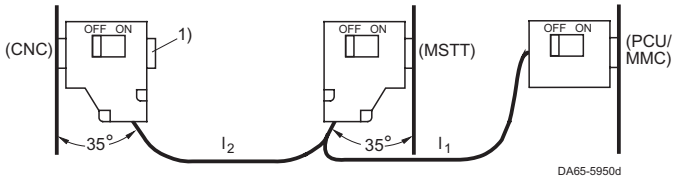
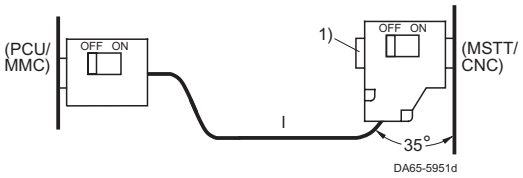
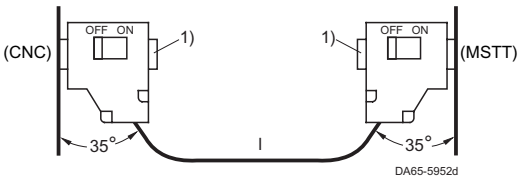
The following conversion factors are to be used when converting units given in the Metric system to Imperial measure.
Simply multiply the unit given in the Metric system by the corresponding factor in right hand column below to obtain the unit in Imperial measure, e.g. 10 m x 3.28 ft = 32.8 ft.

1 mm = 0.039 in
1 cm = 0.393 in
1 m = 3.28 ft/1.09 yd
1 km = 0.62 miles
0.1 kg = 3.5 oz
1 kg = 2.2 lb

In order to avoid system malfunctions please adhere strictly to the maximum permitted technical cable lengths given in the connection diagrams when determining cable lengths for systems described in this catalog.

MPI Cables

Pre-assembled

Ordering data		Order No.	
MPI bus cable with variable length (not for PCU 50) with 3 plugs • Trailing possible • Trailing not possible		**6FX2 002 - 4EA0 - 0** (2, 1) ▲	
Length l: l_1 l_2	1 m		
MPI bus cable with fixed length l_2 = 1 m trailing not possible with 3 plugs		**6FX2 002 - 4EA04 - 1 0** (A F, B A)	
Length l_1	5 m		
Length l_1	10 m		
Length l_2	1 m		
MPI bus cable with variable length with 3 plugs • Trailing possible • Trailing not possible		**6FX2 002 - 4EA80 - 0** **6FX2 002 - 4EA00 - 0** ▲	
Length l: l_1 l_2	1 m		
MPI bus cable with variable length with 2 plugs • Trailing possible • Trailing not possible		**6FX2 002 - 4EA88 - 0** **6FX2 002 - 4EA08 - 0** ▲	
Length l			
MPI bus cable with variable length with 2 plugs • Trailing possible • Trailing not possible		**6FX2 002 - 4EA87 - 0** **6FX2 002 - 4EA17 - 0** ▲	
Length l			

Cable sold by meter and Connector

Cable	Order No.
Bus cable	
• Trailing not possible, 2 cores shielded Minimum order quantity: 20 m	**6XV1 830-0AH10**
• Trailing possible 2 cores shielded Minimum order quantity: 20 m	**6XV1 830-0BH10**

Connector	Order No.
without PG cable gland	
• Cable outlet axial	**6GK1 500-0EA02**
• Cable outlet 35°	**6ES7 972-0BA11-0XA0**
• Cable outlet 35° (also for System 800)	**6ES7 972-0BA41-0XA0** **6FX2003-0AA02**
with PG cable gland	
• Cable outlet 35°	**6ES7 972-0BB11-0XA0**
• Cable outlet 35°	**6ES7 972-0BB41-0XA0**
• Cable outlet 35° (also for System 800)	**6FX2003-0AA03**

MSTT: machine control panel

OFF ON Terminator can be switched off

▲ Length code see page A/1

1) Connection socket for programming device or other device.

In order to avoid system malfunctions please adhere strictly to the maximum permitted technical cable lengths given in the connection diagrams when determining cable lengths for systems described in this catalog.

Preferred lenghts and general lenght codes

6FM1 490 - ■■■..

Length in m

Order No. 6FM1 490 - ■■■..

	0.5	2	5	10	18							
1 B■00		A	B	C	D							
1 C■00		A	B	C	D							
1 D■00		A	B	C	D							
1 E■00		A	B	C	D							
1 F■00		A	B	C	D							
1 K■00			B	C								
1 M■00		A	B	C	D							
1 PY00	1.5 m											
2 C■00			B									
2 G■00		A	B	C								
2 H■00		A	B									
3 B■00		A	B	C	D							
3 C■00		A	B	C	D							
3 D■00		A	B	C	D							
3 F■00		A	B	C	D							
3 J■00		A	B	C	D							
3 K■00		A	B	C	D							
4 A■00	S											
4 AT00	1.0 m											
5 A■00		A	B	C	D							
8 C■00		A										

6FM1 590 - ■■■00

Length in m

Order No. 6FM1 590 - ■■■00

	0.5	2	5	10	18	25	35	50				
1 C■01		A	B	C	D	E	F					
2 A■		A	B	C	D	E	F	G				
2 B■		A	B	C	D	E	F	G				
2 E■		A	B	C	D	E	F	G				
3 B■01		A	B	C	D							
3 F■01	A		B	C	D	E	F	G				
4 A■		A	B	C	D	E	F	G				
6 B■		A	B	C	D	E	F	G				
7 B■01		A	B	C	D							

6FM1 790 - ■■■00

Length in m

Order No. 6FM1 790 - ■■■00

	0.5	2	5	10	18							
1 B■			B	C	D							
1 C■		A	B	C	D							
1 E■			B	C								
1 G■		A	B	C	D							
1 H■		A	B									
1 J■	S	A										
2 A■		A	B	C	D							
2 B■		A	B	C								
2 C■		A	B	C								

6ES7 368 – 3 ..

Length code

Length standard:

- 1 m
- 2.5 m
- 5 m
- 10 m

6ES7 368 - 3BB01 - 0AA0
6ES7 368 - 3BC51 - 0AA0
6ES7 368 - 3BF01 - 0AA0
6ES7 368 - 3CB01 - 0AA0

6FX1 400 - ..■■■

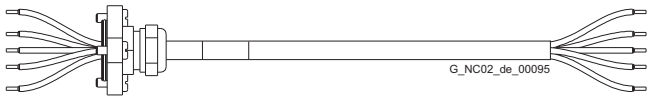
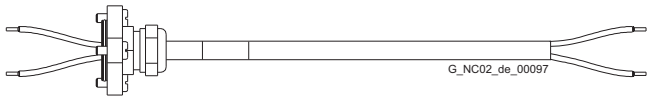
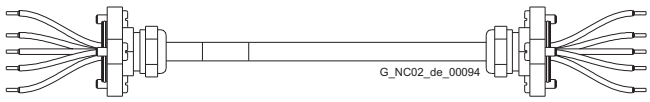
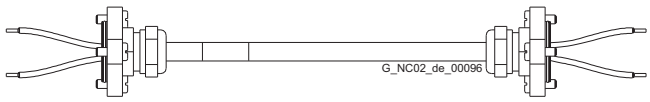
Length in m

Order No.

	2	5	10	15	18	20	25	30	35	50	75	100	200
6FX1 400 - 4 C■■■	C02	C05	C10										
7 C■■■		C05	C10										
6FX1 401 - 5 C■■■		C05	C10	C15				C30					
6 C■■■	C02	C05				C20	C25	C30	C35				
6FX1 402 - 6 C■■■			C10										
8 C■■■					C18								
6FX1 403 - 5 C■■■			C10	C15				C30					
6FX1 404 - 0 C■■■			C10	C15		C20							
1 C■■■	C02	C05	C10		C18		C25			C50			
3 C■■■	C02	C05	C10		C18		C25			C50			
6FX1 410 - 1 C■■■			C10	C15			C25						
2 C■■■		C05											

PROFIBUS-Cables

Pre-assembled, trailing possible

Ordering data	Order No.	
PROFIBUS DP-IN		
• 5 cores with flange on motor side	**6FX1 002 - 1AA01 - 1■■ 0**	
• 2 cores with flange on motor side	**6FX1 002 - 4EA01 - 1■■ 0**	
PROFIBUS DP-OUT		
• 5 cores with flange on both sides	**6FX1 002 - 1AA00 - 1■■ 0**	
• 2 cores with flange on both sides	**6FX1 002 - 4EA00 - 1■■ 0** ▲	

▲ Length code see page A/1

Cable sold by meter

Cable	Order No.
Bus cable	
IN/OUT	
• Trailing not possible, 2 cores shielded Minimum order quantity: 20 m	**6XV1 830-0AH10**
• Trailing possible, 2 cores shielded Minimum order quantity: 20 m	**6XV1 830-0BH10**
• 5 cores, sold by meter, for bus signales, Power supply: standard, PVC coated	**6ES7 194-1LY00-0AA0-Z** Z = Length determination (in m)

In order to avoid system malfunctions please adhere strictly to the maximum permitted technical cable lengths given in the connection diagrams when determining cable lengths for systems described in this catalog.

Appendix

Notes

Responsible for:

Technical contents:
Marco Pigato
Siemens AG, A&D MC BMS

Editing:
Siemens AG, A&D PT 5, Erlangen

Siemens AG
Automation and Drives
Motion Control Systems

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