Planning information

Information on system design

■ HF/HFD commutating reactor
The HF/HFD commutating reactor should be installed as near as possible to the line infeed module.

■ Line filter
The line filters are assigned to the line infeed modules and limit the noise faults emitted by the drive system. Together with the HF/HFD commutating reactor, the line filter should also be installed near the line infeed module, with the filter always on the line side. Since the connecting cables are subject to high interference levels, these cables must be laid with shielding. We generally recommend the use of the appropriate line filter products as listed in Catalog NC 60, Section 9.

■ Line filter package
The line filter and the HF/HFD commutating reactors are combined as a logistical unit in the form of line filter packages.

■ Infeed module
The infeed module must always be located on the left as the first module. It is followed by the main spindle drive modules (induction drive modules) and then the feed modules, which must be located next to the infeed module in descending order of rated current from left to right (highest rating on left, lowest on right).

■ NCU box for SINUMERIK 840D powerline
If the digital drive modules are used in conjunction with the SINUMERIK 840D powerline CNC control, the NCU box must be situated immediately to the right of the infeed module.

■ Drive module
The drive modules comprise the separate components of power section, control unit, device bus cable and, if applicable, drive bus cable as well as any optional module.

The permissible combinations of power module and control unit are given in Planning Tables 2 and 3. Depending on the heat dissipation method employed or the power module's size, additional ventilation components have to be ordered, or be provided by the user.

• Drive module with SIMODRIVE 611 universal HR
When this control unit is plugged into the power module, the user obtains a universally usable drive module for the various SIMODRIVE motors, such as 1FT6/1FK/1FN/1FE1 permanently excited synchronous motors, 1FW6 torque motors and 1PH/1LA induction motors.

The motors can also be operated on the 2-axis power modules if the power consumption demands it. Both analog setpoint specification and digital communication via PROFIBUS DP are possible. The permissible combinations of power module and SIMODRIVE 611 universal HR are given in Planning Table 2.

■ Capacitor module
The capacitor module should preferably be installed at the right end of the system group. The connection is made using the DC link busbars. Several capacitor modules can be connected in parallel depending on the mains supply used. The 20 mF module has a charging circuit and only 10 mF has to be taken into account at the charging limit.

■ Shielded connection plates
Shield connection plates are available for the infeed and power modules. The plates also accommodate mounting points for terminals for the brake connection.

■ Two-tier configuration
If space is limited, the SIMODRIVE 611 converter system modules can also be arranged on top of each other in two tiers.

The distance between the tiers must be greater than 200 mm (7.87 in). The location of the unit bus cable determines the maximum distance.

The modules with higher ratings and the infeed module must be installed in the top tier.

A connecting cable is required for the unit bus in the case of a two-tier configuration of the SIMODRIVE 611 converter system. A connecting cable for the drive bus is also required for the digital SIMODRIVE 611 drive groups.

In a two-tier configuration, the DC-link must be connected with parallel cables (max. length 5 m/16 ft 5 in). The conductor cross-section must be Cu 70 mm^2 for series-connected modules of 300 mm (11.81 in) in width and Cu 50 mm^2 for smaller modules. The cable must be laid short-circuit-proof and earth-fault-proof. An equipotential bonding conductor of the same cross sectional size is to be included in the circuit; this conductor must be in contact with the housing of both modules connected. DC-link adapter terminals are available for connecting the DC-link wiring.

The maximum configuration of a drive group is limited by the performance of the infeed module. Only one device bus extension is permissible: either to the left, e. g. for a second tier; or to the right, e. g. to bypass a cubicle panel.

■ Cabling
The cable cross-section of the DC link connection depends on the actual configuration of the SIMODRIVE 611 converter system, and must be dimensioned according to EN 60204.

All power cables, such as power supply, the connection between the I/RF module, the HF/HFD commutating reactor and line filter, and the motor leads, must be laid with shielding. The shields must have contact with ground over a wide area.

Mains infeed and drive modules as well as the commutating reactors and line filters must be fitted onto mounting plates with a low-resistance conductive surface (e. g. on zinc-plated support plates.

Operation with unregulated infeed

As a general rule the drive modules can be operated on both the unregulated and the regulated infeed modules of the SIMODRIVE 611 converter system. The configuring and performance data in this catalog refer to operation with the regulated infeed/regenerative feedback modules. This data may need to be adjusted for operation of drive modules on unregulated infeed modules.

- Operation of drive modules with 1PH/1FE1 motors on unregulated infeed

When main spindle drive modules are operated on the unregulated infeed (UI module), the maximum motor power available in the upper speed range is not as great as when the infeed/regenerative feedback module is used.

Since the DC link voltage is only 490 V [1] when the UI module is used, the available continuous output is given as follows:

If $\frac{U_{DC\ link}}{1.5 \cdot U_{rated}} < 1$ the continuous output is only permitted

$$P_{continuous} = \frac{U_{DC}}{1.5 \cdot U_{rated}}$$

$U_{DC\ link}$ 490 V for UI module
$U_{DC\ link}$ 600 V for I/RF module

When a UI module is used, it must also be ensured that the regenerated braking energy does not exceed the capability of the pulsed resistor module:

- Infeed module 5 kW
  200 W continuous rating
  10 kW short-time rating for 120 ms
  once per 10 s cycle without previous load
- Infeed module 10 kW
  300 W continuous rating
  25 kW short-time rating for 120 ms
  once per 10 s cycle without previous load
- Infeed module 28 kW
  max. 2 x 300 W continuous rating
  max. 2 x 25 kW short-time rating for 120 ms
  or once per 10 s cycle without previous load
  max. 2 x 1.5 kW continuous rating
  max. 2 x 25 kW short-time rating for 12 ms
  once per 10 s cycle without previous load

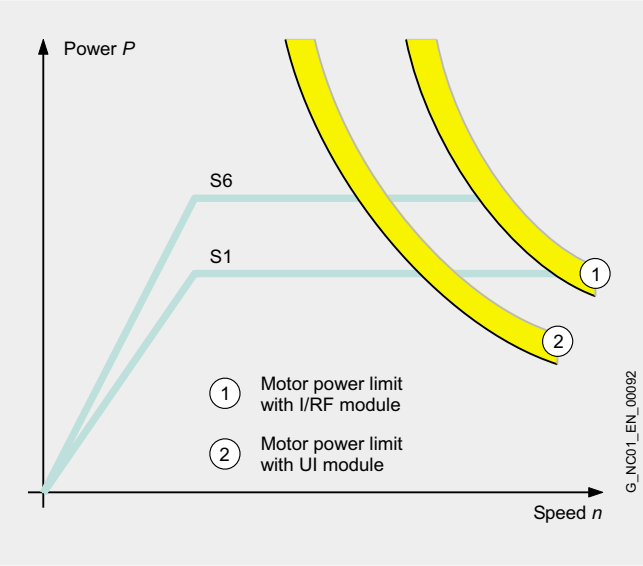
  For the 28 kW UI module, the pulsed resistors must be ordered separately and must be externally mounted.

With greater energy feedback values, a separate pulsed resistor module must be provided or the feedback power must be reduced by prolonging the braking times.

- Operation of drive modules with 1FT6/1FK/1FN motors with unregulated infeed

Owing to the lower DC link voltage of 490 V [1] with UI modules (600 V with I/RF modules), the following restrictions may apply:

- Reduction of dynamic drive characteristics in the upper speed range
- Lower utilization of motor rated speed if operation under overload is still required.



Speed-power graph

Planning of distributed drive system

Planning of the distributed drive system SIMODRIVE POSMO SI/CD/CA is consistent with that of the SIMODRIVE 611 drive system. The following factors must be taken into account when planning:

- The electronics supply is generated internally in the devices and does not therefore have to be considered separately when designing the line infeed. All drive modules include the control module and power module components, while the SIMODRIVE POSMO SI also includes the motor.
- The SIMODRIVE POSMO CA is designed for direct connection to the power supply and contains an unregulated line infeed of 5 kW. The continuous braking power is 150 W max.

For configuring the number of SIMODRIVE POSMO SI/CD units in a line, the maximum permissible cable lengths and the maximum permissible current over the power bus must be taken into account (cross-section = 6 mm^2), in accordance with the wiring configuration (according to VDE EN 602047/ IEC 602047-1 for configuration B2 and max. +40 °C/+104 °F= 29 A).

For each power bus line, the maximum permissible power is 16 kW.

For further planning information, see the user manual SIMODRIVE POSMO SI/CD/CA - Distributed drive technology on the PROFIBUS.

For SIMODRIVE POSMO SI/CD 9 A, for each unit a minimum DC link capacitance of 180 mF is required and for SIMODRIVE POSMO CD 18 A the minimum is 360 mF.

Calculated values for the maximum load rating of the SIMODRIVE 611 infeed modules are available on request.

1) With 400 V 3-phase AC -10% mains supply.

Drive dimensioning guide

Drive dimensioning guide

■ Dimensioning
With the SIMODRIVE 611 converter system, the DC link is included in the dimensioning calculations, thus allowing the following to be taken into account:

- Feed drives and main spindle drives to be retrofitted
- Higher DC link ratings for feed axes with continuous duty at rated torque and rated speed
- Feed axes in main spindle operation

■ Feed axes
In this case it must be noted that the DC link will be over-dimensioned if the motor outputs are simply added together

- Because experience has shown that the feed axes are not operated at rated torque and rated speed
- Because the feed drives are not normally all in operation at the same time

In the planning sheet for calculating the DC power link, these effects are taken into account by the speed ratio $\tilde{n}/n_{rated}$ (ratio of machining speed to rated speed) and the simultaneity factor K.

■ Power supply rating
In addition to the DC link power requirement, it is also necessary to check the power supply rating of the infeed and monitoring modules.
The required power supply rating depends on the:

- Size of the infeed/regenerative feedback modules
- Size of the drive modules
- Number of modules

The power supply rating can be calculated with Table 2 or 3.

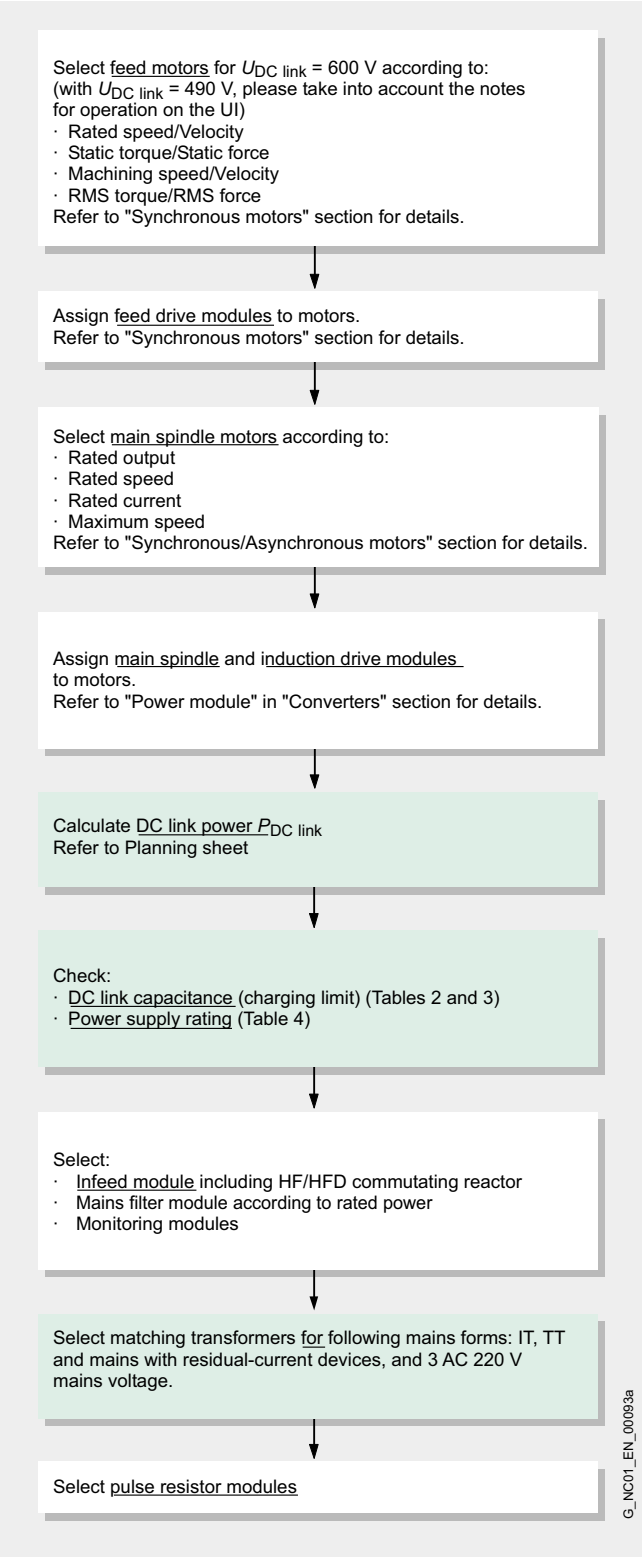
■ DC link capacitance
Every infeed module has a maximum value which restricts expansion of the DC link capacitors. It must be ensured that the DC link capacitance in the selected drive group is not exceeded (see Table 4).

■ Pulsed resistor module
Subject to certain conditions, several pulsed resistor modules can be connected in parallel (see Table 4).

■ Drive bus
The drive bus must not exceed a length of 11 m (36 ft 1 in).

■ Device bus
The device bus cable that passes through a drive group on an infeed or monitoring module must not exceed 2.1 m (6 ft 10 in) from the infeed point. In the two-tiered configuration, two device bus branches are possible, each with a maximum length of 2.1 m (6 ft 10 in) from the branch point at the infeed.

■ Line length
The total length of all motor cables including the mains cable of a drive group must be ≤ 350 m (1148 ft) when using shielded cables for infeed/regenerative-feedback modules in sinusoidal current mode, and ≤ 500 m (1640 ft) for I/RF modules in square-wave current mode as well as for UI modules.



Drive dimensioning guide

Standard applications

For a standard application, the following applies:

$P_{DC\ link} = P_{DC\ link\ FDD} + P_{DC\ link\ MSD}$

$P_{DC\ link} \leq P_{continuous\ infeed\ module}$

■ Feed axes

The following formula is applied in the planning sheet to determine the calculated power:

$P_{calc\ FDD} = 0.105 \cdot M_0 \cdot n_{rated} \cdot 10^{-3}$ [kW]

$P_{calc\ FDD}$	Calculated power for feed axes [kW]
0.105	Factor $2 \cdot \pi/60$
M_0	Stall torque [Nm]
n_{rated}	Rated speed [rpm]

■ Feed axes with linear motors

$P_{calc\ FDD} = F_{rated} \cdot V_{MAX,\ F_{rated}} \cdot 10^{-3}$ [kW]

F_{rated}	Rated force [N]
$V_{MAX,\ F_{rated}}$	Maximum speed at rated force [m/min]

The DC link power $P_{DC\ link\ FDD}$ of the feed axes is calculated with the aid of the planning sheet. The following factors must be taken into account:

- Speed ratio $\tilde{n}/n_{rated}$
- Simultaneity factor K for the feed axes per range

If the exact values of speed ratio $\tilde{n}/n_{rated}$ and simultaneity factor K are known for the application in question, these should be used.

■ Main spindles

The following formula is applied to determine the required calculated power for main spindle drives:

Motors $\leq$ 4 kW

$P_{DC\ link\ MSD} = 1.45 \cdot P_{motor\ shaft\ MSD}$ [kW]

Motors $>$ 4 kW

$P_{DC\ link\ MSD} = 1.25 \cdot P_{motor\ shaft\ MSD}$ [kW]

$P_{DC\ link\ MSD}$	DC link power for main spindle drive [kW]
1.45 or 1.25	factor takes into account the efficiency of the motor
$P_{motor\ shaft\ MSD}$	mechanical power [kW] taken on the motor shaft of the main spindle motor

The rated motor current must not exceed the rated output current of the power modules. The maximum motor current must always be less than the maximum converter current.

Dynamic operation

The peak infeed power must also be calculated for applications that are especially critical with regards to power.

■ Feed axes

The peak infeed power expected for feed axes is calculated according to the following formula:

$P_{P\ FDD} = 0.6\ U_{DC\ link} \cdot I_{max} \cdot \tilde{n}/n_{rated} \cdot 10^{-3}$ [kW]

$P_{P\ FDD}$	Peak infeed power (calculated) [kW] for feed axes
0.6	empirical factor: takes into account DC link energy and e.m.f. of the motor
$U_{DC\ link}$	DC link voltage [V] (600 V)
I_{max}	Peak current set [A] set at an axis
$\tilde{n}/n_{rated}$	Maximum speed of the axis referred to the rated speed of the motor

■ Feed axes with linear motors

$P_{P\ FDD} = F_{MAX} \cdot V_{MAX,\ F_{MAX}} + (I_{MAX}/I_{rated})^2 \cdot P_{Vrated}$ [kW]

$\approx 0.5 \ldots 0.9 \cdot U_{DC\ link} \cdot I_{MAX} \cdot \bar{v}/V_{MAX,\ F_{MAX}} \cdot 10^{-3}$ [kW]

F_{MAX}	Maximum force [N]
$V_{MAX,\ F_{MAX}}$	Maximum speed at maximum force [m/min]
I_{rated}	Peak current [A] set at an axis
$\bar{v}/V_{MAX,\ F_{MAX}}$	Maximum traversing speed of the axis with reference to the maximum speed at maximum force

■ Main spindles

The peak infeed power expected for main spindles is calculated according to the following formula:

Motors $\leq$ 4 kW

$P_{P\ MSD} = 1.45 \cdot P_{P\ motor\ shaft\ MSD}$ [kW]

Motors $>$ 4 kW

$P_{P\ MSD} = 1.25 \cdot P_{P\ motor\ shaft\ MSD}$ [kW]

$P_{P\ MSD}$	Peak infeed power (calculated) for main spindles [kW]
1.25 or 1.45	factor takes into account the efficiency of the motor
$P_{P\ motor\ shaft\ MSD}$	Mechanical power [kW] taken on the motor shaft of the main spindle motor

The sum of $P_{P\ FDD}$ and $P_{P\ MSD}$ must be calculated for all feed axes and main spindles that are operated simultaneously. This calculated power must be less than the peak power of the infeed/regenerative feedback module.

Braking operation

Regarding the braking operation of the motors, check that the energy fed back to the DC link does not exceed the permissible peak load capability of the feedback converter. The peak feedback power of the drive group is calculated as follows:

$P_{RF} \leq 0.9 \cdot (\Sigma\ P_{P\ FDD} + P_{P\ MSD})$

P_{RF}	Peak regenerative feedback power

Planning sheet for calculating the DC link power $P_{DC\ link}$

Axis des.	Order No. of the motor	n_{rated} [rpm]	M_0 [Nm]	I_{rated} [A]	I_0 (PS) [A]	$P_{calcFDD}$ [kW] 1)	$\tilde{n}/n_{rated}$	$P_{calcFDD}$ ($\tilde{n}/n_{rated}$) [kW]
Range I for $P_{calc\ FDD}$ from 0 ... 1.8 kW								
1								
2								
3								
4								
5								
6								
						Sum Range I		
Range II for $P_{calc\ FDD}$ from 1.8 ... 8.8 kW								
1								
2								
3								
4								
5								
6								
						Sum Range II		
Range III for $P_{calc\ FDD}$ from 8.8 ... 27 kW								
1								
2								
3								
4								
5								
6								
						Sum Range III		

		K_I					
Sum Range I		x		=			
		K_{II}			+		
Sum Range II		x		=			
		K_{III}			+		
Sum Range III		x		=			

	x 1.1 =	**DC link power $P_{DC\ link\ FDD}$**	kW
+		**DC link power $P_{DC\ link\ MSD}$**	kW
=		**DC link power $P_{DC\ link}$**	kW

Application	Speed ratio $\tilde{n}/n_{rated}$
Feed drives Robot drives	0.4 ... 0.7 0.9 ... 1
Main spindle drives with 1FT	1

Feed axes for each range	Simultaneity factor K for each
1	1
2	0.63
3	0.5
4	0.38
5	0.33
6	0.28

1) See technical specifications for the motors.

DC link

The maximum possible rating of the DC link is 120 kW. The link charging limits must be observed (Table 1). Only one infeed/regenerative feedback module or one unregulated infeed module is permitted per SIMODRIVE 611 network.

- Checking DC link capacitance

The total DC link capacitance (Table 4) of all modules must be equal to or less than the charging limit (Table 1) of the infeed modules.

- Precharging DC link frequency

$$\text{Number of precharges within 8 min} = \frac{\text{Charging limit of infeed module [µF]}}{\Sigma\ \text{DC link capacitance of configured drive group [µF]}}$$

Planning table 1: Charging limits of infeed modules

DC link power $P_{DC\ link}$ kW	Peak power kW	Infeed module Order No.	Charging limit µF
Infeed, unregulated			
≤ 5	10	**6SN11 46-1AB0.- 0BA1**	1200
≤ 10	25	**6SN11 45-1AA0.- 0AA1**	6000
≤ 28	50	**6SN11 4.-1AA0.- 0CA0**	20000
Infeed/regenerative feedback module, regulated			
≤ 16	35	**6SN11 4.-1BA0.- 0BA1**	6000
≤ 36	70	**6SN11 4.-1BA0.-0CA1**	20000
≤ 55	91	**6SN11 4.-1BA0.-0DA1**	20000
		6SN11 4.-1BB0.-0DA1	20000
≤ 80	131	**6SN11 4.-1BB0.-0EA1**	20000
≤ 120	175	**6SN11 4.-1BB0.-0FA1**	20000

Table 1

Checking the permissible power supply rating

The infeed or monitoring module offers a basic power supply rating for the electronics points (EP) and activation points (AP).

The power supply requirement of a drive group is calculated with Table 4.

Enter the number of all modules in use. Form the product of "Assessment factor single module" and "Number of modules".

If one of these values is exceeded, an (additional) monitoring module must be provided. In this case, Table 4 must be applied again to the module grouping being supplied by the monitoring module.

The monitoring module must be mounted to the left of the modules to be monitored.

Number of pulsed resistor modules

The maximum number of pulsed resistor modules depends on the DC link capacitance of the drive configuration in question. One pulsed resistor module can be installed for every full 500 µF of DC link capacitance.

Only the DC link capacitance of the coupled power modules or special modules need to be taken into consideration for those UI modules that already contain a pulsed resistor unit. If the pulsed resistor unit can be switched off, the internal DC capacitance can be included in determining the dimensions of the pulsed resistor module.

Planning tables 2 to 4

Extension of the DC link with capacitor modules for dynamic processes and buffering of power failures

The following applies to the energy in the case of a braking or acceleration process of a drive from one speed to another within the time t_p:

$$w = ½ \cdot P \cdot t_p$$

For rotary drives with:

$$P = \frac{M_{Mot} \cdot (n_{Mot\ max} - n_{Mot\ min})}{9550} \cdot \eta_{tot}$$

For linear drives with:

$$P = F_{Mot} \cdot (V_{Mot\ max} - V_{Mot\ min}) \cdot 10^{-3} \cdot \eta_{tot}$$

Braking with: $\eta_{tot} = \eta_M \cdot \eta_{inv}$

Acceleration with: $\eta_{tot} = 1 / (\eta_M \cdot \eta_{inv})$

w	Energy [Ws]
P	Motor power [kW]
t_p	Time of process [s]
M_{Mot}	Motor torque when braking or accelerating [Nm]
F_{Mot}	Motor force when braking or accelerating [N]
$n_{Mot\ max}$	Maximum speed at beginning or end of process [rpm]
$n_{Mot\ min}$	Minimum speed at beginning or end of process [rpm]
$V_{Mot\ max}$	Maximum velocity at beginning or end of process [m/s]
$V_{Mot\ min}$	Minimum velocity at beginning or end of process [m/s]
η_{tot}	Total efficiency
η_M	Motor efficiency
η_{inv}	Inverter efficiency

The torque M and the force F which occur depend on the moved masses, the load, and the acceleration in the system. If no exact data are available, the rated data are often used as substitutes.

With the capacitor modules, the charging limit of the infeed modules must not be exceeded.

For the 20 mF capacitor module, 10 mF must be used as the charging limit due to the charging circuit.

Planning table 2: Drive modules with SIMODRIVE 611 universal HR/universal E HR

SIMODRIVE 6SN11 power modules, type	Weighting factors								DC link capacitance
	SIMODRIVE 611 universal HR				*SIMODRIVE 611 universal E HR*				
	6SN1118-				6SN1118-				
	- .NJ01	- .NK01	- .NH01		- .NH11				µF
Single-axis version									
6SN11 2.-1AA00-0HA1	EP 1.1 AP 1.7	EP 1.4 AP 2.0	EP 1.5 AP 2.0		EP 1.5 AP 2.6				75
6SN11 2.-1AA00-0AA1	EP 1.1 AP 1.7	EP 1.4 AP 2.0	EP 1.5 AP 2.0		EP 1.5 AP 2.6				75
6SN11 2.-1AA00-0BA1	EP 1.1 AP 1.7	EP 1.4 AP 2.0	EP 1.6 AP 2.0		EP 1.6 AP 2.6				110
6SN11 2.-1AA00-0CA1	EP 1.1 AP 1.7	EP 1.4 AP 2.0	EP 1.6 AP 2.0		EP 1.6 AP 2.6				330
6SN11 2.-1AA00-0DA1	EP 1.2 AP 1.7	EP 1.4 AP 2.0	EP 1.7 AP 2.0		EP 1.7 AP 2.6				495
6SN11 2.-1AA00-0LA1	EP 1.7 AP 1.8	EP 1.7 AP 2.1	EP 1.7 AP 2.1		EP 1.7 AP 2.7				990
6SN11 2.-1AA00-0EA1	EP 2.7 AP 1.8	EP 2.7 AP 2.1	EP 2.7 AP 2.1		EP 2.7 AP 2.7				990
6SN11 2.-1AA01-0FA1	EP 2.7 AP 1.9	EP 2.7 AP 2.1	EP 2.7 AP 2.1		EP 2.7 AP 2.7				2145
6SN11 2.-1AA00-0JA1 [1]	EP 1.3 AP 1.9	EP 1.5 AP 2.1	EP 1.7 AP 2.1		EP 1.7 AP 2.7				2145
6SN11 2.-1AA00-0KA1 [1]	EP 1.4 AP 1.9	EP 1.6 AP 2.1	EP 1.8 AP 2.1		EP 1.8 AP 2.7				4290
6SN11 23-1AA02-0FA1 [1]	EP 1.3 AP 1.9	EP 1.5 AP 2.1	EP 1.7 AP 2.1		EP 1.7 AP 2.7				2145
Two-axis version									
6SN11 2.-1AB00-0HA1	EP 1.3 AP 2.1	EP 1.5 AP 2.4	EP 1.6 AP 2.4		EP 1.6 AP 3.0				150
6SN11 2.-1AB00-0AA1	EP 1.4 AP 2.1	EP 1.7 AP 2.4	EP 1.7 AP 2.4		EP 1.7 AP 3.0				150
6SN11 2.-1AB00-0BA1	EP 1.6 AP 2.1	EP 1.8 AP 2.4	EP 1.8 AP 2.4		EP 1.8 AP 3.0				220
6SN11 2.-1AB00-0CA1	EP 1.7 AP 2.1	EP 1.8 AP 2.4	EP 1.8 AP 2.4		EP 1.8 AP 3.0				660

Table 2

Weighting factors of individual modules for the electronics points (EP) and activation points (AP) as well as permissible combinations of power modules and control units (analog).

Only combinations with entered EP and AP values are permissible.

The data for the weighting factors EP and AP refer to the approved encoder cable lengths.

Transfer the values to Table 4.

■ SIMODRIVE 611 universal HR with options

- PROFIBUS DP
  Add 0.6 activation points
- Terminal module
  No additional electronics/activation points

■ SIMODRIVE 611 universal HR/universal E HR with options

- Absolute encoder with EnDat
  Add 0.4 electronics points for each encoder

1) With built-on fan or hose cooling.

Planning table 3: Drive modules with digital setpoint interface

SIMODRIVE 6SN11 power modules, type	Weighting factors						
	Control unit, digital						DC link capacitance
	Single-axis version High-Performance closed-loop control 6SN1118-		Two-axis version High-Performance closed-loop control 6SN1118-		Two-axis version High-Standard closed-loop control 6SN1118-		
	- 0DJ21	- 0DJ23	- 0DK21	- 0DK23	- 0DM31	- 0DM33	µF
Single-axis version							
6SN11 2.-1AA00-0HA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	75
6SN11 2.-1AA00-0AA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	75
6SN11 2.-1AA00-0BA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	110
6SN11 2.-1AA00-0CA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	330
6SN11 2.-1AA00-0DA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	495
6SN11 2.-1AA00-0LA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	990
6SN11 2.-1AA00-0EA1	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	990
6SN11 2.-1AA01-0FA1	EP 1.75 AP 1.85	EP 1.75 AP 2.2			EP 1.75 AP 1.85	EP 1.75 AP 2.2	2145
6SN11 2.-1AA00-0JA1 1)	EP 1.5 AP 2.1	EP 1.5 AP 2.45			EP 1.5 AP 1.85	EP 1 AP 2.2	2145
6SN11 2.-1AA00-0KA1 1)	EP 1.5 AP 2.1	EP 1.5 AP 2.45			EP 1.5 AP 1.85	EP 1 AP 2.2	4290
6SN11 23-1AA02-0FA1 1)	EP 1 AP 1.85	EP 1 AP 2.2			EP 1 AP 1.85	EP 1 AP 2.2	2145
Two-axis version							
6SN11 2.-1AB00-0HA1			EP 1 AP 2.8	EP 1 AP 3.4	EP 1 AP 2.8	EP 1 AP 3.4	150
6SN11 2.-1AB00-0AA1			EP 1 AP 2.8	EP 1 AP 3.4	EP 1 AP 2.8	EP 1 AP 3.4	150
6SN11 2.-1AB00-0BA1			EP 1 AP 2.8	EP 1 AP 3.4	EP 1 AP 2.8	EP 1 AP 3.4	220
6SN11 2.-1AB00-0CA1			EP 1 AP 2.8	EP 1 AP 3.4	EP 1 AP 2.8	EP 1 AP 3.4	660

Table 3

Weighting factors for electronics points (EP) and activation points (AP) as well as permissible combinations of power modules and control units (digital).
Only combinations with entered EP and AP values are permissible.
The data for the weighting factors EP and AP are related to the approved encoder cable lengths.

Transfer the values to Table 4.

■ Absolute encoder with EnDat interface

- Add 0.5 electronics points for each absolute encoder
- SSI encoders require an external power supply, so additional electronics/activation points do not apply

1) With built-on fan or hose cooling.

Planning table 4: Summary of the weighting factors

		Electronics points (EP)			Activation points (AP)			DC link capacitance		
		Weighting factor single module	No. of modules	Product	Weighting factor single module	No. of modules	Product	µF	No. of modules	Product
SIMODRIVE 611										
UI module	5 kW/10 kW	0.3	x 1 =		-	x 1 =		150	x 1 =	
	10 kW/25 kW	0.5			0.5			440		
	28 kW/50 kW	0.5			0.5			990		
I/RF module	16 kW/21 kW	0.5			0.5			495		
	36 kW/47 kW	0.5			0.5			990		
	55 kW/71 kW	0.5			0.5			2145		
	80 kW/131 kW	1			0.75			2145		
	120 kW/175 kW	1			0.75			4290		
Monitoring module		0			0			75 [1]	x =	
Capacitor module		2.8 mF	0		0	x =		2800	x =	
		4.1 mF	0		0	x =		4100	x =	
		20.0 mF	0		0	x =		10000 [5]	x =	
Pulsed resistor module		0.2	x =		0.1	x =		75	x =	
HLA module		1.5 [2]	x =		1.5	x =		0		
Power module with control unit for FDD/MSD (values from Table 3)			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
Power module with SIMODRIVE 611 universal HR (values from Table 2)			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
			x =			x =			x =	
SIMODRIVE POSMO SI/CD	9 A	0			0			On request		
SIMODRIVE POSMO CA	18 A	0			0			On request		
SINUMERIK 810D powerline [3]										
incl. integrated power sections CCU box 3PS with CCU 3		2	x =		4.5	x =		660		
CCU box 2PS with CCU 3		2	x =		4.5	x =		220		
SINUMERIK 840D powerline with								0		
NCU 561.4	6FC5 356-0BB12-0AE0	1	x =		3.8	x =				
NCU 571.4	6FC5 357-0BB12-0AE0	1	x =		3.8	x =				
NCU 572.4	6FC5 357-0BB23-0AE0	1	x =		3.8	x =				
NCU 573.4	6FC5 357-0BB34-0AE1	2.3	x =		5 (5.4) [4]	x =				
NCU 573.5	6FC5 357-0BB35-0AE0	2.3	x =		5 (5.4) [4]	x =				
		Sum of electronics points Maximum value 8		EP	Sum of activation points Maximum value 17		AP	Total DC link capacitance		
The following applies for the 5 kW UI: max. 3.5 EP and max. 7 AP. But with 6SN1118-0AA11-0AA0 control units, max. 3 EP.		Maximum value 3.5 (3)			Maximum value 7					

Table 4

1) When power is only supplied from the DC link (no ACinfeed), 1000 mF must be used for calculating the charging limit.

2) When both axes are used with absolute encoders, 2 EPs must be included.

3) For each absolute encoder with EnDat interface that is connected, 0.3 AP must be added.

4) Value 5.4 applies to NCU 573.4/573.5 with link module.

5) 10 mF due to charging circuit.