VK 5

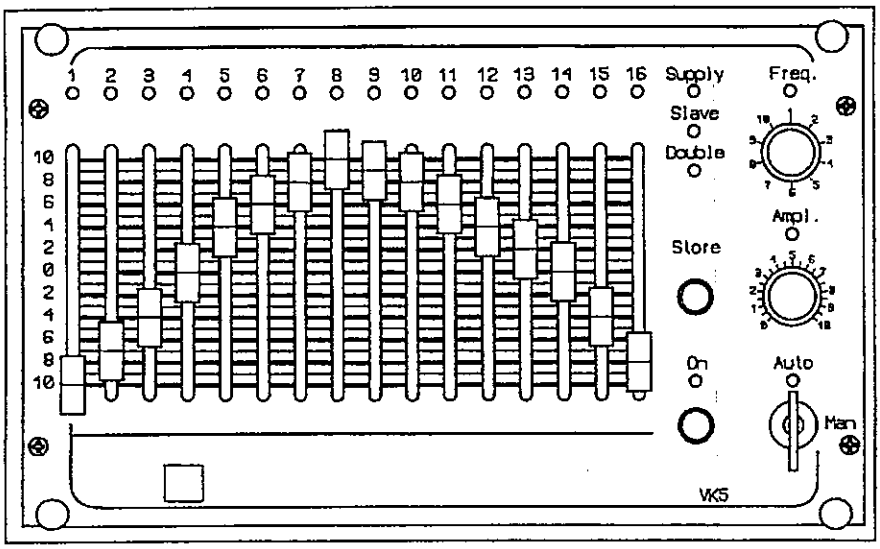
Programable Beam Deflection System

1 Structure

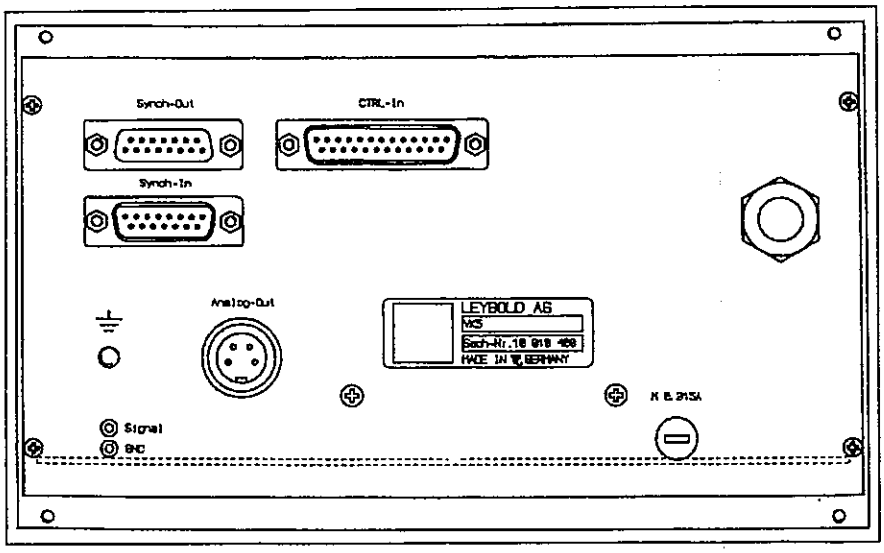
1.1 General

The slide-in module VK 5 accommodates the controller for the programmable deflection of an electron beam and is essentially a functional generator. The device is designed for insertion in an 19" module rack. The layout of the control and connecting elements is shown on the front and rear views on this page and the following one.

1.2 Front View



1.3 Rear View



2 Functional Description

2.1 General

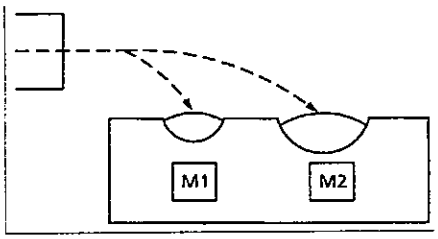
The slide-in module VK 5 is a programable functional generator for electron beam evaporator or gun. It allows the following parameters to be stored as recipes:

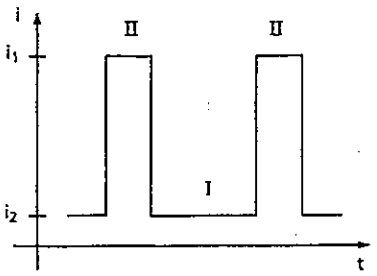
- curve shape
- frequency
- amplitude.

The device is designed to store 256 recipes.
The curve shape is pre-determined by 16 sliding potentiometers and represents a period of time. The repetition frequency can be selected in 10 steps between 1 Hz and 500 Hz.
A sliding potentiometer is used to set the output amplitude between 0 and 100 %. The adjustment range of the sliding potentiometers gives a (bipolar) output signal between -10 V and + 10 V. This output can be released or inhibited with a switch.
Floating digital inputs (binary coded) are used to select the recipe memories.
The recipe 0 is always active unless the inputs have been selected. A keylock switch is used to change the operating mode from manual to automatic and vice-versa. An LED lights up when automatic mode is active. In manual mode the output signal is generated according to the settings of the operating and control elements, whereas in automatic mode the output signal corresponds to the data stored for the recipe which has been selected. During manual mode it is possible to save the current values as a recipe by actuating a key.
If the values stored for an active recipe match those specified by the operating elements, the associated LEDs indicate this conformance.
If two VK 5 modules are operated simultaneously, a floating digital input can be used to change one device to slave mode. This operating mode is indicated by an LED and causes the internal clock-pulse generation to be synchronized via a cable link by the "master". In slave mode the functions of the internal frequency-selector switch, the key for storing recipes and the keylock switch for automatic/manual switchover are blocked on the slave unit. These functions can be called by actuating the appropriate operating elements on the master unit.
Two additional floating digital inputs can be used to set an operating mode that connects in series two modules in terms of time. This mode permits a finer temporal signal resolution. Again, the mode is indicated by an LED. The second device in the series is synchronized according to the procedure described in the preceding paragraph (master/ slave mode). The second of the two digital inputs defines which one of the two devices generates the first part of the output signal.

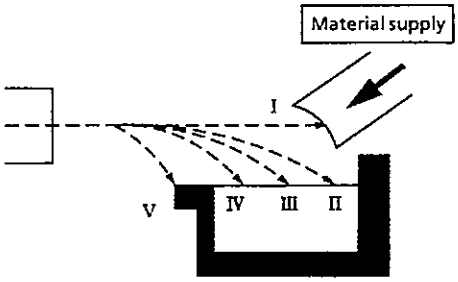
2.2 Examples of Application

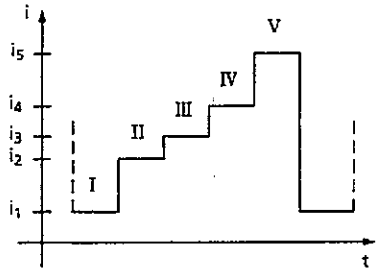
2.2.1 Rectangular deflection (selectable power distribution)



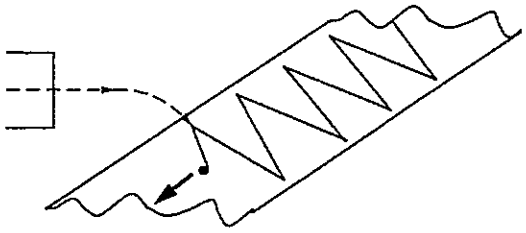


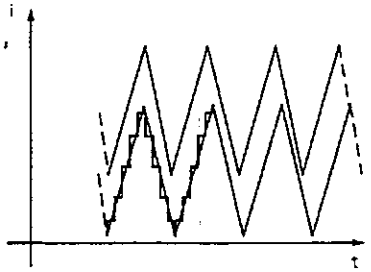
2.2.2 Melt-off various positions



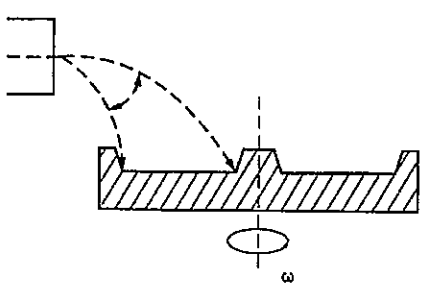


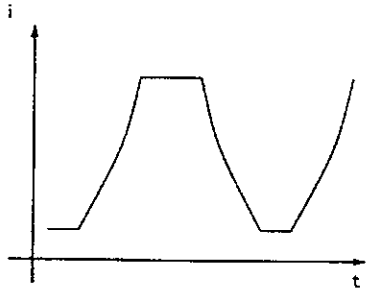
2.2.3 Triangular deflection (e.g. for belt pre-heating)



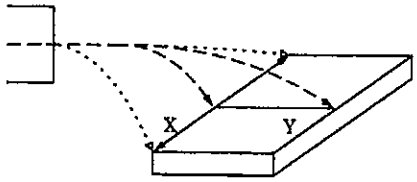


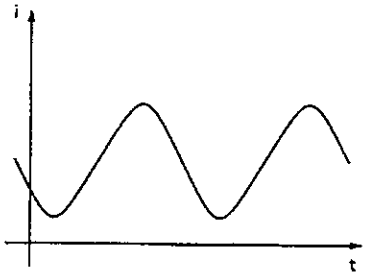
2.2.4 Quartz evaporation



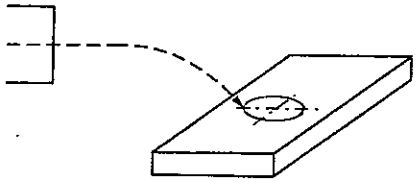


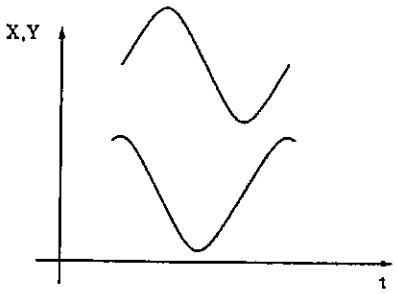
2.2.5 Planiform evaporation, X-Y mode





2.2.6 Synchronous operation





3 Technical Data

3.1 Power Supply

	External	
	Mains voltage	230V +/-10%,PE
	Mains f req uency	50 / 60 Hz
	Max. power consumption	16 VA
	Mainsfusing	Single-pole miniature fuse M 0.315 A
	Connection	Mains cable 1.5 rn (shockproof connector)

3.2 Input Signals

3.2.1	SYNCH-IN	Sub-D connector, 15-pole, pins
		4 optical coupler inputs, mutual cathode connection
		Active-high operation
	Input voltage	-5 V + 1,5 V
	Input current	2,2 5 mA (High)
		0 ... 0,1 mA (Low)
3.2.2	CTRL-IN	Sub-D connector, 25-pole, pins
		12 optical coupler inputs, mutual cathode connection ,
		"active-high" control
	Input voltage	5 V 30 V (High)
	Input current	0 mA 15 mA

3.3 Output Signals

3.3.1	Analog output	Circular plug, 4-pole, sockets
	Amplitude	-10 V 0 + 10V
	Accuracy	≤ 1 %
	Normal strain	RL ≥ 5 kΩ (inherently short-circuit-proof)
3.3.2	SYNCH-OUT	Sub-D connector, 15-pole, sockets
	TRI-state buffer	
	"active-low" control	
	Output voltage	5 V
	Output resistance	820 Ohm
	Short-circuit current	< 6,1 mA
3.3.3	Measuring Output	
	"Signal, GND"	Miniature test sockets, dia. 2 mm.
		This output is electrically parallel to the "Analog-Out" output

3.4 Control Elements

Curve shape	16 sliding potentiometers
Amplitude	Rotary potentiometer
Frequency	Decade selector switch, "0 ... 9"
MANUAL/AUTO	Keylock switch, key removable in either position
STORE	Key
ON/OFF	Switch

3.5 Display Elements

"SUPPLY"	LED
"ON"	LED
"AUTO"	LED
"SLAVE"	LED
"DOUBLE"	LED
"Comparative displays"	18 LEDs

3.6 Internal Memory

Memory type	Nonvolatile RAM (battery stand-by)
Size	8 kbytes
Data preservation	> 10 years

3.7 Ambient Conditions

Temperature range	0 50 OC
Permiss. rel. air humidity	≤ 75 % , no moisture condensation
Installation altitude	≤ 1000 m above NN
Enclosure type	IP 50

3.8 Dimensions

Width	210 mm
Height	112
Depth	150 mm
Weight	2.6 kg
Front panel	213 x 128.4 (1/2 19" insert, 3 HE)
Installation depth	min. 200 mm

4 Technical Description

4.1 Manual Mode

Move keylock switch "Auto/Man" to "Man" position.

Press ON/OFF switch to "ON" position (Button is depressed).

The yellow LED for "Auto" is off, whereas the yellow "ON" LED is lit up.

Using the 16 sliding potentiometers, the amplitude potentiometer and the frequency selector switch, it is now possible to set the required curve shape for the output signal.

4.2 Storing Recipe

The curve shape, frequency and amplitude parameters set in manual mode can be stored as a recipe by actuating the "Store" key. The recipe is saved to the selected recipe memory (0-255) via the address applied binary at the "CtrlIn" input.

The "Freq.". "Ampl." and "1-16" LEDs light up(single LEDs may flicker due to bit leaps of the A/D - D/A conversion) and indicate that the parameters stored in the selected recipe memory match those set by hand.

Caution:

Never actuate the "Store" key immediately before, or during, the changeover from "Auto" to "Man". Otherwise the storage results will be unpredictable, as the storage function is always active for whole cycles only.

4.3 Automatic Mode

Move keylock switch "Auto/Man" into "Auto" position.

Press ON/OFF switch to "ON" position (Button is depressed).

The yellow LED for "Auto" lights up.

The output signal def ined by the parameters stored in the selected recipe memory is now available at the output.

The individual recipe memories can be called up by changing the address at the "Ctrl-In" input.

4.4 Recovering Stored Settings

Move keylock switch "Auto/Man" into "Man" position.

The yellow "Man" LED must be illuminated.

Select recipe.

Move frequency selector switch ("Freq.") to Position 10.

Adjust sliding potentiometers " 1-16" in such a way that the yellow LED`s associated with the potentiometers are lit up.

Now adjust the amplitude potentiometer in such a way that the associated LED lights up.

Adjust the frequency selector switch ("Freq.") in such away that the yellow LED "Freq." lights up. Once this has been done, the manual setting is identical with the setting stored in the selected recipe.

4.5 Slave Mode

In order to synchronize two VK 5 devices the output "Synch-Out" of the master device must be linked 1:1 with the "Synch-in" input of the slave device via a 5-pole cable. As long as the "Ctrl-In" input (X5.9: slave command) of the slave device is not activated, the two devices function independently. Once the input X5.9 is activated, the device switches to the slave mode. The LED "Slave" lights up and the frequency selector switch, the keylock switch. All "Auto/Man" and the "Store" key of the slave device are now disactivated. The functions usually exercised by these switches and the key are handled by the control elements of the master device.

4.6 Double Function

If in addition to the slave-mode settings the inputs (Ctrl-In, Double command) of both devices are activated, the Double Mode becomes active and the yellow "Double" LEDs light up. The outputs of both devices are alternately suppressed for once cycle (output voltage 0 V). If both outputs are summated, a periodical signal with double resolution (32 potentiometers) is obtained.

4.7 Connector Pin Assignment

X.1 Output "Analog-Out"X13

X13.1 GND
X13.2 notassigned
X13.3 outputsignal
X1 3.4 not assigned

X.2 Output "Synch-Out"" X7

X7.1 GND reference potential
X7.2 CLK clock for slave device
X7.3 SYNCO synchronizing signal for slave device
X7.4 STORE store command for slave device
X7.5 AUTO automatic command for slave device
X7.6 GND
X7.7 not assigned
...
X7.15 not assigned

X.3 Input "Synch-in"' X6

X6.1 GND reference potential
X6.2 CLK clock from master device
X6.3 SYNCO synchronizing signal from master device
X6.4 STORE store command from master device
X6.5 AUTO automatic command from slave device
X6.6 not assigned
...
X6.16 not assigned

X.4 Input "Ctrl-in" X5

X5.1 recipe address, bit 0
X5.2 recipe address, bit 1
X5.3 recipe address, bit 2
X5.4 recipe address, bit 3
X5.5 recipe address, bit 4
X5.6 recipe address, bit 5
X5.7 recipe address, bit 6
X5.8 recipe address, bit 7
X5.9 slave command
X5. 10 double command
X5.1 1 first command
X5.12 ext. OV (external reference potential)
X5.13 ext. 0 V (external reference potential)
X5.14 not assigned
X5.15 not assigned
...
X5.25 not assigned

5 Setting Instructions

5.1 Initial Operation

- VK 5 is switched off
- Amplitude = 0
- Set VK 5 keylock switch to Manual Mode
- Fill crucible
- Using remote control, position beam with low power (material- dependent approx. 5-10 mA) in centre of cup.
- Set sliding potentiometer of VK 5 to required curve shape for X and/or Y-position (beam image).
- Transfer (adjust) deflection values of remote control to the deflection unit on the control cabinet. Then remove remote control; otherwise accidental adjustment will be possible.
- Set frequency selector switch "Freq." to required frequency (1-10, depending on method).
- Switch on VK 5.
- Adjust amplitude in such a way that beam dwells in cup and does not stray from the latter.

  Caution!

  Excessive amplitude may lead to destruction of the crucible.

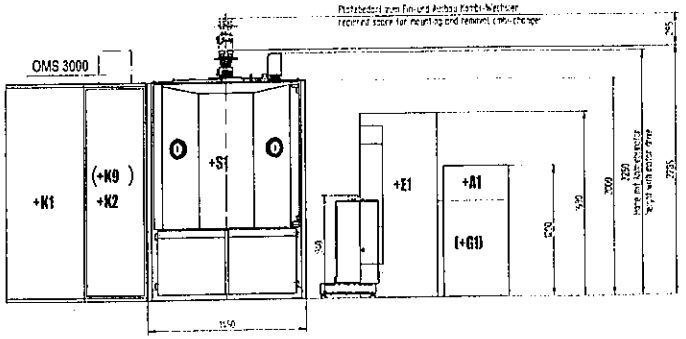
Note:

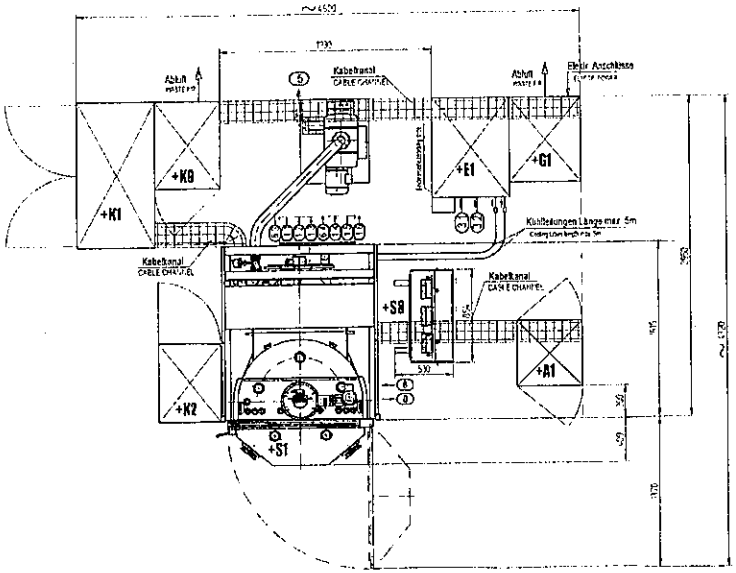
If the beam strays from the cup, a loss of power will result due to the fact that this beam power does not reach the melt. Furthermore, deposits may be evaporated onto the crucible and thereby falsify the coating.

5.2 Storing Parameter Set with LEYCOM IV

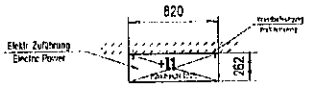
- Set VK 5 keylock switch to Manual Mode.
- Program layer with LEYCOM IV.
- Select required gun and cup.
- Set gun power to 0 %
- No rate regulation
- No pre-set layer thickness
- Specify parameter set (0 to 15) in material parameter set VK 5.
- Start layer in single step mode.
- As soon as layer is running, actuate VK 5 "Store" key.
- The LEDs "Freq.", "Ampl." and sliding potentiometer LEDs "1-16" must be lit up.
- Stop layer.

This completes the storage of the parameter set. For automatic mode, set the keylock switch on the VK 5 to "Auto".





Elektr. Ortbezeichnungen ELECTR. LOCAL DESIGNATIONS			Maße (DIMENSIONS) L(L) B(W) H(H)
+S1	Rezipient-Anlage/Pumpstand Vacuum chamber/pumping part	Gewicht/weight 2000kg/270kg	1450 x 2024 x 2350
+K1	Schaltschrank 1 Electric cabinet	Gewicht/weight 500kg	1340 x 700 x 2000
+K2	Schaltschrank 2 Electric cabinet	Gewicht/weight 250kg	725 x 570 x 2000
+K9	Schaltschrank für APS Electric cabinet	Gewicht/weight 250kg	800 x 600 x 2000
+I1	Leistungsverteilung Power division		262 x 820 x 820
+G1	Plasmagenerator Plasma power supply	Gewicht/weight 210kg	780 x 660 x 880
+E1	Polycold Polycold	Gewicht/weight 450kg	1054 x 711 x 1689
+A1	Hochspannungsversorgung High voltage supply	Gewicht/weight 500kg	600 x 600 x 1200
+S8	Gestell für Trafos Rack for transformers	Gewicht/weight 400kg	854 x 530 x 940



Der Montageort der Leistungsverteilung ist stets in die Nähe des Schaltschrankes +K1 zu legen.
Kabellänge max 5m

Realize the hang of the power division near by the electric cabinet
Cable length max 5m

Nr.	Wasserversorgung: WATER SUPPLY			
	Spezifikation siehe Energiepapier SPECIFICATION SEE ENERGY PAPER			
1	Anlage: PLANT	kalt - Vorlauf COLD ADVANCE	2 x R 3/4"	1.1 1.2
		Rücklauf RETURN	2 x R 3/4"	1.4 1.5
		warm - Vorlauf WARM ADVANCE	1 x R 3/4"	1.3
		Rücklauf RETURN	1 x R 3/4"	1.6
	Leitungen DN 25 (flexibel) Mindestlänge 2 m zwischen Anlage und festem Anschluß. Druckseite am Wassersystem möglich. FLEXIBLE WATER PIPE DN 25, MINIMUM LENGTH 2 M BETWEEN EQUIPMENT CENTER AND WATER PIPE CONNECTION. PRESSURE SIDE AT WATER SYSTEM POSSIBLE			
	Fördermenge RATE OF DELIVERY	warm WARM	V̇ min 100 (l/min)	
		kalt COLD	V̇ min 140 (l/min)	
2	Hochspannungsversorgung HV10 HIGH VOLTAGE SUPPLY HV10			
	Konvektionskühlung Cooling by convection			
3	Polycold PFC 1102 POLYCOLD PFC 1102			
	Anschluß CONNECTION	kalt COLD	Vorlauf ADVANCE	Schlauchtülle 1/2" HOSE NOZZLE 1/2" 3.1
			Rücklauf RETURN	Schlauchtülle 1/2" HOSE NOZZLE 1/2" 3.2
	Fördermenge RATE OF DELIVERY	kalt COLD	V̇ min 20 (l/min)	
4				
	Anschlußdaten: CONNECTION SPECIFICATION			
5	Ausspülleitung: FLUSH LINE			
	Spezifikation siehe Energiepapier SPECIFICATION SEE ENERGY PAPER			
	Drehschieberpumpe D 65 B ROTARY VANE PUMP		Anschluß: CONNECTION	DN 40 5.1
6	Druckluft COMPRESSED AIR			
	Spezifikation siehe Energiepapier SPECIFICATION SEE ENERGY PAPER			
	Zuführung ADMISSION	Luft AIR		1x R 1/4" 6.1
				1x R 3/8" 6.3
	Rückführung REDUCTION	Luft-Wassergemisch AIR/WATER MIX		1x R 3/8" 6.4
7				
8	Prozessgas PROCESS GAS			
	Spez.Ifikation siehe Energiepapier SPECIFICATION SEE ENERGY PAPER			8.1 8.2
	Anschluss: CONNECTION	2x Rohr Ext. Swagelok 2x PIPE EXT. SWAGELOK		

Elektrische Anschlusswerte siehe getrennten Plan ELECTRICAL CONNECTION PLEASE SEE AT SEPARATE DIAGRAM	
Anlagengewicht PLANT WEIGHT	ca. 2200 kg
Vorpumpstandgewicht MEDIUM PUMP SET	ca. 270 kg

SOLID EDGE CAD			A1	120	Aufstellungsplan APS 1104 Floor and erection plan	P.10495 P.10495	
	05.12.2016	Reichert, Christine					
	05.12.2016	Lic Susan			BÜHLER	300042858	02 1 1
	19.12.2016	wirth, Eckhard					