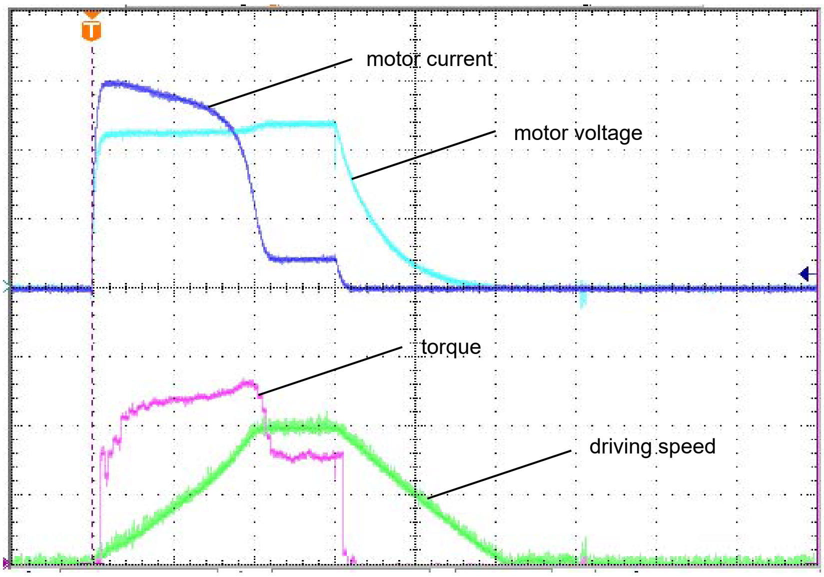
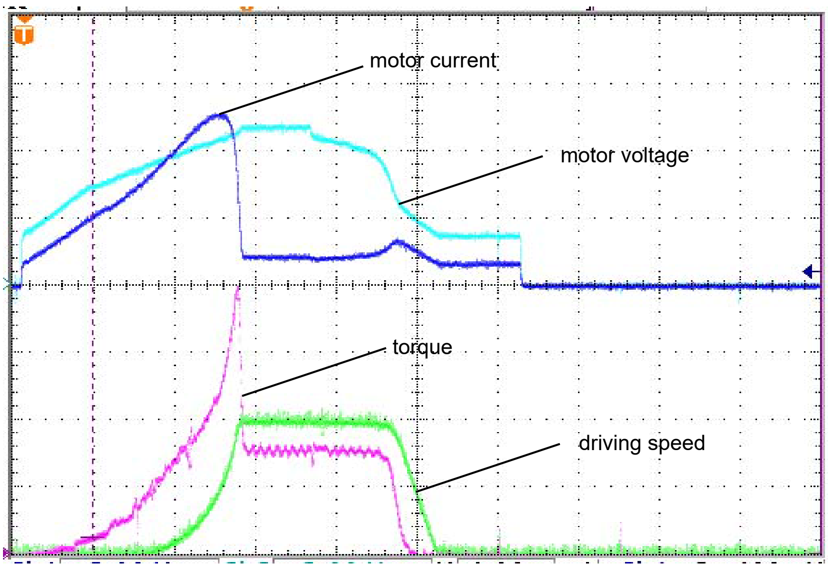
All data sheets and commissioning instructions are available on our homepage at
www.peter-electronic.com.

Configuration Instructions

The two following diagrams for an 11kW-drive operated at nominal load show the waveforms of electrical and mechanical quantities of the drive during the ramp-up phase, both with and without soft starter:



Ramp-up of the three-phase asynchronous motor directly connected to the mains (at nominal load)



Ramp-up of a three-phase asynchronous motor with soft starter (at nominal load)

Both groups of curves show the complete acceleration and deceleration phase.

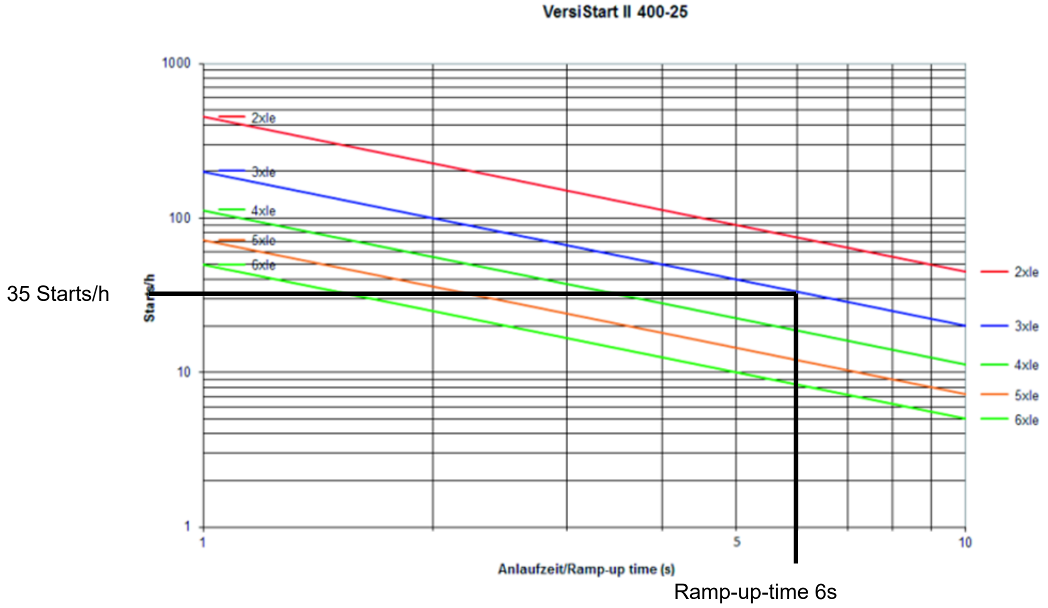
In this connection, especially the waveform of the current during ramp-up with a soft starter is of interest. Depending on the adjusted starting voltage (boost), the current increases more or less steeply until nominal speed is reached. For the following load diagrams (thermal load), the mean value of that current is to be used which is formed by the current flowing at the starting point and the current flowing when nominal speed is reached (see example).

The following diagrams show how the maximum starting frequency (in starts per hour) depends on the ramp-up time and the mean starting current flowing during ramp-up.
The curves represent the thermal ratio oft he heat generated in the power semiconductors and the possible dissipation of heat by the integrated heat sinks, i.e., a high starting frequency in combination with a large mean starting current causes intense heating by the power demiconductors. If, in addition, a long ramp-up time is required for the starting operation, the number of starts possible within a certain unit of time reduces accordingly.

The following example is to explain how to select a soft starter:

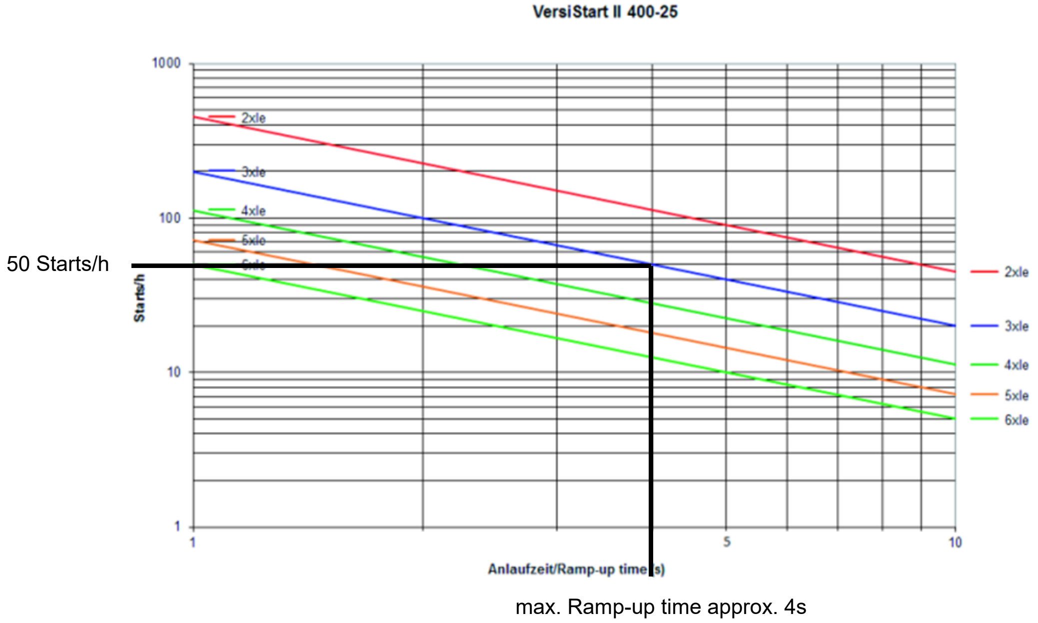
Assumption:	motor shaft power:	11kW
	nominal/rated motor current:	21,7A
	max. ramp-up time:	6s
	mean starting current to be expected:	65A (no high-inertia starting)
	max. starting frequency:	50 starts/h

In compliance with the power rating of the motor, a **VersiStart II 400-25** soft starter is selected (acc. to the data sheet it is suitable for 11kW motors, I_e = 25A).
However, when checking the number of starts per hour possible with this device under these conditions, it turns out that this device is not suitable:



When dividing the starting current of 65A to be expected by the nominal current of 25A of the soft starter **VersiStart II 400-25**, this gives approx. **3 x I_e** (65A/25A) of the soft starter. Consequently, a maximum starting frequency of 35 starts per hour is permissible for this device, i.e., in this case **VersiStart II 400-25** would be overloaded.

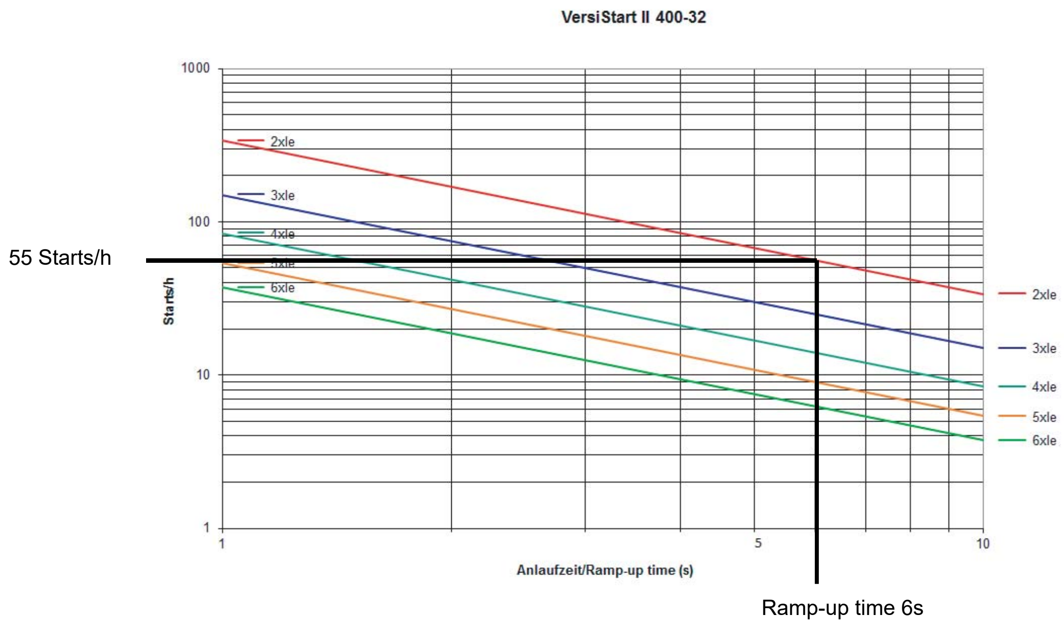
This is only possible by reducing the ramp-up time. As demonstrated by the two below diagrams, the ramp-up time maximally possible for the application of a **VersiStart II 400-25** would be approx. 4s.



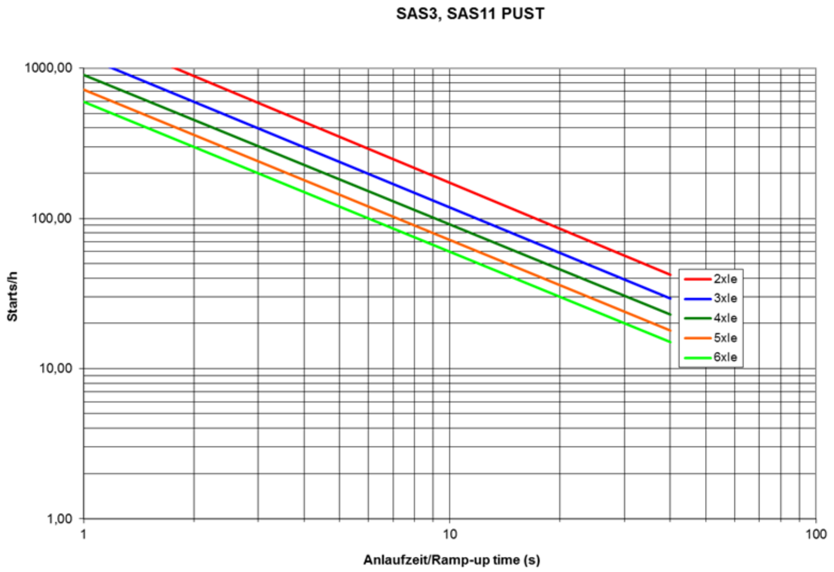
If it is due to technological reasons not possible to go below the specified ramp-up time of 6s, a device that complies with the requested parameters has to be used.

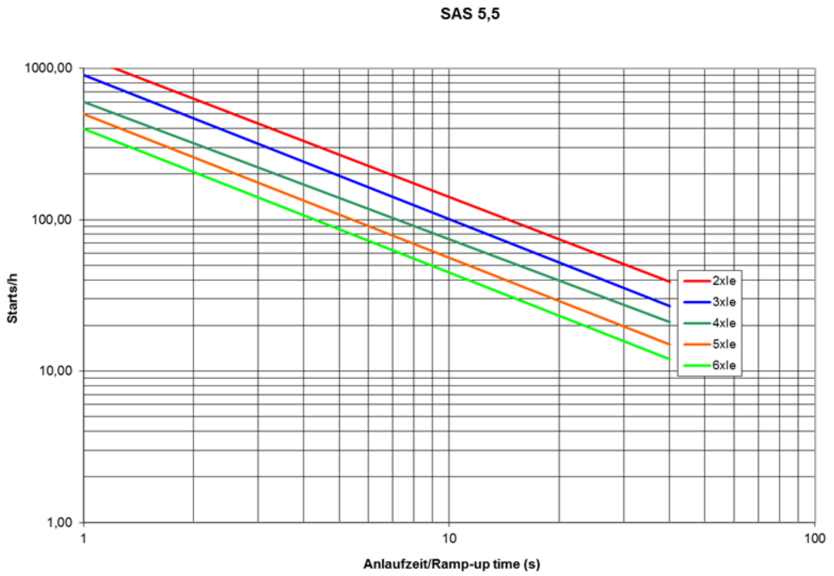
When looking at the characteristic curves, it becomes clear that, for this case of application, a **VersiStart II 400-32** is suitable. With a twofold nominal current of the soft starter, i.e., **2 x I_e** (65A/32A), and a ramp-up time of 6s, this device has a starting frequency of approx. 55 starts/h.

Since only 50 starts/h are required, this device is optimally designed to withstand the most the most unfavorable thermal loading.

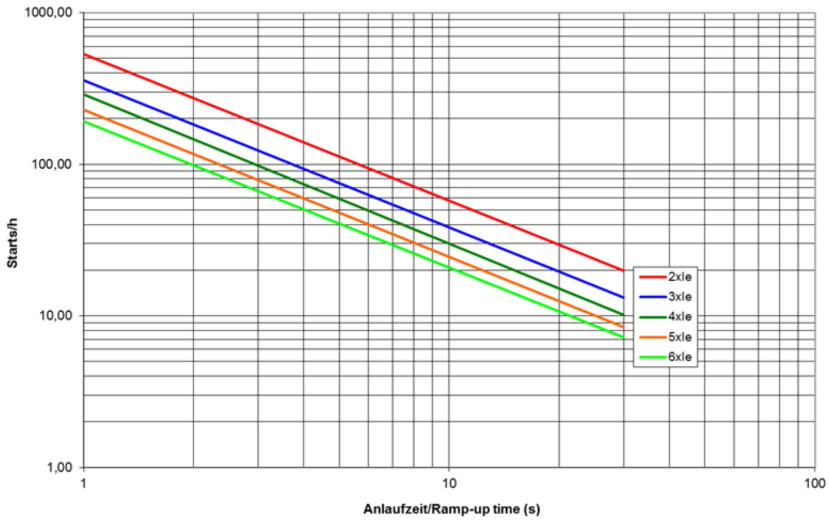


Load diagrams:

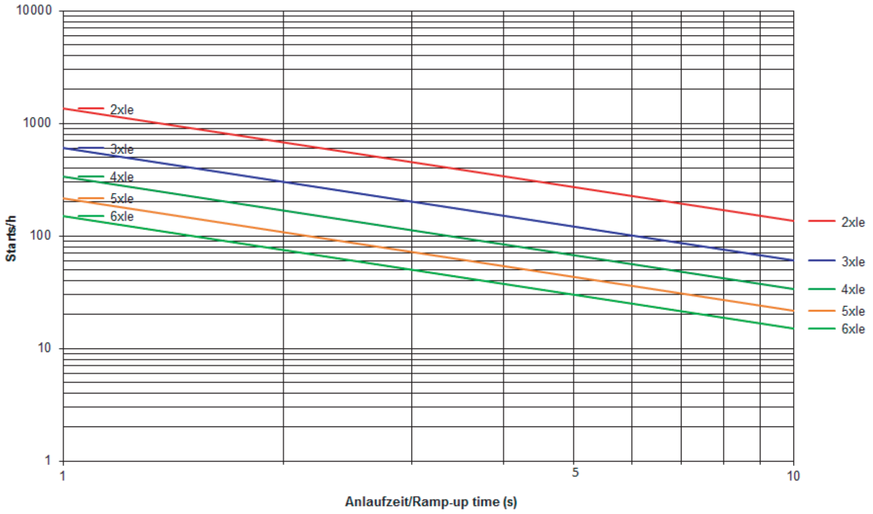




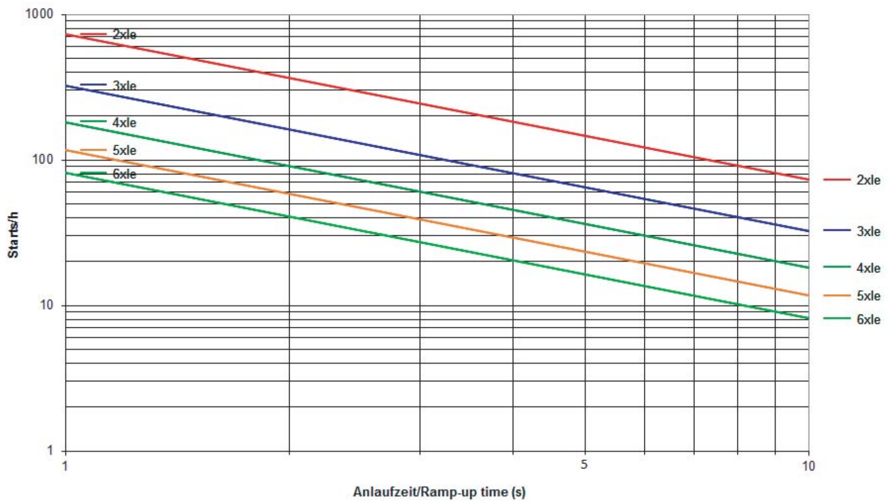
SAS 11

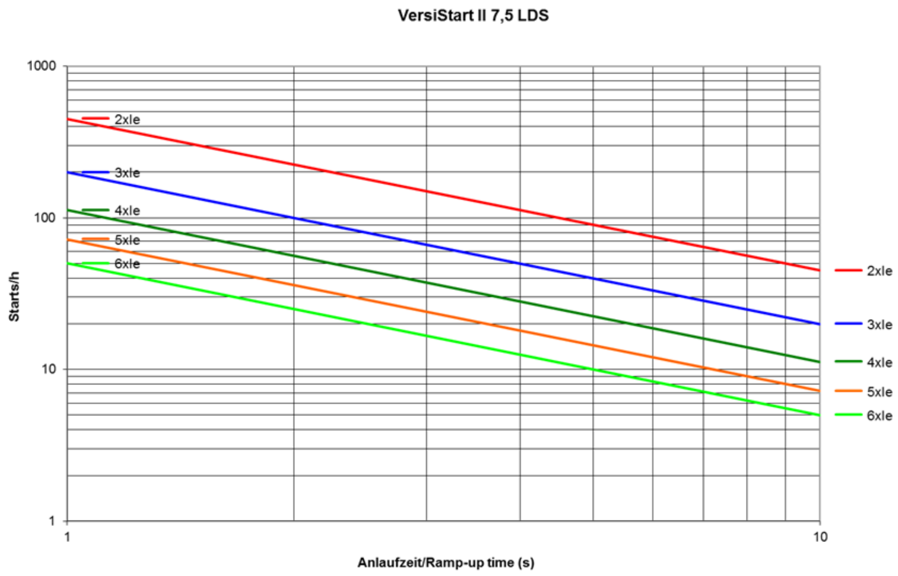


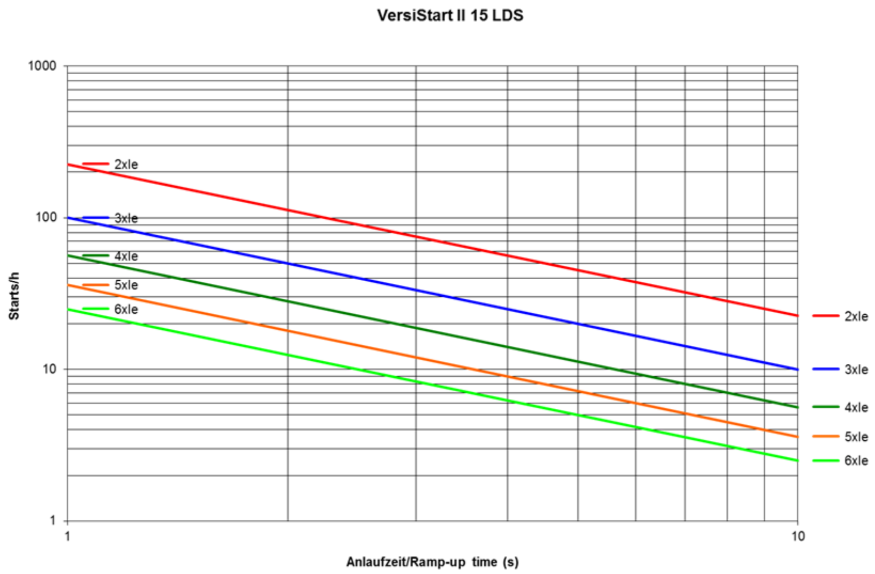
VersiStart II 3 LDS

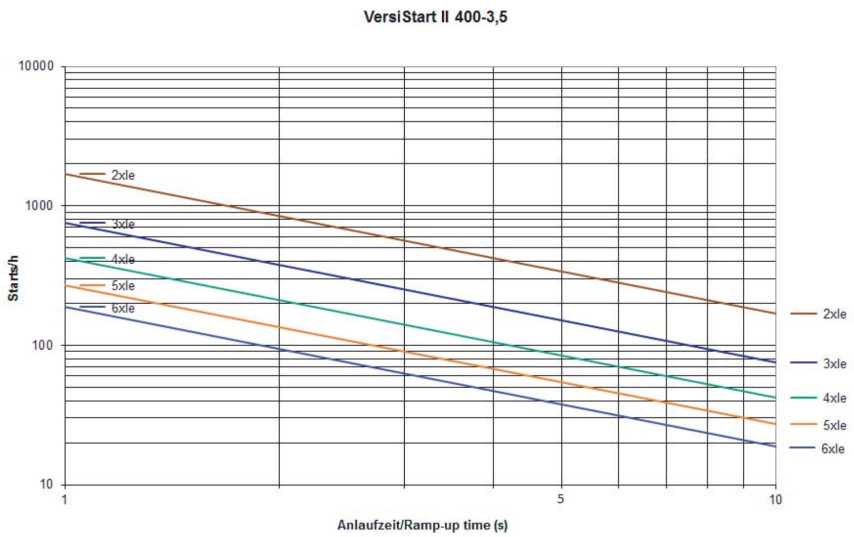


VersiStart II 5,5 / 11 LDS

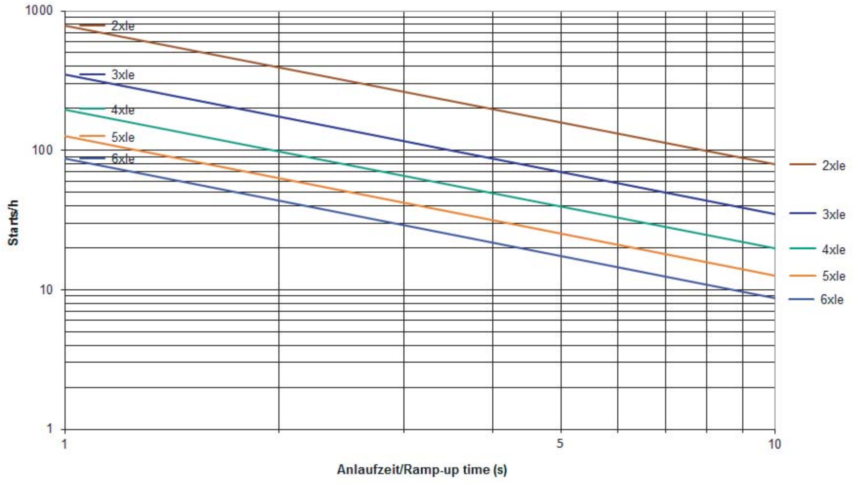



VersiStart II 7,5 LDS
1000
100
10
1
Starts/h
2xle
3xle
4xle
5xle
6xle
1
10
Anlaufzeit/Ramp-up time (s)

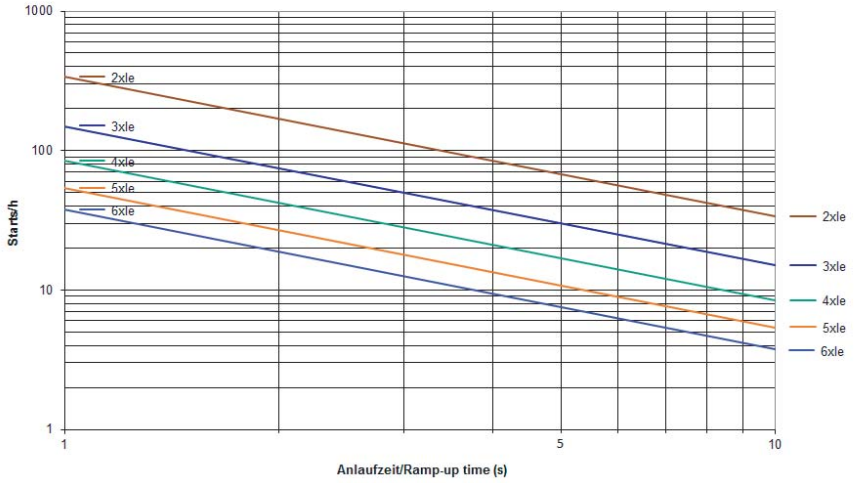

VersiStart II 15 LDS
1000
100
10
1
Starts/h
2xle
3xle
4xle
5xle
6xle
1
10
Anlaufzeit/Ramp-up time (s)


VersiStart II 400-3,5
10000
1000
100
10
Starts/h
2xle
3xle
4xle
5xle
6xle
1
5
10
Anlaufzeit/Ramp-up time (s)

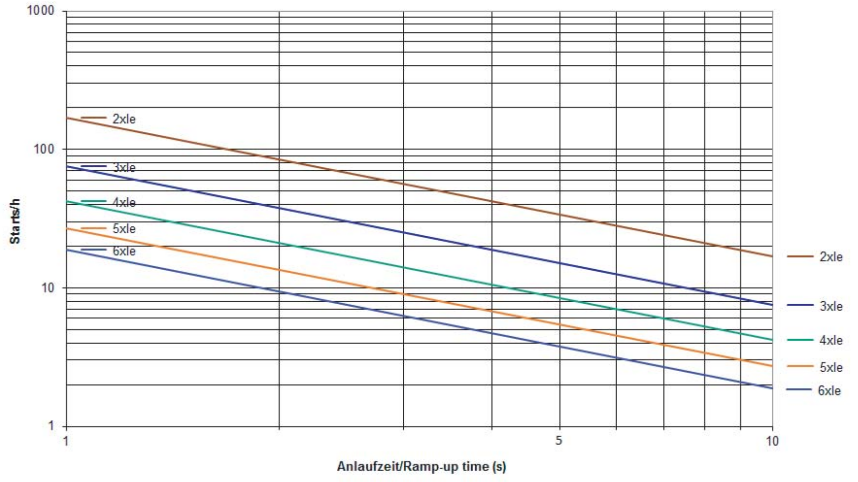
VersiStart II 400-6,5



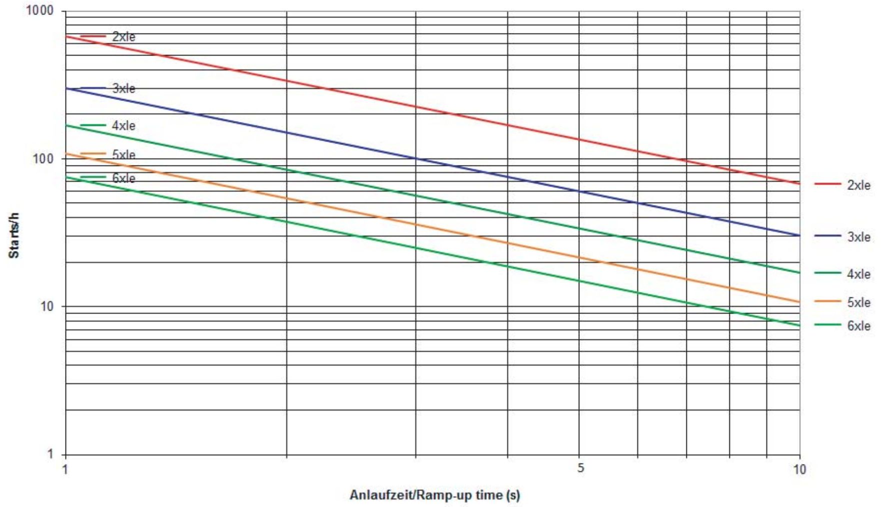
VersiStart II 400-12



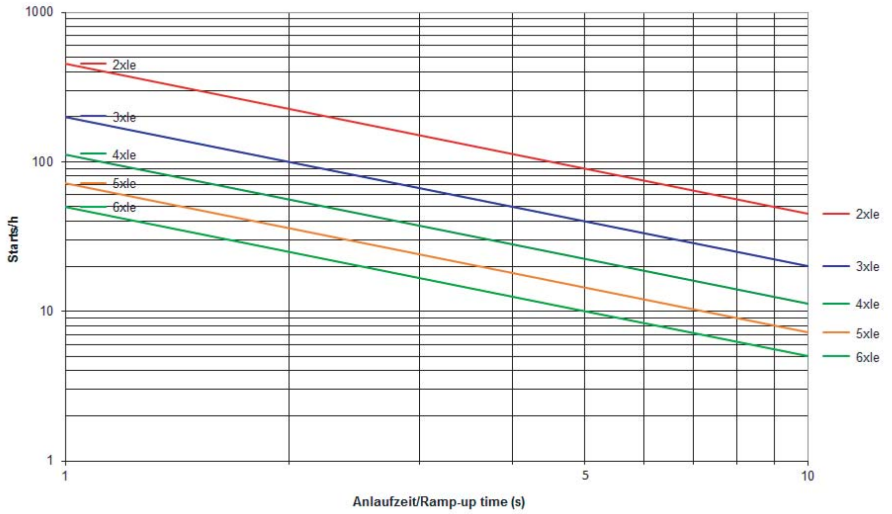
VersiStart II 400-16



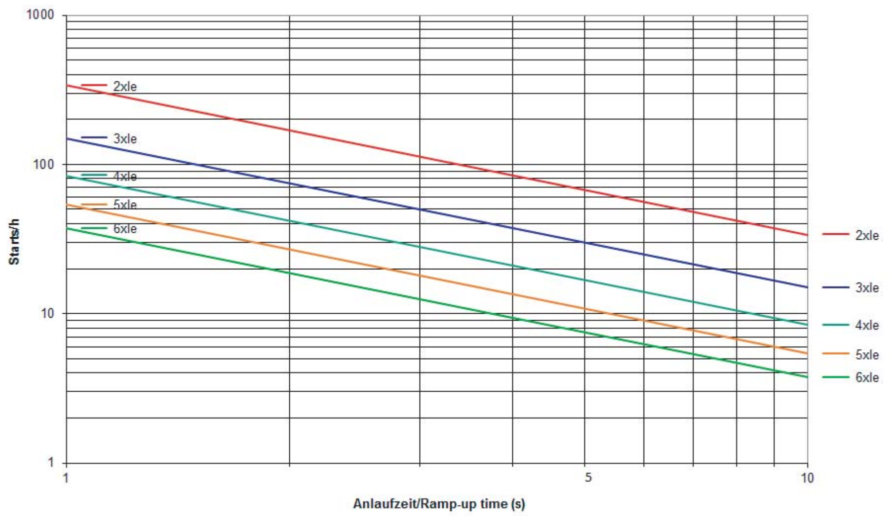
VersiStart II 400-17

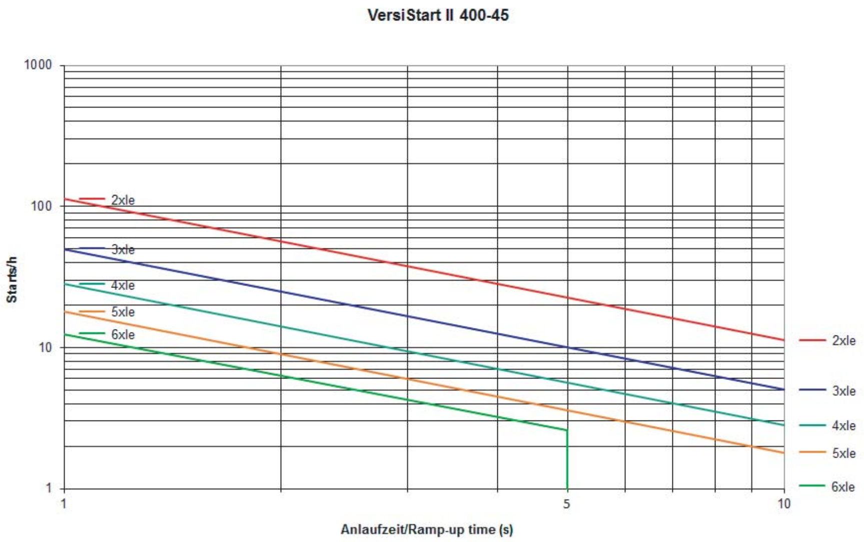


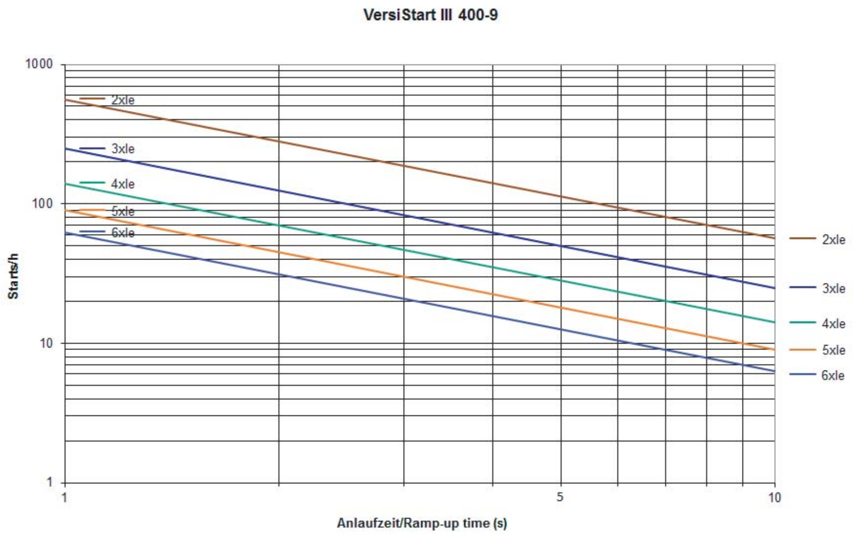
VersiStart II 400-25

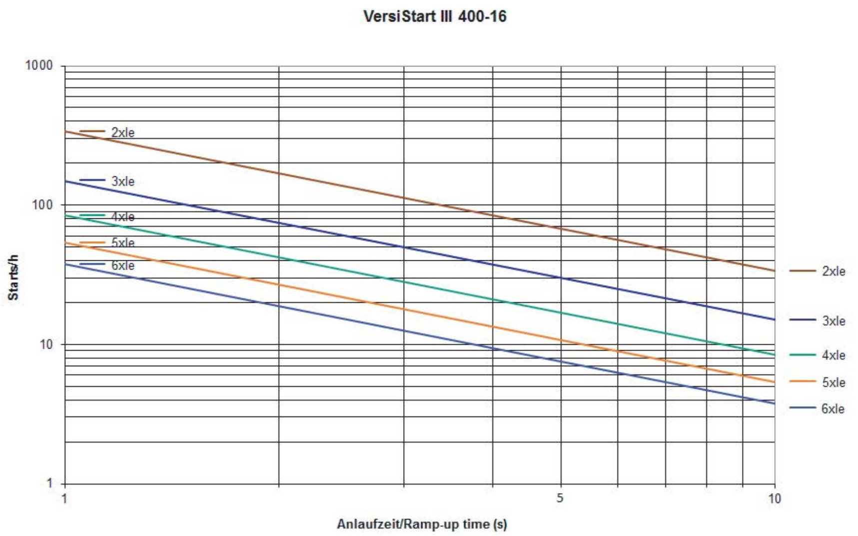


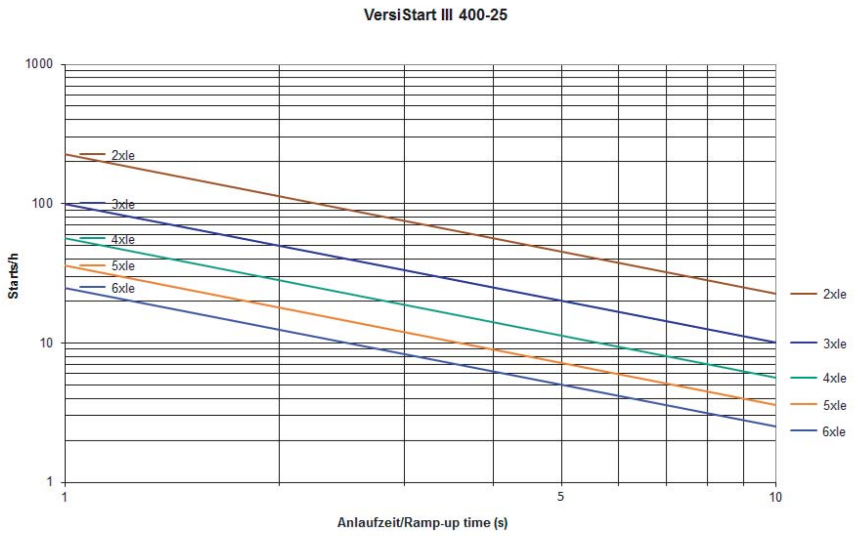
VersiStart II 400-32

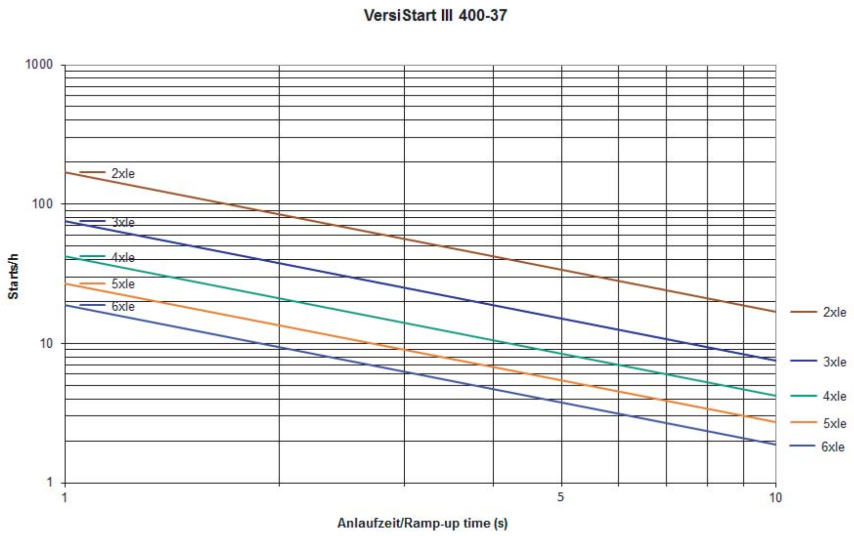


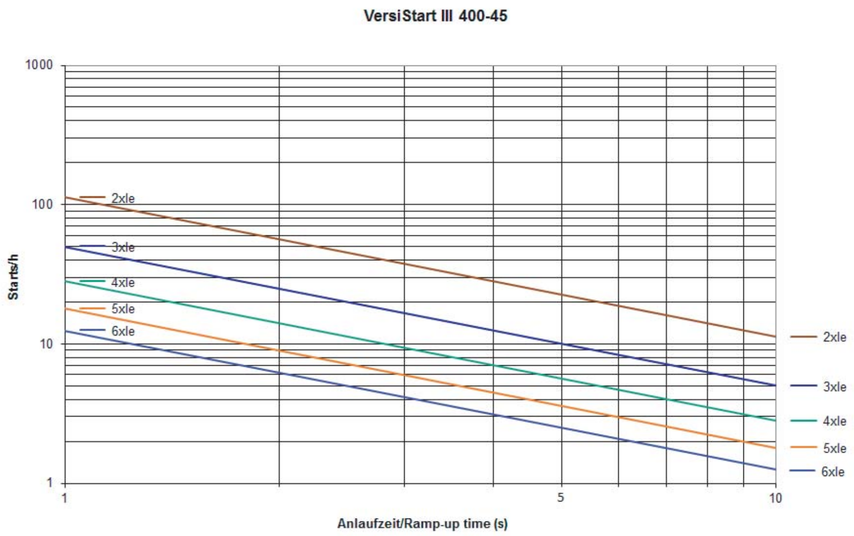

VersiStart II 400-45
Starts/h
Anlaufzeit/Ramp-up time (s)
1000
100
10
1
1
5
10
2xIe
3xIe
4xIe
5xIe
6xIe


VersiStart III 400-9
Starts/h
Anlaufzeit/Ramp-up time (s)
1000
100
10
1
1
5
10
2xIe
3xIe
4xIe
5xIe
6xIe


VersiStart III 400-16
Starts/h
Anlaufzeit/Ramp-up time (s)
1000
100
10
1
1
5
10
2xIe
3xIe
4xIe
5xIe
6xIe


VersiStart III 400-25
1000
100
10
1
Starts/h
1
5
10
Anlaufzeit/Ramp-up time (s)
2xIe
3xIe
4xIe
5xIe
6xIe


VersiStart III 400-37
1000
100
10
1
Starts/h
1
5
10
Anlaufzeit/Ramp-up time (s)
2xIe
3xIe
4xIe
5xIe
6xIe


VersiStart III 400-45
1000
100
10
1
Starts/h
1
5
10
Anlaufzeit/Ramp-up time (s)
2xIe
3xIe
4xIe
5xIe
6xIe

Dimensioning of pre-fuses:

Basically, two types of fuse protection are available fort he user:

1. Fusing according to allocation type „1“ DIN EN 60947-4-2.
   After a short circuit the soft starter is allowed to be inoperative and repair work is poosible.
2. Fusing according to allocation type „2“ DIN EN 60947-4-2.
   After a short circuit the device must be suitable for further use. However, there is the danker that the contacts of the by-pass relays (-contactors) weld. Therefor, if possible, these contacts are to be checked prior to reconnecting the device to the supply. If this check cannot be carried out by the user, the device has to be returned to the producer in order to have it checked.

The following dimensioning information refers tot he below operating conditions:

- Use of standard asynchronous motors
- Standard ramp-up and/or deceleration times

Fusing according to allocation type „1“:
As pre-fuses, we recommend to use fuses of utilization category gG or aM.
The fuse values are to be determined by taking the conductor cross-sectional area of the wiring into account. The wiring cross-sectional area is to be determined in dependence on the rated motor current, the maximally occurring starting current (normally up to the 5-fold rated device current) and the starting frequency. Table 1 shows the values for numerous applications, i.e., with a 3-fold nominal/rated current as mean starting current and a maximum ramp-up time of 10s. In the case of parameter values exceeding these values, it may be necessary to adapt the fuse value accordingly.
Note: Wiring cross-sectional area according to DIN VDE 0100-430, DIN EN 57100-430.

Fusing according to allocation type „2“:
The power semiconductors are to be protected by fuses of the utilization category gR (semiconductor fuses, high-speed fuses). However, since these fuses do not ensure line protection, it is necessary to use additionally line protection fuses (utiliz. category gL).
To protect the semiconductors it is necessary to select gR-fuses featuring cutoff I^2t-values which are approx.. 10-15% below the I^2t-value of the power semiconductor (see technical data). In this connection, the current-value of the selected fuse should not be smaller than the starting current to be expected.
PETER electronic does not prescribe the use of semiconductor protection fuses. However, for some UL- or CSA-listed devices there are exceptions which are indicated in the relevant commissioning instructions.

Notes

- *On the basis of the I^2t-value of the power semiconductors, the ramp-up time and possibly the max. starting current, the fuse supplier is able to select a suitable type. Due to the great variety of producers, sizes and types. PETER electronic does not recommend any particular fuses.*

- *If the value oft he fuse or the cutoff-I^2t-value is selectred too small, it may happen that the semiconductor fuse reacts during the starting phase or during deceleration.*

- *In the case of special devices having increased ramp-up or deceleration times, the recommended fuse value may have to be adapted.*

Table 1

device type	nominal/rated device current (techn. data)	fuse value in the case of allocation type 1	starting frequency starts / h (3xIe 5s)
VS II	3,5A	10A	150
VS II-3LDS, VS II	6,5A	16A/20A	120/75
VS III	9A	20A	50
VS II-5,5LDS, VS II	12A	20A/32A	65/30
VS II-7,5LDS	15A	35A	100
VS II, VS III	16A	32A	15/30
VS II	17A	35A	60
VS II, VS II-11LDS, VS III	25A	50A	40/65/20
VS II, VS II-15LDS	32A	63A	30/35
VS III	37A	63A	15
VS II, VS III	45A	100A/80A	10