Tasks and Functions of the Analog Interface
SSP and SYSKON Product Ranges in Comparison

15th May 2011

Replacement of

SSP KONSTANTERs
(power supplies)

with

SYSKON KONSTANTERs
(power supplies)

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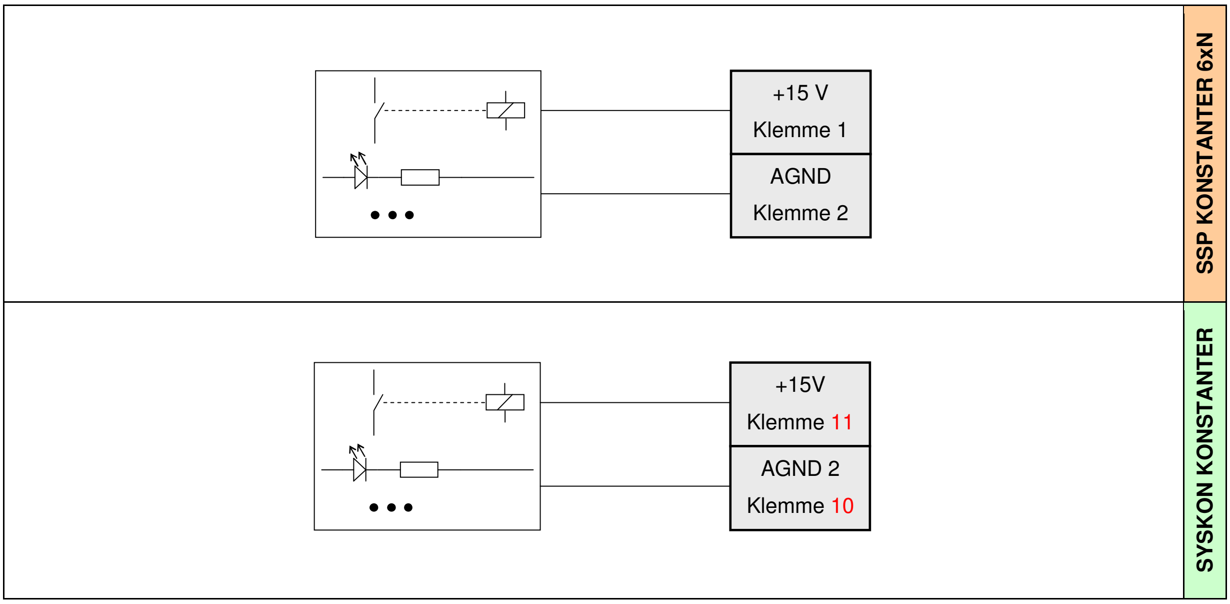
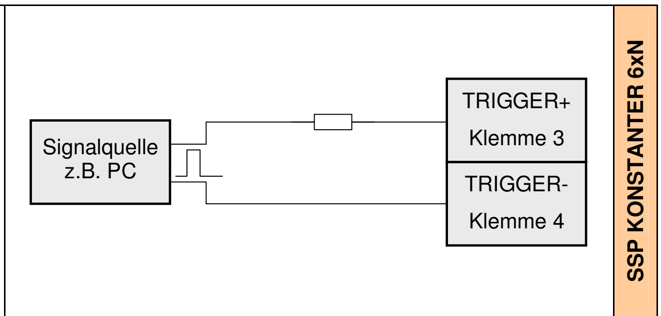
1.1. Auxiliary Power



1.2. Trigger Input

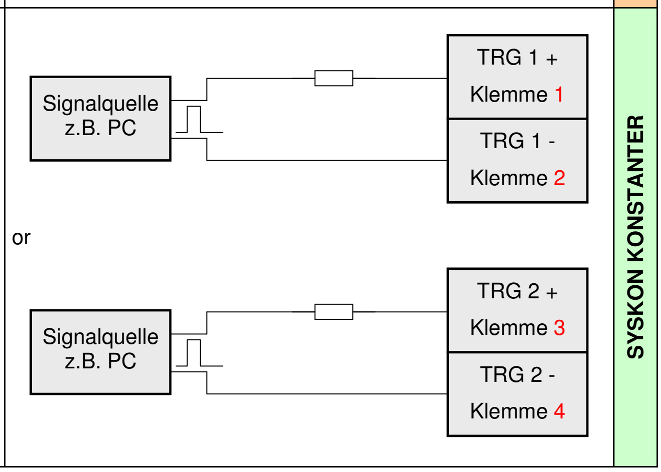
Effect of the trigger input specified by the setup command
T_MODE *txt*
Via the control unit or a digital interface:

OFF		Trigger input function deactivated
OUT	OUTPUT:	Output on/off
RCL	RECALL:	Memory retrieval (single step)
SEQ	SEQUENCE:	Memory retrieval, sequential (SEQUENCE GO)
LLO	LOCAL LOCKED:	Front panel disabling
MIN	MINMAX:	Min-max memory for measured values

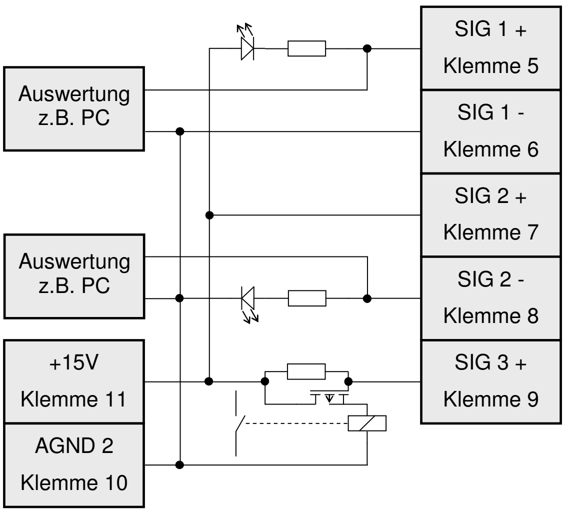


Effect of the trigger input specified by the setup command
T_MODE *txt1,txt2*
Via the control unit or a digital interface:

OFF		Trigger input function deactivated
OUT	OUTPUT:	Output on/off
SQS	RECALL:	Memory recall (step-by-step), edge controlled and time dependent (functions like SEQUENCE STEP)
SEQ	SEQUENCE:	Memory recall, sequential (functions like SEQUENCE GO)
LLO	LOCAL LOCKED:	Front panel disabling
MIN	MINMAX:	Min-max memory for measured values
AIX		Analog input UEXT, IEXT
AIU		Analog input UEXT
AII		Analog input IEXT



1.3. Signal output

None		SSP KONSTANTER 6xN
Examples of signal output usage: SIG 1: With pull-up resistor Signal Evaluation – Active Low – Inactive High SIG 2: With pull-down resistor Signal Evaluation – Active High – Inactive Low SIG 3: Control of a semiconductor switch for switching a relay Signal Relay coil – Active Active – Inactive Inactive Internal power supply (+15 V – AGND 1/2) can also be replaced with an external source. However, if SIG 3 is used reference to AGND 1/2 must be established.		SYSKON KONSTANTER

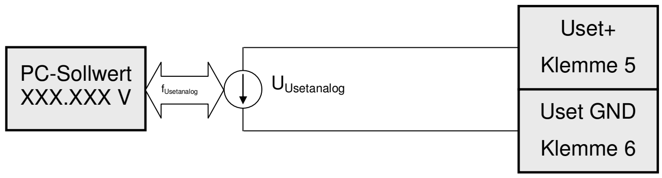
GOSSEN METRAWATT

1.4. Regulating Output Voltage

SSP KONSTANTER 6xN

Conversion table for analog voltage regulation:
$U_{Usetanalog} = f_{Usetanalog} \times U_{set\_PC}$

U_{anom}	$f_{Usetanalog}$
40 V	$^{1}/_{8}\ ^{V}/_{V}$
52 V	$^{5}/_{52}\ ^{V}/_{V}$
80 V	$^{1}/_{16}\ ^{V}/_{V}$



SYSKON KONSTANTER

Conversion table for analog voltage regulation where **nominal voltage** of the **SYSKON** KONSTANTER **is greater than** that of the **SSP** KONSTANTER:

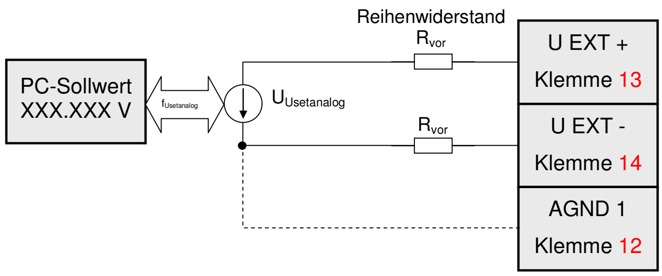
$U_{Usetanalog} = f_{Usetanalog} \times U_{set\_PC}$

U_{anom} SSP	U_{anom} SYSKON	R_{series}*	$f_{Usetanalog}$
40 V	60 V	5 kΩ	$^{1}/_{8}\ ^{V}/_{V}$
52 V	60 V	1.54 kΩ	$^{5}/_{52}\ ^{V}/_{V}$

* Differential input!

Calculation: $R_{series} = R_i \times (^{U_{anom}(SYSKON)}/_{U_{anom}(SSP)} - 1)$

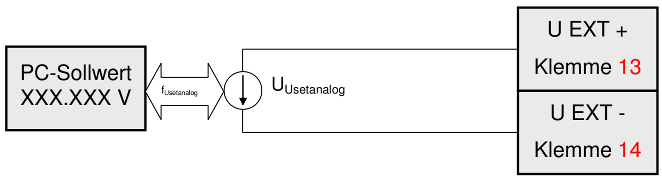
R_i = 10 kΩ for AGND connection



Conversion table for analog voltage regulation where **nominal voltage** of the **SYSKON** KONSTANTER **is less than** that of the **SSP** KONSTANTER:

$U_{Usetanalog} = f_{Usetanalog} \times U_{set\_PC}$
$f_{Usetanalog}(SYSKON) = f_{Usetanalog}(SSP) \times f_{correction}$

U_{anom} SSP	U_{anom} SYSKON	$f_{Usetanalog}$
80 V	60 V	$^{1}/_{16}\ ^{V}/_{V} \times ^{4}/_{3} = ^{1}/_{12}\ ^{V}/_{V}$



Original	Replacement	Voltage $U_{U\ EXT}$	Required Action Correction Factor / Series Resistor
SSP 500-40(-25) SSP 1000-40(-50) SSP 2000-40(-100) SSP 3000-40(-150)	SYSKON XXXX-60-XXX	$U_{U\ EXT}(SYSKON) = ^{2}/_{3} \times U_{Uset}(SSP)$	5 kΩ series resistor
SSP 500-52(-25) SSP 1000-52(-50) SSP 2000-52(-100) SSP 3000-52(-150)	SYSKON XXXX-60-XXX	$U_{U\ EXT}(SYSKON) = ^{13}/_{15} \times U_{Uset}(SSP)$	1.54 kΩ series resistor
SSP 500-80(-12.5) SSP 1000-80(-25) SSP 2000-80(-50) SSP 3000-80(-75)	SYSKON XXXX-60-XXX	$U_{U\ EXT}(SYSKON) = ^{4}/_{3} \times U_{Uset}(SSP)$	Conversion with a factor of $^{4}/_{3}$

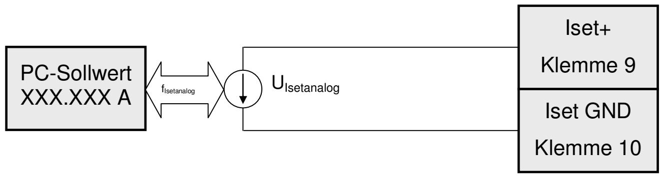
GOSSEN METRAWATT

1.5. Regulating Output Current

SSP KONSTANTER 6xN

Conversion table for analog current regulation:
$U_{Isetanalog} = f_{Isetanalog} \times I_{set\_PC}$

I_{anom}	$f_{Isetanalog}$
12.5 A	$^{2}/_{5}\ ^{V}/_{A}$
25 A	$^{1}/_{5}\ ^{V}/_{A}$
50 A	$^{1}/_{10}\ ^{V}/_{A}$
75 A	$^{2}/_{30}\ ^{V}/_{A}$
100 A	$^{1}/_{20}\ ^{V}/_{A}$
150 A	$^{1}/_{30}\ ^{V}/_{A}$



SYSKON KONSTANTER

Conversion table for analog current regulation where **nominal current** of the **SYSKON** KONSTANTER **is greater than** that of the **SSP** KONSTANTER:

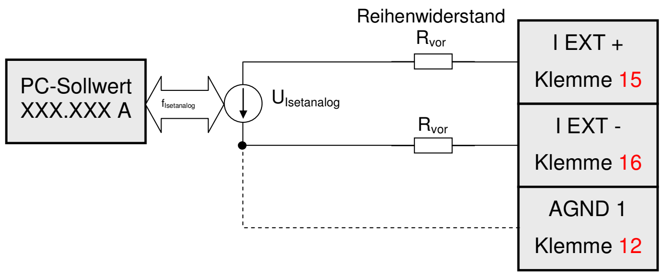
$U_{Isetanalog} = f_{Isetanalog} \times I_{set\_PC}$

I_{anom} SSP	I_{anom} SYSKON	R_{series} *	$f_{Isetanalog}$
12.5 A	60 A	38 kΩ	$^{2}/_{5}\ ^{V}/_{A}$
25 A	60 A	14 kΩ	$^{1}/_{5}\ ^{V}/_{A}$
50 A	60 A	2 kΩ	$^{1}/_{10}\ ^{V}/_{A}$
75 A	120 A	6 kΩ	$^{2}/_{30}\ ^{V}/_{A}$
100 A	120 A	2 kΩ	$^{1}/_{20}\ ^{V}/_{A}$
150 A	180 A	2 kΩ	$^{1}/_{30}\ ^{V}/_{A}$

* Differential input!

Calculation: $R_{series} = R_i \times (^{I_{anom}(SYSKON)}/_{I_{anom}(SSP)} - 1)$

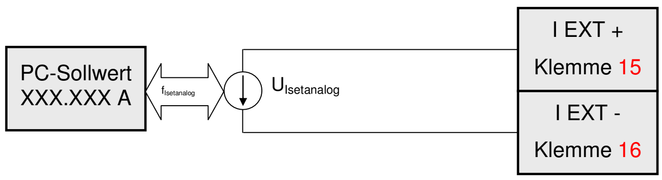
R_i = 10 kΩ for AGND connection



Conversion table for analog current regulation where **nominal current** of the **SYSKON** KONSTANTER **is less than** that of the **SSP** KONSTANTER:

$U_{Isetanalog} = f_{Isetanalog} \times I_{set\_PC}$
$f_{Isetanalog}(SYSKON) = f_{Isetanalog}(SSP) \times f_{correction}$

I_{anom} SSP	I_{anom} SYSKON	$f_{Isetanalog}$
75 A	60 A	$^{2}/_{30}\ ^{V}/_{A} \times\ ^{5}/_{4} =\ ^{1}/_{12}\ ^{V}/_{A}$
100 A	60 A	$^{1}/_{20}\ ^{V}/_{A} \times\ ^{5}/_{3} =\ ^{1}/_{12}\ ^{V}/_{A}$
150 A	120 A	$^{1}/_{30}\ ^{V}/_{A} \times\ ^{5}/_{4} =\ ^{1}/_{24}\ ^{V}/_{A}$



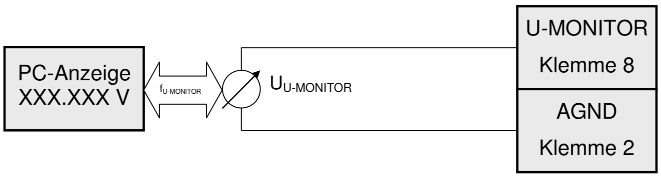
Original	Replacement	Voltage $U_{I\ EXT}$	Required Action Correction Factor / Series Resistor
SSP 500-80(-12.5)	SYSKON 1500-60-60	$U_{I\ EXT}(SYSKON) = {}^{5}/_{24} \times U_{Iset}(SSP)$	38 kΩ series resistor
SSP 500-40(-25) SSP 500-52(-25) SSP 1000-80(-25)	SYSKON 1500-60-60	$U_{I\ EXT}(SYSKON) = {}^{5}/_{12} \times U_{Iset}(SSP)$	14 kΩ series resistor
SSP 1000-40(-50) SSP 1000-52(-50) SSP 2000-80(-50)	SYSKON 1500-60-60	$U_{I\ EXT}(SYSKON) = {}^{5}/_{6} \times U_{Iset}(SSP)$	2 kΩ series resistor
SSP 2000-80(-50)	SYSKON 3000-60-120	$U_{I\ EXT}(SYSKON) = {}^{5}/_{12} \times U_{Iset}(SSP)$	14 kΩ series resistor
SSP 3000-80(-75)	SYSKON 1500-60-60	$U_{I\ EXT}(SYSKON) = {}^{5}/_{4} \times U_{Iset}(SSP)$	Conversion with a factor of ${}^{5}/_{4}$
	SYSKON 3000-60-120	$U_{I\ EXT}(SYSKON) = {}^{5}/_{8} \times U_{Iset}(SSP)$	6 kΩ series resistor
SSP 2000-40(-100)	SYSKON 1500-60-60	$U_{I\ EXT}(SYSKON) = {}^{5}/_{3} \times U_{Iset}(SSP)$	Conversion with a factor of ${}^{5}/_{3}$
SSP 2000-52(-100)	SYSKON 3000-60-120	$U_{I\ EXT}(SYSKON) = {}^{5}/_{6} \times U_{Iset}(SSP)$	2 kΩ series resistor
SSP 3000-40(-150)	SYSKON 3000-60-120	$U_{I\ EXT}(SYSKON) = {}^{5}/_{4} \times U_{Iset}(SSP)$	Conversion with a factor of ${}^{5}/_{4}$
SSP 3000-52(-150)	SYSKON 4500-60-180	$U_{I\ EXT}(SYSKON) = {}^{5}/_{6} \times U_{Iset}(SSP)$	2 kΩ series resistor

1.6. Analog Measured Value for Output Voltage

SSP KONSTANTER 6xN

Conversion table for analog voltage monitoring
$U_{meas\_PC} = f_{U\text{-}MONITOR} \times U_{U\text{-}MONITOR}$

U_{anom}	$f_{U\text{-}MONITOR}$
40 V	4 V/V
52 V	5.2 V/V
80 V	8 V/V

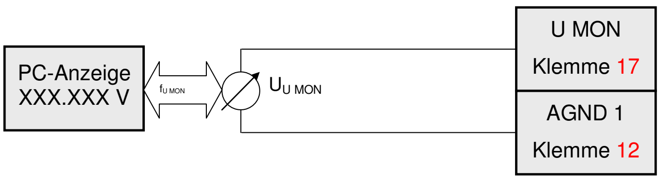


SYSKON KONSTANTER

Conversion table for analog voltage monitoring where **nominal voltage** of the **SYSKON** KONSTANTER **is greater than** that of the **SSP** KONSTANTER:

$U_{meas\_PC} = f_{U\ MON} \times U_{U\ MON}$
$F_{U\ MON} = f_{U\text{-}MONITOR}(SSP) \times f_{correction}$

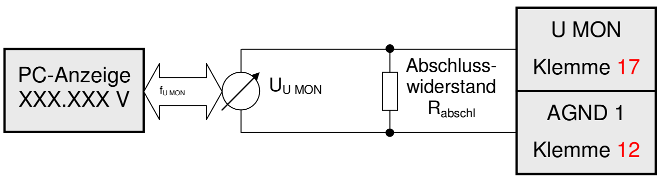
U_{anom} SSP	U_{anom} SYSKON	$f_{U\ MON}$
40 V	60 V	$4\ {}^{V}/_{V} \times {}^{3}/_{2} = 6\ {}^{V}/_{V}$
52 V	60 V	$5.2\ {}^{V}/_{V} \times {}^{15}/_{13} = 6\ {}^{A}/_{V}$



Conversion table for analog voltage monitoring where **nominal voltage** of the **SYSKON** KONSTANTER **is less than** that of the **SSP** KONSTANTER:

$U_{meas\_PC} = f_{U\ MON} \times U_{U\ MON}$

U_{anom} SSP	U_{anom} SYSKON	$R_{terminating}$	$f_{U\ MON}$
80 V	60 V	24 kΩ	8 V/V



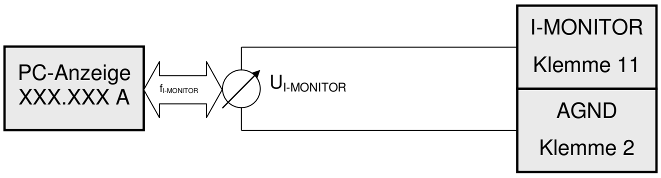
Original	Replacement	Voltage $U_{U\ MON}$	Required Action Correction Factor / Terminating
SSP 500-40(-25) SSP 1000-40(-50) SSP 2000-40(-100) SSP 3000-40(-150)	SYSKON XXXX-60-XXX	$U_{U\ MON}$(SYSKON) = $^{2}/_{3}$ x $U_{U\text{-}MONITOR}$(SSP)	Conversion with a factor of $^{3}/_{2}$
SSP 500-52(-25) SSP 1000-52(-50) SSP 2000-52(-100) SSP 3000-52(-150)	SYSKON XXXX-60-XXX	$U_{U\ MON}$(SYSKON) = $^{13}/_{15}$ x $U_{U\text{-}MONITOR}$(SSP	Conversion with a factor of $^{15}/_{13}$
SSP 500-80(-12.5) SSP 1000-80(-25) SSP 2000-80(-50) SSP 3000-80(-75)	SYSKON XXXX-60-XXX	$U_{U\ MON}$(SYSKON) = $^{4}/_{3}$ x $U_{U\text{-}MONITOR}$(SSP)	24 kΩ terminating resistor

1.7. Analog Measured Value for Output Current

SSP KONSTANTER 6xN

Conversion table for analog current monitoring:
$I_{meas\_PC} = f_{I\text{-}MONITOR} \times U_{I\text{-}MONITOR}$

I_{anom}	$f_{I\text{-}MONITOR}$
12.5 A	1.25 $^{A}/_{V}$
25 A	2.5 $^{A}/_{V}$
50 A	5 $^{A}/_{V}$
75 A	7.5 $^{A}/_{V}$
100 A	10 $^{A}/_{V}$
150 A	15 $^{A}/_{V}$

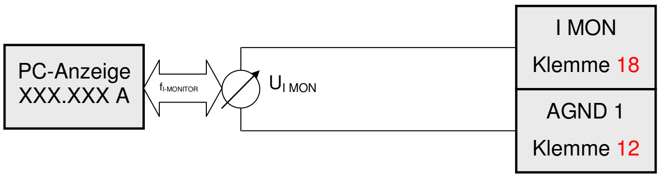


SYSKON KONSTANTER

Conversion table for analog current monitoring where **nominal current** of the **SYSKON** KONSTANTER **is greater than** that of the **SSP** KONSTANTER:

$I_{meas\_PC} = f_{I\,MON} \times U_{I\,MON}$
$f_{I\,MON} = f_{I\text{-}MONITOR}(SSP) \times f_{correction}$

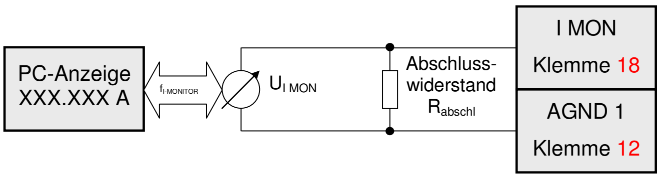
I_{anom} SSP	I_{anom} SYSKON	$f_{I\,MON}$
12.5 A	60 A	1.25 $^{A}/_{V} \times {}^{24}/_{5} = 6\ ^{A}/_{V}$
25 A	60 A	2.5 $^{A}/_{V} \times {}^{12}/_{5} = 6\ ^{A}/_{V}$
50 A	60 A	5 $^{A}/_{V} \times {}^{6}/_{5} = 6\ ^{A}/_{V}$
75 A	120 A	7.5 $^{A}/_{V} \times {}^{8}/_{5} = 12\ ^{A}/_{V}$
100 A	120 A	10 $^{A}/_{V} \times {}^{6}/_{5} = 12\ ^{A}/_{V}$
150 A	180 A	15 $^{A}/_{V} \times {}^{6}/_{5} = 18\ ^{A}/_{V}$



Conversion table for analog current monitoring where **nominal current** of the **SYSKON** KONSTANTER **is less than** that of the **SSP** KONSTANTER:

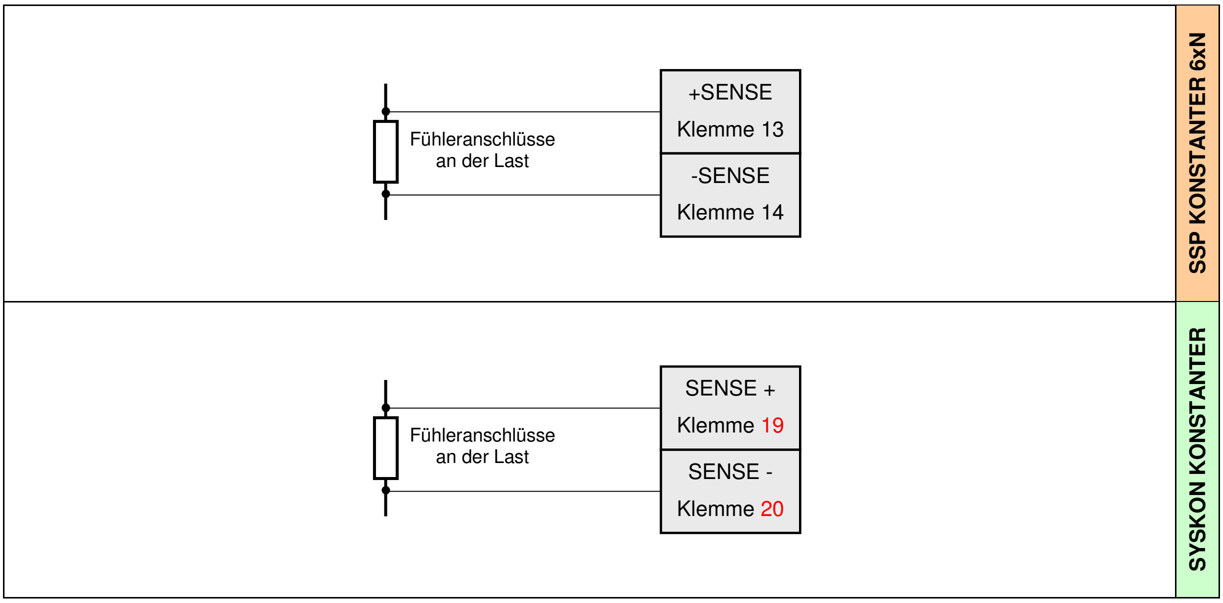
$I_{meas\_PC} = f_{I\,MON} \times U_{I\,MON}$

I_{anom} SSP	I_{anom} SYSKON	$R_{terminating}$	$f_{I\,MON}$
75 A	60 A	32 kΩ	7.5 $^{A}/_{V}$
100 A	60 A	12 kΩ	10 $^{A}/_{V}$
150 A	120 A	32 kΩ	15 $^{A}/_{V}$

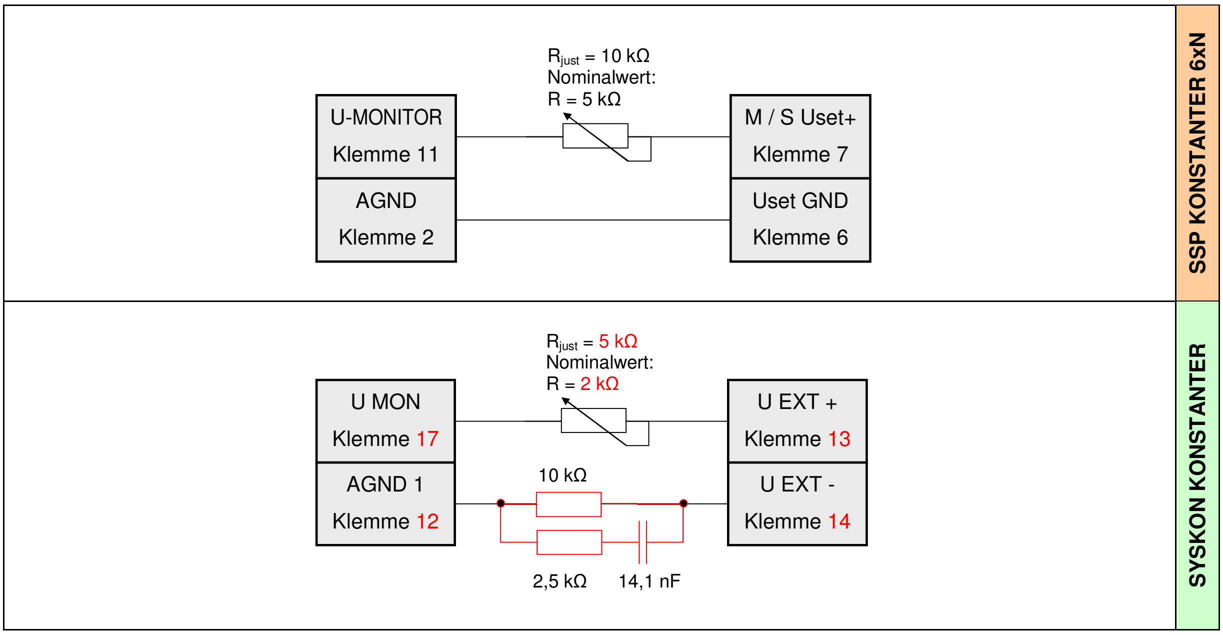


Original	Replacement	Voltage $U_{I\,MON}$	Required Action Correction Factor / Terminating Resistor
SSP 500-80(-12.5)	SYSKON 1500-60-60	$U_{I\,MON}(SYSKON) = {}^{5}/_{24} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{24}/_{5}$
SSP 500-40(-25) SSP 500-52(-25) SSP 1000-80(-25)	SYSKON 1500-60-60	$U_{I\,MON}(SYSKON) = {}^{5}/_{12} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{12}/_{5}$
SSP 1000-40(-50) SSP 1000-52(-50) SSP 2000-80(-50)	SYSKON 1500-60-60	$U_{I\,MON}(SYSKON) = {}^{5}/_{6} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{6}/_{5}$
SSP 2000-80(-50)	SYSKON 3000-60-120	$U_{I\,MON}(SYSKON) = {}^{5}/_{12} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{12}/_{5}$
SSP 3000-80(-75)	SYSKON 1500-60-60	$U_{I\,MON}(SYSKON) = {}^{5}/_{4} \times U_{I\text{-}MONITOR}(SSP)$	32 kΩ terminating resistor
	SYSKON 3000-60-120	$U_{I\,MON}(SYSKON) = {}^{5}/_{8} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{8}/_{5}$
SSP 2000-40(-100)	SYSKON 1500-60-60	$U_{I\,MON}(SYSKON) = {}^{5}/_{3} \times U_{I\text{-}MONITOR}(SSP)$	12 kΩ terminating resistor
SSP 2000-52(-100)	SYSKON 3000-60-120	$U_{I\,MON}(SYSKON) = {}^{5}/_{6} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{6}/_{5}$
SSP 3000-40(-150)	SYSKON 3000-60-120	$U_{I\,MON}(SYSKON) = {}^{5}/_{4} \times U_{I\text{-}MONITOR}(SSP)$	32 kΩ terminating resistor
SSP 3000-52(-150)	SYSKON 4500-60-180	$U_{I\,MON}(SYSKON) = {}^{5}/_{6} \times U_{I\text{-}MONITOR}(SSP)$	Conversion with a factor of ${}^{6}/_{5}$

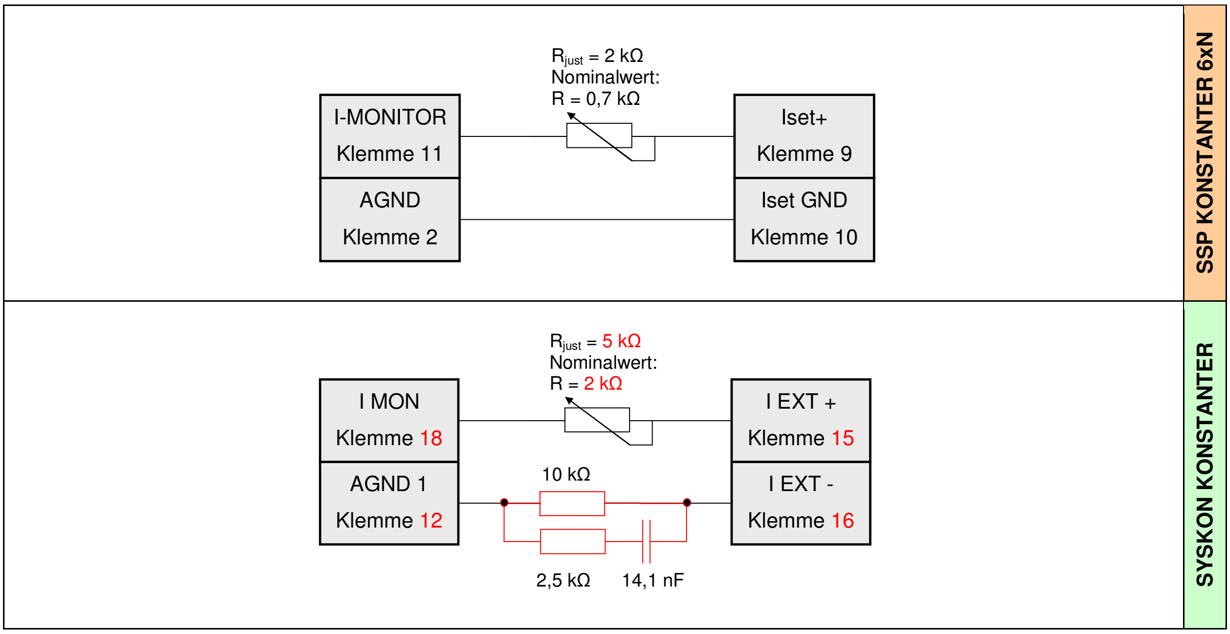
1.8. External Voltage Sensor



1.9. Voltage Regulation with Series Master-Slave Connection

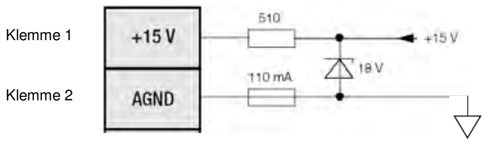
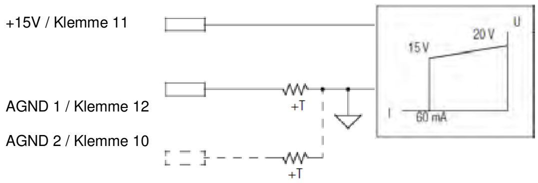


1.10. Current Regulation with Parallel Master-Slave Connection

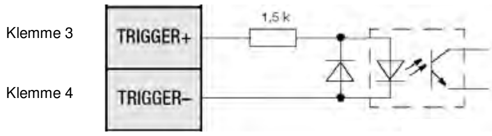
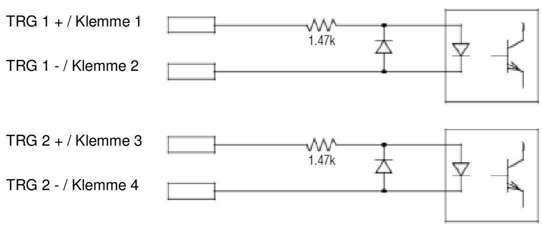


2. Technical Characteristics of the Analog Interface, Sorted by Function

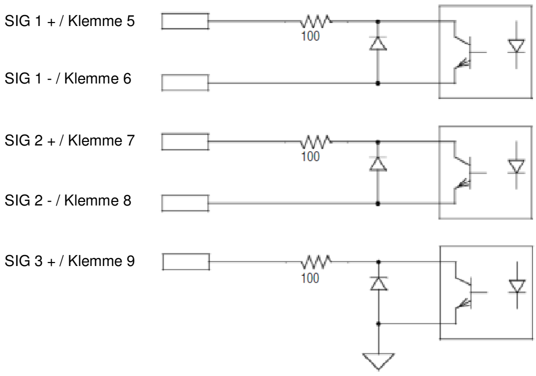
2.1. Auxiliary Power

Open circuit voltage: Internal resistance: Voltage under load:	15 V ± 3% 510 Ω + 25 Ω (PTC) 10 mA 9.7 V 25 mA 1.6 V 50 mA --- 60 mA ---		SSP KONSTANTER 6xN
Open circuit voltage: Internal resistance: Voltage under load:	18.5 V 20 Ω + 25 Ω (PTC) 10 mA 18.0 V 25 mA 17.4 V 50 mA 16.3 V 60 mA 15.8 V 63 mA → 0 V		SYSKON KONSTANTER

2.2. Trigger Input

Operating voltage: Internal resistance:	Low: 0 V ≤ U_s ≤ 1 V High: 4 V ≤ U_s ≤ 26 V 1.5 kΩ		SSP KONSTANTER 6xN
Operating voltage: Internal resistance:	Low: -18 V ≤ U_s ≤ 1 V High: 4 V ≤ U_s ≤ 18 V 1.47 kΩ		SYSKON KONSTANTER

2.3. Signal output

None		SSP KONSTANTER 6xN
Operating voltage: Max. 30 V Operating current: Max. 20 mA Internal resistance: 100 Ω		SYSKON KONSTANTER

2.4. Regulating Output Voltage

SSP KONSTANTER 6xN

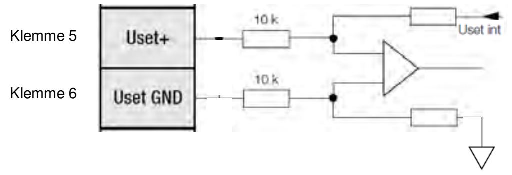
Differential voltage input
The output voltage setpoint is the sum of the analog setpoint and the digitally selected setpoint.

$U_{setsum} = USET + U_{setanalog}$
$U_{setanalog} = k_{uset} \times U_{cu}$

Control voltage U_{cu}: $-5\ V \leq U_{cu} \leq +5\ V$
$-U_{nom} \leq U_{setanalog} \leq +U_{nom}$

U_{nom}	40 V	52 V	80 V	Nominal output voltage
k_{uset}	8	10.4	16	Gain, control coefficient
U_{cu}				$U_{terminal\ 5} - U_{terminal\ 6}$
$U_{setanalog}$				Analog controlled output voltage setpoint
USET				Digitally controlled output voltage setpoint
$U_{setsum} \leq 1.2 \times U_{nom}$				Output voltage setpoint, combined analog and digital

Internal resistance:
Uset+ 10 kΩ
Uset GND 16.56 kΩ



SYSKON KONSTANTER

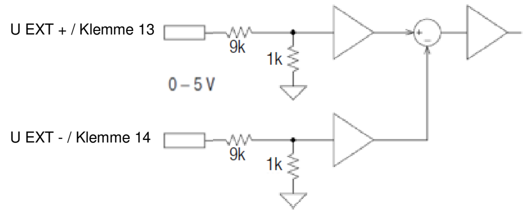
Differential voltage input
The output voltage setpoint is the sum of the analog setpoint and the digitally selected setpoint.

$U_{setsum} = USET + U_{setanalog}$
$U_{setanalog} = k_{uset} \times U_{cu}$

Control voltage U_{cu}: $-5\ V \leq U_{cu} \leq +5\ V$
$-U_{nom} \leq U_{setanalog} \leq +U_{nom}$

U_{nom}	60 V	Nominal output voltage
k_{uset}	12	Gain, control coefficient
U_{cu}		$U_{terminal\ 13} - U_{terminal\ 14}$
$U_{setanalog}$		Analog controlled output voltage setpoint
USET		Digitally controlled output voltage setpoint
$U_{setsum} \leq 1.1 \times U_{nom}$		Output voltage setpoint, combined analog and digital

Internal resistance:
U EXT + 10 kΩ
U EXT - 10 kΩ



2.5. Regulating Output Current

SSP KONSTANTER 6xN

Differential voltage input
The output current setpoint is the sum of the analog setpoint and the digitally selected setpoint.

$I_{setsum} = ISET + I_{setanalog}$

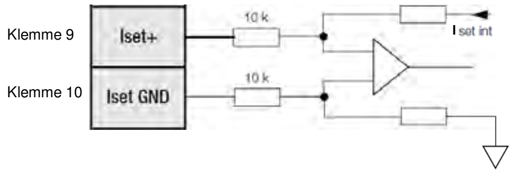
$I_{setanalog} = k_{iset} \times U_{ci}$

Control voltage U_{ci}: $-5\ V \leq U_{ci} \leq +5\ V$

$-I_{nom} \leq I_{setanalog} \leq +I_{nom}$

I_{nom}	12.5 A	25 A	50 A	75 A	100 A	150 A	Nominal output current
k_{iset}	2.5 $^A/_V$	5 $^A/_V$	10 $^A/_V$	15 $^A/_V$	20 $^A/_V$	30 $^A/_V$	Gain, control coefficient
U_{ci}							$U_{terminal\ 5} - U_{terminal\ 6}$
$U_{setanalog}$							Analog controlled output current setpoint
ISET							Digitally controlled output current setpoint
$I_{setsum} \leq 1.2 \times U_{nom}$							Output current setpoint, combined analog and digital

Internal resistance: Iset+ 10 kΩ; Iset GND 16.56 kΩ



SYSKON KONSTANTER

Differential voltage input
The output current setpoint is the sum of the analog setpoint and the digitally selected setpoint.

$I_{setsum} = ISET + I_{setanalog}$

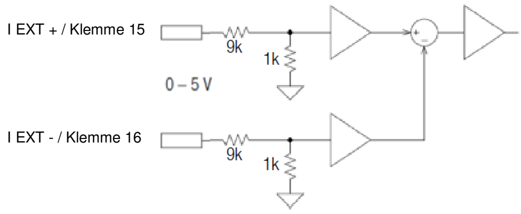
$I_{setanalog} = k_{iset} \times U_{ci}$

Control voltage U_{ci}: $-5\ V \leq U_{ci} \leq +5\ V$

$-I_{nom} \leq I_{setanalog} \leq +I_{nom}$

I_{nom}	60 A	120 A	180 A	Nominal output current
k_{iset}	12 $^A/_V$	24 $^A/_V$	36 $^A/_V$	Gain, control coefficient
U_{ci}				$U_{terminal\ 15} - U_{terminal\ 16}$
$U_{setanalog}$				Analog controlled output current setpoint
ISET				Digitally controlled output current setpoint
$I_{setsum} \leq 1.2 \times U_{nom}$				Output current setpoint, combined analog and digital

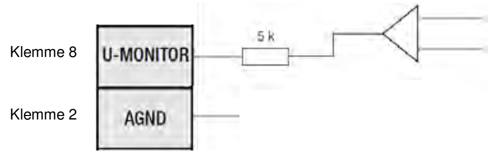
Internal resistance: I EXT + 10 kΩ; I EXT - 10 kΩ



2.6. Analog Measured Value for Output Voltage

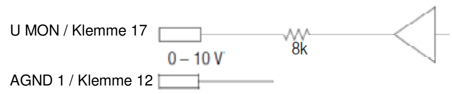
SSP KONSTANTER 6xN

Output voltage measured to AGND:	$U_{U\text{-}MONITOR} = k_{uactual} \times U_{actual}$
Measured value range $U_{U\text{-}MONITOR}$:	$0\ V \leq U_{U\text{-}MONITOR} \leq 10\ V$
Output voltage U_{actual}:	$0\ V \leq U_{actual} \leq + U_{nom}$
U_{nom}: 40 V, 52 V, 80 V	Nominal output voltage
$k_{uactual}$: $^{1}/_{4}$, $^{1}/_{5,2}$, $^{1}/_{8}$	Gain, measuring coefficient
$U_{U\text{-}MONITOR}$	$U_{terminal\ 8} - U_{terminal\ 2}$
Internal resistance:	5 kΩ



SYSKON KONSTANTER

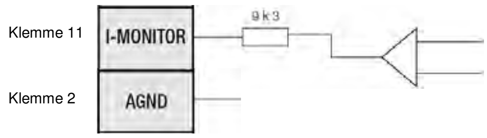
Output voltage measured to AGND:	$U_{U\text{-}MONITOR} = k_{uactual} \times U_{actual}$
Measured value range $U_{U\text{-}MONITOR}$:	$0\ V \leq U_{U\text{-}MONITOR} \leq 10\ V$
Output voltage U_{actual}:	$0\ V \leq U_{actual} \leq + U_{nom}$
U_{nom}: 60 V	Nominal output voltage
$k_{uactual}$: $^{1}/_{6}$	Gain, measuring coefficient
$U_{U\text{-}MONITOR}$	$U_{terminal\ 17} - U_{terminal\ 12}$
Internal resistance:	8 kΩ



2.7. Analog Measured Value for Output Current

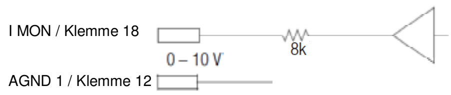
SSP KONSTANTER 6xN

Output current measured to AGND:	$U_{I\text{-}MONITOR} = k_{iactual} \times I_{actual}$
Measured value range $U_{I\text{-}MONITOR}$:	$0\ V \leq U_{I\text{-}MONITOR} \leq 10\ V$
Output current I_{actual}:	$0\ A \leq I_{actual} \leq + I_{nom}$
I_{nom}: 12.5 A, 25 A, 50 A, 75 A, 100 A, 150 A	Nominal output current
$k_{iactual}$: $^{4}/_{5}\ ^{V}/_{A}$, $^{2}/_{5}\ ^{V}/_{A}$, $^{1}/_{5}\ ^{V}/_{A}$, $^{2}/_{15}\ ^{V}/_{A}$, $^{1}/_{10}\ ^{V}/_{A}$, $^{1}/_{15}\ ^{V}/_{A}$	Gain, measuring coefficient
$U_{I\text{-}MONITOR}$	$U_{terminal\ 11} - U_{terminal\ 2}$
Internal resistance:	9.3 kΩ

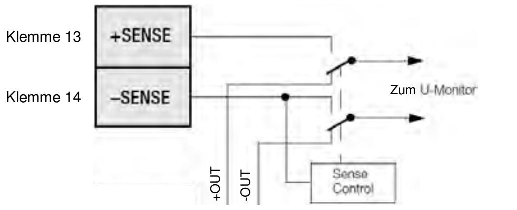
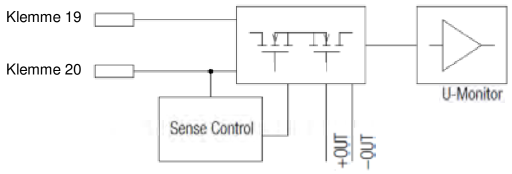


SYSKON KONSTANTER

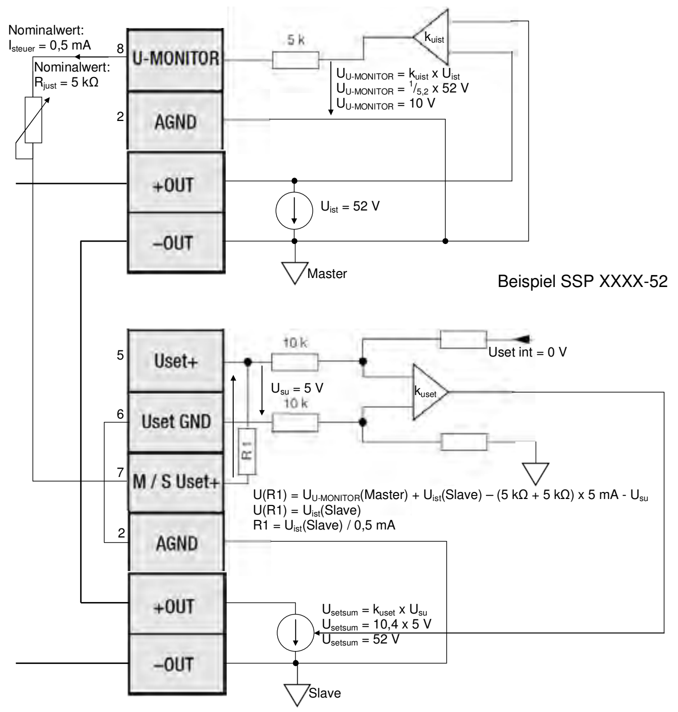
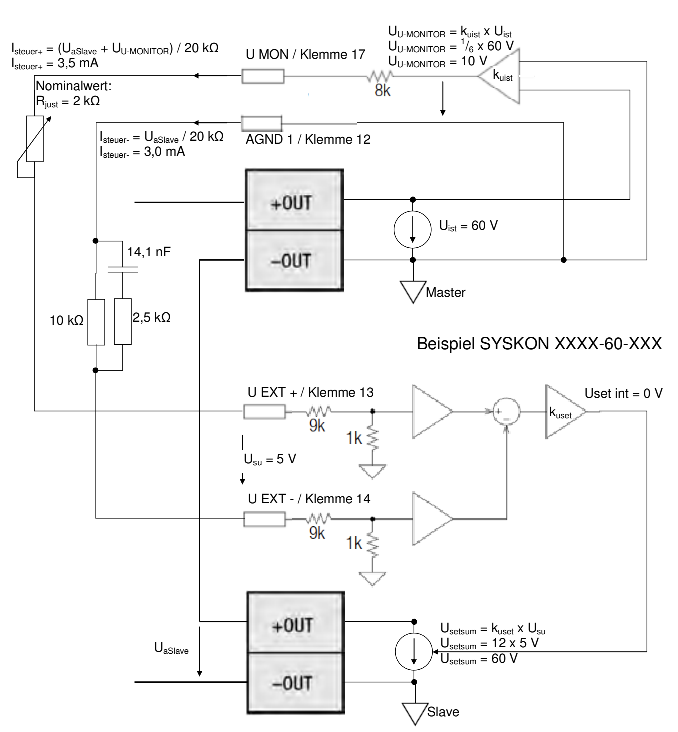
Output current measured to AGND:	$U_{I\text{-}MONITOR} = k_{iactual} \times I_{actual}$
Measured value range $U_{I\text{-}MONITOR}$:	$0\ V \leq U_{I\text{-}MONITOR} \leq 10\ V$
Output current I_{actual}:	$0\ A \leq I_{actual} \leq + I_{nom}$
I_{nom}: 60 A, 120 A, 180 A	Nominal output current
$k_{iactual}$: $^{1}/_{6}\ ^{V}/_{A}$, $^{1}/_{12}\ ^{V}/_{A}$, $^{1}/_{18}\ ^{V}/_{A}$	Gain, measuring coefficient
$U_{I\text{-}MONITOR}$	$U_{terminal\ 18} - U_{terminal\ 12}$
Internal resistance:	8 kΩ



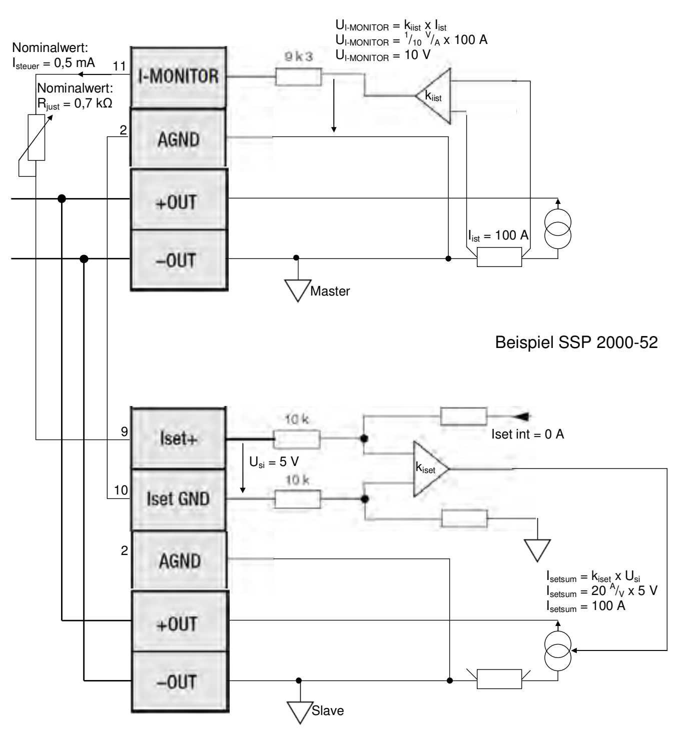
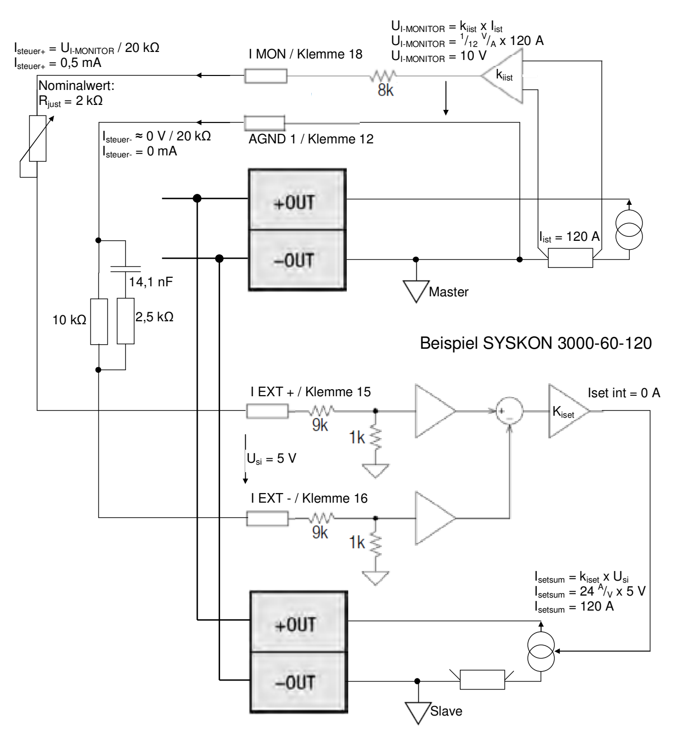
2.8. External Voltage Sensor

Switching to 4-wire operation takes place automatically when the –SENSE lead is connected to the appropriate output pole or negative load pole.		SSP KONSTANTER 6xN
Switching to 4-wire operation takes place automatically when the –SENSE lead is connected to the appropriate output pole or negative load pole.		SYSKON KONSTANTER

2.9. Voltage Regulation with Series Master-Slave Connection

As a result of high impedance resistor R1 at the M/S-Uset+ input, a current of 0.5 mA occurs at nominal output voltage. In order to assure that this is the case, the below specified R1 resistance values are integrated into instruments with various nominal voltages. U_{nom} 40 V 52 V 80 V R1 80 kΩ 104 kΩ 160 kΩ A 10 kΩ ten-turn potentiometer can be used as a trimming resistor. However, one 4.5 kΩ and one 1 kΩ ten-turn potentiometer, connected in series, can be used for finer adjustability.		**SSP KONSTANTER 6xN**
A 5 kΩ ten-turn potentiometer can be used as a trimming resistor. However, one 1.75 kΩ and one 500 Ω ten-turn potentiometer, connected in series, can be used for finer adjustability. Due to the layout of the differential amplifier input for voltages of up to 120 V to internal AGND, no high impedance series resistor is required in addition to the trimming resistor. The network in the inverse feedback path is used for stabilization.		**SYSKON KONSTANTER**

2.10. Current Regulation with Parallel Master-Slave Connection

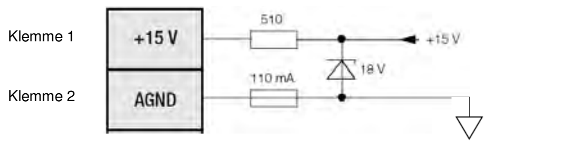
A 2 kΩ ten-turn potentiometer can be used as a trimming resistor. The slave's differential input is not 100% compensated (see internal resistor at the current regulating input).		**SSP KONSTANTER 6xN**
A 5 kΩ ten-turn potentiometer can be used as a trimming resistor. However, one 1.75 kΩ and one 500 Ω ten-turn potentiometer, connected in series, can be used for finer adjustability. The network in the inverse feedback path is used for stabilization.		**SYSKON KONSTANTER**

3. Technical Characteristics of the Analog Interface, Sorted by Instrument Type

3.1. SSP KONSTANTER

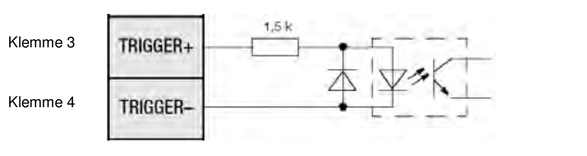
3.1.1. Auxiliary Power

Open circuit voltage:	15 V ± 3%	
Internal resistance:	510 Ω + 25 Ω (PTC)	
Voltage under load:	10 mA	9.7 V
	25 mA	1.6 V
	50 mA	---
	60 mA	---



3.1.2. Trigger Input

Operating voltage:	Low: 0 V ≤ U_s ≤ 1 V High: 4 V ≤ U_s ≤ 26 V
Internal resistance:	1.5 kΩ



3.1.3. Signal output

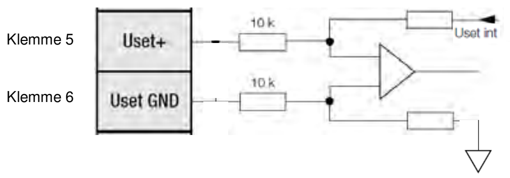
None	

3.1.4. Regulating Output Voltage

Differential voltage input
The output voltage setpoint is the sum of the analog setpoint and the digitally selected setpoint.

U_{setsum} = USET + $U_{setanalog}$
$U_{setanalog}$ = k_{uset} x U_{cu}

Control voltage U_{cu}:				-5 V ≤ U_{cu} ≤ +5 V -U_{nom} ≤ $U_{setanalog}$ ≤ +U_{nom}
U_{nom}	40 V	52 V	80 V	Nominal output voltage
k_{uset}	8	10.4	16	Gain, control coefficient
U_{cu}				$U_{terminal\ 5}$ – $U_{terminal\ 6}$
$U_{setanalog}$				Analog controlled output voltage setpoint
USET				Digitally controlled output voltage setpoint
U_{setsum} ≤ 1.2 x U_{nom}				Output voltage setpoint, combined analog and digital
Internal resistance:				Uset+ 10 kΩ Uset GND 16.56 kΩ



3.1.5. Regulating Output Current

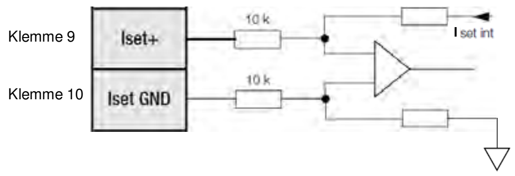
Differential voltage input
The output current setpoint is the sum of the analog setpoint and the digitally selected setpoint.

$I_{setsum} = ISET + I_{setanalog}$
$I_{setanalog} = k_{iset} \times U_{ci}$

Control voltage U_{ci}: $-5\text{ V} \leq U_{ci} \leq +5\text{ V}$
$-I_{nom} \leq I_{setanalog} \leq +I_{nom}$

I_{nom}	12.5 A	25 A	50 A	75 A	100 A	150 A	Nominal output current
k_{iset}	2.5 A/V	5 A/V	10 A/V	15 A/V	20 A/V	30 A/V	Gain, control coefficient
U_{ci}							$U_{terminal\ 5} - U_{terminal\ 6}$
$U_{setanalog}$							Analog controlled output current setpoint
ISET							Digitally controlled output current setpoint
$I_{setsum} \leq 1.2 \times U_{nom}$							Output current setpoint, combined analog and digital

Internal resistance: Iset+ 10 kΩ
Iset GND 16.56 kΩ



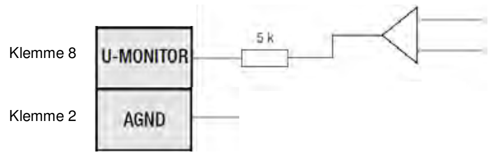
3.1.6. Analog Measured Value for Output Voltage

Output voltage measured to AGND:
$U_{U\text{-}MONITOR} = k_{uactual} \times U_{actual}$

Measured value range
$U_{U\text{-}MONITOR}$: $0\text{ V} \leq U_{U\text{-}MONITOR} \leq 10\text{ V}$
Output voltage U_{actual}: $0\text{ V} \leq U_{actual} \leq +U_{nom}$

U_{nom}	40 V	52 V	80 V	Nominal output voltage
$k_{uactual}$	$^1/_4$	$^1/_{5,2}$	$^1/_8$	Gain, measuring coefficient
$U_{U\text{-}MONITOR}$				$U_{terminal\ 8} - U_{terminal\ 2}$

Internal resistance: 5 kΩ



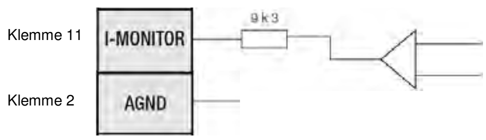
3.1.7. Analog Measured Value for Output Current

Output current measured to AGND: $U_{I\text{-}MONITOR} = k_{iactual} \times I_{actual}$

Measured value range
$U_{I\text{-}MONITOR}$: $0\text{ V} \leq U_{I\text{-}MONITOR} \leq 10\text{ V}$
Output current I_{actual}: $0\text{ A} \leq I_{actual} \leq +I_{nom}$

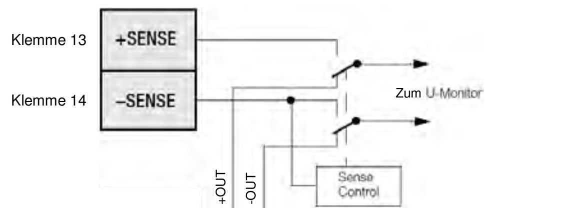
I_{nom}	12.5 A	25 A	50 A	75 A	100 A	150 A	Nominal output current
$k_{iactual}$	$^4/_5$ V/A	$^2/_5$ V/A	$^1/_5$ V/A	$^2/_{15}$ V/A	$^1/_{10}$ V/A	$^1/_{15}$ V/A	Gain, measuring coefficient
$U_{I\text{-}MONITOR}$							$U_{terminal\ 11} - U_{terminal\ 2}$

Internal resistance: 9.3 kΩ



3.1.8. External Voltage Sensor

Switching to 4-wire operation takes place automatically when the –SENSE lead is connected to the appropriate output pole or negative load pole.



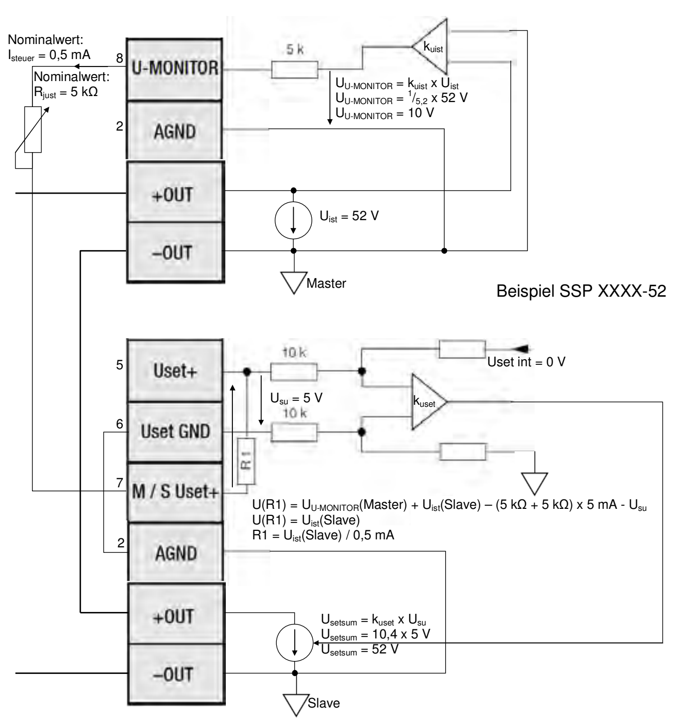
3.1.9. Voltage Regulation with Series Master-Slave Connection

As a result of high impedance resistor R1 at the M/S-Uset+ input, a current of 0.5 mA occurs at nominal output voltage.

In order to assure that this is the case, the below specified R1 resistance values are integrated into instruments with various nominal voltages.

U_{nom}	40 V	52 V	80 V
R1	80 kΩ	104 kΩ	160 kΩ

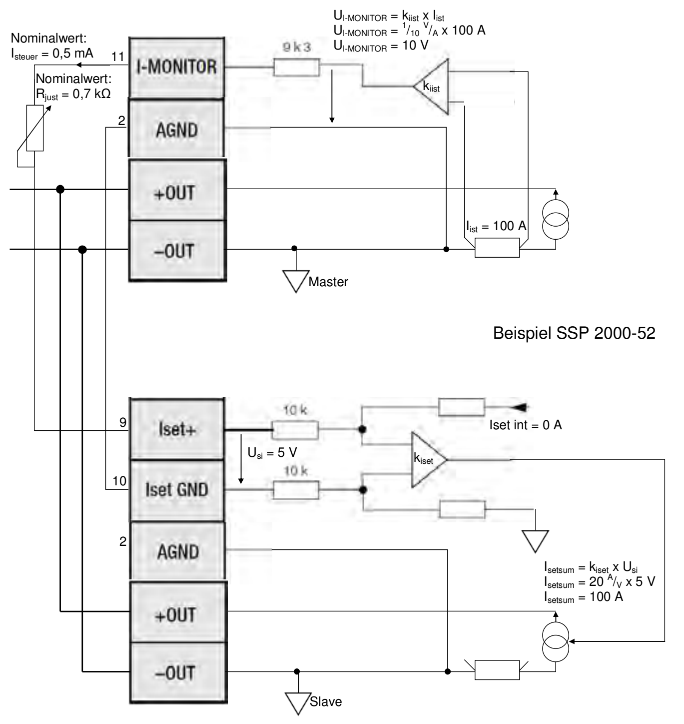
A 10 kΩ ten-turn potentiometer can be used as a trimming resistor.
However, one 4.5 kΩ and one 1 kΩ ten-turn potentiometer, connected in series, can be used for finer adjustability.



3.1.10. Current Regulation with Parallel Master-Slave Connection

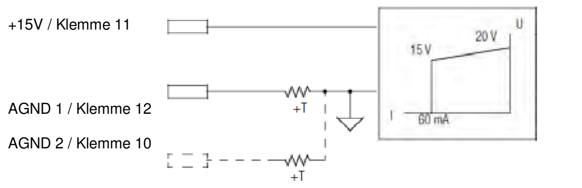
A 2 kΩ ten-turn potentiometer can be used as a trimming resistor.

The slave's differential input is not 100% compensated. (see internal resistor at the current regulating input)

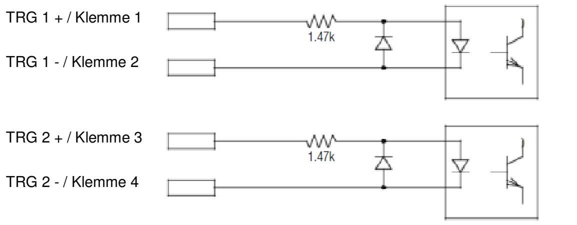


3.2. SYSKON KONSTANTER

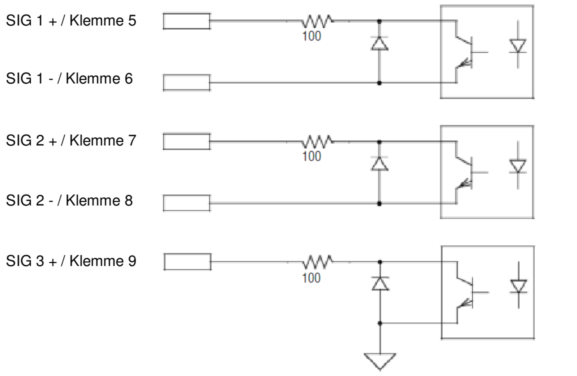
3.2.1. Auxiliary Power

Open circuit voltage:	18.5 V		
Internal resistance:	20 Ω + 25 Ω (PTC)		
Voltage under load:	10 mA	18.0 V	
	25 mA	17.4 V	
	50 mA	16.3 V	
	60 mA	15.8 V	
	63 mA	→ 0 V	

3.2.2. Trigger Input

Operating voltage:	Low: $-18\ V \leq U_s \leq 1\ V$ High: $4\ V \leq U_s \leq 18\ V$	
Internal resistance:	1.47 kΩ	

3.2.3. Signal output

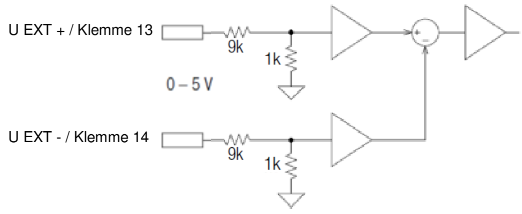
Operating voltage:	Max. 30 V	
Operating current:	Max. 20 mA	
Internal resistance:	100 Ω	

3.2.4. Regulating Output Voltage

Differential voltage input
The output voltage setpoint is the sum of the analog setpoint and the digitally selected setpoint.

$U_{setsum} = USET + U_{setanalog}$
$U_{setanalog} = k_{uset} \times U_{cu}$

Control voltage U_{cu}:		$-5\ V \leq U_{cu} \leq +5\ V$ $-U_{nom} \leq U_{setanalog} \leq +U_{nom}$
U_{nom}	60 V	Nominal output voltage
k_{uset}	12	Gain, control coefficient
U_{cu}		$U_{terminal\ 13} - U_{terminal\ 14}$
$U_{setanalog}$		Analog controlled output voltage setpoint
USET		Digitally controlled output voltage setpoint
$U_{setsum} \leq 1.1 \times U_{nom}$		Output voltage setpoint, combined analog and digital
Internal resistance:		U EXT + 10 kΩ U EXT - 10 kΩ

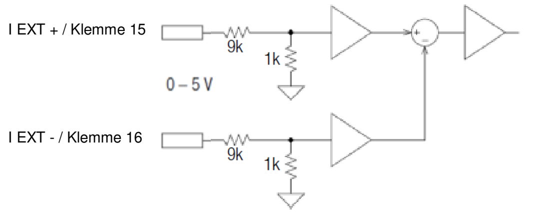


3.2.5. Regulating Output Current

Differential voltage input
The output current setpoint is the sum of the analog setpoint and the digitally selected setpoint.

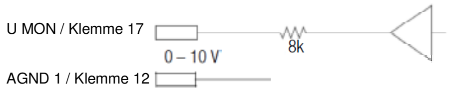
I_{setsum} = ISET + $I_{setanalog}$
$I_{setanalog}$ = k_{iset} x U_{ci}

Control voltage U_{ci}:				-5 V ≤ U_{ci} ≤ +5 V -I_{nom} ≤ $I_{setanalog}$ ≤ + I_{nom}
I_{nom}	60 A	120 A	180 A	Nominal output current
k_{iset}	12 $^{A}/_{V}$	24 $^{A}/_{V}$	36 $^{A}/_{V}$	Gain, control coefficient
U_{ci}				$U_{terminal\ 15}$ – $U_{terminal\ 16}$
$U_{setanalog}$				Analog controlled output current setpoint
ISET				Digitally controlled output current setpoint
I_{setsum} ≤ 1.2 x U_{nom}				Output current setpoint, combined analog and digital
Internal resistance:				I EXT + 10 kΩ I EXT - 10 kΩ



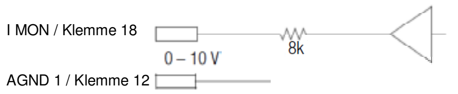
3.2.6. Analog Measured Value for Output Voltage

Output voltage measured to AGND:		$U_{U\text{-}MONITOR}$ = $k_{uactual}$ x U_{actual}
Measured value range $U_{U\text{-}MONITOR}$:		0 V ≤ $U_{U\text{-}MONITOR}$ ≤ 10 V
Output voltage U_{actual}:		0 V ≤ U_{actual} ≤ + U_{nom}
U_{nom}	60 V	Nominal output voltage
$k_{uactual}$	$^{1}/_{6}$	Gain, measuring coefficient
$U_{U\text{-}MONITOR}$		$U_{terminal\ 17}$ – $U_{terminal\ 12}$
Internal resistance:		8 kΩ



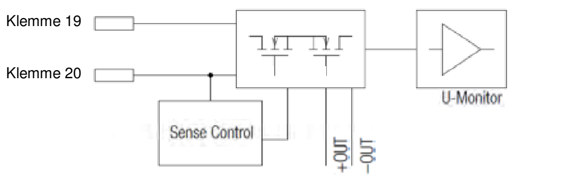
3.2.7. Analog Measured Value for Output Current

Output current measured to AGND:				$U_{I\text{-}MONITOR}$ = $k_{iactual}$ x I_{actual}
Measured value range $U_{I\text{-}MONITOR}$:				0 V ≤ $U_{I\text{-}MONITOR}$ ≤ 10 V
Output current I_{actual}:				0 A ≤ I_{actual} ≤ + I_{nom}
I_{nom}	60 A	120 A	180 A	Nominal output current
$k_{iactual}$	$^{1}/_{6}$ $^{V}/_{A}$	$^{1}/_{12}$ $^{V}/_{A}$	$^{1}/_{18}$ $^{V}/_{A}$	Gain, measuring coefficient
$U_{I\text{-}MONITOR}$				$U_{terminal\ 18}$ – $U_{terminal\ 12}$
Internal resistance:				8 kΩ



3.2.8. External Voltage Sensor

Switching to 4-wire operation takes place automatically when the –SENSE lead is connected to the appropriate output pole or negative load pole.

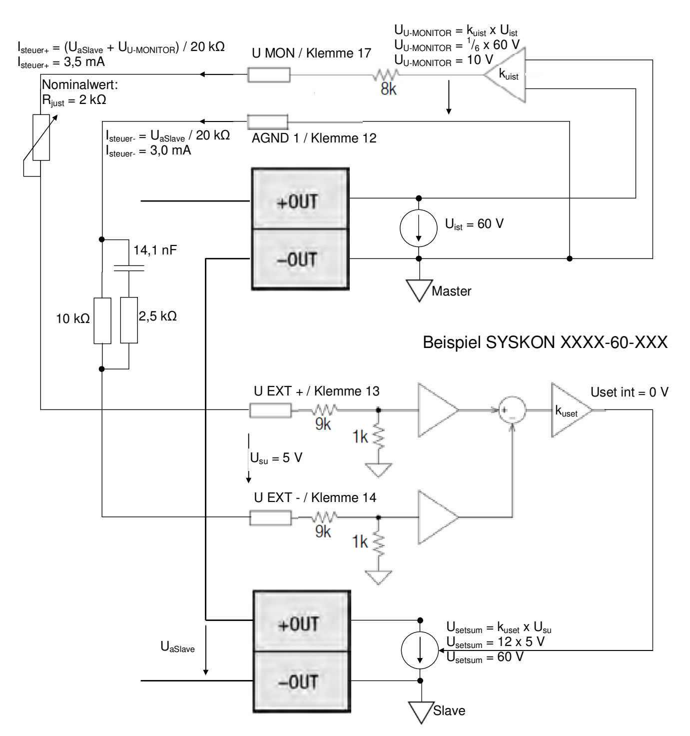


3.2.9. Voltage Regulation with Series Master-Slave Connection

A 5 kΩ ten-turn potentiometer can be used as a trimming resistor.
However, one 1.75 kΩ and one 500 Ω ten-turn potentiometer, connected in series, can be used for finer adjustability.

Due to the layout of the differential amplifier input for voltages of up to 120 V to internal AGND, no high impedance series resistor is required in addition to the trimming resistor.

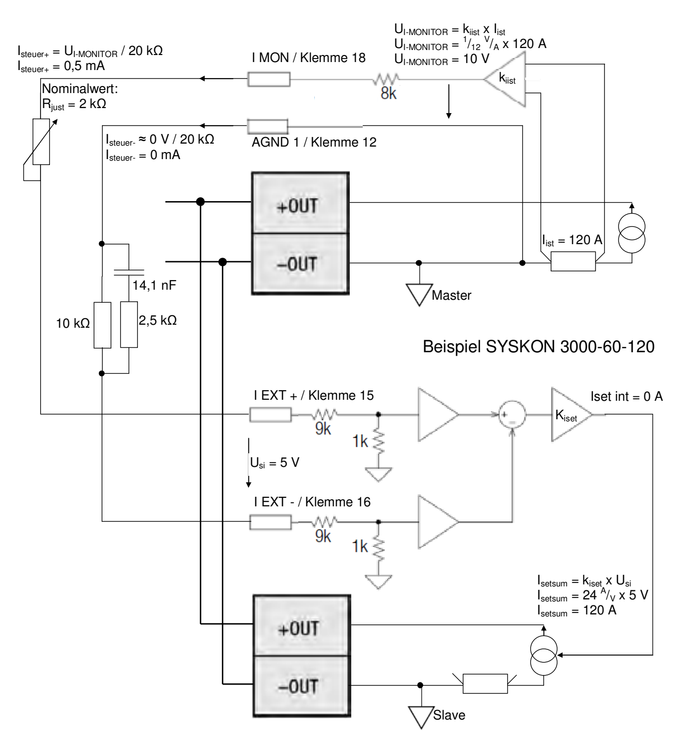
The network in the inverse feedback path is used for stabilization.



3.2.10. Current Regulation with Parallel Master-Slave Connection

A 5 kΩ ten-turn potentiometer can be used as a trimming resistor.
However, one 1.75 kΩ and one 500 Ω ten-turn potentiometer, connected in series, can be used for finer adjustability.

The network in the inverse feedback path is used for stabilization.



Developed in Germany • subject to alterations

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