Electrical amplifier for flow control with proportional valves

RE 29955/09.04 1/6
Replaces: 11.02

Type VT 5035

Component series 1X

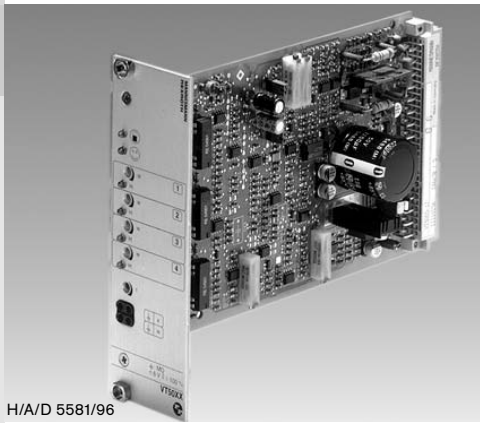

H/A/D 5581/96

Table of contents

Card holder:

– Type VT 3002-2X/32, see RE 29928
Single card holder without power supply unit

Power supply unit:

– Type VT-NE30-1X, see RE 29929
Compact power supply unit 115/230 VAC Æ 24 VDC, 70 VA

Features

VT 5035 amplifiers are used for adjusting the flow of variable displacement pumps of types A4VSO and A4VSG (see RE 92050, RE 92076 and RE 92100).

Features:

– Differential input
– Enable input with LED indicator lamp
– "Ready for operation" signalled by LED
– Ramp generator
– Four command values that can be adjusted by means of a potentiometer; call-up is signalled by LEDs
– Controller for swivel angle
– Two clocked current output stages
– Oscillator and demodulator for inductive position measurement with cable break detection
– Reverse polarity protection for power supply

Note:

With the factory setting, the amplifiers have a ramp time of 5 s (for setting the ramp time to 1 s, see page 5).

Ordering code

VT 5035 –1X / *

Amplifier for the flow adjustment of A4VSO and A4VSG variable displacement axial piston pumps

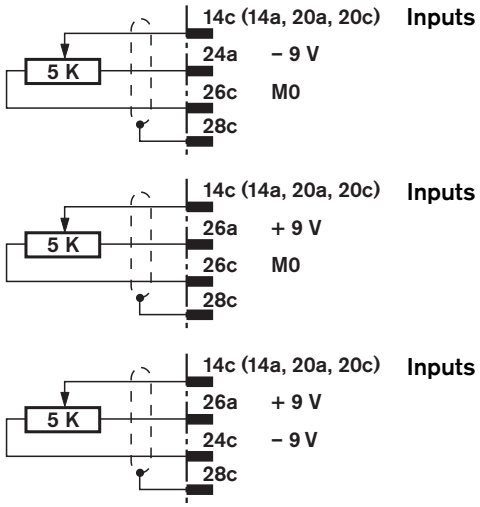
1X = Component series10 to19
(10 to 19: unchanged technical data and pin assignment

Further details in clear text

Functional description

Command value inputs 1 to 4 can be used for calling command values [1] by operating the associated relays (K1 to K4). The command value voltage is provided either directly through the regulated ±9 V voltages of the internal power supply unit [10] or via an external command value potentiometer. The following is valid for these inputs: ± 9 V ≙ 100 % [1]. If these four command value inputs are connected directly to the regulated ± 9 V voltages, four different command values can be set using potentiometers "w1" to "w4". If external potentiometers are used at these inputs, the internal potentiometers act as attenuators or limiters, unless they are set to maximum.

External command vale potentiometers



LEDs "H1" to “H4" signal, which command value is being called up. If more than one command value is called at a time, the input with the highest number has priority.

Example: If command value 1 and command value 3 are activated simultaneously, command value 3, command value 3 becomes effective.

A further output of the card provides a supply voltage for the command value call-ups, which can be changed over from + 9 V to – 9 V by means of relay K6 [1].

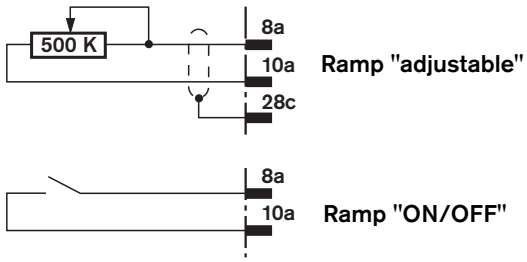
All of the relays on the card are switched with 24 VDC (smoothed).

Command value input 5 is a differential input (0 to ± 10 V). If the command value is provided by external electronics with another reference potential, this input must be used. When switching the command value voltage on or off, care must be taken to ensure that both signal cables are always disconnected from or connected to the input.

Before being passed on, all command values are summated [3] with the correct amount and sign.

The downstream ramp generator [4] creates a ramp-shaped output signal from a step-like input signal. The time constant of the output signal can be adjusted by means of potentiometer "t". The specified ramp rime refers to a command value step-change of 100 % and can be approx. 1s or 5 s depending on the jumper setting (J5, J6). If a command value step-change of less than 100 % is applied to the input of the ramp generator, the ramp time shortens accordingly.

External time potentiometer and ramp "OFF"



Note:

When an external time potentiometer is used, the internal potentiometer for the ramp time must be set to maximum. The maximum ramp time shortens, because the resistance of the external potentiometer is connected in parallel to that of the internal potentiometer (ca. 500 kΩ)!

The ramp time can be set to its minimum value (approx. 30 ms) by operating relay K5 or by means of an external jumper.

The output signal of the ramp generator [4] is the swivel angle command value and is fed to the PID controller [5], measuring socket "w" on the front panel of the card and connection 4a (command value after ramp / external limiting potential). A voltage of – 6 V at command value measuring socket "w" corresponds to a command value of + 100 %.

The PID controller is optimised specifically to the requirements of pump types A4VSO and A4VSG. The current output stages are controlled in dependence upon the difference between the swivel angle command value and the actual swivel angle value. A positive command value signal at the input of the amplifier activates the output stage for solenoid “a”, a negative command value signal the output stage for solenoid “b”.

The inductive position transducer [11] acquires the swivel angle of the pump’s swashplate. The AC voltage signal provided by the position transducer is converted by oscillator/demodulator [9] and fed back to the PID controller as actual swivel angle value.

The zero point of the position transducer (actual value zero point) can be adjusted by means of potentiometer "Zx" (on the printed circuit board). The gain of the actual swivel angle value is calibrated in the factory and must not be changed (± 6V ≙ max. swivel angle).

A signal of > 8.5 V applied to the enable input enables the output stages (indicated by yellow LED "H11" on the front panel). The output stages can also be enabled permanently independently of the state of the enable input by setting jumper J7. The enable input then becomes ineffective.

LED "H12" (ready for operation) is on during trouble-free operation; positively, when:
- the enable signal is applied,
- the internal ± 9 V voltage supply is operable (amplitude and symmetry),
- there is no short-circuit of the solenoid cables and
- no cable break of the position transducer cables.

In the event of a fault, both output stages are immediately de-energised, the controller is switched off and the signal “ready for operation” is reset. After rectification of the fault, the card is immediately operable; LED "H12" is again ON.

[1] = Reference potential for command values 1 to 4 is M0 (measurement zero).

[ ] = Cross-reference to block circuit diagram

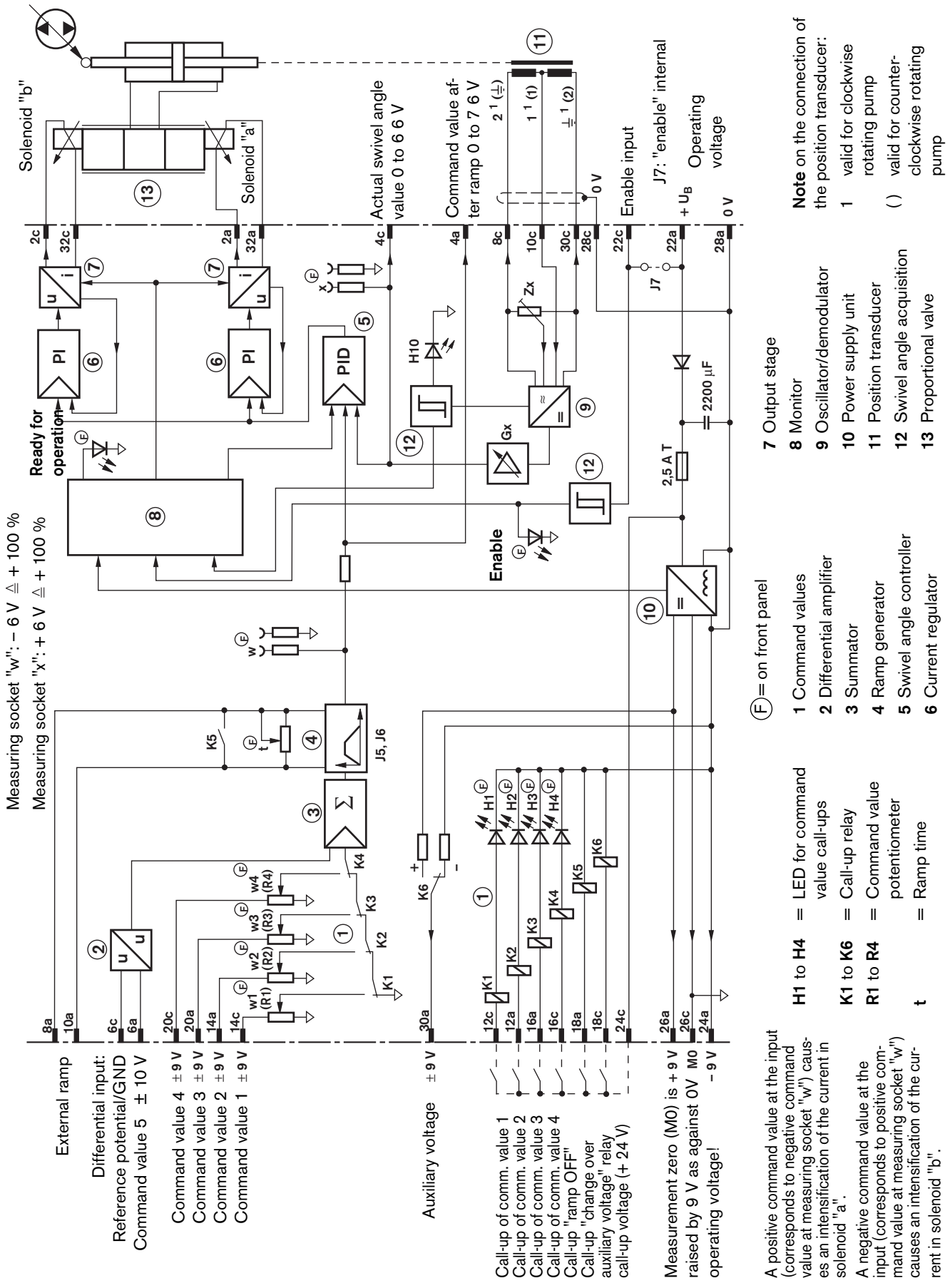
Technical data (for applications outside these parameters, please consult us!)

Operating voltage	U_O	24 VDC + 40 % – 5 %
Operating range:		
– Upper limit value	$u_O(t)_{max}$	35 V
– Lower limit value	$u_O(t)_{min}$	22 V
Power consumption	P_S	< 50 VA
Current consumption	I	< 2 A
Fuse	I_F	2.5 A T
Inputs:		
– Command values 1 to 4	U_i	± 9 V (reference potential is M0)
– Command value 5	U_i	0 to ± 10 V
– Enable		
• active	U_E	> 8.5 V
• not active	U_E	< 6.5 V
Relay data:		
– Nominal voltage	U	Operating voltage U_O
– Response voltage	U	16.8 V
– Release voltage	U	2.4 V
– Coil resistance	R	2150 Ω
Ramp time (adjustment range)	t	30 ms to approx. 1 s or 5 s (± 20 % each)
Outputs:		
– Output stage		
• Solenoid current / resistance	I_{max}	1.8 A ± 20 %; $R_{(20)}$ = 5.4 Ω
• Clock frequency	f	Freely clocking up to approx. 1.5 kHz
– Driver for inductive position transducer		
• Oscillator frequency	f	2.5 kHz ± 10 %
• Max. load carrying capacity • Voltage amplitude (U_{ss})	I	30 mA
	U_a	5 V per output
– Regulated voltage	U	± 9 V ± 1 %; ± 25 mA externally loadable
– Measuring sockets		
• Command value "w"	U_w	0 to 7 6 V (– 6 V ≙ + 100 %; + 6 V ≙ – 100 %); R_i = 100Ω
• Actual swivel angle value "x"	U_x	0 to 6 6 V (+ 6 V ≙ + 100 %; – 6 V ≙ – 100 %); R_i = 100Ω
Type of connection		32-pin male connector, DIN 41 612, form D
Card dimensions		Euro-card 100 x 160 mm, DIN 41 494
Front panel dimensions:		
– Height		3 HE (128.4 mm)
– Width soldering side		1 TE (5.08 mm)
– Width component side		7 TE
Permissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	– 25 to + 85 °C
Weight	m	0.15 kg

Note:

For details regarding **enivironment simulation testing** in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 30095-U (declaration on environmental compatibility).

Block circuit diagram / pin assignment: VT 5035 (series 17 or higher)



A positive command value at the input (corresponds to negative command value at measuring socket "w") causes an intensification of the current in solenoid "a".

A negative command value at the input (corresponds to positive command value at measuring socket "w") causes an intensification of the current in solenoid "b".

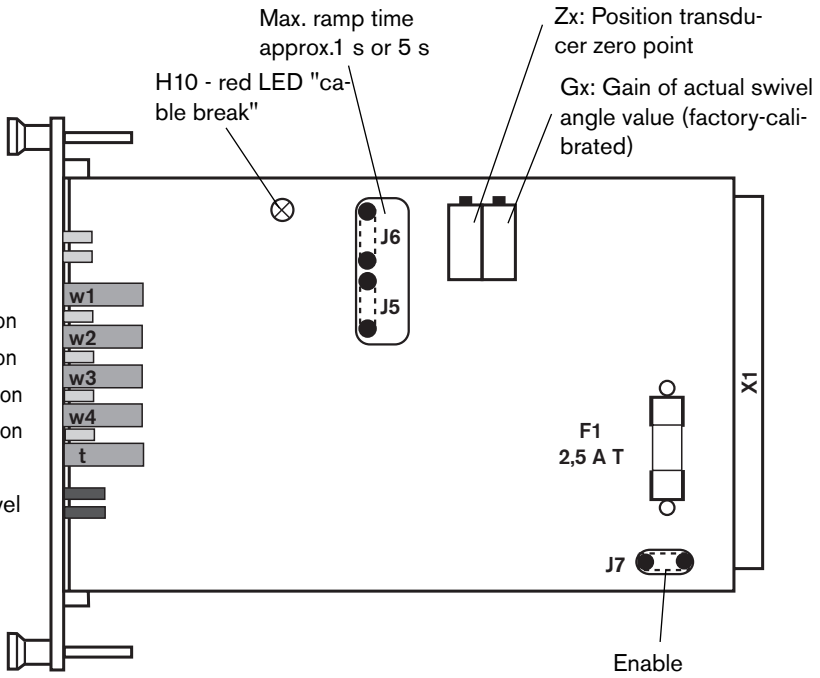
H1 to **H4** = LED for command value call-ups
K1 to **K6** = Call-up relay
R1 to **R4** = Command value potentiometer
t = Ramp time

Ⓕ = on front panel

1 Command values
2 Differential amplifier
3 Summator
4 Ramp generator
5 Swivel angle controller
6 Current regulator
7 Output stage
8 Monitor
9 Oscillator/demodulator
10 Power supply unit
11 Position transducer
12 Swivel angle acquisition
13 Proportional valve

Note on the connection of the position transducer:
1 valid for clockwise rotating pump
( ) valid for counter-clockwise rotating pump

Indicator / adjustment elements

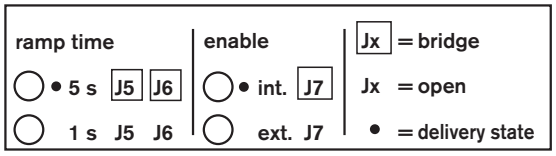


LED "enable" (yellow)
LED "ready for operation" (green)

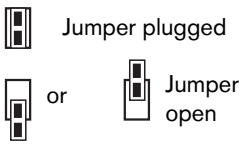
w1/H1 - command value 1 with LED indication
w2/H2 - command value 2 with LED indication
w3/H3 - command value 3 with LED indication
w4/H4 - command value 4 with LED indication
t - ramp time
x - measuring socket for actual swivel angle value
w - measuring socket for command value

Meaning of the jumpers on the card for settings

(nameplate on the back of the front panel)



Ramp time Enable Factory setting



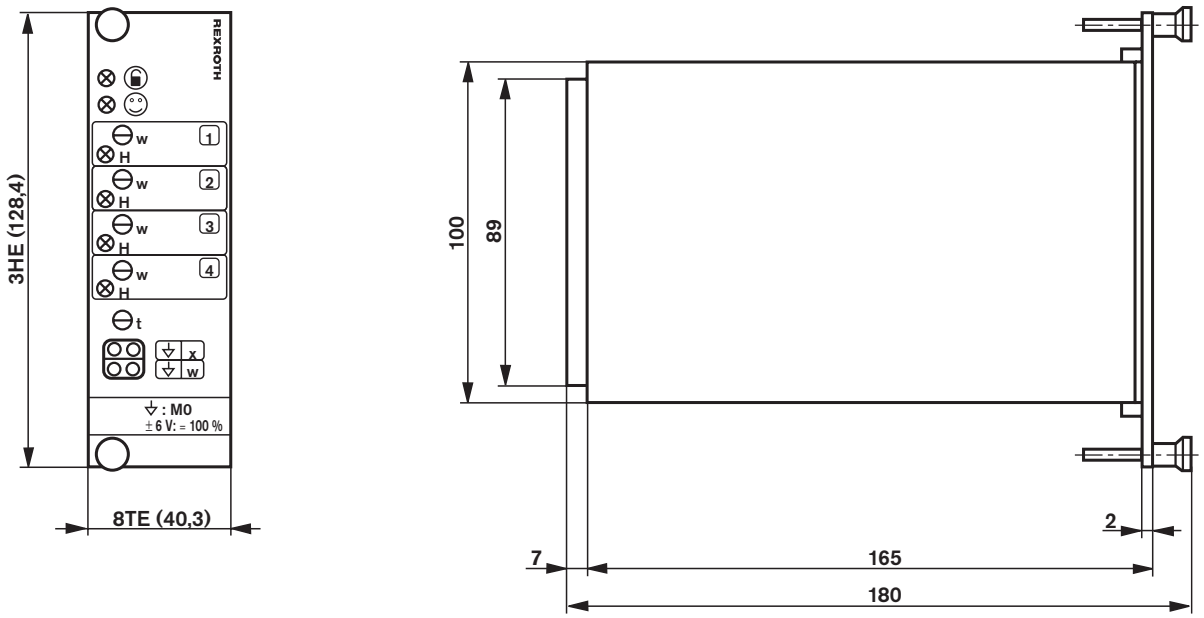
Note:

The circles (◯) denote the settings made by the customer.

Engineering / maintenance notes / supplementary information

- The amplifier card may only be plugged or unplugged when disconnected from the power supply!
- Do not use plugs with free-wheeling diodes or LEDs for connecting the solenoids!
- Measurements on the card may only be taken with instruments with $R_i > 100\ k\Omega$!
- The measurement zero (M0) is raised by + 9 V as against 0V operating voltage and is not electrically isolated, i.e. – 9 V regulated voltage ≙ 0V operating voltage. The measurement zero (M0) must therefore not be connected to the 0V operating voltage!
- Use relays with gold-plated contacts for passing on command values (small voltages, small currents)!
- Use only switching contacts with a load carrying capacity of approx. 40 V, 50 mA for switching the card relays!
  In the case of external controlling, the control voltage may have a maximum residual ripple content of 10 %!
- Always shield the command value cables and inductive position transducer cables separately; connect the shield to 0V operating voltage on the card side and leave the other end open (risk of earth loops)!
  Recommendation: Shield also solenoid cables!
  For solenoid cable lengths up to 50 m use cable type LiYCY 1.5 mm^2. For greater lengths, please consult us!
- The distance to aerial lines, radio sources and radar equipment must be at least 1 m!
- Do not lay solenoid and signal cables near power cables!
- Due to the charging current of the smoothing capacitor on the card, back-up fuses must have slow-blowing characteristics!
- Do not connect the ground symbol on the inductive position transducer to ground!
  (Precondition for compatibility with preceding series!)
- **Caution:** When using the **differential input, both inputs** must always be switched on or off **simultaneously**!
- **Note:** Electrical signals brought out via control electronics (e.g. actual value) must not be used for switching safety-relevant machine functions!
  (See also European standard "Safety requirements for fluid power systems and components - hydraulics", prEN 982)

Unit dimensions (dimensions in mm)



Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengiesser 1
97816 Lohr am Main, Germany
Telephone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de